International Journal of **Advance and Innovative Research** (Conference Special) (Part – 1)

Indian Academicians and Researchers Association www.iaraedu.com



Jhakur Educational Trust's (Regd.)

THAKUR COLLEGE OF SCIENCE & COMMERCE



AUTONOMOUS COLLEGE, PERMANENTLY AFFILIATED TO UNIVERSITY OF MUMBAI NAAC Accredited Grade 'A' (3rd Cycle) & ISO 9001: 2015 (Certified) Best College Award by University of Mumbai for the Year 2018-2019

DEPARTMENT OF BOTANY, ENVIRONMENTAL STUDIES AND IQAC

In Collaboration With

University of Mumbai & Supported By NABARD





Organises

One Day National Level Multidisciplinary Conference on

SUSTAINABLE DEVELOPMENT- A GREEN APPROACH

on Saturday, 6th March 2021.

[PEER REVIEWED] ISSN NO: 2394-7780 [VOLUME-I] SPECIAL ISSUE OF INTERNATIONAL JOURNAL OF ADVANCE AND INNOVATIVE RESEARCH

> CONFERENCE CHAIRPERSON Dr. (Mrs.) C. T. Chakraborty, Principal, TCSC

CONFERENCE CONVENOR *Dr. C. P. Shukla* (Head, Department of Botany)

CONFERENCE CO-CONVENOR *Dr. (Mrs.) Priti Gupta* (Head, Department of Environmental Studies) ORGANIZING SECRETARY Dr. Vinit Vaidya (Asst. Professor, Department of Botany)

CONFERENCE CO-ORDINATOR Mr. Sushil Shinde (Asst. Professor, Department of Botany)

EDITORIAL BOARD

Dr. Tazyn Rahman, Editor in Chief-IARA Dr. Akhter Alam, IARA Dr. Nishikant Jha and Dr. C. P. Shukla, Thakur College of Science & Commerce

ABOUT THE COLLEGE



Thakur Junior College was established in 1992, by the founding members, with the notion of providing an avenue of learning within easy reach to the growing young population of Kandivali and its vicinity. It was a natural augmentation by the Thakur Educational Trust, for the S.S.C. Pass-out students at the various schools as well as Thakur Vidya Mandir. Thakur College had a humble beginning with only 57 students in FYJC first batch of Commerce stream. Its success led to the commencement of the Junior Science stream and the Degree College in 1997 followed by the Post Graduate section in 2002. Our college has accomplished a spectacular growth over the last two decades of its journey towards excellence in Education and emerged as a leading Higher Educational Institution in Mumbai. The present total strength of our Degree College [Science & Commerce] is 7587 and the Junior Section is of 5867 students. The College has consistently attained outstanding results and academics at both Degree & Junior levels. We sincerely believe that innovation, passion and the right technique can make learning effective and fun. The numerous feats and triumphs of our students in Academics, Co-Curricular, Extra-Curricular and Sports etc. attests to our commitment towards their overall development and welfare. Our team of experienced and dedicated educators and state of the art infrastructure aids the learners to fulfil their potential and cultivate talents in various activities. The College, in a short span has a record of ground-breaking achievements in every field and has goals of setting international standards in the arena of education. Skill Development, Entrepreneurial Expertise, Industry Alliance, and Collaboration with Foreign Universities are just a few examples of our efforts for providing the best opportunities to the learners and their mentors.

ABOUT UNIVERSITY OF MUMBAI



The University of Mumbai is one of the oldest and premier university in India. It was established in 1857, one amongst the first three universities in India. The profile of the University carved out more than 164 years of its functioning demonstrates its manifold achievements as intellectual and moral powerhouse of the society. The University has always given its best to the country in general and the city of Mumbai in particular. The University is enthusiastically shouldering and carrying diverse social, moral values and responsibilities. It has four campuses situated at Fort Mumbai, Santacruz (Kalina), Thane and Kalyan and one of the sub-centre situated at Ratnagiri. At present University of Mumbai have 850 affiliated colleges and 75 departments. It has established its name in industrial collaborations and runs various professional courses.

ABOUT NABARD



NABARD was established on the recommendations of B. Sivaramman Committee (by Act 61, 1981 of Parliament) on 12 July 1982 to implement the National Bank for Agriculture and Rural Development Act 1981. It replaced the Agricultural Credit Department (ACD) and Rural Planning and Credit Cell (RPCC) of Reserve Bank of India, and Agricultural Refinance and Development Corporation (ARDC). It is one of the premier agencies providing developmental credit in rural areas. NABARD is India's specialised bank for Agriculture and Rural Development in India. The initial corpus of NABARD was Rs.100 crores. Consequent to the revision in the composition of share capital between Government of India and RBI, the paid up capital as on 31 March 2020, stood at Rs.14080 crore with Government of India holding Rs.14080 crore (100% share). The authorized share capital is Rs.30,000 crore. International associates of NABARD include World Bank-affiliated organisations and global developmental agencies working in the field of agriculture and rural development. These organisations help NABARD by advising and giving monetary aid for the upliftment of the people in the rural areas and optimising the agricultural process.



ABOUT CONFERENCE

Humanity has faced numerous difficulties right from its formative stages to modern times. Now we face the challenges of modern progression or development. The negative impact that development has on the environment is a problem that humankind faces. The only plausible solution is to seek sustainable formulas in our interactions with the environment. Sustainable development is the development that meets the needs of the present without compromising the ability of future generations to meet their own needs. In lieu of the 17 goals of sustainable development laid down by the United Nations, the theme of this conference is to focus on a greener approach as well as the pivotal role of modern science in achieving this objective.

AIM OF THE CONFERENCE

The aim of this conference is to promote interactions, provide solutions, and to spread awareness regarding the challenges of sustainable development.

Sub Themes	Disciplines
Environmental Engineering	Life Sciences
Alternative Energy Resources	Environmental Sciences
Pollution	Commerce and Management
Natural Resources Management	Earth Sciences and Geology
Remote Sensing	Atmospheric Science
Climate Change	Oceanography
Ecology	Geography
Bioremediation	Technical Sciences
Toxicology	Agriculture
Meteorology	Economics
Agricultural and Rural Development	Education

CHIEF PATRONS

Shri. Virendra K. Singh Chairman, Thakur Educational Trust

Shri. Jitendra R. Singh Hon. Secretary, Thakur Educational Trust

CHAIRPERSON OF THE CONFERENCE

Dr. [Mrs.] C. T. Chakraborty Principal, TCSC

CONFERENCE CONVENOR *Dr. C. P. Shukla* (Head, Department of Botany)

ORGANIZING SECRETARY Dr. Vinit Vaidya (Asst. Professor, Department of Botany)

CONFERENCE CO-CONVENOR

Dr. (Mrs.) Priti Gupta (Head, Department of Environmental Studies)

CONFERENCE CO-ORDINATOR Mr. Sushil Shinde

(Asst. Professor, Department of Botany)

CORE COMMITTEE MEMBERS

Dr. S.D. Ajagekar Vice Principal, Faculty of Science **Dr. Vijay Jadhav** Dean, Academics- Faculty of Science

Dr. Nishikant Jha Vice-Principal, Faculty of Commerce, Co-ordinator of Accounting and Finance **Dr. Parul Singhal** Dean, Academics- Faculty of Commerce, Head, Department of Commerce

Dr. Santosh Singh IQAC Co-ordinator, Co-ordinator, Department of Information and Technology

ADVISORY COMMITTEE

Prof. (Dr.) Satish Bhalerao Former Head, Environment Research Laboratory, Wilson College, Mumbai

Dr. Nitin Malekar Director, Agri-Food Securities & Healthcare Services Mumbai

Dr. H.M. Pednekar Ex-Principal, A.C.S. College, Palghar, Maharshtra

RESEARCH PAPER BLIND PEER REVIEW COMMITTEE

Dr. V. S. Kannan Kamalanathan, Vice Principal, KES Shroff College

Dr. Malathi Iyer HOD, Vivek College of Commerce

Dr. Sanjay Mishra Principal, Shree L. R. Tiwari Degree College of Arts, Commerce & Science

Dr. Kuldeep Sharma HOD Research Department,K.P.B Hinduja College & Treasurer, IAA (TB)

Prof. (Dr.) Satish Bhalerao Former Head, Environment Research Laboratory, Wilson College, Mumbai

Dr. Mahendra K Gupta

Professor & Head, School of Studies in Botany, Jiwaji University, Gwalior, M.P.

Dr. Y.K Lahir Visiting Faculty, Department of Biophysics, University of Mumbai

Dr. Willy Shah Assistant Professor, Department of Chemistry, Vartak College, Vasai

ORGANISING COMMITTEE

DR. GITESH PADHYE Head, Department of Physics

DR. VITTHAL MOHITE Head, Department of Zoology

MS. NISHA BHATNAGAR Coordinator, Department of Investment Management

DR. RASHMI SHETTY Coordinator, Department of Financial Markets

> **MS. ANURADHA HAIT** Head, Department of Statistics

MS. RAMA RAY Head, Department of Business Communication

MR. ASHISH TRIVEDI Coordinator, Department of Computer Science **DR. APARNA DESHMUKH** Coordinator, Department of Biotechnology

MR. MANOJ K. MISHRA Head, Department of Accountancy

MR. NIRAV GODA Coordinator, Department of Banking and Insurance

> **MR. KULDEEP KANDWAL** Head, Department of Mathematics

MR. OMKAR SINGH Coordinator, Department of Data Science

> **MS. KANKANA GHOSH** Head, Department of Economics

DR. RUPAL SHROFF Coordinator, Department of Management Studies.

MR. DEEPAK KUMAR TIWARI Coordinator, Department of Multimedia and Mass Communication.

> **DR. PRAVIN PAWAR** Coordinator, Department of Aviation

DR. GULAB NIBRAD Coordinator, Department of Actuarial Science

DR. RAKHI BHATTACHARYA Coordinator, Department of E-Commerce

> MR. MANOJ L MISHRA Head, B. .Com. (Honours)

MS. SHUBHANGI NIRWAN Head, Department of Business Law

MR. ASHISH RICHHARIYA Coordinator, Department of Film, TV & New Media Production

> **MS. JUEELEE PATIL** Asst. Professor, Department of EVA & FC.

> **MR. PRATIK SINGH** Asst. Professor, Department of EVS & FC.

BHAGAT SINGH KOSHYARI GOVERNOR OF MAHARASHTRA



 RAJ BHAVAN

 Malabar Hill

 Mumbai 400 035

 Tel.
 : 022-2363 2660

 Fax.
 : 022-2368 0505

 3 March 2021

MESSAGE

I am pleased to know that the Department of Botany Environmental Studies and IQAC of the Thakur College of Science and Commerce is organising and Online National Conference on 'Sustainable Development- A Green Approach' in Association with the University of Mumbai on 6th March 2021.

It is gratifying to note that the Conference will be deliberating on Environmental Engineering, Alternate Energy Resources, Pollution, Natural Resources Management, Remote Sensing, Climate Change and other relevant subjects.

I congratulate the organisers for their initiative in organising the Conference on the important issue of 'Sustainable Development' and wish the participants fruitful deliberations.

(Bhagat Singh Koshyari)



Dr. Suhas Pednekar Hon. Vice Chancellor, University of Mumbai

I am much pleased to address all the stalwarts, researchers, and young ignited minds of this country through the platform of this conference on "Sustainable Development: A Green Approach".

Today, we are witnessing serious conflicts, climate crisis, severe health issues along with rising hunger and persistent inequalities due to our mistakes. If we are really interested to sustain our lives on this planet, we need to be quick and act in coordinated manner. We must focus on effective partnerships and adequate resources, which is possible only through means of sustainable development.

For this purpose, we need to reorient our economic, financial, and governance systems with paradigm shift in technological and technical knowledge through scientific approach to support the environment and get the benefits to all in amicable way. For that we need to focus on the most vulnerable elements of our society at local and global level.

We need to strive for extraordinary achievements through the process of sustainable development in every sector of the life. I count upon all the stakeholders of the society, especially in the field of higher education to come this dream true through not only fruitful deliberations during this conference but make it a successful forum through proper action and practical implementation. I wish a great success to all of you.

Dr. Suhas Pednekar Hon. Vice Chancellor, University of Mumbai



Shri. Virendra Kumar S. Singh Chairman, Thakur Educational Trust

We, at Thakur Educational Trust, endow every student with the best education and infrastructure. We inculcate each student with the best of creative and technical qualifications along with teaching them indispensable human qualities.

We are working profoundly to reform our Education Policies, Execution Strategies, and approach of the governance in tune with the corporate culture, while steadily pursuing environmental initiatives.

To gain trust of all the stakeholders, we work relentlessly to design new mechanisms and adoption of new technologies in the education by remaining dedicated to the environmental management policies. These policies are based on three core values: pursuing environmentally friendly approach, contributing for conservation of the environment and sustainable development to coexist with and cooperation from the society.

Maintaining the highest sense of ethics and professionalism, we aim to build a richer and more liveable intellectual society. We are committed to take of the environmental friendliness in all aspects. Through environmental management, we strive to contribute to the betterment of the natural environment.

I sincerely feel that this one day Conference on "Sustainable Development: A Green Approach" can be right platform to execute the practical implementation of the academic innovations and creations.

Shri. Virendra Kumar S. Singh Chairman, Thakur Educational Trust



Shri. Jitendra Singh Trustee, Thakur Educational Trust

I sincerely feel that the business must serve the society but in today's world of capitalism, we are leaving many people behind. It is increasing the gap between the haves and the have – not. The planet is under severe stress and it is not possible to achieve long term business success in a world, which is suffering from poverty, hunger, and climate change. Can we drive ourselves to reboot this current scenario and system? The answer is "Yes".

The sustainable development goals launched by the United Nations in 2015, are the excellent means to drive this change. They focus upon the feasible action plan for the society and the planet, to thrive through sustainable development. They emphasize upon various issues like attain healthy life; promote sustainable industrialization; affordable, sustainable, and reliable modern energy services for all etc., which are impacting the central dogma of human progress and issues related to the sustainable development such as clean water, and sanitation along with responsible consumption and production.

We need to find a reasonable and achievable solution to all these problems through restructuring various policies, strategies, and methodologies. I am incredibly happy to provide this platform in the form of One Day National Conference for ponderings and discussions. I am sure that we will be able to take away some prolific solutions at the conclusion of this conference. I welcome all the experts, stalwarts and researchers on this platform and wish all the success to all of you.

Shri. Jitendra Singh Trustee, Thakur Educational Trust



Dr. (Mrs.) C. T. Chakraborty Principal, Thakur College of Science & Commerce

India has played a significant role in shaping the sustainable development goals lead down by United Nations. The expression "Sabka Saath, Sabka Vikas" popularized by Honourable Prime Minister of the Country is translated as "Collective Efforts, Inclusive Growth" and forms the corner stone of agenda of development in India. This has helped various sectors of the country to start up again and focus on the sustainable development including the higher education.

Hence, it is our key duty to concentrate upon our active support and participation in terms of intellectual involvement and arguments, which is our asset. We need to organize such kind of conferences on "Sustainable Development" to review the past, investigate the existing systems and plan out the future strategies to aid the mankind. We must work not only to live upon but also to thrive and make this planet at least a good place to live for the upcoming generations.

If so, it is indispensable to focus upon a quality research in all the arenas of higher education to find out all the conceivable real time solutions and mutually exchange with everyone without any confrontation and reluctance. I hope that this one-day National Conference on "Sustainable Development: A Green Approach" is an apt platform for such kind of intellectual interactions, which all of you will avail of to give some tangible resolutions at local and global level to device new practises with scientific approach. All the Best.

abdud of

Dr. (Mrs.) C. T. Chakraborty Principal, Thakur College of Science & Commerce



Dr. Nishikant Jha

Vice- Principal [Degree Commerce], Thakur College of Science & Commerce

Sustainable development is a process which enables all people to realise their potential and to improve their quality of life in ways which protect and enhance the Earth's life support systems. – Sara Parkin

Dear Colleagues,

As we know; Sustainable development is basically an action plan which helps us to achieve sustainability in any activity which makes use of the resource. Moreover, it also demands immediate and intergenerational replication. Through sustainable development, we formulate organising principles which help to sustain the limited resources essential to provide for the needs of our future generations.

On behalf of Thakur College of Science & Commerce; I am honoured and delighted to welcome you to the National Level Multidisciplinary Conference on "Sustainable Development- A Green Approach".

I sincerely hope that the platform will contribute to the better understanding and more effective promotion of sustainable development. I would like to express my appreciation towards University of Mumbai and NABARD. I am overwhelmed by the support and coordination from the members of advisory board, reviewers, and session chairpersons.

Last but not least, I would also like to express my sincere thanks Management, organizing committee, editorial board, presenters and participants for contributing to the grand success of this conference.

Dr. Nishikant Jha Vice- Principal [Degree Commerce], Thakur College of Science & Commerce



Dr. C. P. Shukla Conference Convenor and Head - Department of Botany

I am pleased to welcome you all for NCSDGA with an aim to achieve goals of sustainable development lead down by United Nations by 2030. Our aim is to focus on the fact that transformation is possible and can happen with innovations and research with the engagement of people from various strata. This National Conference is an opportunity to demonstrate that, if the Stalwarts, Researchers, Teachers and Students across the Nation and Globe are united. We can tackle climate change and pursue sustainable development with active support and cooperation. We can make enormous headway in the coming decades, especially for the most vulnerable and the poorest of the poor. When the public desire for change is supported with the political wish and smart policy choices, rapid progress is inevitable.

The foundation of the entire world is shaken due to the human interference in the nature. This has driven us towards worst of the situations of recession of natural resources with terrible consequences for the most vulnerable species. The Biodiversity is at risk and Greenhouse gases responsible for climate change are recorded at high level of risk. We need to choose a path that can bring a healthy and hopeful life to all of us and assure the future generations to build long-term resilience, sustainability, opportunity, and peace. We can convince the present and coming generations with a simple promise to head towards sustainable development with no one left behind.

We can focus on green transition, which can give a cleaner environment with reduction in the risk of future damage and mitigate the worst effects of the climate change. We need to be clear at our aims & objectives, concepts, methodologies, and expected results to make this planet a better place to live. This is not the time to procrastinate. We must grow with an ambition to cut carbon emissions by half in the next decade, paving the way to carbon neutrality by 2050. We need to work to protect biodiversity, to fulfil the promise of the Sustainable Development Goals.

more

Dr. C. P. Shukla Conference Convenor and Head - Department of Botany



Dr. (Mrs.) Priti Gupta Conference Co-Convenor and Head- Department of Environmental Studies

Dear Delegates,

It is my great pleasure and pride to welcome you all on this common platform of National Conference on "Sustainable Development: A Green Approach". All of us are talking about sustainable development in terms of protection of environment and biodiversity with various aspects of science, commerce, economics, management etc. but the main question is how to proceed in a concrete way to achieve this aim in a strategic way?

There are stake holders from various sectors of the higher education, industry, and corporates as the esteemed delegates for this conference. I sincerely feel that they all can play a pivotal role in transformation of sustained economic growth and environmental protection by integrating information about the sustainability into the reporting cycle and making it as an integral part of the life. The philanthropic action by not only science and research but also by individuals and business can make a real impact by deciding not only the existence and utilization of money but even the resources from where it is generated.

We need to develop multilateral systems to meet our goals in a very systematic and premeditated way by accepting integrated approach as far as environment and biodiversity of this globe is considered. We are facing the problems as global community and all the things are related to the fundamental challenge to make enlightened decisions of today and tomorrow to give a better future to this blue planet. I look forward to the deliberations and discussions with everyone's generous contribution to inspire a ray of hope as the beginning.

Plup

Dr. (Mrs.) Priti Gupta Conference Co-Convenor and Head- Department of Environmental Studies

International Journal of Advance and Innovative Research

Volume 8, Issue 2 (III): April - June 2021

Editor- In-Chief

Members of Editorial Advisory Board

Mr. Nakibur Rahman Ex. General Manager (Project) Bongaigoan Refinery, IOC Ltd, Assam

Dr. Alka Agarwal Director, Mewar Institute of Management, Ghaziabad

Prof. (Dr.) Sudhansu Ranjan Mohapatra Dean, Faculty of Law, Sambalpur University, Sambalpur

Dr. P. Malyadri Principal, Government Degree College, Hyderabad

Prof.(Dr.) Shareef Hoque Professor, North South University, Bangladesh

Prof.(Dr.) Michael J. Riordan Professor, Sanda University, Jiashan, China

Prof.(Dr.) James Steve Professor, Fresno Pacific University, California, USA

Prof.(Dr.) Chris Wilson Professor, Curtin University, Singapore

Prof. (Dr.) Amer A. Taqa Professor, DBS Department, University of Mosul, Iraq

Dr. Nurul Fadly Habidin Faculty of Management and Economics, Universiti Pendidikan Sultan Idris, Malaysia

Dr. Neetu Singh HOD, Department of Biotechnology, Mewar Institute, Vasundhara, Ghaziabad Dr. Tazyn Rahman

Dr. Mukesh Saxena Pro Vice Chancellor, University of Technology and Management, Shillong

Dr. Archana A. Ghatule Director, SKN Sinhgad Business School, Pandharpur

Prof. (Dr.) Monoj Kumar Chowdhury Professor, Department of Business Administration, Guahati University, Guwahati

Prof. (Dr.) Baljeet Singh Hothi Professor, Gitarattan International Business School, Delhi

Prof. (Dr.) Badiuddin Ahmed Professor & Head, Department of Commerce, Maulana Azad Nationl Urdu University, Hyderabad

Dr. Anindita Sharma Dean & Associate Professor, Jaipuria School of Business, Indirapuram, Ghaziabad

Prof. (Dr.) Jose Vargas Hernandez Research Professor, University of Guadalajara,Jalisco, México

Prof. (Dr.) P. Madhu Sudana Rao Professor, Mekelle University, Mekelle, Ethiopia

Prof. (Dr.) Himanshu Pandey Professor, Department of Mathematics and Statistics Gorakhpur University, Gorakhpur

Prof. (Dr.) Agbo Johnson Madaki Faculty, Faculty of Law, Catholic University of Eastern Africa, Nairobi, Kenya

Prof. (Dr.) D. Durga Bhavani Professor, CVR College of Engineering, Hyderabad, Telangana **Prof. (Dr.) Shashi Singhal** Professor, Amity University, Jaipur

Prof. (Dr.) Alireza Heidari Professor, Faculty of Chemistry, California South University, California, USA

Prof. (Dr.) A. MahadevanProfessorS. G. School of Business Management, Salem

Prof. (Dr.) Hemant Sharma Professor, Amity University, Haryana

Dr. C. Shalini Kumar Principal, Vidhya Sagar Women's College, Chengalpet

Prof. (Dr.) Badar Alam Iqbal Adjunct Professor, Monarch University, Switzerland

Prof.(Dr.) D. Madan Mohan Professor, Indur PG College of MBA, Bodhan, Nizamabad

Dr. Sandeep Kumar Sahratia Professor Sreyas Institute of Engineering & Technology

Dr. S. Balamurugan Director - Research & Development, Mindnotix Technologies, Coimbatore

Dr. Dhananjay Prabhakar Awasarikar Associate Professor, Suryadutta Institute, Pune

Dr. Mohammad Younis Associate Professor, King Abdullah University, Saudi Arabia

Dr. Kavita Gidwani Associate Professor, Chanakya Technical Campus, Jaipur

Dr. Vijit Chaturvedi Associate Professor, Amity University, Noida

Dr. Marwan Mustafa Shammot Associate Professor, King Saud University, Saudi Arabia **Prof. (Dr.) Aradhna Yadav** Professor, Krupanidhi School of Management, Bengaluru

Prof.(Dr.) Robert Allen Professor Carnegie Mellon University, Australia

Prof. (Dr.) S. Nallusamy Professor & Dean, Dr. M.G.R. Educational & Research Institute,Chennai

Prof. (Dr.) Ravi Kumar Bommisetti Professor, Amrita Sai Institute of Science & Technology, Paritala

Dr. Syed Mehartaj Begum Professor, Hamdard University, New Delhi

Dr. Darshana Narayanan Head of Research, Pymetrics, New York, USA

Dr. Rosemary Ekechukwu Associate Dean, University of Port Harcourt, Nigeria

Dr. P.V. Praveen Sundar Director, Shanmuga Industries Arts and Science College

Dr. Manoj P. K. Associate Professor, Cochin University of Science and Technology

Dr. Indu Santosh Associate Professor, Dr. C. V.Raman University, Chhattisgath

Dr. Pranjal Sharma Associate Professor, Department of Management Mile Stone Institute of Higher Management, Ghaziabad

Dr. Lalata K Pani Reader, Bhadrak Autonomous College, Bhadrak, Odisha

Dr. Pradeepta Kishore Sahoo Associate Professor, B.S.A, Institute of Law, Faridabad

Dr. R. Navaneeth Krishnan Associate Professor, Bharathiyan College of Engg & Tech, Puducherry **Dr. Mahendra Daiya** Associate Professor, JIET Group of Institutions, Jodhpur

Dr. Parbin Sultana Associate Professor, University of Science & Technology Meghalaya

Dr. Kalpesh T. Patel Principal (In-charge) Shree G. N. Patel Commerce College, Nanikadi

Dr. Juhab Hussain Assistant Professor, King Abdulaziz University, Saudi Arabia

Dr. V. Tulasi Das Assistant Professor, Acharya Nagarjuna University, Guntur, A.P.

Dr. Urmila Yadav Assistant Professor, Sharda University, Greater Noida

Dr. M. Kanagarathinam Head, Department of Commerce Nehru Arts and Science College, Coimbatore

Dr. V. Ananthaswamy Assistant Professor The Madura College (Autonomous), Madurai

Dr. S. R. Boselin Prabhu Assistant Professor, SVS College of Engineering, Coimbatore

Dr. A. Anbu Assistant Professor, Achariya College of Education, Puducherry

Dr. C. Sankar Assistant Professor, VLB Janakiammal College of Arts and Science **Dr. G. Valarmathi** Associate Professor, Vidhya Sagar Women's College, Chengalpet

Dr. M. I. Qadir Assistant Professor, Bahauddin Zakariya University, Pakistan

Dr. Brijesh H. Joshi Principal (In-charge) B. L. Parikh College of BBA, Palanpur

Dr. Namita Dixit Associate Professor, Shri Ramswaroop Memorial University, Lucknow

Dr. Nidhi Agrawal Assistant Professor, Institute of Technology & Science, Ghaziabad

Dr. Ashutosh Pandey Assistant Professor, Lovely Professional University, Punjab

Dr. Subha Ganguly Scientist (Food Microbiology) West Bengal University of A. & F Sciences, Kolkata

Dr. R. Suresh Assistant Professor, Department of Management Mahatma Gandhi University

Dr. V. Subba Reddy Assistant Professor, RGM Group of Institutions, Kadapa

Dr. R. Jayanthi Assistant Professor, Vidhya Sagar Women's College, Chengalpattu

Dr. Manisha Gupta Assistant Professor, Jagannath International Management School

Copyright @ 2021 Indian Academicians and Researchers Association, Guwahati All rights reserved.

No part of this publication may be reproduced or transmitted in any form or by any means, or stored in any retrieval system of any nature without prior written permission. Application for permission for other use of copyright material including permission to reproduce extracts in other published works shall be made to the publishers. Full acknowledgment of author, publishers and source must be given.

The views expressed in the articles are those of the contributors and not necessarily of the Editorial Board or the IARA. Although every care has been taken to avoid errors or omissions, this publication is being published on the condition and understanding that information given in this journal is merely for reference and must not be taken as having authority of or binding in any way on the authors, editors and publishers, who do not owe any responsibility for any damage or loss to any person, for the result of any action taken on the basis of this work. All disputes are subject to Guwahati jurisdiction only.





Volume 8, Issue 2 (III): April - June 2021

CONTENTS

Research Papers

A COMPARATIVE STUDY OF NATIONAL EDUCATION POLICY 1986 AND NEW 1-4 NATIONAL EDUCATION POLICY 2020 WITH RESPECT TO MAHARASHTRA STATE

Dr. Nishikant Jha, Ashutosh Jadia and Prachi Vichare

A STUDY ON PRO'S AND CON'S OF DIGITAL EDUCATION DURING THE TIME OF 5-8 COVID-19 WITH RESPECT TO MUMBAI CITY 5-8

Dr. Nishikant Jha, Sanya Sahni and Ashutosh Jadia

STUDY OF ANTIBACTERIAL EFFECT OF CARICA PAPAYA IN CONTROLLING 9–12 BACTERIAL INFECTION, A SUSTAINABLE APPROACH TO AGRICULTURE

D. Meena S. Rao

DECIPHERING THE INSIGHTS OF METAL-MICROBE INTERACTIONS IN 13-16 BIOREMEDIATION USING PROTEOMICS AS A TOOL- A NOVEL APPROACH

Aparajita Chakraborty and Shreya Upadhyay

A STUDY ON SUSTAINABILITY OF A CASHLESS SOCIETY WITH RESPECT TO $17-21\,$ MUMBAI CITY.

Kajal Gala and Ashutosh Jadia

A STUDY ON SUSTAINABILITY OF DIGITAL ADVERTISEMENTS WITH RESPECT 22-26 TO MUMBAI CITY

Nishikant Jha and Ashutosh Jadia

IMPACT OF GREEN ADVERTISING ON CONSUMERS	27 – 29
Dr. Parul Singhal and Shriya Nirale	
A STUDY ON CONSUMER'S PERCEPTION TOWARDS GREEN PROMOTION	30 - 33
Dr. Deepa Shivaji Jamindar	
IMPACT OF COVID ON THE MODES OF PAYMENT: A STUDY IN ULHASNAGAR	34 - 37
Savita Punjabi	
A STUDY ON IMPACT OF DEMONETIZATION ON SMALL SCALE INDUSTRIES.	38 - 41
Mohammed Sadiq Hasan and Mohammad Khalil Ahmad	
DEALING WITH ENVIRONMENTAL CRISIS – ADOLESCENT STUDENTS 'INCLUSION OF NATURE IN SELF'	42 - 46

Devi Ghosh and Gauri Hardikar

REPORTING STANDARD IN CARBON CREDIT ACCOUNTING: A STUDY IN INDIA	47 – 51
Aditya Prasad Sahoo	
THE ROLE OF SMOG IN THE CLIMATE CHANGE AND SUSTAINABILITY	52 - 55
Dr. Ambrish Singh and Dr. Rahul Wagh	
AN ANALYSIS OF IMPACT OF WATER CONSERVATION INITIATIVES ON AWARENESS AMONG SENIOR SECONDARY SCHOOL STUDENTS (A SUCCESS STUDY OF NATIONAL AWARD-WINNING SCHOOL)	56 - 62
Prashant Thote	
PHYSICO-CHEMICAL ANALYSIS OF DRINKING WATER SAMPLES OF DIFFERENT SCHOOLS OF PANVEL IN RAIGAD DISTRICT, MAHARASHTRA, INDIA	63 – 67
J. M. Pawara	
TRADING OF WATER FUTURES ON STOCK EXCHANGES A STEP TOWARDS SUSTAINABILITY	68 – 71
Jay Shah	
TECHNOLOGICAL VISION ON ICT AND SUSTAINABLE DEVELOPMENT: A REVIEW	72 - 74
Mr. Rajesh Yadav	
A STUDY OF ORGANIC FARMING FOR SUSTAINABLE LIVING IN INDIA	75 - 78
Rakhi Bhattacharya	
STUDY OF THE TRADING STRATEGIES IN THE TRENDING MARKET USING CANDLESTICK CHARTS IN TECHNICAL ANALYSIS	79 – 84
Manju Singhania and Jinal Vishal Lathia	
IMPACT OF COVID-19 ON DIGITAL PAYMENTS IN INDIA	85 – 93
Nirav R. Goda	
CONSUMER AWARENESS- RISING DEMAND FOR SUSTAINABLE PRODUCT DEVELOPMENT	94 – 97
Ms. Snehal Obhan	
A CONCEPTUAL STUDY OF SUSTAINABLE DEVELOPMENT IN THE ERA OF GLOBALIZATION	98 - 100
Manoj L Mishra	
A STUDY of ASSESSING THE ROLE OF YOUTH IN COMBATING THE POLLUTION IN MUMBAI CITY	101 – 107
Dr. Sangeeta Makkad	
PANDEMIC & REVOLUTION IN EDUCATION	108 - 114

Dr. Madhura M. Kulkarni and Ms. PramilaYadav

Dr. Bhakti Mehta

A STUDY ON CUSTOMER SATISFACTION WITH RESPECT TO GREEN BANKING 119-124 PRACTICES IN KALYAN JANATA SAHAKARI BANK

Ranjeet D. Thakur and Mahesh Bhiwandikar

SUSTAINABLE DEVELOPMENT THROUGH THE MEDIUM OF CHILDREN'S 125 – 128 LITERATURE

Denise D'Souza

IMPACT OF MEDIA ON THE LEGISLATION OF ENVIRONMENT RELATED LAWS 129 – 133

Ruchi Pandey and Ms. Rama Ray

ANALYSIS OF MUMBAI METRO RAIL PROJECT: STUDY OF ENVIRONMENTAL & 134 – 139 SOCIAL ASPECTS

Kajol N. Vajani

PREDICTING BUSINESS TRENDS USING ARTIFICIAL INTELLIGENCE 140 – 141

Ashish Trivedi

SOCIAL MEDIA NETWORKING CRIME: ANALYSIS OF LEGAL FRAMEWORK AND 142 - 148 CHALLENGES TO LAW ENFORCEMENT AGENCIES IN INDIA

Gopal Ramnarayan Mantri

MATHEMATICAL MODELS USED AS A USEFUL TOOL FOR SUSTAINABLE 149-155 DEVELOPMENT

Ms Rituparna Choudhary

DIVERSITY OF AQUATIC ANGIOSPERMS AND ASSOCIATED SPECIES OF HERANJ 156–162 WETLAND, KHEDA – GUJARAT FOR SUSTAINABILITY

Jaivin Patel and Dr. Bharat Maitreya

INFLUENCE OF PHYSICO-CHEMICAL PARAMETERS ON DIVERSITY OF FRESH 163–168 WATER ALGAE OF PALGHAR AND THANE DISTRICTS OF MAHARASHTRA

Chandra Prakash Shukla*, S. D. Ajagekar, G. G. Padhye and Muskan R. Dubey

TAXONOMIC STUDY OF THE LICHEN DIVERSITY IN SANJAY GANDHI NATIONAL 169 – 173 **PARK MUMBAI (M.S.) INDIA**

Rafi Ahmed*, More Pranay Dayanand and Rukhsar Bano Ansari

IMPACT OF EDUCATION FOR SUSTAINABLE DEVELOPMENT ON GEN Z 174 – 178

Ms. Rama Ray

WILDLIFE CORRIDOR GEOMETRY DESIGN USING COMPUTATIONAL APPROACH 179–183

Amit Maurya, Vallabh Saklani and Akshata Gupta

STUDY ON BLENDING OF GROUNDNUT OIL WITH OTHER VEGETABLE OILS AND 184 – 190 ITS INFLUENCE ON PHYSICOCHEMICAL PROPERTIES

Dnyaneshwari Kulkarni, Dr. Gitesh Padhye^{*}, Dr. Ravindra D. Kulkarni

ANTIFUNGAL ACTIVITY OF KOKAM LEAF EXTRACT 191 – 194

Dr. Abhijit Sahasrabudhe

SOME IMPORTANT MEDICINAL PLANTS AND METHODS OF UTILIZATION BY 195–197 TRADITIONAL HEALERS IN KUDAL TEHSIL OF SINDHUDURG DISTRICT (MAHARASHTRA)

P. P. Borate and D. M. S. Rao

COMPARATIVE ANALYSIS OF CHEMICAL COMPONENTS OF TANNERY 198 – 205 **WASTEWATER AND ITS IMPACT**

R Mallick

A STUDY ON SUSTAINABLE INSURANCE-OPPORTUNITIES, ISSUES AND 206–208 CHALLENGES ONE DAY NATIONAL CONFERENCE (ONLINE) ON SUSTAINABLE DEVELOPMENT-A GREEN APPROACH

Rashmi V. Shetty

EXPLORING THE EVOLVING RELATIONSHIP BETWEEN ENVIRONMENTAL 209 - 214 SUSTAINABILITY AND BUSINESS

Rakhee Pathak

GREEN ECONOMY: A JAMMU AND KASHMIR PERSPECTIVE 215 – 225

M. H. Wani and Arshad Bhat

CONCEPTION OF EDUCATION FOR ENVIRONMENTAL SUSTAINABLE 226 – 229 **DEVELOPMENT OF PROSPECTIVE TEACHERS OF BHOPAL**

Gyaneshwari Kurmy and Dr. N. C. Ojha

SUSTAINABILITY IN DAY TO DAY LIFE 230 – 233

234 - 237

SUSTAINABLE TOURISM IN INDIA: NEED FOR PRESENT AND FUTURE

Priti Gupta and Alok Raj Soni

GREEN LIBRARY: CONCEPT AND ELEMENTS 238 – 241

Rupesh Sawant

Jueelee Patil

SUSTAINABLE DEVELOPMENT:- THE PROBLEM OF ENERGY AND THE IMPACT 242 - 246 OF ITS CONSUMPTION

Dr. Amardeep D. Jadhav

EFFECT OF CARBENDAZIM AND PENDIMITHALIN AND THEIR COMBINATION IN 247–251 THE NITROGEN FIXING EFFICIENCY OF RHIZOBIUM AND RHIZOSPHERE MYCOPHLORA OF PEA (PISUM SATIVUM L.)

Ruchi S. Singh

STUDY OF AMYLASE INHIBITOR ACTIVITY IN SEED EXTRACTS OF SELECTED 252–256 LEGUMES

Priyanka Shukla and Vibha Gupta

EVOLUTION OF AGRICULTURAL MARKETING IN TELANGANA STATE ISSUES 257 – 259 AND CHALLENGES –A STUDY

J. Ajay Kumar

STUDY OF QUALITY OF WATER WITH CLIMATIC CHANGES OF BEACHES IN 260–267 MUMBAI REGION, MAHARASHTRA, INDIA

Vipul Purohit, Sanjay Shukla and Rajkumar Yadav

A STUDY TO CLASSIFY STUDENTS RECORDS BASED ON ACADEMIC 268 – 271 PERFORMANCE USING TREE BASE CLASSIFIERS

Mrs. Prabha Siddhesh Kadam and Dr. Girish Tere

FUNGAL ORGANISMS AS THE POTENTIAL CATALYST FOR BIOREMEDIATION OF 272 – 276 HEAVY METALS

Vinit Vaidya, Shruti Papaiya and Deepak Gupta

A REVIEW ON POLYCYCLIC AROMATIC HYDROCARBONS: SOURCES, ROUTES OF 277 – 280 EXPOSURE AND METHODS OF BIO-REMEDIATION

Kirti S. Kulkarni, S. D. Ajagekar, C. P. Shukla, G. G. Padhye

THE IMPACT OF 2019 FLOOD ON THE RIVER CHALIYAR OF KERALA 281 – 282

Mohammed Shafi P and Dr. Afeef Tharavattath

CARBON EMISSION-A PROBLEM OF DIGITAL COMMUNICATION 283 – 287

Utkarshkumar Sinha and Shiv Kumar Chandey

A STUDY ON POLLUTION SPREAD BY DOMESTIC WASTE AND ITS CONTROL 288 – 292 PRACTICES IN HARYANA

Anil Kumar Grewal

EFFECT OF INDUSTRIAL AIR POLLUTION ON MICROMORPHOLOGY OF SOME 293–297 **PLANTS GROWING ALONG NAVAPUR ROAD IN TARAPUR INDUSTRIAL AREA.** (MIDC), MAHARASHTRA

Manohar Rathinam and Swaranjit Kaur Cheema

PROBLEMS IN DISPOSING MENSTRUAL WASTE AND EFFECTS OF DISPOSAL 298 – 301 **PRACTICES ON ENVIRONMENTAL SUSTAINABILITY WITH SPECIAL REFERENCE TO WOMEN IN MUMBAI**

Ms. Mamata Madhusudan Tendulkar and Dr. Sushma Raju Ambadekar

DROP IN POLLUTION DUE TO LOCKDOWN – A BOON TO THE NATURE	302 - 305
Prerna Pande and Ms. Rama Ray	
USE OF PLASTIC IN CONSTRUCTION: A CRITICAL REVIEW	306 - 313
Omkar Palande, Samiksha Markande and Doulat M Chainani	
PREPARATIONS OF POLYMER-BASED SENSORS FOR THE DETECTION OF ENVIRONMENTALLY HARMFUL GASES LIKE ETHANOL (C ₂ H ₆ OH), BASED ON ORGANIC CONJUGATED POLYMERS LIKE POLYPYRROLE	314 - 318
Dr. Chitte H. K. and Dr. Milind S. Jog	
STUDY OF SOME FRESHWATER ALGAE FORM HIMACHAL PRADESH, INDIA	319 - 327
R. K. Dwivedi	
INDIAN AGRICULTURE: PRESENT STATUS AND NEED OF SUSTAINABLE DEVELOPMENT	328 - 331
Santosh S. Pharande	
CLIMATE CHANGE – A PRAGMATIC APPROACH	332 - 335
Dr. Nutan. P. Madiwal	
UTILIZATION OF FLY ASH IN INDUSTRIAL APPLICATIONS FOR CONTROLLING ENVIRONMENTAL POLLUTION	336 - 340
M. S. Jog [*] , H.K.Chitte, D. M. Nerkar and Gitesh G. Padhye	
SUSTAINABLE DEVELOPMENT – A GREEN APPROACH" ALTERNATIVE ENERGY RESOURCES A STUDY ON GREEN COMPUTING	341 - 344
Mrs. Vijayalaxmi S Suvarna	
CONDUCTING POLYMERS: AS AN ALTERNATE ENERGY SOURCE	345 - 349
Kirsten lobo* and Dr. PravinPawar	
EFFECT OF CARICA PAPAYA ON SEED GERMINATION AND PHYSIOLOGICAL RESPONSE OF TRIGONELLA FOENUM GRAECUM	350 - 353
Ayesha Maste and [*] Dr. D. Meena S. Rao	
A CRITICAL ANALYSIS OF THE CITRUS PEEL WASTE VALUE CHAIN FROM A SUSTAINABLE CIRCULAR ECONOMY PERSPECTIVE	354 - 360
Ms. D. Pranita Rao and Dr. D. Meena S. Rao	
GENOME EDITING TO DESIGN MICROORGANISMS FOR BIOREMEDIATION	361 - 362
Dr. Aparna Deshmukh and Paridhi Sharma	
NEW AGE BUSINESS VENTURES TO SUPPORT TRIPLE BOTTOM LINE – A STEP TOWARDS SUSTAINABLE ENTREPRENEURSHIP	363 - 367

Dr. Rupal Shroff and Karan Shah

A STUDY ON GREEN INVESTING OPPORTUNITIES IN THE FINANCIAL MARKET	368 - 370
Dr. Sharyn Prabhakar Bangera	
ASSESSMENT OF POLLUTION IN WARD P/N OF GREATER MUMBAI	371 - 376
Prof. Dr. Moushumi Datta	
SPECTRAL RESPONCES OF C.I.E.1964 R.G.B. DATA USING PYTHON	377 – 382
T. N.Ghorude and M. P. Patil	
INFLUENCE OF VAM ON SOME PHYTOCONSTITUENTS IN MEDICINAL PLANTS:	383 - 388

Dr. Ajita Kumar

REVIEW

A COMPARATIVE STUDY OF NATIONAL EDUCATION POLICY 1986 AND NEW NATIONAL EDUCATION POLICY 2020 WITH RESPECT TO MAHARASHTRA STATE

Dr. Nishikant Jha¹, Ashutosh Jadia² and Prachi Vichare³

Vice Principal¹ and Student^{2,3}, Thakur College of Science and Commerce, Kandivali (E), Mumbai

ABSTRACT

Education is essential pillars on which every nation can stand/rely and touch new heights. Each and every living thing deserves the right to be educated, which results in designing their behaviour and future life. Every country adopts different education policies by considering their current situation and trying to make it effective at school and college. Recently the Government of India announced its new Education policy. So what are major changes? And how effective are they? The main aim of this paper is to understand and analyse New Education Policy of the government. In this paper we will study, predict and compare traditional and new policy.

Keywords: Indian Education, Future of Indian Education, Indian Education Policy 2020.

INTRODUCTION:

National Education Policy 1986: Role of any policy is all round development, in the same way NEP 1986 (National Education Policy 1986) aimed amelioration and advancement in the education system of India. Common education structure of 10 (5+3+2)+2+3+2 is followed. The first preliminary education starts at the 6th year of a child at Primary school level. Two years of higher secondary level, students choose specialization areas and subjects like Science subjects or Commerce subjects or Arts subjects. Undergraduate programmes are for three to four years. Postgraduate education is of two years with specialization focus.

National Education Policy 2020: Objective of this policy is to provide Multidisciplinary & interdisciplinary liberal education. Common education structure of 5+3+3+4+4+1 is suggested. The first preliminary education starts at the 3rd year of a child as a Foundation stage. Four years Secondary education stage is designated by clubbing Two years higher secondary level and two years pre-university levels. Four years Secondary education stage contains common subjects and elective subjects. Choice is based on liberal education policy.. Undergraduate programmes are of four years with a provision to exit after one year with a diploma, after two years with an advanced diploma, after three years with a pass degree, and after four years with project based degree.

REVIEW OF LITERATURE:

- 1. Bouhajeb, M., Mefteh, H., & Ammar, R. B. (2018). Higher education and economic growth: the importance of innovation. Atlantic Review of Economics, 1(2), 4.
- 2. Fan, S. C., & Yu, K. C. (2017). How an integrative STEM curriculum can benefit students in engineering design practices. International Journal of Technology and Design Education, 27(1), 107-129.
- **3.** Singh, J. D. (2011). Higher education in India–Issues, challenges and suggestions. Higher education, 93-103, ISBN: 978-3-8465-1753-6.

AIMS AND OBJECTIVE:

- To understand the new education policy 2020.
- To compare National Education Policy 2020 with the National Education policy 1986.
- To study the innovations in new education policy 2020.
- To identify the merits and demerits of new education policy 2020.

International Journal of Advance and Innovative Research

Volume 8, Issue 2 (III) April - June 2021



HYPOTHESIS:

H0: National Education Policy 2020 is sustainable in future and will have positive outcomes.

H1: National Education Policy 2020 is not sustainable in future and will have negative outcomes.

H0: There is a significant relation between sustainability National Education Policy 2020 and expansion of years of schooling.

H1: There is a significant relation between sustainability National Education Policy 2020 and expansion of years of schooling.

RESEARCH AND METHODOLOGY:

Research design is descriptive. The data for the study is collected from both primary and secondary sources. Primary data is generated through an online survey. The population targeted for the study are Mumbai based individuals. A sample of 157 respondents is collected by randomly sending the survey forms through communication means like email and Whatsapp, etc. And secondary data is collected via. reliable website.

ISSN 2394 - 7780

Volume 8, Issue 2 (III) April - June 2021

TESTING OF HYPOTHESIS:

T-Test: Paired Two Sample for Means	Do you feel the new education policy 2020 is more suitable for students considering the post covid -19 scenario?	According to you, What kind of change do you think the new education policy 2020 will bring out in students, parents, and faculty?
Mean	1.381987578	1.366459627
Variance	0.598179215	0.531955651
Observations	322	322
Pearson Correlation	0.960516369	
Hypothesized Mean Difference	0	
df	321	
t Stat	1.292337137	
P(T<=t) one-tail	0.098584971	
t Critical one-tail	1.649614384	
P(T<=t) two-tail	0.197169943	
t Critical two-tail	1.967381707	

By using T-test paired of Two sample mean series as p>0.05 i.e. 0.09858498 P (T>=t), hence hypothesis H1(National Education Policy 2020 is sustainable in future and will have positive outcomes.)is accepted.

Anova: Single Factor						
SUMMARY						
Groups	Count	Sum	Average	Variance		
What are your views on the new education policy which expands the age group from 6- 14 years of schooling to 3-18 years of schooling?	322	373	1.158385093	0.214711403		
Do you feel the new education policy 2020 is more suitable for students considering the post covid -19 scenario?	322	445	1.381987578	0.598179215		
ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	8.049689441	1	8.049689441	19.80509866	0.0000101	3.855984037
Within Groups	260.9378882	642	0.406445309			
Total	268.9875776	643				

By using Anova: Single Factor test as p<0.05 i.e. 0.0000101 P (T<=t), hence hypothesis H0(i.e.There is no significant relation between sustainability National Education Policy 2020 and expansion of years of schooling.) is accepted.

CONCLUSIONS:

As most of us know, education is so important these days and to reach that destination we start investing in ourselves. Improving the quality of education results in improvement of Society in many ways. If you study closely you will come to know, Indian higher education system is moving towards more student focused, from information focused to knowledge focused, from marks focused to skills focused, from examination focused to experimental focused, from learning focused to research focused, and from choice focused to ability focused.

REFERENCES:

•

NEP_Final_English_0.pdf (educati https://www.education.gov.in/sites/upload files/mhrd/files/NEP Final English 0.pdf

- (education.gov.in)
- India National Education Policy (NEP) 2020: Everything you need to know (indianexpress.com) https://indianexpress.com/article/explained/reading-new-education-policy-india-schools-colleges-6531603/
- India National Education Policy (NEP) 2020: Everything you need to know (indianexpress.com) https://indianexpress.com/article/explained/reading-new-education-policy-india-schools-colleges-6531603/
- Sinha, V., & Subramanian, K. S. (2013). Accreditation in India: path of achieving educational excellence. Business education & accreditation, 5(2), 107-116.
- ashutoshjadia.blogspot.com

International Journal of Advance and Innovative Research

Volume 8, Issue 2 (III) April - June 2021

- Sankaran, K., & Joshi, G. V. (2016). Autonomy for excellence in higher education in India. NitteManagement Review, 10(2), 1-10.
- New Education Policy 2020 Highlights: School and higher education to see major changes education Hindustan Times https://www.hindustantimes.com/education/new-education-policy-2020-live-updates-important-takeaways/story-yYm1QaeNyFW4uTTU3g9bJO.html

A STUDY ON PRO'S AND CON'S OF DIGITAL EDUCATION DURING THE TIME OF COVID-19 WITH RESPECT TO MUMBAI CITY

Dr. Nishikant Jha¹, Sanya Sahni² and Ashutosh Jadia³

Vice Principal¹ and Student^{2,3}, Thakur College of Science and Commerce, Kandivali East, Mumbai

ABSTRACT

Education is an important aspect that plays a huge role in the modern, industrialized world. Every person deserves the right to be educated. But the ongoing pandemic brought the entire world to a stand still and this is when digital education was implemented. As schools and colleges were shut an alternative way had to be adopted to start the schools and colleges. Is online education convenient than offline education? Are the students suffering due to network problems? Has the quality of teaching changed. The main aim of this paper is to understand the pros and cons of digital education. In this paper we will study in what ways online teaching affects education.

Keywords: Digital Learning, Digital Classroom, Virtual Learning, Digital Education during Covid times.

INTRODUCTION

Digital Education means Digital Learning. It is a type of learning that is supported by digital technology or by instructional practice that makes effective use of digital technology. Digital education is the innovative use of digital tools and technologies during teaching and learning, and is often referred to as TEL (Technology Enhanced Learning) or e-Learning. Teachers and professors too find it convenient to prepare their teaching plans aided by digital technology. Teaching and learning becomes a smoother experience as it includes animations, gamification and auto-visual effects. Digital Education guarantees more participation from students as the current generation of students are well versed with laptops, I-pads, and smartphones. With evolution of technology such as cloud, data centres and video based learning there is a huge potential for technology to be integrated with educational industry. Teachers find it convenient to prepare their learning plans well aided by technology. Students too view this as a flexible option as it allows them to study as per their time and pace. Today, due to hi-tech network and multimedia, the education sector has emerged as a fast developing field. The internet is further proving to be one of the most cost-effective ways to educate young minds. It is also a powerful system to integrate a world-class learning experience for everyone. Another prominent result of the use of technology in education is that there is an extensive change in the teaching and learning methods, styles, and content across many schools in India.

REVIEW OF LITERATURE

- Anca Gabriela llie, Dan Dunitriu, Rodica Milena Zaharia, Oana Artonia and Colibasaru (2009) had studied the public expenditure on higher education in Romanian Universities. Then compared and analysed both quantitative and qualitative indicators & evaluated and estimated their position on the Romanian education market and finally concluded that setting up of a framework for the resource allocation priorities helps to the quality indicators and for improvement of higher Education.
- World Bank (2002) 86 study indicates that more differentiated systems, including private and non university institutions can help to meet growing demand and make higher education more responsive to labor market needs. Successful higher education systems found in Australia and New Zealand, 38 other than the US is a good example. It also noticed that European countries are undergoing a series of policy debates on financing higher education focusing on the extent and degree of cost recovery for enabling the transition from a select group to mass oriented higher education.

AIMS AND OBJECTIVES

- 1. To study the pros and cons of digital education from a teacher's perspective.
- 2. To study whether online education has a positive or negative impact on students.

HYPOTHESIS

H0: There is no significant relation between online education and quality of teaching.

H1:There is a significant relation between online education and quality of teaching.

RESEARCH AND METHODOLOGY:

International Journal of Advance and Innovative Research

Volume 8, Issue 2 (III) April - June 2021

Research design is descriptive. The data for the study is collected from both primary and secondary sources. Primary data is generated through an online survey. The population targeted for the study are Mumbai based individuals. A sample of 129 respondents is collected by randomly sending the survey forms through communication means like email and Whatsapp, etc. And secondary data is collected via. reliable website. **DATA INTERPRETATION:**



In our survey, 52.7% were males whereas 47.3% were females.



The respondents of our survey belonged to the age group of 16-30.



While conducting the survey we found out that 96.9% students attend lectures / classes / meetings conducted online and 3.1% students don't attend.

31.8%

What do you Prefer 129 responses 68.2% 68.2% Control of the expectation Con

From the survey we understood that only 31.8% people are comfortable with the online education adopted recently where as most of the people that is 68.2% people still prefer the traditional offline education.

Do you interrupted due to lack in internet connection? 129 responses



There are around 89.1% people who face disturbance and get interrupted due to internet problems and only 10.9% people do not face any problems due to the internet.



From the survey conducted, we can conclude that out of the 100% only 45.7% students enjoy online classes / lectures while the remaining 54.3% don't enjoy online lectures.

Should School/College switch to online platform permanently? 129 responses



As per the survey that was conducted, majority of people that is 80.6% of people don't want that schools and colleges should switch to online platform. Where as 19.4% people are in the favour of schools and colleges permanently switching to online platform in the coming years.

TESTING OF HYPOTHESIS:

t-Test: Paired Two Sample for Means	Variable 1	Variable 2
Mean	1.317829457	1.108527132
Variance	0.218507752	0.097504845
Observations	129	129
Pearson Correlation	0.511168997	
Hypothesized Mean Difference	0	
df	128	
t Stat	5.820855001	
P(T<=t) one-tail	2.22287	
t Critical one-tail	1.656845226	
P(T<=t) two-tail	4.44574	
t Critical two-tail	1.97867085	

By using T-test paired of Two sample mean series as p>0.05 i.e. 9.10969 P (T>=t), hence hypothesis H1(There is a significant relation between online education and quality of teaching.)is accepted.

SUGGESTIONS: 1) The teacher can make diagrams, pie charts, animations or show some videos so that the students enjoy online learning.

- 2) The schools and colleges can make a provision of recording the lectures for the students who have missed it due to internet problems.
- 3) Teachers can improve interaction with students and should communicate more often.

CONCLUSIONS:

Education is one the important pillars on which any nation can stand/depend and reach new heights. Each and every living thing deserves the right to be educated, which results in designing their behaviour and future. With the help of online education institutions were able to continue the flow of education. As every coin has two sides, so does online education in our paper we tried to cover both. Nowadays the internet plays a major role in education and many other fields.

REFERENCES:

- www.researchgate.net
- https://shodhganga.inflibnet.ac.in/
- www.cnbc.com
- www.businessinsider.com
- www.forbes.com
- Finance.yahoo.com
STUDY OF ANTIBACTERIAL EFFECT OF CARICA PAPAYA IN CONTROLLING BACTERIAL

D. Meena S. Rao

INFECTION. A SUSTAINABLE APPROACH TO AGRICULTURE

Department of Botany, Seva Sadan's R. K. Talreja College of Arts, Science and Commerce, Ulhasnagar

ABSTRACT

India is an agricultural country. Traditional and modern agricultural practices are followed by the farmers. Sustainable agriculture is a broad area encompassing issues related to financial, social, human, environmental, and biological resources in the development of technology and social institutions. India's agriculture is struggling with insufficient storage. Losses occur due to post-harvest diseases any time during post-harvest handling, from harvest to consumption. Perishables go bad in store houses before they can be consumed. Sustainable agricultural practices help to keep the crop and food healthy, edible and decrease spread of infection and disease. The present study deals with the antibacterial effect of Carica papaya on Escherichia coli as a sustainable approach to agriculture. Carica papaya is from the Caricaceae family and is commonly called 'papaya'. It has anti-inflammatory, antioxidant, diuretic, antibacterial, antifungal activity, antihelmenthic and immunomodulatory properties. Scientific evidence suggests its traditional use in different diseases. Phytochemical studies show that Carica papaya contains mainly alkaloids carpaine, pseudocarpaine, tannins, flavonoids, carcin, gamma terpine, glycoside carposides, sugars etc. The bioactive compounds from the peel, pulp and seeds were extracted using water. These were investigated for antibacterial effect on Escherichia coli. The aqueous extracts of the peel, pulp and seeds were tested at 2, 4, and 8mg/100ml concentrations on the bacterial isolates. All the concentrations of peel, pulp and seeds show antibacterial activity. Results showed that the aqueous extracts of ripe fruit peel at 4%, Pulp at 8% and seed at 8% show maximum zone of inhibition of Escherichia coli while the aqueous extract of raw fruit peel at 4% and seed and pulp at 8% concentrations also showed maximum zone of inhibition. The comparison of results for raw and ripe fruit peel, pulp and seed showed similar zones of inhibition. In both, seed extracts showed a maximum zone of inhibitions at 2%, 4% and 8% concentration.

Keywords: sustainable approach, post-harvest, antibacterial, disc diffusion method, zone of inhibition.

INTRODUCTION:

India is an agricultural country. Traditional and modern agricultural practices are followed by the farmers. Sustainable agriculture is a broad area encompassing issues related to financial, social, human, environmental and biological resources in the development of technology and social institutions [1]. The agriculture sector faces many challenges such as climate change, biodiversity loss, water scarcity, drought, floods, soil degradation, etc. These challenges advocate transition to a sustainable mode of production and consumption [2].

The herbal products are safe in comparison to the synthetic products that are unsafe to humans and the environment [3]. The herbs are valued for their medicinal, flavoring, and aromatic qualities, but the synthetic products surpass their importance. However, the indiscriminate reliance on synthetic products has come to an end and farmers are returning to the naturals with hope of safety and security. Plants have been reported to be the cheapest and most effective source of drugs [4]. India's agriculture is struggling with insufficient storage. Losses occur due to post-harvest diseases any time from harvest to consumption. Perishables go bad in store houses before they can be consumed. Post-harvest diseases of fruit and vegetables are mostly caused by fungi and bacteria. Sustainable agricultural practices help to keep the crop and food healthy and edible and decrease spread of infection and disease. *Carica papaya* is from the Caricaceae family and is commonly called 'papaya'. It has anti-inflammatory, antioxidant, diuretic, antibacterial, antifungal activity, antihelmenthic and immunomodulatory properties. It is rich in antioxidant vitamin A, C, and E, magnesium, potassium, pantothenic acid, folate and fiber [5].

Scientific evidence suggests its traditional use in different diseases. Phytochemical studies show that *Carica papaya* contains mainly alkaloids carpaine, pseudocarpaine, tannins, flavonoids, carcin, gamma terpine, glycoside carposides, sugars etc. The present study deals with the antibacterial effect of *Carica papaya* on *Escherichia coli* as a sustainable approach to agriculture. *Escherichia coli* has been used as a model example for bacterial infection.

MATERIALS AND METHODS:

Collection of plants:

Carica papaya ripe and raw fruits were collected from the local market of Ambernath.

ISSN 2394 - 7780

Volume 8, Issue 2 (III) April - June 2021

Preparation of plant extract:

The raw and ripe papaya fruits were washed under running tap water to remove dust and soil and then dried with tissue paper. The seeds and peel of papaya fruits were separated from the pulp. Papaya peel and pulp were cut into small pieces of about 1 cm. Raw and ripe papaya peel, pulp and seeds were surface sterilized in sodium hypochloride solution for 5 minutes and rinsed several times with distilled water. 2 gm, 4 gm and 8 gm of fresh peel, pulp and seeds were respectively crushed using mortar pestle. The freshly ground material was taken in conical flasks containing 100 ml of distilled water. Conical flasks were kept on a rotatory shaker for 24 hours [6]. The extract mixture was filtered through muslin cloth. Each extract mixture was centrifuged for 20 minutes at 5000 rpm. Aqueous extracts of peel, pulp and seeds of different concentrations (2%, 4% and 8%) were prepared and stored in the refrigerator to reduce the allelochemicals degradation for the further usage [7].

Microorganism preparation:

The model organism *Escherichia coli* culture was obtained from the Microbiology Department of R. K. Talreja College of Arts, Science and Commerce, Ulhasnagar-3. The bacteria were collected on sterile agar slants and incubated at 37° C for 48 hours in nutrient broth. After revival they were then kept as stock cultures in the refrigerator set at 4° C. Nutrient agar plates were inoculated with standardized inoculums of the test microorganism (*Escherichia coli*). Filter paper discs (about 6 mm in diameter) treated with the raw and ripe *Carica papaya* peel, pulp and seed aqueous extract at 2%, 4% and 8% concentration, were placed on the nutrient agar surface. The Petri dishes were incubated at 37° C [8].

Aqueous extract	Zone of inhibition (in mm)						
Concentration of	Ripe			Raw	W		
Carica papaya	Peel	Pulp	Seeds	Peel	Pulp	Seeds	
2%	0.4	0.4	0.6	0.5	0.5	0.6	
4%	0.6	0.5	0.5	0.6	0.5	0.5	
8%	0.3	0.9	0.7	0.5	0.7	0.8	

Table 1 Treatment of Carica papaya aqueous extract on E. coli





Figure 2 Antibacterial effect of Raw Carica papaya

RESULT AND DISCUSSION:

The antibacterial effect of aqueous extract of raw and ripe *Carica papaya* fruits has been observed in all the concentrations of peel, pulp and seeds on E. coli. The results showed that the aqueous extracts of ripe fruit peel at 4%, pulp and seed at 8% have maximum zones of inhibition. Ripe Carica papaya peel at 4% concentration shows zone of inhibition of 0.6 mm, at 8% concentration, pulp show 0.9 mm of zone of inhibition and seeds show zone of inhibition of 0.7 mm. Maximum inhibition was seen at 8% of ripe fruit pulp extract.

The aqueous extract of raw Carica papaya peel, pulp and seeds at 2% concentration show 0.5 mm, 0.5 mm and 0.6 mm zones of inhibition respectively; while at 4% concentration the peel extract shows 0.6 mm zone of inhibition, but the pulp and seed extracts show 0.5 mm zones of inhibition each. At 8% concentration seed extract showed maximum zone of inhibition (0.8 mm), the pulp extract showed 0.7 mm and peel extract showed 0.5 mm zones of inhibition.

The comparison of results for raw and ripe fruit peel, pulp and seed showed similar zones of inhibition. In both seed extracts showed a maximum zone of inhibitions at 2%, 4% and 8% concentration.

The results of different studies have previously provided evidence about some medicinal plants and have suggested they might indeed be potential sources of new antibacterial agents [9]. Other researchers have reported that organic extracts of the dried seed of Carica papaya, produces microbial inhibition [10].

CONCLUSION:

Carica papaya show maximum inhibition at 8% concentration of pulp extract. Peel and seeds also show maximum inhibition. Peel at 4%, seed at 8% show maximum zone of inhibition of Escherichia coli while the aqueous extract of raw fruit peel at 4% and seed and pulp at 8% concentrations also showed maximum zone of inhibition. The use of natural product *Carica papaya* to control bacteria infecting the agricultural crops during pre and post-harvest period will not only minimize the loss of crop and perishables during storage and transit but will also lead a way towards sustainable agricultural practices and help in waste management produced in industries at large scale. Seed management can increase crop yields and aid in sustainable agriculture.

Fruits and vegetables perish rapidly in store houses or during transportation due to bacterial and fungal infections, pests, unpredictable weather, and the lack of appropriate storage facilities. Thus, production and storage need to be improved to feed the ever-growing population. Developing natural product-based treatments has become the need of the hour in pre and post-harvest technology.

REFERENCES:

- 1. Thompson PB (2007) Agricultural sustainability: what it is and what it is not. Int J Agric Sustain 5(1):5–16
- El Bilali H, Allahyari MS (2018) Transition towards sustainability in agriculture and food systems: role of 2. information and communication technologies. Inf Process Agric 5(4):456-464
- 3. Indian Materia Medica by K M Nadkarni, 1st Edn by A. K. Nadkarni, Popular Prakashan Pvt. Ltd, Bombay, 1954, pp.273-277.

Volume 8, Issue 2 (III) April - June 2021

- 4. Dawkins G, Hewitt H,Wint, Y., Obiefuna, P.C. and Wint, B. (2003), Antibacterial effects of *Carica papaya* fruit on common wound organisms *,West Indian Med J.* 2003 Dec;52(4):290-2.
- 5. Aravind. G, Debjit B, Duraivel. S, Harish. G. 2013. Traditional and Medicinal Uses of *Carica papaya*. *Journal of Medicinal Plants Studies*. 1(1): 7-15.
- 6. Orhue P.O. and Momoh A.R.M. (2013), *International Journal of Herbs and Pharmacological Research IJHPR*, 2013, 2(4): 42 47.
- 7. Cowan M.M 1999. Antimicrobial activity of some medicinal plants, *Clinical Microbiology Reviews*. 12(4):564-582.
- 8. Chandra, G., Ghosh, A., Chatterjee, SK., Bhattacharjee, I. 2011. Antibacterial activities of some plant extracts used in Indian traditional folk medicine. *Asian Pacific Journal of Tropical Biomedicine*.S165-S169.
- 9. Rahman, S., Ismail, M., Muhammad, N., Ali, F., Chisthi, A.K. and Imran, M. (2011). Evaluation of the stem bark of *Pistacia integerrima* stews ex Brandis for its antimicrobial and phytotoxic activities. *Afr. J. Pharmacology*; 5(8):1170-1174.
- 10. Emeruwa AC, Antibacterial substance from *Carica papaya* fruit extract, *J Nat Prod.* 1982 Mar-Apr; 45 (2):123-7.

DECIPHERING THE INSIGHTS OF METAL-MICROBE INTERACTIONS IN BIOREMEDIATION USING PROTEOMICS AS A TOOL- A NOVEL APPROACH

Aparajita Chakraborty¹ and Shreya Upadhyay²

¹Department of Biotechnology, St. Xaviers College, Kolkata, West Bengal ²Department of Botany, Bhavans College, Affiliated to University of Mumbai, Azad Nagar, Andheri West, Mumbai

ABSTRACT

Bioremediation may be defined as the process of consuming or degrading toxic metals/environmental pollutants by the use of naturally occurring or deliberately introduced microorganisms to purify a polluted site. There are various types of bacteria which possess appropriate enzymes to degrade particular contaminants which include the dangerous hydrophobic chemicals polychlorinated biphenyls (PCBs). Thus, these bacterial species have adopted various adaptation mechanisms to counteract the toxic effects of the dangerous compounds on cytoplasmic membrane which include saturation-rigidification of cell membrane, cis/trans isomerisation of fatty acids, and most importantly, production of stress proteins. Heavy metals such as Cd^{++} , Pb^{++} , or Zn^{++} can exert their negative effects by the mechanism of oxidative damage resulting from the production of reactive oxygen species, inactivation of proteins or DNA damage. Thus some bacteria have developed several mechanisms to resist or detoxify heavy metals; for instance the production of metallo-thionein like proteins by Synechoccus spp., which possess strong affinity for metals such as silver, zinc, cadmium, copper, mercury and hence detoxify them. The production of some transport proteins such as A-type ATPases may act as metal-exporting proteins, while plasmids with metal resistant genes enable resistance against metals such as cadmium. Plants act as excellent bioremediators and thus plant-microbe interactions has a greater potential for improving phytoremediation. Microbial mediated bioremediation has a greater potential in the effective restoration of a contaminated environment but the lack of information about the factors responsible for regulation of growth and metabolism of such microbial communities in the polluted environment is a limiting factor. Thus the establishment of transcriptomics, or functional proteomics such as advances in MS spectrometry, microarrays are useful in differential expression of various stress proteins or their genome interacting with metals and helping to gain further insights in bioremediation.

Keywords: bioremediation, heavy metals, bacteria, stress proteins, functional proteomics

INTRODUCTION

Bioremediation is a process which mainly utilises living organisms like plants, microbes and bacteria, in the removal of contaminants, pollutants and toxins from soil, water and other environmental surroundings. The common types of bio remediation include microbial remediation, phytoremediation, mycoremediation respectively. Due to more than 200 years of industrialisation and use of dangerous substances in many production processes, there are many countries across the world which are facing a lot of problems associated with the contamination of soil, sediment, and water matrices etc. And can pose a serious threat to human health and the environment. The various chemicals, heavy metals which arise from such contaminated sites such as polychlorinated biphenyls (PCBs), Zn^{++,} Cd^{++,} Pb^{+,} Ni⁺⁺ represent potential health risks for all living organisms. Polychlorinated biphenyls (PCBs) may represent an environmental concern owing to their toxicity and hydrophobicity; although their production has been banned and a heavy restriction has been imposed on their use, yet they pose an environmental problem due to their presence in old electrical transformers, capacitors, landfills, contaminated soil, or sediments. They possess certain physical and chemical properties such as thermal or chemical stability, resistance to degradation, general inertness which contribute to their persistence in the environment. (1,2) On the other hand heavy metals such as Cd⁺⁺, Pb⁺⁺, Hg⁺⁺ poses as ecological risk factors owing to their bioaccumulation in sediment, primary producers and aquatic animals (molluscs, fish,etc.). Based on their biological functions metals may be primarily classified as (i)essential metals (ii) toxic metals and metalloids with unknown biological functions (iii)non-essential, non-toxic metals with no biological functions. These heavy metals are able to exert their negative effect through various mechanisms such as oxidative damage by production of reactive oxygen species, protein inactivation or DNA damage etc. (3)

The microbial population may get seriously affected from metal toxicity at elevated concentrations, so they developed various mechanisms to counteract the effects of such damages caused by these metals and thus help to detoxify them. The various adaptive mechanisms include the following: (i)saturation of fatty acids (ii)Cis/Trans isomerisation of unsaturated fatty acids (UFAs) (iii) changes in phospholipids (iv)production of stress proteins. The primary mechanism is mainly concerned with the maintenance of cell membrane fluidity

Volume 8, Issue 2 (III) April - June 2021

and lipid-phase stability; hydrophobic organic pollutants alter the membrane fluidity of bacterial membrane which can lead to a significant disturbance of physiological function and apoptosis. The increase of saturation of bacterial membrane lipids is a major adaptation mechanism to be adopted by such bacterial species where the linear acyl chains of saturated fatty acids can be tightly packed leading to a lower fluidity which can counteract the the fluidising effects caused by the presence of toxic organic compounds. In order to be able to maintain it's physiological function, a part of the membrane stays in liquid-crystalline phase. Among other adaptations, production and overexpression of stress proteins where the role of alternative sigma factor σB in this adaptation was emphasised to be a key factor. The toxic environment acts not only the envelope but usually causes damage to the cell proteome as well, so damaged proteins can be replaced with the newly synthesised ones. The chaperones assist in proper de novo folding of proteins and provide an important means of restoring activity to the damaged proteins; the overexpression of proteins namely catechol-1,2- dioxygenase, belonging to 3-oxoadipate chlorobenzoate degradation pathway are responsible for the direct reversal of certain forms of protein damage which include proline isomerisation, methionine oxidation or formation of iso-aspartyl residue, while the third mechanism involves proteolysis of abnormal proteins which cannot be repaired.(1,3).

Plants have highly emerged as successful bioremediators owing to their ability of metabolising toxic compounds such as DDT and benzo(α) pyrene. Since then phytoremediation has emerged as a successful technology which involves plant-bacterial interactions for treatment of soil and groundwater contaminated by toxic pollutants. Phytoremediation has several advantages such as preservation of natural properties of soil, acquiring energy mainly from sunlight, low cost and the potential to be rapid. (5).

Recently the role of omics technologies such as transcriptomics, interactomics or proteomics are explored as they serve as remarkable official tools to address longstanding questions regarding the various molecular mechanisms involved in the control of mineralisation pathways. Though high-throughput transcriptomic techniques with microarrays are useful for studying transcript structures and their expression during mineralisation but such transcripts have no ability to operate any physiological response; they must be translated to proteins with significant functional impact. Such proteins may be studied by proteomic techniques using 2-DE, mass spectrometry, protein microarrays. Such proteomic approaches may even serve to identify the damaged proteome/proteins of microbial species caused by heavy metal contamination, or various protein-protein interactions between the plant-microbe or metal-microbe which are highly responsible for the production of a contaminated –free environment. (6,7)

METAL-MICROBE INTERACTIONS SERVE AS IMPORTANT MODULATORS IN BIOREMEDIATION:

Heavy metal pollution poses a serious threat to all forms of life in environment owing to the toxic effects of long-term environmental pollution. Among various metals, Zn is one of the effluents discharged from industries which holds an important role in plant growth. It possesses a functional group which can increase the stabilisation of plants by alteration of it's structure molecule and membrane as well as a defensive mechanism against various microbes. Though Zn in it's metallic form doesn't cause any harm to the environment but it can react with chemicals such as acids or oxygen to form potentially toxic compounds which can cause severe damage to biological systems. In some bacteria the presence of a three-component Czc (Cd⁺⁺, Zn⁺⁺, Co⁺⁺) system which possesses a certain protein CzcA (1064 aa) which is the largest and essential for cation transport; it contains a limited amount of cysteine and histidine residues and decreased possible metal binding sites whereas another component CzcB protein (521 aa) has two possible metal binding sites composed of 4 histidine residues each. Thus, the homology of both binding sites from the two respective proteins, in coordination with each other function as Zn⁺⁺ efflux pumps (2,7). The production of metallothionein-like proteins by species such as *Synechoccus spp., E. coli* and *Pseudomonas Putida* is one of several metal-dependent mechanisms of resistance which have strong affinity for metals such as Zn, cadmium or copper etc and thereby detoxify them after respective binding.

Copper is another toxic metal which may cause severe damage to liver, kidneys and even death if consumed at high concentrations and responsible for the adverse alteration of the functional organ system in fish. Whereas nickel, another metal may enter the bodies via respiratory system in the form of nickel carbonyls which may cause death or respiratory problems of edema, pneumonia, respiratory failure. The presence of a copper resistance and transport system in Gram-positive bacteria *Streptococcus Pneumonia* or *Enterococcus faecalis* is responsible for the remediation of copper metal; the Cop operon is regulated by two gene products CopY and CopZ, acting as apo-repressors and anti-repressors respectively. In the presence of moderate levels of intracellular Cu+, CopY converts into a DNA-binding repressor whereas at elevated concentrations of Cu, Cu binds to CopZ antirepressor which in turn binds to CopY-Cu+ and making an inactive complex. A-type

ATPases are a class of ATP synthases located in mitochondrial inner membranes and chloroplast thylakoid membranes of *E.coli* and *S.Aureus* where they may as metal transporters and efflux mediated additionally by ATP hydrolysis.(3,4,8,10)

The plant-microbe interaction in rhizosphere may be beneficial, neutral or variable for plant growth; plant growth promoting rhizobacteria (PGPR) have a beneficial effect on plant growth which may function in three ways i.e. synthesis of particular compounds for plants (ii) facilitating uptake of certain nutrients from environment (iii) preventing plants from diseases. Such microbes may may solubilise phosphates and other nutrients and increase availability of phosphate for plants in soil. They may produce siderophores β -1,3 glucanases, chitinases, and antibiotics to suppress the growth of deleterious microorganisms. Nowadays gentically engineered bacteria may be utilised owing to their enhanced potential to produce enzymes specific for degrading toxic organic substances. Some transgenic plants such as tobacco plants (*Nicotiana tobacum*) may be genetically modified by insertion of the gene responsible for 2,3-dihydroxybiphenyl ring cleavage bphC which thus degrades polychlorinated biphenyls (PCBs).(5,9)

Microorganism type	Species	Heavy metal removed	Environment type	
2	Bacillus cereus strain	Cr (VI)	Soil	
	Kocuriaflave	Cu	Water	
	Bacillus cereus	Cr (VI)	Water	
Bacteria	Sporosarcinaginsengisoli	As (III)	Water and soil	
	Pseudomonas veronii	Cd, Zn, Cu	Water	
	Pseudomonas putida	Cr (VI)	Soil	
	Enterobacter cloacae	Cr (VI)	Soil	
	B2-DHA			
	Bacillus subtilis	Cr (VI)	Soil	
	Aspergillusversicolor	Ni, Cu	Water	
Filamentous	Aspergillus fumigates	Pb	water	
Fungi	Gloeophyllumsepiarium	Cr (VI)	Soil	
0	Rhizopusoryzae	Cr (VI)	soil	
Yeast	Saccharomyces cerevisiae	Pb, Cd	Water	
Algae	Spirogyra and Cladophora	Pb (II), Cu (II)	Water	
	Spirulina and Spirogyra	Cr, Cu, Fe, Mn, Zn	Water	
	Hydrodictylon	As	Water	
	Oedogonium	As	Water	

Table no.1 Microorganisms species that have successfully used to remove heavy metals from contaminated environments

Table adapted with modification from 9.*

PROTEOMICS APPROACH TO STUDY METAL-MICROBE/PLANT-MICROBE INTERACTIONS:

The role of transcriptomics, proteins, metabolomics plays an important role to elucidate the various proteinprotein interactions of metals with microbes. Proteomic analysis is vital because the observed phenotype is a direct result of protein actions rather than genome sequence. In bioremediation, the proteome of membrane proteins is of particular interest as alterations in any site-specific bacterium affects cell surface receptors or proteins. (6,7) Use of techniques such as liquid chromatography, 2-D gel electrophoresis or MALDI-TOF may be useful to track the expression of stress proteins in bacteria which act against the metals and thus detoxify it. 2-DE approaches have been used to determine variations in protein expression of Pseudomonas putida KT2440 following exposure to a sublethal inhibitory concentration of phenol where 68 upregulated proteins involved in oxidative and general stress response had been elucidated. Six major proteins were overexpressed by 2-DE analysis when Mycobacterium sp. Strain PYR-1 were exposed to phenanthrene, dibenzothiophene and pyrene. Thus recent proteomic approaches may help to reveal new metabolic pathways for degradation of toxic wastes leading to the further identification of new signature proteins.

CONCLUSION:

The process of microbial mediated bioremediation offers a great potential to effectively restore contaminated environment and thus it is highly important to learn the various interactions of proteins secreted by microbes which hold various binding sites for the metals and thereby detoxify them upon their successful binding. The use of transgenic plants or microbes has been increased owing to their potential of generating genetically engineered enzymes which may further contribute to a more enhanced rate of bioremediation. Hence new future approaches using omics technology, particularly proteomics are particularly useful for exploring the expression of specific proteins and screening of entire genome for proteins; such targeted strategies will be highly promising in their ability to predict the microbial-assisted attenuation of contaminants to prevent bioremediation.

REFERENCES:

- 1. Dercova Katarina et. al, 'The Adaptation Mechanisms of Bacteria Applied in Bioremediation of Hydrophobic Toxic Environmental Pollutants: How Indigenous and Introduced Bacteria Can respond to Persistent Organic-pollutants Induced Stress, 2018, 'Open Access Peer Reviewed Chapter, DOI: 10.5772/intechopen. 79646
- 2. Thomas K Wood: 'Molecular approaches in bioremediation'. Current opinion in Biotechnology 2008, 19:572-578.
- 3. Gamal E.H. Osman, et. al '*Recent Progress in Metal-Microbe Interactions: Prospects in Bioremediation*'. *J Pure Appl Microbiol*, 2019, 13(1), 13-26, Article 5460 https://dx.doi.org/10.22207/JPAM.13.1.02
- 4. Molalign Medfu Tarekegn, Fikirte Zewdu Salilih & Alemitu Iniyehu Ishetu: '*Microbes used as a tool for bioremediation of heavy metal from the environment.*' Cogent Food & Agriculture, 2020 6:1, 1783174, DOI: 10.1080/23311932.2020.1783174.
- 5. Bhatia Divya and Malik Deepak Kumar: 'Plant -Microbe Interaction with Enhanced Bioremediation.' Res J. Biotech Vol. 2011, 6(4)
- 6. Amol Uttam Hivrale, Pankaj K. Pawar, Niraj R. Rane, Sanjay P. Govindwar: '*Application of Genomics and Proteomics in Bioremediation*'. 2005, '*Toxicity and Waste Management Using Bioremediation*,' *Chapter 5*, IGI Global book series advances in Environmental engineering and green technology. 97-111 DOI:10.4018/978- 1- 4666-9734-8.ch005.
- 7. OmV. Singh and Nagathihalli S. Nagaraj-'*Transcriptomics, proteomics and interactomics: unique approaches to track the insights of bioremediation.*' Briefing in functional genomics and proteomics. 2006. Vol 4. No. 4. 355-362
- 8. Slavomíra Murínova and Katarína Dercova: 'Response Mechanisms of Bacterial Degraders to Environmental Contaminants on the Level of Cell Walls and Cytoplasmic Membrane.' International Journal of Microbiology.2014, Volume 2014 | https://doi.org/10.1155/2014/873081
- 9. Ojuederie OB, Babablola OO. 'Microbial and plant assisted bioremediation of heavy metal polluted environments: A review.' Int. J. Environ. Res. Public Health, 2017; 14: 1504*
- 10. Dietmar H Pieper and Walter Reineke: 'Engineering bacteria for bioremediation.' Current opinion in Biotechnology 2000, 11:262-270

A STUDY ON SUSTAINABILITY OF A CASHLESS SOCIETY WITH RESPECT TO MUMBAI CITY

Kajal Gala and Ashutosh Jadia

Thakur College of Science and Commerce, Kandivali (E), Mumbai

ABSTRACT

Any transaction which is cashless in India, is an effort to move towards a cashless economy by minimizing the use of physical or hard cash such as coins and notes. The study analyses how a cashless society can benefit both country and environment. Cash is currently one of the most important pedals of the Indian economy's cycle: as a resource it circulates until physically destroyed, by regulation, wear and tear, accidental damage or loss, hence the government needs to maintain cash which results in costing the government millions of rupees. So is cash sustainable? This paper throws light on assessments that spot different perspectives, yet are likely relevant across various countries. This study is to compare India to other developed countries and find the challenges and opportunities which are associated with cashless transactions. It has been conducted to unravel the challenges and opportunities of a cashless economy by promoting E-Money or electronic money instruments, developing electronic financial infrastructures and spreading digital transaction habits among people.

Keywords: Cashless economy, Digital transaction, Resource management.

INTRODUCTION:

Digital payment system before the spread of Covid-19-

Operating in cash cost countries about 0.5% of their GDP per year, but it's not the only reason why we are shifting towards a cashless economy. The other reason is demand, the young and new generation is demanding convenience, fast, easy and more secure way of payment. After 2011 introduced NFC (Near-Field Communication) system payment has become more than easier. Digital payment systems help the government to track and monitor each and every transaction but the downside is that it concerns privacy and cyber-attacks. Besides in remote areas there is always a problem of internet and connection, issues with respect to illiteracy, hence they have no choice but to rely on cash.

Digital payment system after the spread of Covid-19-

Since India went under lockdown from 23rd March 2020, People were trying to go for digital payment as often as possible avoiding physical contact with each other. And this has helped the public with their transactions. As the key element of the digital payment systems is that it can take place anywhere and anytime. And if we take a step back and take a look at the whole picture it has made a global impact since less cash transactions are happening the economy is still moving though at a slower pace but it hasn't just stopped.

REVIEW OF LITERATURE:

- R. Elavarasi in her paper titled "A study on the customer perception towards e-banking" is about Customer Awareness and their Preference towards E-Banking Services provided by the banks. it studied the customer behaviour & attempted to find out their most preferred e-banking services. Inputs have been made to identify better services providing commercial banks with regards to e-banking services to customers. The researcher has identified the level of customer satisfaction of internet banking. The paper shows that age, education, qualification, occupation, income level of customers are major factors that decide usage of e-banking services.
- Leong, Kelvin.; Sung, Anna wrote a paper in 2018, titled "FinTech (Financial Technology): What is It and How to Use Technologies to Create Business Value in the Fintech Way?" focused on advisory services and compliances. Their paper was published in the International Journal of Innovation, Management and Technology.
- A. Samsunisa, in her paper "Adoption of Internet Banking: An Empirical Study in Chennai", focused on utmost satisfaction of users. Her study says that customers are ready to accept internet banking because of certain ethics and benefits such as convenience, efforts and time saving methods, which is possible in the future only by obtaining maximum trust of the customers.

AIMS AND OBJECTIVE:

- To study the Environmental Cost of Cash.
- To analyze the effect of pandemic on Cashless Society.
- To study Sustainability of a Cashless Society.

Volume 8, Issue 2 (III) April - June 2021

ISSN 2394 - 7780

HYPOTHESIS:

H0: There is no significant effect of pandemic on Cashless Society.

H1: There is a significant effect of pandemic on Cashless Society.

RESEARCH AND METHODOLOGY:

Research design is descriptive. The data for the study is collected from both primary and secondary sources. Primary data is generated through an online survey. The population targeted for the study are Mumbai based individuals ranging from the age group of **18 to 40 years** and above. A sample of **62 respondents** is collected by randomly sending the survey forms through communication means like E-mail and What Sapp, etc. And secondary data is collected via. reliable website.

DATA INTERPRETATION:



Explanation- The age of our respondents ranged between 18 to 40 and above, among which 97% of respondents were at the age of 18-40. 3% of respondents were at the age of above 40.



Explanation- When we look at the qualification of our respondents, 14.05% of respondents educated upto 12th, 67.07% of our respondents have completed graduation. 16.01% of our respondents have completed masters/postgraduate degrees and 01.06% hold a doctorate degree.

Volume 8, Issue 2 (III) April - June 2021



Explanation- Out of 62 respondents, 82.3% of our respondents were already the users of digital payment before the discovery of Covid-19 and 17.7% of people didn't use digital payment systems.



Explanation- Out of 62 respondents, 82.3% of our respondents used to use digital payment after the outbreak of Covid-19 and 17.7% of people didn't use digital payment systems.



Explanation- Out of 62 respondents, 38.07% of our respondents prefer cash as their medium exchange and 75.08% of people use digital payment systems.



Explanation- Out of 62 respondents, 33.09% of our respondents think cash is a viable medium of exchange and 74.02% of people think digital payment systems is more convenient.

Anova: Single Factor						
SUMMARY						
Groups	Count	Sum	Average	Variance		
Column 1	62	73	1.177419	0.148334		
Column 2	62	73	1.177419	0.148334		
ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	1.10E-13	1	1.10E-13	7.42E-13	0.9999	3.918816
Within Groups	18.09677419	122	0.148334			

TESTING OF HYPOTHESIS:

By using Anova: Single Factor test as p>0.05 i.e. 0.9999 P (T<=t), hence hypothesis H0(i.e.There is no significant effect of pandemic on Cashless Society.) is accepted.

SUGGESTIONS:

According to our survey, we found out that a certain level of education is required for the usage of digital payment systems. Our suggestion is that the payment interface should be made easy and there should be more awareness regarding the same. With respect to our current situations keeping the pandemic and the social distancing norms in mind, we need to maintain minimum human contact.

Our suggestion to coders and application developers is to create a better and more secure system, as people are putting their hard earned money at risk and it shouldn't get stolen. As the businesses are going online, the risk of cyber-attacks keeps increasing day by day.

It is also important that we have a control on how fast this change takes place because some people might find it difficult to keep up with the pace of development, some people may find it hard to grasp and understand the digital payment system or fintech. Also, there are people who heavily rely on cash because they don't have a proper resources or a bank account.

Volume 8, Issue 2 (III) April - June 2021

CONCLUSIONS:

Digital payment systems are helping local vendors and many consumers at a great extent and in an innovative way. It has managed to keep our economy alive and also reduced the risk of human contact with respect to the current pandemic norms. The people who are using digital payment systems should also encourage others to give it a go. Although if we look at the bigger picture, Central banks enact monetary policies by taking control over the amount of money which is printed and which is in circulation and they are able to do it because they are the only entity that prints money. Here the purpose is to control the flow of cash in the economy, but in a society which is cashless it is a bit harder because there are other entities too that can create money, For instance, Facebook announced that they are looking forward to launching their own digital currency. The point is that the digital payment system is a great opportunity for making the economy cashless but we should also look out for consequences. Also, the government needs to make sure as we move towards a cashless society, no one is left behind.

REFERENCES:

- Reserve Bank of India Payment and Settlement Systems (rbi.org.in)
- Reserve Bank of India Annual Report (rbi.org.in)
- Payment and settlement systems in India Wikipedia
- Reserve Bank of India Payment and Settlement Systems (rbi.org.in)
- Scheduled Commercial Banks in India GKToday

A STUDY ON SUSTAINABILITY OF DIGITAL ADVERTISEMENTS WITH RESPECT TO MUMBAI CITY

Nishikant Jha and Ashutosh Jadia

Thakur College of Science and Commerce, Kandivali (E), Mumbai

ABSTRACT:

Recent technologies have substantially changed the way, how firms communicate and interact with consumers via. digital media and digital advertising. In this digital era, how paperless advertising (also known as digital advertising) can have a significant impact on our environment? How can scholars enhance research on digital advertising? And how can firms and agencies maximize their return on commercials? This research will study the key trends relevant to digital advertising, such as moving toward data-driven marketing communication, the impact of artificial intelligence on advertisement production, and the effect of digital advertisement on our environment. Several topics that can be widely applied to digital advertising are proposed for future research.

Keywords: Paperless advertising, Digital advertising, Commercials.

INTRODUCTION:

During the 1990s, the word Digital Marketing first came into picture, the concept was simple to advertise and pitch their product in the market through the latest technology which included various website software and other kinds of application. Brutal competition pushed vendors to include more and more service into their software, for instance, marketing, sales and service applications. Besides the fact that marketers own huge online customer data by eCRM software as well as were prepared with the planning of their future product, after the birth of the Internet. Companies now knew what the consumers wanted and could update the product accordingly. In the 2000s, as numbers of Internet users increased, smartphones were introduced and social media came into picture, this concept boomed.

Methods of Digital marketing

There are many methods of digital marketing. Some well-known brand building awareness may involve methods such as:

- 1. SEO (Search engine optimization), in this method an individual optimizes Search engine and uses different types of combination while putting hashtags to improve the visibility of one's business websites and brand-related content for common industry-related search queries.
- 2. SEM (Search engine marketing), SEM which is also known as PPC(Pay-per-click) advertising, involves the purchasing of ad space in important or famous, visible positions at top search results pages and websites.
- 3. Social media marketing, approximately 70% of brand awareness can be increased by following only one, marketing on social media platforms. Top platforms currently used by social media marketing teams are Facebook, Instagram, YouTube and Twitter.
- 4. Content marketing, according to Wikipedia, 56% of marketers believe personalized content like brandcentered blogs, articles, social updates, videos, landing pages improves brand recall and engagement.

REVIEW OF LITERATURE:

- Gershwin Reddy wrote a paper in 2016 with the paper titled, "Digital marketing Impact on the consumer decision making process in Nike's customer retail operations In South Africa" in which he focused on the impact of digital marketing on consumer's decision making process in South Africa regarding Nike's retail.
- Andriani Kusumawati wrote a paper in 2019 with the paper titled, "Impact of Digital Marketing on Student Decision-Making Process of Higher Education Institution: A Case of Indonesia " which was published in the Journal of e-Learning and Higher Education (*Volume 2019, Article ID 267057*) by IBIMA Publishing.

AIMS AND OBJECTIVE:

- 1. To study the sustainability of digital advertisements.
- 2. To study the impact of artificial intelligence on advertisement.
- 3. To analyze the relation between digital commercials and sale of products.

Volume 8, Issue 2 (III) April - June 2021

HYPOTHESIS:

H0: There is no significant impact of artificial intelligence on advertisement production.

H1: There is a significant impact of artificial intelligence on advertisement production.

H0: There is no direct relation between digital commercials and sale of products.

H1: There is a direct relation between digital commercials and sale of products.

RESEARCH AND METHODOLOGY:

Research design is descriptive. The data for the study is collected from both primary and secondary sources. Primary data is generated through an online survey. The population targeted for the study are Mumbai based individuals ranging from the age group of below 18 to above 40 years. A sample of 148 respondents is collected by randomly sending the survey forms through communication means like email and whatsapp, etc. And secondary data is collected via. reliable website.

DATA INTERPRETATION:



Explanation- The age of our respondents are differentiated in ranges below *18*, *18 to 40 and above 40*. Among which 02% of respondents were at the age of or below 18. 95.03% of respondents were between the age of 18 to 40. 02.70% of respondents were above the age of 40 years.



Explanation- In our survey out of 148 respondents 77 of were male and 71 were female.

International Journal of Advance and Innovative Research Volume 8, Issue 2 (III) April - June 2021



Explanation- Out of 148 respondents, 73.00% see advertisements on digital platforms *frequently* and 27.00% see *sometime* see advertisements on digital platforms.



Explanation- Out of 148 respondents, 45.09% *frequently* come across advertisements related to their interest and preference, 27.00% *sometimes* comes across, 27.00% *rarely* comes across.



Explanation- Out of 148 respondents, 00.00% *frequently* shop via. advertisement shown on the digital platforms, 04.70% *sometimes* shops, 68.20% *rarely* shops and 27.00% *never* shops.

Volume 8, Issue 2 (III) April - June 2021

TESTING OF HYPOTHESIS:

O THEOLOG		
F-Test Two-Sample for Variances		
	Variable 1	Variable 2
Mean	1.27027027	1.810811
Variance	0.198565913	0.698658
Observations	148	148
df	147	147
F	0.284210526	
P(F<=f) one-tail	7.738254482	
F Critical one-tail	0.761694231	

By using F-Test Two-Sample for Variances as p>0.05 i.e. 7.7382 P (F<=f), hence hypothesis H1 (i.e.There is no significant impact of artificial intelligence on advertisement production.) is accepted.

F-Test Two-Sample for Variances		
	Variable 1	Variable 2
Mean	1.27027027	3.222972973
Variance	0.198565913	0.269672734
Observations	148	148
df	147	147
F	0.7363218	
P(F<=f) one-tail	0.032242161	
F Critical one-tail	0.761694231	

By using F-Test Two-Sample for Variances as p<0.05 i.e. 0.0322 P (F<=f), hence hypothesis H0 (i.e. There is no direct relation between digital commercials and sale of products.) is accepted.

SUGGESTIONS:

This case study provided a better view and let business understand how much importance digital marketing plays in the success of any product. Suggestion to startups is to target the right audience, the audience who continuously search the keywords related to your product or service. By targeting the right audience startups can boat their sales and create awareness about their products and their company. Running engaging advertisement campaigns on different social media platforms will be beneficial.

As our research proved that, there is a significant relation between digital marketing and ongoing trends in the market, to well established businesses we suggest to look out for current advancements in respective markets and try to create trends in the market. Companies can study the consumer behaviour and try to modify your product accordingly.

CONCLUSIONS:

The research revolved around how digital advertisements changed marketing and their impact on consumer's behaviour. By this study we can conclude that digital marketing can help companies to become engaging with customers directly, by allowing them to obtain feedback and resolve issues almost immediately. Also, the cost of Marketing on most social media platforms is very little or free, making it accessible to virtually any size business & allows companies to promote themselves at large. Same goes for ongoing trends Accommodates personalized and direct marketing that targets specific demographics and markets.

REFERENCES:

- https://scholar.google.com/
- Digital marketing Impact on the consumer decision making process in Nike's customer retail operations In South Africa https://repository.up.ac.za/bitstream/handle/2263/59756/Reddy_Digital_2017.pdf? sequence=1&isAllowed=y

Volume 8, Issue 2 (III) April - June 2021

- Impact of Digital Marketing on Student Decision-Making Process of Higher Education Institution: A Case of Indonesia https://ibimapublishing.com/articles/JELHE/2019/267057/267057.pdf
- https://repository.up.ac.za/
- https://ashutoshjadia.blogspot.com/
- Content marketing the fundamental tool of digital marketing http://webbut.unitbv.ro/BU2015/Series%20V/BILETIN%20I/15_Patrutiu.pdf
- https://www.sciencedirect.com/
- https://ibimapublishing.com

IMPACT OF GREEN ADVERTISING ON CONSUMERS

Dr. Parul Singhal¹ and Shriya Nirale²

Assistant Professor BMS¹ and Student², Thakur College of Science and Commerce, Kandivali (E), Mumbai

ABSRACT

It is evident that environmental awareness has increased significantly, owing to the increase in environmental issues like climate change, pollution, etc. Therefore, environmentalism has entered the advertising world under the term 'green advertising'. Green advertising focuses on promoting products and services around environmental situations, showing concern in favour of the environment. This research is aimed at identifying the impact of green advertising on consumers by evaluating their level of concern for the environment, factors influencing their purchase decisions and aspects of an ad that would motivate them to purchase green products. 315 online survey respondents were analysed, which revealed that consumers are aware about the environmental issues and are highly concerned for it. The findings demonstrated that the most important factor considered by the consumers while purchasing, is health benefits, followed by environmental friendliness. The best solution to make a green advertisement compelling and promote the use of environmentally friendly products, thereby aiding sustainable development, is to explain the environmental benefits of the product in the advertisement.

Keywords: Environmental awareness, Green advertising, Green products, Sustainable development

1. INTRODUCTION

Over the past couple of years, the relevance of going "green" in terms of buying green environmentally friendly products, segregating recyclable waste from non-recyclable and spreading awareness about climate change has significantly increased. Consumers now prefer buying organic products, degradable substitute of plastic, fuel efficient cars and much more. This trend has made its way into advertising calling it 'green advertising'. Green advertising is commonly considered a company's efforts to make a product or service more environmentally friendly, along with the advertising used to promote it. Some examples of such advertising are, the Surf Excel detergent which advertises saving water with the message "bucket water is enough", the energy-saving LG consumer durables, the Starbucks campaign on Earth Day wherein people traded their paper cups for reusable mugs, also, Pepsico company build awareness about their efforts to replenish and restore the water through the pack labels of the bottled water Acquafina.

This research is aimed at analysing the impact of such green advertisements on the consumers. It also investigates their level of concern for the environment and aspects of an advertisement that would motivate them to purchase green products to a greater extent.



2. LITERATURE REVIEW

Indian customers prefer television advertising over other forms. Green advertising help to sell products with a protection cover to both consumers and the environment, according to Ekta Rastogi Singh and Dr. MS Khan's research study. Consumers are likely to purchase green products if it advertised valid environmental and health benefits at a valuable price, produced in a sustainable manner that doesn't harm the environment in any stage of production, use and disposal as studied by Lindsay Richards (Fall 2013). It was concluded in this study that consumers buy products whose value outweighs the monetary cost and would purchase environmentally sustainable products if it benefits their long term investment. Consumers look for products having a 'do right, feel good' effect. As per Bing Zhu's study on the impact of green advertising on consumer's purchase intention of green products in 2012, a green advertisement should be associated with a clear, transparent, understandable and concise environmental claim, to grab consumer's attention.

3. OBJECTIVES

Volume 8, Issue 2 (III) April - June 2021

1. To study the perception of consumers towards green advertising

2. To analyse the factors considered by the consumers while purchasing

4. HYPOTHESIS

Null Hypothesis (H₀): Green advertising does not have an impact on consumers.

Alternate Hypothesis (H₁): Green advertising has an impact on consumers.

5. RESEARCH METHODOLOGY

Primary data was used to conduct this research. Data was collected through an online survey of 315 respondents. 10 questions were asked related to their demographics, awareness about environmental issues, level of concern for these issues, preference about buying environmentally friendly products, that is, green products and the factor considered the most while purchasing. Also, their ability to recall green advertisements and aspects useful for increasing its persuasiveness, were examined.

6. FINDINGS

From the online survey conducted of 315 respondents, 56.2% were in the age group of 18-24, 21.3% in the age group of 35-44, 19.7% in the age group of 25-34, and the rest between 45-54 and under 18. Also, 77.1% respondents were female and 22.9% were male. The current employment status of the respondents was, 57.5% were students, 21.9% were self-employed and 20.6% were employed for wages.

They were asked if they're aware of environmental issues like climate change, pollution etc. The result indicated that 100% of the respondents were aware of the same.



When asked about their level of concern towards these issues, 75.2% were highly concerned, 23.5% were moderately concerned and 1.3% were neutral.



The respondents were asked if they preferred buying products having environmental benefits. Out of 315 respondents, 240 (76.2%) said Yes, 65 (20.6%) said Doesn't matter and 10 (3.2%) said No.

Do you prefer buying products having environmental benefits?



Respondents were then asked about the factor they considered the most while purchasing. The majority (54.6%) of the respondents said that it was health benefits that they looked for in a product, followed by environmental benefits (38%), price (6.5%) and brand popularity (0.9%).

Volume 8, Issue 2 (III) April - June 2021

ISSN 2394 - 7780



Then, the participants were asked if they remembered any advertisement of a green product, to analyse the effectiveness of such ads. Only 60.3% people remembered that they'd seen a green advertisement.

Do you remember any advertisement of an environmentally friendly product?



Hence, in order to increase the appeal and effectiveness of green ads, respondents were asked about the aspect of a green ad that would make them purchase green products. To this, 196 respondents said that environmental benefits of the product should be explained in the ad, 137 (43.5%) said that the ad would be effective if it was of a well known and trusted brand, 8 (2.5%) of them said that the ad should be based around a controversial/viral topic and 7 (2.2%) said that the green ad would be compelling if the green product was endorsed by their favourite celebrity.



Therefore the null hypothesis is rejected and alternate hypothesis is accepted as green advertising has an impact on consumers.

7. SUGGESTIONS

In order to increase the usage of green products by the consumers, the green advertisements should be designed in a way that they explain the benefits of the product on the environment and how the company is taking efforts to contribute to the green movement. Both the health benefits and the environmental friendliness of the product should be emphasized on, as these are the two major factors considered by the consumers while purchasing.

8. LIMITATIONS

Further research could be conducted by practically observing the behaviour exhibited by the consumers after watching green advertisements. However, this research is limited to an online survey due to social distancing norms at the time of Covid.

9. CONCLUSION

Green advertising not only helps in spreading awareness about the product but also about the importance of conserving our environment. The consumers are well aware of the issues faced by the environment and are keen on buying products that are in favour of sustainable development.

A STUDY ON CONSUMER'S PERCEPTION TOWARDS GREEN PROMOTION

Dr. Deepa Shivaji Jamindar

Thakur College of Science and Commerce, Kandivali (E), Mumbai

ABSTRACT

In this modern era of societal marketing business ethics and social responsibility are becoming the guiding themes for marketing strategies and practices. Within the field of ethics and social responsibility environmental and green marketing topics are the central topics, which are closely related to biodiversity and sustainability. This paper study consumer perception towards Green promotion and suggest measures to make green promotion more effective.

INTRODUCTION

The concept of green marketing has come into existence in response to the growing concern over environmental degradation. The deterioration of the ecology is a major global concern. There is growing concern about the greenhouse gases in the environment due to the burning of fossil fuels, about the depletion of ozone layer due to certain chemicals and global warming. Environmentalists in India and abroad are voicing their concern and are campaigning against pollution causing industries.

Green marketing in both academic and business sense is crucial to developing countries. This phenomenon has to develop its economic and social agenda. In the past two decades, the concept of green marketing has achieved an exponential growth, making imperative impact both on the market and environment across the globe. In the field of ethics and social responsibility, environmental and green marketing themes are the core areas related to environmental safety and human wellbeing.

Green promotion means promoting eco-friendly products. In green promotion marketers communicate with consumers through advertisement environment friendly benefits of products. Green advertising message helps the company to face competition with non green products. It is found that only 5% of the marketing messages from "Green" campaigns are entirely true and there is a lack of standardization to authenticate these claims. There is no standardization currently in place to certify a product as organic. Unless some regulatory bodies are involved in providing the certifications there will not be any verifiable means. A standard quality control board needs to be in place for such labelling and licensing

LITERATURE REVIEW

- 1. **Ilona Solvalier (2015, Karlstad University, Sweden) in his thesis on "Green marketing strategies case study about ICA Group AB"** study conducted to find out what green marketing strategies are used by the service company stated that company need to improve the green communication strategy while informing better and wider about all the greening procedure.
- 2. Aditi Jaju (August, 2016) in his thesis on "A study of the impact of Green Marketing on Consumer Purchasing Patterns and Decision making in Telangana, India analyzed that there is a positive relationship between green branding and packaging and the environmental behavior of consumers. The first key finding was the perception of green packaging and branding has a significant and positive effect on the environmental behavior of consumers.
- 3. Magaali Morel (2012) in her thesis on "Green Marketing: Consumers' attitudes towards eco-friendly products and purchase intention in the Fast Moving Consumer Goods (FMCG) sector" revealed that consumers really seem influenced by previous satisfaction, advertising and word of mouth communication.
- 4. Jacquelyn A. Ottman in her article "How to Avoid Green Marketing Myopia" stated that Ottman suggested that green marketing myopia can be solved by educating consumers with marketing messages that connect environmental products attributes with desired consumer value.
- 5. John Rooks in his article "The green Market Niche: Being Green Going Mainstream" stated that Messages in eco friendly advertisement must be deeper, attractive and easy to understand for consumers.

OBJECTIVES OF THE STUDY

• To study consumer perception towards Green Promotion

HYPOTHESIS:

• H₀: There is no significant different (relationship) between Green Promotion and consumer perception towards green FMCG goods.

vs.

• H₁: There is a significant different (no relationship) between Green Promotion and consumer perception towards green FMCG goods.

RESEARCH DESIGN

The design of present research is diagnostic in nature. In this research researcher tires to find out of relationship between Green Promotion and Consumer Perception towards Green FMCG Goods. Survey is conducted through a structured questionnaire.

Different statements based on Green Promotion are evaluated. This part consists of 6 statements. These statements were measured by using five point likert scale i.e strongly agree (5), agree (4), Neutral (3), disagree (2) and strongly disagree (1).

SAMPLING PROCEDURE

The studies incorporate 120 consumers who are aware and watch environmental friendly advertisement located in Mumbai City. This research paper is based on primary data. Relevant and reliable data will be collected from various journals, government periodical, etc. A good amount of information can be collected through reference books, published and unpublished reports, management journals etc. Updated information can be gathered through genuine websites.

Data Collected and Analysis



Table No. 4.33:	Respondents	Perceptions	towards	Green	Promotion
-----------------	-------------	-------------	---------	-------	-----------

Marketing mix and consumer perception towards Green Marketing (Green Promotion)						
		Strongl y Agree	Agree	Neutral	Disagree	Strongly disagree
The contents of environmental	Frequency	91	717	152	86	3
advertisements are of little relevance to daily life	Percent	8.7	68.4	14.5	8.2	0.3
Eco friendly advertisements are valuable to the society	Frequency	146	677	194	32	0
	Percent	13.9	64.5	18.5	3.1	0.0
Environmental advertisements are	Frequency	108	345	388	189	19

ISSN 2394 - 7780

Volume 8, Issue 2 (III) April - June 2021

poorly produced and not attractive	Percent	10.3	32.9	37.0	18.0	1.8
Eco friendly advertisements do not	Frequency	67	416	320	229	17
convince customers to buy eco friendly products	Percent	6.4	39.7	30.5	21.8	1.6
Green marketing communications	Frequency	56	517	393	77	6
activities used by the green companies are effective	Percent	5.3	49.3	37.5	7.3	0.6
I like those advertisements that contain	Frequency	158	606	264	21	0
information regarding the eco friendly products	Percent	15.1	57.8	25.2	2.0	0.0

1. 68.4% respondents were agreed that the contents of environmental advertisements are of little relevance to daily life

- 2. 64.5% respondents were agreed that eco friendly advertisements are valuable to the society.
- 3. 37% respondents were neutral that Environmental advertisements are poorly produced and not attractive.
- 4. 39.7% respondents were agreed that Eco friendly advertisements do not convince customers to buy eco friendly products
- 5. 49.3% respondents were agreed that Green marketing communications activities used by the green companies are effective.
- 6. 57.8% respondents were agreed that they like those advertisements that contain information regarding the eco friendly products.

Kolmogorov-smirnov Z value of Green Promotion

Green Promotion				
	Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)		
The contents of environmental advertisements are of little relevance to daily life	12.771	0.000		
Eco friendly advertisements are valuable to the society	11.299	0.000		
Environmental advertisements are poorly produced and not attractive	6.481	0.000		
Eco friendly advertisements do not convince customers to buy eco friendly products	7.889	0.000		
Green marketing communication activities used by the green companies are effective	9.459	0.000		
I like those advertisements that contain information regarding the eco friendly	10.055	0.000		

Above data analysis shows that p-value < 0.05, hence we reject H_0 and conclude that there is a significant difference (no association) between Green promotion and consumer perception towards Green FMCG Product.

All the above statements are analyzed to understand the consumer perception towards green promotion. From the analyzed data it is concluded that majority of consumers agreed that environmental advertisement are valuable to society but not convincing the consumers to buy eco –friendly products.

CONCLUSION:

Green marketing is not going to be an easy concept. The firm has to plan and then carry out research to find out how feasible it is going to be. Green marketing has to evolve since it is still at its infancy stage. Marketers have the responsibility to make the consumers understand the need for and benefits of green products as compared to non-green ones and the benefits they can reap in the future.

Companies producing green products need to highlight the functional benefits of green products in their promotional campaign. Personal selling is also one the way to communicate about the benefits of green products to consumers directly. Salesmanship also helps to show demo of the green products and to solve consumers query immediately.

Volume 8, Issue 2 (III) April - June 2021

REFERENCES OF THE STUDY:

BOOKS:

- 1. Kumar Ranjit, Research Methodology A Step-by-Step Guide for Beginners, SAGE Publications, (2010).
- 2. Chawla Deepak & Sondhi Neena, Research Methodology concepts and cases, Vikas Publishing house Pvt ltd, (2011).
- 3. Kotler, Philip. *Marketing Management The Millennium Edition* Prentice Hall of India Private Limited, New Delhi.
- 4. Research paper on factors affecting consumers green purchasing Behaviour: An integrated Conceptual Framework, by Hans Ruediger Kaufmann1, Mohammad Fateh Ali Khan Panni and Yianna Orphanidou, City University Bangladesh.

Thesis

- 5. The study on attitude and perception of the consumers and marketers towards green marketing with special reference to Fertilizer Industry, Mappayaram Gowri,Shri Jagdishprasad Jhabarmal Tibarewala University, 2013
- 6. Green marketing: an attitudinal and behavioral analysis of consumers in Pune by Sahu Tripti, Symbiosis International University, 2013.

WEBSITES

- 7. www.google.com
- 8. en.wikipedia.org/wiki/Marketing
- 9. www.blog.mbaco.com/importance-of-green-marketing
- 10. en.wikipedia.org/wiki/Green marketing
- 11. www.remarq.co.uk/about.../green-marketing-environmental-definition
- 12. www.businessdictionary.com/definition/marketing.html
- 13. www.greenprof.org/wp.../06/An-Introduction-to-Green-Marketing.pdf
- 14. blog.mbaco.com/importance-of-green-market

IMPACT OF COVID ON THE MODES OF PAYMENT: A STUDY IN ULHASNAGAR

Savita Punjabi

Bharat College of Arts and Commerce, Badlapur (W)

ABSTRACT

Year 2020 will always be registered in history for the never before experienced pandemic called COVID-19 due to the attack of Coronavirus. The entire nation is under lockdown following strict rules of social distancing and contactless transactions. All the countries of the world are badly affected due to the enforced close down of all their entire economy. The necessities are provided during the limited hours and cashless payments are encouraged as the virus impact remains on the paper ranging from few minutes to five days.

So the current study is undertaken on the youngsters of Ulhasnagar i.e the suburban city of Thane which is well known for cash payments. But the study reveals that the modes of payment are changed and maximum youngsters have started increased use of digital modes of payment including GPay and Paytm. The research article also explores the problems faced while using digital payment options and concludes with the suggestion to make it more safe, secure and popular among the residents of selected area.

Keywords: Digital Payments, COVID-19, GPay, PayTM

Impact of COVID on the modes of payment: a study in Ulhasnagar

INTRODUCTION

COVID – 19 led to a never-experienced before situation with series of lockdowns shutting all daily routine activities in totality for more than a year. Lack of free movement and social contact that was the only way for the disease converting pandemic affecting number of people by multiplying due to touch and infection made social distancing a new normal for the safe life along with mask and sanitizer as a vital part. The GDP of the economy fell down sharply marking a steep loss even in the stock market. However, the only thing that remained unaffected was the household expenditure for daily needs. People started hoarding the necessities for the emergencies in more quantity and this led to more payments.

Digital India Campaign though started on 1st July 2015 as a flagship program by Prime Minister Shri. Narendra Modiji with a vision to transform India into a digital society and a knowledge economy. Along with the intention to bring transparency in the government departments, it also intended to make the country digitally empowered for global connectivity. The first push up was given by demonetization, that led to cashless, paperless and faceless payments. The big leap in the use of digital wallets is caused by this pandemic that forced the year to be declared as a blank year changing the game at a massive scale.

An overview: Digital Payments during lockdown

The following table shows the volume of digital payments during lockdown period

Table 1

Month	No. of Banks live on UPI	Volume (in Mn)	Value (in Cr.)
Dec-20	207	2,234.16	4,16,176.21
Nov-20	200	2,210.23	3,90,999.15
Oct-20	189	2,071.62	3,86,106.74
Sept-20	174	1,800.14	3,29,027.66
Aug-20	168	1618.83	2,98,307.61
July-20	164	1497.36	2,90,537.86
June-20	155	1336.93	2,61,835.00

Volume of Digital Payments during June 2020 to December 2020

Source: https://www.npci.org.in/what-we-do/upi/product-statistics

REVIEW OF RELATED LITERATURE

Duvvuri Subbarao (2016) in his book suggested that the Government should come forward. Along with RBI, steps should be taken towards a cashless economy making it more digital. Electronic payments if encouraged can help to maintain transparency, all time automatic records, convenient and cheap mode of payment and at last will lead to the financial inclusion for all. In the same year Dr. V. Sornaganesh and Dr. M. Chelladurai discussed about the impact of demonetization on the economy. The study revealed that the Fast-Moving

Volume 8, Issue 2 (III) April - June 2021

Consumer Goods sector was affected the most due to the paucity of new currency. The credit cycle was extended by these companies till the situation became normal.

According to the article by G. Sudha and Dr. V. Sornaganesh in 2019, the buying behavior of customers changed showing their preference for digital payment through mobile banking and internet banking. One more article by the same author in 2020 revealed how the retailers are also adopting digital methods due to paucity of funds affected by demonetization. Thus, the traditional system of cash payment started changing with more use of e-payments and plastic cards. Mobile wallets, fund transfer, GPay, Paypal, Paytm etc. came into the picture more and more.

PROFILE OF THE STUDY AREA

For the purpose of the study, the working youngsters of the city of Ulhasnagar are selected. Ulhasnagar is a growing city with total population of 5.06 lakhs as per census, 2011 comprising maximum Sindhi population (https://www.census2011.co.in/census/city/370-ulhasnagar.html). The city is known for fast food available on every street and the sellers having turnover of nearly Rs. 2000 to Rs. 5000. Growing by leaps and bounds with modern youngsters ready to take free decisions due to open social environment is the reason for many featured changes in all aspects of life including the modes of payments. The city had people sticking to traditional habit of using cash for making payment for each and every item including grocery, medicines, fast food, hotel, theaters etc. Though demonetization has enforced residents of the sample area to use ATM cards, still digital payment method was not popular in the area. So the current study aims to study the impact of pandemic.

OBJECTIVES OF THE STUDY

The current study is undertaken with the following objectives:

- 1) To study the changing payment pattern among people in Ulhasnagar pre- and post-lockdown
- 2) To study the problems faced while using digital payment modes by youngsters in Ulhasnagar
- 3) To suggest the strategies for safe digital payment modes

HYPOTHESIS OF THE STUDY

 H_0 – There is no significant difference between the preferred mode of payment of the respondents before lockdown and during lockdown period.

METHODOLOGY

For the purpose of the study, the survey was conducted from 250 youngsters (belonging to age group of maximum 30 years) selected on a random sampling basis. Along with the primary data, the secondary data sources like various books, websites, magazines etc. were also used.

LIMITATIONS OF THE STUDY

- 1) The information given by the respondents might be biased because some of the youngsters might not be interested in providing correct information.
- 2) Respondents tried to avoid answering some statements due to security issues.

ANALYSIS AND DISCUSSIONS

Table-2 Demographic profile of the respondents

Demographic Factor	Options	Frequency	Percentage
A	Below 20 yrs	73	29.2
Age	21 – 25 years	157	62.8
	25 - 30 years	20	8
Canadan	Male	113	45.2
Gender	Female	137	54.8
Marital status	Married	89	35.6
	Un married	161	64.4

Volume 8, Issue 2 (III) April - June 2021

Level of Education	School	08	3.2
Level of Education	Degree/Diploma	131	52.4
	Post Graduate	70	28
	Professional	41	16.4
	Home Makers	37	14.8
Occupation	Government employee	19	7.6
	Private employee	73	29.2
	Business	51	20.4
	Student	62	24.8
	Others	8	3.2
Marthly	Up to Rs 10,000	83	33.2
Income	Rs 10,000 – Rs 20,000	92	36.8
	Rs 20,000 – Rs 30,000	47	18.8
	Above Rs 30,000	28	11.2

 H_0 – There is no significant difference between the preferred mode of payment of the respondents before lockdown and during lockdown period.

Table 3 -	T test on	Preferred	Mode of	Payment	before and	during the	e lockdown
-----------	-----------	-----------	---------	---------	------------	------------	------------

Factors	Paired Differences					t	Df	Sig.
	Mean	Std. Devi ati	l. Std. vi Error i Mean	95% Confidence Interval of the Difference				(2- tailed)
		On		Lower	Upper			
Vegetables & Groceries	131	.575	.039	206	052	-3.782	249	.001
Medical expenditure	264	.630	.042	347	180	-7.054	249	.000
Utility Bill Payments (electricity, petrol etc.)	197	.701	.048	291	103	-4.717	249	.000
Hotel expenditure	132	.617	.047	221	036	-3.127	249	.007
Others including shopping	155	.677	.045	246	065	-3.853	249	.001

Source: Primary Data

The above table shows the relationship between different modes of payment preferred before lockdown and during the lockdown period. For various categories, the table values are less than the p value. Thus, it shows that the null hypothesis cannot be accepted leading toe acceptance of alternative hypothesis and it is concluded that there is a significant difference of preferred mode of payment before and during the lockdown period.

Volume 8, Issue 2 (III) April - June 2021

OTHER FINDINGS

- As far as the payment patterns are concerned, it is found that prior to March 2020, 227 respondents (90.8%) preferred cash payment for regular purchases of vegetables, sweets, hotels etc. However, during lockdown, out of 250, 181 respondents (72.4%) started using digital modes of payment even for the regular purchases of necessary items.
- 2) As per the data received, prior to March 2016 about the most preferred way of making online payment, 131 respondents (52.4%) were using credit cards, while 43 respondents (17.2%) used debit cards), 61 respondents (27.73%) opted for Paytm card payments and 15 respondents (6%) used GooglePay. After March 2016, the scenario changed regarding the most preferred way of online payment, i.e., 101 respondents (40.4%) use credit card, 32 respondents (12.8%) used debit cards, 52 respondents (20.8%) used Paytm and 65 respondents (26%) used GooglePay. Thus, the preferred modes of payment showed a big change.
- 3) While inquiring about the problems faced by the respondents making digital payments, 147 respondents (58.8%) reported network issue, 119 respondents (47.6%) reported delay in payments, 53 respondents (21.2%) reported failure in payments, 228 respondents (91.2%) reported risk of frauds and 203 sample (81.2%) reported too many entries made in pass book due to use of GPay

CONCLUSION

Still the improvements are required for encouraging people to use digital modes of payment by making it more and more safe. At the same time, more incentives and cashback for encouraging the use of digital mode of payment along with improvement in network connectivity using public open wi-fi and increased number of towers can be other strategies. Easy and convenient method of making payment encouraging not only youngsters but also senior citizens through electronic literacy to enforce the contactless payments is the need of future economy making it the active member of globalized developed world.

REFERENCES

- V. Somaganesh and Sudha Ganesh (2020) "Impact of Covid-19 Outbreaks in Digital Payments" International Journal of Innovative Research in Multidisciplinary Field Vol-6, Issue-8, August 2020, ISSN: 2455-0620
- 2. Dr. Duvvuri Subbarao (2016) "Who Moved My Interest Rate?" Penguin Random House India, ISBN: 9780670088928
- 3. Dr. V. Sornaganesh and Dr.M.Chelladurai (2016), "Demonetization of Indian currency and its impact on business environment" International Journal of Informative and Futuristic Research Vol-4, Issue-3 November- 2016, PP5654-5662
- 4. http://cashlessindia.gov.in/mobile_wallets.html
- 5. http://cashlessindia.gov.in/upi.html

A STUDY ON IMPACT OF DEMONETIZATION ON SMALL SCALE INDUSTRIES

Mohammed Sadiq Hasan¹ and Mohammad Khalil Ahmad² ¹Thakur College of Science and Commerce, Kandivali (E), Mumbai ²Kalsekar College of Commerce & Management

ABSTRACT

This paper aims to understand the impact of demonetization on the small scale industries/ businesses. A descriptive study was done by conducting a survey and collecting the responses from 20 respondents consisting of both male and female. Demonetization means removing or stopping the currency from the circulation with the legal framework of the country. On November 8, 2016, Honourable Prime Minister Narendra Modi in a surprise announcement said the existing higher denomination currency (Rs 500 and Rs 1000) would cease to be legal tenders. The decision to demonetize Rs 500 and Rs 1000 currency notes had a huge impact on the small industries / small businesses in Mumbai. No doubt that Demonetization is a great move for a better future on India and its economy. It definitely is influencing many shoppers to start using plastic money in the long term. The impact of Demonetization was also on consumers, facing sudden cash shortage, long queues accumulating in front of Banks and ATMs. This paper also shows how much problems has been faced by shopkeepers, how their business got effected.

Keywords: Demonetization, small industries, small businesses, plastic money, economic system

1. INTRODUCTION:

The currency was demonetized first time in 1946 and second time in 1978. On November 2016, the currency is demonetized third time by the present Modi government. This is the big step taken by the government of India for the betterment of the economy and country. Demonetization is done when a country wants to change its currency so that, the country become cashless economy, curb terrorism, push people to pay taxes for the unaccounted pile of cash.

The Reserve Bank of India on August 30, 2017 released its report on demonetization. In the report, it is said 99% of the banned notes came back into the banking system, which trashes all claims of Narendra Modi that the move will flush out the black money and counterfeit currency. To demonetize Rs 500 and Rs 1000 currency notes was the decision that had a huge impact on the small industries/small businesses in Mumbai. Most small business placed a notice at their entrances, declaring their compliance with the government's order and requesting customers to tender notes of Rs 100 denomination or use E-wallets, credit and debit cards for any purchase. This led to fall in sales. In the short to medium-term, large denomination purchases will likely be made via electronic purchases rather than through brick and mortar outlets. This will affect the small business adversely. Impulse buying refers to unplanned, sudden buying behaviour, which is often accompanied by a feeling of excitement and pleasure and/or a powerful urge to buy. Impulse buying is an inevitable part of everyday life. It is well thought-out as a source of relaxation and reflects certain traits of personality. Around 75% of purchases are not planned, so retailers view impulse buying as an important component of their business. Impulse buying behaviour is a sudden, compelling, hedonically complex buying behaviour in which the rapidity of an impulse decision process precludes thoughtful and deliberate consideration of alternative information and choices. Several researchers have reported that consumers do not view impulse purchasing as wrong; rather, consumers retrospectively convey a favourable evaluation of their behaviour. Other researchers have treated impulse buying as an individual difference variable with the expectation that it is likely to influence decision making across situations. Impulse buying behaviour is a reasonable unplanned behaviour when it is related to objective evaluation and emotional preferences in shopping. Impulse buying is a concept which has evolved from the simple definition of Unplanned buying' to more complex definitions. If each impulse buying is unplanned, each unplanned buying is not an impulse buying. Impulse buying is related to positive (hedonism, reward, etc.) and negative (bad mood, stress) emotions. Impulse buying is also linked to a deficit of self-control, and low self-esteem, can contradict long-term goals (e.g., saving money) and engender satisfaction, but also involves regrets or guilt. The main focus of this paper is on small scale businessmen and how they have been affected because of this decision. Many reports stated that the small scale businessmen have immensely affected after demonetization because of the cash crunch and lack of infrastructure like digital payment system etc. Small traders in retail sector (grocery shops etc), service sector (restaurants, nursing homes etc.), gems and jewellery, small traders in agricultural products, SMEs, small dealers, professionals like doctors, lawyers etc, have highly affected because of demonetization during last one year.

Volume 8, Issue 2 (III) April - June 2021

2. REVIEW OF LITERATURE:

- i. **Surjit Victor and Mohammad Imtiaz** in their paper titled THE IMPACT OF DEMONETIZATION ON INDIAN RETAIL SECTOR concluded that: Indian Retail sector reported downfall of averaging up to 42% profits in the sector in their early weeks. Demonetization is the big challenge in retail sector in India. After a chaotic fortnight for the whole country ever since the government announce the fractional demonetization of the higher value rupee notes. The retail industry has definitely confronted a short-term effect of this, as spend are adjourn towards immediate needs. So, the knock has mostly been confined to the unorganised retail sector. They said that Demonetization changes the working environment of the market. Organizations would also modify in their usage and utilization of the innovative tools and applications for the cashless payment.
- ii. **C.V. Ranjani and Manikya Veena** in their research paper titled IMPACT OF DEMONETIZATION ON RETAIL SECTOR concluded that: Demonetization is a historical step to curb black money but it has to be taken into consideration that most of the black money is kept in the form of land, building or gold or kept abroad. The objective of their paper was to study the impact of demonetization on retail sector as well as on consumers. The paper was based on secondary data.
- iii. M. Angel Jasmine Shirley has studied about the IMPACT OF DEMONETIZATION IN INDIA in her research paper. In the first part of the paper, the impact over Indian economy had been explained. As per the research, the BSE SENSEX and NIFTY 50 stock had been fall near about 6% on the very next day. Moreover on the later on days, the country felt severe shortage of the cash. Moreover due to lack of cash overall production had decreased. Banks had not enough new currency for the exchange of the old notes, which breakdown the overall economic system. Moreover there was a major impact over the domestic sectors, reduction in the government liability, farming and fishing industry, business, drop in industrial output, black money, impact over counterfeit currency, hawala, bank deposits, jewellery and real estate, IT sectors etc. "Not all black money is in cash, not all cash is black money". People face too much inconveniency due to improper planning about post demonetization.
- iv. Geeta Rani had presented the research paper to show the effect of demonetization over the retail outlets. She had done her research work by taking the primary data. She had used the questionnaire method. This was filled by the 50 shopkeepers of the area. As a result she had been ready with some out comes likewise 80% shopkeeper presented their view that from 9th Nov, 2016 to 10th Dec, 2016 there was 20% increase in sales due to accepting the old notes. But after that sales had declined. Shopkeeper started Paytm and cheque system. Shopkeepers had extended credit period. Top brands like HUL, P&G had affected with only decrease of 20% sales due to brand name. She concluded the paper by giving the views that though demonetization is painful for short term, but it will surely beneficial for the long run moreover most customers are now adopting cashless means like Paytm, debit card, cheque etc.

3. AIMS AND OBJECTIVES:

- i. To study the impact of demonetization on small scale industries / businesses.
- ii. To study the impact of demonetization on businessmen.
- iii. To study whether daily transactions of small businessmen have any effect on digitization of their transaction method or not.
- iv. To analyse the problems that have taken place due to demonetization.
- v. To study the remedial measures taken by the government to solve the problems or Chaos caused due to demonetization.

4. HYPOTHESIS:

H0: There is a negative impact of demonetization on small scale industries/small business. H1: There is a positive impact of demonetization on small scale industries/small business.

5. RESEARCH AND METHODOLOGY:

Research Design: Descriptive.

Sources: This contains both well secondary paper primary data. as as Primary Primary Data: Data has been collected through conducting online survey. Secondary Data: Secondary Data has been collected through various websites.

6. DATA INTERPRETATION (QUESTIONS FOR THE STUDY):

i. Do you think demonetization was a good step for the country?

Volume 8, Issue 2 (III) April - June 2021

- ii. Have you faced any problem in your daily transaction after demonetization?
- iii. Has your business has been reduced /down after demonetization?
- iv. Is there is a positive effect of demonetization on small businesses?
- v. Are the customers are paying through digital payment systems now?

7. FINDINGS OF THE STUDY:

- i. 80% of the respondents think that was a good step for the country.
- ii. 60% of the respondents said that they have faced problems in their daily transactions after demonetization whereas 40% of the respondents didn't faced any problems.
- iii. 83% of the respondents said that the business has been reduced sales has been reduced after demonetization, whereas 27% of the respondents business where running smoothly.
- iv. 63% of the respondents said no they were disagree, there were no positive effect of demonetization on their businesses, where as 37% of the respondents were strongly agreed with the positive effect of demonetization on their small business.
- v. 54% of the respondents said yes that many of the customers have started paying through digital payment systems.



8. IMPACT OF DEMONETIZATION ON SMALL SCALE INDUSTRIES/BUSINESSES:

Small and marginal business owners narrated tales of cashlessness that has drastically reduced their business. The nature and, frequency and amounts of the commercial transactions involved within these sections of the economy necessitate cash transactions on a more frequent basis. Thus, these segments are expected to have the most significant impact. Traditional grocery retailers still account for more than 90% of packaged food value sales in India. Since a big part of these retailers are not well equipped with card payment Machines, it is likely that sales during this period will have gone to modern/ internet retailers, which offer consumers that convenience of paying by card or through net banking.

9. TESTING OF HYPOTHESIS:

As we have applied T- test in this paper and since the P value was more than 0.05, thus, our null hypothesis were rejected.

10. CONCLUSION:

Demonetization may have had considerable negative effect in the first few days but in the end, it will have a positive impact on the economy. The government is taking all the necessary steps and actions to meet the currency demand and soon the trial and tribulations of the people will be over with the smooth flow of the new currency. The decision of demonetization affected the Indian economy to a larger extent but demonetization as the only way to curb block money and fake currency notes is not the only and ultimate solution to solve the economy problems.

Volume 8, Issue 2 (III) April - June 2021

REFERENCES

- 1. Angel Jasmine Shirley, M. Impact of demonetization in India.
- 2. http://indiaexpress.com/article/india/india-news-indiaacademia.edu/impact of demonetization on Indian Retail sector.
- 3. https://www.questia.com/library/journal/1P4-2159201707/the-impact-of-demonetization-on-the-impulse-buying.
- 4. Jai Bansal (2016), "Impacts on Demonetization: Organised and Unorganised sector", International Organization of Scientific Research, Journal of Humanities and Social Science, p- ISSN: 2279-0845, e- ISSN: 2279-0837, Pp-01-11, www.iosrjournals.org.
- 5. Ambalika Sinha and Divya Rai (2016), "Aftermath of demonetization on rural population", International Journal of Research in Economics and Social Sciences, 6(11), Pp. 223-228, ISSN(O):2249-7382.

DEALING WITH ENVIRONMENTAL CRISIS – ADOLESCENT STUDENTS 'INCLUSION OF NATURE IN SELF'

Devi Ghosh and Gauri Hardikar

Kapila Khandvala College of Education Santacruz, Mumbai

ABSTRACT

Nature connection is an innate human need. The extent to which an individual feels oneself as an intrinsic part of nature thinking of oneself and nature as one, they will treat it with respect and take actions beneficial for the environment. Considering oneself separate from nature is negative because it might allow one to think they are above nature, these thoughts perpetuate actions that impact the environment negatively.

In the present study inclusion with nature in which the self and nature become amalgamated has been studied in adolescent students in the age group 16-18 yrs from XI standard or junior college of the arts stream from the different mediums of instruction at the school level. Total of 43 students from each medium form a part of this study. The students are from a single institute.

This study aims to assess human-nature relationships to better understand what promotes adolescents desire to protect nature. In adolescence, values, identities and moral structures undergo intense development; the question is whether these factors can motivate adolescents to act pro environmentally to deal with the environmental crisis facing entire mankind today. For the present study, the mixed-methods approach was used. The descriptive research design was adopted for the quantitative part. Quantitative data was collected using the standardized INS Scale- by Shultz to measure the 'Inclusion of Nature in Self', from amongst the available scales. Qualitative data on the viewpoints of students regarding the environmental crisis was collected in the classroom through a semi-structured interview. Both the data were triangulated, our findings indicate contrary to what has often been assumed about other mediums of instruction. The findings point towards not much significant difference in results between students from the different mediums of instruction.

Keywords: Adolescent students, Inclusion of nature in self, Connection to nature, Nature crisis

INTRODUCTION:

Humans are a tiny fraction of the weight of living things but have a disproportionately large impact on our environment. The few studies that have addressed the perceptions and nature connectedness of children have focused on describing educational experiences and activities in natural environments like lakes and streams (Liefländer, Fröhlich, Bogner and Schultz 2013), lagoons (Cheng and Monroe 2012) and botanical gardens. Studies reveal that a positive human-nature relationship is essential for countering today's environmental problems.

Adolescents are impacted most by the effects of climate change and its related problems. India is among the countries most vulnerable to climate change. Potential effects of climate change in India include changing rainfall pattern, extreme heats, droughts, depleting groundwater levels, melting of glaciers, rising sea levels, ecosystem threats. Sustainability is the capacity for Earth's biosphere and human civilization to co-exist. Indifference towards nature will result in it being valued only for individual benefits. "Nature is in crisis". Failure to act is failing humanity.

LITERATURE REVIEW

The split with nature is at the heart of our environmental crisis (Jordan 2009). Our modern environmental problems are crucially interwoven with our relationship to nature. Individuals who value and feel concerned for the natural environment also want to protect it (Frantz et al. 2005; Nisbet, Zelenski, and Murphy 2009). According to (Schultz 2002) in a close association cognitive depiction of self and others become amalgamated. This is the central aspect of inclusion with nature that is observed in the schematic representation of the INS Scale.

Liefländer, Anne K. & Fröhlich, Gabriele & Bogner, Franz & Schultz, Paul. (2013).In their study 'Promoting connectedness with nature through environmental education'- applied the Inclusion of Nature in Self (INS; Schultz 2002) scale to assess pupils' perceived connectedness with nature. They used a pre-, post- and retention test design, to study a comprehensive four-day environmental education programme on the water at a school field centre, to identify the change in the connectedness of 9- to 10- and 11- to 13-year-old pupils. They found that younger children and university-track pupils had higher connectedness to nature (INS) scores than older children and general education-track pupils, respectively. Participating in environmental education resulted in a

Volume 8, Issue 2 (III) April - June 2021

robust short-term increase in connectedness with nature in both age groups.

Pandve, H. T. Deshmukh, P. R., Pandve, R. T., & Patil, N. R. (2009) – 'Role of youth in combating climate change'. They conducted a questionnaire-based pilot survey in Pune city of Maharashtra state, India to assess awareness about climate change among college-going youth. Amongst 201 respondents 66.2% were males and 33.8% were females studying in various faculties or courses. About 98.5% of respondents said the global climate is changing, 95.5% of the respondents also commented that human activities contribute to climate change.

Earlier studies do not find mention of the effect of inclusion of nature in self on adolescent students from the different mediums of instruction. The medium of instruction is often an area of assumed one-

upmanship, does this translate into environment-friendly actions, values and beliefs, or concern is the main focus of the study.

OBJECTIVES OF THE STUDY:

- To compare the difference in INS scores among adolescent students from the different mediums of instruction.
- To investigate the reasons for the difference in INS scores in adolescent students from different mediums of instruction.
- \cdot To study the perception of inclusion of nature in self in adolescent students of different mediums of instruction.
- To study the relationship with nature in the current pandemic as a result of the inclusion of nature in self amongst the adolescent students of different mediums.

Methodology: For the present study mixed-methods approach was used as it provides a holistic picture. The descriptive research design was adopted for the quantitative part. Qualitative data regarding the viewpoints of students regarding the environmental crisis was collected by semi structured interview to understand the breadth and depth of understanding and corroboration.

The sample, identified using the stratified random technique, consisted of 43 Class XI students each studying in English (sample-1) and Marathi medium (sample-2) of the same institute from the Arts stream.

The study used the standardized INS Scale- by Shultz to measure the 'Inclusion of Nature in Self', from amongst the available scales.

DATA COLLECTION:

Descriptive data were collected from students by administering them the single-item scale (**INS Scale**) and their responses were recorded. The test re-test validity of the scale was established which was 0.956. Participant's who include nature as a part of themselves and are connected to nature choose the pair of circles completely overlapping (scored 7). Similarly, participants who do not feel a part of nature or disconnected from nature choose a pair of circles non-overlapping (scored 1).

Qualitative data was collected from a Sub-sample of 20 students identified randomly from each sample group of 43 students. Data was collected from these two sets of 20 students in the classroom through a semi-structured interview for the measurement of variables like perception, motivation and emotions.

DATA ANALYSIS:

For the present study, the triangulation method was used which seeks corroboration, correspondence of results from different methods.

Triangulation Design Quantitative-INS Scale – Data collection, Analysis (t- Test), Results Qualitative- semi structured interview. Data analysed, Results Results of both the types of data were merged to compare, interrelate, and validate results Interpretation -Equal emphasis on both data forms to corroborate

Volume 8, Issue 2 (III) April - June 2021

Quantitative Analysis: Both the samples were compared with regards to their scores on INS, using two independent samples t-test (unequal variance). The results and graph are given below.

Variab le	Mean&(Variance) Sample 1	Mean&(Variance) Sample 2	Ν	df	Cal.t value	Crit.t value	Null Hypothesis
INS	4.19 (0.77)	4.68 (2.65)	43 + 43	65	1.73	2	Retained

Null Hypothesis: H0 There is no significant difference in the scores on the Inclusion of Nature in Self of adolescent students from different mediums of instruction.

Interpretation: The value of t observed (1.73) is less than that of t critical (2.00). Hence the Null hypothesis is retained. It is, therefore, concluded that there is no significant difference between INS Scores of the sample-1 and sample-2 students. Students of both groups have similar knowledge of INS.

Graph of INS SCORES of both samples



(Sample-1- English Medium) (Sample-2- Marathi Medium)

QUALITATIVE ANALYSIS

Feeling responsible for the environmental crisis -

From sample-1, 97% and from sample-2, 100%, feel that they are responsible for the environmental crisis. 3% of sample-1 students do not feel responsible for the environmental crisis. According to Sample-1 human greed is responsible whereas sample-2 feels that industry, vehicles pollute the air and people like builders destroy forests to serve their selfish purposes.

It was observed that some students from sample-1 feel a sense of disconnect from nature probably stemming from the fact that they feel that their actions cannot harm the environment. What does not belong to me, how can it be my responsibility? Others are responsible for all the damage to the environment, small actions on my part can't change the situation. Their responses point to others being responsible for environmental damage. They are high scorers compared to the sample-2 students. They do not have experiences of what nature has to offer, probably since they spend more time indoors. Students from sample2 feel responsible for the environmental crisis Many of these students visit their villages during holidays, festivals. Their village environment provides more contact with nature.

The difference, though not statistically very significant between the scores of the two samples could be due to their perception of nature being from different socio-economic backgrounds and even the difference in marks obtained in the secondary school certificate exam. It could also be a pointer in the direction of awareness of environmental issues, the importance of nature due to the inclusion of EVS in their curriculum. The results also point to the fact that the medium is not a barrier in connecting with nature.

Perception of inclusion of nature in self

When asked about how they can include themselves as a part of nature, sample-1 expressed that they go for walks in the society garden to relax, do not dirty immediate surroundings, and enjoy seeing the birds, butterflies around, minimalistic living and using electronic data storage instead of paper. The responses about conscious environmental actions as a result of including nature as a part of oneself or amalgamated with it by sample-1point towards immediate comfortable achievable actions which if they incorporate in their lifestyle will go a long way in preventing damage to the environment like minimalistic living which is a bold choice for adolescents, as also paperless living.

The responses of sample-2 show a closer bonding with nature. They include themselves as a part of mother earth. They are aware of the fact that a mother will always care, nourish and protect her children. Planting trees taking care of them also will build up empathy in them, strengthen the bonds between them. This also points
Volume 8, Issue 2 (III) April - June 2021

towards sustainable living. The Environmental Crisis is a crisis of consciousness.

Change in the relationship with nature during the pandemic

Both the groups revealed that their relationship with nature has certainly changed during the pandemic. Sample-1 felt more responsible for their actions towards the environment compared to their earlier response of not feeling responsible for the damage to the environment. They had time to observe nature in the silence, they could connect with it. Until now human had covered nature with plastic, shockingly now, nature has covered human in masks and PPE kits. Just as nature gives us everything for our needs, it can hit back at us when we exploit it. Sample-2 students had a focussed approach to personal and social behaviour. They had a more ground approach. They realized the importance of keeping the surroundings clean, the importance of personal hygiene, thereby acting responsibly to contain the spread of infection.

RESULTS & DISCUSSIONS:

The scores obtained on the INS scale administered to the Arts students from the different streams show unexpected results. The sample-1 (85-93% at SSC) student's INS scores are comparatively lower than those of sample-2 students (50-70% at SSC), despite them having strong views on life. The normal perception would be those adolescent students with strong views about life and future goals would display more concern towards the environment since they are the future but the results indicate otherwise. The sample-2 students showed comparatively higher scores on the INS scale. Many of these students visit their native villages which are greener with some of them having farms, which have helped them maintain that bond with nature. They have seen the produce from their farms and how it nourishes the body. The sample-1 students are mostly from urban settings secure in their four walls with gadgets for company. They have fewer chances of connecting with nature. Unless a bond is developed there is no connection developed and no feelings of kinship. Inclusion emphasizes the value that individual places on their place in nature and how their actions impact the environment. We feel closest to nature when we realize that we are part of Nature. Mayer and Frantz, (2004) have mentioned that a strong relationship exists between humans and nature, a disconnection from nature will result in attitudes and behaviours which may cause irreparable damage to the planet. The adolescents are students of impressionable age, they are the future they need to develop a kinship and ascribe responsibility for their actions. The sample-1 students have an awareness that needs to translate into action; the sample-2 students, on the other hand, have more experiential knowledge which might be reflecting in their scores. Nature connectedness is an indicator of environmental behaviours (Mayer and Frantz, 2004).

Limitations: The present study was conducted with adolescent students from the Arts stream of a single institute. Hence the results have limited generalizations.

CONCLUSION:

Connectedness to nature, valuing it, feeling a sense of belongingness leads to caring. The sense of caring leads to feelings of kinship, commitment to protect nature. To have a sustainable world, in which the human needs and the needs of nature are balanced is through inclusion. Small changes in sustainable living can go a long way in healing the environment. The present pandemic has taught us many life lessons. We should play our parts, assume our responsibilities and do our bit to a better life on mother earth. Many of these questions need to be addressed by all of us especially the 'adolescents' as nature is a gift in their hands. There is only one planet and they need to save it. Youth can play a crucial role in combating climate change.

REFERENCES

- 1. Cheng JC-H, Monroe MC. (2012) Connection to Nature: Children's Affective Attitude Towards Nature. Environment and Behaviour.; 44(1):31-49.
- 2. Frantz, C., F.S. Mayer, C. Norton, and M.Rock (2005). "There is no 'I' in nature: The influence of self-awareness on connectedness to nature." Journal of Environmental Psychology 25 (4): 427–36.
- 3. Jordan, M. (2009). "Nature and Self—An Ambivalent Attachment?" Ecopsychology 1 (1): 26–31.
- 4. Liefländer, Anne K. & Fröhlich, Gabriele & Bogner, Franz & Schultz, Paul. (2013). Promoting connectedness with nature through environmental education. Environmental Education Research.19. 370–384. 10.1080/13504622.2012.697545.
- 5. Mayer, F.S., & Frantz, C. M. (2004). The connectedness to nature scale: A measure of individuals' feeling in community with nature. Journal of Environmental Psychology, 24, 503-515.
- 6. Nisbet, E.K., J.M. Zelenski, and S.A. Murphy. (2009). "The nature relatedness scale: Linking Individuals' connection with nature to environmental concern and behaviour." Environment and Behavior 41 (5): 715–

40.

-

- 7. Pandve, H. T., Deshmukh, P. R., Pandve, R. T., & Patil, N. R. (2009). Role of youth in combating climate change. Indian journal of occupational and environmental medicine, 13(2),105.
- 8. Schultz. P.W.(2002)."Inclusion with nature: The psychology of human-nature relations." In Psychology of sustainable development. Edited by P. Schmuck and P.W Schultz, 61–78. Boston, Dordrecht, London: Kluwer Academic Publishers.

REPORTING STANDARD IN CARBON CREDIT ACCOUNTING: A STUDY IN INDIA

Aditya Prasad Sahoo Ph.D. Research Scholar, KSOM, KIIT University

ABSTRACT

India has appeared as a frontrunner in carbon trading (Bhardwaj D. B., 2013). This study targets to examine how carbon credit trading is done, carry out of reporting of carbon emission in financial statement of various Indian companies and to provide some commendation on reporting for Certified Emission Reductions. This study is an exploratory in nature and used secondary data. In this study data from 20 Indian Companies annual reports has been taken in to consideration. As per the Guidance Note on Accounting for Self-Generated Certified Emission Reduction (CERs) issued in 2012 by Institute of Chartered Accountants of India (ICAI, 2012) reporting standards of CER has been compared. This study includes judgmental sampling. It was found out that 7 percent of Indian Companies provide particulars about number of CER held as inventory, their valuation basis in financial report and number of CER sunder certification. Only 17 percent of Indian companies doing carbon trading disclose about equipment used for reduction of CER and 93 percent does not provide any details. Indian companies hardly reveal about depreciation, maintenance and operating costs of equipment's used for CER reduction. The result of this study would help Indian listed companies to save carbon and implement reporting standards for Certified Emission Reductions.

Keywords: Credit accounting, CERs, Financial, Reporting, Companies

1. INTRODUCTION

The Kyoto Protocol has created a mechanism under which countries those who are emitting carbon and other gases has voluntarily decided that thev will bring down the level of carbon to level Kyoto the of early 1990's. Protocol suggested that governments should reduce their emission of greenhouse gases. The Protocol commits Annex I countries (developed countries which have accepted the emission-reduction goals for the period between 2008 and 2012) to individual, legally-binding commitments on the reduction of their greenhouse gas-emissions. The general target that the developed countries were to reduce their greenhouse-gas emissions by about 5% below their 1990 levels in the timeframe as addressed by the Kyoto Protocol (UNFCCC, The Kyoto Protocol).

The Protocol divides the nation into two general categories as: Annex I countries: where the group of countries included in Annex I as amended in 1998 to the UNFCCC, including all the OECD (Organization for Economic Co-operation and Development) countries and economies in transition and Non-Annex 1 countries which are developing countries, and they have no emission reduction targets(TFS Green, Glossary).Clean Development Mechanism (CDM) is applicable to India.

2. REPORTING STANDARDS IN CARBON CREDIT ACCOUNTING

Lot of companies in India are generating and trading in carbon credits, but there remains lot of questions for the accounting accounting treatment. There questions are on for expenditure on the CDM projects, accounting for self-generated CERs, accounting for sales and so on. Some countries suggest carbon recognition of credits as government grant. But, this approach **CERs** is not a benefit that is provided by government. It is an incentive provided to entities for conservation of the environment (Sharma, 2013). International Accounting Standards Board had issued an interpretation on Emission Rights but later withdrew the same. The Institute of Chartered Accountants of India(ICAI) has issued an Exposure Draft of the Guidance Note on Accounting for Self-generated Certified Emission Reductions in2009 suggesting accounting principles for CERs (Certified Emission Reductions) generated by an entity. It provides an accounting principles relating to recognition, measurement and disclosures of CERs generated by CDM. An entity should show certified emission as a part of Inventories, in the balance sheet, separately from other categories of inventories such as Raw material, Finished Goods and others (ICAI. 2012).

An entity should disclose the information relating to the certified emission rights in the financial statements: (ICAI. 2012). Those are:

- \checkmark No of CERs held as inventory and the basis of valuation
- ✓ No of CERs held under certification
- ✓ Depreciation, operating and maintenance costs of Emission

 \checkmark Reduction equipment expensed during the year.

An entity should apply this Guidance Note for accounting periods beginning on or after April 01, 2012.

3. LITERATURE REVIEW

Kolks Ans, Levy David and Pinkse Jonatan (2008) there is a study which has been done to examine reporting mechanisms for greenhouse gases focusing on carbon disclosure projects in UK. The result shows that Carbon disclosure Projects is very successful in terms of reporting and backing from prominent investment banks and pension funds. But it is still very difficult to get insight of the emissions of a firm by Carbon Disclosure Project.

Simpkins Kevin (2008) Research has been done to study the standards of emission reporting in New Zealand. It has been suggested that New Zealand constituents should participate in the international deliberations. New Zealand boards may move quickly to adopt the international standards.

S.Raval Dharmesh (2009) a study shows that there has been a strong growth for carbon credits and offsets projects in India. Global warming has become an advantage for developing countries and lot of credits goes to corporates.

Sarkar A. N. (2010) in India for developing sound marketing system there is a need to comply Global Accounting Standards. Carbon neutrality and Carbon literacy will play major role. Business Model for CERs transaction needs to be developed in India. Voluntary carbon market with focus on Carbon Offsetting will help in emission reduction.

Mondal Atish Prosad, Sachdev Sanchit (2012) India is at third place in the global supply of project-based emission reductions in 2005 (at 3%) 13, behind China (73%) and Brazil (11%). The public sector in India is relatively absent from the carbon market. At present, there is no accounting guidance within International Financial Reporting Standards (IFRS) for transactions involving carbon allowances. The International Accounting Standards Board (IASB) issued IFRIC-3 on 'Emissions Rights'but it was withdrawn in June 2005.

Chika Saka (2014) it was found out that reduction in carbon emissions improves medium and long term profits and cash in ows in Japan. Disclosure of carbon management practices has a positive relation with the market value of equity for Japanese companies. There is a negative relation between the volume of carbon emissions and the market value of equity and positive relation between the disclosure of carbon management and the market value of equity with a larger volume of carbon emission.

4. STATEMENT OF PROBLEM

some studies has been conducted on carbon credit trading reporting and accounting, but no specific study has been conducted on reporting Standards in Carbon Credit for Indian listed companies.

5. OBJECTIVE OF THE STUDY

This paper aims to discuss the reporting standards for carbon emission according to the Guidance note on selfgenerated certified emission reduction and 30 listed Indian companies doing carbon trading were analyzed.

6. RESEARCH METHODOLOGY

Annual report of 30 listed Indian companies was analyzed for the year 2014-18. It compares the disclosing of CERs in the annual report according to Guidance note on self-generated certified mission reduction by ICAI.

7. ANALYSIS AND INTERPRETATION

An empirical model was suggested to analyze the carbon emission and carbon management disclosure.(Chika Saka, 2013).

MVEt = a + B1BVEt + B2EARNt + B3Et (EARN t+1) + B4Disclosure + e

Where;

MVEt = Market Value of Equity at time t

BVEt = Book Value of Equity at time t

EARN = Earnings before extraordinary items in period t

Et (EARNt+1) = Forecast of earnings before extraordinary item for the next year at time t.

Disclosure = a dummy variable that takes a value of 1 if the company responded to the questionnaire at time t, otherwise 0, and all other variables are as previously defined.

e = error term

Volume 8, Issue 2 (III) April - June 2021

In this study on the basis of secondary data reporting standards for carbon emission according to the Guidance note on self-generated certified emission reduction and 30 listed Indian companies doing carbon trading were analyzed. Analysis is shown below:

Basis of valuation of CERs held as inventory					

Table - 1

FIGURE - 1: BASIS OF EVALUATION OF CERS HELD AS INVENTORY



Source: CMIE, India

Interpretation from Pie Chart - Only 8 percent of Indian Listed Companies gives details about number of CER held as inventory, basis of valuation in their financial report. 92 percent does not give details.

Table – 2

Number of CERs under Certification						
YES 7						
NO DETAILS	93					





Source: CMIE, India

Interpretation from Pie Chart - Only 7 percent of Indian Listed Companies gives details about number of CERs under certification on basis of valuation in their financial reportand 93 percent does not give details.

Volume 8, Issue 2 (III) April - June 2021

Table-3

Equipment used for CERs reduction				
DISCLOSES 18				
NOT DISCLOSES	82			



FIGURE - 3: EQUIPMENT USED FOR CERS REDUCTION

Source: CMIE, India

Interpretation from Pie chart - Only 18 percent of Indian Listed Companies disclose aboutequipment used for reduction of CER and 82 percent does not disclose.

No Indian Listed Companies disclose about depreciation, maintenance and operating for equipment used for CER reduction. From the above table we can interpret that no Indian listed companies completely follows the guidance notes given by ICAI for reporting of CER.

8. FINDINGS

Reporting of environmental performance and CER reduction has becomes a high priority for many companies (Lasalle, 2008). Now day's companies are scrutinizing the way it is monitoring and reporting on sustainability issues to stakeholders (Lasalle, 2008). Companies are facing challenges for balancing these sustainability reporting requirements, which are complex and varied, with existing operational performance reporting and analysis (Lasalle, 2008). The major challenge for these companies is to develop effective measurement and reporting tools to provide all the information required via a common set of base data (Lasalle, 2008).

9. SUGGESTION

- Companies may disclose the number of CER they have kept as inventory (if, in case) and basis of valuation
 of CERs as inventory. Companies may also disclose of number of CERs under their certification by
 UNFCCC.
- Companies may disclose in what way and at what price they are trading CERs. Is it OTC, derivatives, SPOT exchange etc. Also, they should disclose with whom they have traded.
- Companies may disclose about taxation for purchase and sale of CERs. Companies may disclose about equipment's used for CER reduction and how are they operating and maintaining the equipment's and how are they charging depreciation on that equipment's.

10. CONCLUSION

According to this study, no Indian Listed company follows the reporting standards guided by ICAI. This leads to mismatch of comparison of financial performance of companies for shareholders. Companies may disclose about the information related to CERs as this will help the investors to make a fair judgment. Companies may disclose about the price of the CERs at which they are trading. Proper reporting standards for CER in the financial statements can be made mandatory by Companies Law. This study is limited to 30 listed Indian companies' annual report for the year 2012 and based upon guidance note issued by ICAI for certified emission reductions. There are no set guidelines for reporting of carbon credits in the financial statements. This can lead to further research and suggestion in this regard.

11. REFERENCES

- 1. Bhardwaj, D. B. (2013). Future of carbon Trading: A Business That Works for Global Environment. International Journal Of Science, Environment and Technology, 115-121,
- 2. ICAI. (2012). Guidance Note on Accounting for Self-Generated Certified Emission Reduction. New Delhi: Institute Of Chartered Accountant of India.
- 3. UNFCCC(n.d.) The Kyoto Protocol. Retrieved 21 Tuesday, 2014, from http://www.mtholyoke.edu.
- 4. Sharma, S. (2013, December). Carbon Credits A growing opportunity with boon to Environment. EPCI&I.
- 5. Ans Kolk, D. L. (2008). Corporate Responses in an Emerging Climate Regime: The Institutionalization and Commensuration of Carbon Disclosure. European Accounting Review, 719-745.
- 6. Simpkins, K. (2008). Standards on emissions information reporting, assurance some way off. Chartered Accountants Journal, 1-3.
- 7. lasalle, J. l. (2008). Sustainability: The Measurement and Reporting Challenges. New Knowledge First.
- 8. S.Raval, D. (2009). Businesses and Global Warming Interface: Carbon Credit. SCMS Journal of Indian Management, 31-40.
- 9. A.N.Sarkar.(2011). Global Climate Governance: Emerging Policy Issues and Future Organizational Landscapes. International Journal of Business Insights & Transformation, 1-19.
- 10. Alex Frino, J. K. (2009). Liquidity and transaction costs in the European. Journal of Derivatives & Hedge Funds, 100–115.
- 11. Janek Ratnatunga, S. J. (2011). The Valuation and Reporting of Organizational. Accounting Horizons, 127–147.
- 12. Kanwalroop K. Dhanda, P. J. (2011). The New Wild West Is Green: Carbon Offset Markets, Transactions, and Providers. Academy of Management Perspectives, 1-14.
- 13. Atish Prosad Mondal, S. S. (2012). Carbon Credit: A Burning Business Issue. International Trade & Academic Research Conference, 170-178.
- 14. Chika Saka, T. O. (2014). Disclosure effects, Carbon emission and corporate value. Sustainability Accounting, Management and Policy Journal Vol.5 No. 1, 22-45.

THE ROLE OF SMOG IN THE CLIMATE CHANGE AND SUSTAINABILITY

Dr. Ambrish Singh¹ and Dr. Rahul Wagh² ¹Rajkiya Engineering College, Azamgarh, Uttar Pradesh ²SKN Sinhgad School of Business Management, Pune-Maharashtra

ABSTRACT

Climate change is a big threat to the present civilization and it creates the real danger to the very existence of life on planet earth. The increasing pollution and average annual temperature is playing havoc with atmosphere, lithosphere and hydrosphere, the basic building blocks of life on globe. Impact of climate change is visible in the different walks of life, whether economy, agriculture, politics, health of living creatures including plants. The changing climate has also put impact on the livelihood patterns. The present study is an attempt to analyse the impact of climate change by studying and elaborating Smog a constituent of it. Smog is a small ingredient of the big recipe of climate change. The case study method is chosen for the present study in which the researcher has taken smog for discussion in detail. The increasing smog in the big cities of the world is a matter of high level debate now-a-days. The smog condition of some big cities of the world is also investigated. This paper discusses various reasons behind the creation and generation of smog and its impact on the climate change has also been analysed. The present study also put forward the measures to combat increasing trend of smog and to reduce the impact of the smog on the social and economic life of the nation.

Keywords: Climate Change, Smog, Global Warming, Atmosphere, Pollution, Health and Economy

INTRODUCTION

Today the world is grappling with climate change and is committed to bring down the global temperature at pre industrial level. The increasing level of global warming, pollution of air and water are the product of anthropogenic activities in the world .Starting from the invention of Steam engine and commencement of Industrialization in Britain the world became more and more interested in extracting the natural resources from the earth and using it indiscriminately to get industrialized. The western countries of Europe were the predecessor of this economic movement. But the developing countries also came into its group not for their economic development but for serving the European imperial bosses by supplying more and more natural raw material. This led to complete devastation of the earth around the globe. The natural resources extracted by the earth ranges from forest cover available on earth for wood and metals and fuel available inside the crust like iron and coal. Scientific inventions for the progress of human beings also add up to the pollution. Industrial revolution polluted our planet in multifarious ways. It has polluted our atmosphere, our lithosphere, our hydrosphere and accompanying with scientific invention it has led to emergence of something known as non biodegradable. These components will live in our planet forever and will pollute it forever. Plastic is an example of it. This pollution which results primarily from industrial revolution is the cause of global warming. With independence the newly formed developing countries too started taking up industrial revolution as the primary activity to get developed. The problem of climate change is long an issue which was ignored by the world community to preserve their economy. The first step taken by the world community to preserve and protect our environment is the Stockholm Summit in 1972 in which the world community has recognized for the first time that climate change is a serious problem of concern. But it was only in Kyoto protocol of 1997 that world has taken a first step to reduce the climate change serious under the aegis of United Nation Framework Convention for Climate Change. Now we are close to the heels of beginning of a new treaty called Paris agreement of 2015. This international scenario came into play because the world is facing dire consequences of climate change.

AIMS AND OBJECTIVES OF THE STUDY

- 1. The present study will try to explain what is Smog and what are the major constituents present in it.
- 2. The study will also list out various reasons behind the formation of the smog in the local atmosphere.
- 3. The study will try to find out factors which led to creation of Smog in India
- 4. The study will show where India is situated in the world order of smog.
- 5. The study will try to analyse the artificial atmosphere created due to smog and its impact on health of the living beings residing beneath the cover of this artificial atmosphere.
- 6. The study will also find out how smog is impacting Indian economy.
- 7. The study will look out the ways through which other countries dealt with smog.

Volume 8, Issue 2 (III) April - June 2021

8. The study will also suggest various ways to provide relief from the creation and generation of smog.

Research Methodology-The descriptive research design is used for this study is basically an attempt to analyse the secondary data present on air pollution. This research will specifically deal with smog which is the major pollutant of the air. This research will look out various materials, studies present and will try to give a holistic picture of Smog, its constituents, its impact, on various walks of human life. The research will be a unique effort in its own because it attempts to deal with multifarious aspects of air pollution at a single place. Mainly secondary data sources are consulted for writing this paper. The reports of the different stock-holders and ministries are also used for completion of this work.

What is Smog? - Our atmosphere has been maligned by the pollutant released into it by various sources. When these pollutants get mixed with the fog present in the atmosphere it led to the creation of smog. Encyclopedia says that "smog refers to an atmospheric condition of atmospheric instability, poor visibility, and large concentrations of gaseous and particulate air pollutants." The word "smog" is an amalgam of the words "smoke" and "fog." There are two types of smog: reducing smog characterized by sulfur dioxide and particulates, and photochemical smog characterized by ozone and other oxidants. Smog is a yellowish or blackish fog formed mainly by a mixture of pollutants in the atmosphere which consists of fine particles and ground level ozone. It can also be defined as a mixture of various gases with dust and water vapor.

Reasons behind creation of smog- The atmospheric pollutants or gases that form smog are released in the air when fuels are burnt. When sunlight and its heat react with these gases and fine particles in the atmosphere, smog is formed. It is purely caused by air pollution Ground level ozone and fine particles are released in the air due to complex photochemical reactions between volatile organic compounds (VOC), sulphur dioxide (SO_2) and nitrogen oxides (NO_x). These VOC, SO₂ and NO_x are called precursors. These precursors are created through the emission from major industries, basically those industries which uses non renewable sources of energy. The other big source of the creation of smog is the emission by vehicular pollution, practicing of Slashn-burn agriculture also contribute to smoke in the atmosphere, in the modern agriculture also stubble burning which is economically nonviable for farmers is heavily contributing to smog in the northern India, the other prime reasons are claiming more and more land for human settlement by clearing forest which makes the land barren and erosion led to taking up of the top cover of the soil and making atmosphere dusty. India being a developing country has a high construction demand which adds up to particulate matter and dust into the atmosphere. Smog is often caused by heavy traffic, high temperatures, sunshine and calm winds. These are few of the factors behind increasing level of air pollution in atmosphere. All these activities led to the mixing up of our atmospheric gases such as life supporting oxygen with noxious gases such as carbon dioxide, nitrogen oxide, carbon monoxide, ozone, particulate matter 2.5 and particulate matter 10 and creation of smog.

Creation of Smog in India- Creation of smog in India is a common feature from past many years it has reached to its peak in 2012 when the world started comparing New Delhi's smog with the smog of Beijing. In India smog is seen in cities close to industrial bases from quite a long time but from past few years it is also apparent in tier II cities like Lucknow, Agra, Meerut and Varanasi, vehicular pollution and pollution by stubble burning by the farmers can be taken as two prime reasons of it.

During the winter months when the wind speeds are low, it helps the smoke and fog to become stagnate at a place forming smog and increasing pollution levels near the ground closer to where people are respiring. It hampers visibility and disturbs the environment. This period coincide in Northern India by two major calendar events, first, among which is *Diwali* celebration. *Diwali*, known to be the festival of light and triumph of truth over evil but this festival is also accompanied by cracker firing which is rampant along the major cities of the country. The second reason is, the commencement of a new season in agriculture popularly known as *Rabi* this season demands cleared fields and to do this farmer burns the stubble residue of the previous season by burning it. They claim that this stubble is non economic for them that is why they don't want to waste their labour on it and prefer to burn it. These two reasons are the prime factors accompanied with onset of winters, marked by southward march of the sun. This provides perfect condition for the smog formation.

India's place in the world order of Smog-India has overtaken China in terms of the number of deaths due to ambient (outdoor) air pollution with the country witnessing 50 deaths more than China reported per day in 2015, according to Global Burden of Disease project. Recent data shows that in 2015, India witnessed 3,280 Premature Deaths (fatalities due to Ozone concentration and particulate matter concentration) per day, whereas China had recorded 3,230. In 2010, numbers of Premature Deaths in India were at 2,863, whereas in China it was at 3,190. Similarly, in 2005 India was at 2,654 and China at 3,332.

So, while Premature Deaths have increased by 23 per cent in India over the last decade, China has reversed the trend and recorded a decline of three per cent. Global Burden of Disease (GBD) project has been compiled by the Institute for Health Metrics and Evaluation at the University of Washington in Seattle. As per the study, the rate of Premature Deaths in India has been increasing at an alarming rate, and from 2,140 deaths per day in 1990, it has reached to 3,280 in 2015. This is nearly 53% increase in premature deaths in the last 25 years, a much sharper increase than in China, which has seen 16 per cent increase over the corresponding period as it managed to reverse the trend 2005 onwards. This study showed that for the first time in this century the average particulate matter exposure was higher for Indian citizens than that for the Chinese.

Impact of Smog on health of Living beings-Smog is harmful and it is evident from the components that form it and effects that can happen from it. It is harmful to humans, animals, plants and the nature as a whole. Many people deaths were recorded, notably those relating to bronchial diseases. Heavy smog is responsible for decreasing the UV radiation greatly. Thus heavy smog results in a low production of the crucial natural element vitamin D leading to cases of rickets among people. When a city or town gets covered in smog, the effects are felt immediately. Smog can be responsible for any ailment from minor pains to deadly pulmonary diseases such as lung cancer. Smog is well known for causing irritation in the eye. It may also result in inflammation in the tissues of lungs; giving rise to pain in the chest. Other issues or illnesses such as cold and pneumonia are also related to smog. The human body faces great difficulty in defending itself against the harmful effects of smog.

Minor exposure to smog can lead to greater threats of asthma attacks; people suffering from asthma problems must avoid exposure. Smog also causes pre-mature deaths and affects densely populated areas building it up to dangerous levels. The highly affected people include old people, kids and those with cardiac and respiratory complications as they have easy tendency to be at disadvantage of asthma. The ground level ozone present in the smog also inhibits plant growth and causes immense damage to crops and forests. Crops, vegetables like soybeans, wheat, tomatoes, peanuts, and cotton are subject to infection when they are exposed to smog. The smog results in mortifying impacts on environment by killing innumerable animal species and green life as these take time to adapt to breathing and surviving in such toxic environments. Smog is a devastating problem especially due to the fast modernization or industrialization as the hazardous chemicals involved in smog formation are highly reactive is spread around in the atmosphere.

Impact of smog on Indian economy and Livelihoods- Impact of smog on the Indian economy is multifarious. It led to crippling of important sectors of economy like tourism, transport, automobile and real estate. Though there is no figure available of economic loss but, there is no doubt that several billions of dollars of fresh investment and GDP loss would occur. Besides, it would lead to a loss of confidence among the citizens. Tourism is the hardest hit sector particularly with the Delhi and NCR pollution making global headlines and creating an impression that visitors should avoid these places for a large number of foreign tourists who visit the 'Golden Triangle' of Delhi-Agra-Jaipur (entire Rajasthan).

The feedback from tour operators and hoteliers clearly points out a deep concern over the negative impact that the pollution can cause to the economy. It said that along with tourism, transportation would also take a hit if investment and flow of tourists suffer setback. Transportation is one of the key contributors to the national economy in the services sector. Both transportation and tourism are highly employment-oriented and jobs may be a casualty of the pollution.

WAYS THROUGH WHICH PROMINENT CITIES IN THE WORLD DEALT WITH SMOG Beijing

Beijing once called as the pollution capital of the world. But, Beijing has dealt with this problem successfully and the innovative ways used by the city are started paying off by showing the reduced level of pollution. In Beijing, whenever a 'Red' alert was issued last year because of polluted air, an alarm was sounded and messages were played in buses and trains asking people to be cautious. Beijing has had stringent emergency measures to combat chronic air pollution in place since 2011. These were formalized in 2013. The Chinese capital enforces an odd-even road-rationing scheme for private cars whenever a 'Red' alert is sounded, immediately pulling some 1.8 million cars off the roads for every day that the scheme is in force. All schools are closed so that children are not exposed to toxic air, factories are shut down, and fireworks which are a major draw during the Chinese New Year celebrations are banned. Even outdoor barbecues, which are very popular in local markets, are stopped. All government departments have to ensure that only 70% of their vehicles are on the roads. An alert is sounded on the day before a heavy smog day based on forecasts.

PARIS

March 2015, a thick cover of smog enveloped the iconic Eiffel Tower, the French capital, Paris took half its cars

off the roads, much like Delhi's odd-even scheme. Heavy fines were imposed for flouting the ban, and the speed limit was set at a low 20 km per hour. Public transport and parking in residential areas were made free to encourage people to use public transport. According to the government, the steps were successful and helped cut pollution significantly.

2015 was only the third time since 1997 that the city had to implement emergency measures.

MEXICO CITY

Mexico City too made public transport free when air quality dipped last year. When it declares an air emergency, Mexico City bans a fifth of private cars from roads on every day of the week. It also offers free rides on buses and trains. The city started its battle with air pollution in the late 1980s and was the first to implement the odd-even scheme. Over the years, many gains have been made in Mexico City's air quality but experts say that the concentration of pollutants has been on the rise again over the past four years.

Ways to get relief from smog-Smog is an emergency situation of air pollution which needed to be tackled by the tough immediate measures. So, when the air quality touches the 'severe' limit the government needs to introduce some emergency measures to deal with it. It includes sprinkling of water using helicopters, stopping construction activity, stopping stone crushing and thermal power plants and diesel generator sets that cause more pollution than is permitted. Other step that the government needs to undertake is introduction of odd-even road rationing and parking restrictions in the city.

In concern to the specific problems faced by India such as burning of crackers during *Diwali*. One can spread awareness about the harmful effects of air pollution. The government needs to ban the firing of crackers during Diwali, and during New Year celebrations. In relation to the burning of field stubble by farmers, government can incentivize them and can pay them for their crop residues and can use the procured stubble for generation of clean energy through renewable source of energy like Bio-Gas Plant. Whenever the dust content consisting of PM10 and PM2.5 is high in air the government can introduce vacuum cleaners to clean the roads of the city is also a good solution. Large parts of the city are becoming permanent dust bowls because of clearing up of the tress so the government can either paved or put these places under grass or plantations. The rules and norms made for construction should be properly adhered with and the entire construction site should be properly covered, and construction materials should lie under it. Trucks used to transport construction material like sand should have properly covered containers at the back, the emission norms for a number of industries, including cement and coal power plants should be strengthened. Government should enforce the implementation and adherence of waste management rules. Every city should mandatorily prepare a Comprehensive Mobility Plans (CMPs) to ensure optimal use of all modes of transport based on people's choices and the city's needs. Public transport consisting of metros, buses, and railways should be made efficient and comfortable and at the time of alarming levels of air pollution they should be made free to encourage citizens to use them instead of using their private vehicles. Affordable and comfortable connecting bus services which connect major metropolitan and urban centers to the satellite towns should be introduced. Above all awareness should be spread by the government about the lifestyles option which citizen could follow to add minimum possible pollution by them into the atmosphere because most of the air pollution is generated by anthropogenic activities and cleaning the atmosphere is not possible without the support and effort of the citizens.

CONCLUSION-Humanity have enjoyed the fruits of industrialization, modernization and urbanization without realizing the after effects of such extravaganza, smog is one such shocking surprise which is haunting the very pillars of our modern, heavily industrialized, consumer society, and is warning us to go back to a sustainable lifestyle for the very continuance of this planet Earth. It is time for us to unite against the fight of climate change with our governments and international institutes to take up multipronged efforts and restore our planet back to the pre-industrial levels of atmosphere.

REFERENCES

- 1. Bond Patrick (2012); Politics of Climate Justice
- 2. http://data.worldbank.org/topic/climate-change
- 3. http://www.encyclopedia.com/science-and-technology/biology-and-genetics/environmental-studies/smog
- 4. Mckibben Bill (1989); the End of Nature
- 5. www.envfor.nic.in
- 6. www.un.org

AN ANALYSIS OF IMPACT OF WATER CONSERVATION INITIATIVES ON AWARENESS AMONG SENIOR SECONDARY SCHOOL STUDENTS (A SUCCESS STUDY OF NATIONAL AWARD-WINNING SCHOOL)

Prashant Thote Gyanodaya Vidya Mandir, Narsingarh

ABSTRACT

In the present century shortage of water is a burning environmental problem that requires dynamic change in terms of thinking and practice in day-to-day life. Education for sustainable development goals aims at nurturing learner's awareness on these burning issues and induces the rationing of usage of water among the future citizen of our nation. Learning values and knowing about the importance of conservation of natural resources is an essential requisite that has to be practiced from childhood days. School is the place for nurturing social and mental development. Acquiring knowledge, skills and attitude for conservation of water at an early age (starting from school) will be inherited in future life also. The study school initiates several measures to enhance the water conservation awareness among the school students at grass root level. The present study is experimental in nature. Purposive sampling technique is used to draw the sample. Totally 200 students participate in the study. Sample is distributed into two groups: the study and the control group. Each group consists of 100 students. Data is collected by using questionnaire. The result of the study shows that the school initiation on water conservation enhances awareness among the study group. Rural students have more awareness when compared to the urban students. Girls are more mindful when compared to boys.

Keywords: Water audit, water bank, green practices, attitude and sustainable development.

INTRODUCTION:

"Thousands have lived without love, not one without water" - W.H. Auden

Water – natural substance and the most abundant thing on the earth surface. There is no life on earth without water. This relationship between water and life is same with air. Air is uniformly distributed on earth whereas in case of water it is not. Water is unevenly distributed on earth in terms of quality and quantity. Individuals, institutions, industrial sector, agricultural segment and other areas need water. Water is the key resource for life and due to industrialization; urbanization and global warming water is depleting on our earth surface. The drought or heavy rain disturbs the water cycle and adversely affect life on the earth. It is essential to create awareness and initiate the water conservation activities to ensure the quantity and quality of water for the present and the future generations. The present study is based on water conservation initiatives carried out by the study school.

World water supply is restricted, finite and limited. Hence globally it mounts pressure among the stakeholders to take some measures for water conservation. In the era where the focus is on the sustainable developmental goals, water management is the principle element which needs more attention. Our nation is under pressure for continuous and quality supply of water during the mounting crisis of energy and extreme shortage of resources. Mounting pressure on water system may be due to climate change and exponential population growth and to overcome such challenges it is essential to accomplish suitable sustainable approach for water management.

Educational institutions consumes huge amount of water in day to day activities like providing drinking water, restrooms, common area taps, laboratories, outdoor play areas, for landscaping and gardening. There is a burning need to promote efficient water management for the sustainable growth within the school premises as well the in the households of the children and the staff members. Promoting efficient water management system creates awareness at two levels - educational as well as societal. Well planned and executed plans in the school play a vital role in the society by encouraging students for water conservation.

Water has become a limited resource for human welfare but through effective management it can be renewed. Water plays a vital role in promoting the resilience of social, environmental and economic system that faces dynamic and unpredictable challenges. Such concept is materialized through the best conservation methods and through effective and efficient monitoring and mentoring. To achieve effective water mange system in the school management- the first step is to reduce water consumption by controlling, reducing, reusing, refusing and recycling the water flow.

Conservation of water aims at the drastic reduction in the consumption pattern. It may be achieved through building positive mental attitude among the young learners towards efficient use of water. The educational

institutions provide an excellent opportunity to propagate and nurture water conservation approaches. If students develop positive mental attitude towards conservation of water it will likely alter the attitude of the society at large.

The water conservation strategies implemented in the school act as learning resources. Learners not only observe the system and the process of conservation of water but also actively participate in the conservation process. They also involve in the collection of data through installed devices in terms of water conservation. The data collected is examined, analyzed and are used for Maths and Science curriculum.

The water conservation action aims at supporting socio and economic problems, protecting and improving environmental development. It is achieved through best management practices, well defined curriculum development and through efficient utilization of water resources. The collaboration and cooperation of various aspects of water management optimizes and advances the benefits through amalgamation of various components. Water conservation offers school educational, environmental and other financial benefits.

STUDY AREA:

The study area is situated at Narsingarh, Damoh district in the state of Madhya Pradesh, Central India. The present study area is located between 23°59" North (latitude) and 79° 23" East (longitude). The school is situated in Narsingarh which is 20km away from the district headquarter, situated on Chatrapur-Damoh state highway (N-37) and is connected through bituminous road.

To create awareness and nurture water conservation habits amongst the future citizen of the nation the following activities and days are observed:

Sl.No	Month	Date	Day			
1	Feb	2	Wet land day			
		28	National Science Day			
2	March	21	World Forest Day			
		22	World water Day			
3	April	22	Earth Day			
4	June	5	World Environmental Day			
		17	World Day to Combat Deforestation and			
			Drought			
5	July	11	World Population Day			
		28	World Habitat Conservation Day			
6	August	9	International Day for World Indigenous People			
7	September	16	World Ozone Day			
		21	International Peace Day			
		27	World Tourism Day			
8	October	2	Cleanliness Drive			
		15	Global Hand Wash Day			
		16	World Food Day			
		17	International Poverty Eradication Day			
9	December	3	World Conservation Day			
		14	World Energy Day			

Activities:

- Administer pledge on water conservation
- Poem recitation (English) Theme: Water
- Exhibition of 3-D models about water conservation
- Slogan writing "Save Water"
- Survey on water resources in school (Before and After installation of water saving taps)
- Experts lecture on water conservation, purification and harvesting
- Field visit water falls and dams
- Awareness on Soak Pit

Volume 8, Issue 2 (III) April - June 2021

- Drawing competition.
- Poster making competition
- Elocution competition on waste water treatment
- Essay competition Linking level is hydraulic suicide
- Quiz (Hydro mania)
- Rangoli Competition: Save water
- Skit on save water
- Mime on water conservation
- CBSE water conservation series
- Story telling competition (success story of water conservation)
- Recycling week (water conservation)
- Art integrated teaching activities (Drama on water conservation)
- Art integrated activity (Dance on water conservation) Water conservation initiatives by school:
- Rain water harvesting system
- Drinking water facility in school
- RO drinking water facility
- School sanitation system renewal
- Reuse of waste water
- Water audit
- Green belt development
- Installation of water meter
- Drip irrigation system
- Sprinkler system
- Water pond (Rain water collection)
- Installation of Piezometer
- Go green project implementation
- Medicinal plant exhibition
- Experiential learning activities tropical rain forest
- Plantation drive in school
- Raksha bhandan (rakhi tying to tree)
- Vermin composting
- Eco tour
- Guest lecture to develop kitchen garden/terrace garden
- Herbal products / Green product making)

Volume 8, Issue 2 (III) April - June 2021

ISSN 2394 - 7780



Volume 8, Issue 2 (III) April - June 2021





STATEMENT OF THE PROBLEM:

The present study is designed to explore the effect of water conservation initiatives taken by the school for creating awareness on water conservation among the Senior Secondary School students therefore the title of the paper is entitled as "An Analysis of Impact of Water Conservation Initiatives on Awareness among Senior Secondary School Students"

OBJECTIVES:

The following objectives are preferred to conduct the present study

- 1. To investigate the level of awareness on water conservation amongst Senior Secondary School students.
- 2. To find out the noteworthy difference between the demographic variables such as gender, area of dwelling, elective stream offered on awareness of water conservation.
- 3. To give suggestions to germinate awareness about water conservation among the Senior Secondary school students.

HYPOTHESIS:

The following hypothesis are designed to collect the data

H₀1:

The level of awareness on water conservation among Senior Secondary school student is very low.

H₀2:

There is no noteworthy difference on the awareness level between the groups based on gender, area of dwelling on water conservation.

H₀3:

Senior Secondary School students dwelling in the rural area have more awareness on the water conservation practices.

H₀4:

Girls have more awareness on water conservation when compared to their counterparts

METHODOLOGY:

Research Design:

The researcher prefers normative survey research design to collect the data.

Population:

The population of the present study comprises of all Senior Secondary students in the study area. Sample:

200 Senior secondary school students participate in the present study.

Table 3: Demographic Variables

Variables	Gen	ıder	Dwelling		
	Boys Girls		Rural	Urban	
	50	50	50	50	



Statistical Technique:

Data is analyzed using mean, SD and t-test

Result:

Table 4:	Students	awareness o	on water	conservation
----------	----------	-------------	----------	--------------

Score	Frequency	%	Category
30-40	0	0	Low Awareness
40-50	20	10	Poor Awareness
50-60	40	20	Below average
60-70	20	10	Average
70-80	20	10	Above average
80-90	40	20	Good
90-100	60	30	High Awareness
70-80 80-90 90-100	20 40 60	10 20 30	Above average Good High Awareness



Volume 8, Issue 2 (III) April - June 2021

		1	1	1			
Variables		Ν	Mean	SD	t-value	Level of significance	
Ago	Below 17	100	65	7.61	0.07	NC	
Age	Above 17	100	66	7.67	0.07	113	
Condor	Girls	100	66	7.70	1 15	S	
Gender	Boys	100	67	8.75	4.43	3	
Straam	Science	100	68	7.89	2.52	NE	
Sueam	Commerce	100	65	7.04	5.55	CIN C	
Area of	Urban	100	68	8.98	1 15	S	
Dwelling	Rural	100	66	8.54	4.43	3	
Family	Nuclear	189	67	7.86	2.51	NE	
гашту	Joint	11	66	7.95	5.51	112	
Reading	Regular	56	68	8.98	1 15	S	
Habit	Rearly	144	66	8.51	4.43	٥	

Fable 5: Difference	in the	level of	awareness	on water	conservation
----------------------------	--------	----------	-----------	----------	--------------

DISCUSSION:

The result of the study reveals that 30% (n=60) of the Senior Secondary school student have high awareness and 20% (n=40) of the students awareness level about water conservation is good. 10% (n=20) of the students fall under the average category, 10% (n=20) of the students awareness level is above average and 30% (n=60) are below the average level. More than 10% (n=20) of the students awareness level about the water conservation is poor. Almost every student in the study area has some basic knowledge about water conservation methods initiated by the school that are applicable to the local environment. The result of the study illustrate that the water conservation initiatives taken by the school is germinating awareness among the future generations.

CONCLUSION:

Conservation of water reduces the school carbon footprints. The study school water conservation model practices are taught through amalgamation of sustainable development goals in the school curriculum. The simple initiatives that are incorporated wisely such as leakage free water taps, pledge, and signature campaign are the great ways to educate the young learning buds. These simple initiations like repairing of water leaking taps, broken sewage pipe line save tremendous amount of water.

Students are the future of the nation and the development of the nation lies on their shoulders definitely. Keeping this in mind, the study school organizes various programmes to germinate the awareness among the students as our nation is a water stress nation. To ensure abundant water supply for school - everyone is counted. The study school initiatives for the green school practices including water conservation bags awards at national level. The present study clearly reveals that the integration of these activities in the school curriculum is also important to create awareness about water conservation among the Senior Secondary school students.

REFERENCES:

- 1. Barreda, A.B. (2018). Assessing the Level of Awareness on Climate Change and Sustainable Development among Students of Partido State University, Camarines Sur, Philippines. The Journal of Sustainability Education. Retrieved December 13, 2018 from www.susted.com/.../assessing-the-level-ofawareness-on-climate-change-and-sustainab
- 2. Houghton, J.T. (2004). Global Warming-The Complete Briefing. Cambridge University Press. 216-241
- 3. Parant, A.; Pascual, A.; Jugel, M.; Kerroume, M.; Felonneau, M.L.; Guéguen, N. Raising Students Awareness to Climate Change: An Illustration with Binding Communication. Environ. Behav. 2017, 49, 339–353. [CrossRef].
- 4. Prashant Thote and Gowri. S, "Climate Change Inclusive Education School Curriculum", Review of Research, Volume 8, Issue 3, Dec 2018.
- 5. Prashant Thote and Gowri. S, "School Principal: A Catalyst for Sustainable Development", Review of Research, Volume 8, Issue 9, June 2019.

ISSN 2394 - 7780

PHYSICO-CHEMICAL ANALYSIS OF DRINKING WATER SAMPLES OF DIFFERENT SCHOOLS OF PANVEL IN RAIGAD DISTRICT, MAHARASHTRA, INDIA

J. M. Pawara

Department of Chemistry, Changu Kana Thakur ACS College (Autonomous), New Panvel

ABSTRACT

The present study is based on the analysis of drinking water parameters in a Different Schools of Panvel in Raigad District, Maharashtra, India. Sample from six different schools of Panvel were collected in the month of December 2016. It is necessary to know details about different physico-chemical parameters such as colour, temperature, acidity, hardness, pH, sulphate, chloride, DO, BOD, COD, alkalinity used for testing of water quality. Heavy metals such as Pb, Cr, Fe, Hg etc. are of special concern because they produce water or long-lasting harming in marine animals. Some water analysis reports with physic-chemical parameters have been given for the exploring parameter study. Guidelines of different physic-chemical parameters also have been given for relating the value of real water sample. The results of the present research work showed that some of the water samples do not comply with standards for drinking purpose.

Keywords: Drinking water quality, Physico-chemical properties, DO, BOD, COD.

INTRODUCTION

pollution is generally regarded as the result of the industrial revolution. The revolution introduced various industrial activities that rendered the environmental quality of the area concerned deteriorated¹. The activities further gave birth to different sources of pollution that are essential to be identified on the first hand for exploring the current status of the pollution in the area. On an average, a human being consumes about two litres of water every day during his whole life period. All segments of the environment are being polluted by various ways. However, water pollution has been taken under inspection since water forms an integral part of life on earth. The most prominent factors that elevates the level of water pollution are exploding population, increasing industrialization and urbanization. Various treatment methods are adopted to raise the quality of drinking water^{2,3}. Water should be free from the various detoxifications such as Organic and Inorganic pollutants, Pesticides, Heavy metals etc. As well as all its parameter like pH, Dissolved Oxygen, Chloride, Total Dissolved Solid, Total Alkalinity, Calcium, Magnesium, Total Hardness, and Electrical Conductivity should be within acceptable limit. The present work is an attempt to measure Physico-Chemical Analysis of Drinking Water Samples of Different Schools of Panvel.

1. MATERIALS AND METHODS

2.1 Materials

All the samples were collected in the month of December 2016. The Drinking water samples were collected from St. Joseph's high school CBSE, Shanti Niketan public school, DAV public school, New Horizon public school, Mahatma international School and St. George high school of Panvel. The samples were collected in clean polythene bottles. The bottles were washed before sampling and tightly closed after collection. The temperature of the samples was measured in the field itself. The samples were kept in refrigerator at 4° C.

2.2 Methods

The physico-chemical properties of Drinking water samples were carried out to determine temperature, pH, Total dissolved solid (TDS), Total hardness (TH), Acidity, Electric Conductance (EC), Dissolved Oxygen (DO) and Chemical Oxygen Demand (COD). Analysis was carried out as per standard procedures^{4, 5}. The pH measured using standard pH meter; electric conductance was measured on an Equiptronics auto conductivity meter, total dissolved solids by standard methods, total hardness by EDTA titrimetric method and chemical oxygen demand (COD) by open reflux technique. The chemicals used for analysis were of analytical grade.

Standard required perimeter of water quality parameters in drinking water set by different agencies^{6, 7} are specified in table 1:

Paramete rs	ISI (1983)		WHO	(1984)	BIS	
	HD L	MPL	HDL	MPL	HDL	MPL
pH	6.5- 8.5	6.5- 9.2	7.0- 8.5	6.5- 9.5	7.0- 8.3	8.5- 9.0

ISSN 2394 - 7780

Volume 8, Issue 2 (III) April - June 2021

TH (mg/L)	300	600	200	600	200	600
TDS	500	2000			500	2000
(mg/L)						
COD	150	255		255	150	255
(mg/L)						

HDL- Highest Desirable Level, MPL-Maximum Permissible Level, ISI- Indian Standard Institute , WHO-World Health Organization, BIS- Bureau of Indian Standard

2. RESULTS AND DISCUSSION

The results of chemical analysis of Drinking water samples in the study are presented in table 2.

The result obtained during study was compared with the standards. The Drinking water from the study area has no colour, odour. The temperature was found to be in the range between 29°C to 33°C. The higher temperature in the current study could be attributed to period of study is summer. The pH values of water sample show and it is found in the range of 6.77 to 7.34. The desired pH values essential for drinking water is from 6.5 to 8.5. The pH of all samples is in required limit as set for drinking water standard. The conductivity of water sample under study varies from 350 to 1840 mho/cm. The high value of conductivity specifies the presence of more electrolytes in the water samples under study. The total hardness of Drinking water samples of St. Joseph's high school CBSE, Shanti Niketan public school and St. George high school was found well within the needed limits and is safe for drinking purpose. However, the total hardness for water samples from DAV public school, New Horizon public school and Mahatma International School was found much higher than the required limits for drinking water standards.

Total dissolved solid (TDS) is a measure of the content of all inorganic and organic substances in a liquid. The permissible limit of TDS for drinking water is 500 mg/L. The results of present study shows that the TDS of Drinking water samples from St. Joseph's high school CBSE and Shanti Niketan public school are within the acceptable limit while others are beyond the limit. The values of dissolved oxygen (DO) and chemical oxygen demand (COD) for all samples under study are all within the desirable limits.

The heavy metal analysis of Drinking water samples of the study area is presented in table 3. All the studied heavy metals present in the water samples are within the allowable limit.

Parameters	St. Joseph's high school CBSE	Shanti Niketan public school	DAV public school	New Horizon public school	Mahatma internatio nal School	St. George high school
Temp. ⁰ C	32	27	31	33	23	30
pH	7.19	6.76	7.34	7.33	7.05	7.02
EC (mho/ cm)	520	340	1840	800	530	480
TH (mg/L)	170	187	846	458	350	200
TDS (mg/L)	320	200	1860	980	920	900
Acidity (mg/L)	5.82	9.70	7.76	7.76	7.76	5.72
COD (mg/L)	0.0268	0.082	0.12	0.122	0.12	0.12
DO (mg/L)	3.09	4.22	4.22	3.09	2.23	4.09

Table 2: Physico-Chemical Analysis of Drinking Water Samples of Different Schools of Panvel in Raigad District, Maharashtra, India

 Table 3: Different Physico-Chemical parameters used for testing of quality of water and their source of occurrence and potential health effects with USEPA guidelines⁷.

Sr. No.	Parameter	Source of occurrence	Potential health effect
1	pН	pH is changed due to	Affects mucous
		different dissolved	membrane; bitter taste;
		gases and solids.	corrosion
2	Dissolved oxygen	Presence due to	D. O. corrode water
		dissolved oxygen.	lines, boilers and heat
			exchangers, at low

Volume 8, Issue 2 (III) April - June 2021

			level marine animals
			cannot survive.
3	Total Hardness	Presence of calcium	Poor lathering with
		(Ca2+) and magnesium	soap; deterioration of
		(Mg2+) ions in a water	the quality of clothes;
		supply. It is expressed.	scale forming
		Hardness minerals	
		exist to some degree in	
		every water supply.	
4	Total Alkalinity	Due to dissolved gases	Embrittlement of boiler
		(CO2)	steel. Boiled rice turns
			yellowish
5	TDS	Presence all dissolved	Undesirable taste;
		salts	gastro-intestinal
			irritation; corrosion or
			incrustation
6	Biochemical Oxygen	Organic material	High BOD decreases
	Demand (B.O.D.)	contamination in water	level of dissolved
			oxygen.

EC-Electric Conductivity, TH-Total Hardness, TDS- Total Dissolved Solids

COD- Chemical Oxygen Demand, DO- Dissolved Oxygen

Name of the schools	Heavy
	metal Lead
	(Pb) ppm
St. Josephs high school CBSE	0.0231
Snantiniketan public school	0.0342
DAV public school	0.0460
New Horizon public school	0.0520
Mahatma International School	0.0688
St. George high school	0.0519

Table 4: Physico-Chemical Analysis of Drinking Water Samples of Different Schools of Panvel in Raigad District, Maharashtra, India

ND-Not Detected



Fig. 1: Measured pH of the samples







Fig. 3: Total Dissolved Solid (TDS) in mg/L in samples







Fig. 5: Chemical Oxygen Demand (COD) in mg/L of samples

ISSN 2394 - 7780

Volume 8, Issue 2 (III) April - June 2021

3. CONCLUSIONS

The result of chemical analysis of Drinking water samples from the study zone stipulates substantial variations. Some of the water samples do not comply with standards for drinking purpose. The water quality in Drinking water samples in St. Joseph's high school CBSE, Shanti Niketan public school and St. George high school is found to be suitable for drinking purposes. However, the regular chemical analysis must be done to ensure that the quality of water in this area is not polluted. The Drinking water quality of DAV public school, New Horizon public school and Mahatma International School is not complying with standards for drinking water hence it is not suitable for drinking purpose but can be used after practicing suitable technological measures. The investigation of Drinking water samples of DAV public school, New Horizon public school and Mahatma International School total dissolved solids (TDS) and as a result of this water loses its potability and decreases the solubility of oxygen in water.

ACKNOWLEDGEMENT

Author acknowledges the Principal of CK Thakur college, Mrs. Dr. J. S. Thakur N.S.S. Programme Officer and involvement of N.S.S. volunteers of Department of Chemistry of our college.

REFERENCES

- 1. Basavaraja Simpi, S.M. Hiremath, KNS Murthy, K.N.Chandrashekarappa, Anil N Patel, E.T.Puttiah; Analysis of Water Quality Using Physico-Chemical Parameters Hosahalli Tank in Shimoga District, Karnataka, India; Global Journal of Science Frontier Research, 11(3), (2011).
- 2. Bhaven N. Tandel, Dr. JEM Macwan, and Chirag K. Soni, Assessment of Water Quality Index of Small Lake in South Gujarat Region, India.
- 3. Basavaraja Simpi, S.M. Hiremath, KNS Murthy, K.N.ChandrashekarappaAnil N Patel, E.T.Puttiah; Analysis of Water Quality Using Physico-Chemical Parameters Hosahalli Tank in Shimoga District, Karnataka, India; Global Journal of Science Frontier Research, 11(3); (2011).
- 4. H. A. Solanki, P. U. Verma and D. K. Chandawat, Evaluating the Water Quality of Malav Lake by Mean of Physico-chemical Analysis,944-955, (2011).
- 5. Hydrology project; Government of India & Government of The Netherlands; Standard Analytical Procedures for Water Analysis May (1999).
- 6. Indian Standard Specifications for Drinking Water, IS: 10500, (1992)
- 7. ISI, Indian Standard specifications for drinking water, USEPA ISI0500, ISI, New Delhi, (1983).

Volume 8, Issue 2 (III) April - June 2021

TRADING OF WATER FUTURES ON STOCK EXCHANGES A STEP TOWARDS SUSTAINABILITY

Jay Shah

Rotary Club of Mumbai Worldwide, National University of Ireland

ABSTRACT

With increasing scarcity of natural resources, Water scarcity proves to be a serious threat to economy and to environment. There have been various instances where water has caused catastrophes in human life and environment. The introduction of water futures creates a vision towards sustainable management of water as a natural resource. This research will highlight some key facts, benefits and criticize this economic exploitation of water as a basic human right. Economically, water futures give a safe spot to farmers and other industrial players to secure water supply at a fixed price determined by market sources. But on humanitarian grounds this trading discriminates basic access to water challenging the Human Rights. This activity being started in the world superpower in 2020 will spark more interest and similar actions by other nations. Trading of futures for stock, precious metals was never criticized based on their market demand, but trading of water will spark interest in markets and can lead to global harmony or global warfare. With advancement of time, this might also inspire trading of oxygen, trading of sun rays, but this are the speculations of the future and currently it is important to understand will this trading of water futures be a bane or boon.

Keeping the humanitarian cause as one aspect, this paper will go through its economic and environmental importance. Apart from the Sustainable development goals by the United Nations, such steps might also inspire sustainable usage of all resources. The paper also aims at finding how sustainable usage of water will be promoted and practiced at a large scale.

Index Terms- Trading of Water, Sustainable Usage of Water, Economic importance of Water

INTRODUCTION

The year of 2020 saw onset of a Pande mic which was preceded by ravaged forest fires. Alone in 2020, wildfires started from Indonesia, Serbia, expanded outrageously in Australia followed by California (Hess, 2020). These wildfires economically destroyed millions of dollars but also caused irreversible damage to the environment. Apart from loss of habitat, we all saw increased air pollution, destruction of land along with affecting water tables in the surroundings. These wildfires and droughts situation served as a base for the need of water and thus the CME launched the index for trading water in the spot market. The contract for January traded at index point of 496, equal to \$496 per acre-foot (Chipman and Crowley, 2020). This launch of water in the spot market clearly indicates the growing scarcity of water. Apart from serving basic human needs, water serves as one of the most essential raw material for production of various economic needs. Countries like India, whose economy is dominated by agriculture demands regular supply of fit for consumption water.

While collecting information from secondary sources, one could easily identify the challenges and relives that are being derived from this economic listing of water. This research will evaluate such secondary sources and highlight the fundamentals and humanitarian viewpoints.

According an article posted by Yale edu, this water futures on the Chicago Mercantile Exchange are linked with contracts worth \$1.1 billion tied to prices of water in California (Wall Street Begins Trading Water Futures as a Commodity, 2020). This clearly sparks the economic need and advantage of speculation on water prices and supply of water. This was immediately commented by an UN correspondent, "You can't put a value on water as you do with other traded commodities," said Pedro Arrojo-Agudo. "Water belongs to everyone and is a public good. It is closely tied to all of our lives and livelihoods and is an essential component to public health." This comment has highlighted the basic human need of water. Apart from the basic day to day usage, it also serves as an important element in the fight of the pandemic. This research will evaluate the economic, environmental and humanitarian impact of water futures. The common name for the water future on the exchange is denoted as NQH2O.

Towards the end, there will be an aim to provide possible solution on humanitarian, ecological and economical grounds. While reading this research, always remember the universal fact, despite the earth being 70% water only 0.3% is fit for human consumption.

Volume 8, Issue 2 (III) April - June 2021

IDENTIFY, RESEARCH AND COLLECT IDEA

This research is based on secondary data. The source of data has been given due reference. Facts and figures are yet to be understood as this introduction is recent and not much details have been presented. This paper uses secondary sources and publications from strong and verified stakeholders of the project and futures of water.

STUDIES AND FINDINGS

In the early span of December 2020 introduction of water futures on Wall Street, traded on Chicago Mercantile Exchange has impacted human outlook towards usage and cost of water. The below examines different scenarios of water futures and its compatibility.

- a) Environment and NQH2O All-natural resources have been exploited and used to the maximum capacities by the humans for financial gains. Every element is either extracted or polluted for profits. This activity has led to various environmental threats. Climate Change, Melting of Polar Icecaps and loss of habitat are the key losses of the environment. In this growing adversity of environmental loss, Scarcity of water plays a dominant role. Measures like rainwater harvesting, optimum use of water, managing leakages have played their role, but with advancement of time, these practices are not enough (4.5 other water conservation practices, 2021). NQH2O and its importance in environment are yet to be understood. In the coming years, we will have definite answers to understand if this step has protected water in Environmental benefits or not. The 6th goal of Sustainable Development by United Nations casts Water and Clean water as an important element (Nations, n.d.), to achieve this goal, Water Futures can be a probable measure as, if the prices of water are higher, the consumption will be lower. High prices may demotivate the consumers from excessive or undue usage of water. The supply, demand and price factor will play a vital role to understand Water Futures as a means to conservation of water.
- b) Economy and NQH2O Economically, water is used by farmers for irrigation of crops. This water is provided by local civic bodies. Before the introduction of futures, water trading happened only in the spot market where the right of pumping water from the reservoir was sold. During dry years, the local authorities charged higher for supply of water. There was no transparency in the prices and the supply was highly uncertain (Tappe, 2020). This introduction of futures makes water listed on the index. Index is publicly available and thus this mechanism boosts price transparency.
- b.1) Water Futures as Price Transparency Mechanism Prices of water have nearly doubled in California. Year on year there is great increase in the prices of water as the supply of water is uncertain. Factors like population growth, drought situation put pressure on water demand which leads to increase in prices and exploiting resources (Almendros, 2020). Water futures will bring an end to this opaque price system and make it transparent. Consumers can now bet on higher prices, fix future prices, and manage the price variation.
- b.2) Water Furfures as Drought hedge Mechanism Hedging of water will be beneficial for the farmers and agriculture industry. States in the US with surplus water will become sellers and drought spelt states will benefit with cheap price and easy supply of water. Farmers will be able to compare current and future prices. These prices will give farmers a clarity of produce pricing and estimating future prices (Tappe, 2020). This market will attract municipalities and farmers, industries, and other users of water. Chances are such that investors will stay away from this market.
- b. 3) Water Futures and Speculation With great power comes great responsibilities and the freedom of price certainty can be affected by the activity of the speculators. Stock markets where companies trade their stocks are often speculated by price movers who may target stocks by changing buy and sell prices for profit. Similarly, players like hedge funds, banks and other nations can take advantage on this by speculating the prices of water. If more countries venture into similar products, global warfare can be instigated (Perry, 2021). Strong checks and regulations need to be introduced to manage these adverse possibilities.
- c) Human Rights, Environment and NQH2O Mr. Pedro Arrojo Agudo serves as the special rapporteur on the human rights to safe drinking water and sanitation presented his view right after the announcement of water futures on the CME expressed saying that water is not like other traded commodities and no one can put value on that. Water is already under peril of population growth, high demand and pollution from industrial activities leading to climate change. Water is an essential resource for the economy, but this activity attracts speculation which can adversely affect the price and accessibility to humans (OHCHR | Water: Futures market invites speculators, challenges basic human rights UN expert, 2020). Water is the

basic requirement for humans and a proper check needs to be incorporated to ensure that the SDGs are respected, followed and given to all humans.

All these scenarios and discussions clearly highlight:

- a. Water is priceless. There needs to be immediate action on conservation
- b. Trading of water can be devasting in future. Serve as a source of global warfare
- c. Speculators can hamper availability of water to humans, directly affecting the human rights
- d. Trading of futures gives price transparency. It may reduce economic hoarding of water
- e. Suppliers of water will have to be fair in pricing and cannot create artificial shortage in supply.

All nations collectively need to take a stand in following the Sustainable Development Goals and focus on conservation of water. There is a need to address this scarcity now more than ever and based on the United Nations forecast, year 2025 will bring more challenges related to water and accessibility of clean water. Sustainable and optimum usage of water needs to be introduced for ensuring smooth retention and renewal of water as a natural resource. One cannot openly say that the water futures will lead towards sustainable usage but it will definitely add a price tag to this vital resource which may promote effective and thoughtful usage of water.

CONCLUSION

It is hard to comment if water futures and NQH2O will increase the sustainable usage or not, but this activity creates a need for

- a. Increased governance and regulation on water futures be introduced. This will reduce the exposure to unnecessary speculation and price manipulation
- b. Countries need to unite to fulfill the SDGs and work towards water conservation
- c. Futures of Water may be a fruitful economic venture but threatens the Human Rights. Effective legislation should be incorporated to protect human rights
- d. Environmentally, water futures may promote sustainable and optimum usage of water as the price certainty will encourage consumers to hedge their water usage With advancing times, new and strict regulations need to be introduced to preserve the environment and protect the human rights. Every misuse of natural resources increases threat to human existence. Sustainable Development Goals should be collaborated wisely and firmly. Every step should be taken towards managing the menace of water scarcity.

ACKNOWLEDGMENT

This research work was supported in discussion but Mr. Vineet Chhabria (Student at MET – MBA Finance'22). The author thanks Dr. Priti Gupta (Thakur College of Science and Commerce) for supporting this research. This research also appreciates all the SDG ambassadors and other stakeholders covering the Water Futures topic.

REFERENCES

- Almendros, P., 2020. *The future of water is traded in the stock exchange*. [online] Smart Water Magazine. Available at: https://smartwatermagazine.com/news/smart-water-magazine/future-water-traded-stockexchange [Accessed 24 February 2021].
- Chipman, K. and Crowley, K., 2020. *California Water Futures Begin Trading Amid Fear of Scarcity*. [online] Bloomberg.com. Available at: https://www.bloomberg.com/news/articles/2020-12-06/water-futures-to-starttrading-amid-growing-fears-of-scarcity [Accessed 22 February 2021].
- HESS, L., 2020. *FIRES 2020: EXPERTS EXPLAIN THE GLOBAL WILDFIRE CRISIS*. [ONLINE] LANDSCAPE NEWS. AVAILABLE AT: <htps://news.globallandscapesforum.org/47794/fires-2020-experts-explain-THE-
- GLOBAL-WILDFIRE-CRISIS/> [ACCESSED 22 FEBRUARY 2021].
- Nations, U., n.d. Goal 6 Department of Economic and Social Affairs. [online] Sdgs.un.org. Available at:
- <https://sdgs.un.org/goals/goal6> [Accessed 24 February 2021].

Volume 8, Issue 2 (III) April - June 2021

- Oas.org. 2021. 4.5 Other water conservation practices. [online] Available at:
- <https://www.oas.org/dsd/publications/unit/oea59e/ch31.htm> [Accessed 24 February 2021].
- OHCHR.ORG. 2020. OHCHR / WATER: FUTURES MARKET INVITES SPECULATORS, CHALLENGES BASIC HUMAN RIGHTS -
- UN EXPERT. [ONLINE] AVAILABLE AT:
- <https://www.ohchr.org/en/newsevents/pages/displaynews.aspx?newsid=26595 &Langid=e> [Accessed 24 February 2021].
- Perry, G., 2021. *Chicago's Dystopian Bet on Water Trading, Explained*. [online] Chicago Magazine. Available at: https://www.chicagomag.com/chicago-magazine/february-2021/two-minute-guide-the-futures-of-water/ [Accessed 24 February 2021].
- Tappe, A., 2020. Investors can now trade water futures. [online] CNN. Available at:
- <https://edition.cnn.com/2020/12/07/investing/water-futures-trading/index.html> [Accessed 24 February 2021].
- Yale E360. 2020. *Wall Street Begins Trading Water Futures as a Commodity*. [online] Available at: https://e360.yale.edu/digest/wall-street-begins-trading-water-futures-as-a-commodity> [Accessed 23 February 2021].

TECHNOLOGICAL VISION ON ICT AND SUSTAINABLE DEVELOPMENT: A REVIEW

Mr. Rajesh Yadav

Department of Computer Science, V. K. Krishna Menon College, Mumbai

ABSTRACT:

Sustainable development is perhaps most significant societal challenges of the 21st century. One worldwide pattern with critical implications for sustainable development is the extraordinarily fast turn of events and utilization of data innovation (IT), regularly referred as the "IT revolution." As a result of the "IT revolution," there have been numerous endeavours to use IT for supportable turn of events, especially with regards to empowering developing nations.

Here I discuss various views and conceptual frameworks put forward in the discussion of ICT and sustainable development:

- An idealistic view and a cynical view of ICT with regard to sustainability.
- The limits of technical solution to sustainable development.
- Conceptual Frameworks for ICT and Sustainable Development.
- The three-approaches of ICT impacts.

I show that each of these approaches has its problems and limitations and conclude with formulating the challenges of finding an analytical approach which will effectively support decision-makers in using ICT in the service of sustainable development.

Keywords: Sustainable Development, ICT Impact, IT Revolution, Green ICT, ICT for Development, Technological vision.

1. INTRODUCTION:-

The most-referencing definition to meaning of "Sustainable Development" was given by the World Commission on Environment and Development: In request to be viewed as supportable, an example of improvement needs to guarantee "that it addresses the issues of the present without bargaining the capacity of people in the future to address their own issues". This definition, otherwise called the "Brundtland definition", consolidates two moral cases:

• intragenerational equity (addressing the requirements of the present) and

• intergenerational equity (not bargaining the capacity of people in the future to address their own issues).

Given the physical and organic constraints of our planet, this twofold case is indeed a moral situation on the grounds that broadening the current utilization examples of the industrialized nations to all pieces of the world would put an extraordinary burden on people in the future. Getting away from this quandary requires an underlying difference in the economy that will profoundly influence the present mechanical examples of creation and utilization.

As to part of ICT in the maintainability difficulty, there are two inverse positions.

- An idealistic view dependent on the conviction that this primary change is now under path because of the turn of events and overall dissemination of ICT;
- An cynical view wherein ICT adds to asset utilization and contamination and fortifies impractical constructions and conduct. Exploration in "ICT and Sustainable Development" or "Informatics and Sustainability" has the commitment to make progress toward a sensible view and give leaders deductively solid answers.

It is consequently urgent to discover models of ICT administration that underly the capability of ICT for practical arrangements while hindering the negative potential. This needs, in any case, a theoretical system of the association between the improvement of ICT and its applications and other cultural turns of events.

2. THE LIMITS OF TECHNICAL SOLUTIONS TO SUSTAINABLE DEVELOPMENT:

Innovative determinism rejects that the turn of events and utilization of advances are the consequence of human decision. With regards to ICT and "the data society" this fundamental supposition that is especially weakening. As Holvast et al. put it: "Such determinism decreases mankind to frail pawns who can just acknowledge their

destiny and hold on to perceive how others will deal with assistance them. It is our conviction that more should be possible by individuals themselves than is regularly conceded."

The connection between mechanical ancient rarities and the general public that makes and deciphers them is an unpredictable one: Technologies interface with our view of the world, which again impacts how we utilize and create advances. Consequently, utilizing advances impacts needs, qualities, convictions and other social real factors that give the setting to the further turn of events and utilization of advances. From this view of technologies as being embedded in societal development, it follows that solutions to the sustainability dilemma will not be technical solutions alone. As far as technology is involved – and ICT might play a crucial role there – it can only be instrumental as part of a more comprehensive approach, being embedded in organizational or institutional frameworks or in structures of governance.

3. CONCEPTUAL FRAMEWORKS FOR ICT AND SUSTAINABLE DEVELOPMENT:

A theoretical system for a scientific way to deal with the connection among ICT and manageable advancement initially needs to disintegrate the regulating idea of economical turn of events. A typical thought is the purported three-column or three-dimensional way to deal with practical turn of events, deteriorating the idea into an environmental, a social and a financial dimension.

The part of ICT would then be able to be examined along the accompanying inquiries:

- **Ecological dimension:** What is the part of ICT in biological (natural) issues? How might we use ICT to expand our comprehension of biological systems and to lessen natural weight (Environmental Informatics)? How could the natural effect of creation, use and removal of ICT be diminished (Green ICT)?
- Social dimension: What is the role of ICT in friendly turn of events? How might we use ICT to help (virtual) networks running after the point of maintainable turn of events? How could social equity on a worldwide scale be upheld by ICT? How might we increment the commitment of ICT to long haul thinking and maintain a strategic distance from childish, innovatively decided turns of events?
- **Economic dimension:** What is the role of ICT in the underlying difference in the economy from a mechanical to a post-modern mode? How could ICT add to a decoupling of financial development from development in asset utilization, to substitute virtual types of creation and utilization for energy-serious cycles, to dematerialize important pieces of the monetary framework?

Although this three-dimensional methodology may fill in as a beginning stage for conceptualizing, it doesn't give a sound premise to examination. First and foremost, we likewise need to decay the role of ICT in this specific situation, since advanced ICT is a practically all inclusive innovation and application classes are more pertinent than the innovation all things considered. Besides, multidimensional ideas of maintainable advancement have been condemned for being conflicting (the "measurements" are not at a similar reasonable level, for example they wrongly propose symmetry) and for watering down the idea of feasible improvement by recommending that an exhaustion of natural or social capital might be acknowledged in return for monetary capital. Reasonable systems for "ICT and practical turn of events" that go past this methodology are momentarily talked about in the accompanying sub-segments. None of these structures professes to give a complete arrangement. Or maybe, they might be seen as fixings in a more exhaustive methodology that actually must be figured.

4. THREE APPROACHES OF ICT IMPACTS:

This methodology centers around utilizations of ICT and first asks in what direction they impact the climate. The three levels cover ecological effects going from the most immediate impacts (actual impacts of utilizing the equipment) to the most roundabout impacts, for example, the impact of ICT on monetary designs and ways of life:

- "First-approach impacts: Includes all ecological effects coming about because of ICT equipment during the item lifecycle, covering creation, use, and removal."
- "Second-approach impacts: The utilization of ICT makes impacts different cycles, for example, traffic or modern creation and impacts their ecological effects in a roundabout way."
- "Third-approach impacts: Owing to the accepted inescapable utilization of ICT in regular day to day existence, financial constructions and ways of life can change, by implication influencing the outflow of first-and second-request impacts."

ISSN 2394 - 7780

Volume 8, Issue 2 (III) April - June 2021

The three-level methodology is extremely regular in examination on ecological effects of ICT, despite the fact that it could on a basic level be summed up to consequences for social frameworks, including the monetary framework. Indeed, the idea of second-approach impacts surmises some authoritative setting wherein ICT is utilized, while third-approach impacts must be evaluated or clarified in a cultural setting, including, for instance, market elements.

With the "Green IT" or "Green ICT" publicity beginning in 2008, the energy devoured by ICT terminal gadgets and organization foundations (specifically the Internet) has acquired public consideration. This view once in a while incorporates parts of the subsequent level, specifically when "Green Software" is presented. At the subsequent level, the philosophies utilized for evaluation are more assorted and hard to look at. How might we measure the ramifications of – for example – portable work, realizing that versatile ICT is just one of numerous variables changing the portability conduct of individuals.

5. CONCLUSION:

I have shown that analysing the relationship between ICT and sustainable development poses a number of challenges:

- finding a meaningful decomposition of the concept of sustainable development to start with.
- finding a meaningful classification of ICT interactions with aspects of sustainable development.
- finding methods to quantify effects of ICT applications

REFERENCES:

- 1. United Nations Millennium Ecosystem Assessment (MEA): Ecosystems and Human WellBeing: Synthesis. Island Press, Washington (2005).
- 2. Hilty, L.M., Ruddy, T.F.: Sustainable Development and ICT Interpreted in a Natural Science Context: the Resulting Research Questions for the Social Sciences. Information, Communication & Society, 13(1), 7-22 (2010).
- 3. World Commission on Environment and Development: Our Common Future. Oxford University Press, London (1987). http://dx.doi.org/10.1080/13691180903322805.
- 4. Holvast, J., Duquenoy, P., Whitehouse, D.: The Information Society and its Consequences: Lessons from the Past. In: Berleur, J., Avgerou, C. (eds.), Perspectives and Policies on ICT in Society An IFIP TC9 (Computers and Society) Handbook, pp. 135-152. Springer, New York (2005).
- 5. Köhler, A., Erdmann, L.: Expected Environmental Impacts of Pervasive Computing. Human and Ecological Risk Assessment, 10, 831–852 (2004).
- 6. Williams, E.: Energy intensity of computer manufacturing: hybrid assessment combining process and economic input-output methods. Environmental Science and Technology, 38(22), 6166-6174 (2004).
- Houghton, J.W.: ICT and the Environment in Developing Countries: A Review of Opportunities and Developments. In: Berleur, J., Hercheui, M., Hilty, L.M. (eds.) What Kind of Information Society? Governance, Virtuality, Surveillance, Sustainability, Resilience, Proceedings of the 9th Human Choice and Computers International Conference (HCC9) and the WCC 2010 Critical Infrastructure Protection Conference. Springer, Heidelberg (2010).
- 8. Frischknecht, R., Jungbluth, N., Althaus, H.J. et al.: The Ecoinvent Database: Overview and Methodological Framework. International Journal of Life Cycle Assessment, 10, 3-9 (2005).

A STUDY OF ORGANIC FARMING FOR SUSTAINABLE LIVING IN INDIA

Rakhi Bhattacharya

Thakur College of Science and Commerce, Kandivali (E), Mumbai

ABSTRACT:

Increase in awareness about the quality of food and its impact on health and environment has made people take keen interest in organic produce. Consumers are becoming aware of the adverse effect of conventionally grown and produced food which sees presence of higher pesticide residue, nitrate, heavy metals and genetically modified organisms. Hence in search for safer food alternative, the demand for organically produced food is increasing.

Organic food production is defined as cultivation done without the application of chemical fertilisers, synthetic pesticide or genetically modified organisms. The popularity of organic farming is increasing day by day and even Government has stepped in to increase awareness about organic farming owing to its favourable environment impact and sustainability.

India was late in adopting organic farming but has picked up pace in recent times. This descriptive research reviews various literature written by authors on organic farming and explore how sustainable organic farming is, it also reviews various Government scheme on organic farming and interest of the cultivator.

Keyword: pesticide, sustainable, organic farming

INTRODUCTION

The growing awareness of health and environmental issues associated with the intensive use of chemical inputs in our conventional agricultural method has led to the increasing interest in alternate form of agriculture in the world. Organic agriculture is both healthy and environmentally sustainable and hence is in high demand in recent times. Organically grown foods have become one of the best choices for both consumers and farmers. In India, organic farming has started recently. The commercial growers of spices, basmati rice and cotton adopted organic farming process for premium prices in export market and the resource-poor farmers in rainfed marginal lands adopted it as an alternative livelihood approach, which not only promised clean environment and healthy food but also ensures soil fertility, long-term sustainability and freedom form debt and market forces.

The term 'organic' was first coined by Northbourne, in 1940, in his book entitled 'Look to the Land'.

The book mentioned that organic produce is not grown with synthetic pesticides, antibiotics, growth hormones, application of genetic modification techniques (such as genetically modified crops), sewage sludge, or chemical fertilizers. On the other hand, conventional farming is the cultivation process where synthetic pesticide and chemical fertilizers are applied to gain higher crop yield and profit. In conventional farming, synthetic pesticides and chemicals are able to eliminate insects, weeds, and pests and increase growth rate.

But these synthetically produced pesticides and chemical fertilizers used in conventional farming are unhealthy and even bad for environment. Hence, consumption of conventionally grown foods is discouraged, and organic farming is encouraged.

OBJECTIVE OF THE RESEARCH:

To explore the benefit of organic farming

To find various government scheme supporting organic farming

To study sustainability of organic farming in India

Research Methodology: this is a descriptive research based on secondary data. Various researches are thoroughly reviewed and analysed for writing this paper.

BENEFIT OF ORGANIC FARMING:

Nutritional and health benefit of organic farming

Growing demand for organically cultivated products have created an interest in both consumer and producer regarding the nutritional value of both organically and conventionally grown foods. According to a study conducted by AFSSA (2003), organically grown foods, especially leafy vegetables and tubers, have higher dry matter as compared to conventionally grown foods. It is found that organic cereals and their products contain lesser protein than conventional cereals, but have higher quality proteins.

ISSN 2394 - 7780

Volume 8, Issue 2 (III) April - June 2021

Organically grazed cows and sheep contain less fat and more lean meat as compared to conventionally reared one (Hanneson, 2000). Even the quality of milk produced by organically reared cow is far more superior compared to cows reared with artificial supplement. Organic plants contain significantly more magnesium, iron, and phosphorous. They also contain more calcium, sodium, and potassium as major elements.

According to a Food and Marketing Institute (2008), some organic foods such as corn, strawberries, have greater than 30% of cancer-fighting antioxidants. Fruits and vegetables grown organically also have more phytochemicals. They taste better and smells good.

Rossi et al (2008) stated in his research that organically grown tomatoes contain more salicylic acid than conventional counterparts. Salicylic acid is a naturally occurring phytochemical having anti-inflammatory and anti-stress effects.

As organically grown foods are cultivated without the use of pesticides and sewage sludge, they are less contaminated with pesticide residue and pathogenic organisms. Thus, it can be concluded that organic foods ensure better nutritional benefits and health safety.

ENVIRONMENTAL IMPACT

Organic farming aids environmental conservation. The effect of organic and conventional agriculture on the environment has been extensively studied. It is believed that organic farming is less harmful to the environment as it does not allow synthetic pesticides, which are harmful to water. In addition, organic farms are better than conventional farms at sustaining biodiversity, due to practices of crop rotation. Organic farming improves physio-biological properties of soil thereby ensuring more organic matter, biomass, higher enzyme, better soil stability, enhanced water percolation, holding capacities, lesser water, and wind erosion compared to conventionally farming soil. Organic farming uses lesser energy and produces less waste per unit area or per unit yield (Stolze et al 2000; Hannal et al 2001). In addition, organically managed soils are of greater quality and their water retention capacity is also more resulting in higher yield even during the drought years

SOCIOECONOMIC IMPACT

Organic cultivation requires a higher level of labour, hence produces more income-generating jobs per farm (Halberg,2008). According to Winter and Davis (2006), an organic product typically costs 10%–40% more than the similar conventionally crops and it depends on multiple factors both in the input and the output arms. On the input side, factors that enhance the price of organic foods include the high cost of obtaining the organic certification, the high cost of manpower in the field, lack of subsidies on organics in India, unlike chemical inputs. But consumers are willing to pay a high price as there is increasing health awareness. Some organic products also have short supply against high demand with a resultant increase in cost.

Government initiative towards organic farming:

Indian states essentially depend on the Union Government schemes to promote organic and natural farming. Some states also utilize funds from other schemes such as Rashtriya Krishi Vikas Yojana and the Mission for Integrated Development of Horticulture to do the job.

Following are the major government initiatives to support organic farming:

- 1. The New Godhan Nyay scheme: The scheme aims to increase income of farmers and cattle ranchers, promote organic compost, reduce chemical fertilizer usage and improve soil health. It also proposes to purchase cattle dung at Rs 2 per kilogram, convert it to vermicompost and make it available to farmers at Rs 8 per kg.
- 2. Paramparagat Krishi Vikas Yojana (PKVY): The scheme promotes cluster based organic farming with PGS certification. Cluster formation, training, certification and marketing are supported under the scheme. Assistance of Rs.50,000 per ha /3 years is provided out of which 62% i.e., Rs. 31,000 is given as incentive to a farmer towards organic inputs.
- 3. Mission Organic Value Chain Development for North Eastern Region (MOVCDNER): The scheme promotes 3rd party certified organic farming of niche crops of north east region through Farmers Producer organizations (FPOs) with focus on exports. Farmers are given assistance of Rs 25000/ha/3 years for organic inputs including organic manure and fertilizers etc. Support for formation of FPOs, capacity building, post-harvest infrastructure up to Rs 2 crores are also provided in the scheme.
- 4. Capital investment Subsidy Scheme (CISS) under Soil Health Management Scheme: 100% assistance is provided to State Government/Government agencies for setting up of mechanized fruit/vegetable market waste/ Agro waste compost production unit up to a maximum limit of Rs.190.00 Lakh /unit (3000 Total

ISSN 2394 - 7780

Per Annum TPA capacity). Similarly, for individuals/ private agencies assistance up to 33% of cost limit to Rs 63 lakh/unit as capital investment is provided.

5. 4. National Mission on Oilseeds and Oil Palm (NMOOP): Financial assistance at 50% subsidy to the tune of Rs. 300/- per ha is being provided for different components including bio-fertilizers, supply of Rhizobium culture/Phosphate Solubilizing Bacteria (PSB)/Zinc Solubilizing Bacteria (ZSB)/ Azatobacter/Mycorrhiza and vermicompost.

In 2013, to encourage organic farming in Maharashtra, the State Government has formulated a special policy for the sector. The policy has devised a roadmap for developing the whole value chain — from the farm gate to the consumer.

Maharashtra seems to be a frontrunner in this organic mission with the government not just focusing on chemical free farming, but also on bringing down expenses of farming, and assuring better financial returns to the farmers. The state has allotted over 18,000 hectares for organic farming.

ORGANIC FARMING AS SUSTAINABLE ALTERNATIVE IN INDIA

The concept of sustainable agriculture integrates three main goals—environmental health, economic profitability, and social and economic equity. The concept of sustainability rests on the principle that we must meet the needs of the present without compromising the ability of future generations to meet their own needs.

India is an agriculture-based country with 67% of its population and 55% of manpower depending on farming and related activities.(Organic farming in India: a vision towards a healthy nation Suryatapa Das, Annalakshmi Chatterjee, Tapan Kumar Pal)

Agriculture fulfils the basic needs of India's fastest-growing population and is accounted for 30% of total income. Organic farming has been found to be an indigenous practice of India which is in existence for many years in countless rural and farming communities. With increase in population, organic produce was not enough to cater to the need and hence modern techniques were adopted to support increased burden of population. This led to a shift towards conventional farming that involves the use of synthetic fertilizer, chemical pesticides, application of genetic modification techniques, etc. but with time people are becoming more aware of the health value of eating organic food. Even the environmental consciousness is pushing people to follow more organic practices which are sustainable. The demand for organically grown produce are increasing steadily as people are more aware about the safety and quality of food, and the organic process has a massive influence on soil health, as it is devoid of chemical pesticides. Organic cultivation has an immense prospect of income generation too (Bharadwaj et al, 2019). The soil in India is bestowed with various types of naturally available organic nutrient resources that aid in organic farming (Adolf and Butterworth, 2010)

For Indian farmers, organic practices are not new. They have deep insight of using indigenous method for cultivating crops. Their knowledge, observation, perseverance and ability to maintain soil fertility by using minimum of fertilizer is commendable. They are even good at controlling pest by applying ingenious method thus making them pioneer of organic farming practices.

CONCLUSION

Organic food is the future as more and more people are becoming aware of their health benefits and its sustainable approach towards environment. Organic food is considered safer, tastier and is demanded more in the market. The farm to plate concept can be best addressed by organic produce. Even this kind of farming keeps soil healthy and maintains environment. Thus, for the health of the nation, the ecological health of the nation, and the economic growth of the nation organic farming is the only solution.

REFERENCES

- Adolph, B., Butterworth, J (2002). Soil fertility management in semi-arid India: its role in agricultural systems and the livelihoods of poor people. Natural Resources Institute, UK
- FSSA. (2003). Report on Evaluation of the nutritional and sanitary quality of organic foods (Evaluation nutritionnelle et sanitaire des aliments issus de l'agriculturebiologique, in French), AFSSA, 164. http://www.afssa.fr. Accessed 3 August 2018
- Barik, A., Sarkar, N. (2017, November 8-11). Organic Farming in India: Present Status, Challenges and Technological Break Through. In: 3rd International Conference on Bio-resource and Stress Management, Jaipur, India.
- Bhardwaj, M., Dhiman, M. (2019). Growth and performance of organic farming in India: what could be the future prospects?Journal of Current Science, 20: 1–8

Volume 8, Issue 2 (III) April - June 2021

- Chandrashekar, H.M. (2010). Changing Scenario of organic farming in India: an overview. International NGO Journal, 5: 34–39.
- Chopra, A., Rao, N.C., Gupta, N., Vashisth, S. (2013).Come sunshine or rain; organic foods always on tract: a futuristic perspective. International Journal of Nutrition, Pharmacology Neurological Diseases, 3: 202–205.
- Gour, M. (2016). Organic farming in India: status, issues and prospects. SOPAAN-II, 1: 26–36
- Kumar, V. (2020, February 03). Union Budget 2020–21: Big talk on natural farming but no support

STUDY OF THE TRADING STRATEGIES IN THE TRENDING MARKET USING CANDLESTICK CHARTS IN TECHNICAL ANALYSIS

Manju Singhania¹ and Jinal Vishal Lathia²

¹Thakur College of Science & Commerce, Kandivali (E), Mumbai ²Prahladrai Dalmia Lions College of Commerce and Economics, Sunder Nagar, Malad West, Mumbai

ABSTRACT

Technical analysis is an important tool in the financial market that provides a clear idea about the current market situation and helps the investors make correct investment decisions. Technical analysis is a means of examining and predicting price movements in the financial markets, by using historical price charts and market statistics. It is based on the idea that if a trader can identify previous market patterns, they can form a fairly accurate prediction of future price trajectories. Technical Analysis can be used to make the correct financial decision of buying and selling securities. Analysis Used for Stocks Maximization of return on stocks with minimal risk is the aim of every astute investor. Technical analysis is widely used by forex, equity, and commodity traders, to determine the short term as well as the long term trends of the market. The scope of technical analysis to earn good returns. The main chart types used by technical analysts are the line chart, bar chart and candlestick chart. Charts can also be displayed on an arithmetic or logarithmic scale. Objective of this research is to find out the effectiveness of candlestick charts to make investment decisions in trending markets as per price action analysis.

H1- candlestick chart is effective to make investment decisions in the trending market.

H0- candlestick chart is not effective to make investment decisions in the trending market.

price action analysis in candlestick chart will be used for analysis

Key Words: Trading Strategies, trending market, candlestick charts, Technical Analysis

INTRODUCTION-

Trading strategies are framed based on the analysis of the market. Analysis means forecasting the price of the shares on the basis of past trends of the company.

There are two type of Analysis

- 1) Fundamental Analysis
- 2) Technical Analysis

FUNDAMENTAL ANALYSIS

Fundamental analysis is a method used by investors to identify the intrinsic value of a stock. This is done by using various qualitative and quantitative factors such as the company's revenues, profit margins, return on equity, future growth potential and other metrics. The main purpose of this method is to identify companies that are fundamentally strong in order to invest in them for the long term.

Technical Analysis

- Technical analysis is a means of examining and predicting price movements in the financial markets, by using historical price charts and market statistics. It is based on the idea that if a trader/Investor can identify previous market patterns, they can form a fairly accurate prediction of future price trajectories.
- Technical analysis uses historical price and volume statistics to make an investment decision. It concentrates mainly on the market's actions and reactions but never considers the fundamental changes related to the stock or the index in the market.

An Overview of Chart Types Used in Technical Analysis

One of the main methods used by technical analysts to forecast security prices is by the recognition of patterns and trends of security prices, and the easiest way to spot patterns and trends is through the use of charts.

Charts are graphical displays of price information of securities over time. Market volatility can also be easily gleaned from charts. Charts also help technical analysts to decide on entrance and exit points, and at what prices to place stops to reduce risk.

The main chart types used by technical analysts are the line chart, bar chart and candlestick chart.

Candlestick Charts

In candlestick chart, the main component of the chart representing prices looks like a candlestick with a thick body called the **real body**, and usually a line extending above and below it, called the **upper shadow** and **lower shadow**, respectively. The top of the upper shadow represents the high price, while the bottom of the lower shadow represents the low price.



The candlestick chart emphasizes opening and closing prices. The top represents the opening or closing price depends on the color of the real body — if it is **Green/White**, then the top represents the close; **Red/Black**, or some other dark color, indicates that the top was the opening price. The length of the real body shows the difference between the opening and closing prices. Obviously, Green/White real bodies indicate bullishness, while Red/Black real bodies indicate bearishness, and their pattern is easily observable in a candlestick chart.

- **Objective of Research:** To find out the effectiveness of candlestick charts to make investment decisions in markets as per Price Action Analysis.
- **Hypothesis1:** Price Action Analysis in Candlestick chart is effective to make Investment decisions in Trending Market.
- **Hypothesis0:** Price Action Analysis in Candlestick chart is not effective to make Investment decisions in Trending Market.

LITERATURE REVIEW

- 1. Siriporn Thammakesorn and Ohm Sornil 2019 *J. Phys.: Conf. Ser.* 1195 012008 Generating Trading Strategies Based on Candlestick Chart Pattern Characteristics. Study is based on Indicators like MACD, RSI, STO, ADX, EMA but does not give full proof 100% results of Entry and Exit point.
- 2. George Joseph¹, Saranya G Das², Amrudha Romeo³ A Study On The Formation Of Candlestick Patterns With Reference To Nifty Index For The Past Five Years : Study is based on Candlestick patterns with Indicators but does not give full proof 100% results of Entry and Exit point .

Research Methodology: Analytical Method is used with the help of Secondary Data of Various Companies mentioned below and Charts being taken from Investing.com website.

RESEARCH ANALYSIS OF TRENDING MARKET AND HOW TO TRADE IT.

The Market structure

Through price action analysis, one can experience two types of Markets - Trending market, Ranging or choppy market.

An Investor or trader has to identify every market and how to trade it. One does not need to trade all the markets in the same way; one needs to study how the market moves and how traders behave in the market. The market structure is the study of market behavior.

1. Trending market:

Trending Market is a repetitive pattern of higher high and higher low in up trending market; and lower high and lower low in a down trending market.
Volume 8, Issue 2 (III) April - June 2021



This can be explain with the help of the Monthly chart of TCS Ltd.



By observing the above chart, an investor can buy a TCS stock in the month of June as soon as it breaches the May month High i.e level of Rs 2032. And Stop Loss will be May Month Low i.e level of Rs 1865. Then an Investor can keep a time frame of monthly candlestick chart and accordingly should fill the below presented table

Month	High	Low	Trend	Position	Stop
					Loss
April	2032	1650	Not predicted	No Position	
May	2032	1865	HL	No Position	
June	2132	1981	HH,HL	Buy	▶ 1865
July	2358	2080	HH,HL	Hold Buy position	1981
August	2328	2216	HL,HL	Hold Buy position	2080
September	2555	2241	HH,HL	Hold Buy position	2216
October	2885	2492	HH,HL	Hold Buy position	2241
November	2744	2600	HL	Hold Buy position	2492
December	2952	2624	HH,HL	Hold Buy position	2600
Jan '21	3340	2879	HH,HL	Hold Buy position	2624
24 th Feb '21	3003	2921			

Prediction/ Analysis suggest that an investor can hold TCS stock till it does not breach the previous month low. In above case if TCS stock breaches the January month low of Rs 2879 then it is preferable to square off the position i.e. to sell the stock.

Here if Investor sells for @Rs 2879 also then too one gets a return of 40% approximately which is far more better than a return from any asset class .

Volume 8, Issue 2 (III) April - June 2021

As you can see in the example above, the market is making a series of higher highs and higher lows which indicates that the market is up trending.

You don't need indicators to decide if it is bullish or bearish, just a visual observation of price action is quite enough to get an idea about the market trend.

Let's see another research of the downtrend market.



The example above shows a bearish market, as one can see there are Series of Lower High and Lower Low which indicate Downtrend.



By observing the above Monthly chart of Yes Bank ,it has given us a clear view of Price action analysis of Downtrend i.e If an investor held a position till month of August' 18 where High is 404 and Low is 336.25. Then subsequently in the month of September'18 it had made LH of 348 and LL of 165. Here if an investor had exited the stock at 336.25 (Previous month Low) then it was the correct time to exit. Currently As per Feb Month Data it has MPS of Rs 15 only.

Other Example of Hero Motor Company Stock

International Journal of Advance and Innovative Research Volume 8, Issue 2 (III) April - June 2021

ISSN 2394 - 7780



Similarly, we can see various company charts and Price Action Analysis of HDFC Bank, Sun Pharma, JK paper Ltd.

Tabular Presentation:

Sun Pharma Ltd

Month	High	Low	Trend	Position	Stop Loss
Oct	529	452	Observed		
Nov	526	459	Observed		
Dec	599	512	HH, HL	Buy Position	459
Jan '21	628	550	HH, HL	Hold Buy Position	512
24th Feb '21	609	595.85		Hold Buy Position	550

HDFC BANK Ltd

Month	High	Low	Trend	Position	Stop Loss
Oct	1251	1090	Observed		
Nov	1464	1177.50	HH, HL	Buy Position	1090
Dec	1449	1345	HL	Hold Buy Position	1177.50
Jan '21	1511	1346	HH,HL	Hold Buy Position	1345
24th Feb '21	1613	1516.25		Hold Buy Position	1346

JK PAPER Ltd

Month	High	Low	Trend	Position	Stop Loss
Oct	94.45	86.30	Observed		
Nov	100	86.35	HH, HL	Buy Position	86.30
Dec	118	96.25	HL,HL	Hold Buy Position	86.35
Jan '21	134.45	106.35	HH,HL	Hold Buy Position	96.25
19th Feb '21	379	360.50		Hold Buy Position	106.35

OBSERVATION AND FINDINGS/ RESULTS AND DISCUSSIONS:

- 1. After the study of the trading strategies in the Trending market using candlestick charts for the following month selected, it is being found that Price Action Analysis is 95% effective to earn a profit for a long term trade in the trending Market.
- 2. Entry / Exit point is easily identified by the above mentioned analysis of trending market.

CONCLUSION:

With the help of Price Action Analysis an Investor can earn good returns in the Trending Market. This strategy is 95% fruitful for Investment in long term Point of View as it helps to know the Entry Point, Exit Point and the most important, an investor knows the amount of Loss, if incur, prior to the investment.

• **REFERENCES:**

_

- 1. www.Investing.com
- 2. www.Chartink.com
- 3. www.NSE.com
- 4. Candlestick Forum.com
- 5. Reference Book Candlestick Trading Bible

IMPACT OF COVID-19 ON DIGITAL PAYMENTS IN INDIA

Nirav R. Goda

Thakur College of Science and Commerce, Kandivali (E), Mumbai

ABSTRACT

The digital payment space in India has witnessed a steady transformation Since the 90's with the liberalisation of the Banking industry and introduction of new technologies such as Magnetic Ink Character Recognition (MICR), Automated Teller Machine (ATM), etc. Thereafter, in 2010, various payments Products (stored value cards, wallets, recharge vouchers) and service providers were launched. India is experiencing a growth trajectory in digital payments that is more prolific than many advanced less-cash economies. Demonetization in November 2016 and constant push by Government and regulators for less cash economy have propelled the growth trajectory. The digital payments market in India was valued at INR1,638.49 trillion in FY 2019 and is expected to reach INR4,323.63 trillion by FY 2024, expanding at a compound annual growth rate (CAGR) of ~22 per cent during the FY 2020 -FY 2024 period.

Keywords: - Digital Payments, Demonetization, Digital Revolution.

INTRODUCTION

The industry has been equally supported by technological innovations. In the last 10 years, the country has seen many unique and state of the art product innovations in the digital payment industry. The advent of a younger population who has grown up with mobiles and data, has enabled faster adoption of technological advancements in digital payments. According to a survey conducted on parameters such as round-the-clock availability of the services, adoption, and immediacy of payments, India is considered to have a more evolved digital payment ecosystem compared to 25 other countries including the U.K., China and Japan. The industry has also seen continued Involvement from the government by Way of its targeted regulatory policies In the payments space. While, Demonetization indirectly pushed Forward the digital transformation Of the Indian payments ecosystem, Other initiatives like the Digital India program (under the Ministry Of Electronics and Information Technology), Jan Dhan Yojna, mandating electronic Payments for businesses having turnover over INR50 Cr and several Other incentive and awareness Programs have directly contributed to the industry's growth. A number of Remarkable innovations and initiatives have changed the way India Transacts. For instance, push towards Digital payments with initiatives such as United payments interface (UPI), Bharat interface for money (BHIM), RuPay cards, introduction of interoperability on wallets, Cash recyclers, or innovations by FinTech players like radio frequency Identification (RFID) based fuelling Apps, all-in-one quick response (QR) Code for merchants and, QR-based Cash withdrawals on ATMs; digital India clearly holds an extremely Promising future. However, Consumer awareness and security concerns continue to be amongst the biggest hurdles faced by the Industry, and needs continuation of sustained collaborative drive from banks, payment providers, regulators and government.

In the current COVID-19 situation, the Digital payments sector witnessed a decline of ~30 per cent in the transaction value, and recent data made available from National Payments Corporation of India (NPCI) attest to a sharp decline observed in the months when lockdowns were Initiated (primarily due to the impact on the travel, hospitality and retail Sectors). However, Government and regulator have pushed digital payments in such times by means of National electronic funds transfer (NEFT), Immediate payment service (IMPS), UPI, BHIM etc. So as to avoid usage of physical cash which has higher risk element of COVID-19 Transmission. Such efforts along with opening of economy are further reflected in the recoveries observed in various digital payment platforms on NPCI in a relatively short period of time. This clearly indicates that the detrimental impact of COVID-19 on digital payments, although significant, is not lingering and digital payment ecosystem in India is expected to evolve rapidly to help shape the post-COVID-19 era growth.

LITERATURE REVIEW

Rakesh H M & Ramya T J (2014) in their research paper titled "A Study on Factors Influencing Consumer Adoption of Internet Banking in India" tried to Examine the factors that influence internet banking adoption. It is found that Internet banking is influenced by its perceived reliability, Perceived ease of use and Perceived usefulness. In the process of internet banking services expert should emphasize the benefits its adoption provides and awareness can also be Improved to attract consumers" attention to internet banking services.

Sanghita Roy, Dr. Indrajit Sinha (2014) stated that E- payment system in India, has shown tremendous growth, but still there has lot to be done to increase its Usage. Still 90% of the transactions are cash based.

Volume 8, Issue 2 (III) April - June 2021

Technology Acceptance Model used for the purpose of study. They found Innovation, incentive, Customer convenience and legal framework are the four factors which Contribute to strengthen the E- payment system.

Kartikeya Bolar (2014)In his research paper "End-user Acceptance of technology Interface In Transaction Based Environment "stated that Creators and investors of technology need information about the customers" evaluation of their technology interface based on the features and various quality dimensions to make strategic decisions in improving technology interfaces and compete on various quality dimensions.

Nitsure (2014) in his paper observed that the problem being faced by developing countries like India in the adoption of E-banking initiatives due to low dissemination of Information Technology. The paper highlighted the problems such as security concerns, rules, regulation and management. In India there is a major risk of the emergence of a digital split as the poor are excluded from the internet and so from the financial system.

Slozko & Pello, 2015 E-payment systems are important mechanisms used by individual and Organizations as a secured and convenient way of making payments over the Internet and at the same time a gateway to technological advancement in the field of world economy

Balazs Vinnai, general manager, Digital Channels, Misys(April 25, 2016), says that "It is critical for banks to consider new digital channels as part of an integrated strategy and evolve from first to second generation digital banking: switching digital from a supporting role, to the primary sales and communication channel for banks," says Vinnai. "Reengineering processes around the customer is not easy, but banks must embrace digital banking to remain competitive and relevant."

Objectives

- To examine the age of respondents impact on digital payments.
- To analyze the impact of customers education on usage of digital Payments.
- To analyze the impact of customers income status on usage of digital Payments.
- To gauge the extent of operations of digital payments while dealing with online transactions.

Hypothesis

- There is no significant impact of customers age on usage of digital Payments.
- There is no significant impact of customers education on usage of digital Payments.
- There is no significant impact of customers income on usage of digital Payments.

METHODOLOGY

The study is based on secondary data. The Materials were collected from books, journals, Newspapers and relevant websites which have Been consulted in order to make the study an Effective one.

Types of digital Payments

- 1) Payments cards:- The most common types of payment cards are credit cards and debit cards. Payment cards are usually embossed plastic cards, 85.60 × 53.98 mm in size, which comply with the ISO/IEC 7810 ID-1 standard. They usually also have an embossed card number conforming with the ISO/IEC 7812 numbering standard. Most commonly, a payment card is electronically linked to an account or accounts belonging to the cardholder. These accounts may be deposit accounts or loan or credit accounts, and the card is a means of authenticating the cardholder. The information required for using payment cards are Card Verification Value (CVV Number) and Expiry date of the payment card. CVV number is a combination of features used in credit and debit cards for the purpose of establishing owner's identity and minimizing the risk of fraud. Payment cards require 2 factor authentications. Authentication is a process in which credentials provided are compared to those on file in a data base of authorized users information on a local operating system. Factors of authentication includes Knowledge factor (PIN), Possession factor (ID card, Smart phone) and Inherence factor (Fingerprint, face or voice).Generally the Payment cards can be distinguished on the basis of its features.
- Credit card: The first universal credit card, Which could be used at a variety of Establishments, was introduced by the Diners' Club, Inc., in 1950. Another major card of this type, known as a travel and entertainment card, was established by the American Express company in 1958.Central Bank of India was the first public bank to introduce Credit card. The issuer of a credit card creates a line of credit (usually called a credit limit) for the cardholder on which the cardholder can borrow. The Cardholder can choose

either to repay the full outstanding balance by the payment due date or to repay a smaller amount, not less than the "minimum amount", by that date.

- Smartcard: Bank are adding chips to their current magnetic stripe cards to enhance security and offer new service, called Smart Cards. Smart Cards allow thousands of times of information Storable on magnetic stripe cards. In addition, these cards are highly secure, more reliable and Perform multiple functions. They hold a large amount of personal information, from medical and health history to personal banking and personal preferences.
- Debit card: Debit card was introduced by Citi Bank .With a debit card, when a cardholder makes a purchase, funds are withdrawn directly from the cardholder's bank account. Debit card is a plastic payment card that can be used instead of cash when making purchases. It is similar to a credit card, but unlike a credit card, the money is immediately transferred directly from the cardholder's bank account to pay for the transaction.
- Charge card: With charge cards, the cardholder is required to pay the full balance shown on the statement, which is usually issued monthly, by the payment due date. It is a form of short-term loan to cover the cardholder's purchases.
- Fleet card: A fleet card is used as a payment card, most commonly for gasoline, diesel and other fuels at gas stations.
- Gift card: A gift card also known as gift voucher or gift token is a prepaid stored-value money card usually issued by a retailer or bank to be used as an alternative to cash for purchases within a particular store or related businesses.
- Store card: It is a credit card that is given out by a store and that can be used to buy goods at that store.
- 2) Unstructured Supplementary Service Data (USSD) USSD is sometimes referred to as "Quick Codes" or "Feature codes", is a protocol used by GSM cellular telephones to communicate with the service provider's computers. A typical USSD message starts with an asterisk (*) followed by digits that comprise commands or data. Groups of digits may be separated by additional asterisks. The message is terminated with a number sign (#). The innovative payment service *99# works on Unstructured Supplementary Service Data (USSD) channel.
- **3)** Aadhaar Enabled Payment Service (AEPS) The AEPS system leverages Aadhaar online authentication and enables Aadhaar Enabled Bank Accounts (AEBA) to be operated in anytime-anywhere banking mode through Micro ATMs. This system is controlled by the National Payments Corporation of India (NPCI). Aadhaar Enabled Payment System is a way to get money from the bank account. This system of getting money neither requires your signature nor Debit card. It is also not needed to visit a bank branch for getting money through the Aadhaar Enabled Payment System. For AEPS transaction following information is needed.
- ✤ Aadhaar Number
- Bank Issuer Identification Number (IIN) or Name
- Finger Print
- 4) Unified Payments Interface (UPI) Unified Payment Interface (UPI) is a new payment interface introduced by National Payments Corporation of India (NPCI) under the supervision of Government of India to promote a cashless-society and mobile banking. Unified Payments Interface (UPI) is a system that powers multiple bank accounts to use several banking services like fund transfer, and merchant payments in a single mobile application. Sending and receiving money through UPI payment app is like sending and receiving a text message on your Smartphone. A user need not have multiple banking app installed in his/her Smartphone. A user can simply add all the bank accounts in a single UPI payment app without the hassle of remembering or even typing banking user ID/Passwords. Each Bank provides its own UPI App for Android, Windows and iOS mobile platforms
- 5) Point of Sale machines Point of Sale Machine made it faster and easier for cashiers to ring up sales and keep tabs on transactions. In the 1970s, innovation helped traditional cash registers evolve into computerized point of sale systems. It was also during these years that devices such as credit card terminals and touch screen displays were introduced. The point of sale (POS) or point of purchase(POP) is the time

and place where a retail transaction is completed. It is the point at which a customer makes a payment to the merchant in exchange for goods or after provision of a service.

- 6) Mobile banking Mobile banking is a service provided by a bank or other financial institution that allows its Customers to conduct different types of financial transactions remotely using a mobile device such as a mobile phone or tablet. It uses software, usually called an app, provided by the banks or financial institution for the purpose. Each Bank provides its own mobile banking App for Android, Windows and iOS mobile platforms. The earliest mobile banking services used SMS, a service known as SMS banking. with the introduction of smart phones with Wireless Application Protocol (WAP) support enabling the use of the mobile web in 1999, the first European banks started to offer mobile banking on this platform to their customers. Mobile banking is known as M-banking or SMS Banking. The European company called PayBox supported financially by Deutsche Bank, in 1999 started mobile banking. Transactions through mobile banking may Include obtaining account balances and lists of latest transactions, electronic bill payments, and funds transfers between a customer's or Other's accounts. E.g. –iMobile for ICICI bank, Kotak Bank App for Kotak Mahindra bank, SBI Freedom app for State bank of India.
- 7) Internet Banking Internet banking, also known as online banking, e-banking or virtual banking, is an electronic payment system that enables customers of a bank or other financial institution to conduct a range of financial transactions through the financial institution's website. Online banking was first introduced in the early 1980s in New York, United States. Four major banks —Citibank, Chase Bank, Chemical Bank and Manufacturers Hanover offered home Banking services. Chemical introduced its Pronto Services for individuals and small businesses in 1983, which enabled individual and small Business clients to maintain electronic Check book registers, see account balances, and Transfer funds between checking and savings Accounts. . ICICI Bank was the first Indian bank to provide internet banking facility. Information required for Internet banking are Account number and Indian Financial System Code(IFSC Code). Indian Financial System Code is a 11 Digit alpha numeric code that uniquely identifies a bank branch participating in any RBI regulated
- Bill payment service:- Internet banking facilitates payment of electricity and telephone Bills, mobile phone, credit card and insurance Premium bills as each bank has tie-ups with Various utility companies, service providers and Insurance companies, across the country
- Railway pass:- Railways has tied up with ICICI Bank and so the railway pass for local trains is available in online.
- Recharging the prepaid phone:- By just Selecting the mobile number and the amount for Recharge, phone recharge can be done within few Minutes.
- Shopping:- With a range of all kind of products, Online shopping and the payment is also Made conveniently through the account.

FUND TRANSFER

National Electronic Fund Transfer (NEFT) :-National Electronic Funds Transfer (NEFT) is a Nation-wide payment system facilitating one-to-one funds transfer. Under this Scheme, Individuals, firms and corporates can Electronically transfer funds from any bank Branch to any individual, firm or corporate having an account with any other bank branch in the country participating in the Scheme.

Real Time Gross Settlement (RTGS):- RTGS is defined as the continuous (real-time) Settlement of funds transfers individually on an Order by order basis (without netting). 'Real Time' means the processing of instructions at the Time they are received rather than at some later Time; 'Gross Settlement' means the settlement of Funds transfer instructions occurs individually (on an instruction by instruction basis).

Immediate Payment Service (IMPS) :- IMPS offers an instant, 24X7, interbank Electronic fund transfer service through mobile Phones. IMPS is an emphatic tool to transfer money instantly within banks across India through mobile, internet and ATM which is not only safe but also economical both in financial and non-financial perspectives.

Electronic Clearing System (ECS):- ECS is an alternative method for effecting Payment transactions in respect of the utility-Bill-payments such as telephone bills, electricity bills, insurance premia, card payments and loan repayments, etc., which would obviate the need for issuing and handling paper instruments and thereby facilitate improved customer service by banks / companies / corporations / government departments, etc., collecting / receiving the payments. Table 1 shows the birds view on digital operations.

ISSN 2394 - 7780

Volume 8, Issue 2 (III) April - June 2021

Impact of COVID-19 on the Payments industry

Analysis of payments products in times of COVID-19

1) Payments done through NPCI NPCI is an umbrella organization set up by banks under guidance of the Reserve Bank of India and Is de-facto responsible for all retail Payments done in India. It acts as an intermediary for processing of a multiple modes of digital payments such as IMPS, UPI, Bharat BillPay, among others. A review of the value and volume of such transections from January 2020 to June 2020 has depicted a decline in payments In India in lieu of COVID-19 and accompanying containment measures but has later shown a quick recovery in subsequent months across various modes. The lockdown period was the period of significant limitation in spending among consumers, along with deferral of multiple routine monthly Payments. Lockdowns caused significant uncertainty in decisions with respect to quantum and timing of spending and payments among consumers. This is reflected by a 49 per cent decline in value of overall NPCI payment products observed across digital payment modes in April 2020, compared to March 2020 payments.



2) UPI, BHIM and IMPS UPI and BHIM transaction values have both seen a Decline of 30 per cent and 39 per cent in April 2020 Respectively, as compared to January 2020, whereas IMPS transactions saw a decline of 44 per cent. UPI and IMPS primarily cater to the peer to peer transactions at an individual level. Ergo, this decline is potentially triggered by stringent lockdown regulations in April 2020, restricting expenditure to essential products and services, Decrease in employment and manual labour, deferrals of routine fixed expenses such as rentals and maintenance and reduction of disposable income of the population. Post easing of lockdown restrictions from mid-May 2020, value transacted via UPI and BHIM in June 2020 have regained to 122 per cent and 91 per cent of their January 2020 levels respectively. IMPS transactions have also reached to 95 per cent of its January 2020 transaction levels by June 2020.



3) Bharat Bill Payment System (BBPS) BBPS transactions have also seen a decline in transaction volumes, post lockdown, possibly due to non-payment of routine bills due to existent or anticipated cash crunches as well as significant deferrals in routine bill payments, A fall of 30 per cent was observed in the bill payments in April 2020 compared to January 2020. Nonetheless, the amount of bill fetch requests in the NPCI ecosystem surged in April 2020 by 26 per cent to 110 million, compared to 82 million requests in

Volume 8, Issue 2 (III) April - June 2021

January 2020, potentially signifying enrolment of new billers and bill payers anticipating need for online settlement in lieu of cash payments options becoming inaccessible. This may have led to adoption of digital bill payments at end customer levels or even digital payment hubs by merchants who accept cash in return for indirect online payments. The corresponding impact of the same is observed In May 2020, with an immediate rise observed in bill payments, marginally surpassing the bill values paid in each month of January to March 2020 by INR2 bn.



4) AePS Transactions over Micro ATMs Aadhaar enabled payment system (AePS) has seen an Unprecedented and substantial surge in April 2020 in transactions handled. In April 2020 AePS transaction volumes and value increased by as much as 118 percent and 30 percent compared to January 2020. This is Indicative that the outreach of the banking correspondent and micro ATMs payment mechanism spread widely during and post lockdown in the rural areas for the Nation. Direct benefit transfer or DBT schemes announced by the central governments have encouraged Rural populace to actively avail AePS services to retrieve cash supports transferred to their Aadhaar linked bank accounts. Further, enhanced support from telecom operators for setup of strong AePS infrastructure, for last mile connectivity of business correspondents and micro ATMs boosted enrolment numbers. As of June 2020, AePS transaction values increased by 9 per cent compared to April 2020 which denotes that the population enrolled in AePS ecosystem has continued to avail of their services in greater measure. Further, NPCI has indicated that the potential rollout of Aadhaar-linked face recognition enabled payments, In a measure to make AePS contactless.



2.1.4. AePS Transactions over Micro ATMs

5) National Financial Switch (NFS) Cash Withdrawals Cash in general was treated with caution and reprehension once the lockdown was instituted primarily due to fear of transmission of the COVID-19 virus, lack of access to ATMs and challenges in the ATM replenishments due to restriction of physical movement. This is reflected as cash Withdrawals in April 2020 via NFS ATMs seeing 52 percent decline

Volume 8, Issue 2 (III) April - June 2021

as compared to January 2020 withdrawals. This is further aggravated by the unavailability of non-essential goods and services during lockdowns and cash on delivery not accepted as a mode of payment by most services delivering essential services. Cash withdrawals did see an increase from May 2020 onwards and by June, they stood at ~84 per cent of January 2020 withdrawals. Demarcation policy of contamination zones as red, amber and green and Substantial relaxation in the green and amber zones post May 2020 were implemented, allowing access to ATMs. Further, services delivering essential goods started accepting cash on delivery to boost declining sales (E.g. Food aggregators, e-commerce players, etc.).





EMERGING TRENDS DURING PANDEMIC TIME

- 1) **Product innovations** According to a monetary policy press release in 2019, RBI mentioned that it is in early stages of thinking about considering a sovereign digital currency for the country . Furthermore, a much needed boost to Virtual card (open-loop) segment may come in, as RBI mandated tokenization of cards (currently only applicable on credit cards), thus, ushering in further growth for digitization. Removal of merchant discount rate (MDR) on RuPay cards and UPI transactions as well as creation of Payment Infrastructure development Fund (PIDF) are among the government Initiatives which are expected to provide required push for growth of merchant acceptance infrastructure and subsume more people within the digital ecosystem. Further, we also expect to see increased QR code Usage across sectors which is expected to not only continue to aid the urban users but also empower the less digital-savvy sections of society due to the push provided for digital literacy beyond tier one and tier two Cities Some of the key product innovations in the digital payments space in India include:
- i. **QR Code**: Quick Response Code-based payments are gaining popularity because it can be used to pay for fuel, grocery, utility bills, food, travel and several other services as well as the fact that QR codes can be scanned from both paper and screen.
- ii. **UPI for Merchant transactions**: It is an instant payment system wherein the customer can scan a dynamic QR code generated on the POS screen using any mobile-based UPI app which may include contactless payment solutions as well
- iii. **Payment gateway**: Internet payment gateway Enables merchants to accept payments through multiple payment channels via an e-commerce platform. This allows merchants to accept voluminous payments in a safe manner amid COVID-19 especially for online grocery, entertainment, food and other e-commerce merchants.
- iv. **Contactless payments**: The Near Field Communication (NFC) feature, coupled with Magnetic secure transmission (MST) technology, allows customers to pay via their contactless credit or debit cards or through a 'Tap and Pay' feature on a mobile application by tapping them on the PoS terminal.
- v. **SMS-based payments**: An SMS payment link sent by a merchant is used to pay for products or services especially for services preferring advance payments for booking or reservation such as restaurants and salons. The e-commerce companies are using this feature to migrate cash on delivery (COD) customer base

to digital payments. SMS Based payments have become less popular with the penetration of advanced smartphones and Introduction of newer modes of payment. However, Its scope remains high in the service sector.

- vi. **Prepaid cards**: Prepaid cards can be recharged or redeemed by using them on terminals, to serve as meal cards, transit cards or any such payment modes with designated purposes.
 - 2) **Infrastructure Innovations** It can be said that India has led the path to payments innovations, especially with the introduction of interoperable QR codes, one of the first of its kind in the world. While, this has increased ease of payments and made the user experience seamless, similar innovations/ initiatives are required to ramp-up the merchant acquiring pace. For India's rural population, the key is minimal requirements for merchant on boarding and limited knowledge of operations. An Indian merchant in a tier three or tier four city may not be the most comfortable to use PoS machines because they may lack even minimal technical skill to operate it and not have continual access to PoS machine support services.
 - 3) **Analytics-based solutions** The first wave for adoption of digital payments was supported by the ease of transacting, the seamless user experience that it offered and cashbacks. The next wave of growth may be led by fierce competition amongst existing players aiming to capture the market share through value added services like payment reminders, automated debit instructions, individual cash management and analytics based on consumer spending and providing users with information on/ location of stores accepting digital payments.

CONCLUSION

The downward impact of COVID-19 on the payment landscape has been profound and significant, yet not irreparable. Elements in the payment ecosystem are most adaptable to disruption and least dependent on physical infrastructure have been able to withstand, mitigate and even so far as capitalize the crisis, turning an imminent threat to their advantage. The pandemic has compelled individuals as well as organizations to re-evaluate their payment framework and infrastructure so as to incorporate considerations of disruption mitigation and continuity planning.

Cash withdrawals in the NFS Network have displayed signs of rebounding to pre-COVID-19 Levels indicating that the Indian Populace has a certain proclivity and propensity to transact in cash. Thus, COVID-19 may have given a sizable push in the endeavour to marginalize cash transactions, butt not so far as to eradicate it completely. Nevertheless, COVID-19 has been a silver lining, in many ways, for acceptability of digital payments in India. A key factor that served as a festering barrier towards the growth of digital was the impenetrability of existing payment infrastructure. However, The disruption caused by the pandemic allowed businesses the bandwidth to step back and reconsider their payment protocols for inclusion of digital from a streamlining and ease perspective. Also, individuals were inclined to consider digital payments in lieu of prevention to physical access to their funds as highlighted by the polls conducted, apprehension towards digital payments, due to lack of awareness, infrastructure availability, technicality and costs Involved played key reasons for non-adoption of digital payments.

SUGGESTIONS

The past three weeks over 42% Indians have used digital payment mode multiple times as compared to the pre lockdown period. Digital payment platforms have also not just seen a surge in the number of transactions but the number of downloads of digital payment platforms have also almost doubled. According to a survey of 42,000 respondents by consultancy firm Local Circles, buying essentials and mobile recharges are top use cases for digital payments and Paytm and Google Pay are among the top digital payment apps being used by consumers. According to the report, after the lockdown kicked in more people have switched to digital payment mode. With accessibility to the ATMs in the last three weeks being limited the digital payments companies are making most of it. The lockdown has also brought many first-time users who were earlier not very keen on using digital payments' mode for payments as now due to social distancing measures they need to pay online for buying essentials. Among the top gainers, according to the report include Paytm and Google Pay. "When consumers were asked what digital payment app have they been using the most in the last three weeks, since the coronavirus outbreak, 33% said Paytm, 14% Google Pay, 4% PhonePe, 10% Amazon Pay, 6% BHIM while 33% used other apps," the survey report said.

As the market for essential services has expanded, the retail stores have also witnessed a growth in the number of payments made via payment apps. "Many retail stores and local general stores have been reporting a major rush and spike in order because of the lockdown and as people purchase and stock essentials for use during this period," the survey said. Further there has been a rise in e-payments to the e-commerce platforms, delivering

Volume 8, Issue 2 (III) April - June 2021

groceries and other essentials in the last three weeks with some reporting five times demand. Many e-retailers are also requesting payments via digital mechanisms, which is also contactless and reduces risk of spreading coronavirus. Besides the National Payments Corporation of India (NPCI) has also urged people to use digital payment methods, so that people do not step out even to go to the ATM, reduce social contact and curb the spread of Covid-19. As per the report about 54% of respondents have used their Visa card, while 30% have made online payments via MasterCard. About 12% respondents have used Rupay card for making online payments, the report added.

REFERENCE

- 1) Demonetization effect: Flipkart, Amazon, Snapdeal witness 50% Spike in undelivered COD Orders http://www.bgr.in/news/demonetization-effect-flipkart- amazon-snapdeal-witness-50-spike-in-undeliveredcod-orders/
- 2) Go Cashless: Digital Wallets, NEFT, IMPS, UPI, Debit Cards, Credit Cards https://www.bemoneyaware.com/blog/cashless-digital-wallets-neft-imps-upi-debit-cards/
- 3) http://economictimes.indiatimes.com/wealth/spend/goingyou/articleshow/55908649.cms cashless-is-it-good-for-
- 4) Pib.nic.in/newsite/PrintRelease.aspx?relid=1552
- 5) www.icommercecentral.com>open-access
- 6) https://en.wikipedia.org/wiki/Mobile_banking

CONSUMER AWARENESS- RISING DEMAND FOR SUSTAINABLE PRODUCT DEVELOPMENT

Ms. Snehal Obhan

Assistant Professor, Maniben Nanavati Women's College, Vile Parle, Mumbai

ABSTRACTS

We live on one planet and living on other planets with all resources, is way far ahead. With the increasing pollution, Depleting resources it is an alarming situation for Individuals and Companies to be careful about what they use and how they use it. Manufacturers are the major extractors of the environment whereas Customers are major consumers, now it's high time to give back, or at least be cautious about what we use. Today after living in Artificial cities filled with dust and pollution people now are changing their lifestyles. They are creating demand for organic, Sustainable, Cruelty free, or Chemical free Products. The Manufacturers are similarly modifying their products to meet the expectations of the concerned consumers. Smart Companies work with 3 components- "People, Planet and Profit". This study aims at understanding the initiatives that various companies are undertaking in order to meet the needs of the consumers by taking care of its Nature. The study also attempts to understand the strategies undertaken by Companies for Sustainable Development.

Key Words: Sustainable Products, Consumer awareness, Environmentally safe.

I. INTRODUCTION

The World is Witnessing Ecosystem collapse, extinction of various animals, Melting of Icebergs and Glaciers, there are continuous climatic changes every year. The earth is getting warmer year by year, there is no more fog but what is left is smog, the time is not far away when we will come down to a level when we shall lack resources, especially oxygen, landfills are increasing and cutting down of forest to build cities are evident. With so much mistreatment to the environment there is now a fear that we will soon have to pay back the damage we have done. There is an urgent need to rise up with Sustainable Development in order to survive. There is a need to adapt to a sustainable environment to survive in the future for Business firms(Article Survival of the Greenest: Business Must Reduce their footprints, UNO, February 2021). Also The youth has been encouraged by the means of education, Inspiration and Activism and Green jobs in future. (Youth Power to Save the Planet, UNO, February 2021).

II. STATEMENT OF PROBLEM

Greta Thunberg, an Environment Activists in the United Nations Sustainable Development- Climate Conference on 2019, used the term "How Dare You?" and raised her concerns about the climate changes, the depletion of resources, the effect on our natural Environment with nothing that is going to be left for the future generations. Her campaign "School Strike for Climate" has inspired youth all around the world and Students from US, Europe to Japan stood in her Support.

This is just the beginning, With the quality of environment depleting, Ecological systems collapsing, increasing the number of emissions of carbon gases has really raised the concern about what and where we are going to live tomorrow and what we are going to use. It is not the factories that affect the environment, but it is the consumers who push these industries to create more and more, costing enormous effects on the environment. It is the consumer driven world which is affecting the environment for their selfish needs. Yet we are now seeing the awakening amongst the consumers, slowly but today there is awareness that is seen amongst the consumers demanding for products and services that create a win-win situation and letting consumer achieve the products of their choice yet not affecting the Environment. Hence the Researcher has made an attempt to understand the scope of sustainable products in Indian Market.

1. OBJECTIVE OF THE STUDY

- To understand the concept of Sustainable development and Green Products.
- To Identify the need for sustainable products in today's Environment.
- To comprehend the challenges faced to promote sustainable products in India.
- To locate the scope of sustainable products in Indian Market.
- To provide conclusion and Suggestion for the study.
- **III. SIGNIFICANCE OF THE STUDY** This Study will help the manufacturers to understand the need and importance of sustainable products and develop products accordingly. It will also help them understand the

changing consumer attitude towards the products that consumers buy. It will help the product managers to develop product strategies. It will help the companies to develop strategies in product mix and product line.

- **IV. RATIONALE OF THE STUDY** There has been Increasing concern amongst people towards Environment. The need of this study is to understand how consumers can initiate in saving the environment. Consumers are the driving force of the economy so as for ecology, changes in the use of quality and type of products can make a huge difference.
- **V. HYPOTHESIS** H1: Consumers have willingness to buy sustainable products irrespective to high prices. H2: Consumers are aware and educated with Sustainable development Goals and Act to it. HO: Lack of awareness and high Prices affect growth of sustainable development goals.
- **VI. RESEARCH METHODOLOGY** The researcher has made an attempt to collect the data from secondary sources such as E- Journals, Magazines, E-Newspapers, Articles from experts, etc. The research has made use of case studies to understand the context and the scope of the study and has elaborated in a descriptive format.
- VII. REVIEW OF LITERATURE In an article by Peter Dockrill on "Consumers Have a Bigger Impact on The Environment Than Anything Else, Study Finds" stated that its is the consumers who needs to be blamed as their demands are the driving force for the companies to produce more and more, he also stated that though China is the major producer of Co2 gases but the footprint of consumption is less as the products produced in China are for export purposes. He also considered an analysis done in "Journal of Industrial Ecology" which included a survey of impact of consumers from 43 countries. The Analysis Concluded the United States being the worst performer of greenhouse gases emission, with Luxembourg being the second followed by Australia. The article concluded by stating that consumers contribute 60-80 percent of damage to the planet over the manufacturers. According to the research Conducted by Borin, Norm & Cerf, Douglas & Krishnan, Ram. (2011) Stated certain factors that hinders the growth of sustainable markets, they mentioned the factory that sustainable products are usually priced higher than regular products discouraging consumers to buy sustainable products. They also mentioned that Communication has also been an obstacle as consumers lack information on sustainable products and why there is a need for sustainable products which at the end are unable to make right purchase choices. They also mentioned the point of concern that the manufacturer does not disclose complete and accurate information and the impact of the product on the Environment. Subramanian, Sp Mathiraj & Jane, E.Jeevaratnam. (2016). In their article they have given emphasis on the Need for companies to adopt Green Marketing. They listed certain factors that aid companies when green marketing is adopted such as Builds good corporate Image, aids competitive advantage, stays updated with the market trends of Sustainable Development. They also added that Green Marketing is not necessary for a good and balanced ecological environment but also the need for consumers to have better living. The Researchers also listed certain challenges such as Green Marketing is a New concept, It Needs time and Patience to grow, Expensive products leading to Green Myopia, Costly process, Meticulous R&D needed, Lack of awareness amongst consumers. Shrikanth, R & Surya, Deepti & Raju, Narayana. (2012). Their article has highlighted the need for Green Marketing in India. They also mentioned that for companies to survive in the competitive market especially in growing markets like India has to follow the trend in the market. Though the Indian consumers have not completely adopted green products yet there is a huge scope of growth in Indian Market. On the other side the mentioned an analysis conducted by Global ImagePower Green Brands stated that 64% of consumers are willing to buy green products when offered though when asked upon willingness to pay a high price for green products there was 48 % only who can pay only 10% beyond the price of their existing product. Majority of them stated that strong Advertising can help consumers make right choices. In an Article by Katy Askew on "What is the future of Vegan Food? Culinary comfort and honesty on health." She mentioned that by the year 2018 UK has become Vegan New Product Development Capital, as they have launched the highest number of vegan- dairy free and Non-Meat Products. Social media has helped the UK witness growth in Vegan consumers. The supermarkets are demanding more variety of vegan products. The article also raises the concern of saturation of vegan products. But not to forget Social media has helped create a trend amongst consumers in the UK.

Case Study

The Body Shop

A British brand The Body Shop has been successfully able to print its name amongst the consumers across International Borders. They are prominently well known for its ethical and Sustainable practices like Against Animal Testing, Fair Community Trade, activate self Esteem, Defend Human Rights, Protect the Planet.

In an Article by Andrew McDougall, Africa, Middle East and Europe, yet struggling in Asian Market. They have adopted a global CSR Strategy - Enrich Not Exploit

The strategy Incorporates the following Key Points:

Enrich Planet- Develop habitat helping projects, reduce production wastage, innovate sustainable packaging and recycle other packaging. Reduce use of fossil fuel.

Enrich People- Providing employment opportunities to low-income background and economically vulnerable people. Distributing trade amongst different ingredients to support communities.

Enrich Product- Create 100% Natural and Sustainable Products, Reducing environmental footprint categories, Publishing origin and chemistry of products lastly Innovative product Line Extensions.

VIII. INTERPRETATION According to the research conducted the following points have been observed.

- Indian consumers have not appreciated the willingness to pay a higher price for the sustainable product when their needs are being fulfilled by Low priced Non-Sustainable products.
- According to the research conducted there is lack of awareness amongst Indian Consumers, Literacy regarding the right product plays a very important role to make the right purchase of product.
- Sustainable Development and Green Products are still new to Indian consumers, Lack of trend is observed in Indian market yet high growth prospects.
- Indian consumers carry Traditional Approach towards products they use and buy.
- Great scope for Vegan Food Industry- India being on the top when considered with vegetarian consumers, leaving a huge scope for the food industry to flourish its market.
- Indian consumers aspire for International products increasing transportation expenses, burning of fuel and costing high making it illogical to buy international products over Sustainable products.
- **IX. LIMITATIONS** This study is based on secondary data only, it does not cover the perception of consumers at the prevailing state.
- X. CONCLUSION India is a Developing country with young aspiring minds, and vast number of aspiring consumers who aspire to have better Jobs, lifestyle and Better products. According to the research conducted it can be observed that there is a greater scope of green products in India. Green Marketing can be a huge success if incorporated efficiently. Agriculture is the backbone of Indian Economy which can be sourced for green and organic products not only promoting sustainable development but also economic development. Today consumers prefer international products over home grown products If awareness initiated at the right stage and with the right methodology can be of great boon to Indian Economy. Today the biggest challenge is the cost of green products and awareness amongst Indian Consumers. The per capita income of average Indian consumers cannot enable them to buy expensive products. Also, the lack of right information being communicated has to be at the major point of concern once a consumer is educated about the product, they can make a shift.
- **XI. SUGGESTIONS** According to the research conducted it can be concluded that not only one sector has to take the initiative, it is the duty of both consumers and the manufacturers to do certain efforts from their side.

Manufacturers:

- As price being the challenge can be countered by mass production, once the demand for the products increases the cost of Raw material will also drop down.
- Use of Green Marketing has to be increased slowly decreasing down the use of materials that affect the environment directly or indirectly. Incorporation of 4 P's of Marketing mix with Green Marketing can Impact a massive change.
- Create local products and sell in the local markets, helps avoid pollution that can be caused due to transportation, Create Organic products and support growth of organic Markets.
- Increase awareness amongst the consumers in terms of production process with the help of advertisements and other means of promotions. Eg: Ads can be created showcasing the production process and how it helps in sustainable development.

- Motivate and assist farmers to grow quality resources without use of chemicals and pesticides. If the companies undertake projects with farmers, supporting them with loans, technologies and knowledge can add at a great level to the Nation.
- Involve consumers in campaigns and activities which can be conducted for the environment. The Body Shop has been successfully initiating consumer involvement by campaigns such as "Bring Back Our Bottles" and "Return, Recycle and Repeat". They have also been Conducting Number of Cleanliness drives and other activities to protect and Nourish the environment.
- The concept of "Ayurveda" and Natural products can be encouraged amongst the consumers, most of traditional consumers can be tapped using this as a strategy.
- Advertisements will play a vital role in making the consumer choose sustainable products when shown the impact of non-sustainable products on our environment.
- The concept of Veganism can be easily promoted amongst Vegetarians in India.

CONSUMERS:

- Consumers must Demand only and only organic products.
- Use products that are free from animal testing.
- Buy local products only as it adds to reduction in pollution and overuse of fuels due to transportation but also helps grow the economy.
- Follow healthy and sustainable food patterns like eat more greens, waste less foods, Vegan food creating lower environment footprint.

REFERENCES

- 1. https://www.bbc.com/news/world-europe-49918719
- 2. https://www.happycow.net/vegtopics/environment
- 3. https://www.unep.org/news-and-stories/story/survival-greenest-businesses-must-reduce-their-footprint
- 4. https://www.unep.org/events/publication-launch/youth-power-save-planet-launch-geo-6-youth-report
- 5. https://www.sciencealert.com/consumers-have-a-bigger-impact-on-the-environment-than-anything-elsestudy-

finds#:~:text=By%20measuring%20'secondary%20impacts'%20%E2%80%93,percent%20of%20global%2 0water%20use.

- 6. Borin, Norm & Cerf, Douglas & Krishnan, Ram. (2011). Consumer effects of environmental impact in product labeling. Journal of Consumer Marketing. 28. 76-86. 10.1108/07363761111101976.
- 7. Subramanian, Sp Mathiraj & Jane, E.Jeevaratnam. (2016). EMERGING TRENDS IN GREEN MARKETING AUTHOR CO-AUTHOR.
- 8. Shrikanth, R & Surya, Deepti & Raju, Narayana. (2012). Contemporary green marketing-brief reference to Indian scenario. International Journal of Social Sciences & Interdisciplinary Research. 1.
- 9. https://www.sciencedaily.com/releases/2016/02/160224132923.htm
- $10. \ https://www.foodnavigator.com/Article/2019/01/25/What-is-the-future-of-vegan-food-Culinary-comfort-and-honesty-on-health$
- 11. https://www.cosmeticsdesign-europe.com/Article/2016/02/16/The-Body-Shop-goes-for-a-green-makeoverwith-new-CSR-strategy

A CONCEPTUAL STUDY OF SUSTAINABLE DEVELOPMENT IN THE ERA OF GLOBALIZATION

Manoj L Mishra

Thakur College of Science and Commerce, Kandivali (E), Mumbai

ABSTRACT

From the beginning, the miracle of globalization has captured the attention of the world in various ways. Major changes in the world have led to a dramatic erosion of environmental quality. The concept of sustainable development has therefore gained importance since the Rio Declaration. Its main purpose is to create a conducive environment in which all people live a safe and healthy life. This paper focuses on the negative effects of global warming on the environment, as well as the need for sustainable environmental development through industrial growth.

Keyword:-Globalization Principles, Rio Declaration, Sustainable Development, WTO

INTRODUCTION

Foreign trade is the engine of growth and innovation. It is common to increase the use of international resources in countries that focus on the production of the most suitable goods according to the supply of environment and labour. International trade leads to increased productivity and competitiveness and lower costs and thus to growing nations. But economic growth over the past century and a half has had a devastating effect on the world's environment. New economic policies and a structural reform program often predict environmental impacts with inaccuracies due to the complex integration of various economic, social, political and environmental factors. This is being done in an effort to meet India's dire financial crisis (BOP), as well as to advance its economy in rapid growth and globalization.

This has led to depletion of the ozone layer, pollution, loss of forests and biodiversity, extinction of species, loss of marine life, soil and water pollution at an alarming rate. Recognizing the importance of biodiversity, the problems created by them and their impact on human settlements the concept of ecosystems gained prominence during the 1980's. So the concept of sustainable development has first emerged, with the aim of doing something for the present to improve the human condition and the global system in which we live, to last longer and benefit future generations, leading to sustainable human development.

FOCUS ON FURTHER AND FIRST DEVELOPMENT

The concept of sustainable development came from the Report of the World Environment and Development Commission (WCED), Our Commonwealth (1987 Brundtland Report) which described sustainable development as "development that meets the needs of the present generation without compromising the ability of future generations to meet their needs." a conference at the United Nations Environment and Development Organization (UNCED) ("Earth Summit") held in Rio in 1992, which followed the notion that sustainable development quickly gained widespread funding and promoted greater awareness of major environmental problems and diversity in the world. It marked the decision-making process by recognizing the challenges and problems that were common in the world and in all people, and by seeking to identify cases where joint obligations could not be established. Thus it has increased the scope of global problems including issues such as environmental, health, trade and poverty. It also highlighted the link between globalization, global risk and shared responsibilities that created the need for action by the international community.

OBJECTIVES OF THE SYSTEM OF FURTHER DEVELOPMENT

Sustainable development includes the two terms, 'sustainability' and 'development' to reflect a growth pattern that strengthens both national capacity to care for their people in relation to their full relations with global resources. It focuses on the relationship between humans and their environment and shows a warning that man cannot push evolution against nature. Sustainable development has specific forward-oriented goals that transcend phase, phase, language and regional barriers.

These are-

- to maintain the standard of living of a large number of people equally and fairly, consideration of past implications and consequences in decision-making must be achieved.
- conserve and protect the earth's natural resources from misuse and misuse.

- develop new technologies and scientific techniques that work in accordance with the laws of nature and do not conflict with them.
- respect the diversity and involve local and indigenous communities to find policies that develop grass roots.
- to establish international institutions that recognize the needs of poor countries and support them to achieve their growth goals without compromising their natural and natural resources.
- to seek the peaceful co-existence of all nations of the world; this requires respect for international agreements and agreements. Sustainable development, therefore, is a desirable guide to change and provides a framework for determining developmental actions through individual communities and individuals. In theory, sustainable development can be thought of as integrating three 'pillars'; namely-International Environmental Law, International Human Rights Law and International Economic Law. An integrated development plan is so sustainable that it needs support from each pillar. In saying that people are at the center of concern for sustainable development and that they have the right to live a healthy and productive life in harmony and nature, the Rio Declaration used the language of the Bill of Rights. The emergence of sustainable development is accompanied by a growing general consensus on International Human Rights. The third pillar of sustainable development is the International Economic Law. The concepts of Economic Law are borrowed as concepts of International Environmental Law.
- The concept of inclusion in the economic costs of pollution and environmental degradation, referred to in environmental law as "total prices";
- "Pollution payroll" means that the polluter is responsible for all pollution costs, be it economic, human, social or cultural;
- The concept of environmental responsibility and debt based on the product cycle of "birth to the grave"; and,
- The "economic tools" approach provides incentives and reductions in relation to the desired performance or behavior.

WORLDWIDE DEVELOPMENT AS A NEW ECONOMIC POLICY

Now the main purpose of India's new economic policy is globalization. Globalization can be defined as, "the business philosophy of looking at your business with a global perspective on global perspective, using world-class technology, providing products and services that better meet the needs of customers around the world, maintain international adherence to global identity and ultimately promote international organizational and business culture ".

The main idea of globalization is that more trade is better for all parties involved. Any action that disrupts the free flow of money, goods and services, will produce the best results. The term globalization means the opening up of the global economy to globalization. Globalization is considered an integral part of the transformation package and has four parameters:

- 1 To allow the free movement of goods by reducing or eliminating trade barriers;
- 2 Construction of large international cash flows;
- 3 The creation of an environment, which allows free movement of technology between countries; and
- 4 In the eyes of the developing world, the creation of an environment in which workers can move freely in various parts of the world.

In response to the opportunity for trade and foreign investment from land redistribution, a large and growing number of developing countries including India have begun to liberate their trade and foreign investment regimes, as well as restructuring their domestic economic structures and exporting capacity.

EFFECTS OF WORLDWIDE ENVIRONMENT

Economic development often means increased pressure on the environment. Starting with the impact on the environment; there is a common view that as global trade promotes economic growth, trade, investment, etc., it will lead to more pollution and environmental degradation. In this view, the greatest damage to the environment is the result of the process of social and economic development. The impact of globalization on the environment needs to be further considered in the context of Indians who are firmly entrenched in change.

In addition to globalization, economic inequality has led to an increase in inequality that has led to increased environmental impacts such as climate change, ozone depletion, biodiversity and desertification. But these international trading systems and environmental agreements contain very little of the provision of trade and trade development coordination. Globalization and its effects have caused widespread concern about global governance. Traditionally it is seen as an economic situation linked to the emergence, development and integration of the global market, linked to areas that were once considered insignificant in economic development. However, a new body of international economic law is emerging in terms of trade and investment, which has a profound impact on the environment and human rights that are questionable. Many recent publications and analyzes have focused on the environmental impacts of the World Trade Organization (WTO). This body, along with other objectives, aims to facilitate sustainable environmental development among member states.

CONCLUSION

In conclusion, although industrialization is seen as a solution to providing economic growth and economic growth, it all inevitably produces harmful emissions and wastes. While high population growth and economic growth require resources and emissions, not many industries have reached the right proposals through sustainable measures, thus putting pressure on the environment. The practice of globalization has led governments and individuals to recognize the magnitude of the countries and beyond the limits of environmental problems, which in turn led to the adoption of the concept of sustainable development. The WTO, considered a major center in international trade affairs, also aims to protect the environment while promoting international trade. The Rio Declaration has brought together ideas such as the polluting process; generation equality, etc., to preserve and preserve the environment for the next generation through sustainable industrial growth. But your awareness of environmental protection and preserving it for future generations is a matter of the hour.

REFERENCES:

- 1. PROCHÁZKOVÁ, D. Principles of Sustainable Development. Manuscript, 200 p. [In Czech].
- 2. PROCHÁZKOVÁ, D. Field Management and Organization Management Strategies. Prague: Karolinum, 2011, 399 p., Printed. [In Czech]. ISBN 978-80-01-04844-3
- PROCHÁZKOVÁ, D. 5 Research reports to the Department of Agriculture project 1R56002 System Multiple Decision-Making Systems Supporting Sustainable Development of Earth and Human Settlements ". Prague: MZe ČR, 2005-2007, 1023 k. [In Czech].
- 4. PROCHÁZKOVÁ, D. (ed.): Environmental Monitoring and Near Problems. Praha: ČEÚ and MŽP ČR, 1993, 356 p.
- 5. PROCHÁZKOVÁ, D. Environmental Monitoring Czech Republic. Conception. Praha: MŽP ČR Study. ČEÚ, 1993, 465 k. [In Czech].

A STUDY of ASSESSING THE ROLE OF YOUTH IN COMBATING THE POLLUTION IN MUMBAI CITY

Dr. Sangeeta Makkad

Assistant Professor & HOD and Course Coordinator: MAPR & MACJ Departments & BMM & BAMMC Department, Affiliated to University of Mumbai

ABSTRACT

COVID-19 proved to be a pandemic but yet another silent killer has been reigning our skies and impacting both young and old causing deaths globally. Air Pollution has become a very strong concern and a major public Health Hazard especially for the bigger parts of the urban India. A strong cause of chronic illnesses both of lungs and heart it is the silent killer of air pollution which has spelt doom and death and threatened the health of millions of people in India especially in the metro cities of Delhi Mumbai Chennai and many more. It has its long ranging impact creating deformities in newborn babies, affecting a lot of cognitive development of young children, impacting the old and youth too especially with co morbidity impacted people. WHO has given strong indications of air pollution being one of the strongest negative health parameter and have advised air quality guidelines. Significantly the youth are paying a price for this grave concern from the young age .World Bank and WHO have pointed out to huge impact of air pollution as an economic loss of huge amounts apart from lost income. This study aims to explore the role of youth that can be channelized towards taking initiatives for managing ways and possibilities of controlling air pollution in their day to day life as well as creating safe spaces for the society to breathe healthier air. The study examines college students and their awareness and openness to adopting various means to cut down carbon carbon footprints and control emissions and create a healthier lifestyle to regulate air pollution. Through a primary research on one hundred college going students the study explores the student's initiatives and possibilities of controlling air pollution through education and awareness.

Keywords: air pollution, youth education, fuel, Mumbai

INTRODUCTION

A challenge of the modern days and modern life leading to industrialization and fast pace of technology with the high pace of life has resulted into various environmental concern with air pollution as one of the very toxic component of them. This is a combination of various toxicity intense chemicals within the air which reach beyond a permissible level thus causing a strong health concern to all age groups inclusive from children to elderly. Various different kinds of elements with high pollution rates are carbon dioxide, monoxide, Sulphur dioxide and many more. One of the very strong concerns and high risk at both physical and physiological level from the environment is also a reason for more than many thousands of pre-mature deaths and high morbidity health concerns worldwide each year. The impact of Air pollution is many folds. Apart from it costing the degradation of loss and quality of human lives, it also lowers the ability to effectively do productive work impacting the vital organs .It also creates a lot of damage of various monuments and culturally rich heritage buildings. This creates a dent in the economic growth as it depreciates the human resources and increases the burden for restoration of the various ecosystems .WHO has termed air pollution as one of the biggest health hazard in the world and it has strongly suggested various governments to take active steps in the community to intervene on an urgent mode towards better quality of life?

Both Delhi and many years and Mumbai have had a strong impact of environment pollution with air-pollution being credited as one of the highest to create a lot of health hazards for the people and for the industries. The high rate of industrialization ,high-rises coming up at every other block and the construction boom has given way to whole lot of dust and air pollution across the city creating a lot of respiratory illnesses like asthma and bronchitis for the young and old.

LITERATURE REVIEW:

Cardinal (2016), examining the impact on the health by the air pollution and its correlation without a physical activities the author conducted a survey on children and a Collison's. The experiment was done in China's XNG at 1980 to understand the increasing growth due to industrialization in urbanization created by the change changes in economy policies have led to a very unhealthy influence on the environment. The author assessed that increase in level of physical activity in the young children and adults is a need of the day with however any adverse effect of air-pollution causes health damage the author comments that to increase physical health by outdoor play an activity a healthy natural environment is important to cater to good health of children. With the prevalence of high air-pollution the challenges to health can be can we be intense Elizabeth Cooper-Gaiter

ISSN 2394 - 7780

Volume 8, Issue 2 (III) April - June 2021

(2015), This study examined mainly the psychological variables are computer anxiety and computer selfefficacy which could reflect the possibility of a comfortable skill set for effective usage of computers and technology.

This study was conducted on senior citizens and the descriptive statistics of the study scored on a high positive. The study also highlighted the possibility of low-cost approach for creating a mobile computer laboratory to enable the senior citizens become more skilled and more enabled in the usage of computers and new relevant technology which is ever evolving and thereby helping them make the best usage of internet computers with their skills.

Shahid (2018), the author through his study tries to examine the challenges of air-pollution on health and its causes and death and sensitization level in the public of Delhi specially those still engaged in education in various colleges and universities. For this a survey of 419 respondents Who was conducted and through various forms of analysis it went on to reveal that is basically the intense negative quality of air is due to vehicular pollution as the major cause in Delhi after that the crop burning by Haryana and pollution by various industries contribute to a great extent towards air-pollution. All these who want to create a lot of health hazards like lung infections and various other bronchitis diseases in humans the writer the author highlighted the need of awareness and sensitization programs for improving the conditions in Delhi.

OBJECTIVES OF THE STUDY

- > To examine the awareness of youth towards Air pollution.
- > To study the readiness of youth for working in space of environment.
- > To understand and assess the possibility of creating awareness campaigns by youth for combating air pollution.
- > To find out about awareness of preventive measures of Air pollution by youth.
- To suggest various possibilities for youth to create a better quality of life through various means to reduce air pollution.

SCOPE OF THE STUDY

The study is undertaken in the city of Mumbai. Primary data is collected from the youth studying in colleges of metro city of Mumbai. Views of 100 respondents as sample size are gathered in this study

RESEARCH DESIGN AND METHODOLOGY:

This study is descriptive and exploratory in nature. Both primary as well as secondary analysis of data is undertaken. The researcher has made an attempt to satisfy the objectives of the study by testing the hypothesis. Secondary data is collected through the books and related websites. The instrument used to collect primary data is structured questionnaire which is duly filled by the elderly.

The sample size is 100.

LIMITATIONS OF THE STUDY

- 1. Descriptive Statistics and Frequency model has been used for primary analysis.
- 2. Due to limitation of time and cost the sample size is kept small.
- 3. The sampling universe is also limited to Mumbai only.

Hypothesis of the study

- 1) H0: There exists no correlation between sensitization of youth in awareness of air pollution issues on health and their positive behavioral changes.
- H1: There exists high correlation between sensitization of youth in awareness of air pollution issues on health and their positive behavioral changes.
- 2) H0: Youth in Mumbai have high awareness towards Air pollution and its causes and its health hazards.
- H1: Youth in Mumbai have low awareness towards Air pollution and its causes and its health hazards.

Sample Distribution

Table 1: Mumbai youth students from different colleges

Volume 8, Issue 2 (III) April - June 2021

Mumbai colleges for Survey	South	North	West	East
	Mumbai	Mumbai	Mumbai	Mumbai
Sample size	25	25	25	25

These four zones of Mumbai colleges for Survey had 25 as sample size each as respondents.

Profile	V	Vorking (F	ull/Part ti	me)		
	Use	Digital Platf	forms rea	sonably		
Age		25-30) years			
Sample Size Category Wise	Own Sr	nart Phone	Η	Have social media accounts (FB & Whats		
Total	Male	Female	Male	Female	Are Engaged in Higher Education	Are working Full time /Part time
100	25	25	25	25		

Table 2: Profile of respondents for Survey

Analysis and Interpretation

Table 3 Descriptive Analysis of Respondents

		WORKI		Working Bart		Smart Phone		Faceboo		Whats		Studying in Higher	
AGE		NG F ull time		r uri time		r none owner		K account		app Account		institution	
AUL		ume		ume		Uwiter		uccouni		Account		3	
			26		10								
Mean	25	Mean	20. 6	Mean	10. 4	Mean	80	Mean	34	Mean	88	Mean	18
	14		10		32		31		12		00		85
	14		41		64		62		98		2.5		08
Standard	21	Standard	92	Standard	96	Standard	27	Standard	07	Standard	49	Standard	81
Error	4	Error	1	Error	6	Error	8	Error	5	Error	51	Error	9
Median	25	Median	20	Median	10	Median	80	Median	20	Median	90	Median	10
	#N		#N		#N				#N				#N
Mode	/A	Mode	/A	Mode	/A	Mode	80	Mode	/A	Mode	90	Mode	/A
	3.1		23.		7.3		7.0		29.		5.7		
Standard	62	Standard	29	Standard	00	Standard	71	Standard	02	Standard	00		19.
Deviatio	27	Deviatio	80	Deviatio	68	Deviatio	06	Deviatio	58	Deviatio	87	Standard	02
n	8	n	7	n	5	n	8	n	5	n	7	Deviation	63
Sample	10	Sample	54	Sample	53.	Sample		Sample	84	Sample	32.	Sample	36
Variance	10	Variance	2.8	Variance	3	Variance	50	Variance	2.5	Variance	5	Variance	2
			-		-				-		-		2.7
			0.9		1.5				2.6		0.1		61 00
Kurtosis	1.2	Kurtosis	57 16	Kurtosis	01	Kurtosis	2	Kurtosis	94	Kurtogia	51	Kurtogie	00
Kultosis	1.2	Kurtosis	0.7	Kurtosis	04	Kurtosis	2	Kurtosis	0.5	Kurtosis	51	Kuitosis	²
			13		48				15		04		43
Skewnes		Skewnes	64	Skewnes	24	Skewnes		Skewnes	24	Skewnes	0.4		55
S	0	S	6	S	8	s	0	s	7	s	8	Skewness	2
Range	8	Range	57	Range	18	Range	20	Range	65	Range	15	Range	48
Minimu		Minimu		Minimu		Minimu		Minimu		Minimu			
m	21	m	3	m	2	m	70	m	5	m	80	Minimum	2
Maximu		Maximu		Maximu		Maximu		Maximu		Maximu			
m	29	m	60	m	20	m	90	m	70	m	95	Maximum	50
	12		13				40		17		44		
Sum	5	Sum	3	Sum	52	Sum	0	Sum	0	Sum	0	Sum	90

Volume 8, Issue 2 (III) April - June 2021

Count	5	Count	5	Count	5	Count	5	Count	5	Count	5	Count	5
	3.9		28.	Confide	9.0	Confide		Confide	36.	Confide	7.0		23.
Confiden	26	Confiden	92	nce	64	nce	8.7	nce	04	nce	78	Confidenc	62
ce Level	48	ce Level	83	Level	99	Level	79	Level	03	Level	57	e Level	42
(95.0%)	6	(95.0%)	7	(95.0%)	8	(95.0%)	89	(95.0%)	5	(95.0%)	4	(95.0%)	7

Graph 1: Awareness of Respondent about Air Pollution causes & Health Hazards



Table 4: Correlation of Respondents Profile and Air Pollution awareness and causes.

			Health Hazard	Health Hazard	No	
	Awareness of	Cause	shall be for short	shall be for Long	Health	Not
	AIR pollution	S	time	time	Hazard	sure
Awareness of AIR						
pollution	1					
Causes	0.268515	1				
Health Hazard		-				
shall be for short		0.0735				
time	0.306386	4	1			
Health Hazard						
shall be for Long		0.5874				
time	0.195401	58	0.045134	1		
No Health Hazard	-0.6957	-0.375	-0.72318	-0.6026	1	
		-				
		0.6846				
Not sure	0.297114	5	0.716115	-0.11057	-0.34233	1

Graph 2: Correlation of various data Groups of respondents



ISSN 2394 - 7780

Volume 8, Issue 2 (III) April - June 2021

	Would you use Public Transport	Would you share travel options	Plant more trees	Report Smoking vehicles in your area	Use Solar Lighting	Get vehicles PVC regularly	done
Are	15	40	10	10	10	25	30
working							
Full time							
Are	10	20	20	10	20	20	20
working							
Part time							
Are	20	10	15	30	20	15	15
Engaged							
in Higher							
Education							
Are	25	10	25	10	15	10	10
Married							
Are	30	20	30	40	35	30	25
Connected							
on Social							
Media							
	100	100	100	100	100	100	100

Graph 3: Positive Behavioral changes to control air pollution





	Would you use Public Transport	Would you share travel options	Plant more trees	Report Smoking vehicles in your area	Use Solar Lightin g	Get vehicles PVC done regularly	
Would you use							
Transport	1						
Would you							
options	0.900561	1					
Plant more trees	0.986567	0.891874	1				
Report Smoking		.	0.9455				
vehicles in your	0.962654	0.850946	66	1			

ISSN 2394 - 7780

Volume 8, Issue 2 (III) April - June 2021

area							
			0.9867				
e Solar Lighting	0.977849	0.892603	25	0.979554	1		
Get vehicles							
PVC done			0.9597		0.97341		
regularly	0.959701	0.970057	01	0.945566	1	1	
			0.9417		0.95122		
	0.946269	0.987431	91	0.919933	1	0.995522	1



DISCUSSION AND CONCLUSIONS:

There exists high correlation between sensitization of youth in awareness of air pollution issues on health and their positive behavioral changes.

Important to note that the sensitization of youth in awareness of air pollution issues on health clearly as evident from the statistical correlation table have a positive correlation towards positive behavioral changes of youth. Positive Behavioral changes to control air pollution have been marked as strong positive correlation with the youth when they are educated and sensitized about various causes which can lead to health hazards for self and family or society. Apart from this when they understand that their small efforts can initiate and start the change which effectively will lead to more awareness and cooperative efforts by their various campaigns can hopefully arrest the health hazards caused due to air pollution. The various simple behavioral changes as using public transport, sharing travel options, planting more trees, reporting smoking vehicles in your area, using Solar Lighting, getting their vehicles PVC done regularly have been established in the graphs and details above. Also to be notified that from the graphs it is also clear that from amongst the profile of respondents it's those who are strongly connected on Social Media are the ones who are most motivated to make the positive behavioral changes. This is followed by those who are engaged in higher studies with married youth as the next line of respondents who are proactively making changes in their life style for controlling air pollution. Very clearly it is evident that took respondents actively want to engage in activities and changing of behavior for control of airpollution and there is a high correlation between sensitization and awareness of these issues and positive behavioral changes. Skewedness and ketosis levels are given along with the minimum and maximum range.

Thus the analysis clearly points out that the Alternate Hypothesis Is proved true and correct.

H1 HYPOTHESIS: There exists high correlation between sensitization of youth in awareness of air pollution issues on health and their positive behavioral changes.

And the second Alternate hypothesis

The youth clearly showed very poor knowledge and awareness of the causes and the dangers due to air pollution for the health they had no awareness about the causes and the toxicity that could lead to dangerous health hazards for a long period of time they truly believed that the health hazards posed for short period of time And some of them were not sure at all how it could be causing long-term health issues neither the causes nor the impact on their health .The graphs and the correlation between the respondents profile shows a very poor relationship.

Thus the analysis clearly points out that the Alternate Hypothesis two is proved true and correct

ISSN 2394 - 7780

H1: Youth in Mumbai have low awareness towards Air pollution and its causes and its health hazards is also proved true and correct

SUGGESTIONS AND RECOMMENDATIONS

Volume 8, Issue 2 (III) April - June 2021

- The avoid air pollution the youth may be directed to avoid using various forms of insect and mosquito repellents
- The societies and the community houses be discouraged to burn waste like papers leaves of plastic and rubber.
- Since construction and real estate growth pattern is on a high ground so the houses near to the sides must keep their windows closed to avoid dust of these construction sites to enter their houses.
- Regular lung function test LFTs for comorbid cases or senior citizens should be encouraged.
- > Wearing of mask in areas where it is excessive and high dust should be encouraged.
- Awareness drives in communities in colleges and schools from various NGOs government rotary and lion clubs would be a positive awareness/for arresting and imparting knowledge on air pollution
- People can be guided to buy energy efficient appliances and using efficient and low polluting models of vehicles while doing their CNG test regularly
- Usage of an air purifier allows a lot of pollutants to be removed from the air people with comorbidities like allergy and asthma may be encouraged to use them
- > Planting of trees and maintaining them may be encouraged in all housing societies.

BIBLIOGRAPHY

- Ahmed, S. (pril 2018). Air Pollution, Its Sources and Health Effects: A Case Study of Delhi. The Research Journal of Social Sciences, 9(4), pp. 62-74.
- Bradley J. Cardinal, P. (2017). The Health Impact of Air Pollution and Outdoor Physical Activity on Children and Adolescents in Mainland China. The Journal of Pediatrics, VOLUME 180, P251-255, JANUARY 01, .
- IMPRI, Y. K. (28th December, 2020). Why Compromising On Air For Development Is Not A Good Idea. MPRI Impact and Policy Research Institute Environment.
- Krupnick, A. A. (1997). Air Pollution and Acute Respiratory Illness: Evidence from Taiwan and Los Angeles. American Journal of Agricultural Economics, Volume79, Issue5.
- Rees, N. (December 2017). Danger in the air: How air pollution can affect brain development in young children. 3 UN Plaza, New York, NY 10017: Division of Data, Research and Policy.
- SDGs, U. a. (Accessed on2021). Supporting countries to achieve the SDGs. The UNITED NATIONS Economic Commission for Europe (UNECE).

PANDEMIC & REVOLUTION IN EDUCATION

Dr. Madhura M. Kulkarni¹ and Ms. PramilaYadav²

¹Assistant Professor-cum- Asst. Director in Accountancy & Research Guide, IDOL, Mumbai University,

Mumbai

²Assistant Professor & Research Scholar, DTSS College, Malad

ABSTRACT

Education is the tool to modify one's skill in right direction. As the growth of nation is depend on the youth's progress and youth progress is measured through the education system prevailing in the country. In today's era education and technology are go hand in hand. Covid-19 has steered education sector towards technology. Due to some technical & infrastructure incapability online mode is not favorable, blended learning can be accepted post covid-19.

Keywords: Education, Covid-19, traditional & modern method of learning.

I. INTRODUCTION:

Education has begun in prehistory where adults used to train the younger which was gained through imitation. As story-telling, skill from one generation to next slowly and gradually as time passes various systems of education emerges. Teaching methodology has been also changed from "Gurukul" to "School". Education helps the individual to sharpen their skill, values, morals etc. Education can be taken place in formal, informal ways. Vocational Education has been added since decades, favorable response has also noticed in such area.

As world is facing tremendous issues due to pandemic (Covid-19), which has led impact on all aspects of life including education.During mid of March2020 almost whole world had bared such unknown calamity. Many of wage workers Industries, school, colleges, cinema, restaurant etc. were closed down completely up to five months. Though we all are witnessed the ill effect of Covid-19 but there are some positive activities are also noted. Developing countries like India where more than 90% education were prevailing through offline mode, but due to outbreak of pandemic teaching learning organizations has adopted to online mode . Since the lockdown announced as other sectors were closed but learning part was still open. Educators have started learning the skill to deliver lectures via use of different software. It is noted the period from March2020 to June 2020 many of the institutions has arranged various webinars, workshops, faculty development programme etc. to make teachers familiar with modern teaching. All age group of teaching fraternity welcomes modern learning system it's because of pandemic. Despite of lots of problem in all over the country with respect to IT infrastructure, network, electricity, educators has moved ahead to the path of modern learning . It is seen many of courses viva- voce held online including doctor of philosophy, it proves the axiom "Where is a will there is a way".

II. Objectives: The objectives considered for the study are as follows:

- 1. To know the impact of Covid-19 on teaching learning system.
- 2. To study the overlap of modern method (on-line) on traditional method of learning.
- 3. To find out the appropriate learning system post Covid-19.
- **III. Hypothesis :** The tentative assumptions are framed as following:
- H0: Modern method (on-line) of learning is not better than traditional method. H1: Modern method (on-line) of learning is better than traditional method.
- ▶ H0: Modern method of learning is not appropriate post Covid-19.

H2: Modern method of learning is most appropriate post Covid-19.

LITERATURE REVIEW:

Dr. Parvat Kumar Daksh (July2020), stated that the pandemic has disturbed many sectors including education sector. The lockdown has compelled many education institutions to cancel their classes, examinations, internship etc. and to choose the online modes. To prevent spread of Covid-19 government has taken various initiative on education during Covid19.Pandemic has noted some positive and negative impact on the society. During Covid-19 teachers were instructed to hold online classes. Teacher & students came closure via digital platform. As lectures are arranged through live video conferencing like Zoom App, Webex, and Google Meet etc. The digital initiative of MHRD for secondary education during Covid-19 is

take by using Diksha, E-Pathshala, and National Repository of open educational resources and for higher education SWAYAM, Sawayam Prabha, E-PG Pathshala etc. Positive impact noted as there is a move towards blended learning, rise in use of Learning Management System, rise in online meetings, enhanced digital literacy etc. The adverse part of pandemic are educational activity hampered, impact on employment reduced, increased responsibility of parents to educate their wards, loss of nutrition due to school closure etc.

- **Dr.RadhikaKapur(March2018),** has explained teaching attribute is in a low state, the quality of teaching is not up to the mark, the reason of such is shortage of teachers, curriculum and the industrial methods are not properly developed. Many institutions are not involving technology in teaching. Suggestions given for improvements in the Indian education system as there should be connection between industry and academics, incentives should be given to teachers and researchers teaching vocational and diploma courses, these courses needs to be specialized. Innovative practices should be used to enhance opportunities for economic growth. Methods of higher education has to focus upon learning to learn, learning to do, learning to be and learning to become. Educational courses should be frame in such a manner that should assist the individuals to obtaining jobs & employment opportunities. Individuals from all the background realizes the importance of education, enrolment of the students has been increased.
- **IV. Research Methodology:** The purpose of the study is to know the impact of pandemic on existing education system.
- **a.** Method of Sample Selection: Sample has been selected by way of convenient sampling without replacement.
- **b.** Sample Size: Sample size for the study is selected 100 respondents from Mumbai Metropolitan City.
- c. Data Collection: For the study of research primary as well as secondary data has been used.
- (i) **Primary Data:** Primary data is collected by way of structured questionnaire, sent to respondents. The responses have been recorded through Google form.
- (ii) Secondary Data: Secondary data is collected through various published and unpublished sources such as magazines, articles, journals, e-journals, e-books, these etc.
- V. **Rationale:** After reviewing various literatures on education & covid-19. It is found that many researchers have done study on national level considering different factor other than education. Hence, I selected the topic considering the education factor, to study the revolution in education due to pandemic.

Factors	Category	Percentage of Respondents(%)
Gender	Male	29%
	Female	71%
Age	20-30years	32%
	30-40 years	39%
	40-50 years	24%
	Above 50 years	5%
Designation	Assistant Professor	35%
	Associate professor	4%
	Lecturer	17%
	Visiting Faculty	4%
	Principal	4%
	Teachers	36%
Teaching Experience	0-1 years	4%
	1-5 years	31%
	5-10 years	30%
	10-15 years	22%
	More than 15 years	13%

VI. Data Analysis and Interpretation:

ISSN 2394 - 7780

Use of online teaching before covid-19



As above pie diagram depicts most of teachers (79%) were not using online teaching before copvid-19. Use of online teaching during Covid-19:



The percentage of using online teaching has increased considerably (74%).





Zoom is being most preferred one app for online learning.

The safest app among the following:



People are relying on Zoom than You tube & Google Meet.

ISSN 2394 - 7780

Satisfaction with online teaching:



Only 34% teachers are satisfied through online mode of teaching.



Network connectivity issue is one of the hindrances faced by teachers in online teaching. Teachers are not only misses personal attention but also feels lack of students attention towards learning.

After Covid-19 which mode of teaching should be continued?



66% teachers are in favor to follow both teaching pattern(online & offline), whereas 32% feels to go with only traditional method of teaching.

Immediate Feedback:



Where can we see more familiarity between teachers and students?



Do you feel it is complicated to use E-learning methods in practical subject?



Does your institution have sufficient IT infrastructure to support use of E-learning methods post COVID?



HYPOTHESIS TESTING:

Percentage is used as tool to test hypothesis of the study.

- 1. H0: Modern method (on-line) of learning is not better than traditional method. H1: Modern method (online) of learning is better than traditional method. After study it is found that barriers in online learning system are 71%, feedback spontaneity is 7% and familiarity between teachers and students are 5% only as compare to traditional method. Hence, H0 is accepted.
- 2. H0: Modern method of learning is not appropriate post Covid-19. H2:Modern method of learning is most appropriate post Covid-19.

To test appropriateness of modern method of teaching some factors are considered such as complication faced to use E-learning methods in practical subject is 51%, sufficient IT infrastructure to support use of E-learning methods post COVID(40%) & costly mode of teaching (online-48%). So, H2:Modern method of learning is most appropriate post Covid-19 is accepted.

VII. LIMITATIONS:

The study bears some of the limitations as follows:

- 1. Data collected for the study is from the Mumbai Metropolitan City only .
- 2. Only 100 response were colected for the study.
- 3. Information collected from the respondents was within short span of time.

VIII. SUGGESTIONS:

- The study further can be conducted at broader level with larger sample size along with considering more factors.
- More technical equipment are made available.
- Hands-on training should be given to each section (primary to PG) teachers.

IX. CONCLUSION:

Out of 100 most of the respondents were not opted online teachings before covid-19, whereas 74% people have adopted it during pandemic situation. The reason to obtain online mode of teaching as school & colleges are closed and to proceed with work from home, very few has willingly accepted it. For the conduction of online lectures Zoom platform is much preferred (92%) followed by YouTube, Google meet, webinar etc. Despite of some rumors related to security of Zoom app, it is still most preferred one where more than 50% respondents are using as compare to YouTube& Google Meet who ranks second as far as security is concern. It is noticed that less than 550% teaching fraternity (34%) of the study are satisfied with online teaching methodology, 39% people are not completely but somewhat satisfied. While teaching online network connectivity is noted as major hurdle which affects interest of teacher & learner also teacher misses attention of students.

As online learning kills distance & saves time but people are interested to switch blended learning post pandemic instead of continued with online teaching. It is observed that through offline teaching feedback can be easily assembled than online; the bonding between the teacher and student can be seen in traditional teaching method (78%) than modern method (17%). Teachers teaching to practical subjects faces more difficulty through online mode than those teaches theoretical subjects, reason for such might be as time limitation given by app which hinders the completion of questions. Only 40% participants are agreed that their institutions has sufficient IT infrastructure to support the use of E-learning. People also feel that online method (48%) is more costly than offline method.

REFERENCES:

- 1. K. Kakkar(2011), A demand of value based higher education system in India: A comparative study, Journal of Public Administration and Policy Research Vol. 3(5), pp. 156-171, May 2011 Available online http://www.academicjournals.org/jpapr ISSN 2141-2480 ©2011 Academic Journals.
- M. Gautam (2016), Education System in Modern India, International journal of Scientific Research and Education ,Vol.4(1), pp.4876-4879,Jan.2016, ISSN(e): 2321-7545, DOI: http://dx.doi.org/10.18535/ijsre/v4i01.16.
- 3. N. Soni& T. Patel(2014), International Journal of Scientific and Research Publications, Volume 4, Issue 1, January 2014, ISSN 2250-3153, www.ijsrp.org

Volume 8, Issue 2 (III) April - June 2021

- 4. Thanky, P. (2013). Education System in Present Scenario: Problems & Remedies. Indian Journal of Applied Research, 3(7), 166-167. Retrieved September 19, 2017.
- 5. Chahal, M. (2015). Higher Education in India: Emerging Issues, Challenges and Suggestions. International Journal of Business Quantitative Economics and Applied Management Research, 1(11), 67-74.
- 6. P.Jena(2020), IMPACT OF PANDEMIC COVID-19 ON EDUCATION IN INDIA, International Journal of Current Research Vol. 12, Issue, 07,pp.12582-12586, July, 2020, ISSN: 0975-833X DOI:https://doi.org/10.24941/ijcr.39209.07.2020.
- 7. https://www.who.int/news/item/13-10-2020-impact-of-covid-19-on-people's-livelihoods-their-health-and-our-food-systems.
- 8. M.Nicola, Z. Alsafi (2020) The socio-economic implications of the coronavirus pandemic (COVID-19): A review,Int J Surg. 2020 Jun; 78: 185–193,Published online 2020 Apr 17. doi: 10.1016/j.ijsu.2020.04.018.

PRESENT AND FUTURE TRENDS OF GREEN MARKETING IN INDIA

Dr. Bhakti Mehta

Nava Samaj Mandal Degree College, Vile Parle East Mumbai

ABSTRACT

Green advertising is a wonder which has created specific significance in the cutting edge market. This idea has empowered for the re-advertising and bundling of existing items which as of now cling to such rules. Also, the improvement of green promoting has opened the entryway of chance for organizations to co-brand their items into independent line, praising the green-amicability of a few while disregarding that of others. The paper additionally inspects the current patterns of green promoting in India and depicts the motivation behind why organizations are receiving it and eventual fate of green advertising and infers that green showcasing is something that will constantly fill in both practice and request.

Keywords: items, organizations, rules, marking and bundling

INTRODUCTION

As per the American Marketing Association, green promoting is the showcasing of items that are dared to be ecologically protected. Subsequently green showcasing joins abroad scope of exercises, including item adjustment, changes to the creation interaction, bundling changes, just as altering publicizing. Green advertising, additionally on the other hand known as ecological showcasing and practical advertising, alludes to an association's endeavors at planning, advancing, estimating and dispersing items that won't hurt the climate

OBJECTIVES OF THE STUDY

- To investigation the qualities and need of green showcasing
- To show the present and future patterns in green showcasing

HYPOTHESIS OF THE STUDY

- 1. Consumers know about green promoting.
- 2. Consumers will pay more for eco-accommodating items.

RESEARCH METHODOLOGY:

The Methodology used for this paper is exploratory in nature, and is based on information collected from secondary sources. The paper analyzes the motives of companies and tries to explain the techniques to be adopted for Green Marketing. The mounting awareness about disturbed ecological balance and environmental consciousness has changed the behavioral pattern of individuals and businesses across the world. Today is the time of recyclable, non-toxic and environment-friendly green products that can help in preserving the environment and keeping it healthier. This has led the marketers to adopt the concept of "Think Green" i.e. GET GREEN, STAY GREEN. Green marketing incorporates a broad range of activities, including product modification, changes in the production process, packaging changes, as well as modifying advertising.

RATIONALE STUDY OF GREEN MARKETING

In the current situation, challenge is to keep the clients just as shoppers increase and even guard our common habitat – which is the greatest need of the time. In the present creative business universe of high innovation because of developing local area and purchaser interests in green and socially dependable items, pressed organizations to disguise externalities, for example, medical problems, neighborhood convenience, environmental change; ecological and legislative sanctions and activities; inventive advances and approaches of managing contamination, improved asset and energy proficiency, and to hold old (steadfast and productive) clients and buyers, it is a lot of critical to carry out green showcasing. For instance, the boycott of plastic packs in numerous pieces of the country, and restriction of smoking in open zones, and so forth numerous organizations take up green advertising to keep up their serious edge.

NEED FOR GREEN MARKETING

In excess of 12 different investigations in the US, Brazil Europe, Mexico, South Korea and Taiwan have set up joins between air poisons and low birth weight untimely birth actually birth and newborn child demise. As assets are restricted and human needs are limitless, it is significant for the advertisers to use the assets proficiently without squander just as to accomplish the association's level headed. So green advertising is inescapable. There is developing interest among the purchasers everywhere on the world in regards to security of climate. Overall proof shows individuals are worried about the climate and are changing their conduct.

Volume 8, Issue 2 (III) April - June 2021

Therefore, green showcasing has arisen which represents developing business sector for feasible and socially capable items and administrations. Consequently the developing mindfulness among the purchasers everywhere on the world in regards to insurance of the climate in which they live, People would like to grant a spotless earth to their posterity. Different examinations by naturalists show that individuals are worried about the climate and are changing their standard of conduct in order to be less antagonistic towards it.

CHARACTERISTICS OF GREEN PRODUCTS

The items those are made through green innovation and that caused no natural perils are called green items. Advancement of green innovation and green items is important for preservation of regular assets and economical turn of events. We can characterize green items by following measures:

- Products those are initially developed,
- Products those are recyclable, reusable and biodegradable,
- Products containing reused substance, non-poisonous compound,
- Products substance under affirmed compound,
- Products that don't hurt or contaminate the climate,
- Products that won't be tried on creatures,

Need for Standardization

It is discovered that showcasing messages from "Green" crusades are totally obvious and there is an absence of normalization to verify these cases. There is no normalization to confirm these cases. There is no normalization right now set up to guarantee an item as natural. Except if some administrative bodies are engaged with giving the accreditations there won't be any certain methods. A standard quality control board should be set up for such marking and permitting.

GOLDEN RULES OF GREEN MARKETING

Know you're Customer: Make sure that the purchaser knows about and worried about the issues that your item endeavors to address, (Whirlpool took in the most difficult way possible that shoppers wouldn't pay a premium for a sans CFC fridge since buyers dint understand what CFCs were.).

Educating your clients: isn't simply a question of telling individuals you're doing whatever you're doing to ensure the climate, yet in addition a matter of telling them why it is important. Something else, for a huge bit of your objective market, it's an instance of "So what?" and you're green promoting effort goes no place

.Being Genuine and Transparent: implies that a) you are really doing what you guarantee to do in your green showcasing effort and b) the remainder of your business arrangements are reliable with whatever you are doing that is harmless to the ecosystem. Both these conditions must be met for your business to set up the sort of ecological accreditations that will permit a green promoting effort to succeed.

Reassure the Buyer: Consumers should be made to accept that the item plays out the work it should do-they will not forego item quality for the sake of the climate.

Consider Your Pricing: If you're charging a premium for your item and numerous ecologically best items cost more because of economies of scale and utilization of more excellent fixings ensure those buyers can manage the cost of the premium and feel it's awesome.

Giving your clients a chance to take an interest: implies customizing the advantages of your harmless to ecosystem activities, ordinarily through allowing the client to make a section in certain ecological move.

Driving brands ought to perceive that shopper assumptions have transformed: It isn't sufficient for an organization to green its items; buyers expect the items that they buy pocket agreeable and furthermore to help lessen the natural effect in their own lives as well.

REASONS FOR ADOPTING GREEN MARKETING BY THE FIRMS

Green showcasing has been generally received by the organizations worldwide and coming up next are the potential reasons referred to for this wide appropriation:

Opportunities - As request changes, numerous organizations consider these to be as a chance to misuse and have an upper hand over firms promoting non-earth mindful other options. A few instances of firms who have strived to turn out to be all the more earth dependable, trying to more readily fulfill their purchaser needs are:
Volume 8, Issue 2 (III) April - June 2021

- McDonald's supplanted its shellfish shell bundling with waxed paper in view of expanded buyer concern identifying with polystyrene creation and Ozone exhaustion.
- Tuna makers altered their fishing strategies in light of the expanded worry over driftnet fishing, and the subsequent demise of dolphins.
- Xerox presented a "great" reused printer paper trying to fulfill the requests of firms for less earth unsafe items.

Government Pressure - As with all showcasing related exercises, governments need to "secure" purchaser and society; this insurance has huge green advertising suggestions. Government guidelines identifying with natural advertising are intended to ensure buyers severally diminish creation of destructive merchandise or side-effects Modify customer and industry's utilization and additionally utilization of hurtful products guarantee that a wide range of shoppers can assess the ecological piece of merchandise. Government builds up guidelines intended to control the measure of perilous squanders created by firms.

Competitive Pressure - Another significant power in the ecological advertising zone wants to keep up their serious position. As a rule firms notice contenders advancing their natural practices and endeavor to copy this conduct. In certain cases this serious pressing factor has made a whole industry adjust and along these lines diminish its hindering ecological conduct. For instance when one fish produce quit utilizing driftnets the others went with the same pattern.

Social Responsibility - Many firms are starting to understand that they are individuals from the more extensive local area and consequently should act in an ecologically mindful design. This converts into firms that accept they should accomplish natural destinations just as benefit related targets. This outcome in ecological issues being incorporated into the association's corporate culture. There are instances of firms embracing the two techniques.

Cost of Profit Issues - Firms may likewise utilize green showcasing trying to address cost or benefit related issues. Discarding ecologically unsafe results, for example, polychlorinated biphenyl (PCB) tainted oil are getting progressively expensive and sometimes troublesome. In this way firms that can diminish hurtful squanders may bring about significant expense reserve funds. When endeavoring to limit squander, firms are frequently compelled to reevaluate their creation measures. In these cases they frequently grow more viable creation measures that lessen squander, however diminish the requirement for some crude materials.

PRESENT TRENDS IN GREEN MARKETING IN INDIA

Associations are Perceive Environmental promoting as an Opportunity to accomplish its goals. Firms have understood that shoppers lean toward items that don't hurt the common habitat as additionally the human wellbeing. Firms showcasing such green items are liked over the others not doing as such and in this way build up an upper hand, all the while meeting their business targets. Associations accept they have an ethical commitment to be all the more socially mindful. This is with regards to the way of thinking of CSR which has been effectively embraced by numerous business houses to improve their corporate picture. Firms in the present circumstance can adopt two strategies:

Use the way that they are naturally mindful as a promoting instrument.

Become capable without inciting this reality.

Contenders' Environmental Activities Pressure Firms to change their Environmental Marketing Activities. To settle the score with contenders guarantee to being harmless to the ecosystem, firms change over to green advertising. Result is green promoting permeates whole industry. Cost Factors Associated With Waste Disposal or Reductions in Material Usage Forces Firms to Modify their Behavior. With cost cutting turning out to be important for the procedure of the organizations it receives green showcasing according to these exercises.

THE FUTURE TREND OF GREEN MARKETING

There are numerous exercises to be figured out how to be figured out how to stay away from green showcasing nearsightedness, the abbreviated form of this is that viable green advertising requires applying great promoting standards to make green items attractive for customers. The inquiry that remains, nonetheless, is, what is green showcasing's future? Business researchers have seen it as a "periphery" subject, given that environmentalism's acknowledgment of cutoff points and protection doesn't work well with promoting's customary sayings of "give client what they need" and "sell however much you can". Proof demonstrates that effective green items have kept away from green showcasing nearsightedness by following three significant standards:

Volume 8, Issue 2 (III) April - June 2021

LIMITATIONS OF THE STUDY:

We dissected the effect of green advertising approaches and customer convictions towards the climate. Be that as it may, we recognized the accompanying center constraints:

- 1. We have not given any proof in regards to the thought of organizations managing green showcasing and related product offerings.
- 2. Our discoveries should be additionally approved with a more extensive examination for the adequacy of green advertising and related methodologies.
- 3. Because of the absence of a definition for green advertising and related examples, the current examination has covered some pre-restricted pointers for green showcasing. To improve our future arrangement, there is a requirement for future exploration that thinks about the above restrictions, explicitly for purchaser conduct identified with climate. Future examination can likewise be extended while thinking about the idea of natural maintainability and ought to incorporate some subjective strategies to assess green advertising and its impact, explicitly regarding business execution.

RECOMMENDATIONS

Green showcasing is a persistent cycle that requires consistent contributions from the providers, government enactments and strategies and individuals. This is required with the goal that the organizations green advertising procedure can be adjusted to the objective business sectors thus it can acquire an economical upper hand. It is significant that procedures and approaches corresponding to green items be created and executed to guide and help the retailers and clients towards a green change. Besides organizations should likewise introduce endeavors in a way that lessens the danger identified with costs. Taking everything into account, making and carrying out a green showcasing procedure isn't straight forward in light of the fact that it isn't just intricate, yet in addition a relative idea that persistently differs over the long run.

CONCLUSION

Presently this is the perfect opportunity to choose "Green Marketing" around the world. It will accompany extraordinary change in the realm of business if all countries will make exacting jobs since green showcasing is fundamental for save world from contamination. From the business perspective in light of the fact that a cunning advertiser is one who persuades the buyer, yet additionally includes the shopper in promoting his item. With the danger of a worldwide temperature alteration posing a potential threat, it is critical that green promoting turns into the standard instead of a special case or simply a trend. Reusing of paper, metals, plastics, and so on, in a safe and earth innocuous way should turn out to be substantially more organized and widespread. It needs to turn into the overall standard to utilize energy-proficient lights and other electrical merchandise. Advertisers additionally have the obligation to cause the purchasers to comprehend the requirement for and advantages of green items when contrasted with non-green ones. In green promoting, customers will pay more to keep a cleaner and greener climate. At long last, shoppers, modern purchasers and providers need to compress impacts on limit the negative consequences for the climate agreeable. Green advertising accepts considerably more significance and importance in non-industrial nations like India.

REFERENCES

- [1] J.A Ottoman, et al, "Avoiding Green Marketing Myopia", Environment, Vol-48, June-2006
- [2] www.greenmarketing.net/stratergic.html
- [3] www.epa.qld.gov.au/sustainable_industries
- [4] www.greenpeace.org/international
- [5] www.google.com
- [6] http://www.iocl.com/AboutUs/environment%28GFA%29.aspx

A STUDY ON CUSTOMER SATISFACTION WITH RESPECT TO GREEN BANKING PRACTICES IN KALYAN JANATA SAHAKARI BANK

Ranjeet D. Thakur¹ and Mahesh Bhiwandikar² ¹NCRD's Sterling College of ACS ²K.M. Agarwal College

ABSTRACT

The current scenario of banking is moving to a new era where certain value added practices which can be considered as a benchmark are being practiced by several banks. In the overall growth of either a nation economy or an individual, Co-Operative banks have put their contribution at par with other banks. To meet the challenges imposed by other banks, such cooperative banks have started using advanced technologies and offering their customers, remote banking practices(Green Banking practices). The term 'Green Banking Practices' refers to all such practices followed by a bank to promote energy conservation and protection of natural resources. It includes certain services offered by bank for which no paper work is required. The services can be availed online from remote locations too which can save energy and certain resources. Government of India took initiative to start the cooperative movement in the country in the year 1904. Then the government, therefore, decided to develop the Co-Operatives as the institutional agency to tackle the problem of usury and rural indebtedness, which has become a curse for population. In such a situation cooperative banks operate as a balancing centre. At present there are several cooperative banks which are performing multipurpose functions of financial, administrative, supervisory and development in nature of expansion and development of cooperative credit system. In brief, the cooperative banks have to act as a friend, philosopher and guide to entire cooperative structure. The study is based on a Case study of An urban cooperative bank namely-Kalyan Janata Sahakari Bank operating in Kalyan taluka of Thane District-Maharashtra. The study is an attempt to analyze how successfully the bank follows the Green banking practices and customer's satisfaction accordingly.

Keywords:- Customer satisfaction, Green Banking Practices, Cooperative Banks, Green banking products,

1. INTRODUCTION

The present scenario of banking industry is undergoing through a tremendous phase of transformation from the old practices to advanced one with new technologies. The technology up-gradation is playing an important role in the day to day life and thereby making people understand the importance of it. Along with the technology up-gradation, one important aspect of customer satisfaction also plays an important as far as banking industry is concerned. It helps to analyze the decisions being taken and its implementation in favor of the bank customers.

Psychologies describe that satisfaction as "a state of mind that normally is derived out of a comparison between expected and perceived." Satisfaction is mind set which comes from past experience and knowledge. Now in a competitive world customer satisfaction is widest area where all the service industries are focusing on. Unlimitedly it's the customer satisfaction which will decide whether the organizations will remain in the business or not.

The present study is conducted to measure the level of customer satisfaction with respect to Green banking practices followed by 'Kalyan Janata Sahakari Bank'

1.1 SCENARIO OF COOPERATIVE BANK:-

Cooperative is not even a free choice, it is necessity in a developing country like India where a small minority enjoys excessive richness; while a vast majority have a hand-to mouth-existence. Co-operative banks, another component of the Indian banking system, originated with the enactment of the co-operative credit societies act of 1904, which provided for the formation of co-operative credit societies. Under the Act of 1904, a number of co-operative credit societies were started. Owing to the increasing demand for co-operative credit, a new Act was passed in 1912, which provided for the establishment of co-operative central banks by Union of Primary credit societies or by a union of primary credit societies and individuals. In short, co-operative banks are by the people and for the people.

The co-operative banking is discussed here mainly under five headings.

- ✓ Urban co-operative banks. (UCBs)
- ✓ Primary agricultural credit societies. (PACS)
- ✓ Central / district co-operative banks. (DCCBs)

Volume 8, Issue 2 (III) April - June 2021

- ✓ State co-operative banks. (SCBs)
- ✓ Long- term co-operative credit structures. (LTCCS)

1.2 PROFILE OF KALYAN JANATA SAHAKARI BANK:-

The history of the bank dates back to the year 1970 when Advocate Bhaurao Sabnis and Shri. Vasantrao Purohit took the initiative, against heavy odds, in founding a bank for the predominantly middle class people of Kalyan. It was around the same time that The Kalyan Peoples' Co Operative Bank had failed leading to severe discontent among the people. Against this background, raising share capital for a bank was an extremely daunting task but their determined and relentless efforts culminated in a modest beginning on 23rd December, 1973 in a 180 sq.ft. office with three employees, share capital of Rs. 50,000/- and deposits of Rs. 80,000/-.

The Kalyan Janata Sahakari Bank Ltd. has completed more than four decades of dedicated service to the people of Kalyan city and surrounding areas. From a modest beginning in December, 1973, the bank has grown by leaps and bounds in a short span of 40 years with a business mix of over Rs. 4548 crores today. With over 55000 shareholders and a client base of over 3 lakhs, the Bank is continuously striving to improve quality and set standards in customer service.

1.3 GREEN & FINANCIAL PRODUCTS OFFERED BY THE BANK:-

- ✓ Green checking: Converting checking accounts to online banking.
- ✓ Green Money Market Accounts: Converting savings accounts to online banking
- ✓ Green CDs: Bonus rates for online banking.
- ✓ Green Loans: Better rates for energy-efficiency projects.
- ✓ Green Mortgages: Better rates for energy-efficiency houses.
- ✓ Online Bill Payment.
- ✓ Reward Checking Accounts

2. RESEARCH METHODOLOGY

2.1 STATEMENT OF THE PROBLEM

The concept of Green banking practices are getting fame among the bankers nowadays. But how far the same is being understood and interpreted by the bank customers is not known. One more interesting concept is, such practices also influence the satisfaction level of bank customers. Therefore, it was felt a need to conduct a research study in this area. For the purpose of study- an urban cooperative bank in the taluka of kalyan, District-Thane being selected.

2.2 SCOPE OF THE STUDY

In this research study, Green banking practices followed by a cooperative bank being considered and thereby an attempt is made to measure the impact of the same on customer satisfaction. The study will help the bankers for designing better customer training tools in the area of research.

2.3 SIGNIFICANCE OF THE STUDY

It is essential for every bank to go for self evaluation with respect to every new pattern of banking practices followed. This will help them to improve and set standards for others. This may help the bank officials too for understanding the expectations of the customers.

2.4 LIMITATIONS OF THE STUDY

- 1. The information furnished by the customers may or may not be true.
- 2. The sample selected by me may not be across section of a society.
- 3. The information is collected within a short period.
- 4. The study area was restricted to Kalyan-taluka in Thane district of Maharashtra.

2.5 OBJECTIVES OF THE STUDY

- 1. To Identify the Green banking practices followed by Kalyan Janata Sahakari Bank
- 2. To evaluate the customer satisfaction with relate the green banking practices followed
- 3. To offer suggestions based on the findings of the study

Volume 8, Issue 2 (III) April - June 2021

2.6 DESIGN OF STUDY

The Research Design is undertaken for the study is Descriptive one. A study, which wants to portray the characteristics of a group or individuals or situation, is known as Descriptive study. It is mostly qualitative in nature.

2.7 DATA COLLECTION METHOD:

Survey method is considered the best method for data collection of data and the tools used for data collection are Questionnaire. This method is quite popular particularly in case of big inquiries. Private individuals, research works, private and public organizations and even government are adopting it.

In this method a questionnaire is sent to the persons concerned with a request to answer and return the questionnaire. A questionnaire consists of a number of question involves both specific and general type.

2.8 SOURCES OF DATA

The two sources of data collection are namely Primary & Secondary.

PRIMARY DATA

The Primary source of data was collected through survey method with the help of a questionnaire. The questionnaire includes the question drafted for the enquiry about the customer friendly services and the level of satisfaction among the customers regarding these services.

Proper care was taken to frame the questionnaire in such a manner it should be easily understood in view of educational level of customers. Generally 24 questions are prepared and asked to the customers of Kalyan Janata Sahakari Bank.

SECONDARY DATA

The Secondary data was collected from the bank annual reports and magazines, literature available on the subject, information available on internet, published articles and different books on banking sector.

2.9 SAMPLING DESIGN

Universe	:	3,132
Sample Element	:	Customers
Sample Size	:	100 Samples
Sample Test	:	Percentage Method and Statistical Tools
Sample Media	:	Questionnaire
Analysis method	:	Graphs & Diagram

3. REVIEW OF LITERATURE-

- 1. Jyothi gupta and suman Jain (2012) analyzed the lending practices of co-operative banks in India, comparison of efficiency of co-operative banks in India, Impact of size on the efficiency of the co-operative banks and different types of loans preferred by different set of customer from these banks.
- 2. Dwayne D.Gremler and Stephen W. Brown (1996) in their article "Service Loyalty: Its Nature, Importance, and Implications". Service organizations are frequently looking for ways to boost customer loyalty. He examines service loyalty and factors affecting its development. Satisfaction, switching costs, and interpersonal bonds are proposed as model of service loyalty.
- 3. S.Sivesan (2012), He found the impact of the service quality on customer satisfaction in banking sectors. Service quality are inter related with customer satisfaction. Manager of the bank or administrative body needs to identify the primary quality determinants, clearly managing the customer expectation, educating the knowledge to customer regarding the service for improving the service quality in the banking sectors.
- 4. Mesay Sata Shanka (2012) in his article "BankService Quality, Customer Satisfaction and Loyalty in Ethiopian Banking Sector". He measures the servicequality offered by private banks in Ethiopian. The relationship between the service quality and customer satisfaction and loyalty.
- 5. Ravi C.S & Kundan Basavaraj (2013) investigated the preference and satisfaction level of level of customer toward loans, deposits schemes, insurance and value added services rendered, by and public banks in private banks in shivamogga district.

4. DATA COLLECTION & ANALYSIS

- It is to be noted that the sample size for the purpose of data collection is decided as 100 but only 92 respondents have filled the questionnaire completely and gave their responses.
- > Therefore, the analysis is based on the available 92 responses.

Demographic Variables	No. of Respondents	Percentage
Sex	L	
Male	68	73.91%
Female	24	26.09%
Age		
Below 25 years	15	16.30%
25 to 35 years	23	25.00%
36 to 45 years	38	41.30%
45 to 55 years	12	13.04%
Above 55 years	04	4.35%
Marital status		
Married	69	75.00%
Unmarried	23	25.00%
EDUCATION LEVEL		
Below HSC	27	29.35%
Diploma	11	11.96%
UG	41	44.57%
PG	08	8.70%
Above PG	05	5.43%
Occupation		
Government	21	22.83%
Private	43	46.74%
Self-employee	15	16.30%
Professional	05	5.43%
Others	08	8.70%
Monthly Income		
Upto 10,000	06	6.52%
10,000 to 20,000	32	34.78%
20,000 to 30,000	39	42.39%
Above 30,000	15	16.30%

			.
'l'ahle.	41(1)	emogranhic	Variahle)
Labic	TOTO	cmogi apme	variable)

Source: Primary DATA

ANALYSIS :-

- ✓ It seems from above details regarding Demographic profile of the Respondents that 68 (73.91%) of the total respondents are male, 38 (41.30%) of the total respondents are in between the age group of 36 to 45 years, 69 (75%) of the total respondents are married, 41 (44.57%) of the total respondents are having educational level up to UG(Under-Graduation), 43 (46.74%) of the total respondents are employed in private sector and 39 (42.39%) of the total respondents are having monthly income in the range of 20,000 to 30,000.
- ✓ Only 24 (26.09%) of the total respondents female, Only 04 (4.35%) of the total respondents are above the age of 55 years, Only 23 (25%) out of total respondents are unmarried, Only 05 (5.43%) of the total respondents are having the qualification above PG(Post-Graduation), Only 08 (8.70%) of the total respondents are having occupation other than the mentioned in questionnaire and Only 06 (6.52%) of the total respondents are having monthly income less than Rs.10,000/-.
- ✓ It seems from above analysis that the 92 respondents who were participated in the survey are from mixed nature of demographic background and through which those respondents are being covered in the survey who are from working class needs frequent access of banking services and understand the importance of Green banking practices in current scenario.

123

International Journal of Advance and Innovative Research Volume 8, Issue 2 (III) April - June 2021



Table-4.2 Level of satisfaction of the respondents towards Green Banking services of the bank under study

HS-	Highly	satisfied;	S-Satisfied;	N-Neutral,	D -Dissatisfied	and HD-	Highly	Dissatisfied
-----	--------	------------	--------------	------------	------------------------	---------	--------	--------------

Green Banking services	HS	%	S	%	Ν	%	D	%	HD	%
Smart Cards	38	41.30	29	31.52	12	13.04	9	9.78	4	4.35
Net Banking	32	34.78	25	27.17	10	10.87	17	18.48	8	8.70
Mobile Banking	41	44.57	27	29.35	5	5.43	12	13.04	7	7.61
SMS Alert	59	64.13	23	25.00	4	4.35	5	5.43	1	1.09
E-Statements	43	46.74	32	34.78	7	7.61	6	6.52	4	4.35
Digital Loan Application	31	33.70	22	23.91	12	13.04	9	9.78	18	19.57
SME's Loan on Green Udyog	32	34.78	28	30.43	6	6.52	13	14.13	13	14.13
Any Branch Banking(ABB)	61	66.30	24	26.09	2	2.17	3	3.26	2	2.17
Online Insurance products Agent	8	8.70	12	13.04	29	31.52	19	20.65	24	26.09
Online Demat Account	6	6.52	11	11.96	39	42.39	15	16.30	21	22.83
Green CD's	38	41.30	29	31.52	6	6.52	12	13.04	7	7.61
Online Bill Payment	18	19.57	11	11.96	48	52.17	11	11.96	4	4.35
Green Mortgage for Energy Efficiency Houses	8	8.70	7	7.61	51	55.43	21	22.83	5	5.43

(Primary DATA)

ANALYSIS:-

✓ From the above analysis, it is interpreted that out of the total 92 respondents in survey, 18 (19.57%), 13 (14.13%), 24 (26.09%), 21 (22.83%) respondents are highly dissatisfied with certain green banking products offered by the bank under study such as Digital Loan Application, SME's Loan on Green udyog, Online insurance product agency & Online Demat Account. The reason could be the demographic background of the respondents being selected for study.

ISSN 2394 - 7780

Volume 8, Issue 2 (III) April - June 2021

- ✓ Out of the total 92 respondents involved, majority are highly satisfied with certain green banking products and services offered by the said cooperative bank under study. These products or services are Smart Cards, Net Banking, Mobile Banking, Green CD's, Any Branch Banking, SMS Alert services and E- statements...
- ✓ Through a bird view study it seems that on an average 60 to 70 % respondent customers are found satisfied with the green banking services offered by the said bank.



(Source: Primary DATA- based on Number of Respondents)

SUGGESTIONS & CONCLUSIONS:-

- 1. The bank is recommended to advance offer more loan options in digital mode and all the procedures with relate to loan application to loan disbursal should be online.
- 2. As far as possible the said bank need to open new ATM centers in the areas under coverage depending on the demand and supply of money to put in ATM center.
- 3. The banker may open a separate customer care centers to educate the customers for green banking products and services offered by the bank.
- 4. Thus, it can be concluded that the overall approach of a major segment of the Customers towards Green banking practices followed by the said bank seems positive and satisfactory and it should be continued to be followed by the bank under study.

REFERENCES

- 1. Kajal chandhary and monika Sharma, "performance of India public sector banks and private sectors bank: A Comparative study", International Journal of Innovation, management and Technology, Vol. 2, No.3, June, 2011.
- 2. Nandhini P.V. 2016 "Customer satisfaction towards online banking in Coimbatore District" International Journal of multidisciplinary Research and moderneducation, Vol-II, issue-1 2016. P.No 62-68.
- 3. Naveen, K. & Gangal, U.K. (2011), "customer satisfaction in new generation banks: A case study of HDFC bank, "International Referred Research Journal, Vol.11 (4) pp. 177-186.
- 4. Surabhi singh and Renu Arora, "A comparative study of banking services and customer satisfaction in public, private and foreign banks, Journal ofeconomics, (2011) 2(1): 45-56.
- 5. Customer satisfaction and the internal market: marketing our customers to our employees," Journal of marketing practice: Applied marketing science, Vol. I,Iss.22-44.

SUSTAINABLE DEVELOPMENT THROUGH THE MEDIUM OF CHILDREN'S LITERATURE

Denise D'Souza

Thakur College of Science and Commerce, Kandivali (E), Mumbai

ABSTRACT

Man's greed and complete disregard for the world around him has no limits. Icebergs diminishing in the Arctic or the indiscriminate felling of trees in the Amazon forest have not put the brakes on his unquenchable thirst for power and destruction.

Therefore, in today's age of Industrialization, creating methods of sustainable development is the need of the hour gone by. Man needs to harmonize with Nature so that the song they sing together can be heard by future generations. However, unless introduced at grass root levels, we would be staring at a barren landscape before long. Unless sensitized at an early age, we would be looking into a stark future.

Many psychologists who dealt with behavioral analysis and learning, like B.F Skinner, Lacan, Freud, Chomsky stated that these values through repetition must be ingrained at a young age especially since they are still flexible in understanding concepts. We can also look to John Locke who stated that children posses a 'Tabula Rasa', a blank slate which can be written upon through the sensory experiences and what they understand as the world around becomes their definition. With the understanding in child psychology, it must be also recognized that Children's Literature which encompasses stories, fables, myths, fairy tales, books and movies that are created for children or young adults leaving its undeniable stamp on young minds. This in turn creates the world that they are exposed to, and hence if we need to sensitize the future generations to the various plagues of environmental issues, it would be through the children's literature.

Hypothesis Statement: To study movies through children's literature as a means to have a sustainable tomorrow. Through the analysis of Disney's Moana amongst other movies and how this can in turn could potentially translate into the Indian scenario.

Research Methodology: Qualitative research

Keywords: Children's Literature, Ecofeminism, Popular Culture

INTRODUCTION

The planet belongs to all species. Yet environmental degradation, plundering of our natural resources, extinction of certain species and population explosion are destroying this earth. Major deforestation is taking place because of large scale migration to urban areas. What life form exists today may become a mere reference point or just a picture in a book if we do not take immediate action.

RATIONALE: However dark and gloomy the scenario seems to be, there is a flicker of hope. Strategies to develop the practices for environment protection are visible from the various school activities and field trips a child goes on. Many Nature clubs have mushroomed around the country encouraging children and adults to live off the land without destroying its natural habitat. Many companies like Johnson and Johnson, through their corporate social responsibility (CSR) are working towards reducing their carbon foot print. Ikea plants a tree for every tree they take down. At the government level, the Swachh Bharat Abhiyan was the most noteworthy stance taken on the issue, along with several NGO's that worked towards cleaning the beaches, rivers and many other issues. From an international standpoint, the United Nations Framework Convention on Climate Change (1992) is an international environmental treaty overseeing actions to combat climate change through control of emission of Green House Gases (GHGs) that cause global warming. At various levels, initiatives have been taken to endure a safer, sustainable and ecologically viable future. The implementation of these strategies has created a much-needed difference; however, it is common knowledge that more is needed to be done.

OBJECTIVE: To create any change, we must take actions at the grass root levels. Rather than being an afterthought, ingraining these changes as a part of society, would create an impact with long term effects. The best way to do this to bind the concept of environment with culture, because culture is what we are surrounded by. To introduce children to these concepts through culture would have endless possibilities. A great example of this is the Japanese students who clean their school every day for about 15 minutes. It is a great way to instil good values in kids. It teaches them from a young age that public space is a shared space, and everyone is responsible for maintaining it. This is one reason why Japan, as a whole, is so clean. Therefore, we must acknowledge that the power of value, traditions and ideology is what frames us. Our grandparents would tell us mythological stories, folk tales, lullabies, etc. It transported us to a world where we felt safe and secure. The

Volume 8, Issue 2 (III) April - June 2021

tales are recognized as our first encounter with children's literature. This genre of study looks at material written and produced or passed down through an oral tradition, for the information or entertainment of children and young adults. It creates the notions of right and wrong, good over evil, as many have demonstrated. It includes all non-fiction, literary and artistic genres. In the early days of the building of this cannon, children's books arrived in an unsystematic fashion. It was in 1744 when John Newbery published 'A Little Pretty Pocket-Book'. The volume was recognized as the first true book intended for children's pleasure reading. Today, he is also known as the father of Children's Literature. The value of this genre is immense in its methods of the transformative power it possesses. As Martha Crippen stated, it helps to improve cognitive development in allowing students to respond to these stories. Creating an opinion about issues, furthermore building personality through the relationship with heritage and culture and with that, an understanding of society as well as developing emotional intelligence is where the moral decisions of life can be explored.

The scope of this genre allows us access to the impact it makes on children through the trope of the fairy tales. Grimm brothers, Hans Christian Andersen, Charles Perrault, Aesop's fables are heralded for their contribution to this field. Essentially, a fairy tale is a children's story about magical and imaginary beings and takes on moral codes of conduct to be embedded within them. Characterised by "A long time ago, in a land far far away They lived happily ever after" it embodies the notions of human behaviour and values, social hierarchy, power, gender roles, freedom, responsibility, and justice. Cinderella, Snow White, Sleeping Beauty, Red Riding Hood are even till today seen as the most popular fairy tales having lived on through Disney's constant remaking of them.

DATA ANALYSIS AND INTERPRETATION: There is a thread that connects these tales and that is the integration of women with nature. This can be attained by looking at the study of ecofeminism. Ecofeminism aims to avoid any discrimination of the genders while emphasizing that the earth and all life forms need to be preserved. Ecofeminists call attention to the way that women are seen as connected to nature, while men are conceptually linked to culture, and how these connections have been used to justify both the abuse of the environment and the oppression of women. This would be symbolized by creating 'man-made' structures over the fertile, abundant land. This construct of the gender viewed through ecofeminism is clearly visible in fairy tales. The genteel, docile, beautiful, caring and respectable woman juxtaposed to the masculine, hard-working, handsome, rich and bachelor male is not just cliché. Reimagining these tropes, we can note that Cinderella and Snow White exhibit their own agency thus indicating the need for courage and willingness to act instead of waiting for things to happen. They are the epitome of kindness to other living creatures. Cinderella's godmother transforms the lowly pumpkin into a carriage and mice and lizards as footmen to help her to meet the prince. While Cinderella even grows a tree that she planted in honour of her mother through her tears, again symbolizing this link to nature. Snow White has an eve like element – a poisoned apple that puts her into a deep sleep. The similar trope is visualized in Sleeping Beauty, who also after having her finger pricked by a spindle falls into a deep sleep.

To further this, we must see how today's children's literature has embarked on a journey to value nature. Bambi, Tarzan, the Jungle Book, 101 Dalmatians, Wall-E, Avatar, Over the Hedge, Ice Age and Happy Feet to name a few, are easily recognized as having won over the hearts of many kids.

For the purpose of this paper, I will focus on the movie Moana. A film based on Polynesian mythology, takes us on a journey with a young girl, who while in search of her identity is able to lift the curse that had befallen her people which in turn makes her island green and fruitful once again. Moana also created interest in Polynesian tattoos, culture, lifestyle etc. Moana is the perfect example of ecofeminism as well. It is her, not the Demi-God Maui who restores balance. 'Te Fiti' is the goddess of the earth and life, again bringing back the themes of women as the life giver and symbol of fertility and abundance. Moana, whose name means "the Ocean" must sail through turbulent waters, symbolic of her journey of finding herself and who she is; in other words, her identity. Through this journey she learns her heritage. Her access to the world is through her grandmother who tells her about her ancestors and where they came from. And it is with that knowledge, she returns the heart and saves the earth from destruction. We could even go one step further in analysing Maui as a figure of both good and evil. He uses his magic fish hook which could be seen as a phallic symbol to remove the heart. Although his intentions were true at heart, to allow humans to have the power of creation itself, it led to an imbalance. And his identity is that of a "Demi- God, a Shapeshifter, a Trickster" and this creates an imbalance in his identity itself. The agency that Moana uses to venture out into the unknown is the same that she uses to embark on a journey to tide over what has plagued the earth. We could also see that Moana's father is the patriarch of the family and more importantly who tries to integrate her into the construct of a political framework that is a predominant male establishment. She initially rejects this to harmonise the lands from the devastation beginning to appear with the heart of the land missing. It is here that agency allows her to access the skills of astronomy, sailing, fighting, and most importantly, wayfinding. She even personifies Moses who parts the Red Sea to allow the Israelites to pass through, as when the ocean parts itself to allow Ta-Ka to approach her. Te-Fiti becomes Ta-Ka the lava monster or 'made of fire from earth' transforming her into the antagonist of the movie until Moana realises that just like herself, Te-Fiti needs to be 'who you truly are'. With the identity and balance restored, the land is replenished and alive again.

There are few others movies that are worth mentioning. Bambi is a heart-warming story of the life of a deer and her kindness to other animals. It warns us though not to kill animals just for sport and that we need to co-exist. Wall – E tells us we are on a one-way street to destruction if we do not minimize our garbage pile up. Avatar demonstrate how one person's greed could have almost destroyed another planet.

Free Willy is an endearing movie of a friendship between a young boy with a killer whale who has been separated from his family. This friendship is what frees the whale from the greedy clutches of the marina owner who wants to kill it. Ice Age is a two-pronged story depicting the tussle between man and mammoth and the problems of climate change. These movies have captured the hearts of the little minds. The impact of Avatar was felt deeply and that can easily be identified by the number of times it runs on television.

It is Disney movies like Moana that have allocated the importance of nature, culture and identity within it. Being globally available, it has created a plethora of demand for merchandise, birthday cakes, research into the Polynesian islands, etc. This symbolizes its mark in popular culture.

Popular culture is the set of practices, beliefs, and objects that embody the most broadly shared meanings of a social system. It includes media objects, entertainment and leisure, fashion and trends, and linguistic conventions, among other things.

By Disney creating a trend through popular culture which created a global phenomenon so also we must look at setting up a more relatable and regional outlook. Till today we can see that even though Bollywood has tried to address this issue, they still fall painfully short. It is generally seen in the 'short film' category like "Save Me" which is a heart-warming story of children who come together to save a tree. There hasn't been a movie of a mass scale that has created an impact to make the idea of sustainable development as something that is of pertinence. Kadvi Hava and Jal have come close to it however it didn't create a lasting impact. We could look towards Biswajeet Bora's 2015 Hindi feature film Aisa Yeh Jahaan, which in a way showcased the alienation of urban denizens from nature and demonstrated that even the film industry can take action to tackle climate change by being India's first carbon neutral film.

Each of these have nature, animals, environment, the element of imbalance and a restoration of good as the theme. Although there is a bank of movies, this theme needs to be popularized. We need to make sustainable development similar to what the West has done with yoga, or with lifestyle changes such as going vegan. These gained massive popularity and by being main stream were incorporated into life.

LIMITATIONS: While creating a platform for children to internalize sustainable development techniques the space around them, must have the potential for this change. It is mesmerising, to have the ability to undo the damage that has taken place, at the same time we need to remember that it would take years to see the impacts of it. And in this world of instant gratification, our children should have the necessary tools with them.

SUGGESTION

With the understanding of the urgency to create art that can be accessed by children allowing them to develop a sense of responsibility can be done especially through the medium of movies. And this isn't just the responsibility of directors or producers, but an overarching need that should be there so that even the content creators can see the viability in making these films without worrying about how many box office hits it needs to get. Who knows we may have 'environment man' who saves the citizens from looking at smog filled gloomy, dark skies instead of beautiful, peaceful surroundings.

CONCLUSION

To conclude, sustainable development is possible only if every individual makes a conscious effort to reduce pollution, waste, protect our natural resources and reduce global warming. Otherwise, it will remain a pipe dream.

REFERENCES

 May, Jill P. "Children's literature and cultural theory: reading and writing for understanding". Oxford University Press. 1995

Volume 8, Issue 2 (III) April - June 2021

- Abrams, M.H. "A Glossary of Literary Terms". Cengage Learning India Private Limited. 11th Edition. 2015
- Storey, John. "Cultural Theory and Popular Culture: An Introduction". Routledge. 2018
- Warren, K J. "Ecofeminism-Women, Culture, Nature". John Wiley & Sons. 1997.
- Chandramouli, Kartik. "Can India's film industry call lights, camera, and climate action?" One Earth. 2019

IMPACT OF MEDIA ON THE LEGISLATION OF ENVIRONMENT RELATED LAWS

Ruchi Pandey¹ and Ms. Rama Ray²

Student¹ and Guide², Thakur College of Science and Commerce, Kandivali (E), Mumbai

ABSTRACT

Experts underlined the need for effective Environmental Impact Assessment (EIA) to mitigate

Environmental damages and losses to national kitty. Media's influence on current generation and on the future generations are far-ranging. Broadcast media emerged during the 20th century. Radio briefs and television reports entered the conversation, bringing political stories to general public in no time. Influence of Media is being heavily discussed in debates and discussion on how it determines the legislative initiatives. This Research studies and analyzes the role of media coverage in the process of law or policy making. In addition to acting as a watchdog, media claims to be the voice of general public where the citizens get a platform to remark on the political decisions. The media has the potential to directly or indirectly influence legislator's policy decisions, including setting the political agenda for discussion, the introduction of amendments, and the decision to support or reject an amendment during the legislative process. Given the media's role in surveillance as well as participation in the legislative process, there can be an evidence that the media can directly or indirectly influence policymaker's decisions.

Keywords – Media, Influence, Potential, Lawmaking, Policies, Legislation, Watchdog, Environment, EIA [Environmental Impact Assessments]

INTRODUCTION

Critical to Environmental Impact Assessments (EIA) evolution has been the advent of more meaningful processes for participation. The use of the Internet as a tool of participation, as well as the scope and ambition of EIA, has been growing since their inception. Media's influence on current generation is far ranging. Media will be one of the important aspects in coming years. Considering its value and dynamic work in every field, Media is an emerging topic in discussions regarding its reliability and involvement in certain sectors including Law making and policy making. The motive behind selecting this topic is that the media has been playing an active role of a watchdog and bringing political stories to general public in a jiffy. The public is heavily relied on the media for updates on issues across the world. Media's interest and involvement in judiciary and laws raises a question if media alters the decisions made by policy and law makers.

RESEARCH METHODOLOGY

The method for research used is secondary mode of data collection. In secondary mode, data was collected from articles available on internet, publications, reports and books. The internet has articles and web reports to support this subject matter, hence secondary mode of data collection has proved to be very useful and informative. It provides data from various other countries who have previously collected data for the similar purpose.

RATIONALE

Studying and describing the relevance and reliability of Media and the important coverages carried by it for EIA. The viewers or the public receive the information in the way Media presents it through various mediums. It is important to understand that if Media is capable of being a part of Lawmaking procedures. By investigating the use of media in environmental impact assessment and planning processes of national linear infrastructure development, we explore how social media impinge on participatory practices and how the potential of social media is realized in the current use related to public participation processes.

BACKGROUND

What is EIA?

Environment Impact Assessment or EIA can be defined as the study to predict the effect of a proposed activity/project on the environment. A decision-making tool, EIA compares various alternatives for a project and seeks to identify the one which represents the best combination of economic and environmental costs and benefits.

EIA systematically examines both beneficial and adverse consequences of the project and ensures that these effects are taken into account during project design. It helps to identify possible environmental effects of the

proposed project, proposes measures to mitigate adverse effects and predicts whether there will be significant adverse environmental effects, even after the mitigation is implemented.

Evolution of EIA.

EIA is one of the successful policy innovations of the 20th Century for environmental conservation. Thirtyseven years ago, there was no EIA but today, it is a formal process in many countries and is currently practiced in more than 100 countries. EIA as a mandatory regulatory procedure originated in the early 1970s, with the implementation of the National Environment Policy Act (NEPA) 1969 in the US. A large part of the initial development took place in a few high-income countries, like Canada, Australia, and New Zealand (1973-74). However, there were some developing countries as well, which introduced EIA relatively early - Columbia (1974), Philippines (1978).

History of EIA in INDIA.

The Indian experience with Environmental Impact Assessment began over 20 years back. It started in 1976-77 when the Planning Commission asked the Department of Science and Technology to examine the river-valley projects from an environmental angle. This was subsequently extended to cover those projects, which required the approval of the Public Investment Board. Till 1994, environmental clearance from the Central Government was an administrative decision and lacked legislative support. On 27 January 1994, the Union Ministry of Environment and Forests (MEF), Government of India, under the Environmental (Protection) Act 1986, promulgated an EIA notification making Environmental Clearance (EC) mandatory for expansion or modernization of any activity or for setting up new projects listed in Schedule 1 of the notification. Since then, there have been 12 amendments made in the EIA notification of 1994.

The MoEF recently notified new EIA legislation in September 2006. The notification makes it mandatory for various projects such as mining, thermal power plants, river valley, infrastructure (road, highway, ports, harbours and airports) and industries including very small electroplating or foundry units to get environment clearance. However, unlike the EIA Notification of 1994, the new legislation has put the onus of clearing projects on the state government depending on the size/capacity of the project. Certain activities permissible under the Coastal Regulation Zone Act, 1991 also require similar clearance. Additionally, donor agencies operating in India like the World Bank and the ADB have a different set of requirements for giving environmental clearance to projects that are funded by them.

The Process of EIA.

The stages of an EIA process will depend upon the requirements of the country or donor. However, most EIA processes have a common structure and the application of the main stages is a basic standard of good practice. The environment impact assessment consists of eight steps with each step equally important in determining the overall performance of the project. Typically, the EIA process begins with screening to ensure time and resources are directed at the proposals that matter environmentally and ends with some form of follow up on the implementation of the decisions and actions taken as a result of an EIA report.

The eight steps of the EIA process are presented in brief below:

- Screening: First stage of EIA, which determines whether the proposed project, requires an EIA and if it does, then the level of assessment required.
- Scoping: This stage identifies the key issues and impacts that should be further investigated. This stage also defines the boundary and time limit of the study.
- Impact analysis: This stage of EIA identifies and predicts the likely environmental and social impact of the proposed project and evaluates the significance.
- Mitigation: This step in EIA recommends the actions to reduce and avoid the potential adverse environmental consequences of development activities.
- Reporting: This stage presents the result of EIA in a form of a report to the decision-making body and other interested parties.
- Review of EIA: It examines the adequacy and effectiveness of the EIA report and provides the information necessary for decision-making.
- Decision-making: It decides whether the project is rejected, approved or needs further change.

Volume 8, Issue 2 (III) April - June 2021

• Post monitoring: This stage comes into play once the project is commissioned. It checks to ensure that the impacts of the project do not exceed the legal standards and implementation of the mitigation measures are in the manner as described in the EIA report.



SALIENT FEATURES OF 2006 AMENDMENTS TO EIA.

Environment Impact Assessment Notification of 2006 has decentralized the environmental clearance projects by categorizing the developmental projects in two categories, i.e., Category A (national level appraisal) and Category B (state level appraisal).

Category a projects are appraised at national level by Impact Assessment Agency (IAA) and the Expert Appraisal Committee (EAC) and Category B projects are apprised at state level.

State Level Environment Impact Assessment Authority (SEIAA) and State Level Expert Appraisal Committee (SEAC) are constituted to provide clearance to Category B process.

After 2006 Amendment the EIA cycle comprises of four stages:

- Screening
- Scoping
- Public hearing
- Appraisal
- Category A projects require mandatory environmental clearance and thus they do not undergo the screening process.
- Category B projects undergoes screening process and they are classified into two types.
- Category B1 projects (Mandatorily requires EIA).
- Category B2 projects (Do not require EIA).

Thus, Category A projects and Category B, projects undergo the complete EIA process whereas Category B2 projects are excluded from complete EIA process.

DATA ANALYSIS & INTERPRETATION

One of the major amendments made to EIA Notification in 1997 was to introduce public consultation procedure. It outlines the process of conducting public hearing, from submission of report to SPCB to the specification for public hearing notice, composition of the hearing panel and time period for the completion of

Volume 8, Issue 2 (III) April - June 2021

public hearing process (MoEF, 1997). Public participation in the form of public hearings is mandatory only during the EIA review process in India.

Further in comparison to well developed nations EIA system viz. USA, Netherlands, Australia, public participation is obligatory during screening and Scoping (Wood, 2003).

Social Media is a platform used by the participants to share and receive information. Social media has gained prominence about public participation and their input in regards to EIA.

The implementation of EIA in the internet and media age has established innovation and public participation on a higher end. The innovative use of virtual cloud environments for collaboration and the establishment of one of the first websites for starting, signing and submitting public petitions with a focus on the local environment. Suggestions are made regarding how to better connect the rise in e-participation and conventional EIA public participation.



Economical Environmental Social Political Managerial Factors causing regional variation in EIA follow-up in India (based on perceptions of interviewees).



Regional variation in implementation of follow-up (adapted from Morrison-Saunders et al., 2003).

CONCLUSION

The survey has deliberately studied the thoughts that people have about media and its involvement in law making procedures. Media as well as social media claims to give a platform to the general public for debates and discussions. Media asserts that it is the voice of the citizens which proves to be true at some points, in certain subject matters. Despite all the claims and directives, there is proof that media has exaggerated certain issues cases beyond extremities, and this has caused outrage and violation of laws. Media has an extensive reach

Volume 8, Issue 2 (III) April - June 2021

and if the media chooses to be unbiased regarding the lawful decisions, it can prove to be a powerful ally. However these conditions are executable. The reality is different from what we can expect.

According to the survey, majority of the respondents think that Media can certainly be involved in the process of law making since the officials in parliament attempt to generate media coverage. Exchange, the media should regulate and change the strategies and dynamics of working. Media strategies can be a part of legislative working. Although the law makers will have to be convinced for media participation. This can prove to be a major change in the procedure of law making and policy making.



Youngsters in Kerala lead drive against draft notification Three consecutive years of climate calamities in the State seems to have created an awareness among the youth regarding environmental issues, going by the number of youngsters who became part of a social media campaign calling for the rejection of the draft Environment Impact Assessment (EIA) Notification 2020, which they alleged waters down the existing EIA notification of 2006.

After a delayed publication of the draft in the gazette by the Centre, the Delhi High Court had extended the deadline further to August 11 to register public opinion on the draft. With the deadline approaching, Malayalam social media has witnessed a sustained campaign from meme page creators, video bloggers and instagram influencers, all of whom veered away from their usual light-hearted content to speak about weighty environmental issues.

An Article from The Hindu, which emphasized on social media participation in context of EIA implementation.

REFERENCES

- Media and lawmaking: exploring the media's role in legislative processes by Melenhorst, L.D. https://openaccess.leidenuniv.nl/handle/1887/46974
- The use of media to impact on legislation S P Shelov. Pediatr Ann. 1995 Aug. https://pubmed.ncbi.nlm.nih.gov/7478773/
- https://www.academia.edu/37809776/Q_Examine_the_role_of_media_in_influencing_legislatio n
- https://www.tandfonline.com/doi/full/10.1080/14615517.2016.1251697#.YD3mhVplFKk.link
- https://www.cseindia.org/understanding-eia-383
- https://www.sciencedirect.com/science/article/pii/S0195925512000078# An assessment of EIA system in
- India Jitendra K.Panigrahia & Susruta Amirapu
- https://www.tandfonline.com/doi/full/10.1080/14615517.2016.1251697?scroll=top&needAccess =true Environmental assessments in the Internet age: the role of e-governance and social media in creating platforms for meaningful participation - A. John Sinclair, Timothy J. Pierson-Smith & Morrissa Boerchers
- https://www.thehindu.com/news/national/kerala/social-media-abuzz-with-campaignagainsteia/article32317780.ece
- Environmental impact assessment follow-up in India: Exploring regional variation Scientific Figure on Research Gate. Available from: https://www.researchgate.net/figure/Factors-causingregional-variation-in-EIA-follow-up-in-India-based-on-perceptions-of_fig3_227652699 [accessed 6 Mar, 2021]

ANALYSIS OF MUMBAI METRO RAIL PROJECT: STUDY OF ENVIRONMENTAL & SOCIAL ASPECTS

Kajol N. Vajani

Thakur College of Science and Commerce, Kandivali (E), Mumbai

ABSTRACT

High population growth rate of Mumbai coupled with high economic growth has resulted in an ever increasing demand for transport creating excessive pressure on the city's existing transport system comprising mainly of suburban trains, and road transport mainly consists BEST buses and private cars. Transportation being the most vital element that effect normal life in Mumbai, any deficiency, in the infrastructure related to Transportation, seriously affects the productivity and economic growth of the city. The presently available network of Suburban Railways and the Road Transport System been stretched to the crisis levels. The increasing population requires faster transportation to avoid delay in work and decongestions in the region. Thus, upgrading transport system is imperative for rapid growth and economic development in Mumbai Metropolitan Region (MMR). The expansion of road network in Mumbai is not possible as it requires large land acquisition leading to huge displacement of the people. In order to improve the overall traffic and transportation in Mumbai Metropolitan Region (MMR) and meet the future travel demand, the Government of Maharashtra through MMRDA has identified metro mode of transport as efficient, economically viable and environmentally friendly mass transport system.

The objective of the study is to understand the environmental impacts of proposed activity of Mumbai Metro Rail Projects - Mumbai Metro Line 3(MML-3) project specially on Aarey Forest area, understand its social aspects, understand Cost-Benefit Analysis and take timely and effective measures for mitigation of negative impacts, suggest suitable solutions.

Keywords : Mumbai Metro Rail Projects, Environmental Impact, Social Aspect, Aarey, Sustainable Infrastructure

INTRODUCTION

Mumbai is the economic /commercial capital of India, which is identified by higher growth in economy as well as population. The Island City has experienced rapid growth in economic activity and its suburbs are growing faster than the Island City in terms of population distribution and activity location. The major challenge is in promoting growth by adequate inputs into infrastructure, which would improve quality of life of the residents. MMRDA (Mumbai Metropolitan Region Development Authority) is a nodal agency for promoting planned development in this region, which makes it automatically the nodal agency for studying and implementing transport related projects within Mumbai Metropolitan Region.

Mumbai Metropolitan Region (MMR) is one of the fastest growing metropolitan regions in India. It covers an area of 4355 sq.km. From a long-term perspective, it is evident that it will eventually reap multiple benefits by encouraging public transport and thereby saving valuable resources. A master plan for Mumbai metro was prepared in 2004 which proposed implementation of metro corridors in three phases i.e. Phase I: 2005-2011, Phase II: 2011-2016 and Phase III: 2016-2021. MMRDA has carried out DPR studies of all three corridors of Phase-I during 2005-2009 and DPRs of four lines of Phase-II & III in 2010. MML-3 is a 33.5 KMs long underground corridor running along Colaba-Bandra-SEEPZ. Length of the corridor is marked with 27 key stations out of which 26 will be underground and 1 at grade.

SCOPE OF RESEARCH

The scope of this research includes the study of Environmental & Social impacts resulting from preconstruction, during construction and operation phases of Mumbai Metro Line 3(MML-3) project specially on Aarey Forest Area located in Goregaon, Suburban area of Mumbai. Further, studies can be conducted for other metro projects (ongoing or completed) in other area and also with purpose of studying different aspect of those projects.

OBJECTIVES

- To analyse Mumbai Metro Rail Project
- To study Environmental & Social aspects of Mumbai Metro Rail Project
- To identify negative impact of Metro Rail Construction on Environment

Volume 8, Issue 2 (III) April - June 2021

- ✓ With Special study of impact on Aarey Forest of the construction of Mumbai Metro Line 3(MML-3) project
- * To analyse Social Cost Benefit analysis & Sustainable Infrastructure Development approaches

REVIEW OF LITERATURE

A number of transportation studies were carried out in the past for Mumbai Metropolitan Region (MMR). These studies discussed travel pattern, network characteristics, and the degree of traffic saturation on the existing roads in the Study Area. The following major studies, which recommended transportation improvements in MMR, have been reviewed.

Mass Transport Study (1969): The objective of this Study was to determine the existing conditions of available mass transportation services, future desire lines and to evolve a comprehensive, long term mass transportation plan for Greater Mumbai.

Mumbai Metro Study, by Mumbai Metro Planning Group: The Study examined the feasibility of constructing and maintaining the 7th rail corridor as a heavy metro.

Sky Bus Metro Study by MMRDA: The Konkan Railway Corporation presented to GOM(Government of Maharashtra) a proposal for development of a new transport system called sky bus metro system. It envisages a system, which will be elevated and supported to central columns. The conclusion of this Study was that since this system has not been implemented anywhere in the world, it needs to be further examined on a 2 km pilot section.

RESEARCH GAP

The Mumbai Metro Rail Project corridor have direct as well as indirect benefits.

The completed, ongoing & proposed projects is considered Energy efficient with Higher carrying capacity which is more reliable, comfortable and safer than road based system. It shall contribute to reduction in road traffic and road stress, fuel consumption, air pollution, less travel time, vehicle operating cost, accidents and road maintenance. The metro projects shall increase mobility and accessibility to facilitate, increase in economic stimulation in the region, increase in business opportunities, improve aesthetics and image of the city. Overall, the proposed project shall change the transportation face of MMR.

Where as on the other hand, there are many negative impacts found on environment & society specially during its construction phase such as Loss of trees/forest, Change of Land use, Utility/Drainage Problems, Risk Due to Earthquake, Air Pollution, Noise Pollution, Solid and Hazardous waste generation, Construction & Demolition waste generation, Loss of Residence, Loss of Business, etc.

It becomes a real question as to assess & identify whether this Metro Rail projects really serve an efficient & prominent infrastructure development in the city or the development at the cost of environment and other important aspects, being ignored on ground. In order to study & analyse this gap lying in facts & figures found from various sources, this study is conducted to understand the real impact of Mumbai Metro Rail Projects both environmental & social.

RESEARCH METHODOLOGY

The study is done after going through information gathered through secondary sources which are taken from Government authentic & original sources, government decisions & its impact on society, reaction & opinion of environment activists on such decisions & all updated reports providing data on progress of metro rail project, project funds, status of trees cut-transplanted-retained, etc.

*** RESEARCH AREA:**

Mumbai Metro Rail Project - Mumbai Metro Line 3(MML-3) project

*** DATA COLLECTION:**

- Secondary Data from Authentic Source
- Nature of study Analytical

DATA ANALYSIS

Construction of Metro Rail is not covered under EIA Notification,2006. Hence Environmental Clearance is not applicable for Metro Projects.

The length of Mumbai Metro Line 3(MML-3) project i.e. Colaba-Bandra-SEEPZ corridor is 33.5 km. It will facilitate the commuters to travel from South Mumbai to Airport via Mahim-BKC. It will also provide direct access to the economic hubs such as BKC, MIDC Industrial Estate, SEEPZ and famous landmarks such as Vidyanagari, Mahalakshmi etc.

A. PROJECT FUNDING

MML-3 is a 33.5 KMs long underground corridor running along Colaba-Bandra-SEEPZ. Length of the corridor is marked with 27 key stations out of which 26 will be underground and 1 at grade. Mumbai Metro Line 3(MML-3) project is estimated to cost INR 23,136 Crore. Japan International Co-operation Agency(JICA) will provide loan assistance worth Rs.13,235 Crore, which accounts for 57.2% of the total cost. Balance funding will be made available by Govt. of India, Govt. of Maharashtra/MMRDA in the form of equity and subordinate debt and the funds from MIAL(Mumbai International Airport Pvt. Ltd.)



Source : MMRCL

B. ENVIRONMENTAL IMPACT¹

	Mumbai Metro Rail Corporation Limited					
Pro	gress of the Permitted Tree Cut, Transplantation and New Plantation for Mumbai N (05 th January 2017 to as on 28 th Feb 2021)-2/2	Aetro Line 3 F	roject from			
Sr	Tree Plantation Location	Details	No of			
No			Trees			
			Planted			
1	Trees planted in SGNP Area	Total Trees	20,900			
2	Trees planted in other locations within MCGM areas such as Aarey Colony,	Total Trees	3120			
	SRA Plot Govandi, MMRDA Recreational Ground Govandi, Mumbai Police					
	Gymkhana, Marine Drive, Naval Dockyard Kanjurmarg, Military Camp					
	Vidyanagari, Marol FireBrigade Station, Casting Yard JVLR, Darga Plot SGNP					
	& National Security Guard Powai.					
	Total Trees Plantation	24,0	20			

Source : MMRCL

¹ Note : Environmental & Social impact of Mumbai Metro Rail Project is studied with special reference to Mumbai Metro Line 3(MML-3) project.

Volume 8, Issue 2 (III) April - June 2021

		Mum	bai Met	ro Rail (Corporation I	Limited				
Р	rogress of the Per	mitted Tree Cu	t, Trans	splantati	on and New I	Plantati	on for M	lumbai N	Aetro I	Line 3
		Project from (05 January 2017 to					2021)-1/2	2 Tm	oo Cutt	ing
Sr No	Civil Packages	MCGM Ward	No of existin g trees	ed Trees to be retaine d	Permitted trees for Transplanta tion	Trees Trans plante d	% Compl eted	Permitt ed trees for Cut	Trees Cut	% Comple ted
1	UGC 01	A (Zone I)	940	196	340	269	79%	404	354	88%
2	UGC 02	A, C & D (Zone I)	563	292	135	102	76%	136	92	68%
3	UGC 03	E (Zone I) & G South (Zone II)	1008	134	506	454	90%	368	321	87%
4	UGC 04	G South, G North (Zone II) & H East (Zone III)	502	229	104	99	95%	169	143	85%
5	UGC 05	G North (Zone II), H East (Zone III)	544	222	181	145	80%	141	124	88%
6	UGC 06	K East (Zone III)	386	37	342	241	70%	7	7	100%
7	UGC 07	K East (Zone III)	1123	377	458	296	65%	288	257	89%
8	Aarey Colony Area, Pylon Termination	K East (Zone III)	137	0	32	4	13%	105	101	96%
9	Receiving Substation (RSS), Dharavi	G North (Zone II)	32	0	22	14	64%	10	9	90%
10	K3-Rehab residential building, Kalbadevi	C (Zone I)	5	0	1	0	0%	4	2	50%
			5240	1487	2121	1624	77%	1632	1410	86%

Aarey milk colony located in suburban Goregaon ("**Aarey**'), a green belt with over 5,00,000 trees, a rarity in the concrete city. The construction of a metro car depot on the flood plains of the Mithi river at Aarey for expansion of metro services in the city received much wrath from environment activists, citizens and even courts for cutting down 2,600 trees overnight.

C. SOCIAL IMPACT

The objective of Social Impact Assessment is to prepare a complete inventory of structures, affected families and persons, to identify social impacts.

Volume 8, Issue 2 (III) April - June 2021

Project Residential PAPs Non-residential PAPs Total 1. MUTP-I 17,255 1.434 18,65 2. MUIP 17,255 1.434 18,65 3. Mithi River Protection 15,121 2,177 17,29 4. Metro-I, Monorail, Skywalks 294 71 365 5. MUTP-II 150 150 150	Sr.No.						
I. MUTP-I Total Total 2. MUIP 17,255 1,434 18,65 3. Mithi River Protection 15,121 2,177 17,29 4. Metro-I, Monorail, Skywalks 294 71 365 5. MUTP-II 150 150 160			Project	Residential Pape	Non		
2. MUIP 17,255 1,434 18,65 3. Mithi River Protection 15,121 2,177 17,29 4. Metro-I, Monorail, Skywalks 294 71 365 5. MUTP-II 150 1434 18,68		1,	MUTP-I	TAPS	PAPe		
Mithi River 15,121 1,434 18,68 3. Development and Protection 4,029 355 4,384 4. Metro-I, Monorail, Skywalks 294 71 365 5. MUTP-II 150 160 160	-	2.	MUIP	17,255		rotal	
3. Development and Protection 2,177 17,29 4. Metro-I, Monorail, Skywalks 294 355 4,384 5. MUTP-II 150 160 160 Total 36,849 150 150 150			Mithi River	15,121	1,434	18,68	
4. Metro-I, Monorail, Skywalks 294 71 365 5. MUTP-II 150	3	1	Development and		2,177	17,29	
4. Skywalks 294 71 365 5. MUTP-II 150 150 150 Total 36,849 150 150 150			Metro L M	4,029	355	,	
5. MUTP-II 294 71 385 Total 150 - 150	1	l	Skywalks			4,384	
Total 150 - 150	5.	1	MUTP-II	294	71		
36,849 - 150		7	tal 150			365	
				36,849	-	150	

- 75.89 ha of land has been acquired for the purpose of temporary and permanent usages. Total 2856 structures of residential, commercial, residential cum commercial and others were identified in the area to be affected by the project.
- Loss of residence
- Loss of business
- The magnitude of project impact on the structures, which is categorized as partially affected structures or fully affected structures. Total 2856 structures are fully affected and there is no partial affected structure.
- About 2736 families are affected due to the proposed metro rail project.
- The squatters and kiosks are on public land without any legal permission. Those have been duly relocated at the suitable place.
- The proposed metro project shall affect total 187 vulnerable families consisting 545 vulnerable people.
- The proposed metro project shall affect total 187 vulnerable families consisting 545 vulnerable people. Out of 187 vulnerable PAFs comprised 6.83% and vulnerable PAPs is 6.25%. Highest vulnerable people are living in Aarey Colony (Sariput Nagar) area.

. NO.	1 Martine Contraction of the Con	
1.	Co-operative Housing of	The second s
2.	Associations of our	Number
3.	Tenoment in CHSs registered	35
4	Cure	0
	CHSs whose office bearers trained	1010
5.	CHSs paid interest on Mainten	1040
6.	CHSs paid amount of Maintenance Deposit	181
	completion of 10 years	241
	MMPDA	46

INTERPRETATION

With urban areas growing exponentially, especially in emerging countries, sustainable infrastructure is showing its worth as a more efficient, productive and environmentally friendly option. The world will have to invest \$90 trillion in sustainable infrastructure by 2030, according to estimates by The New Climate Economy.

The Aarey forest imbroglio is a clear example of the failure to appreciate the need to balance the demands of economic development and environmental protection.

ISSN 2394 - 7780

Volume 8, Issue 2 (III) April - June 2021

However, based on data analysis it can be found that Mumbai Metro Rail Project - Mumbai Metro Line 3(MML-3) has both positive as well as negative impact on environment & social aspect.

CONCLUSIONS

- 1. Promoting Sustainable Infrastructure
- a. It include & ensure Economic, Social, Environmental & Institutional Sustainability
- b. Sustainable Urban development also encourages the decarbonisation of the economy and a gradual energy transition towards a model based on renewable sources
- 2. Social Cost Benefit Analysis
- a. The calculus of social cost and social benefit must be done. It should fully factor in the benefits, better public transport, in this case, with attendant reduction in private vehicle use and carbon emissions, and the costs, forgoing the ecosystem services the Aarey forest provides to Mumbai, and the cost of compensatory afforestation. If the net benefit is positive, the project should move ahead, not otherwise.
- 3. Adopt Energy Management Policy

REFERENCES

- https://www.mmrcl.com/
- https://mmrda.maharashtra.gov.in/
- https://www.indiatoday.in/india/story/mumbai-metro-mmrda-construction-environment-trees-wildlifegreen-1542502-2019-06-04
- https://www.globenewswire.com/news-release/2020/05/13/2032465/0/en/Worldwide-Metro-Rail-Projects-Report-Database-2020-2035-Analysis-of-Opportunities-in-Terms-of-Geographic-Region-Development-Stage-and-Type-of-Project.html
- https://mmrda.maharashtra.gov.in/documents/10180/945537/Metro+R%26R+Allotment+List/d643f663d6f2-40c4-ba44-b2a3e9afd656
- https://www.reliancemumbaimetro.com/web/reliance-mumbai-metro/index
- https://www.mmrcl.com/en/project/project-route
- Feb 2021 Tree Progress Report, MMRCL
- ✤ July 2019 Tree Progress Report, MMRCL & News paper article

Volume 8, Issue 2 (III) April - June 2021

PREDICTING BUSINESS TRENDS USING ARTIFICIAL INTELLIGENCE

Ashish Trivedi

Thakur College of Science & Commerce, Kandivali (E), Mumbai

ABSTRACT

An artificial neural network denotes a network of biological neurons connected through axons and signals are transmitted through a unit called synapses. Similar to natural intelligence, we learn things through our sensory organs whereby synapses are generated and passed from one neuron to other in the layered hierarchy. This process helps us in remembering and memorizing things. Using the concept of activation function, opportunities are explored using multidimensional big dataset. The activation function is used in artificial neural network to build an intelligent model using classification techniques. The neuronal behavior is related with the activation function. For this we shall be considering three important attributes of any neuron viz. weight, bias and activation function. The paper shall be suggesting which activation shall be better for the underlying neural network for predicting business trends. Initially multiple neurons are arranged in hierarchy of layers, the foremost layer serves as an input layer while the last layer represents an output layer, and in between different layers are termed as hidden layers through which we shall be finding deviation from the expected output and refining through a process known as backward propagation so as to minimize the error.

Keywords: Neurons, Activation function, Linear and non-linear transformation, layering architecture, Weight, Bias, Sigmoidal, ReLU function, training set, classification.

The neurons perform a linear transformation on input using weights and biases while the non-linear transformation is achieved through an activation function. If the generated model produces an output, deviated significantly from the expected output then the weights and biases of the neurons are adjusted accordingly so as to minimize the errors which is the basis for our model prediction. Prediction is a function of neuronal activation which in turn is dependent on activation function. This activation function acts on input fed to the neuron, multiplied to the corresponding weight and then the bias is added to the resultant. The output so obtained is subsequently fed to the next neuronal layer. The output of chosen activation function represents a polynomial of degree one) like classification, prediction, speech recognition, language translators. Next the weights and biases are adjusted using gradient which is obtained by differentiating the non-linear function which essentially helps in reducing the errors gradually. This concept is used in exploring business opportunities and learning from the existing big dataset. Thus any process or model can be represented as a function which can be approximated using neural network. Consider an activation function g(x) providing a non-linear mapping from input to output in a multidimensional big dataset. Next we find d/dx (g(x))for finding gradient of deviation relative to weights and then optimize weights using gradient descend.

We shall implement two activation functions for a given data set which is used for classification :

A sigmoidal function is of the form $g(x)=1 \setminus (1+exp(-x))$ and has value between 0 and 1 forming aS-shaped



The behavior of sigmoidal function is not centered around zero and so optimization becomes difficult because gradient updates are dispersed between 0 and 1 and as such convergence is slow

While in case of rectified linear units(ReLU), the convergence factor is smaller because it follows the function f(x) = max(0,x) i.e if x < 0, f(x) = 0 and if x >= 0, f(x) = x and because it overcomes the vanishing gradient problem, the ReLU based model is preferred.

International Journal of Advance and Innovative Research Volume 8, Issue 2 (III) April - June 2021

The following data is obtained using Anaconda Navigator for the sigmoidal and ReLU function when training set data is subjected to classification.



Conclusion: Sigmoidal function is not preferred because of lower accuracy and problems in training due to vanishing gradient issue while ReLU function applies to hidden layers provides better accuracy provided the dead neurons do not occur.

REFERENCES:

- 1. Pascanu, Razvan; Mikolov, Tomas; Bengio, Yoshua (2012-11-21).,"On the difficulty of training Recurrent Neural Networks"..
- 2. Knight K., Rich E. (2017), Artificial Intelligence, , 3rd Edition, 2017

SOCIAL MEDIA NETWORKING CRIME: ANALYSIS OF LEGAL FRAMEWORK AND CHALLENGES TO LAW ENFORCEMENT AGENCIES IN INDIA

Gopal Ramnarayan Mantri

Research Scholar, Mithibai College of Arts, Chauhan Institutes of Science & Amrutben Jivanlal College of Commerce and Economics, Mumbai

"Social media can be a useful and fun way to interact with others and to share content, but use it carefully. Remember that there is nothing totally private on the internet and once online it is hard to control." — Amanda-Jane Turner,

ABSTRACT:-

This research paper deals with crime which are happening on social media networking sites and apps are generally sexual assault, breach of privacy, criminal coercion, and defamation are all violations that are dealt with under the penal provisions that deal with traditional charges such as sexual harassment, invasion of privacy, criminal intimidation, terrorism and defamation, They tend to be woefully unable to cope with these technologically motivated offences, which have a much more serious and violent effect on the victim than typical crimes. The sole cause for this inefficiency is lawmakers' inability to ensure healthy interactive social networks for their female constituents. The helplessness of female users of social media outlets, which results in their departure or coerced silence on social media as a consequence of personal violence, victimization, and stigmatization, does not bring much merit to the country's criminal justice system, but rather exacerbates its shortcomings and pitfalls. In recent times social media networking sites are also used for global terrorist activities.

Keywords:- Crime on social media Networking sites and apps, Legal provisions related to social media crime

INTRODUCTION:

For more than a decade, social networking sites have dominated the mainstream. These websites have ushered in a new age in cyberspace culture, affecting netizens both individually and professionally. Terrorism, financial crime, and victimizations of women and children are only a couple of the problems that law enforcement officials are worried with because of social media.¹ Today, they are more than just a way of staying in contact with old and new friends; they have grown into a collective platform for people to share their views and prepare for a social movement. Yahoo, LinkedIn, Instagram, Twitter, and WhatsApp, Telegram, Tinger, Ticktack are all popular social networking sites. Another issue that requires attention is the fact that law enforcement agencies and the police need to be duly trained about the viruses relating to E-commerce laws. While punishment by imprisonment and fine a large number cyber-crimes that have already emerged still have not been regulated by the E-commerce laws of India.²

The explosive growth and effect of these websites has attracted cyber criminals to commit cybercrimes in social media, posing a threat to personal privacy and national security. According to the National Investigative Agency's sources, social media is used in India for every sixth cybercrime. According to statistics from the National Crime Reports Bureau, cybercrime rose by about 70% annually between 2013 and 2015. (NCRB). According to a study by Symantec, a security solutions company, India was the second most targeted country for cybercrime via social media in 2014, after the United States. Today, cybercrime takes many forms, including breach of privacy, slander, misrepresentation of identity, obscenity, cyber terrorism, and so on.

Not long after, four people, including a minor child, abducted and sexually assaulted a 22-year-old Kurla man who enjoyed posting selfies on social media. They tracked him down to a popular restaurant in the city. Although criminals sometimes target people after befriending them online, this is undoubtedly the first time a person has been followed with a selfie, and by complete strangers.³ During the 2013 riots in Muzaffarnagar, Uttar Pradesh, the government alleged that anti-social forces used social media extensively to spread hate and

¹ Social media poses a serious challenge to law enforcement agencies Rajnath - BW Businessworld (accessed on 26 Feb, 2021 at 2:30 pm)

² Mehra Raman, Information Technology and Cyber Laws, Global India Publication Pvt Ltd, ISBN: 978-93-80228-65-5, Pg. No. 08

³ Four from Ghatkopar abduct, rape man they 'liked' on Instagram (indiatimes.com)

Volume 8, Issue 2 (III) April - June 2021

disinformation among groups.¹ Similarly, in 2012, a propaganda campaign through the Internet and social media allegedly triggered a mass migration of people from the Northeast from south India.²

IMPACT AND ENFORCEMENT CHALLENGES ON SOCIAL MEDIA

Initially the use of social networking was limited to corporates and business for connecting with peers, customers, clients, with Twitter handle, Facebook accounts or WhatsApp mentioned on business and visiting cards. Social Networking has now branched to include friends, family associated and classmates as well.³ The expression "cybercrime" is derived from the root "cyber," which is derived from the word "cybernetic," which is derived from the Greek word "kubernân," which means "to rule or control." The term "cyber" applies to all kinds of interactive operations, regardless of whether they use a particular network. Since no judge can assert authority over cyberspace, it has no boundaries. Cybercrime is defined as any criminal act involving a computer, computer device, or computer network. Furthermore, any offence committed on a computer is referred to as a cyber-crime. The Information Technology Act distinguishes between cyber infractions and cyber-crimes. The former is a breach of a statute or code of practice that may or may not result in the defendant being liable to pay a penalty while he or she is under civil litigation. A crime, on the other hand, is a prohibited act that is punishable by a fine and/or punishment if the perpetrator is found guilty.

Cyber-attacks can be divided into three groups. They begin by targeting electronic identities. They collect confidential personal information accessible on social media and other retail websites using advanced hacking tools; they steal credit information or build a false identity on social media. Second, this is an assault on children and minors. Child pornography is a growing market that benefits from the proliferation of the internet. When it comes to uploading pornographic images or abusive videos in the virtual world, women and children are more often abused than men. Young people are often enticed by fake messages and fabricated names on social media, and they fall victim to criminals in both cyberspace and the physical world. The third form of attack is on networks. Infrastructure is a frequent target for cyber terrorism. This attacks on vital resources have the ability to paralyze a country by wreaking havoc on the economy, health care, military, and power, among other items. A social network, according to the Oxford Dictionary, is "a dedicated website or other programme that allows users to connect with one another by sharing content, notes, notifications, photos, and so on." This can take the form of social media networks, blogs, and online chat rooms. Cybercrime is distinguished by anonymity and the use of a false name. Cyber criminals have been able to envelop these innocent people in illegal or other illegal activities due to a lack of knowledge among netizens, inadequate security features associated with these websites, and overuse of social media.

Cyber defamation, cyber obscenity pornography, cyber stalking, hacking, privacy violation, internet piracy, unauthorized destruction of computer networks by malware, and copyright infringement are all common cybercrimes in social media.

ISSUES RELATED TO PRIVACY BREACH

The right to control one's personal information, as well as the freedom to dictate if that information can be accessed and used, is referred to as privacy. Article 21 of India's Constitution, which deals with the right to life and liberty, acknowledges "right to privacy" as a constitutional right. While the right to privacy is not expressly specified in the Constitution, it has been acknowledged in a variety of judicial rulings. The consequences of the right to privacy in the virtual universe, on the other hand, are a fiercely contested subject. Any right to privacy must in the encompass and protect the personal intimacies of the home, family. Marriage, motherhood, procreation, and child rearing.⁴

Facebook is the example of potential privacy violations in social media. When Facebook came along, Orkut, once hailed as one of the first successful social networking platforms, lost its luster. Many users could not deactivate their passwords, leaving confidential personal details open to the media. The Facebook public search function allows anybody who types a user's name into the search engine to display their personal information.

⁴ Sharma Vakul, Information Technology- Law and Practice, Fifth Edition 2017, Universal Law Publication, ISBN: 978-93-5035-891-7, Pg no. 267

¹ Social media used to spread hatred: Rajnath Singh - The Hindu (Assessed on 25 Feb, 2021 at 08:30 am)

² Social media poses a serious challenge to law enforcement agencies: Rajnath Singh (bgr.in) (Accessed on 12 Feb, 2021 at 04:30 pm)

³ Akashdeep Bharadwaj, and Vinay Avasthi, Impact of Social Networking on Indian Youth- A Survey, I.J. of Electronics and Information Enginnering, Vol. 07, No. 01sept, 2017, , Pp 45 -55,

Volume 8, Issue 2 (III) April - June 2021

The law of privacy is the recognition of the individual's right to be let alone and to have his personal space inviolate.¹ By choosing 'Public' in privacy settings for details such as ethnicity, networks, username, email address, phone number, images, and videos, the person's identity is jeopardized. Furthermore, using social media apps and gaming poses a significant danger to a person's identity.

Cyber-attacks on social media are widely viewed as a breach of data privacy laws. Names, emails, hobbies, family members, and other personal information are widely accessible on social media websites. Sections 43A, 72A, 69, and 69B of the IT Act regulate data security in India.

Section 43A broadens the spectrum of data protection by providing a description of "sensitive personal data or information," as well as requiring data handlers to adopt "fair security standards." In the event of a violation, data controllers and cyber criminals could face exorbitant fines that could reach Rs. 5 crores. Section 72A of the Act makes an intermediary accountable if he discloses "sensitive details" collected when delivering services under a contract and rendered with the intent to inflict or knowledge that he is likely to cause wrongful harm or benefit to an individual. Sections 69 and 69B grant the state the authority to issue instructions for the interception, tracking, and even collection of traffic data or information from any electronic resource for the purpose of cyber protection. Though the heading of the newly inserted Sec. 66 E provides as punishment for violations of privacy, the penal provision only seeks to prohibit electronic voyeurism which is only one of the forms of breaching another's privacy.²

LAWS RELATING TO SOCIAL MEDIA CRIME IN INDIA CYBER DEFAMATION

The publishing of defamatory material in an electronic medium is referred to as cyber defamation. Cyber defamation means the harm that is brought on the reputation of an individual in the eyes of other individuals through the cyber space.³ The Court weighed considerations such as the time of event, manner of dissemination, and authority when assessing cyber defamation. Since there are no boundaries, assessing sovereignty is a daunting challenge. The High Court of Australia ruled in Joseph Gutnick v. Dow Jones & Company Inc. that the location of publishing (or jurisdiction) is where the defamatory comment is made and where the specific material is downloaded, not where the statement is transmitted or where the publisher's server is stored. According to Indian law, cyber defamation is illegal under Section 499 of the Indian Penal Code ("IPC") and Section 4 of the Information Technology Act. S.66A, which punishes the publishing of material that is profoundly abusive, has previously accepted cyber defamation. The Supreme Court, however, has struck this down as a breach of Article 19 (1) (a) of the Indian Constitution.

The main in the legal scenario between cyber-crime and real world crime and the main reason why judges have difficult in deciding cases related to cyber-crime is that the cyber world is omnipresent, there may be actions done in some part of the world whereas the damage occurs in a different part.⁴

PORNOGRAPHY CRIME

Cyber pornography, also known as cyber obscenity, is an online medium for stimulating sexual activity that involves pornographic blogs and magazines. Previously, the Hecklin's test was used to assess obscenity: "the propensity to deprave and corrupt those whose brains are exposed to such unethical forces" was deemed obscene.

The Supreme Court described obscene as anything that is "offensive to modesty or decency, indecent, disgusting, and repulsive" in Ranjeet Udeshi v. State of Maharashtra. As a consequence, obscenity without a common intent or benefit cannot be covered under the First Amendment. The Supreme Court has claimed in Ajay Goswami v. Union of India that the criterion for judging a job should be that of "an ordinary man of good sense and prudence, not an out of ordinary or hypersensitive man."

¹ Mehra Raman, Information Technology and Cyber Laws, Global India Publication Pvt Ltd, ISBN: 978-93-80228-65-5, Pg. No. 135

² Gupta Apar, Commentory on Information Technology Act, 3rd Edition, 2016, Lexis Nexis, ISBN: 978-93-5143-7116, Pg No. 238

³ Animesh Sarmah, Roshani Sarmah, A Brief Study on Cyber Crime and Cyber Laws of India, International Research Journal of Engineering and Technology, Vol. 04, Issue.06. Jun, 2017, e-IISN: 2395-0056

⁴ Mani A., Practical Approach to Cyber Laws, Part-I, Second edition 2012, Kamal Publications New Delhi, pg no. 230

Many nations have taken legal and other measures to prevent trafficking in children, i.e. the sale of children, child prostitution and child pornography, and further to punish offenders and ensure that child victims are rehabilitated and reintegrated in the society. An increasing number of nations have made formal legal commitments to take measures in cooperation with other states, including by becoming parties to relevant international instruments.¹

With the recognition of the '.xxx' domain, ICANN (Internet Organization for Assigned Names and Numbers) has granted formal recognition to cyber pornography. Child pornography, on the other hand, is widely denounced around the world. The IT Act, under section 67B, punishes child pornography, which is based on Article 9 of the Convention on Internet Crime. Obscenity on the internet is a federal crime. In the grounds of Sections 66E and 67, it leaves the defendant accountable. Section 66E preserves bodily integrity by prosecuting someone who takes pictures of a person's private parts without their permission. Section 67A makes it illegal to print or distribute sexually explicit material over the internet.

CYBER STALKING AND FRAUDULENT TRANSACTION ON SOCIAL MEDIA NETWORKING SITES:

This involves harassing or contacting another person in order to stalk them while maintaining an anonymous identity through the use of technologies. Stalking is now prohibited under the Criminal Law (Amendment) Act of 2013, which applies a special section 354D to the law. A cyber stalker relies upon the anonymity afforded by the Internet to allow them to stalk them to stalk their victim without being detected.²

One of the most common malicious practices on social media is impersonation. Fake accounts abound on social networking sites, created purely for the purpose of collecting information and other sensitive data such as bank account numbers and credit card numbers.

HACKING AND VIRUS ATTACK

Cyber bullying involves the use of information and communication technologies to support deliberate, repeated and hostile behaviors by the individual or group that is intended to harm others.³ Virus attacks are usually carried out by posting links to users of social networking networks or by telling them to open a page on their device. Virus infection corrupts, kills, or affects data stored on a device or in the cloud. The perpetrator is responsible under Section 43 (c) of the IT Act to compensate someone who is injured by the entry of a data contaminant or virus into a computer, computer system, or computer network.

Hacking is typically a programmed phase in which the hacker researches the target's security features and creates programmes to obtain unauthorized access. Simply put, hacking is trespassing in the virtual universe. Unauthorized access to a computer facility that is performed "dishonestly or fraudulently" is punishable under Section 43 of the IT Act. In this situation, the aggrieved party must create men's rea.

HATE SPEECH ON SOCIAL MEDIA:

Online forums are often viewed in isolation, but they are actually representations of culture. In recent years, polarizing content and hateful material have proliferated on the Internet in India. Opinions that may once have been silenced for fear of social consequences have now found a safe haven on the internet. A broad range of extreme comments can be found on the internet. Today's social media is a hotbed of poisonous and hateful debates. Combating hate speech and fake news has been a big problem for policymakers around the world.⁴

With a 30 percent internet penetration rate (World Bank, 2016), India now has over 241 million Facebook users (The Next Web Report, 2017). According to the Yral Study (2016), at least 136 million Indians are active social media users across channels.

¹ Sharma Vakul, Information Technology- Law and Practice, Fifth Edition 2017, Universal Law Publication, ISBN: 978-93-5035-891-7 Pg no. 218

² Jadeja Pritviraj Manubha, Cyber Crime and Cyber Law Under Information Technology Act, 2000, Research Review International Journal of Multidisciplinary, Vol. 03, Issue.01, Jan, 2018, ISSN: 2455-3085 (Online)

³ Mali Prashant Adv, Cyber Law & Cyber Crimes, second edition (2015), Snow White Publication, ISBN: 978-93-5039-152-5Pg no. 43

⁴ It is time to regulate hate speech on social media | Opinion | Hindustan Times (Assessed on 20 Feb, 2021 at 02:35 pm)

Furthermore, when it comes to social media, we can't forget WhatsApp's success in India, where it has over 200 million users (Mashable, 2017). This means that 200 million Indian consumers are exchanging messages in real time on a regular basis. As one of the most commonly used means of expression today, social media plays a vital part in both countering and amplifying hate speech.¹

All knows that the person who publishes the material should be kept accountable for his acts. The Indian Penal Code includes laws that forbid hate speech (Section 153A), obscenity (Section 292), and slander, among other things (Section 499). Our criminal jurisprudence acknowledges the value of people behaving responsibly. Prosecuting anyone who publish inflammatory material is, on the whole, complicated and time-consuming. As a result, politicians have long proposed that content control should be shared by intermediaries.

Question is that will these intermediaries be held accountable for the material they host? So far, the Information Technology Act's Section 79(2) has excluded social media platforms from any potential responsibility for the content they host. When this legislation was enacted a decade ago, such an approach may have appeared fair. Instagram and WhatsApp didn't exist at the time, and Facebook had just 10 crore users. Today, all three sites serve as hubs for social networking and expression, ranging from intelligent discussion and dog images to conspiracy theories and hate speech.

SOCIAL MEDIA AND CYBER TERRORISM AND ENFORCEMENT CHALLENGES

The pace at which the public hears about terrorist threats and how they respond is evolving as a result of social media. Instead of conventional news sources, social media networks such as Twitter are now expected to be the first to educate the public about events. When the use of cyber tools to shut down critical national infrastructure such as energy, transportation and communication coerce governments into submission. Internet bombs treats, internet harassment and technology- driven crimes, such as focused virus strikes are the next wave of crime that the world has to encounter in the days to come.²

Since smartphones are so commonly used, reports can be disseminated in real time to a vast audience, including specifics on the attack and police reaction, as well as alerts about potential changes. As a consequence of this modern fact, politicians, intelligence forces, and law enforcement authorities must understand the effect of social media in the wake of terrorist attacks, in terms of response preparation for terrorist threats, and quick distribution of information.³

The investigation into the Mumbai terrorist attack of 26/11 is revealed the- proof of terrorist cyber telecommunication, with the aid of which they became acquainted with the map, population infrastructure, location, and so on. They use "Google earth" to carry out their plan, as well as the mobile network for command and control and social media to monitor the movement of Indian rescue and defense forces. Furthermore, they use technologies for "conversion of audio signals into data," making it difficult for "Indian defense forces3" to trace the source of information.⁴

There is no clear law in India to combat cyber terrorism. Sec. 66F of the Information Technology Act of 2000 was amended in 2008 to combat cyber terrorism. Such provisions and regulations are in addition to other legislative provisions in terrorism-related law and special legislation. Section 66F is the only law that deals with and protects any act conducted with the intent to endanger India's unity, dignity, stability, or sovereignty, or to encourage terrorism by DoS attacks, the insertion of a data contaminant, unauthorized access to a computer resource, the stealing of sensitive information, or any information likely to endanger India's sovereignty or integrity.

Other offences mentioned in Sec. 66 are punishable by three years in jail and a fine of five lakhs, and these offences are cognizable and bailable. Sec. 66A defines the punishments for transmitting unauthorized communications using a contact service, among other items. Furthermore, Sec. 84B allows abetment to commit a crime punishable with the same sentence as the offence under the Act, and Sec. 84C makes attempt to commit

¹ Hate speech and the role of social media (livemint.com) (Assessed on 10 Feb, 2021 at 01:20 pm)

² Mali Prashant Adv, Cyber Law & Cyber Crimes, second edition (2015), Snow White Publication, ISBN: 978-93-5039-152-5Pg no. 21

³ Security, terrorism and social media - Economic and Social Research Council (ukri.org) (Assessed on 09 Feb, 2021 at 02:45 pm)

⁴ Shiv Raman, and Nidhi Sharma, Cyber Terrorism in India: A Physical Reality Orvirtual Myth, Indian Journal of Law and Human Behavior Volume 5 Number 2 (Special Issue), May - August 2019, , eISSN: 2455-4189

Volume 8, Issue 2 (III) April - June 2021

an offence punishable with a period of imprisonment up to one-half of the actual term of imprisonment prescribed for that offence. The sentence for such crimes, such as hacking (Section 66), has been increased from three years in jail and a fine of two lakhs to five lakhs.

PREVENTIVE MEASURES AND SUGGESTIONS TO AVOID SOCIAL MEDIA CRIME

Netizens should recall a number of precautionary initiatives to enhance cyber security. These include: Always avoid submitting any photograph online, particularly to unknown friends or strangers, to avoid photo misuse. To defend yourself from virus threats, keep your anti-virus programme up to date. Data failure due to a malware attack can be stopped by backing up files.

To prevent credit cards being stolen, charges for accessing games and apps on social networking sites must be made into a protected payment mechanism. Cybercrime on social media can be taught to children in schools. It is preferable to use a protection application that helps you to access cookies. Website owners and intermediaries must keep an eye on traffic and respond to any irregularities.

CONCLUSION

Since its inception, cybercrime has posed a danger to social media. Fraudulent sales, malware, ransomware attacks, cyber defamation, and cyber stalking are all forms of this. Despite the fact that India has strong legislation in place to deal with these offences, the conviction rate is exceedingly poor. Cyber forensics is a quickly developing field. It needs to be encouraged in order to work out how to identify Cyber Evidence. In order to regulate cybercrime, required changes to Indian law must be made such that it reads in accordance with the IT Act.

BIBLIOGRAPHY/WEBLIOGRAPHY

- 1) Mehra Raman, Information Technology and Cyber Laws, Global India Publication Pvt Ltd, ISBN: 978-93-80228-65-5, Pg. No. 08
- 2) Akashdeep Bharadwaj, and Vinay Avasthi, Impact of Social Networking on Indian Youth- A Survey, I.J. of Electronics and Information Enginnering, Vol. 07, No. 01 sept, 2017
- 3) Mali Prashant Adv, Cyber Law & Cyber Crimes, second edition (2015), Snow White Publication, ISBN: 978-93-5039-152-5
- 4) Sharma Vakul, Information Technology- Law and Practice, Fifth Edition 2017, Universal Law Publication, ISBN: 978-93-5035-891-7,
- 5) Gupta Apar, Commentory on Information Technology Act, 3rd Edition, 2016, Lexis Nexis, ISBN: 978-93-5143-7116,
- 6) Animesh Sarmah, Roshani Sarmah, A Brief Study on Cyber Crime and Cyber Laws of India, Internation Research Journal of Engineering and Technology, Vol. 04, Issue.06. Jun, 2017, e-IIS: 2395-0056
- 7) Mani A., Practical Approach to Cyber Laws, Part-I, Second edition 2012, Kamal Publications New Delhi,
- 8) Sharma Vakul, Information Technology- Law and Practice, Fifth Edition 2017, Universal Law Publication, ISBN: 978-93-5035-891-7
- 9) Jadeja Pritviraj Manubha, Cyber Crime and Cyber Law Under Information Technology Act, 2000, Research Review International Journal of Multidisciplinary, Vol. 03, Issue.01, Jan, 2018, ISSN: 2455-3085 (Online)
- Shiv Raman, and Nidhi Sharma, Cyber Terrorism in India: A Physical Reality Orvirtual Myth, Indian Journal of Law and Human Behavior Volume 5 Number 2 (Special Issue), May - August 2019, eISSN: 2455-4189
- 11) Social media poses a serious challenge to law enforcement agencies Rajnath BW Businessworld (accessed on 26 Feb, 2021 at 2:30 pm)
- 12) Four from Ghatkopar abduct, rape man they 'liked' on Instagram (indiatimes.com)
- 13) Social media used to spread hatred: Rajnath Singh The Hindu (Assessed on 25 Feb, 2021 at 08:30 am)
- 14) Social media poses a serious challenge to law enforcement agencies: Rajnath Singh (bgr.in) (Accessed on 12 Feb, 2021 at 04:30 pm)
- 15) It is time to regulate hate speech on social media | Opinion | Hindustan Times (Assessed on 20 Feb, 2021 at 02:35 pm)

Volume 8, Issue 2 (III) April - June 2021

- 16) Hate speech and the role of social media (livemint.com) (Assessed on 10 Feb, 2021 at 01:20 pm)
- Security, terrorism and social media Economic and Social Research Council (ukri.org) (Assessed on 09 Feb, 2021 at 02:45 pm)

MATHEMATICAL MODELS USED AS A USEFUL TOOL FOR SUSTAINABLE DEVELOPMENT

Ms. Rituparna Choudhary

Thakur College of Science and Commerce, Kandivali (E), Mumbai

ABSTRACT

Sustainable development can be defined in many ways but according to Brundtland Report the definition of sustainable development is as follows : "Sustainable development is a development that meets the basic need of the present situation but without doing any compromise with the need of the resource of future generations." So in simple language sustainable development is a method in which developments are done with the thought that future generation will not face any problem because of it.

In sustainable development, Mathematical modelling plays an important role. Mathematical modelling is applied for understanding the real time problem and after understanding the problem predictions are made on the problem and this is the general way by which sustainable developmental process is controlled. But for long term future prediction generally ordinary Mathematical differential equation models are used in real life problems. Various differential equation models are available. Differential equation models are known as mathematical models and they are used for building a mathematical model for a development process. In this study out of different mathematical models we will discuss only two effective differential equation models – Mathematical equation model and Mathematical logistic differential equation model. These Mathematical models are applied in different real time problem like study of growth in a population, to find quality of water, in fishery and in economics.

In this paper we will try to find, in sustainable development process how it is very important to build an effective mathematical model on human-environmental system.

INTRODUCTION

The term development with Sustainability can be defined in many ways but according to Brundtland Report the development with sustainability is definition as :"Sustainable development is a development that satisfy the basic need of the present circumstances but without doing any compromise with the need of the resource of future generations." So from this definition it is prominent that the development with sustainability is the idea that human societies must live and meet their needs by doing various developments but without compromising the need of future generations. So in simple words we can conclude that the sustainable development process is a method in which developments are done with the thought that future generation will not face any problem because of it.

Mathematical modelling plays a very impotent tool in the process of development with sustainability. Mathematical modelling is applied in many cases for understanding, predicting, and controlling sustainable developmental processes. Various models of Mathematical differential equation is available for building a mathematical model and applying it in real life problem to get a result. In case of long term prediction generally ordinary mathematical differential equation models are used. Out of all differential models , in this paper , we will discuss only two effective differential equation models - mathematical exponential equation model and mathematical logistic differential equation models. In the study of population growth , water quality, fishery and economy we use these models . For development with sustainability , there are various constraints. Out of those we will take few constraints and will see how this models are applied to solve these constraints.

After doing all this analysis, it will be concluded that in development with sustainability, how it is very important to build effective mathematical models of human-environmental systems.

OBJECTIVES OF THIS PAPER

There are different Mathematical models used to analyse development with sustainability process. Here we will discuss two models – exponential equation model and logistic differential equation model. Using this two models we will try to find out

(i) how these two models are applied to analyse development with sustainability process.

(ii) how this two models work in improving the idea of sustainable development process.

(iii) weather these models are effective to study sustainable development process. And if this models are effective then we will try to find out the efficiency level of this model. We will also try to find the graphical representation of this models.

Volume 8, Issue 2 (III) April - June 2021

METHODOLOGY

The study will be done by using various mathematical formulas. Here we will consider mathematical formulas for mathematical exponential equation model and mathematical logistic differential equation model and using those formulas we will try to find out how to do calculations of various parameters of a real time problem. For calculation we will consider different real time problem and we will use the real time parameters to find the result.

ANALYSIS

Exponential growth is modelled using an exponential mathematical equation. For example, if a species has nonoverlapping populations (e.g., annual plants), and each organism produces R offspring, then, population numbers N in generations t = 0, 1, 2, ... is equal to:

$$N_1 = N_0.R$$
$$N_t = N_0.R^t$$

For very large value of t, the approximation of this equation can be done by an mathematical exponential function. So if the population of a species grows exponentially over time then modelling can be done by using the following mathematical exponential formula:

$$N_t = N_0 \cdot \exp(r \cdot t) = N_0 \cdot e^{rt}$$

Where N_t denotes the population after time *t* whereas N_0 is the original population when t = 0, and *r* is known as the growth constant .The growth constant r is equal to the <u>frequency</u> of growing by an exponential factor *e* where the frequency is calculated as number of times per unit time.

But for smaller size populations this type of growth is usually found and smaller size population growth are not yet limited by the resources around them or by their environment. In a small population, generally the growth is nearly constant, and the equation above is used to model the population growth.

There are 3 possible exponential model outcomes:



- 1. Exponentially declined population (when r < 0) : In the diagram the blue line represents exponential population growth.
- 2. Exponentially increasing population (when r > 0) : In the diagram exponential decay of the population is represented by green line .
- 3. In case of r = 0, no change in the population: In the diagram red line represents the population which is constant over the time .

Three assumptions are made for an exponential model. These assumptions are :

- 1. Reproduce continuously (e.g., no seasonality) in this case consideration is always done on the basis that the process of reproduction is a continuous process which never stops over time.
- 2. Identical organisms (e.g., age structure is not present) In this assumption we consider that all organisms are same identity.

3. For time and space environment is constant (e.g., unlimited resources) :- This assumption is based on the thought that all the components of environment is unlimited and their quantities are also constant , irrespective of time period.

Exponential equation model is considered as a dynamic model as it gives reasonable accuracy or almost accurate results even if these above assumptions do not satisfy. We can consider as an example that different species may differ in their living age, survival, and mortality rate but for a bigger population which consists many organisms, birth rates and death rates are always equal to an average value. So we can interpreted the parameter r in the exponential equation model as a difference between the birth (reproduction) rate and the death (mortality) rate and the formula can look like

$$\frac{dN}{dt} = (b-m)N = rN$$

where b is defined as the birth rate and m is the death rate of any population .

We can define birth rate as the total number of offspring species produced per one existing species in the population per unit time whereas on the other hand death rate of a population can be defined as the probability of death per one species. So from the above formula it is clear that the growth rate of the population (r) is equal to the difference between population birth rate (b) and death rate (m).

As an example consider the case :-

A strain of bacteria growing on your desktop doubles every 5 minutes. Assuming that initially there is only one bacterium, calculate how many bacteria could be present at the end of 96 minutes?

Here we will take the assumption that bacteria grows continuously.

Let us consider the formula :

With constant r, first let us find the population growth rate,

At initial stage $N_1 = 2$ and $N_0 = 1$

Here doubling time is given as 5, so t = 5

So after placing all this values in the formula (1) we get

$$2 = 1. e^{r.5}$$

i.e.
$$2 = e^{5r}$$

Taking logarithm in both side we get

log 2 = log (
$$e^{5r}$$
) = 5 r
So , r = $\frac{log 2}{5}$ = 0.1386294361

So if we substitute the value population growth r in the above equation, after calculation we get

$$N_t = N_0 \cdot e^{0.1386294361t}$$

Now when time , t = 96 minutes then from the above formula we get

 $N_{96} = 1 \times e^{0.138629436 \times 96} = 602248.76225$ (app) bacteria's.

Therefore, from this calculation we get that after 96 minutes there will be approximately 602248.76225 bacteria's on the desktop.

So using this formula we can approximately calculate growth rate.

Exponential model has various applications. They are as follows :-

- Biological conservation (processing restoration of disturbed populations),
- Rearing insect (predicting yield),

Volume 8, Issue 2 (III) April - June 2021

- Quarantine of plant or insect (population growth calculation for introduced organism),
- fishery analysis (prediction made about fish dynamics).

But for large population, carrying capacity will be approach. With this context carrying capacity is termed as the largest population and this can be sustained by the surrounding environmental conditions. For this case, the population growth will start to level off. In case if the carrying capacity is exceeded by the population, then a negative growth will observed and it will continue till the population shrinks back to its starting carrying capacity or lower value. In general to model population growth, account for carrying capacity and its direct effect on growth of population, we have to solve the following equation

$$\frac{dN}{dt} = rN(1 - \frac{N}{K})$$

Where K is the carrying capacity of the population and r is called the population growth constant and N represents the population density.

During a population's growth if we consider any point of time, the expression (K - N) tells us how many more individuals can be added to the existing population before it hits carrying capacity K. When the population carrying capacity K is used up more then the term $(1 - \frac{N}{K})$ will reduce and hence the population growth rate will also reduce with it.

In case of small population if compared to carrying capacity K with population density N then we can observe that N is ridiculously small. The term $(1 - \frac{N}{K})$ becomes approximately equal to 1 (as $\frac{K}{K} = 1$) then this condition gives us back the exponential equation.

Let us now try to understand the carrying capacity K dependents on which factors. Any kind of resource important to a species survival can act as a limit. For a plant, the sunlight, water, the space to grow, and nutrients are some key resources for the growth. Similarly for any animal important resources are water, shelter, nesting space and food. But these quantities are limited. Limited quantities of these resources results in competition between same population members. If the carrying capacity of a population is less then the competition for resources may not affect populations. In case of low population resources are more than enough and all individuals can satisfy their basic needs. However, the competition for these basic resources also intensifies when the population size increases. Also we need to note the fact that by accumulation of waste products the environment's carrying capacity can be reduced.

The parameter r can also be known as the following names :-

- Malthusian parameter
- Intrinsic rate of increase
- Instantaneous rate of natural increase
- Population growth rate

Out of all these names, "Instantaneous rate of natural increase" and "Population growth rate" are generic terms hence they do not have any relationship with population density. So for population growth it is better to use the name for parameter r as "Intrinsic rate of increase " in the logistic mathematical model rather than in the exponential mathematical model. In logistic mathematical model the parameter r is equal to the population growth rate at exceptionally low population density .

Graphical representation of the logistic equation model is as follows :


Let us solve one example using logistic growth model.

Q. Find a mathematical logistic growth equation and find the population after 5 years for a group of ducks with an initial population of N=1,500, and a carrying capacity of population K=16,000. The duck population after 2 years is 2,000.

We'll start by plugging what we know into the mathematical logistic growth equation. With N=1,500 and K=16,000, we get

$$\frac{dN}{dt} = rN(1 - \frac{N}{K})$$
$$\frac{dN}{dt} = 1500r\left(1 - \frac{1500}{16000}\right) = 1500r \times \frac{29}{32} = \frac{10875r}{8}$$

This equation is known as the logistic growth equation. Now let us find the population after 5 years. Consider this problem as a variable separable differential equation problem . Now integrating the equation from both sides, and solving it for P as a function of time t we get

$$dN = \frac{10875r}{8} dt$$
$$\int dN = \frac{10875r}{8} \int dt$$
$$N + C_1 = \frac{10875r}{8} t + C_2$$
$$N = \frac{10875r}{8} t + C_2 - C_1$$

 $N = rac{10875r}{8}t + C$, where $C = C_2 - C_1$

Here the initial given condition is , N(0)=1,500, Therefore placing this value we get

$$N(0) = \frac{10875r}{8} \times 0 + C = C$$

. . . -

From this we get , C = 1500

Therefore the equation looks like :

Volume 8, Issue 2 (III) April - June 2021

$$N = \frac{10875r}{8}t + 1500$$

SSN 2394 -

like

We were also told in the problem that the duck population after 2 years is 2,000. Plugging in this information, we get

$$2000 = \frac{10875r}{8} \times 2 + 1500$$

Which gives , $r = \frac{2000}{10875} = \frac{16}{87}$

Hence the equation loop $N = \frac{10875}{8} \times \frac{16t}{87} + 1500$ -----(2)

In this problem we need to calculate the duck population after 5 years. For this let us now put t = 5 in the equation (2) we get as follows :

looks

$$N = \frac{10875}{8} \times \frac{16 \times 5}{87} + 1500$$

= 1250 + 1500

= 2750

Hence we get the duck population reached 2,750 after 5 years.

Now we will find different applications of the mathematical logistic differential equation model.

Some of these applications are as follows :

1) Psychological Applications

Psychologists are very interested in learning the theory of learning curves. A learning curve can be defined as a graph of a function N(t), the performance of someone learning a skill as a function with the training time is considered as t. The derivative dN/dt represents the rate at which performance improve.

2) Biological Applications

A lake is stocked with large number of fish of one species and the biologists want to estimate the species "carrying capacity" in the lake . After that they calculated the number of the fish tripled in one year.

3) World's Population Prediction

In 1990, "the population in the world was about 5.3 billion" whereas "the birth rates in the 1990s range from 35 to 40 million per year" and "the death rate rates from 15 to 20 million per year". Let us suppose that the carrying capacity for the world population is 100 billion. With this carrying capacity value the world population can be calculated for future years.

4) Undergraduate Student Population UNLV Prediction

The UNLV undergraduate student population was 20,842 in 2003. In 2004, it was 21,783. Let us assume that the population carrying capacity for the undergraduate student population is 500,000 and with this value the calculations can be done.

5) Application of differential mathematical equation model in the field of maximum Sustainable Yield :-

We can define the maximum sustainable yield as the maximum level at which the basic natural resource can be routinely exploited but without any long-term depletion. Using logistic equation model the calculation can be done and we can generate a mathematical model.

Conclusion:-

So from the analysis we can understand that in development with sustainability mathematical models plays a very important roll. In this paper only two such models are discussed but this type of many mathematical models are used to analysis sustainable development process. So in the conclusion of this paper we can state that Models of Mathematics play a key tool to analyse Development with Sustainability.

Volume 8, Issue 2 (III) April - June 2021

REFERENCE

- 1) https://www.nature.com/scitable/knowledge/library/how-populations-grow-the-exponential-and-logistic-3240157/#:~:text=The%20 Exponential%20Equation% 20is%20a, laboratory%20depression%20slide%20is%20pictured.
- 2) https://mathbitsnotebook.com/Algebra2/Exponential/EXGrowthDecay.html
- 3) https://www.kristakingmath.com/blog/exponential-growth-for-population-growth
- 4) https://www.khanacademy.org/science/ap-biology/ecology-ap/population-ecology-ap/a/exponential-logistic-growth
- 5) http://www.appstate.edu/~neufeldhs/bio1102/lectures/lecture18.htm#:~:text= Net%20reproductive% 20rate%20(r)%20is%20calculated%20as%3A%20r%20%3D,terms%2C%20just%20multiply%20by%201 00.&text=the%20population%20is%20so%20much%20bigger%2C%20many%20more%20individuals%2 0are%20added.&text=If%20a%20population%20grows%20by,what%20we%20call%20exponential%20gr owth.
- 6) https://www.jstor.org/stable/2529810?seq=1
- 7) https://digitalscholarship.unlv.edu/cgi/viewcontent.cgi?article=1057&context =focs_ug_research

Volume 8, Issue 2 (III) April - June 2021

DIVERSITY OF AQUATIC ANGIOSPERMS AND ASSOCIATED SPECIES OF HERANJ WETLAND, KHEDA – GUJARAT FOR SUSTAINABILITY

Jaivin Patel and Dr. Bharat Maitreya

Department of Botany, Bioinformatics and Climate Change Impacts Management, School of Sciences, Gujarat University, Ahmedabad

ABSTRACT

Wetlands are one of the most productive and fertile ecosystems on earth. They cover about 6.4% of the land area of the earth (Mitsch and Gosselink, 1986). Wetlands are tremendously valuable pools of biodiversity and genetic resources, but unmaintainable development is intimidating the bio-wealth and even initiating species extinction. Floodplains, mangroves, sea grasses, saltmarshes, arctic wetlands, peat lands, freshwater marshes and forests are very diverse habitats, with different stressors and aquatic angiosperms act as primary creators in aquatic ecosystems and they maintain energy flow in whole bionetwork. Wetland systems are vulnerable to fluctuations in quantity and quality of their water supply, and it is expected that climate change will have a pronounced effect on wetlands through alterations in hydrological regimes with great comprehensive variability. Wetland habitat responses to climate change and the implications for restoration will be realized differently on a regional and mega-watershed level, making it important to recognize that specific restoration and management plans will require examination by habitat. The present study reveals a total of 30 species of Aquatic angiosperms were recorded from the Heranj wetland (Taluka: Matar District: Kheda, Gujarat) that include 9 species of submerged, 2 species of free floating, 6 species of rooted with floating leaves and 13 species of emergent Aquatic angiosperms. Najas sp., Hydrilla sp., Typha sp., Potamogeton sp. are dominant species in Freshwater wetland and hence, different management and restoration techniques are needed for its sustainability.

Key Words: Aquatic angiosperms, Heranj pond, Wetland, Ecosystems.

INTRODUCTION

Wetlands are one of the most productive and fertile ecosystems on earth. They cover about 6.4% of the land area of the earth (Mitsch and Gosselink, 1986). In india, wetland also cover 1-5% of the land area(SAC, 2011). Gujarat have both coastal and inland wetland habitat diversity (Stanley, 2004). As per SAC (2011) Gujarat has total 23,891 wetlands (Both Coastal and Inland wetlands), of which, 9,708 wetlands are those having an area less than 2.25 ha. Total area of these 23,891 wetlands has been estimated at 34,749.50 sq. km which accounts for about 17.56% of geographical area of the State and 22.7% of the total wetland area of the country. The area of the Gujart State under coastal wetlands (coral reefs, creeks,inter-tidal flats, sand/beach, coastal marsh mangroves, etc.) are approximately 28,071 sq.km and that under inland wetlands (ponds, rivers, tanks, streams, oxbow lake) has been approximately 6,582 sq. km.

The present study of inland wetland has been carried out for knowing the diversity of the aquatic angiosperms and Associated Species of Heranj wetlands of Gujarat. This is a man-made wetland having an Open Water, emergent hydrophytic vegetation growth, water with *Nymphaea/Nelumbo* cover, water with decomposing submerged vegetation mat as the predominant habitat component within it.

STUDY AREA

The study covered one Prioritized wetlands sites from Central Gujarat, Viz., Heranj Wetland. Heranj wetland is located in Matar taluka at 22°40'9.7"N latitudes and 72°41'28.5"E longitudes. It is situated at the distance of just 27 km north of Tarapur on Tarapur-Kheda State highway, 50 km from Ahmedabad and 50 km from Khambhat . The big lake of heranj is approximately kms. in area with depth varying between 2 ft to 10 ft.



Figure 1: Satellite image of Heranj Wetland (Source: Google Map)

Volume 8, Issue 2 (III) April - June 2021

MATERIALS AND METHODS

The field survey was started with a reconnaissance survey of Heranj Wetland located at Khambhat District of Gujarat state, India. Further, data collection was carried out in each of the season i.e., Summer, Monsoon and Winter. For flora study, a Belt- Transect with stratified random sampling method were carried out. The entire area of wetlands was covered by satisfied sampling and belt transect. The transects were decided and marked in such a way that each transect would represent a type of habitat. The data of flowering plants collected in each season from selected transect-based for habitat stratification. Heranj wetland endowed with six habitat components, i.e. inlet, outlet, open water, emergent hydrophytic vegetation growth, water with *Nymphaea/Nelumbo* cover, water with decomposing submerged vegetation mat. The plants were identified with the help of standard literature and based on micro-morphological plants Characters and flowers. **Results and discussion**

QUALITATIVE ANALYSIS

During the present study, a total of 63 species belonging to 32 families and 53 genera of flowering plants have been recorded from the in and around the Heranj wetland. Dicots represented by 40 species belong to 33 genera and 23 families while Monocots represented by 23 species belongs to 20 genera and 9 families. **Graph 1** showed habit wise analysis of plants i.e., tree, shrubs, climber, herbs, etc. Furthermore, plant checklist was prepared based on the visual observation in the quadrats as well transects (**Table 3**).



Out of 32 families, 47 genera are represented by single species of each genus. Asteraceae is largest families among the dicot while Poaceae and Cyperaceae are largest among the monocots which are poorly represented. A total of 63 species of flowering plants, 44 species are herbs, 7 species are shrubs, 6 species are climbers and 6 species are trees. This study show that herbaceous plants are dominating in the wetland and its surrounding areas.

MOST REPRESENTATIVE FAMILY AND GENERA IN HERANJ WETLAND

Most representative family, genera and species of Heranj are Poaceae (7 species), followed by Asteraceae (6 species), Cyperaceae (5 species), Convolvulaceae (5 species), Convolvulaceae (5 species) etc. as given in graph 2.



Volume 8, Issue 2 (III) April - June 2021

AQUATIC ANGIOSPERMS

The Angiosperms are classified into submerged, free floating, rooted floating and emergent vegetation. Total 28 species recorded under this study belonged to 15 families. Majority of the species are recorded from emergent (13 species) vegetation followed by submerged (8 species), Rooted floating (5 species) and Free floating (2 species) Vegetation, etc. (graph 3)



Table 1:	List of Ac	matic Angiosperms	at Herani Wetland	h
	List of At	luane Anglosperms	at merang wettand	

Sr. No.	Botanical Name	Family	Status	Habit	Indicator status
1	Ammannia baccifera L.	Lythraceae	Emergent	Herb	FAC
2	Cyperus difformis L.	Cyperaceae	Emergent	Herb	FACW
3	Cyperus iria L	Cyperaceae	Emergent	Herb	FACW
4	Cyperus rotundus L.	Cyperaceae	Emergent	Herb	FACW
5	Cyperus bulbosus Vahl	Cyperaceae	Emergent	Herb	FACW
6	<i>Eichhornia crassipes</i> (Mart.) Solms	Pontederiaceae	Free Floating	Herb	OBL
7	Fimbristylis aestivalis Vahl	Cyperaceae	Emergent	Herb	FACW
8	Hydrilla verticillata (L.f.) Royle	Hydrocharitaceae	Submerged	Herb	OBL
9	Hygrophila auriculata (Schum.) Heine	Acanthaceae	Emergent	Herb	FACW
10	Ipomoea aquatica Forssk.	Convolvulaceae	Rooted Floating	Climber	FACW
11	Ipomoea carnea Jacq.	Convolvulaceae	Emergent	Climber	FACW
12	<i>Ipomoea marginata</i> (Desr.) Verdc.	Convolvulaceae	Rooted Floating	Climber	FACW
13	Ipomoea triloba L.	Convolvulaceae	Rooted Floating	Climber	FACW
14	Lemna minor L.	Lemnaceae	Free Floating	Herb	OBL
15	Limnophyton obtusifolium (L.) Miq.	Alismataceae	Emergent	Herb	FACW
16	Ludwigia adscendens (L.) Hara	Onagraceae	Emergent	Herb	FACW
17	Najas marina L.	Hydrocharitaceae	Submerged	Herb	OBL
18	Najas minor All.	Hydrocharitaceae	Submerged	Herb	OBL

Volume 8, Issue 2 (III) April - June 2021

19	Nelumbo nucifera Gaertn.	Nelumbonaceae	Rooted Floating	Herb	OBL
20	Nymphaea nouchali Burm.f.	Nymphaeaceae	Rooted Floating	Herb	OBL
21	Persicaria glabra (Willd.) M.Gómez	Polygonaceae	Emergent	Herb	FACW
22	Potamogeton crispus L.	Potamogetonaceae	Submerged	Herb	OBL
23	Potamogeton nodosus Poir.	Potamogetonaceae	Submerged	Herb	OBL
24	Scirpus littoralis Schrad.	Cyperaceae	Emergent	Herb	FACW
25	Stuckenia pectinata (L.) Börner	Potamogetonaceae	Submerged	Herb	OBL
26	Typha angustifolia L.	Typhaceae	Emergent	Herb	FACW
27	Utricularia inflexa Forssk.	Lentibulariaceae	Submerged	Herb	OBL
28	Vallisneria spiralis L.	Hydrocharitaceae	Submerged	Herb	OBL

(* Obligate Wetland Plants (OBL), Facultative Wetland Plants (FACW), Facultative Plants(FAC), Facultative Upland Plants (FACU), Obligate Upland Plants (UPL)).

During fieldwork at Heranj wetland 28 species of aquatic macropytes were identified and listed based on the visual observation in the quadrats as well transects by using Cook (1996) and Shah (1978). The given table show list of aquatic macrophytes with their indicator statuses, habit, family, class etc.(**Table:1**)

WETLAND INDICATOR STATUS

The National List of Plant Species that Occur in Wetlands is a list of wetland plants and their assigned indicator statuses. The five indicator statuses are: Obligate Wetland Plants (OBL), Facultative Wetland Plants (FACW), Facultative Plants (FAC), Facultative Upland Plants (FACU), Obligate Upland Plants (UPL). Based on these indicator statuses total of 63 species of plants were categories and represented. Out of these 31 species belong to Obligate Upland Plants, 15 Facultative Wetland Plants, 12 Obligate Wetland Plants, 5 Facultative Upland Plants and 1naturalized, 1 Facultative Plants. (**Graph 4**.)



Table:2 Role of Species involved in wetland Sustainability:

Sr. No	Species	Role	References
1	Hydrilla verticillata	Cleaning of wetland water	Toth & Anderson., 1998
		Helps in Phosphorus removal	Gu., 2006.

International Journal of Advance and Innovative Research Volume 8, Issue 2 (III) April - June 2021

ISSN 2394 - 7780

2	Ipomoea aquatica	Bio-accumulation lead, cadmium and arsenic	(Ghosh, 2010)
3	Eichhornia crassipes and Hydrilla verticillata	Phosphorus removal efficiency	Shardendu <i>et al.</i> , 2012.
4	<i>Phragmites</i> sp. and <i>Typha</i> sp.	Sequential nitrogen detoxification, removal of BOD and TSS of	Brix,1997
5	Scirpus Sp.	Removing ammonia	Brix,1997
6	Typha	Accumulation of phosphorous	Brix,1997
7	Eleocharis spp, Nymphaea odorata	Increases nitrogen content	Zweig et al 2008

Table 3: Check list of flowering plants of Heranj Wetland.

Sr. No.	Botanical Name	Local name	Family	Habit
1	Abutilon indicum (L.) Sw.	Mudra, Petari, Karandi	Malvaceae	Shrub
2	Achyranthes aspera L.	Andhedi	Amaranthaceae	Herb
3	Alternanthera sessilis (L.) R.Br. ex DC.	-	Amaranthaceae	Herb
4	Ammannia baccifera L.	Jal agiyo	Lythraceae	Herb
5	Azadirachta indica (L.) Juss.	Neem, Limdo	Meliaceae	Tree
6	Blumea lacera (Burm.f.) DC.	-	Asteraceae	Herb
7	Blumea mollis (D. Don) Merr.	-	Asteraceae	Herb
8	Calotropis procera (Aiton) Dryand.	Akado	Asclepiadaceae	Shrub
9	Chloris barbata Sw.	-	Poaceae	Herb
10	Cocculus hirsutus (L.) W.Theob.	Vevdi	Menispermaceae	Climber
11	Coix lacryma-jobi L.	-	Poaceae	Herb
12	Commelina benghalensis L	-	Commelinaceae	Herb
13	Cyanthillium cinereum (L.) H.Rob.	-	Asteraceae	Herb
14	Cynodon dactylon (L.) Pers.	Darbh	Poaceae	Herb
15	Cyperus difformis L.	-	Cyperaceae	Herb
16	Cyperus iria L	-	Cyperaceae	Herb
17	Cyperus rotundus L.	Dilo	Cyperaceae	Herb
18	Dichanthium annulatum (Forssk.) Stapf	Darbha	Poaceae	Herb
19	Digitaria abludens (Roem. & Schult.) Veldkamp	Bondya	Poaceae	Herb
20	Eclipta prostrata (L.) L.	-	Asteraceae	Herb
21	Eichhornia crassipes (Mart.) Solms	-	Pontederiaceae	Herb
22	Eragrostis tenella (L.) P. Beauv.	-	Poaceae	Herb
23	Euphorbia hirta L.	-	Euphorbiaceae	Herb
24	Ficus virens Dryand. ex Ait.	-	Moraceae	Tree

International Journal of Advance and Innovative Research Volume 8, Issue 2 (III) April - June 2021

_

25	Fimbristylis aestivalis Vahl	-	Cyperaceae	Herb
26	Glinus lotoides L.	-	Molluginaceae	Herb
27	Grangea maderaspatana (L.) Poir.	-	Asteraceae	Herb
28	Heliotropium supinum L.	Prostrate Heliotrope	Boraginaceae	Herb
29	Hydrilla verticillata (L.f.) Royle	-	Hydrocharitaceae	Herb
30	Hygrophila auriculata (Schum.) Heine	-	Acanthaceae	Herb
31	Ipomoea aquatica Forssk.	Vel	Convolvulaceae	Climber
32	Ipomoea carnea Jacq.	Bush Morning Glory	Convolvulaceae	Climber
33	Ipomoea marginata (Desr.) Verdc.	-	Convolvulaceae	Climber
34	Ipomoea pes-tigridis L.	-	Convolvulaceae	Climber
35	Ipomoea triloba L.	-	Convolvulaceae	Climber
36	Lantana camara L.	-	Verbenaceae	Shrub
37	<i>Launaea procumbens</i> (Roxb.) Ramayya & Rajagopal	Gadjepi	Asteraceae	Herb
38	Lawsonia inermis L.	Mahendi	Lythraceae	Shrub
39	Lemna minor L.	-	Lemnaceae	Herb
40	Limnophyton obtusifolium (L.) Miq.	-	Alismataceae	Herb
41	Ludwigia adscendens (L.) Hara	-	Onagraceae	Herb
42	Mangifera indica L.	Ambo	Anacardiaceae	Tree
43	Najas marina L.	-	Hydrocharitaceae	Herb
44	Nelumbo nucifera Gaertn.	Kamal	Nelumbonaceae	Herb
45	Nymphaea nouchali Burm.f.	Poynu	Nymphaeaceae	Herb
46	Polygonum plebeium R.Br.	-	Polygonaceae	Herb
47	Potamogeton crispus L.	-	Potamogetonaceae	Herb
48	Potamogeton nodosus Poir.	-	Potamogetonaceae	Herb
49	Prosopis cineraria (L.) Druce	Khijdo	Leguminosae	Tree
50	Prosopis juliflora (Sw.) DC.	Gando Baval	Leguminosae	Shrub
51	Rungia repens (L.) Nees	-	Acanthaceae	Herb
52	Salvadora persica L.	Piludi	Salvadoraceae	Shrub
53	Scirpus littoralis Schrad.	-	Cyperaceae	Herb
54	Senna auriculata (L.) Roxb.	Tarvad, Awal	Leguminosae	Tree
55	Sida cordifolia L	-	Malvaceae	Herb
56	Solanum surattense Burm. f.	Boyringni	Solanaceae	Herb
57	Sporobolus coromandelianus (Retz.) Kunth	-	Poaceae	Herb
58	Stuckenia pectinata (L.) Börner	-	Potamogetonaceae	Herb
59	Typha domingensis Pers.	Gha Bajariu	Typhaceae	Herb
60	Vachellia nilotica (L.) P.J.H. Hurter & Mabb.	Baval	Leguminosae	Herb
61	Vallisneria spiralis L.	-	Hydrocharitaceae	Herb
62	Ziziphus jujuba Mill.	Bor	Rhamnaceae	Tree
63	Ziziphus nummularia (Burm.f.) Wight & Arn	Chani-Bor	Rhamnaceae	Shrub

Volume 8, Issue 2 (III) April - June 2021

CONCLUSION

Anthropogenic activities have impacted on wetland ecosystem services across the world. Restoration of wetlands are needed. Present study show the species composition of aquatic angiosperm are play vital role for wetland sustainability as well as it can be consider throughout the wetland restoration activity. Study will also helpful to recreate wetland diversity precisely to Kheda District which have maximum number of wetland in Gujarat state. Furthermore, study can be also helpful for understanding the complexity of wetland ecosystem.

ACKNOWLEDGMENT

The authors are thankful to SHODH-Scheme Of Developing High quality research, Education Department, Gujarat State for facilitating Scholarship and also Gratitude for Gujarat Ecological Education and Research (GEER) Foundation, Gandhinagar for facilitating various training and workshop support. Gratitude are also due to the Gujarat Forest Department authorities managing Heranj wetlands. I particularly express my deep and sincere sense of gratitude to **Mr. Rupesh Maurya** who took special interest in my study and gave me valuable inputs during my entire work. I always remain indebted to **Dr. Archna A. Mankad**, Professor & Head, Department of Botany, University School of Sciences, Gujarat University, Ahmedabad. Her constructive criticism, continuous support and much needed motivation helped me to improve my work thought the tenure of my research.

REFERENCES

- 1. Brix, H. (1997). Do macrophytes play a role in constructed treatment wetlands?. *Water science and technology*, 35(5), 11-17.
- 2. Cooke, G. D., Welch, E. B., Peterson, S., & Nichols, S. A. (2016). *Restoration and management of lakes and reservoirs*. CRC press.
- 3. Ghosh, S. (2010). Wetland macrophytes as toxic metal accumulators. *International Journal of Environmental Sciences*, 1(4), 523-528.
- 4. Gu, B. (2006). Environmental conditions and phosphorus removal in Florida lakes and wetlands inhabited by Hydrilla verticillata (Royle): implications for invasive species management. *Biology*
- 5. Mitsch WJ, Gosselink G. Wetlands. New York: Van Nostrand Reinhold; 1986.
- 6. SAC. National Wetland Atlas. Ahmedabad, India: SAC/EPSA/ABHG/N WIAATLAS/34/2011, Space Applications Centre (ISRO); 2011.
- 7. Shah, G. L. (1978). Flora of Gujarat state.
- 8. Shardendu, S., Sayantan, D., Sharma, D., & Irfan, S. (2012). Luxury uptake and removal of phosphorus from water column by representative aquatic plants and its implication for wetland management. *ISRN Soil Science*, 2012.
- 9. Stanley, O. D. (2004). Wetland ecosystems and coastal habitat diversity in Gujarat, India. Journal of coastal development, 7(2), 49-64.
- Toth, L. A., & Anderson, D. H. (1998, March). Developing expectations for ecosystem restoration. In Transactions of the North American Wildlife and Natural Resources Conference(Vol. 63, pp. 122-134). Wildlife Management Institute.
- 11. Zweig, C. L., & Kitchens, W. M. (2008). Effects of landscape gradients on wetland vegetation communities: information for large-scale restoration. *Wetlands*, 28(4), 1086-1096.

INFLUENCE OF PHYSICO-CHEMICAL PARAMETERS ON DIVERSITY OF FRESH WATER ALGAE OF PALGHAR AND THANE DISTRICTS OF MAHARASHTRA

Chandra Prakash Shukla*, S. D. Ajagekar, G. G. Padhye and Muskan R. Dubey Thakur College of Science and Commerce, Kandivali (East), Mumbai

ABSTRACT

The paper presents the results of original studies of the species composition of algae in the freshwater bodies of Maharashtra (Western Ghat). In different reservoirs with 33 species of algae from 3 divisions were recorded in different reservoirs with 25 species of algae from 2 divisions were recorded. Present communication deals with morpho-taxonomic study of 33 taxa belonging to class Cyanophyceae, Chlorophyceae and Bacillariophyceae. Algal samples were collected from freshwater bodies of Ganesh kund, Shirgaon Fort, Gokhivare Talao, Vasai (E), Waliv Talao, Vasai (W), Achole Talao, Nalasopara (E), Palghar district and Kolshet lake as well as Heart Lake, Thane district of Maharashtra (Western Ghat). These taxa belong to 20 Genera, 27 species + 5 varieties. Class Cyanophyceae is represented by 7 genera, 14 species and Chlorophyceae is represented by 7 genera, 6 species 5 varieties. while class Bacillariophyceae is represented by 6 genera 7 species.

Key Words: Cyanophyceae, Chlorophyceae, Diatoms, Palghar, Thane, Maharashtra.

INTRODUCTION

Algae are diverse group of thalloid plants with unicellular sex organs. They exist either as single cell or multicellular organization (Round *et. al* 1990). Among the pioneer organisms which were capable of photosynthesis and evolving the oxygen, algae was one of them. It forms the base of aquatic food chain which support the giant food web. They are found in diverse habitats and greatly vary in size. Their size ranges from 0.5μ m (unicellular) in diameter to about 30 meters or more in length (*Macrocystis pyrifera*). Between these two extremities are thousand of unicellular, colonial, filamentous or leaf like bushy algae with myriads of shapes and complex designs.

Algae can tolerate a wide range of temperature and can be found in ice caps of mountains or deep within polar ice, hot water springs. Some forms of Blue-Green Algae can tolerate temperature as high as 85^o C. Genera like *Rapidonema, Scotiella, Chlamydomonas* and many other occur on snow and when abundant, form Red Snow at high altitude.

Science has attempted to classify and categorize the variability in nature for over a century. This led to an understanding of organization into communities of plants and animals. This information has helped in utilizing the earth's biological wealth for benefit of humanity and has been integral to the process of development.

Algal samples were collected by random sampling technique from different aquatic habitats of Palghar and Thane districts, in the month of April, May & June, 2019. All these collections were made in the plastic bottles (250ml.) and fixed in 3-4% formalin, immediately and the collection number, date and localities were marked, along with measuring pH, conductivity and TDS.

MATERIAL AND METHODS

Microscopic scrutiny of every sample was done by preparing glycerin mounted temporary slides to gather the information about number of the genera present and their dominancy recorded. Cyanophycean forms were stained with 1% aqueous Methylene blue, whereas Chlorophycean forms with Iodine solution.For Diatoms Patrick and Reimer (1966) method was applied by cleaning their frustules with modified conc. $H_2SO_4 - K_2Cr_2O_7$. For this purpose, the collection tube called 'Mixgen' was shaken vigorously and two drops of algal suspension were dropped on one side of a slide and then heated gradually so that the water evaporated, leaving behind the material dry. When the slide was completely dried, a drop of conc. H_2SO_4 was dropped on the material and heated again till the residue become brownish then it was decanted slowly. That procedure was carried out repeatedly till all the organic matter were completely digested. In the final step 3-4 drops of conc. H_2SO_4 were dropped on the material and slightly heated then few crystals of $K_2Cr_2O_7$ were added and again heated till the solution become yellow homogeneously. After 10 minutes, the solution was decanted and let the slide to become cool and dry. The traces of acid and $K_2Cr_2O_7$ were washed with distilled water and heated till it become dry. A drop of DPX (DistyrenePthalate Xylol) was put on the dried and cleaned diatom material and covered carefully with cover slip (Circular, No. 1). Several permanent slides were made of each compositive sample and those representing maximum taxa were chosen for the study.

Volume 8, Issue 2 (III) April - June 2021

The algal taxa were studied by examining their morphological characters and identification was confirmed by cross-checking with the authentic illustration and description of related monographs and journals available in the department.

Distribution of algal taxa has been shown on the basis of identifying taxa and frequency of occurrence of each genus is on the microscope visual basis and classified into four categories: (a) abundant (dominant): occurring homogeneously in large number in a locality; (b) frequent: occurring homogeneously in low number in a locality; and (d) absent; not occurring at all.

RESULT AND DISCUSSION

Algal samples were brought to the Laboratory, Botany Department, Thakur College of Science & Commerce, Kandivali (E), Mumbai, for detailed study on morpho-taxonomy of the algal samples. Species identification for Cyanophyceae have been done after Desikachary (1959), Prasad and Srivastava (1992), while genera belonging to Chlorophyceae are arranged according to Tiffany and Britton (1952) & Prescott (1951). Chlorococcalean forms have been identified after Philipose, (1967), Komarek & Fott (1983). Order Oedogoniales has been identified from Gonzalves (1981) and members of order Zygnematales (Conjugales) have been identified after West & West (1904-1912), Scott & Prescott (1961), while members from Bacillariophyceae have been identified after Gandhi (1958,1960,1962a & b) and from monograph by Gandhi (1999) Krammer and lange-Bertalot, (1986& 1988). Following taxa have been recorded from the different aquatic habitats of the study area. Microphotograph of most of them have been taken (presented in the Plate No. 1, 2 & 3). Measuring scales given for algal photographs and are mentioned above the scale. Collection., localities, date, temperature, conductivity, TDS, pH and Class wise representation of taxa and their abundance have been presented in the table form.

S.No.	Collection No.	Locality	Collection Months	Temp. ⁰ C	Conductivity (µS)	TDS (ppm)	рН
1.	Pal/Maha- 01 & 13	Ganesh kund, Palghar	7/04/19 & 16/06/19	27	190	300	7.60
2.	Pal/Maha- 02 & 14	Shirgaon Fort, Palghar	7/7/4/19 & 16/06/19	30	370	460	7.58
3.	Pal/Maha- 03 & 09	GokhivareTalao, Vasai (E)	21/4/19 & 26/05/19	33	320	140	7.66
4.	Pal/Maha- 04 & 10	WalivTalao, Vasai (W)	21/4/19 & 26/05/19	30	140	250	7.03
5.	Pal/Maha- 05 & 11	AcholeTalao, Nalasopara (E)	21/4/19 & 26/05/19	28	280	320	8.44
6.	Pal/Maha- 06 & 12	Virar Pond	21/4/19 & 26/05/19	32	180	280	7.32
7	Tha/Maha-07	Kolshet lake, Thane	12/05/19	31	190	290	7.91
8.	Tha/Maha- 08	Heart Lake, Thane	12/05/19	28	200	330	7.58

Table-1

Table. 2

S.No.	Class	Taxon	Sample Number	Abundance [abundant (+++), frequent (++), and rare (+)]
1.	Cyanophyceae	Chrococcusturgidus	Pal/Maha- 01, 9	++
2.	Cyanophyceae	Chroococcusminutus	Pal/Maha- 03	++
3.	Cyanophyceae	Aphanothecemicroscopia	Pal/Maha- 01	+
4.	Cyanophyceae	Syctonemabohneri	Tha/Maha- 07	++
5.	Cyanophyceae	Syctonemaschmidii	Pal/Maha- 02	++
6.	Cyanophyceae	Syctonemaocellatum	Pal/Maha- 03,06,11	++
7.	Cyanophyceae	Syctonemasp.	Pal/Maha- 03	+
8.	Cyanophyceae	Oscillatoria subbrevis	Pal/Maha- 05	++

International Journal of Advance and Innovative Research Volume 8, Issue 2 (III) April - June 2021

9.	Cyanophyceae	Oscillatoria princeps	Pal/Maha- 02	+++
10.	Cyanophyceae	Oscillatoria limosa	Pal/Maha- 06,11	++
11.	Cyanophyceae	Lyngbyakuetzingii	Tha/Maha- 08	+
12.	Cyanophyceae	Lyngbyatruncicola	Pal/Maha- 05	++
13.	Cyanophyceae	Anabaena sp.	Pal/Maha- 03	+
14.	Cyanophyceae	Nostoc sp.	Pal/Maha- 02,06,08	+++
15.	Chlorophyceae	Ulothrix sp.	Pal/Maha-06	+
17.	Chlorophyceae	Pediastrum simplex var. sturmii	Pal/Maha- 03	++
18.	Chlorophyceae	Coelastrumsp.	Tha/Maha- 07	++
19.	Chlorophyceae	Coelastrumreticulatumvar. reticulatum	Pal/Maha- 06	+
20.	Chlorophyceae	Coelastrumpulchrumvar. pulchrum	Pal/Maha- 05,09	+++
21.	Chlorophyceae	Scendesmusacutusvar. Acutus	Tha/Maha- 07,12	++
22.	Chlorophyceae	Scendesmusovalternusvar. graevenitzii	Tha/Maha- 08	+
23.	Chlorophyceae	Scendesmusacuminatus	Pal/Maha- 01	+++
24.	Chlorophyceae	Cosmarium botrytis	Tha/Maha- 07	+
25.	Chlorophyceae	Spirogyra sp.	Pal/Maha- 02	++
26.	Chlorophyceae	Oedogonium sp.	Pal/Maha- 04	+
27.	Bacillariophyceae	Melosiragranulata	Tha/Maha- 07,	+
28.	Bacillariophyceae	Pinnularia sp.	Pal/Maha- 03,10,11	+++
29.	Bacillariophyceae	Gomphonemaparvulum	Pal/Maha- 06	++
30.	Bacillariophyceae	Cymbellasp.	Tha/Maha- 08	+++
31.	Bacillariophyceae	Cymbellacymbiformis	Pal/Maha- 04	+
32.	Bacillariophyceae	Surirellasp.	Tha/Maha- 08	++
33.	Bacillariophyceae	Synedra ulna	Pal/Maha- 04,03,05,08	+++

Table- 2: Class wise Distribution of taxa and their abundance

PHOTO PLATE:-1



Volume 8, Issue 2 (III) April - June 2021

Explanation of Figures

A.Chrococcusturgidus(Kutz) Nag. (After Smith). B.AphanothecemicroscopiaNag.
 C.SyctonemabohneriSchmiddle. D. S. schmidii(after Frémy). E. S. ocellatumLyngb. (after Frémy). F. Oscillatoria subbrevisSchmidle. G. O. princeps Vaucher (Orig). H. LyngbyakuetzingiiSchmiddle. I. L. truncicolaGhose. J & KUlothrix sp.



PHOTO PLATE:-2

Explanation of Figures

A & B.Pediastrum simplex var. sturmii(Reinsch) Wolle. C.Coelastrumsp. D. C.reticulatum(Dang.) Senn var. reticulatum. E & F. C. pulchrumSchmiddle var. pulchrum. G. ScendesmusacutusMeyen var. acutus. H. S. ovalternusChod. var. graevenitzii(Bernard) Chod. I.Oedogonium sp.

PHOTO PLATE:-3



Explanation of Figures

A.*Melosiragranulata* (Ehrenberg) Ralfs. **B**. *Pinnularia* sp. **C**. *Gomphonemaparvulum* (Kützing) Kützing. **D**.*Cymbellasp.* **E**.*Cymbellacymbiformis* C.Agardh. **F**. *Surirellasp. G*. *Synedra ulna* (Nitzsch) Ehrenberg

Volume 8, Issue 2 (III) April - June 2021

DISCUSSION

In the present study, a total of 33 taxa belonging to 3 different classes viz. Cyanophyceae, Chlorophyceae & Bacillariophyceae of fresh-water algae have been studied.

Class Cyanophyceae has been represented by order Chroococcales and Nostocales with a total 14 taxa belonging to 7 genera and 14 species. Class Chlorophyceae has been represented by order Volvocales, Chlorococcales, Oedogoniales and Zygnematales. Total taxa of the class chlorophyceae are 11, belonging to 7 genera and 6 species and 5 varieties. Class Bacillariophyceae has been represented by order Melosirales, Naviculales, Cymbellales, Surirellales and Fragilariales. Total taxa of the class Bacillariophyceae are 7, belonging to 6 genera and 7 species.

CONCLUSION

This study aimed at understanding the impact of physico-chemical factors on species richness of the algae in different fresh water bodies community existing in different aquatic bodies. Temporal and spatial variation is attributed to the anthropogenic activities viz. use of chemical fertilizer, other agrochemicals and land use system which favored the growth of certain forms while others were inhibited.

Temp, pH, conductivity and TDS varies from place to place which alter the species composition and species richness of that water body

Some forms are dominating the communities while others were represented by few genera, species, variety or forma.

In the class Cyanophyceae, *Syctonema* occur dominantly and represented four species and *Oscillatoria* with 3 species .; while in Chlorophyceae, Genus *Coelastrum* with species 3 and 2 variety is the most dominating genera of the study area. *Scendesmus* is the second dominating genus by 3 species and 2 variety .

In class Bacillariophyceae, *Cymbella*occurs dominantly with 2 species, *Pinnularia* and *synedraulna* were also dominant.

From the present study it can be concluded that water bodies are eutrophic in nature particularly due to planktonic Cyanophytes Chlorophytes with the orders Chlorococcales and Desmidales recorded in both the readings. Chlorophyceans forms can be used in the prediction of trophic status of the water body. The enrichment due to the different sources like leaf litter from the terrestrial vegetation growing in nearby area causing the increased organic nutrients and altering the composition of freshwater ecosystem. So regular cleaning and clearing of the waterbodies can keep away from algal bloom in future and to preserve and conserve the water resource.

ACKNOWLEDGEMENT

Authors are indeed grateful to the Management and Dr. (Mrs.) C. T. Chakraborty, Principal, Thakur College of Science & Commerce, Kandivali East, Mumbai for providing infrastructural facilities, encouragement & moral support throughout the tenure of the study. We are also very much thankful to support staff from the Department of Botany for their support and cooperation during the study.

REFERENCES

- Desikachary, T.V. 1959. Cyanophyta, A monograph, I.C.A.R., New Delhi.
- Dixon, C. and Wilken R.L. 2018. *Green microalgae biomolecule separations and recovery*. Vol. V. Pub. Bioresources and Bioprocessing, pp 1-24.
- Gandhi,, H.P, 1958. Fresh water Diatoms from Kolhapur and its immediate environs. *J. Bomb. Nat. Hist. Soc.* **55**(3): 493-511.
- Gandhi, H.P. 1960.Fresh water diatom flora of the Panhalgarh Hillfort in the Kolhapur district. *Hydrobiol.***14** (2): 93-129.
- Gandhi, H.P. 1962a. Some freshwater diatoms from Lonavla Hill-Station in the Bombay-state (Maharashtra). *Hydrobiol.* **20** (2): 128-154.
- Gandhi, H.P. 1962b. The diatom flora of the Bombay and Salsette Island-II. *Nova Hedwigia***3**(4): 469-506.
- Gandhi, H.P. 1999. Fresh water diatom of Cental Gujrat. B. Singh and M.P. Singh. Deharadun, India. 324p.
- Gonzalves, E.A. and Jain, S.C. 1970. Some Oedogoniaceae from near Thana district. *Phykos*9(1-2): 1-16.

Volume 8, Issue 2 (III) April - June 2021

- Gonzalves, E.A. 1982. Oedogoniales, I.C.A.R. monograph on algae. New Delhi. 757p.
- Hortobagyi, T. (1973). The microflora in the settling and subsoil water enriching basins of the Budapest water works. (Translated by L. Zambori). AkademiaiKiado-Budapest, pp 341.
- Komarek, J. and Fott, B. 1983. Das Phytoplankton des Süβwasser systematic und Biologie. E. Schweizesbart'scheVerlagsbuchhandlung. 1044 pp.
- Krammer, K. and lange-Bertalot, H. 1986. Bacillariophyceae: Süβwasser flora von Mitteleuropa. Band 2/1. Gustav Fischer verlag Stuttgart. New York, 876 p.
- Krammer, K. and lange-Bertalot, H. 1988. Bacillariophyceae: Süβwasser flora von Mitteleuropa. Band 2/2. Gustav Fischer verlag Stuttgart. New York, 596 p.
- Philopose, M.t. 1967. Chlorococcales. ICAR New Delhi. 365pp.
- Patrick, R. and Reimer, C.W. 1966. The diatoms of the United States, exclusive of Alaska and Hawaii. Monograph of the Academy of Natural Sciences, Philadelphia, No. 13. Vol. I. 688p.
- Prasad, B.N. and Srivastava, M.N. 1992. *Fresh water algal flora of Andaman and Nicobar Islands*. Vol. I.B Singh and M.P.Singh Pub. Dehradun, India. 369 pp.
- Prasad, B.N. and Misra, P.K. 1992. *Fresh water algal flora of Andaman and Nicobar Islands*. Vol. II. B. Singh and M.P.Singh Pub. Dehradun, India. 284 pp.
- Prescott, G.W. 1951. Algae of the Western great lakes area. W.M.C. Brown Publishers, Dubuque, Iowa. 977pp.
- Round, F. E., Crawford, R. M. & Mann, D. G. 1990. The Diatoms. Biology and morphology of the Genera. *Cambridge University Press, Cambridge*, 747 pp.
- Scott, A.M. and Prescott, G.W. 1961. Indonesian desmids. *Hydrobiologia*17: 1-132.
- Shukla, C. P., Singh, D. R. & Yadav, S. R. 2018. Algofloristic Studies of the of Palghar district of Maharashtra, India. *Phykos* 48 (2): 6-12.
- Singh, D. R., Yadav, S. R. & Shukla, C. P. 2017. Studies on freshwater algae of Mumbai and it's Environs. *Phykos* 47 (2): 85-94.
- Sumaiya, K. & Singh, N. 2017. *Phytoplankton Dynamics of Fresh Water Lake Varhala in Thane District, Maharashtra.* Vol. XVII Issue III Version I Pub. Global Journal of Science Frontier Research (H), pp 13-18.
- Tiffany, L.H. and Britton, M.E. 1952. *The Algae of Illinois*. Hafner Publishing Comp., New York, 407.
- West, W. and West, G.S.1904-1912. Desmidiaceae: A monograph of the British Desmidiaceae, 1: 1-224, 1904; 2: 1-204, 1905; 3: 1-272. 1908; 4: 1-191,1912. Ray Society, London

TAXONOMIC STUDY OF THE LICHEN DIVERSITY IN SANJAY GANDHI NATIONAL PARK MUMBAI (M.S.) INDIA

Rafi Ahmed*, More Pranay Dayanand and Rukhsar Bano Ansari

Department of Botany, Maharashtra College of Arts, Science & Commerce, Mumbai (M.S.) India

ABSTRACT:

This study recorded 8 genera and 11 species of the Lichen. Employing a combination of classical field inventory and Morphological characteristics like the presence or absence of isidia, or whether or not the surface was ridged or smooth, and chemical attributes like the results of the medulla reaction were of profound importance within the differentiation of species biodiversity and evolution of lichens and associated fungi in Sanjay Gandhi Park, Mumbai (India).

KEYWORDS: Anatomy, Chemistry, Morphology, Biodiversity, Evolution

INTRODUCTION

Lichens are a complicated body that's a symbiotic partnership of two separate organisms, a fungus, and an algal. The dominant partner is that the fungus provides the Lichen most of its characteristics, from its thallus shape to its fruiting bodies. The alga is usually either a green alga or a blue-green alga, otherwise mentioned as cyanobacteria. Many lichens will have both kinds of algae. Lichens can grow in diverse climates and on various substrates. The lichens growing on trunk and bark are called Corticolous Lichens; Twing inhabiting ones are Ramicolous, on wood – Legnicolous, on Rocks and boulders – Saxicolous (Epithelic), on Mosses- Muscicolous, on Soil- Tericolous and on Evergreen leaves- Folicolous (Epiphyllous). Generally, any Lichen growing on another plant is known as Epiphytic. The Lichen can grow on underwater Rocks but not accessible in water or on Ice. The Lichens are cosmopolitan in most of the Phytogeographical regions of the earth. Sufficient moisture, Light and Altitude, Unpolluted air, and undisturbed, perennial substratum often favor the expansion and abundance of Lichens.

India features an upscale diversity of lichens as represented by 2,300 species belonging to 305 genera and 74 families, about 10% of the 20,000 lichen species reported from the planet (Singh and Sinha,2010). this estimate of lichen representation in India must be reassessed as more unexplored areas (Negi and Gadgil,1996; Negi and Upreti,2000). Maximum lichen diversity in India is reported from South India and Eastern Himalayas so far (Awasthi, 1988). Lichen studies have initiated a touch late in India as compared to the rest of the earth. Aquarius (1810, 1814) described four species of Lichens in India. During the 40s, the faculty of Lichenology in India was established by Dr. D. D. Awasthi. Following various lichenological investigations, works were initiated. Awasthi(1991) recorded the occurrence of about 13,000 Lichen species from the Indian subcontinent. Awasthi(1988;1991) keyed out both micro and macro Lichens from India's different regions.

Among the 20,000 lichen species known worldwide, 95% belong to the Ascomycetes group of fungi. In contrast, Basidiomycetes and Deuteromycetes groups represented by only 3% and a few species, respectively.

The study area's higher plant vegetation is broadly classified as temperate mixed oak and coniferous forest through the sub-alpine forest to alpine scrub or grassland along the altitude gradient (Gadgil and Meher-Homji 1990). The area harbors more than 250 vascular plant species (Semwal and Gaur 1981) and 177 species of mosses (Negi and Gadgil 1997), besides supporting a rich diversity of fauna, including the highly endangered musk deer.

MATERIALS AND METHODS:

8 genera and 11 species of lichens from Sanjay Gandhi Park were identified using a microscope, while a Dissecting microscope (Nikon SMZ645) was wont to Identify Morphological Characters, Colour, Size, and Shapes.

Lichens preservation techniques are drying the collecting samples on small containers, and section of pieces is by jiffy deepening the instances it becomes soft then take the Thallus area and observed the Anatomical characters. Anatomical Characters of the Thallus, Apothecium, Perithecium, Pycnidium were observed under a microscope. In Chemical Test were used during identifications are potash (KOH), hypochlorite (CaClo2), Iodine, Para-phenylenediamine C6H4u(NH2)2, and a few other reagents like HNO3, H2SO4, HCL are rarely used for the specific color reaction. Iodine within the Lugols solution is employed to assist microscopical examination of asci; it's made by dissolving 0.5g of iodine and 1.5g of potassium iodide in 100ml of water. Another sort of iodine is Melzer's solution formed by dissolving 1.0g of iodine, 1.5g of Potassium iodide in

Volume 8, Issue 2 (III) April - June 2021

50ml water, plus 50g of sedative. In advantages are that it clears the preparation, making complex structures more transparent; its high viscosity prevents flow movement of spores. Thin hand-cut sections were observed in water and Lactophenol cotton blue solution.

Additionally, a Dissecting microscope was wont to investigate Morphological thallus structure. The various lichens occurred in several substrata; alongside the lichen collection, the small print of locality, date of supply, substratum, and Altitude were also recorded. The groups made during the daytime were placed in separate sterile bags or collection bottles with details of locality, date of supply, field number, collector, and other ecological notes. The recent literature of Awasthi(1988,1991), Upreti(1988), Singh (1994 and 1997), and Upreti(1984) was consulted for the identification of most of the Lichen taxa.

RESULTS AND DISCUSSION:

Botanical Name: Usnea sp.

Diagnostic characteristics:

The thallus is radiate fructose, the attachment to the substratum is by a basal disc or hold - fast formed by mycobiont hyphae, which penetrate to the substratum thallus growth, is apical from the upper lichenized part. The fronds are usually branched, cylindrical, and subcylindrical or flattened strap shape.

Apothecia are disc-shaped, up to 0.5-0.8 mm in diameter, disc color is greenish-brown, and the asci are bitunicate, cylindrical.

Chemistry: Thallus k+, medulla K-, K C+ Brown.

Habitat and Distribution: The species is found growing on bark at altitudes of between 30m (98ft.) and 480m (1,570ft).

Botanical Name: Dirinaria sps.

Diagnostic characteristics:

The thallus is crust over the substratum, greyish-green in color, small granules-like surface. Apothecia are absent. Soredia (vegetative reproductive organ) are present.

Chemistry: Thallus K+ (yellow), medulla KC+ (Light Yellow), C-.

Habitat and Distribution: The species growing on bark growth is favored by humid weather. Its altitude range is 1,555 ft.

Botanical Name: Chrysothrix sps.

Diagnostic characteristics:

The thallus is a Leprose type of powdery or granular surface. Lack an outer skin or cortex. It contains algal cells and fungal hyphae with no overlapping cortex. The Colour is yellowish–green.

Chemistry: Thallus K+ (Light yellow), medulla KC+ (Light yellow), C+(yellow).

Habitat and Distribution: The species growing on bark growth is flavored by moist weather. Its altitude range is 1,000 ft.

Botanical Name: Heterodermia sps.

Diagnostic characteristics:

Foliose Lichen attached on the substratum (Wood), i.e., Lignicolous Lichen. Whitish color, Pro straight to the substratum, irregular, branched thallus. Rhizomes are present. Algae and fungal mycelium are present.

Chemistry: Thallus K+(Yellow), medulla KC+(Red), and C+(Yellow).

Habitat and distribution: Grow on tree bark and deadwood. Its altitude range is 1,230ft.

Botanical Name: Heterodermia sps.

Diagnostic characteristics:

Foliose Lichen, the thallus, is prostrate, branched lobed, greenish. Rhizines are present with dichotomous branching. Apothecia having a short stalk, and maturity is whitish, and apothecia are brown. The ascus is a cylindrical, Pachysporaia type of ascospores.

Volume 8, Issue 2 (III) April - June 2021

Chemistry: Thallus K+ (Yellow), medulla KC+ (Red), and C+ (Yellow).

Habitat and distribution: Grow on tree bark and grows in the Rainy season. Its altitude range is 1,680ft.

Botanical Name: Heterodermia sps.

Diagnostic characteristics:

Foliose Lichen, the thallus, is a prostrate closely attached to the substratum, profusely branched, and lobes are branched, overlapping to each other. It is white in color. Rhizines are present on the ventral surface & it is dichotomous. Cylindrical asci are present, and ascospores are Pachysporia type.

Chemistry: Thallus K+ (Brown), Medulla C-, KC+ (Yellow).

Habitat and distribution: Grow on tree bark & grown in moist weather.

Botanical Name: Endpcarpon sps.

Diagnostic characteristics:

Thallus firmly forms a crust over the substrate and is attached to eat and spherical in shape. There is an upper cortex in early development, but no lower cortex and the medulla directly contact the substrate. The thallus surface (sexual reproductive structure) apothecia are present about 2mm in diameter, disc color is dark brown, and the disc's margin is whitish in color.

Chemistry: Thallus K+ (Brown), Medulla C+ (Light yellow) & KC+ (Yellow).

Habitat and distribution: Grow on bark bamboo & at Altitude is 11m (36ft).

Botanical Name: Dirinaria sps

Diagnostic characteristics:

Corticolous lichen whitish color thallus is irregularly arranged on the substratum. It is squamulose type lichen. It shows a symbiotic relationship with mosses.

Chemistry: Thallus K+ (Yellow), Medulla C- & KC+ (Yellow).

Habitat and Distribution: Grows on tree bark & mainly found in the winter season.

Botanical Name: Lepraria sps

Diagnostic characteristics:

Saxicolous Lichen is attached to the rock. The thallus is a branched thallus, whitish color, smooth, flat over the substratum. Algae and Fungal mycelia are present; spores are small, spherical.

Chemistry: Thallus K+(Brown), Medulla C- and KC+(Yellow).

Habitat and distribution: Growing over Rock at an elevation of 300 - 500 mm.

Botanical Name: Physcia sps.

Diagnostic characteristics:

Crustose Lichen, Thallus is green in color, irregular, crust over the substratum's surface; the surface is rough, cracked-areolate.

Chemistry: Thallus K+ (Yellow), Medulla C- & KC+ (Brown).

Habitat and Distribution: Grows on tree bark & mainly found in winter weather.

Botanical Name: Pertusaria sps

Diagnostic characteristics:

Crustose Lichen, Thallus is whitish, spherical, crust over the substratum. Algae and fungal mycelium, aseptate, branched, and spores are small, spherical in nature.

Chemistry: Thallus K+ (Yellow), Medulla C+(Brown) & KC+ (Orange).

Habitat and Distribution: Grown on Tree bark and mainly occurred in the winter season.

L) Botanical Name: Heterodermia sps.

ISSN 2394 - 7780

Volume 8, Issue 2 (III) April - June 2021

• Diagnostic characteristics:

Foliose Lichen, Thallus is greenish, vegetative branching lobes loosely attached to the substratum, and it grows Lichen over to the Lichen, irregular patches. Fungal mycelia aseptate branched, the spore is small and spherical, and algae are Trebouxia.

Chemistry: Thallus K+ (Yellow), Medulla C-, & KC+ (Brown).

Habitat and Distribution: Grows on Tree bark and mainly occurred in Rainy

Season.



Fig: a-:Usnea species,b-:Dirinaria sps.,c-:Chrysothrix sps.,d-:Heterodermia sps. e-:Heterodermia sps.,f-:Heterodermia sps.,g-:Endpcarpon sps. h-:Dirinaria sps.,i-:Lepraria sps.,j-:Physcia sps.,k-:Pertusaria sps.

RESULTS AND DISCUSSION

CONCLUSION:

The study revealed 8 genera of lichens from Sanjay Gandhi Park Mumbai, characterized by their different structure and chemical characterization for taxonomical identifications.

ACKNOWLEDGEMENT:

Authors are thankful to people that shared their knowledge about the taxonomy of lichens. We are also grateful to Maharashtra College's principal for giving us all the support for completing scientific research.

REFERENCES:

- Negi H R and Gadgil M 1996 Patterns of distribution of macrolichens in western parts of Nanda Devi Biosphere Reserve; Curr. Sci. 71 568–575.
- Negi H R and Upreti D K 2000 Species diversity and relative abundance of lichens in Rumbak catchment of Hemis National Park in Ladakh; Curr. Sci. 78 1105–1112.
- Awasthi D D 1988 A key to the macrolichens of India and Nepal; J. Hattori Bot. Lab. 65 207–302.

Volume 8, Issue 2 (III) April - June 2021

- Awasthi D D 1991 A key to the microlichens of India, Nepal, and Sri Lanka (Berlin: J Cramer).
- Gadgil M and Meher-Homji V M 1990 Ecological diversity; in Conservation in developing countries: Problems and prospects (eds) J C Daniel and J S Serrao (Bombay: Bombay Natural History Society) pp 175–198.
- Semwal J K and Gaur R D 1981 Alpine flora of Tunganath in the Garhwal Himalaya; J. Bombay Nat. Hist. Soc. 78 498–512.
- Negi H R and Gadgil M 1997 Species diversity and community ecology of mosses: a case study from Garhwal region of Western Himalayas; Int. J. Ecol. Environ. Sci. 23 445–462.
- Upreti D K and Negi H R 1998 Lichen flora of ChoptaTunganath, Garhwal Himalayas, India; J. Econ. Tax. Bot. 22 273–286.
- Upreti D K 1984 Lichens: the great benefactors; Appl. Bot. Abst. 14 164–175.
- Singh K P and Sinha G P 1994 Lichen flora of Nagaland (Dehra Dun: Bishen Singh Mahendra Pal Singh)
- Singh K P and Sinha G P 1997 Lichens; in Floristic diversity and conservation strategies in India, Vol. 1 Cryptograms and Gymnosperms (eds) V Mudgal and PK Hajra (New Delhi: Botanical Survey of India) pp 195–234.

Volume 8, Issue 2 (III) April - June 2021

IMPACT OF EDUCATION FOR SUSTAINABLE DEVELOPMENT ON GEN Z

Ms. Rama Ray

Assistant Professor, Thakur College of Science and Commerce, Kandivali (E), Mumbai

ABSTRACT

Education for Sustainable Development (ESD) encourages the growth of the Knowledge, Skills, Understanding, Values and Activities required to construct an Ecological World. It guarantees Ecological Safety and Conservation, endorses Social Equity and encourages Economic Sustainability. Education for Sustainable Development offers an exhilarating vision of an interdisciplinary and learner-centered approach to endow the GEN Z [people born from 1995 to 2010] to advance a pro-social and environmental program in their organizations, communities and personal lives. As a result of these universal advances, the Next Generation have a growing and immediate need for education that goes beyond career aspirations. Environment Sustainability protects both the wellbeing of future generations and the earth's ability to renew, as such the Environment plays a central role in human Society and in turn in the Economy. The three important pillars of Sustainable Development - Economy, Society and Environment are symbiotic and reciprocally fortifying concepts and needs to be supported. To make concept a reality and to save Mother Earth, the GEN Z can play major role for which they need to be prepared.

KEY WORDS: Education, Sustainable Development, GEN Z, Ecological Safety, Symbiotic, Fortifying

INTRODUCTION "Without Environmental Sustainability, Economic Stability and Social Cohesion cannot be achieved." Phil Harding

In today's interconnected world, information can be easily acquired. Information that experts once acquired as an outcome of years of research are now easily available on the Internet Today's education requires knowing what to do with information, that is, how to analyze it; make sense of its abundance and complexity; cooperate with others to synthesize information; and communicate the results. The Next Generation of learner, popularly known as Gen Z, deliberates, act and study differently as they have been born in Tech Era. Consequently, quality education is no longer based primarily on fact acquisition, as such it needs to be tailored according to the changing times and requirements of the GEN Z.

The Tech Era learners want and expect innovative viewpoints so that they are capable of comprehending the swiftly altering realm they are living in. More than that, they feel the need to be part of the change in this world. Several of them are inclined to aid in lessening poverty, safeguard the environment and build all-encompassing societies. To fulfill the Goals, a new approach to education is desirable. Sustainability Education offers this alternate methodology, training and educating learners as universal citizens for sustainable development. Education for Sustainable Development's prime target is the enhancement of the standard of life for people without harming the atmosphere. ESD also includes the Social and Human Rights elements along with the environment. To educate the GEN Z makes it imperative for the educationalists to use technology as an essential part of training, as it facilitates research-based learning.

OBJECTIVES

- > To examine the challenges of executing Education for Sustainable Development.
- > To assess the impact of Education for Sustainable Development on the GEN Z.

HYPOTHESIS

- H₀: There is no significant Impact of Education for Sustainable Development on GEN Z. Vs.
- H₁: There is a significant Impact of Education for Sustainable Development on GEN Z.

RESEARCH METHODOLOGY

- Primary Source Data collection through a structured questionnaire.
- Secondary Source Books, Journals, Newspaper, Internet etc.

LITERATURE REVIEW

• The notion of excellence persists repeatedly in worldwide instructive treatise. For example, the World Educational Forum on Education for All (EFA) has advocated value education in its EFA agenda and

objectives. The agenda has six objectives; calls for: Refining every facet of the value of education, and guaranteeing...quality so that accepted and quantifiable knowledge outcomes are attained by all, specifically in literacy, proficiency and crucial life skills. (UNESCO, 2000, p. 17).

- The economist opinion of edification uses quantifiable assessable outputs as a quantity of excellence. For example, registration ratios and retaining rates, rates of return on investment in education in terms of incomes and intellectual accomplishment as measured in national or international tests. (Barrett et al., 2006, p. 2)
- The humanist custom highlights edification as a procedure, with the learner at the epicenter of that course. Objectives of education comprise broader societal aims (e.g., human rights, social justice and democracy) and individual goals. The humanist custom is founded on the reflection that youngsters have an inherent attention and aptitude to acquire. It targets to cultivate the whole persona as well as ingenuity and problem-solving skills. Presently, humanist tactics are defined with terms such as student aligned, participative and independent. Moreover, they hold present-day apprehensions of human rights and environmental sustainability (Barrett et al., 2006; Kumar & Sarangapani, 2004).
- Sustainability: focuses on performance modification and recognition of responsibilities...in a course of goal-setting, policymaking, and assessment (Nikel & Lowe, 2010, p. 599). This aspect attends to the longer-term prospect over the present and to the international as much as the local (p. 599).
- The seven elements integrate features of the three models of educational quality stated before. The Nikel and Lowe (2010) agenda accepts essential facets of well-known models of excellence in education. Moreover, the agenda is beneficial to this research study on the contributions of ESD to value education.
- Education for Sustainable Development lets every human being to obtain the information, expertise, outlooks and standards needed to shape a sustainable future. Education for Sustainable Development means comprising key sustainable growth matters into education and learning; for example, climate change, disaster risk decrease, biodiversity, poverty reduction, and sustainable depletion.
- It also necessitates participating in teaching and learning techniques that inspire and endow students to alter their behavior and take steps for sustainable development. Education for Sustainable Development therefore endorses proficiencies like critical thinking, visualizing future situations and making decisions in a collective way. Education for Sustainable Development needs in-depth modifications in the way teaching is often practiced currently. UNESCO, 2014

RATIONALE

The UN's Sustainable Development Goals (SDGs) were implemented in 2015 as the worldwide call to act for overcoming poverty and hunger, safeguard the planet and guarantee inclusion, peace and affluence for all by 2030. Agenda 2030 is playing a very significant part in shaping future living circumstances. However, without energetic involvement from people the program cannot be effective at a broader scale. As such accepting of SDGs and steps to achieving them needs to be assimilated in the daily lives of common people, as early as possible. GEN Z can play a very significant role in achieving the SDGs to save Mother Nature and Humanity. They can be made aware of the environmental issues and the impact it will have on their lives and future with the help of Modern Technology.

Modern Technology as a medium of Communication and Instruction has become an integral part of the education system in the 21st Century. Like everything else the way to teach and educate our next generation needs to change according to the demands of the times. Education for Sustainable Development is an essential step towards ensuring a better and safer future. In the present scenario effective use of Modern Technology in delivering the message of UN's Sustainable Development Goals (SDGs).

DATA ANALYSIS & INTERPRETATION

The GEN Z lives in the Access Economy; as such they do not have to depend on possessing things. Success, according to them is determined by their involvement in the world community, how efficiently connected to numerous information sources, and how many planet's problems is he or she solving. This shift in style should be dealt appropriately and swiftly. The situation has different stratums influencing how 17 SDGs should be presented. To make it even more appealing for GEN Z's needs and lifestyle, Education on Agenda 2030 should include at least three actions:

Integrating SDGs into familiar and interesting themes: Popular Cartoons, Online Games etc.;

✓ Delivering On-Demand Access: responsive and interactive digital platform with constant gamification;

Volume 8, Issue 2 (III) April - June 2021

✓ Engaging individuals with challenges: creating various exercises around 17 SDGs.

FIGURE 1



• 83% Respondents said YES there is a positive impact of ESD, 10% said NO & 8% said MAYBE

FIGURE -2

GEN Z PRIORITY LIST







GEN Z preferred taking action to bring about changes through various means like Petition, Protest; Donation & Boycott

FIGURE - 4

SOCIAL MEDIA AS A CHANGE MAKER



GEN Z believes in using Social Media to learn about various issues, generate awareness as well as to communicate their thoughts across a wide variety of spectrum.

SUGGESTIONS

All the countries across the globe need to induct Education for Sustainable Development in their curriculum overcoming the challenges of executing the policies. It is the only way to bring about real change and secure the future of our planet Earth. Governments should collaborate with the Corporates in their respective countries to implement Green Strategies for the well-being of their citizens and GEN Z can be instrumental in the whole process of change.

- ESD should be introduced in the curriculum in an interdisciplinary and all-inclusive manner, agreeing for a whole-institution methodology for policy making.
- Share the ideals and ethics that reinforce sustainable development.
- Endorse critical thinking, problem solving and action, all of which develops confidence in dealing with the challenges to Sustainable Development.
- Implement a variety of educational methods, such as Literary Work, Art, Drama and Debate to demonstrate the processes.
- Motivate learners to contribute in the policymaking of the structure and content of Educational programs.
- Include local as well as global matters, and avoid jargon-ridden language and terms.
- Look to the future, guaranteeing that the content has a long-term perspective and uses medium and long-term planning.

CONCLUSION

As Netizens, GEN Z prefers using Social Media not only to learn about various issues, but also to create significant change. They genuinely think Social Media Engagement can lead to substantial change. The youth believe that Social Media Engagement assembly can bring together a Cross-Sector and Cross-Generational group of people who share a passion for the SDGs.

GEN Z (born after 1995) have made their presence known and are formally creating considerable shifts through the world of Education and Business. They are also popularly known as "The Sharing Generation." Generation Z (Gen Z) are very much different than their previous generations. But just as the earlier generations is

Volume 8, Issue 2 (III) April - June 2021

challenged certain things and brought change in the way of thinking, learning & doing business they have also changed Higher Education and how employment works in business.

An fascinating fact is GEN Z are inclined to make their selection of higher education based on their passion, mainly in the way the qualification provides entree to the career that interests them and rewards them monetarily. Overall, their main apprehension related to education is whether or not they will be able to find a Good and well-paid career after completion of studies but at the same time they are actively involved in the process of Sustainable Development.

REFERENCES

- Amit Dutta and A. V. Senthil Kumar, "Analysis and Predictions on Students' Academic Performance Using ID3 Algorithm", International Journal of Data Mining and Emerging Technologies Volume 7, Number 2, November, 2017, pp. 107-113, DOI: 10.5958/2249-3220.2017.00014.3
- Barrett, A. M., Chawla-Duggan, R., Lowe, J., Nikel, J., Ukpo, E. (2006). The concept of quality in education: A review of the 'international' literature on the concept of quality in education (EdQual Working Paper No. 3). Bristol, the UK: EdQual RPC.
- Chahal, M. (2015). Higher Education in India: Emerging Issues, Challenges and Suggestions. International Journal of Business Quantitative Economics and Applied Management Research, 1(11), 67-74.
- Chawla Deepak & Sondhi Neena, Research Methodology concepts and cases, Vikas Publishing house Pvt ltd, (2011).
- Dunking, Michael, J. (1987) The International Encyclopedia of Teaching and Teacher Education Oxford, Pergamum Press.
- Kumar, K. (2010). Quality in education: Competing concepts. Contemporary Education Dialogue, 7(1), 7–18.
- Thanky, P. (2013). Education System in Present Scenario: Problems & Remedies. IndianJournal of Applied Research, 3(7), 166-167. Retrieved September 19, 2017.
- Jonassen, D. H. (1996). *Computers in the classroom: Mind tools for critical thinking*. Columbus, OH: Prentice Hall.
- Nolet, V. (2016). Education for sustainability: Principles and practices for teachers. New York: Routledge.
- Tilbury, D. (2011). Education for sustainable development: An expert review of processes and learning. Paris: UNESCO.
- United Nations Educational, Scientific and Cultural, Organization (UNESCO). (2012b). Exploring Sustainable Development: A multiple perspective approach. ESD in Action, Learning and Training Tools No. 3. Paris: UNESCO.
- http://www.unesco.org/new/en/unesco-world-conference-on-esd-2014/resources/what-is-esd/
- https://journals.sagepub.com/doi/full/10.1177/0973408216661442

WILDLIFE CORRIDOR GEOMETRY DESIGN USING COMPUTATIONAL APPROACH

Amit Maurya, Vallabh Saklani and Akshata Gupta Shree L. R. Tiwari College of Engineering

ABSTRACT

A wildlife corridor is a link of wildlife habitat, generally native vegetation, which joins two or more larger areas of comparable wildlife habitat. this permits an exchange of people between populations, which could help prevent the negative effects of inbreeding and reduced genetic diversity (via genetic drift) that sometimes occur within isolated populations. Corridors may additionally help facilitate the re-establishment of populations that are reduced or eliminated thanks to random events (such as fires or disease).

We demonstrate our approach on two realistic landscapes and present numerical results on several computergenerated landscapes. The computational results indicate that this approach is efficient and might address problems controlling corridor geometry that were previously thought intractable. The approach has potential applications in such areas because the selection of routes or barrier construction problems, an example of which is fire break design.

In this paper, we use graph theory, membership functions and chain code algorithm to model and style a group of wildlife. We identify the parameters which might affect the animal's population in an exceedingly landscape complex and using the presence of those identified parameters construct a graph using the habitat patches supporting animal presence within the landscape complex as vertices and therefore the possible paths between them as edges.

Key Words: Sustainable, Graph theory, path planning, Chain code algorithm, Landscape complex, Corridor, Computational approach.

INTRODUCTION

Wildlife corridors, as we all know from the definition above, are integral components of ecological landscapes. The objective of wildlife corridors is to ease the movement of processes and organisms between considered areas in the landscape. Corridors are those regions within a given landscape that generally include native vegetation, and connect otherwise disconnected, fragmented, non-contiguous wildlife habitat patches within the focal landscape

Corridors, being essential components of landscapes, are characterized by two distinct categories of components, namely, pattern and process components. The structural corridor and therefore the functional corridors present the categories of wildlife corridors. The structural categorization refers to the geographical existent of the landscape between the focal patches and therefore the functional corridor could be a result of both – species and landscape. Hence, a functional wildlife corridor refers to both, species - additionally as landscape-specific concepts. Corridors thus could also be considered as evolving phenomena, caused by the interaction between process and pattern attributes of the realm. The essential function and utility of wildlife corridors is thus to attach a minimum of two key habitat areas of biological significance, and thus ensure gene flow between spatially separate populations of species, fragmented thanks to landscape modifications, by helping the movements of both biotic and abiotic processes

OBJECTIVE

- 1) Wildlife corridors prefer to avoid human interaction and areas of exposure for the animals to get benefits.
- 2) To design a feasible animal corridors networks which can connect the habitat patches for animals' corridors.
- 3) To put an effort on conserving the animal, we need to find the important habitat patches with their community structures.
- 4) We need to design corridors in such way that it can interconnected with existing habitats.
- 5) The major purpose is to provide a computational framework to understand the animal corridors and its network design.
- 6) An approach that employs path planning techniques from artificial intelligence for controlling corridor geometry. It will help the user to control and optimize the geometric characteristics of wildlife corridors.

Volume 8, Issue 2 (III) April - June 2021

7) This will help to maintain the richness of species at landscape and patch. Thus, maintaining ecosystem processes such as pollination.

METHOD

4.1 Graph theory

For the aim of this work, we assume that the animal habitat patches in India constitute the vertices and also the collection of connections within this complex that connect any two of the habitats constitute the sides, comprising the focal landscape complex as a graph $\Gamma(V,E,\psi_{\Gamma})$. The existence of a grip between any two vertices represents some ecological flux, like animal movement, between the adjacent vertices.

To model the possible paths to function passages for animals from one habitat patch to a different habitat patch within any considered landscape complex, we first identify a group landscape factors or parameters, which can be natural or anthropogenic, and every of which can either constrain or support the passage of the animal through the focal landscape matrix to numerous degrees, and hence become the main determinants within the structural connections becoming a corridor. For describing the current model, we consider five parameters a, b, c, d, and e.

We assume that animals within the landscape (Θ 1) and the set of above-mentioned parameters of the landscape (Θ 2) constitute the 2 rational agents that play the peace of mind game G iterated over a variety of generations. The players may use a variety of strategies within the game so as to optimize their payoff. These payoffs are the prices sustained by the animal population (called animal henceforth within the paper) in using the landscape matrix for movement between habitats.

Next, we code the different animal habitats included in the focal landscape complex, by the following table:

S.No	Tiger habitat	Code
1	H1	1
2	H2	2
3	H3	3
4	H4	4

Table 1. Coding for the tiger habitats in the complex.

In order to explain the model, we create a random landscape image as shown in figure 1.



Fig 1. Sample landscape complex

4.2 Chain code Algorithm

For the present theoretical modelling we assume the following order of the scores, which can be correctly obtained using the presence, absence and abundance data of Remote Sensing and GIS:

S13 = S31 < S12 = S21 < S34 = S43 < S23 = S32 < S24 = S42 < S14 = S41

Using the above scores, we can rank the grids using the chain code algorithm which can be seen as:

ISSN 2394 - 7780

Volume 8, Issue 2 (III) April - June 2021



Let the DFA that models the corridor designing and improving the landscape conditions for supporting the movement of animals be $\Delta(Q,\Sigma,q,\delta,h)$,

where Q is that the set of states, Σ is that the alphabet, the set of input symbols or letters, $q \in Q$ is the initial state, δ is that the transition function that prescribes the mapping of the automaton from one state to the following in time steps of $t \in N$, h is that the set of ultimate states, the theorems during a Turing machine.

We list the objects comprising Δ within the following paragraphs: Q comprises the subsequent states, which represent the various states of grids that the animal encounters while moving through it:

- Initial State(I)
- Not favourable state (NFS)
- Fairly favourable state (FFS)
- Moderately favourable state (MFS)
- Favourable state (FS)

The alphabet Σ = comprises the letters (inputs for the automata), which are the parameters present in the grid to play G. I is that the initial state, representing the initial state of a grid which appears because the animals move out from the territorial region. The transition function δ is described by the subsequent matrix:

Letter 🔿	а	b	с	d	e
State 🖊					
I	MFS	FS	NFS	FFS	NFS
NFS	FFS	FS	NFS	FFS	NFS
FFS	MFS	FS	NFS	MFS	NFS
MFS	FS	FS	FFS	FS	NFS
FS	FS	FS	FFS	FS	NFS

Transitions of Δ to various states

4.3 Eldorado Dataset

To demonstrate the utilization of the OCCA, we consider a component of the Eldorado National Forest in California . The test dataset was obtained from the Forest Management Optimization Site, a landscape data repository housed by the University of latest Bruncwick (FMOS 2014).

Volume 8, Issue 2 (III) April - June 2021

The landscape is assumed to comprise parcels that are both suitable wildlife habitats and available for sale to be included during a wildlife corridor. the target is to urge a subset of the parcels in such a way so core habitat patches (represented by dark polygons) are connected with a corridor of maximal width. the acquisition price of each parcel is assumed to be proportional to their size and the available budget B is sufficient for getting only 15% of the total expanse. Due to computational limitations, it's impractical to give some thought to every contiguous set of parcels as potential polygon. For this study, we limited the polygon set to any or all of the 1,282 individual parcels, plus 527 polygons that comprised multiple parcels not exceeding a combined area of 20 hectares. The data included 5 polygons with holes. This resulted in an exceedingly total of 1,814 polygons and 112,000 gate pairs.

CONCLUSION

Wildlife corridors are region with given landscape to connect the habitat with the landscape which will help to facilitate the movement of processes between intact habitat areas. The identified parameters can affectively in a particular landscape complex of animal habitation and by using all this information we can graph the patches supporting the animal presences as a vertices in landscape complex and thus creating the possible path inbetween them as a vertices.

Wildlife corridors will make sure of the long term survival of animal habitat. The wildlife management should aim to enhance the habitation of the animal. From the complex landscape viewpoint of the animal habitat, a corridor is a linear habitat of which is embedded into dissimilar matrix which connects Two or more blocks of habitat which is main purposed of conservation to maintain viability of specific wildlife population in the block. Thus, we hope that our present efforts to make available of computational approach for the wildlife and designing the complex landscape through incorporating data from realistic consideration.

REFERENCES

- 1) Yumnam B, Jhala Y D, Qureshi Q, Maldonado J E, Gopal R, Saini S, Srinivas Y, Fleischer R C (2014) Prioritizing animal conservation through landscape genetics and habitat linkages. PLoS ONE 9(11):e111207.
- 2) Wikramanayake E, McKnight M, Dinerstein E, Joshi A, Gurung B, Smith D (2004) Designing a conservation landscape for animal in human-dominated environments. Conservation Biol. 18(3): 839 844.
- Le Bras, R., B. Dilkina, Y. Xue, C.P. Gomes, K.S. McKelvey, M.K. Schwartz and C.A. Montgomery. 2013. Robust Network Design for Multispecies Conservation. Proceedings of the 27th AAAI Conference on Artificial Intelligence, AAAI 2013, 1305-1312.
- Alig, R., A. Platinga, S. Ahn and J. Kline. 2003. Land use changes involving forestry in the United States: 1952 to 1997, with projections to 2050. USDA Forest Service General Technical Report. PNW-GTR587. USDA Forest Service, Pacific Northwest Research Station, Portland, OR. 92p.
- 5) Chew, L. 1989. Constrained Delaunay Triangulations. Algorithmica 4 97-108. CPLEX, IBM ILOG 2011. http://www.ibm.com/software/integration/optimization/cplex/.
- 6) Conrad, J., C. Gomes, W. van Hoeve, A. Sabharwal and J. Suter. 2012. Wildlife corridors as a connected subgraph problem. J. Environ. Econ. Manag. 63 1-18.
- Dilkina, B. and C.P. Gomes. 2010. Solving connected subgraph problems in wildlife conservation. Lodi A., M. Milano and P. Toth, eds. Integration of AI and OR Techniques in Constraint Programming for Combinatorial Optimization Problems . Lecture Notes in Computer Science, Vol. 6140 (Springer Berlin), 102-116.
- 8) Harris, L. D., Gallagher, P. B., 1989. New initiatives for wildlife conservation: the need for movement corridors. In Preserving Communities and Corridors G. Mackintosh (ed.) Defenders of Wildlife, Washington D.C. pp.96.
- Jhala, Y. V., Gopal, R., Qureshi, Q., (eds.) 2008. Status of Tigers, Co-predators and Prey in India. National Tiger Conservation Authority, Govt. of India, New Delhi, and Wildlife Institute of India, Dehradun. TR08/001 pp-151.
- 10) Minor, E. S., Urban, D. L., 2008. A graph-theory framework for evaluating landscape connectivity and conservation planning. Conservation Biol. 22(2): 297 307.

Volume 8, Issue 2 (III) April - June 2021

- 11) Onal, H. and Y. Wang. 2008. A graph theory approach for designing conservation reserve networks with " minimal fragmentation. Networks 51 142-152".
- 12) Axelrod, R., Hamilton, W. D., 1981. The evolution of cooperation. Science 211: 1390 1396 and Axelrod, R., 1984. The Evolution of Cooperation, Basic Books Inc., New York.
- 13) St John, R., K. Ohman, S.F. T'oth, P. Sandstr'om, A. Korosuo and L. Eriksson. 2016. Combining spatiotem- " poral corridor design for reindeer migration with harvest scheduling in Northern Sweden. Scand. J. For. Res. 31(7) 655-663.
- 14) FMOS- Forest Management Optimization Site. 2014. Forest Management Optimization. Accessed February 12, 2014, http://ifmlab.for.unb.ca/fmos/.
- 15) Baum, K. A., Haynes, K. J., Dillemuth, F. P., Cronin, J. T., 2004. The matrix enhances the effectiveness of corridors and stepping stones. Ecology 85(10): 2671 2676.

Volume 8, Issue 2 (III) April - June 2021

STUDY ON BLENDING OF GROUNDNUT OIL WITH OTHER VEGETABLE OILS AND ITS INFLUENCE ON PHYSICOCHEMICAL PROPERTIES

Dnyaneshwari Kulkarni¹, Dr. Gitesh Padhye^{2*}, Dr. Ravindra D. Kulkarni¹

¹Department of Oils, Oleochemicals and Surfactants Technology, Institute of Chemical Technology, Matunga (E), Mumbai 400019, India ²Thakur College of Science and Commerce, Thakur Village, Kandivali, Mumbai

ABSTRACT

Vegetable oil is a major component of the everyday diet and plays an important role in the functioning of the human body. Single unmixed oil has low shelf life, usefulness, nutritional value and consistency. Therefore, to fulfil the constraints for a certain properties and food applications, it is necessary to use a mixture of various vegetable oils. In Maharashtra, groundnut oil has great consumer acceptability. Considering that groundnut oil was blended with rice bran oil, sunflower oil and mustard oil. The blends were taken in the ratio of 1:1. Physicochemical properties like acid value, Saponification value, Iodine value, pH, Fatty acid profile, refractive index, colour range, etc. were evaluated. The result of the present study will help the oil producing industry to find out the most economically viable oil blends for cooking purposes, with maximum nutrition as well as desirable physico-chemical properties.

Key words: Blending of oils, Groundnut oil, stability, physio-chemical properties.

1.0 INTRODUCTION:

The prevalence of sedentary lifestyle results in health issues and diseases. Sitting at the office desks from 9 to 5 is rising dramatically. So, organic food is now becoming more important to a large number of people than chemically treated food. Everyone is focusing on a healthy diet and safe food, as nobody wants to compromise their health. A healthy diet is a balance between both micro and macro nutrients along with fats [1,2]. Avoiding fats in the diet may have an adverse effect on the body functioning [3]. Yet oils and fats still remain unvalued. These days, people choose fat-free diet and face health issues related to fat and oil. Dietitians emphasize the need of fats in the human body.

Fat plays an important role in the biological functions of the human body. The fats cover nerve cells and help to pass electrical messages[4]. A significant part of the human brain is also made of fat. They track the entry and exit of substances through the cell wall[5]. They aid in the synthesis of steroid hormones in the body and also keep our skin and bones healthy[6]. Thus, fats are essential for the control of many biological processes.

In the meanwhile, it has been shown that switching cooking oils more often is better for the health than sticking to the one particular oil [7]. There is no pure vegetable oil available having good functional and nutritional properties with sufficient oxidative stability[7]. So, the concept of blending oils and fats entered, which is a combination of two or more oils or fats, giving the best of both the worlds. These oils are marketed as healthier alternatives to conventional cooking oils. Blending can enhance the shelf life, use, nutritional value and stability of the oils and fats[8]. Two blended oils have a better balance of PUFAs (polyunsaturated fatty acids), MUFAs (monounsaturated fatty acids) and SFAs (saturated fatty acids)[9]. Essential fatty acids status (omega 3 and omega 6), cholesterol level, tocopherol and other nutritional compositions can be accomplished by blending two or more vegetable oils[10]. It may also increase the antioxidants and enzymes activity and minimize

hepatic lipid peroxidation and oxidation of LDL (low density lipoproteins – bad cholesterol)[11]. Each vegetable oil has its own different composition, so the oils used in the blend can determine the overall nutritional composition of the final blend. The resulting properties can be achieved by blending both oils is good for our heart and increases immunity[12]. So, dietitians recommend blended oils in place of traditional oils. If you are not used to blended oils, then using a combination of two different oils for cooking can also help. For example, sunflower or safflower oil can be used for one meal and groundnut or mustard oil can be used for another.[13, 14]. Whatever the blend may be, but the fact that every gram of oil contains 9 calories does not change[3,11]. When taken in excess, blended oils can still cause health problems[11,12]. The quantity should be well contained to prevent adverse health effects. The quantity should be well contained to prevent adverse health effects. So, the main thrust of this work is to study vegetable oil blends of groundnut oil and other vegetable oils with a specific emphasis on the stability and physico-chemical properties of oil blends such as acid value, saponification value, iodine value, pH, refractive index, colour, FFA content, etc.

Volume 8, Issue 2 (III) April - June 2021

2.0 EXPERIMENTAL SECTION:

Vegetable oils such groundnut oil(G), rice bran oil(R), sunflower oil(S), and mustard oil(M)were purchased from local market of brand Gemini. All the analytical chemicals and solvents like KOH, HCl, ethanol, neutral alcohol, distilled water, starch indicator, phenolphthalein indicator, hexane, KI, chloroform, wij's solution, sodium thiosulphate, etc.

used during experiments were supplied by different vendors.

- **2.1 Preparation of Blends:** Groundnut oil was mixed with other vegetable oils such as rice bran oil, sunflower oil, and mustard oil in the ratio of 1:1. Each blend (GR, GS, GM) of weight 100gm was taken in 250 ml of beaker and stirred on magnetic stirrer at 200rpmat 60^oC for 1hr.
- **2.2** Acid Value: Acid value was determined by titration method of ASTM D1980-87. As per this method, take 3gm of sample in 250 ml of conical flask. Dissolve it in 50 ml of ethanol. Add 2-3 drops of phenolphthalein indicator and titrate against 0.5N alcoholic KOH until pale pink colour appears[15]. Calculate the acid value with given formula,

Acid Value = 56.1 × ml of KOH cosumed × Normality of KOH solution

Weight of the sample in gram

2.3 Saponification Value: Saponification Values were determined by ASTM D 5558-95. As per this method. Weigh 5gm sample in 250 ml of conical flask. Add 25 ml of alcoholic KOH in it and put it on hot water bath with condensers for an hour to dissolve the sample in alcoholic KOH. Titrate the sample against 0.5 N HCl using phenolphthalein indicator[16]. This formula is used to calculate saponification value,

 $Saponification Value = \frac{56.11 \times (Blank - Sample) \times Normality of HCl}{2}$

Weight of sample in gram

2.4 Iodine Value: AOCS Official Method Da15-48 method was used to determine the iodine value. 3gm of sample is mixed with 20ml of chloroform and 25ml of wij's solution. Keep it in dark for 30 mins. Add 20 ml KI solution and titrate against 0.5 N Sodium Thiosulphate till brown colour gets disappeared using starch indicator[17]. Formula to calculate Iodine value,

 $Iodine Value = \frac{12.69 \times (Blank - Sample) \times Normality of Sodium Thiosulphate}{Weight of samle in gram}$

- **2.5 Refractive Index:** The refractive indices of the blends and oil samples were measured by using the ATAGO Pocket Refractometer with controlled temperature at 24°C.
- **2.6 Color:** Lovibond tintometer was used to measure colour of the samples at controlled temperature. The colour unit are calculated by given formula, Colour units = Y+5R Where, Y= Yellow colour ; R= Red colour
- 2.7 Free Fatty Acids: Free Fatty Acid composition of oils is calculated by given formula,

Acid Value

FFA % = 2

In case of NaOH, then,

Acid Value

FFA % = 1.42

2.8 pH: pH of the blends and oil samples was checked by digital pH meter (Labman) at ambient temperature.

3.0 RESULTS AND DISCUSSION:

- **3.1** Acid value: The acid value (AV) is a common parameter in the specification of quality of fats and oils. The acid values are used to calculate the degree to which lipase and other physical factors such as light and heat have decomposed glycerides in the oil. So, the acid value of the blends i.e., GS, GR, GM is markedly low than single unmixed groundnut oil which shows good lubrication properties. Low acid value prevents the oxidation which ultimately results in the good shelf life of oil blends at ambient temperature[18].
- 3.2 Saponification Value: It is a measure of the average molecular weight (or chain length) of all the fatty

acids present as triglycerides in the study. The higher the saponification amount, the lower the average length of fatty acids, the lighter the average molecular weight of triglycerides and vice versa[19]. Thus, from above data, saponification value of groundnut oil and their blends with mustard oil, sunflower and rice bran oil, is similar to this.

3.3 Iodine value: Iodine value is used to calculate unsaturation or the average number of double bonds in fats and oils. A high iodine value suggests a high degree of unsaturation[20]. The present study shows that the groundnut and sunflower oil blend has the higher iodine value so has good drying properties. Furthermore, the blends which show lower amount of iodine value, suggest that amount of unsaturated fatty acids.

Parameters	Ground Oil	GS Blend	GR Blend	GM Blend
Acid Value (in mg KOH/g)	0.61±0.01	0.32±0.01	0.56±0.01	0.54±0.01
Iodine Value	96.02±0.01	119.7±0.01	100.02±0.01	98.03±0.01
Saponification Value (in mg KOH/g)	194.35±0.01	192±0.01	189.01±0.01	188.02±0.01
Colour (in units)	6±1	3±1	7±1	25±1
Refractive Index (at 24.5 °C)	1.4685±0.01	1.4709±0.01	1.4703±0.01	1.4702±0.01
Free Fatty Acids (in %)	0.30±0.01	0.16±0.01	0.28±0.01	0.27±0.01
pH	7.34±0.01	6.97±0.01	7.00±0.01	6.80±0.01

Table no. 1 Physico-chemical properties of groundnut oil and its blends

- **3.4 Free Fatty Acids:** Free fatty acids (FFA) in plant oils and fats (e.g., edible oils and fats) are a quality feature for these oils. Blended oils have better balance of polyunsaturated fatty acids, monounsaturated fatty acids than single unmixed groundnut oil[21,22].
- **3.5 pH:** Oils and fats have a pH-value on a scale of 0 (extremely acid) to 14 (extremely alkaline), and they are around 7 in most cases. With very few exceptions, they are neutral. The study shows that all three blends have a neutral pH so lowers down the degradation process and improves shelf life and stability.
- 3.6 Gas Chromatography Analysis:



Figure. 1 GC Chromatogram of Groundnut oil and GM, GR, GS Blends

Volume 8, Issue 2 (III) April - June 2021

Fatty acids composition of oil blends was determined by gas chromatography Shimadzu Lab Solutions by method 41 ming/cm. Fig. 1 shows the GC chromatogram of oil blends whichconfirms the presence of thevarious fatty acids such as palmitic, stearic, linoleic, arachidic, erucic, myristic, lignoceric, behenic acids, etc. and the main unsaturated fatty acid is oleic acid.

	Key Fatty Acids	Retention Time	Concentration
1	Palmitic acid	11.055	10.942
2	Stearic acid	14.558	3.021
3	Oleic acid	14.937	59.318
4	Linoleic acid	16.306	21.645
5	Arachidonic acid	22.025	1.484
6	Lignoceric acid	22.638	3.590

Table no. 2 Groundnut Oil

Table no. 3 GM blend

	Key Fatty Acids	Retention Time	Concentration
1	Palmitic acid	11.366	10.411
2	Stearic acid	14.825	2.677
3	Oleic acid	15.223	48.353
4	Linoleic acid	16.601	22.135
5	Arachidonic acid	22.162	1.382
6	Erucic acid	22.680	15.042

Table no. 4 GR Blend

	Key Fatty Acids	Retention Time	Concentration
1	Palmitic acid	10.964	14.983
2	Stearic acid	14.570	2.216
3	Oleic acid	14.945	48.463
4	Linoleic acid	16.205	32.806
5	Arachidonic acid	22.124	0.792
6	Lignoceric acid	22.796	0.551
7	Myristic acid	8.614	0.189

Table no. 5 GS Blend

	Key Fatty Acids	Retention Time	Concentration
1	Palmitic acid	10.916	9.631

ISSN 2394 - 7780

Volume 8, Issue 2 (III) April - June 2021

2	Stearic acid	14.466	2.997
3	Oleic acid	14.946	51.240
4	Linoleic acid	16.126	31.466
5	Arachidonic acid	21.937	1.633
6	Lignoceric acid	22.555	3.033

3.7 Infrared Spectroscopy Analysis:



Figure 2 IR Spectroscopy of Groundnut oil, GM, GR, GS Blends

Fourier transform infrared spectroscopy (FTIR). The chemical structure of vegetable oil and its blends verified on FTIR 8400 (Shimadzu, Japan) using the transmittance method at a range of 4000–400 cm–1 and 4 cm–1 of resolution. Figure. 2 shows the FTIR spectrum groundnut oil and its blends. The characteristic peak at 3008 cm -1 are attributed to the stretching frequency of unsaturation (C=C). The absorption peak is 1738 cm -1 corresponding to the stretching frequency of the ester carbonyl (–C=O). The characteristics peak at range of 2861–2936 cm -1 represent -CH 2 - symmetric and asymmetric stretching of long chain fatty acid from vegetable oil. The peaks at 1108 cm -1 attributed to stretching vibration of -C-O, which reports the ester linkages from vegetable oil.

CONCLUSION:

Fats and oils are the basic ingredients having different physico-chemical and nutritional properties which can be modified by blending. Groundnut oil was successfully blended with rice bran oil, sunflower oil and mustard oil. The blends prepared in the ratio of 1:1 were stable at room temperature and showed good physico-chemical properties .Blended oils are more stable to the physical and chemical reactions which occur during cooking. The
Volume 8, Issue 2 (III) April - June 2021

GC analysis showed fatty acids present in the blend and FTIR confirmed the functional groups present in the blends and structure of the components present in the blends. So, the shelf life, utility. characteristic nutritional composition and stability can be controlled and enhanced by blending fats and oils for the betterment of the human health.

ACKNOWLEDGEMENT:

I am thankful to Dr. Amit Pratap (H.O.D. At ICT, Mumbai) for allowing me to work in ICT laboratories and special thanks to Rakhi Patil, Pavan Paraskar and Deepak Sonawane for great support and encouragement.

REFERENCES:

- [1] R. W. Warne, "The micro and macro of nutrients across biological scales," Integrative and comparative biology, vol. 54, no. 5. pp. 864–872, Nov. 01, 2014, doi: 10.1093/icb/icu071.
- [2] A. Mousa, A. Naqash, and S. Lim, "Macronutrient and micronutrient intake during pregnancy: An overview of recent evidence," Nutrients, vol. 11, no. 2. MDPI AG, Feb. 01, 2019, doi: 10.3390/nu11020443.
- [3] A. L. Carreiro et al., "The Macronutrients, Appetite, and Energy Intake," Annual Review of Nutrition, vol. 36. Annual Reviews Inc., pp. 73–103, Jul. 17, 2016, doi: 10.1146/annurev-nutr-121415-112624.
- [4] L. Montani et al., "De novo fatty acid synthesis by Schwann cells is essential for peripheral nervous system myelination," Journal of Cell Biology, vol. 217, no. 4, pp. 1353–1368, Apr. 2018, doi: 10.1083/jcb.201706010.
- [5] J. T. Sanderson, "The steroid hormone biosynthesis pathway as a target for endocrine-disrupting chemicals," Toxicological Sciences, vol. 94, no. 1. pp. 3–21, Nov. 2006, doi: 10.1093/toxsci/kfl051.
- [6] L. Schiffer et al., "Human steroid biosynthesis, metabolism and excretion are differentially reflected by serum and urine steroid metabolomes: A comprehensive review," Journal of Steroid Biochemistry and Molecular Biology, vol. 194. Elsevier Ltd, Nov. 01, 2019, doi: 10.1016/j.jsbmb.2019.105439.
- [7] S. C. Manchanda and S. J. Passi, "Selecting healthy edible oil in the Indian context," Indian Heart Journal, vol. 68, no. 4. Elsevier B.V., pp. 447–449, Jul. 01, 2016, doi: 10.1016/j.ihj.2016.05.004.
- [8] S. Gulla, K. Waghray, and U. Reddy, "Blending of oils-does it improve the quality and storage stability, an experimental approach on soyabean and palmolein based blends," American Journal of Food Technology, vol. 5, no. 3, pp. 182–194, 2010, doi: 10.3923/ajft.2010.182.194.
- [9] Y. Li et al., "Heating quality and stability of aqueous enzymatic extraction of fatty acid-balanced oil in comparison with other blended oils," Journal of Chemistry, vol. 2014, 2014, doi: 10.1155/2014/530787.
- [10] M. Alagawany et al., "Omega-3 and omega-6 fatty acids in poultry nutrition: Effect on production performance and health," Animals, vol. 9, no. 8. MDPI AG, Aug. 01, 2019, doi: 10.3390/ani9080573.
- [11] J. Chen and H. Liu, "Nutritional indices for assessing fatty acids: A mini-review," International Journal of Molecular Sciences, vol. 21, no. 16. MDPI AG, pp. 1–24, Aug. 02, 2020, doi: 10.3390/ijms21165695.
- [12] D. Lairon, "Invited commentary on Mediterranean diet, fats and cardiovascular disease risk: What news?," British Journal of Nutrition, vol. 82, no. 1. CAB International, pp. 5–6, 1999
- [13] A. F. G. Cicero and A. Gaddi, "Rice bran oil and γ-oryzanol in the treatment of hyperlipoproteinaemias and other conditions," Phytotherapy Research, vol. 15, no. 4. pp. 277–289, 2001, doi: 10.1002/ptr.907.
- [14] B. Chugh and K. Dhawan, "Storage studies on mustard oil blends," Journal of Food Science and Technology, vol. 51, no. 4, pp. 762–767, Apr. 2014, doi: 10.1007/s13197-011-0540-8.
- [15] Q. Zhang, J. Wu, P. Ma, J. Cai, and Y. Zhang, "Acid Value Determination and Pre Esterification of Crude Euphorbia lathyris L. Oil," World Journal of Engineering and Technology, vol. 3, pp. 70–75, Apr. 2015, doi: 10.4236/wjet.2015.32007.
- [16] "Fat and Oil Saponification value of Fat and Oil Acid-base titration (non aqueous) by Automatic Potentiometric Titrator."
- [17] R. Chandra Gupta and G. Kanwar, "Determination of Iodine Numbers of Edible Oils," American Association for Clinical Chemistry, 1984.
- [18] S. Devarajan et al., "A Blend of Sesame and Rice Bran Oils Lowers Hyperglycemia and Improves the

Volume 8, Issue 2 (III) April - June 2021

Lipids," American Journal of Medicine, vol. 129, no. 7, pp. 731–739, Jul. 2016, doi: 10.1016/j.amjmed.2016.02.044.

- [19] P. M. K, "Physico-chemical properties of groundnut oil and their blends with other vegetable oils," Available online www.jocpr.com Journal of Chemical and Pharmaceutical Research, vol. 6, no. 8, pp. 60–66, 2014, [Online]. Available: www.jocpr.com.
- [20] A. Dhyani, R. Chopra, and M. Garg, "Chemical Science Review and Letters A Review on Blending of Oils and Their Functional and Nutritional Benefits," Chem Sci Rev Lett, vol. 7, no. 27, pp. 840–847, 2018.
- [21] A. Vani, R. Laxmi, and B. Sesikeran, "Effects of Dietary α α-Linolenic Acid from Blended Oils on Biochemical Indices of Coronary Heart Disease in Indians," 2002.
- [22] H. Benefits, "Review on: Blending of Oils, their Properties."

ANTIFUNGAL ACTIVITY OF KOKAM LEAF EXTRACT

Dr. Abhijit Sahasrabudhe

Research Laboratory, Department of Botany, K.V.Pendharkar College of Arts, Science and Commerce, Dombivli (E), Thane, MS, India

ABSTRACT

Dandruff is a common disorder affecting the scalp. The genus Malassezia is the main causative agent of dandruff. This fungus lives and feeds on human skin, causing the itching and flaking associated with the condition. Out of 17 different species, Malassezia furfur and Malassezia globosa are the main cause of dandruff. In recent years plant based products are widely used as therapeutic weapon to cure human disorders. The plant Garcinia indica (Kokam) belonging to family Clusiaceae native to India is one of such plants which has shown many therapeutic uses. The present study shows the anti-dandruff activity of leaf extract of G.indica against Melassezia globosa Out of two screened fractions (ethyl acetate and water fraction), ethyl acetate fraction showed zone of inhibition 9 ± 0.34 mm and 12.3 ± 0.12 mm at 80 and 100 % concentration respectively

Key words: Dandruff, Malassezia globosa, leaf extract, inhibition, Garcinia indica

INTRODUCTION:

Dandruff (pityriasis, capitis, seborrheic dermatitis confined to scalp) is a disease that has been around for centuries despite of several treatment options. It is a common scalp disorder affecting almost half of the pubertal population of both genders but most prevalent in male population between age group of 20 to 60 years ¹. It is the major cosmetic problem which causes a great public health concern both in the developed as well as developing countries. Dandruff is characterized by slight to moderate scaling of the scalp with varying degrees of sensations of dryness. Characteristics flaking and scaling of the scalp suggest impairment in the desquamation process. In most of the dandruff affected people, hair fall is a very common problem.

Dandruff and dry scalp are mostly used interchangeably by almost everyone because of similar symptoms. Dry scalp lacks moisture which causes dryness and itchy scalp followed by the shedding of small flakes of dead scalp cells due to scratching. The causes of the dry scalp can be dehydration in the body, poor diet or environmental conditions. Dandruff occurs due to the overproduction of the sebum and excessive action of yeast-like fungus known as *Malassezia*. This yeast feeds on the excessive oil sebum and on dead scalp cells resulting in the faster renewal process and further leads to the frequent shedding of scalp cells which fall off in the form of visible flakes. *Malassezia* (formerly called as *Pityrosporum*), yeast like lipophilic basidiomyctous fungi is considered to be the chief cause of dandruff problem which is present as scalp commensal ² Lipid dependant *Malassezia* yeasts are commonly found on human skin in particular in the upper part of the body, where sebum secretion is highest ³. Though dandruff is associated with scalp, flakes may also appear on face, nose and eyebrows as well as on the skin behind the ears and neck. Due to impact of male hormone testosterone, the sebaceous glands are stimulated to secrete more sebum which enhances the microbial growth and also associated formation of dandruff on scalp.

ACTION OF THE FUNGUS:

Though there are seven different species of *Malassezia* found, till date the species *M.globusa*, *M.restricta* and *M.furfur* have been mostly related with dandruff in human beings ⁴. *M.globosa* is an important causal factor for dandruff. Synthesis of lipase by species *Malassezia* hydrolyzes triglycerides which then release oleic acid that attracts neutrophils towards them. As a result neutrophils release the reactive oxygen species and cytokines that aggravate scalp by causing the dermal inflammation and tissue damage⁵. *M.globosa* is the most likely initiating organism by virtue of its high lipase activity, and that an *M.globosa* lipase is expressed on human scalp. As a result the corneocytes present in the epidermis clump together to form large flakes on the skin which causes irritation and uneasiness ⁶. Therefore, effective treatment is the need of the hour for people suffering from dandruff formation.

In the current scenario, many synthetic chemical substances are used for treating dandruff. The main active agents present in it are imidazole derivatives such as ketoconazole and other compounds such as selenium sulphide, zinc pyrithione, piroctone olamine, cipropirox olamine and many others. They act by removing the scalp thereby reducing *Malassezia* species adherence to corneocytes and inhibit its further growth. Pharmacological properties of medicinal plants may be used as leads in developing novel therapeutic agents. Today herbal products and extracts are widely used to control various human diseases. Medicinal plants are providing an efficient local aid to the health care and disease free life. They contain physiological active

Volume 8, Issue 2 (III) April - June 2021

constituents that over the years have been exploited in traditional medicine for the treatment of various alignments⁷. India is rich in biodiversity and has a wide spectrum of habitats from tropical rainforests to alpine vegetation and from temperate forests to coastal wetlands. About one third of the country's recorded flora is endemic and is concentrated mainly in the North-East, Western Ghats, and North-West Himalaya. Western Ghats of India are known for their valuable biodiversity and has been considered as one amongst the top most important eight hotspots in the world⁸. This hotspot of biodiversity is a treasure house of genetic resources of many plant species. Garcinia indica (family- Clusiaceae) is one such tree species endemic to tropical rain forests of Western Ghats of India. Its fruits are a rich source of Hydroxycitric Acid (HCA), an important biologically active plant metabolite used as anti-obesity and anti-cholesterol drug. The fruits are also used to prepare a pleasant attractive beverage which has bilious action. The fat extracted from the seeds is used in cosmetics as emollient. A lot of work has been carried out on various aspects of extracts separated from fruit rinds of G.indica. Fruit rind extracts have shown good anti hyaluronidase and anti elastase properties ⁹. Researchers demonstrated anti microbial and cytotoxic effects of fruit rinds of G.indica. Garcinol and Hydroxycitric Acid (HCA) present in G.indica have showed significant anti oxidant and anti hyperlipidemic activity ¹⁰. But there are very few reports on anti dandruff activity of *Garcinia indica*. Taking this into consideration it was decided to screen various fractions of leaf extract of G.indica for their anti dandruff ability against *M.globosa*.

MATERIALS AND METHODS:

- 1. Microorganism used: The test organism used in this study *Malassezia globosa* was of clinical origin
- 2. Reagents and chemicals: Organic solvents used were of analytical grades (Merck and Qualigen). Sabouraud's Dextrose agar (M286) was purchased from Hi Media, Mumbai.
- 3. Preparation of leaf extracts:
- **a. Preparation of Methanolic Extract:** The methanolic extract (ME) was prepared by immersing (10 gms) of fresh leaves of *G.indica* in 100 ml of acidified methanol (1% Concentrated HCl). The extract was poured in the evaporating dish and allowed to dry at room temperature to obtain 4 gm solid (ME).
- **b.** Separation of ethyl acetate fraction: One gram of ME was dissolved in 25 ml of D/W. To this 25 ml of ethyl acetate was added and two fractions were allowed to separate in a separating funnel for at least one hour. Ethyl acetate fraction (EAF) and water fraction (WF) were separated. Both fractions were air dried to obtain 0.2 gm EAF, and 0.5gm WF. These fractions were used to study anti dandruff activity.
- 4. **Preparation of positive control:** *Terminalia bellarica* fruit extract was used as the positive control.

ANTIFUNGAL SUSCEPTIBILITY TESTING BY WELL DIFFUSION METHOD

Malassezia globosa of clinical origin was grown on Sabouraud's Dextrose Agar supplemented with 1% corn oil for a period of one week at 32° C in an incubator. *M.globosa* culture was then further maintained on the same medium with subcultures being carried out every alternate week. Loopful colonies of organism was transferred to 100 ml of Sabouraud's dextrose broth and maintained for a period of seven days at 32° C on an shaker till the culture became 70% confluent. The broth culture of *M.globosa* was swabbed over the Sabouraud's dextrose agar by using sterile cotton buds. Sterile 5 mm diameter Whatman no. 32 filter paper discs were dipped in to all three extracts with various concentrations ranging from 20,40. 60, 80 and 100%. *Terminalia bellarica* fruit extract was used as the positive control in the same concentrations like other tested extracts. The replicates were maintained. These plates were incubated at 32° C and the zone of inhibition was observed after seven days. Control was maintained with filter paper discs dipped in sterile distilled water.

RESULT AND DISCUSSION:

Malassezia globosa is pleomorphic yeast like fungus. It is also referred to as *P. orbicularae* and *P. ovale* depending on the morphology of the cells. However in recent years the name Malassezia furfur is widely accepted for yeast like cells produced by *P.orbicularae*. It is also well known that the optimum requirement of physicochemical parameters varies depending on the species and the habitat in which they grow. Antifungal activity of certain bioactive compounds extracted from medicinal plants has attracted a lot of attention within the scientific community largely as a result of the growing problem of multidrug resistance among pathogenic fungi ¹¹. In addition to this medicinal plant extracts are the promising sources of antifungal drugs, even though they have relatively mild effect against human pathogenic fungi when compared with the commercial synthetic drugs ¹² *Garcinia indica* commonly known as Kokam plant has already gained a lot of attention due to its various anti inflammatory, anti oxidant, free radical scavenging activities. Anti dandruff activity of two fractions separated from leaf extract of *G.indica* against *Malassezia globosa* at various concentrations (20, 40,

Volume 8, Issue 2 (III) April - June 2021

60, 80 and 100%) were examined. It was observed that parent methanolic extract exhibited a week inhibition zone of 4.3 mm only at 100% concentration while at lower concentrations the activity was negligible. Out of the two fractions separated from ME, ethyl acetate fraction showed good inhibition at higher concentration i.e. 9 ± 0.34 mm and 12.3 ± 0.12 mm at 80 and 100% respectively (**Table 1**). It was observed that the water fraction was not effective in inhibiting the growth of *Malassezia globosa*.

Fraction Name	Concentration of fraction (%) and Zone of inhibition (mm)				
	20	40	60	80	100
ME	1.2	1.9±0.2	2.0±0.4	2.3±0.9	4.3
EAF	3±1.5	5±0.9	7.3±0.3	9±0.34	12.3±0.12
WF	0.8	2.4	3.2±0.3	5±0.6	7.6±1.3
Tb	5.6±0.3	9.3	12.4±1.2	16.2±0.8	25.6±1.2

Table 1: Effect of various concentrations of three fractions against M. globosa

ME: METHANOLIC EXTRACT, EAF: ETHYL ACETATE FRACTION, WF: WATER FRACTION AND TB: TERMINALIA BELLARICA

It was reported that *Terminalia chebula* and *Terminalia bellerica* exhibited a significant inhibition activity against *Malassezia globosa*. They also showed that *Lantana camara* which was less effective against the fungus, but if used in combination with *Terminalia chebula* showed good synergistic effects against the fungus ¹³ Anti *Pityrosporum* activity of herbal drug, a combination of *Wrightia tinctoria* and *Hibiscus rosasinensis* was tested *invitro* against the isolates of *Pityrosporum ovale* recovered from dandruff ¹⁴. In another study, screening with four plants (*Aloe vera, Eucalyptus globulus, Phyllanthus embilca* and *Wrightia tinctoria*), E. *globulus* (30 \pm 1.14) and *Aloe vera* (29 \pm 0.94) were found to be very much effective against this dandruff causing fungus ¹⁵. In the present study, among the various tested fractions, only ethyl acetate fraction at higher concentrations showed inhibition against *Malassezia globosa* while water fraction was not that effective. Comparing with positive control (*Terminalia bellarica*) leaf extracts of *G.indica* were not that effective against the fungus.

REFERENCES:

- 1. Ravichandran G, Shivaram, Kolhapur SA. Evaluation of the clinical efficacy and safety of "Antidandruff Shampoo" in treatment of Dandruff. The Antiseptic.2004; 201(1): 5-8
- 2. Mistry Zoya, More Bhikhu and Shah Gaurav Anti-dandruff activity of synthetic and herbal shampoos on dandruff causing isolate: Malassezia, International Journal of Applied Research 2016; 2(7): 80-85
- 3. Ranjith M., Gokul Shankar S., Ranganathan S., Shivramkrishanan M., Natarajan V and Rasool S. Role of ABO blood group in the infection rate of dandruff caused by *Pityrosporum ovale*, Indian Journal of Dermatology, 2002; 47 (1): 21-23
- 4. Gupta A., Batra R. and Bluhm R. Skin diseases associated with *Malassezia furfur*, Journal of American Academic Dermatology, 2004; 51 (5): 785-798
- 5. DeAngelis Y., Saunders C., Johnstone K., Reeeder N., and Coleman C. Isolation and expression of a *Malassezia globosa* lipase gene, LIPI. J Invest Dermatology, 2007; 127: 2138-2146
- 6. Nazzaro- Porro M. and Passi S. Growth requirements and lipid metabolism of *Pityrosporum obiculare*, J. Invest. Dermatology, 1976; 66: 178-182
- 7. Srinivasan K., Natarajan D. and Dheen M. Anti bacterial activity of selected medicinal plants, Ham. Medicine, 2006; 2: 5-8
- 8. Myers N, Mittermeier R, Mittermeier CG, da Fonseca, GAB and Kents J. Biodiversity hotspots for conservation priorities, Nature, 2000; 403: 853 858.
- 9. Sahasrabudhe A. and Deodhar M. Anti hyaluronidase, anti elastase Activity of *Garcinia indica*, Int. J. Bot. 2010; 6 (3): 299-303
- 10. Varalakshmi K., Sangeetha C., Shabeena A., Sunitha S. and Vapika J. Antimicrobial and cytotoxic effects of *Garcinia indica*. World Journal of Agricultural Sciences, 2011; 7 (2): 193-196
- 11. Tim cushnie T. and Lamb A. Antimicrobial activity of flavonoids, Int. J. Antimicrob. Agents, 2005; 26: 343-356

Volume 8, Issue 2 (III) April - June 2021

- 12. Hammer K., Carson C. and Riley T. Anti microbial activity of essential oils and other plant extracts, J. Am. Acad. Dermatology, 1999; 51 (5): 785-798
- Balkrishnan K., Narayanswamy N., Mathews S. and Gaurang K. Evaluation of some medicinal plants for their dandruff control properties, Int. J. Pharma and Bio Sciences, 2011; 2 (4): 38-45
- 14.. Krishnamurthy J and Rangananthan S. Anti *Pityrosporum ovale* activity of herbal drug combination of *Wrightia tinctoria* and *Hibiscus rosasinensis*, Indian J. Dermatology, 2000; 45: 125-126
- 15. Prabhu Manju et al., Anti fungal acitivity of selected plant extracts against *Malassezia globosa International* Journal of Advanced Scientific Research (2012), 2(5), 162-168

Volume 8, Issue 2 (III) April - June 2021

SOME IMPORTANT MEDICINAL PLANTS AND METHODS OF UTILIZATION BY TRADITIONAL HEALERS IN KUDAL TEHSIL OF SINDHUDURG DISTRICT (MAHARASHTRA)

P. P. Borate and D. M. S. Rao

P G Department of Botany R. K. T. College, Ulhasnagar, Dist. Thane (MS)

ABSTRACT

The traditional methods of use of medicinal plants for treatment of certain ailments are still followed in rural area. Kudal Tehsil of Sindhudurg district is located on Mumbai Goa National highway passing through western part of Sahyadri ranges. The entire tehsil is hilly area and peoples in villages still rely upon traditional methods for treatment of certain diseases. Survey of medicinal plants in Kudal tehsil was conducted during May 2018 to April 2019. Almost 118 plants were reported from the tehsil. Information of methods of utilization of plants was collected from traditional healers in the tehsil. The data acquired is screened and tabulated scientifically. The use of synthetic drugs has adverse effects if taken for long period, resulting in failure of treatment of ailments. Due to this nowadays, western countries have started relying upon herbal molecules, which generally have no side effects. The data presented here will help in discovery of new phytomolecules in treatment of some important ailments, which is need of modern age.

Key words: Traditional methods, healers, ailments.

INTRODUCTION:

Humans and plants have a complex relationship extending far back into our joint evolutionary history. Plants are central to our well-being, not only as food, but also as key components of our cultures, religions and medicines. The forests in India are the principle repository of large number of medicinal and aromatic plants. This legacy can be seen today as plants provide nutrition, fibre, pharmaceuticals, and energy for people and animals across the globe.

Sindhudurg is one of the costal districts in south Konkan, the south-western part of Sahyadri in Maharashtra. It consists of eight tehsil *viz*. Vaibhavwadi, Devgad, Kankavali, Kudal, Malvan, Vengurla, Sawantwadi and Dodamarg. The district is well known for its greenery, forest patches, rich diversity of medicinal plants, cashew, mango, coconut and areca nut plantations, jackfruit, wild fruits and vegetables, scenic beautiful beaches, historical forts, folk arts and Konkani language, variety of fish, waterfalls, mountains and lush green valleys, temples, creeks, hot water springs, etc.

Kudal tehsil is almost centrally located in Sindhudurg district and surrounded by scattered villages. The villagers in the tehsil rely upon natural resources for sustainability. The local rural people mostly don't believe on synthetic medicines because of lack of education & prefer traditional way of treatment by vaidus/natural healers using medicinal herbs.

It was observed that traditional healers use locally available medicinal herbs for treatment of dental problems, lactation, fatigue, scabies, wounds, skin diseases, psoriasis, itching, allergies, piles, leprosy, eye infections-cataract, night blindness, infertility, menstrual problems, snake bites, scorpion bites, hair loss, headache, cough, cold, detoxification of body etc. The rural as well as some urban people make use of wild and/or cultivated plants as the sources of materials for the treatment of these ailments.

The natural healers collect medicinal plants from the vicinity, make different kinds of preparations and treat the patients. They are generally reluctant in sharing the recipes.

Lack of scientific knowledge and understanding of plant & drug interaction have led to adverse effect that are sometimes life threaten, hence, proper clinical trials are needed to determine safety of each plant before utilization or before they are recommended for medicine use.

In present investigation, attempts were made to document some important medicinal plants, their recipes and ailments treated by the traditional healers from Kudal tehsil.

MATERIALS AND METHODS:

The Study Area: The area of the Sindhudurg district is 5087.5 sq.km. There are eight tahsils in the district namely Kankavli, Kudal, Malvan, Savantwadi, Vaibhawadi ,Devgad, Dodamarg and Vengurla.. The climate of the district is mostly humid with average annual rainfall was 3042.2 mm. The average maximum and minimum temperatures of the year in Kudal tehsil were 33.7°C and 16.7°C respectively. The study area Kudal is located at almost 16.9 km far from its district headquarters Oros (Sindhudurg).

Sindhudurg

Volume 8, Issue 2 (III) April - June 2021

volved direct interactions with vaidus/traditional healers, some avu

The methodology involved direct interactions with vaidus/traditional healers, some ayurveda practitioners and the villagers treated by them for various disorders. The information about more commonly used important medicinal plants for the treatment of certain ailments and the methods of use was collected during interactions. The traditional healers provides herbal medicines in different formulations such as pills, powder, decoctions, raw crush, poultices, etc.

Identification of Plants: The plant materials were collected with the help of informants from the study area. Efforts were made to collect the plant materials in flowering and fruiting conditions. For correct identification, the herbaria were compared with those in Botanical Survey of India, Pune. The plants were identified using standard keys (Cooke, 1958; Hooker, 1892; Sharma *et. al.* 1996; Almeida, 1990; Yadav and Sardesai, 2002; Kothari and Murthy, 1993; Gamble and Fisher, 1935). Plants and their medicinal uses were confirmed by using standard literature (Nadkarni, 2002).

RESULTS:

Present study focuses on 22 common medicinal plants belonging to 14 families which are commonly used by local people for treatment of common ailments. These plants are extremely safe & have immense potential for the replacement of synthetic drugs. The data obtained is scientifically organised, tabulated in table no. 1.

Sr. No	Plant Name	Common Name	Family	Uses
1.	Aegle marmelous (L.)	Bel	Rutaceae	To avoid nausea, Constipation, diarrhea.
2.	Asparagus racemosus Willd.	Shatavari	Liliaceae	Lactation, fatigue, Cough
3.	Abrus precatorius Linn.	Gunj	Papilionaceae	Skin disease, asthma and Stomach ache
4.	Terminalia bellirica (Gaertn.) Roxb.	Behda	Combretaceae	Expectorant, stomach ache
5.	Eclipta prostrata Linn.	Maka	Asteraceae	Hair problem, Skin diseases
6.	Tridax procumbens Linn	Jayanti	Asteraceae	Wound healing
7.	Embelia basaal Roem. et. Schult.	Wawding	Myrsinaceae	Piles, sore throat, dyspepsia
8.	Plumbago zeylanica Linn.	Chitraka	Plumbaginaceae	Rheumatism, piles
9.	Mimusops elengi Linn.	Bakul	Sapotaceae	Ulcers, headache, dental caries
10.	Jasminum sambac (L.) Ait.	Jasmin	Oleaceae	Aromatherapy
11.	Holarrhena antidysentrica (Roth) Wall.	Kuda	Apocynaceae	Diarrhoea
12.	Rauvolfia serpentina (L.) Bth.ex Kurz.	Sarpgandha	Apocynaceae	Snake bites
13.	Vitex negundo Linn.	Nirgudi	Verbenaceae	Arthritis
14.	Gloriosa superba Linn.	Kal lavi	Liliaceae	Abortifacient

Table No.1. List of medicinal plants used by traditional healers in Kudal Tehsil.

Volume 8, Issue 2 (III) April - June 2021

15.	Costus speciosus Koenig.	Pewa	Costaceae	Burns, constipation,
16.	Tinospora cordifolia (Willd.) Miers	Gulwel	Menispermaceae	Fever
17.	Garcinia indica (Thou.) Chois.	Kokam	Clusiaceae	Digestive
18.	Helicteres isora Linn.	Murudsheng	Sterculiaceae	Antidiabetic
19.	Memecylon umbellatum Burm. F.	Anjani	Melastomaceae	Diabetes
20.	Bauhinia purpurea Linn.	Apta	Caesalpinceae	Scorpion bite
21.	Mimosa pudica Linn.	Lajalu	Mimosaceae	Insomnia, inflammation
22.	Caesalpinia crista Linn.	Sagargoti	Caesalpinceae	Diabetes, fever

DISCUSSION:

The study area is rich in biodiversity with variety of plants and animals. Historically thousands of species of plants have been reported to be being useful for the treatment of various diseases. Survey of medicinal plants in some tehsils of Sindhudurg district has been done by Kunure (2013), Somkuwar *et.al.* (2012 and 2013), Borate and Rao (2018). These recent studies revealed that there are 118 species of medicinal plants in the tehsil. Out of these plants, 22 are being used by traditional healers to treat different kinds of ailments prevailing in the tehsil. The common ailments treated by these healers include, jaundice, fever, problems related to lactation, menstruation, skin, hair-fall, diarrhoea, dysentery, piles, burns, joint pains, diabetes, digestion issues, headache and bites of snakes and scorpions. The treatment involves use of plant parts in the form of either crude pure extracts, aqueous extracts, decoctions, raw tablets, etc. attempts were made to explore full information about recipes, but these people are very much reluctant and can't share the knowledge. Hence more detailed studies are required to find out new and safer biomolecules for the treatment of such diseases.

CONCLUSION:

The information gathered may be scant but definitely, it is useful to the researchers who are trying to formulate new herbal drugs. These new preparations could be of more use in Ayurveda system of therapy.

BIBLIOGRAPHY:

- 1. Kunure, V. B. (2013). Study on Medicinal Plants Used By Traditional Healers in Devgad Taluka of Sindhudurg District in Maharashtra. Ph. D. Thesis submitted to JJTU, Rajasthan.
- 2. Somkuwar S. R., Chaudhary R. R., Patil V. N and S. S. Deokule (2012). A Study of Important Medicinal Plants of Sawantwadi Region, Western Ghats, (MS), India. *International Journal of Current Research*, Vol. 4 (12), Pp.154-159.
- 3. Somkuwar S. R., Chaudhary R. R. and A. A. Chaturvedi (2013). Ethnofloristc Diversity in Dodamarg Region (MS) Central Western Ghats, India. *Life Science Leaflets*. Pp. 55 71.
- 4. Borate P. P. and D. Meena S. Rao (2018). An Ethnobotanical Study of Pinguli Village in Kudal Tehsil of Sindhudurg District of Maharashtra. *I J R B A T*, Issue (VI), Vol. I, Pp: 1:4
- 5. Cooke, T. (1958). Flora of Presidency of Bombay, Indian Edn. 1997. Dehra Dun, India: Bishen Singh Mahendra Pal Singh, (BSI reprint, Calcutta) I & II: Pp. 771-774.
- 6. Gamble, J. S. and E. S. Fisher (1935). Flora of Madras Presidency. London, Reprinted Ed., BSI Calcutta. Vol. I and II.
- 7. Hooker, J. D. (1892). The Flora of British India, (London: L. Reeve): L. Reeves and company London. Vol. I-VII.
- 8. Kothari, M. J. and J. S. Murthy (1993). Flora of Raigad District, Maharashtra State: Pp. 403-404.
- 9. Nandkarni, K. M. (2002). Indian Material Medica. Popular Prakashan. Vol. I and II.
- 10. Sharma, B. D., Karthikeyan, S. and N. P. Singh (1996). Flora of Maharashtra State, Monocotyledons, Botanical Survey of India, Flora of India- series 2: Pp. 121-129.
- 11. Yadav, S. R. and M. M. Sardesai (2002). Flora of Kolhapur District: Pp. 495-498.

Volume 8, Issue 2 (III) April - June 2021

COMPARATIVE ANALYSIS OF CHEMICAL COMPONENTS OF TANNERY WASTEWATER AND ITS IMPACT

R. Mallick

Assistant Professor, Department of Environmental Science, Amity University Madhya Pradesh, Maharajpura, Gwalior, Madhya Pradesh

ABSTRACT

Wastewater coming out of tanneries are extremelycontaminated, complex and it contains chemical, organic and inorganic compounds and many toxic substances. The treatment of this type of wastewater treatment can be done by various processes like physical process, chemical process and biological process. Present study is a review of comparative study of physical, chemical and biological treatment method applied for tannery wastewater. The results of present investigation shows that the raw effluents of tannery wastewater were yellowish-brown in colour with basic pH. Values of Dissolved Oxygen (DO), Chemical Oxygen Demand (COD), Biological Oxygen Demand(BOD₅), Total Dissolved Solid (TDS), Total Suspended Solid (TSS), Electrical Conductivity (EC) are very high from the standard value and contain high concentration of Chromium, Sodium, Phosphate, Chloride, Copper, Cadmium, Lead, Zinc and Nickel. After treatment with physical, chemical and biological process this comparative study shows very effective outcomes, but results vary form process to process. After combining all the results and outcomes it can be concluded that methodologies and the objectives the result has been made.

Keywords – Tannery, Wastewater, comparative study, physico-chemical treatment, biological treatment, environment.

INTRODUCTION

Discharge of raw biodegradable organic compounds of tannery wastewater is responsible for strong reduction in the amount of dissolved oxygen in surface water¹. Chemical compounds like ionized ammonia and chromium, present in tannery effluents can cause toxic effect on aquatic life. Macro nutrient element like Phosphorus and nitrogen, can cause eutrophication in water bodies². Groundwater contamination occurs when wastewater and chemicals percolate through the soil from unlined ponds, drains and pipes, or from dumps and spills³. But groundwater takes long time to clean itself because leaching is a very slow process and is out of contact with air. Toxicity of chlorophenols study have been conducted involving plants⁴. So, treatment of tannery wastewater is highly required. The major public concern regarding the water from tannery are odour and pollution. Important pollutants from tannery include tannins, chromium, chlorides, sulphate and sulphides, traces of organic chemicals and increasing use of synthetic chemicals such as dyes, pesticides and finishing agent, as well as use of newer processing chemical solvents⁵. These substances are highly persistent, frequently toxic and effect both human and environment²⁷. Tanning process is claimed to be the world's second oldest profession⁶. Tanning was considered as a noxious trade in ancient period. Now leather industry is recognized as one of the major industries with great economic importance on an international scale⁷. But on the other hand, it generates huge amount of polluted and toxic wastewater. Due to presence of chemicals in higher quantity, including organic load, inorganic matter, TDS, Total Suspended Solid and some specific pollutants such as - chromium (Cr), chloride (Cl⁻), sodium (Na), cadmium (Cd), lead (Pb) and other residues⁸. Tannery wastewater is highly polluted in terms of COD, BOD, suspended solids (SS), nitrogen, conductivity and chromium⁹.

Treatment of tannery wastewater can be done by various processes include

- i) physico-chemical process,
- ii) biological process etc.

Water consumption is highest in the pre tanning process, but post-tanning also consumed significant amount of water, contributes around 50-55% of the total pollution load of the tanning industry¹⁰. in Variousphysico-chemical techniques are studied for tannery wastewater. Among these are coagulation, flocculation, ozonation, reverse osmosis, absorption and ion exchange. Coagulation is not a perfect process¹¹. So further treatment is required such as biological treatment and advance treatment to meet proposed tannery effluent standards¹².

The objective of this comparative study is to present suitable technology for environmentally sound and friendly production system for reducing the pollutants in the tannery effluents. So that various effluents parameters have been evaluated in this study.

Volume 8, Issue 2 (III) April - June 2021

METHODOLOGY

The methodology of analysis is as per the following steps -

- 1. Collection of effluent samples
- 2. Analysis of physico-chemical parameters
- 3. Collection of aquatic macrophytes and algae
- 4. Toxicity testing on aquatic macrophytes and algae
- 5. Treatment with Macrophyte
- 6. Combined Treatment with Aquatic Macrophytes and Algae:
- 7. Mixed Treatment
- a) Chemical Process
- b) Biological process:

RESULT & DISCUSSION

The main aim of this comparative study is to evaluate the various process to distinguish and find the most efficient removal process of tannery effluents.





Graph 1: Dissolved oxygen (DO)

Graph 2:Total Dissolved Solids (TDS)



Graph 3: Total Suspended Solid (TSS)









Graph 5: Chemical Oxygen Demand (COD)





Graph 8: Phosphate (PO₄³⁻)

International Journal of Advance and Innovative Research Volume 8, Issue 2 (III) April - June 2021



Graph 7: Electrical Conductivity (EC)



Graph 9: Chloride (Cl)



Graph 10: Lead (Pb)



Graph 11: Copper (Cu)







Graph 13: Chromium (Cr)



Graph 14: Cadmium (Cd)



Graph 15: Zinc (Zn)

ANALYSIS OF THE CHARACTERISTICS OF TANNERY WASTEWATER:

The characteristics of tannery wastewater vary considerably from tannery to tannery depending upon the size of the tannery, chemicals used for a specific process, amount of water used and type of final product produced by a

Volume 8, Issue 2 (III) April - June 2021

tannery¹³. Tannery wastewater is characterized mainly by measurements of BOD, COD, SS and TDS, chromium and sulfides etc. The permissible limits for parameters in the wastewater from an industrial establishment mentioned in the rightmost column are stipulated by World Health Organization (WHO)¹⁴. Among the parameters TDS and TSS were found 21300 mg/l and 1250 mg/l respectively. pH and temperature of the wastewater were recorded to be 8.3 and 31°C. DO was found 2.72 mg/l.COD and BOD was found 12840 mg/l and 4464 mg/l respectively. EC was found 42500 μ S/cm. Water anions like phosphate, bicarbonate and chloride were found 17.1 mg/l, 207.6 mg/l and 13.8 mg/l respectively which were within the permissible limit. Metals like Na and K were tested in the sample and were found within the permissible limit. However, heavy metals like Cr, Cu, Pb and As were found way beyond the permissible limit in the tannery effluent.Due to their unawareness of the toxic effluents of chromium, hydrogen sulphide, lead, zinc, cadmium and formaldehyde released from tanneries have a temporary effect such as dizziness, headache, irritation of eyes, skin or lungs, allergic reactions, poisoning of liver, kidney¹⁵.

CONCLUSION

The harmful activities of Cr is reliant on its valance. Tanning operations discharge the unutilised Cr with its effluent in trivalent state¹⁶. Though Cr3+ is reported an essential micronutrient and helps as glucose tolerance factor in carbohydrate and lipid metabolism yet some studies reported that both Cr3+ and Cr6+ are interfering with human physiological processes depending on their concentrations in ambience. Cr3+ released in the environment with tannery effluent is very much subject to conversion to various valence states¹⁷. Scientists pointed out the role of soil microbes along with some physico-chemical agents (UV ray, Mn and Fe) in conversion of Cr3+ to Cr6+. Photochemical oxidation of Cr3+ to Cr6+ is also found to be significantly high at the surface level of the soil¹⁸. As a result the released Cr in the environment has ample potential to migrate from water and soil system to bio-system¹⁹. However, different study has reported the presence of high concentration of detoxification pathways via the superoxide dismutase, catalase and the metal arresting protein, metallothionein, in the flora and fauna of EKW. Biota growing at the area with high Cr concentrations in their ambient environment have their innate capability to protect their physiological activities against Cr toxicity²⁰.

From the present study a steady natural amelioration of waste Cr along the 40 km course of the canal is observed, which signifies the intrinsic capacity of wetlands in water treatment and quality improvement²¹. From the present study it is also revealed that on an average 95.8-99.6% reduction of Cr species in wastewater and 96.4-99.6% in sediment between Site 1 and Site 3 in EKW is evident. However, nearly 37% of the wetland area and 75% of the water spread area of this wetland are lost in the meantime. Even after such onslaught on the natural wealth, by which Kolkata city is blessed the EKW is working with such amazing efficiencies²². May be the technological intervention in ameliorating composite tannery wastewaters in CETPs at KLC and surely the declining population growth in Kolkata Metropolitan Area (KMA population is estimated to be 15,001,383 in 2018, and thereby, between years 2001 and 2018, the growth of population in KMA has declined to 12.6% fromestimated growth rate of 30% in previous two decades²³.

In India a substantial amount of valuable mining resources are wasted by different industries. The tanning industries, likewise, drain out 30-50% Cr after tanning operation. Thus, we wouldurgently look forward to sensitive attitude towards handling the waste Cr and in-house technological improvisation and application of modern technologies to recover and reuse ofwaste Cr from tanneries²⁴. Therefore, to enjoy the sustained ecological subsidy from EKW in wastewater treatment, social awareness, technological improvement and a holistic management plan are much needed to protect this Ramsar site which serves the KMA for nearly a century.

The study showed that the untreated tannery effluents contained extremely high values of TSS, TDS, BOD5, COD, sulfate, sodium, calcium and trace metal ions²⁵. These values were far above the standard prescribed limits for WHO and the results suggest that the leather industrial effluents were not suitable for discharging into surface water bodies which pose potential threats to human health and the environment²⁶. The study illustrate that the sand-stone filtration process could reduce certain pollution levels but not enough to consider the process alone using in effluent treatment. It is observed that chemical treatment with 150 mg/L coagulant (FeCl3) dose showed the best efficiency in removing major physico-chemical parameters which are well below the standard prescribed limits for WHO. Thus the study suggests that the combined treatment process, i.e., filtration and coagulation could be promising in order to reduce pollutants from the other tannery effluents.

REFERENCES

1. A.D. Apte, S. Verma, V. Tare, P. Bose, Oxidation of Cr(III) in tannery sludge to Cr(vi): Field observations and theoretical assessment, Journal of Hazardous Materials B 121 (2005) 215–222.

Volume 8, Issue 2 (III) April - June 2021

- 2. A.R. Mesdaghinia, Z. Yousefi, The use of oxygen in catalytic oxidation of sulphides in tannery wastes, Iranian Journal of Public Health 20 (1991) 1–4.
- 3. Ahn D H, Chung, Y C, Yoo, YJ, Pak, DW and Chang, WS (1996), Improved treatment of tannery wastewater using zoogloearanigera and its extracellular polymer in an activated sludge process, Biotechnol. Let, vol.18 (8): 917 922.
- 4. Aich, A., Chattopadhyay, B., Mukhopadhyay, SK. (2010) Immunolocalization of metallothionein in hepatocytes of guppy fish (Poeciliareticulata) exposed to tannery effluent: A biomarker study. Chemosphere 169:460-466.
- 5. Anderson, RA. (1995) Chromium and parenteral nutrition. Nutrition. 11:83–86.
- 6. Anonymous, APHA, (1998), Aggregate organic constituents. In Standard method for the examination of water and waste, (Greenberg, A, E., Clesceri, L. S. & Eaton, A. D. eds), 20th (Ed), (pp. 513-517) APHA, AWWA & WEF.
- 7. Anonymous, UNEP IE/PAC (1994), Tanneries and the Environment. A Technical Guide, Technical Report (2nd Print) Series No 4. Vijayaraghvan K and Murthy DVH (1997), Effect of toxic substances in anaerobic treatment of tannery wastewater, Bioprocess Biosys. Eng, 16: 151-155.
- 8. Anonymous, WHO (2002), Water pollutants: Biological agents, Dissolved chemicals, Non dissolved chemicals, Sediments, Heat, WHO CEHA, Amman, Jordan.
- 9. Anonymous. Unione Nazionale IndustriaConciaria. Environmental report (2009), Available at:www.unic.it.
- 10. APHA (American Public Health Association), Standard Methods for the Examination of Water and Wastewater, 20th Ed., APHA, Washington, DC, USA, 1998.
- 11. APHA(American Public Health Association), Standard Methods for the Examination of Water and Wastewater, 21st Ed., American Water Works Association, and Water Environment Federation, Washington, DC, 2005.
- 12. Aslam MM, Baig AM, Hassan I, Qazi AI, Malik M and Saeed H (2001). Textile wastewater characterization and redsuction of its COD and BOD by oxidation, Electron. J. Environ. Agric. Food Chem., 3(6):804-811.
- 13. B.Y. Gao, Y.B. Chu, Q.Y. Yue, B.J. Wang, S.G. Wang, Characterization and coagulation of a polyaluminium chloride (PAC) coagulant with high Al13 content, Journal of Environmental Management 76 (2005) 143–147.
- 14. Bassett, J., Denney, RC., Jeffery, GH., Mendham, J. (1978) Vogel's Testbook of Quantitative Inorganic Analysis. Longman Groug, London. pp. 738.
- 15. Brix H. (1993), Wastewater treatment in constructed wetlands: systems designs, removal processes and treatment performance. Constructed Wetlands for Quality Improvement. Moshiri, G.A. (ed), CRC Press, Boca Raton, Florida, pp. 9-22.
- 16. Bunting, SW, Pretty, J, Edwards, P. (2004). Wastewater-fed aquaculture in the East Kolkata Wetlands, India: anachronism or archetype for resilient ecocultures? Reviews in Aquaculture (2010) 2:138–153.
- 17. C.F. Baes Jr., R.E. Mesmer, The Hydrolysis of Cations, Krieger Publishing, 1986, pp. 229-237.
- 18. C.J. Song, Williams, R.G.J. Edyvean, Tannery waste water treatment, Environmental Engineering Science 20 (6) (2003) (2003).
- 19. C.J. Yee, Y. HSU,W.K. Shieh, Effects of microcarrier pore characteristics on methanogenic fluidized bed performance, Water Research 26 (8) (1992) 119–1125.
- 20. C.R. Costa, P. Olivi, Effect of chloride concentration on the electrochemical treatment of a synthetic tannery waste water, Electrochimica Acta 54 (7) (2009) 2046–2052.
- Chatterjee, S., Chattopadhyay, B., Mukhopadhyay, SK.(2006) Trace metal distribution in tissues of cichlids (Oreochromis niloticus and O. mossambicus) collected from wastewater-fed fishponds in East Calcutta Wetlands, a Ramsar site. ActaIchthyologica Et Piscat. 36(2):119-125

22. Chatterjee, S., Chattopadhyay, B., Mukhopadhyay, SK.(2007) Sequestration and localization of metals in two common wetland plants at the contaminated East Calcutta Wetlands, a Ramsar site in India. Land Contamination & Reclamation 15(4):1-16

- 23. Chatterjee, S., Datta, S., Das, T.K., Veer, V., Mishra, D., Chakraborty, A., Chattopadhyay, B., Datta, S., Mukhopadhyay, S.K., Gup ta, D.K.(2016) Metal accumulation and metallothionein induction in Oreochromis niloticus grown in wastewater fed fishponds. Ecological Engineering 90:405–416.
- 24. Chattopadhyay, B., Chatterjee, A., Datta, S., Mukhopadhyay, SK. (2000b) Calcutta Wetland: Past and Present vis-à-vis Calcutta tannery agglomerates. JILTA 50(8): 55-63.
- 25. Chattopadhyay, B., Chatterjee, A., Mukhopadhyay, SK. (2002) Bioaccumulation of metals in the East Calcutta Wetland Ecosystem. Aquatic Ecosystem Health Management 5(2):191–203
- 26. Chattopadhyay, B., Datta, S., Chatterjee, A., Mukhopadhyay, SK. (2000a) The Environmental Impact of waste chromium of tannery agglomerates in the East Calcutta wetland ecosystem. JSLTC 84(2): 94-100.
- 27. Chattopadhyay, B., Singha Roy, U., Mukhopadhyay, SK. (2010) Mobility and Bioavailability of Chromium in the Environment: Physico-Chemical and Microbial Oxidation of Cr (III) to Cr (VI). Journal of Aplied Science Environment and Management 14 (2) 97 101

A STUDY ON SUSTAINABLE INSURANCE-OPPORTUNITIES, ISSUES AND CHALLENGES ONE DAY NATIONAL CONFERENCE (ONLINE) ON SUSTAINABLE DEVELOPMENT-A GREEN APPROACH

Rashmi V. Shetty

Thakur College of Science & Commerce, Kandivali (E) Mumbai

ABSTRACT

Sustainable Insurance is a novel approach towards sustainable development which is need of the hour. It has a noble objective to reduce risk and to give contribution to environmental, social and economic sustainability. Principles of sustainable insurance developed by United Nations Environment Programme Finance Initiative (UNEP FI) in the year 2012. In this paper an attempt is made to understand the role of insurance sector in sustainable development, the types of green insurance products can be developed by the insurers to the society, and to find out the issues of the insurers in this noble effort. Paper is prepared with help of secondary data.

Keywords- Green Insurance products, sustainable insurance, opportunities for green insurance

INTRODUCTION:

An environmental friendly insurance sector is a necessity of any country. Most of the infrastructure development fund is provided by insurance companies. As early as 2012, the UNEP FI "Principles for Sustainable Insurance" were announce to focus on including ESG issues in insurance decision-making, raise awareness about sustainability with the insured and promote action with governments and regulators. Insurance companies can rightly address these ESG issues, as they play an important roles as risk managers.

OBJECTIVES OF THE STUDY:

To understand the idea of sustainable insurance

To study the green insurance products issued by the insurance companies in an attempt to follow sustainable insurance.

To understand the issues and aspects influence the insurers to conduct business in sustainable way by keeping in mind, social and economic environment.

Research Methodology: Paper is an exploratory work which is prepared after studying the past literature that is secondary data, including published research, websites, books, journals etc.

FINDINGS OF THE STUDY:

Sustainable Green insurance Products:

Sustainable green insurance products are those products which gives insurance coverage to production and use of sustainable products, or insure the liability associated with their production and use. Green insurance products indemnify against the environmental consequence of potential climate change decision.

Following sustainable and green insurance products are found on the website of prominent companies.

Green Property Rebuilding: This insurance coverage given for the utilisation of environmentally friendly or more energy-efficient materials while repairing the building and for using more energy efficient equipment or appliances. Discounts offered on premiums if builders follow the green policies.

Property Loss Mitigation Device: Discounts are offered in the premium to be payable the homeowners who choose storm resistant buildings.

Pay As You Drive/Low Mileage Discount Pay: - Automobile insurance products give incentives to drive less is also a Green Insurance Product. For the commercial vehicles too, insurance product offers an option to upgrade the company's fleet to hybrid vehicles for new vehicle replacement as part of an endorsement to the policy.

Insurance for Renewable Energy Projects is provided for solar energy, wind energy etc.

Insurance for Green Building : Insurance companies gives the coverage to motivate clients to build sustainably by evaluating designs and specifications for new structures and suggesting ways to ensure high-quality construction by preventing risk. These products cover green materials used in the construction of building.

Energy Savings Insurance is provided by some insurers to the service companies, who provide guarantees for energy saving while selling their products to the customers.

Insurance for Carbon Capture & Storage or Emission Reduction Projects: There are organizations who capture and store large volumes of carbon dioxide and other greenhouse gases. They can avail this insurance from the insurance companies.

Insurance products and services are offered Global Weather Insurance: This insurance covers against unpredictable weather conditions and climate change. The product is useful for event organisers who want to hedge against a defined weather conditions such as rain/wind exceeding a defined threshold during the hours of insurance cover.

Political Risk Insurance for Carbon-Trading: Investors, and lenders are given financial protection for political risks arising from change in government policies, embargo, license cancellation, war and riots which will hamper the production, certification and delivery of carbon credits.

Professional Liability insurance for Raters and Home Energy Survey Professionals is given order to protect them from accidents and potential lawsuits that may occur as a result of business operation.

Agriculture Insurance: Credit guarantees and equipment Insurance: This insurance partly covers the default risk of loans. Also there are weather insurance products where insurance companies make use of remote-sensing, instead of using weather station data, improves the accuracy of underwriting and speed of claims processing and settles claim within 45 days as compared to previous time of 2 years.

Some examples of Insurance Companies following sustainable insurance:

Swiss Re selling weather-risk products to 320,000 small farmers in India.

Willis Holdings covers potential power under production of wind farms through its renewable energy-related insurance products

Lexington Insurance Company's new policies, will pay the insured to rebuild a home using environmentally friendly and energy-efficient materials after it is destroyed by natural disasters under its green-building policies.

Sompo Japan Insurance, give premium discounts to who drive low-emitting cars.

Opportunities of insurers offering Sustainable products:

Insurance companies which offers sustainable green products gets several benefits:

They encourage environmentally friendly behaviours, so gets accolades from the society and public and brand image is created.

They provide risk protection to new green technology or project. By this they can create competitive advantages over their competitor.

It will increase their coverage in to the automobile insurance sector. They can expand their business coverage into new businesses like renewable energy sector as this is booming due to government incentives.

Issues and Challenges.

Difficulty in finding the solutions for heavily exposed risks and regions such as houses or factories on river banks with flood potential or properties in areas of high earthquake risk.

Developing the products which support sustainability is another challenging task in front of insurance companies.

Capital Allocation: Insurance firms need to generate long-term, stable returns and it is very difficult to maintain during disasters.

Especially in India awareness very low about the Problems of climate change, depletion of resources, new technological risks etc., another sustainability challenges that insurers are facing today is creating awareness about the new green insurance product.

Suggestions derived from the study:

Insurers are involved in the settlement of all sorts of environmental losses and they have considerable knowhow in, underwriting the insurance, managing the risk and settlement of the claim. They find themselves in a better position to give guidance to the business organizations, general public and to the society for prevention of loss through their professional expertise.

Insurance companies should adopt paper less documentation system, mobile insurance, and online insurance to better utilise the resources through green marketing

Volume 8, Issue 2 (III) April - June 2021

Insurance companies should adopt innovative ways to product differentiation. They should develop and offer green products which help them getting a competitive edge and earn good returns. Insurance company which is proactive in offering innovative sustainable green products is seen as environmental-friendly, corporate responsible and it helps the company to build green brand name which assist in its brand building and marketing strategies.

Government should organize various campaigns to aware the society on various environmental issues and the importance of green insurance products. Integrated efforts should be needed from the whole society to make sustainable development possible in this field

CONCLUSION:

Indian insurers cannot afford to ignore sustainable insurance. Studies suggest that among the top 20 worst polluted towns of the world, 15 from India. Our country is witnessing very dangerous pace of deforestation, rise in the water level of sea, coastline erosion, and fall in groundwater levels, and emissions of industry and vehicles. In India insurance is highly under-penetrated, so have a huge market for innovative green products. Sustainable Insurance will play a significant role in developing a sustainable insurance companies through its innovative products and help the nation and society in a great way in combating the challenges environmental degradation.

REFERENCES:

- https://saylordotorg.github.io/text_a-primer-on-sustainable-business/s06-06-sustainable-insurance.html
- EY Global Insurance Leader
- https://www.ey.com/en_gl/innovation-in-insurance/how-the-insurance-industry-can-boldly-shape-a-more-sustainable-future
- Rahul Kanojia, Insurance and its Role in Sustainable Development- Global Journal of Finance and Management. ISSN 0975-6477 Volume 6, Number 3 (2014), pp. 227-232
- Olivier Jaeggi https://sloanreview.mit.edu/article/the-insurance-industry-wants-a-world-that-is-sustainableand-insurable/?gclid=EAIaIQobChMIz97124eK7wIVXZZLBR3_bgrOEAMYASAAEgIn8_D_BwE
- _Promotion_of_Sustainable_Insurance_Practices-_THE_JOURNAL_of_Insurance_Institute_of_India
- http://www.lse.ac.uk/GranthamInstitute/news/where-next-for-sustainable-insurance-five-priorities-for-thenext-decade/
- https://www.axa.com/en/about-us/axa-and-climate-change
- https://economictimes.indiatimes.com/blogs/et-commentary/ensure-insurers-know-the-climate/

Volume 8, Issue 2 (III) April - June 2021

EXPLORING THE EVOLVING RELATIONSHIP BETWEEN ENVIRONMENTAL SUSTAINABILITY AND BUSINESS

Rakhee Pathak

Assistant Professor, Thakur College of Science and Commerce, Kandivali (E), Mumbai

ABSTRACT:

Concern for the environment is a long-term interest of the general public and it is more latent than urgent and top of mind, but will awaken when threatened. Businesses World over are expected to be the front runners in the area of environmental sustainability as they are considered to be the biggest contributors who are in a position to make a significant difference. In the past businesses have either totally ignored or given very less importance to the environment. In many instances, the businesses have had a negative impact on the environment and found guilty on accounts of polluting the environment and engaging in unsustainable environmental practices. The awakening for concern of the environment can be triggered by numerous levers. If history is an indicator, smart business leadership will read these signs in the environment, anticipate the market shift, and seek to take advantage of the situation.

Currently due to media attention and concerns for the environment all over the world, we see an increasing number of businesses actually committed to reverse the trend and are working towards having a positive influence on environmental sustainability through Green Marketing and Green Consumerism.

Realisation has set in the large and small organisations which clearly understand that its marketing strategy, messaging and activations should be aligned with sustainability and responsible business practices. Increased Business benefits will accrue to the company if it embeds sustainability into its marketing practices coupled with a change in consumer mindset and purchase decision making. Businesses will have to focus on strategies and communications which empower the consumers to make responsible and sustainable purchase and consumption choices. This Research Paper proposes a Business Case for Environmental Sustainability as the need of the hour and the Sustainability Strategies that the Businesses must adopt.

Keywords: Environmental Sustainability, Marketing Strategy, Sustainable Purchase, Green Marketing

INTRODUCTION:

Concern for the environment is a long-term interest of the general public and it is more latent than urgent and top of mind, but will awaken when threatened. The awakening for concern of the environment can be triggered by numerous levers. If history is an indicator, then smart business leadership will read and identify these signals from the environment, anticipate the market shift, and seek to take advantage of the situation.

There is a growing connect and relationship between marketing and sustainability. The focus should be now to see how marketing and sustainability work in tandem to communicate in unique and innovative ways with the consumers. Empowering the consumers to make effective purchasing decisions based on their own value system will make it convenient for them to take responsible, informed and sustainable consumption choices. Keeping in mind the relationship between sustainability and marketing, it will be quite natural for companies to now initiate campaigns and strategies which will stand the test of current times to stay relevant and in action. Economic growth along with population increase and globalization has led to structural changes in consumption patterns around the world. Dependent on their composition, these changes can be very demanding on natural resources and may create unsustainable challenges for the environment.

In today's current scenario, people are fully aware of the environmental problems affecting the whole world. People do realise the impact of businesses and individuals on the environment. Environmental sustainability involves taking responsible decisions which are in the best interests to protect the natural world and also ensure the capacity of the environment to support and sustain human life in the coming decades. Environmental Sustainability should be followed by all manufacturing units, business houses etc. and be made responsible for the same. They should take efforts to reduce the businesses' negative impact on the environment. Focus should be on developing and implementing sustainable processes in the entire value supply chain rather than only looking at reducing waste or reducing energy consumption. The aim of this research paper is to show that sustainability can be an opportunity rather than just a mere obligation. Making businesses more sustainable starts first with awareness. This is followed by the intent then to make changes for the business and for the planet earth. This research paper is an attempt to help business owners and administrators to understand and make their organizations more environmentally aware and friendly. This Research work indicates that not only

Volume 8, Issue 2 (III) April - June 2021

can environmental and economic performance be optimised simultaneously, but economic performance can be optimised through environmental strategies.

OBJECTIVES OF THE RESEARCH STUDY:

- 1) To Examine Environmental Sustainability and why it matters for Business.
- 2) To Highlight the Business Case for Environmental Sustainability.
- 3) To Describe the Sustainable Marketing Strategies that the Businesses should Adopt.
- 4) To Suggest Sustainable Business Models for the Enterprises

There is a growing need for business to consider the nexus and the trade-offs between food, water and energy. Today businesses are facing changing trends in consumption, population and economic growth coupled with environmental degradation. This can present long-term risks to business viability, consumers and the society at large. The trade-offs that businesses make between food, water and energy are steadfastly driven by the need to meet consumer's needs, policy, regulations, the environment and both the immediate and long-term viability of the company. For some businesses, it will be necessary to act and address the nexus issues. Many companies are actively managing the nexus. Utility companies provide water and energy directly to customers and the farming and retail communities are increasingly challenged to grow and source food in an environmentally sound manner.

BUSINESS CASE FOR ENVIRONMENTAL SUSTAINABILITY:

More than ninety percent of CEO's state that sustainability is crucial to their company's brand equity and success. Companies develop sustainability strategies, market sustainable products and services, create official positions in the organisation chart such as chief sustainability officer, and also publish sustainability reports for its stakeholders like consumers, investors, activists and the community at large.

Research findings through Secondary Data reflect that Environmental Sustainability lies in the fact that businesses should target at long term implications on the natural world rather than making short term gains. Information for this research work has been sourced from books, articles, websites and various other research papers. This research paper is based on secondary data for presenting views and opinions related to highlight the business case for sustainability. The analysed data projects a strong case for environmental sustainability.

Environmental issues like climate change, water scarcity, species extinction, and many others continue to deteriorate. Sustainable business is reaching the limits of what it can accomplish in its present state. It is slowing the speed at which we are approaching a crisis, but we are not changing course of action. Instead of just edging around, the businesses should bring about disruptive innovation with new value-added products and services. There is a need for transformation and this should be the focus of the next phase of business sustainability.

Environmental Authorities have initiated various Acts, Audits and Assessment programs to ensure that businesses conform to environmental regulations. In this regard Sustainability Policies and reporting mechanisms must be incorporated within the companies as a policy matter. Guidelines and monitoring mechanisms must be introduced for all business-related activities. To ensure that companies have a sustainable business model, the businesses should understand the full environmental impact of its marketing expenditure because marketing generally falls out of the purview of the boundaries. Since marketing directs and drives the product, buying decisions, brand image, brand reputation and brand value, it is imperative for the business to understand the impact of its expenditure on marketing related activities.

The essence of Environmental Sustainability lies in the fact that businesses should focus on its long- term impact and long-term implications on the natural world. They should be futuristic and look beyond only making short term gains. There are a lot of benefits and a strong business case for environmental sustainability. When businesses move towards environmentally sustainable practices it poses very few risks to the business operations. Businesses which will initiate these environmental-sustainable practices will get a head start over their competitors who may join later. Hence, sooner the better since in the coming years it will be a heavily regulated and important issue needing compliance.

Business Case Point for Environmental Sustainability is its potential to reduce expenses both in the long term and medium term. For example, the companies' bottom line (profitability) will improve if the business become energy efficient thereby saving on significant energy costs. A Cost-Benefit analysis will help the company analyse the benefits of environmentally sustainable practices with the implementation cost. Another Business Case Point for Environmental Sustainability lies in gaining competitive advantage because such companies will Volume 8, Issue 2 (III) April - June 2021

be able to attract investors and customers. Today's consumer is well aware of the current environmental and social issues. He keeps himself updated and informed about the businesses which are acting responsibly towards the environment. Similarly, investors are also keeping themselves abreast of environmental issues and invest their money in companies employing sustainable environmental practices.

Consumers' education and awareness about their impact and actions of the business on the environment is growing significantly. Consumer's conscience will compel them to choose which services they want to buy and from whom. Factors influencing this decision include media, friends, popular opinion, family and personal values. When people select a service aligned to their moral values, they feel satisfied. However, when they make a decision against their principles, they feel disappointed and dejected. This practice over a period of time becomes the buying behaviour of consumers because they start actively searching for services that makes them feel good as they have favourably contributed to the environment. Businesses and marketers have now understood that there is an opportunity to capitalise with respect to consumer's conscience levels. If consumer conscience directly affects buying behaviour, then they should customise the products and services to meet the expectations of the customers. Businesses should make changes in its operations to make it environmentally friendly and sustainable.

Businesses differentiating on the basis of Environmental Sustainability is an emerging trend by providing complimentary range of environmentally sustainable options along with the existing products. Another choice with the Businesses is to make the entire supply chain and operations from cradle to grave and back to cradle more sustainable. This aids in the business becoming more socially responsible and environmentally thereby lending an overall positive impact.

SUSTAINABLE MARKETING IS THE NEED OF THE HOUR:

Green Marketing assumes great importance in todays' world owing to the scarcity of resources and endless human wants. Green marketing involves developing products and services and promoting them to the consumers to satisfy their needs. Such Consumers who prefer green products want the products which offer them convenience and performance at a reasonable cost and which do not have a negative impact on the environment. Successful marketing is the core activity of any business enterprise in todays' world of fierce competition. Green Marketing encompasses aspects like product modification, changing the production and packaging process to reduce the detrimental impact on the environment with respect to the products, their consumption and disposal. The main emphasis is to satisfy the needs of the stakeholders in an environmentally responsible manner. Green Marketing and Green Consumerism is the need of the hour to fix onus on the producers to manufacture environment-friendly products ensuring environment conservation in a sustainable manner. It takes into account the relationship of the organisation and its products to the environment. It integrates the strategic link between the organisation, the environment and marketing efforts rather than only considering the communication process for 'only-profits'. Green marketing and green consumerism is the answer to those companies world over who are trying to reduce their carbon footprints.

Sustainable marketing is the need of the hour, as it serves both as a product and brand marketing strategy. Many companies have announced environmental and social initiatives that places the responsibility on the customer and challenges them to choose between the cheaper option and the morally correct option. Companies are using Sustainable marketing strategies for the promotion of environmental and socially responsible products, and brand values. Businesses can use sustainable marketing for a specific product, or for a cause or, use it as their Unique Selling Proposition. Environmental issues are large and solicit a longer time span to tackle than the seasonal promotions. Companies' objectives towards sustainable eco-friendly marketing of its products should be over a large time frame as it requires a high scale change. If one element of the brand talks about sustainability but, if it is not supported by other elements of the service, then the company may get a negative publicity through the instant communication via social media platforms.

The essence of sustainable marketing is that the company should position their brand as an active figure in an environmental or societal issue. It can humanize their brand messages and create another reason why customers should choose their company's products over the competitors. The companies should be ready for their commitment towards sustainable initiatives to reduce carbon emissions, using recyclable materials and providing prospects for the coming generations. Brands will have to invest in these causes towards their goal of sustainability. The Unique Selling proposition of such companies can centre around the supply of green energy solutions and a vision of zero-carbon lifestyle through its sustainable marketing efforts. Sustainable marketing will help to form a strong bond between the brand and its renewable initiatives in the minds of the customers. Sustainability of the products complemented with Sustainable Marketing practices is the way to go ahead

leaving minimum carbon footprint. Digital Outdoor Advertising should be powered by renewable energy coupled with digital marketing efforts so as to realise the true essence of sustainability.

GREEN PRODUCTS:

Companies help satisfy consumer needs and initiatives to protect the environment by offering environmentally friendly, or green, products. Marketers can reduce the environmental impact associated with the consumption of a product or service by changing the source of materials, monitoring the carbon footprint, minimizing packaging, providing recycling options for product disposal (product); developing pricing options that allow different pricing structures based on environmental offsets (prices); utilizing decentralized or local production and sustainable distribution channels (place); and utilizing less print materials and labelling products with information about the environmental impacts of the products (promotion) (Kotler, 2011).

APPEAL OF GREEN PRODUCTS AND TOTAL LIFE CYCLE COST:

A marketer who wants to introduce environmentally friendly version of an existing product should be able to communicate it effectively and increase its appeal. Also, marketers should emphasise the strength of a green product and make its association explicit. The Quality Concerns of the Green Products should be addressed through hands-on trial and display. This can lead to increase in the adoption of green products and excellent word of mouth publicity. Marketers should avoid the phenomena of greenwashing, or making environmental claims that are not true. Companies adopting Greenwashing do not have a commitment to sustainability. This can lead to an increase in consumers doubting the environmental message about such products and making its reach to non-adopters difficult. Companies that want to differentiate their green products and services must invest in environmentally friendly technologies, environment certifications, green packaging, clear product labels and credible spokespeople.

Marketers must stress on the Total Life Cycle Cost of their products to Non-Adopters by considering cost to purchase, usage, disposal and the product price. Cost Calculators should be added to enable the customers carry out the mathematical calculations. This will allow the users to compare the total cost of the green product with other non-green products. Marketers should give Clarification about the Eco-Costs (costs of the environmental burden of a product on the basis of prevention of that burden). These costs are essential since they reduce the environmental pollution and materials depletion to a level which is in line with the earth's carrying capacity. Life Cycle Assessment must be carried out for the products to find out its eco-cost of emissions and use of resources during its product life cycle from cradle to cradle.

Sustainability marketing can contribute to the Triple Bottom Line, which takes into account the environmental quality, social equity and economic prosperity helping the marketers manage resources and capabilities to develop a competitive advantage. The Environment aspect concerns the responsibility about natural resources, the social dimension is about the responsibility to society and economic aspect is about value creation and the firm's financial performance. The Triple Bottom Line (TBL) for Green Products will help the marketers reach out to non-adopters, latent and potential green segments and also deter increased regulations. TBL reporting holds firms accountable for their environmental claims and increases general buy-in toward making sure the firm delivers on its claims from the bottom up.

SUSTAINABLE BUSINESS MODELS FOR ENTERPRISES

A systems-change approach to propel change is the need of the hour. Top risks are environmental, but market economics cannot be ignored. Climate-related risks overshadow all other risks including the economic risks which undermines the cohesive action and creates blind spots. Today, Society needs a new growth paradigm that addresses the interconnectedness of socio-economic factors with climate change. Responsible Businesses need to adapt their metrics and performance indicators to assess the value of nature. Two business models are suggested namely Enterprise Integration and Market Transformation to progress towards business sustainability.

Enterprise Integration: Business sustainability represents a market shift and Market pressures bring sustainability to business attention through core management channels and functions. Enterprise integration is based on a model of business responding to market changes and shift patterns to increase its competitive positioning. This can be done by integrating sustainability into pre-existing business considerations. Corporate social responsibility (CSR) is a response to such pressures and companies can seek to improve competitive positioning by linking sustainability and corporate strategy. This involves translating the issue into the core language of business management like operational efficiency, capital acquisition, strategic direction, and market growth. The firm can develop a model that it can use to conceptualize the issue and formulate a response. In this way, sustainability becomes much like any other business threat, where market expectations change and technological developments advance, leaving certain industries to adapt or phase out while others rise to occupy

Volume 8, Issue 2 (III) April - June 2021

their positions. Another signal can come from impact investors, who consider environmental, social, and governance (ESG) factors in their investment criteria. These are all indicators that the market has shifted and continues to shift its patterns. Consumers can purchase sustainable products, stay in sustainable hotels, eat sustainable food items, and purchase sustainable cleaning products. Going green is a good sign, but it is not solving the root cause of problems it was meant to address in the first place. Our planet earth continues to become less sustainable.

Market Transformation means how business is transforming the market. Instead of waiting for a market shift to create incentives for sustainable practices, companies should create these shifts to enable new forms of business sustainability. World is witnessing unprecedented human impacts on the natural environment that threaten the viability of life on Earth. Market Transformation calls for discarding outdated notions as treating the environment as a limitless source of materials and sink for waste and looking at economic value as the only measurement of nature's worth. Corporate leaders who are strategic decision makers have a key role to play in bringing about this transition. Market rules need to be changed now and should incorporate the planet's Key Performance Indicators. For example, to turn around the Key Performance Indicator of climate change, the market must go carbon neutral and eventually go carbon negative. This feat cannot be achieved by one company or one product alone. It requires a change in the overall market indicating market transformation. New Conceptions of Business Models and Metrics should be created reflecting a shift in the economic emphasis from the production of goods to an overall well-being where measures for health, education, security and sustainability are undertaken.

Digitalization and artificial intelligence can be seen as opportunities for enhancing the efficiency of energy and resource use. They offer new opportunities for circular economy, agriculture, monitoring of ecosystems and biodiversity, sustainable finance and decarbonization. Digitalization offers new access to markets, impacts market forms and shapes consumer behaviour all of which can have extensive implications for the ecological, social and economic dimensions of sustainable development. Enterprise Integration and Market Transformation as Sustainable Business Models can integrate the limited economic resources with social concerns and environmental protection. These three pillars of sustainability cannot be ignored in the decision-making process.

CONCLUSION:

The Perception of high cost and low quality of green offering still stays in the minds of many consumers. Also, different consumers may not have the knowledge or motivation to find out the impact of their consumption choices. Segmenting the non-adopters will be the right move ahead to target specific customers who are not considering green product or service. Product trial should be initiated for such consumers who are considering green offerings. Companies pursuing green marketing should track their progress and create a transparent environment to advance green initiatives and improve the perception of the consumers regarding the credibility of their green claims.

Businesses which are incorporating green consumerism and green marketing must take into cognizance the wider relationship of the organisation, its products and the surroundings. A sensitive approach is solicited which integrates the strategic link between the company, the environment and marketing rather than only being concerned with profits alone through tactical communication. The separate Stakeholder Needs (customers, investors, parent company, directors, employees, community, legislators, pressure groups, suppliers and media) should be satisfied in an environmentally and socially responsible manner. Ecological and Social Concerns should be induced with the Economic Agenda in all the Business Sectors. Embedded sustainability efforts will clearly lead to positive impact on business performance. New business opportunities can be created by redesigning products to meet the environmental standards and social needs as well. And companies are now realising the significant cost savings through environmental, social and governance factors) and are correlating better financial performance with better ESG performance. Those companies that proactively make sustainability core to their business strategy, will drive innovation and loyalty from employees, customers, suppliers, communities and investors.

REFERENCES:

- 1. Aggrawal, Artee, Chaudhary, Richa and Dr. Gopal (2010), "Green Marketing in India Way Ahead to Sustainability", SIES National Research Marketing Conference, Vol. 1, No. 1, pp.23-29.
- 2. Azhagaiah, Ramachandran and Ezhilarasi, Eganathan (2012), "Consumer Behavior Regarding Durable Goods", Indian Journal of Marketing, Vol. 42, No. 2, pp. 29-39.

Volume 8, Issue 2 (III) April - June 2021

- 3. Diwani, Pawan, Saloni and Bodia, B.S. (2011), "Green Marketing : A New Paradigm of Marketing in the Automobile Industry, Prabandhan: Indian Journal of Management, Vol. 4, No. 5, pp. 29-35.
- 4. Davis Joel J., "Ethics and environmental marketing" Journal of Business Ethics (eds). Random: New York; 2001; pp. 233–346.
- 5. Elangovan, A., Murugesan, B., & Azhagaiah, R. (2006), "Consumers Attitude and Behaviour Toward Environmental Marketing", Udyog Pragati, The Journal for Practicing Mangers, Vol. 30, No. 4, pp.37-43.
- 6. Global Guidance for Life Cycle Impact assessment Indicators Volume 1, United Nations Environment Programme, 2016
- 7. Godfrey PC, Merrill CB, Hansen JM (2009) The relationship between corporate social responsibility and shareholder value: an empirical test of the risk management hypothesis. Strateg Manag J 30(4):425–445
- 8. Kollmuss, A., & Agyeman, J. 2002. Mind the gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? Environmental Education Research, 8(3): 239–260. https://doi.org/10.1080/13504620220145401.
- 9. Masurel, E. 2007. Why SMEs invest in environmental measures: Sustainability evidence from small and medium-sized printing firms. Business Strategy and the Environment, 16(3): 190–201.
- 10. Ponzi, D., 2019. The business of greening: Policy measures for green business development in Asia.

GREEN ECONOMY: A JAMMU AND KASHMIR PERSPECTIVE

M. H. Wani and Arshad Bhat

Rajiv Gandhi Chair in Contemporary Studies on Livelihood & Food Security, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir

ABSTRACT

Green Economy a development strategy throughout the world is gaining momentum, it peruses sustainability and harmonises both economic & ecological development. The developing world with a huge natural resource base lags behind in investing in green most probably due to lack of awareness and fund flow from the developed world for mitigation and adaptation purposes, etc. India is still following conventional economic growth strategy to reduce the environmental degradation and mitigate climate change. Jammu and Kashmir with rich biodiversity and vast natural resources of water, mineral, forests and niche based crop ecosystems etc. is observing depletion of these resources owing to huge population pressure and excessive use of modern technology. The present study suggests that existing production & consumption system and the rate of harnessing natural resources cannot sustain for long, therefore, sustaining development process would require to follow 'Going Green' which will influence positively towards generating employment, trade, agriculture, domestic industries, business etc. Thus, the current flow of economic prosperity could sustain only through rational development of infrastructure and manufacturing leading to the path of Green Economy. The paper acknowledges the importance of development strategies and uses the available data for assessing the adoptability of principles of Green Economy in Jammu and Kashmir.

Key-words: Going green, environmental sustainability, economic prosperity, climate change mitigation, resource use efficiency, sustained growth rate.

INTRODUCTION

Environmental complexities arises out of potential non-linearities in economic and ecological variables. Rate of natural resource depletion over the years has become faster than its regeneration, raising the cost of extraction and pushing the economy towards its limits to growth. The current rate of resource depletion could lead to economic contraction in a few years from now, necessitating sustained economic policies that could arrest the over utilisation of natural resources to equilibrate the current rate of natural resource consumption and to sustain it for future generations (The Green Economy Barometer, 2018).

The Green Economy concept came into being soon after the recent global financial downfall, with the prime objective of reviving the world economy, saving and creating jobs, and protection of vulnerable groups, promotion of sustainable and inclusive growth, reduced risks from carbon dependency and ecosystem degradation. Green Economy concept is comprising of a set of transformative actions focussed on sustainability. Green Economy has been defined by various organisations as;

"Green Economy is one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities".

(United Nations Environment Programme, 2011)

"Green Economy is one that fosters economic growth and development while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies."

(Organisation for Economic Co-operation and Development, 2011)

"Green Economy is a fair and resilient economy, which provides a better quality of life for all achieved within the ecological limits of one planet"

(Green Economy Coalition)

"Green Economy implies the decoupling of resource use and environmental impacts from economic growth."

(National Strategy for Sustainable Development, South African Department of Environmental Affairs, 2011)

Green Economy acts as a medium to achieve the goals and principles set out within the concept of Sustainable Development, it eradicates poverty and pursues social justice in the ecologically sound economic system. The existing production scenario and economic system is detrimental to environmental sustainability and sustainable economic growth which endangers the sustainability of the economic structure. The concept is advantageous and outweighs its limitations. Therefore, it is believed that the concept can bring happiness to the poor through generating employment opportunities and bringing social equity. It reduces CO₂ emission and can improve the economic growth which is the biggest concern for the present day world (UNEP, 1992).

GLOBAL SCENARIO

The persistence of poverty and degradation of the environment can be traced to a series of market and institutional failures that make the prevailing economic model far less effective than it otherwise would be in advancing sustainable development goals. These market and institutional failures are well known to economists, but little progress has been made to address them. For example, there are not sufficient mechanisms to ensure that polluters pay the full cost of their pollution. A Green Economy attempts to remedy these problems through a variety of institutional reforms and regulatory, tax, and expenditure-based economic policies and tools. More than half of the worlds' population now live in urban areas increasingly in highly dense cities. In the 21st century, few trends have matched the economic, environmental, and societal impact of rapid urbanization (Eurostat, 2017). A steady stream of human migration out of the countryside, and into swelling metropolitan centers, has shaken up the world's power dynamics in just decades. Energy consumption for electricity, transportation, cooking, and heating is much higher in urban areas than in rural villages. When this is combined with random and unexpected growth as well as unemployment, there is the spread of unlawful resident settlements represented by slums and squatters. The growth of slums and squatters in urban areas is even further exacerbated by fast-paced industrialization, lack of developed land for housing, large influx of rural immigrants to the cities in search of better life, and the elevated prices of land beyond the reach of the urban poor (EC, 2018).

Buildings and construction together account for 36% of global final energy use and 39% of energy-related carbon dioxide (CO₂) emissions. Moreover, global buildings sector continues to grow, with floor area reaching an estimated 235 billion m^2 in 2016. Buildings and construction generate nearly 40 per cent of CO₂. (UN Global Status Report, 2018). Transport accounts for about 64 per cent of global oil consumption, 27 per cent of all energy use, and 23 per cent of the world's energy-related CO₂ emissions. Also International Institute of Refrigeration (IIR) estimates that the total number of refrigeration, air-conditioning and heat pump systems in operation worldwide is roughly 3 billion (www.iifiir.org).

WHAT IS IGNORED?

The global recession has brought new attention to chronic structural flaws in current economic models and assumptions. As economies struggle to recover, many are taking a closer look at the broad concept of a "Green Economy," one that simultaneously promotes sustainability and economic growth. The pursuit of a green economy will mean economic restructuring. The green economy is being put forth as a model to solve ecological and economic crises. There are issues related to its implementation;

The green economy exudes optimism

It even then can become a driver for better growth. Yet reconciling climate protection and resource conservation with economic growth in a finite and unjust world remains an illusion. With its positive associations, the term "green economy" suggests that the world as we know it can continue as before; thanks to a green growth paradigm of greater efficiency and lower resource consumption (Barbara Unmüßig,et al, 2016). The perception that it excludes optimism as its own place but, however, making this promise requires deliberately downplaying complexity and having powerful faith in the miracles of the market economy and technological innovation, while at the same time ignoring and not wanting to tackle existing economic and political power structures. The green economy is thus a matter of faith and selective blind spots. It can only be a realistic option for the future if it recognizes planetary boundaries and ensures the radical reduction and fair distribution of emissions and resource consumption (www.greeneconomycoalition.org).

Fixing the failure of the market

Instead of rethinking business, the green economy redefines nature as the decisive answer to the current crises. Economics has become the currency of politics, with an intend to correct the failure of the market economy by enlarging the market. The green economy on the other hand wants the market to encompass things that have previously been beyond its scope by redefining the relationship between nature and the economy resulting a new version of the concept of nature as natural capital and the economic services of ecosystems-and not a transformation of our way of doing business. Instead of rethinking business, the green economy wants to redefine nature by measuring and recording it, assigning it a value and putting it on the balance sheet-based on a global, abstract currency: (carbon credits).

This hides many structural causes of the environment and climate crisis and no longer takes them fully into account in the search for real solutions and ways out. The consequences of such an approach are also reflected

Volume 8, Issue 2 (III) April - June 2021

in the new market mechanisms for trading biodiversity credits. In many cases, they do not prevent the destruction of nature but merely organize it along market lines. The green economy reduces the needed fundamental transformation to a question of economics and gives the impression that it can be implemented without major upheavals and conflicts. It does not even ask the decisive question-how to create a better future with fewer material goods, a different outlook and greater diversity (www.greeneconomycoalition.org).

Ecological policy goes beyond reducing carbon emissions

The green economy states its central decarbonisation strategy in its mantra "put a price on carbon". But this reduction to prices and a single currency unit (carbon credits) is one-dimensional. Decarbonisation can mean many things-the phasing-out of coal, oil and gas, the compensation of fossil emissions by storing equivalent quantities of carbon in plants or soils, or the use of technology for carbon capture and storage (CCS) on an industrial scale. From the social and ecological vantage points, these alternatives lead to completely different results (Barbara Unmüßig, et al, 2016).

Jammu and Kashmir

The recent available statistical estimates reveal that at least 44 per cent of all conflicts in the present day world arouse due to depletion of natural resources which applies to Jammu & Kashmir as well which may face similar situation soon. Ecological services of forests, an important carbon sink, account for notably 10.3 per cent of States overall GSDP, but also contributes highly to the GSDP of the poor or the effective household income of those living below the poverty line and relying on activities like subsistence farming and the gathering of nontimber forest produce. The state's GSDP grew at a CAGR of 10.30 per cent, during 2011-12 to 2018-19. The GSDP is expected to grow at 11.71 per cent by 2018-19 to reach Rs 1.17 trillion (US\$ 16.74 billion). The state's NSDP increased at a CAGR of 10.02 per cent from 2011-12 to 2017-18 and further expected to reach to Rs. 1.34 trillion (US\$ 20.73 billion) in 2018-19 (Table 1 a&b & Fig 1). A vast natural resource base has enabled Jammu & Kashmir to develop land for cultivating major fruits. With varied agro-climatic conditions, the scope for horticulture is significantly high. Food processing and agro-based industries (excluding conventional grinding and extraction units) thrive in the region which possess an ideal climate for floriculture and an enormous assortment of flora and fauna (IBEF, 2019). Unconscious economic activities lead to deterioration of environment which pose serious and devastating impact on the living conditions and livelihoods of poor people, due to the dependence on natural resources for their livelihood. The economy of Jammu & Kashmir is primarily services based and agri-oriented, but has a vast potential for going green, owing to the climate diversity rich water, forests, livestock, agriculture and horticulture ecosystems which fulfil the requirements of the elements of Green Economy viz; generation and use of renewable energy; Energy efficiency; Waste minimisation and management; Preservation and sustainable use of existing natural resources and green job creation.

Table 1 (a): GSDP of Jammu & Kashmir at current prices			
Year	US\$ Billion	Rs Trillion	
2011-12	16.69	0.78	
2012-13	16.05	0.87	
2013-14	15.86	0.96	
2014-15	16.10	0.98	
2015-16	18.19	1.19	
2016-17	18.82	1.26	
2017-18E	21.86	1.41	
2018-19F	24.42	1.57	
Note: Exchange rates used are averages of each year, E-Estimate, F-Forecast			
Source: Directorate of Economics and Statistics Jammu and Kashmir, Central Statistical Office, J&K, Economic Survey, 2017			

Volume 8, Issue 2 (III) April - June 2021

Table 1 (b): NSDP of Jammu & Kashmir at current prices			
Year	US\$ Billion	Rs Trillion	
2011-12	14.36	0.67	
2012-13	13.44	0.73	
2013-14	13.22	0.80	
2014-15	13.27	0.81	
2015-16	15.33	1.00	
2016-17	15.85	1.06	
2017-18E	18.51	1.19	
2018-19F	20.73	1.34	
Note: Exchange rates used are averages of each year, E-Estimate, F-Forecast			

Source: Directorate of Economics and Statistics Jammu and Kashmir, Central Statistical Office, J&K, Economic Survey, 2017



Climate change effects

Jammu and Kashmir being the mountainous region, though rich in natural resources is prime to climate change effects due to increased externalities like pathogens that intrude in to the natures lap and negatively affect the ecosystem in terms of availability of fresh water, low ground water recharge, food production, increased water borne diseases with impact on human health, agriculture, reduction in length of water bodies, natural ecosystems, and biodiversity. The future of agriculture/horticulture, which provides livelihood to more than 60 per cent of Jammu & Kashmir population, is threatened by loss of biodiversity and ecosystem services, depletion and erosion of top soil nutrients, scarcity of freshwater, aggravated water pollution caused by poor nutrient management, hazardous chemical release, rising greenhouse gas (GHG) emissions and disposal of waste, as a usual scenario.

Volume 8, Issue 2 (III) April - June 2021

Climate change effects on agriculture production

Growth in agricultural productivity has generally been modest and the sector remained unexploited owing to weak technical capacity, various sources of inefficiency, growing pressure on environmental sustainability and particularly the water and land resources which are the important determinants of the production. Agriculture retains the share of employment to the tune of (16.67 per cent, while share of industrial and service sector during the period from 2011 to 2019 has increased to 29.23 per cent and 59.08 per cent respectively as per Directorate of Economics and Statistics J&K 2018-19. But growth in GDP in agriculture & allied sectors remains 8.49 per cent in Gross State Domestic Product (GSDP) during the same period. In J&K, every 1°C rise in temperature could badly affect the production of fruits, vegetables, medicinal plants, and rice production while as demand for food shall continue to increase more rapidly and shall become diverse with rising living standards, urbanisation and population growth, thus putting more pressure on agricultural supply capacity.

Population increase and green cover

J&K has been experiencing fast population growth over the decades and has already touched 14,528,801 mark. The high population growth with the share of urban population increasing from 17.3 per cent in 1951 to 31.2 per cent in 2011 and the population is slated to increase to 590 million by 2030 (Table 2). High employment opportunities and higher per capita income attract large number of migrants from surrounding rural areas resulting in an increased number of slums in the region. Such growth in city population has put huge pressure on basic services like water supply, sewage collection and disposal, solid waste management, public healthcare, sanitation, etc. Slum dwellers' lack of durable housing, secure tenure and access to basic services-including health services, adequate food, education and employment opportunities, decent transport, credit and the rule of law-often further entrench them in poverty. All this has led to conversion of green cover to a non-green and commercial hub and transformed Green Economy to Brown Economy

Year	Population	Decadal Growth	Change in Growth (%)
1901	2,139,362	-	-
1911	2,292,535	7.16	-
1921	2,424,359	5.75	-1.41
1931	2,670,208	10.14	4.39
1941	2,946,728	10.36	0.22
1951	3,253,852	10.42	0.06
1961	3,560,976	9.44	-0.98
1971	4,616,632	29.65	20.21
1981	5,987,389	29.69	0.04
1991	7,837,051	30.89	1.20
2001	10,143,700	29.43	-1.46
2011	12,541,302	23.64	-5.79
2019	14,528,801	-	-

Table 2: Decadal variation in Population in Jammu and Kashmir

Source: statisticstimes.com

Degree of urbanisation in Jammu and Kashmir and its effect on the essential services

The degree or level of urbanization is defined as relative number of people who live in urban areas. Percent urban [(U/P)*100] and percent rural [(R/P)*100 and urban-rural ratio [(U/R)*100] are used to measure degree of urbanisation. These are most commonly used for measuring degree of urbanization. The ratio U/P has lower limit 0 and upper limit 1, i.e. 0 < U/P < 1. The index is 0 for total population equal to rural population. When whole population is urban, this index is one. When 50 per cent of the population is rural, it means that there is one urbanite for each rural person. The urban-rural ratio has a lower limit of zero and upper limit α i.e. $0 < U/R < \alpha$. theoretically, upper limit will be infinite when there is no rural population (R=0) but this is impossible. From fig.2 it is clear that per cent urban has increased from 7.4 per cent in 1901 to 27.4 per cent in 2011, whereas per cent rural has shown gradual decrease from 92.6 per cent to 72.6 per cent during the same period. Urban rural ratio is a simple index measuring number of urbanizes for each rural person in an aerial unit experiences an increasing trend during hundred years in the process of urbanization in India. The urban-rural ratio for J&K in 2011 turns out to be around 37.7, meaning that against every 100 ruralites there are 38 urbanites in J&K in 2011. All these indices pin point that J&K is in the process of urbanization. It is important

to note here that the figures estimated for 2021 and 2031 also confirm the sustained urbanisation in Jammu and Kashmir putting the rural-urban ratio at 49.05 and put huge pressure on the basic necessities and waste-disposal in the urban centres.





Depleting water & vanishing wetlands

Due to huge urban expansion in Srinagar and some major towns of Kashmir there is a threat to the region's wetlands. According to the reports of Department of Environment, Ecology and Remote Sensing, Government of Jammu & Kashmir, more than 50 per cent of water bodies in Srinagar and its suburbs have been lost during the past century. Fig 3 reveals that based on the data figures of year 1911 and 2018 that wetlands like Batamaloo Nambal, Rakh-i-Gandakshah and Rakhi-i-Arat and Rakh-i-KhanKhan besides streams of Doodhganga and Nala Mar have been completely lost while other lakes and wetlands have experienced considerable shrinkage during the last century. The loss of water bodies of Srinagar and its suburbs is attributed to heavy population pressures, siltation, heavy deforestation etc. The report reveal that Srinagar city has grown 12 times in terms of population and 23 times in terms of area between 1901 and 2011. A report in 2011 said that Srinagar city is one of the 100 fastest growing urban areas in the world (Romshoo, 2011). The wetland, too, has shrunk from 18.75 square km in 1969 to to13 square km in 2008 (Romshoo, 2008).

Volume 8, Issue 2 (III) April - June 2021



Source: Study: Quantification of loss of spatial extent of lakes and wetlands in the suburbs of Srinagar city during last century using geospatial approach. Authors: Humayun Rashid and Gowhar Naseem

Fig 3: Lakes and wetland of Srinagar and its suburbs

Natural resource reduction

Table 3 presents the grim picture of the available natural resources and their harnessing rate in the J& K. From the table it is evident that percapita forest area had been reduced from 0.19 ha in 1961 to 0.05 in 2011 and if the rate of deforestation continue at same pace the situation further grimes up and it will reach to 0.03 ha in 2031 and that will be having very severe and serious repercussion to the whole state and the country in general. Likewise the per capita net sown area in the region in 1961 was 0.18 and has also receded to 0.06 ha in 2011 and will further showing a declining trend and will reach to 0.04 ha in 2031. Similarly, per capita gross sown area in the region has also declined from 0.23 ha in 1961 to 0.09 in 2011 and will further deteriorate and decline to 0.06 ha in 203. The depletion is due to overutilization and unjust harnessing of natural resources.

Census Year	Per capita forest area	Per capita net sown area	Per capita gross sown
			area
1961	0.19	0.18	0.23
1971	0.14	0.15	0.19
1981	0.11	0.12	0.16
1991	0.08	0.09	0.14
2001	0.06	0.07	0.11
2011	0.05	0.06	0.09
2021	0.04	0.05	0.07
2031	0.03	0.04	0.06

 Table 3: Rate of Natural resource reduction in Jammu and Kashmir

Problems of waste-management

Due to rise in population growth, everyday 3134 tonne of solid waste are generated

" (www.greaterkashmir.com). Waste collection in J&K largely inefficient due to lack of infrastructure to handle such a huge quantity of waste. Open dumping is a major method of waste disposal and burning of garbage causes significant air pollution. Moreover, solid waste management in J&K has a predominant involvement of child labour (from other states) which deprives many children their basic rights like education, food, nutrition and traps them into vicious circle of poverty.

Gap in power supply & associated health issues

The rising income level in J&K households puts a huge pressure on electricity and modern day technology, therefore, for achieving economic prosperity and decent living standard, electricity becomes the most preferred carrier for lighting. The share of gas/ electricity has increased tremendously in the region. The economic advancement in the region has replaced the traditional bio-fuels (fuel wood, charcoal/coal, dung, etc.) but still

SSN 2394 -

ISSN 2394 - 7780

Volume 8, Issue 2 (III) April - June 2021

there are vulnerable sections like Gujjars and bakarwals, Hanjis, rural people etc. which do not have much access to electricity. This inadequacy in access to modern energy services leads to loss of employment opportunities, negative health effects, and negative effect on vulnerable groups of women and children, rural poor people.

Economic development and health concerns

A significant portion of diseases caused by poor water supply, sanitation and hygiene is borne by children under 5 years. About 5. 23 per 1000 live births of child mortality in the region was recorded in 2018 and it could be attributed to environmental degradation. New communicable diseases and the health impacts from environmental pollution and ecosystem degradation are borne to the largest extent by disadvantaged and vulnerable populations, including children and women and perpetuate poverty by directly impacting the economic productivity, at both the micro and macro level.

Improper sanitation measures

Although, J&K, is rich in natural water resources, but still there is huge dearth of drinking and potable water especially in rural areas. In rural areas, water supply is marked by inadequate coverage, intermittency, low pressure and poor quality. Internationally acceptable figures of the non-revenue water are 15 to 20 per cent but in J&K it is over 40 per cent which is matter of serious concern (The Tribune, 2020). Sanitation in Jammu & Kashmir (J&K) is among the worst in India, with around 59 percent of households without a toilet (Swachh Report Card, 2018).

Fertilizer consumption

Horticulture the main sector providing the employment and livelihood to almost 70-80 per cent of population either directly or indirectly. The excessive use of chemical fertilisers and pesticides has increased the morbidity rate among the pregnant women, high rate of mischarges and lot more diseases and expenditures. Over the years in the state the consumption of fertilisers has increased from 20.70 (1980-81) thousand tonnes to 157.31 (2018-19) thousand tonnes (Table 4). Due to heavy consumption of fertilisers the environment and ecology in the state has faced so many challenges in the form of loss of flora and fauna and much more.

Year	Fertilizer consumption	
	'000 tonnes	Kg/ha of TCA
1980-81	20.70	21.25
1985-86	36.10	35.05
1990-91	42.59	39.94
1995-96	51.01	47.55
2000-01	62.71	56.25
2005-06	93.90	85.29
2009-10	113.19	98.89
2014-15	134.18	103.23
2018-19	157.31	126.54

 Table 4: Fertiliser consumption in Jammu and Kashmir

FUTURE AGENDA

- Combat poverty by promoting economic development and job creation.
- Involve local community in local government.
- Reduce air pollution by upgrading energy use and alternative transport systems.
- Create private-public partnerships to provide services such as waste disposal and housing.
- Plant trees and incorporate the care of city green spaces as a key element in urban planning.

The Jammu and Kashmir region has a vast potential for going green especially when it specialises in horticulture produce. The climatic diversity and topography of the region stands a great promise for pursuing the fundamental principles of green economy. The Karl Burkart has proposed following six main sectors for a sustainable green economy;

o Renewable energy

Source: Authors' calculations (Baba et al)

- Green buildings
- Sustainable transport
- Water management
- Waste management
- Land management

For sustainable development of these sectors, following fiscal measures which would have to be considered;

Tax Policy: environment-related taxes on goods, services, incomes and assets can influence behaviour in terms of the nature of the goods and services produced and provided, consumer choices and spending and the kind of assets acquired

Expenditure policy: Governments incur significant expenditure on public goods and services that should better account for the environment to prevent inefficient resource use and environmental impacts

Pricing policy: The government can influence or determine the pricing of goods and services in a variety of ways either by directly setting the price of certain products, or indirectly influencing prices.

These fiscal measures shall require;

1. Green Economy Pricing Mechanism

Conventional pricing;

P=MC

Where,

P= Price, MC=marginal cost of production

Green pricing;

P= MC+MEC+MUC

Where,

P= Price, MC=marginal cost of production, MEC=marginal external cost of production (Environmental & social cost),

- MUC= marginal user cost, i.e. the value of future benefits forgone by using a resource now, (David, 1992).
- 2. Green Tax
- Green taxes should encourage social inclusion, social equity, economic efficiency and environmental sustainability.
- Should discourage the use of non-renewable resources, monopoly of common resources, pollution and waste.
- Green Tax: Reduce emission until marginal abatement costs are equal to the charge on emissions.

Green Tax = MAC = Charges on emission

Or

MAC=MD

MAC= marginal abatement cost, and MD= marginal damage.

3. Green GDP

- Gross Domestic Product is defined as the market value of all the final goods and services produced within a country in a given period of time
- > The most common approach to measuring and understanding GDP is the expenditure method

GDP=C+I+G+(X-M)

GDP= Gross Domestic Product, C=Consumption, I=Investment, G=Government Expenditure, X=Exports and I=Imports, + Value of ecosystem good & services

Volume 8, Issue 2 (III) April - June 2021

Green GDP as the regular GDP minus the cost of environment and social damage.

Green GDP= GDP- (Environmental costs + Social costs) + VES

CONCLUSION

To conclude green economy approach was recognised as an important tool for sustainable development and poverty eradication. By fulfilling these two goals, it would automatically satisfy all three pillars of sustainable development Knowledge, information and resources are essential during the transition to greener economy. For an environmentally sustainable future, J&K needs to value its natural resources, and ecosystem services in a better and efficient manner and to frame policy and decision-making documents. Environmental sustainability is becoming a growing challenge along the state's/UT's projected growth trajectory, and thus, a low-emission, resource-efficient greening of the economic strategy is needed. While it may come at a slightly higher price for the regional economy but it promises to deliver greater benefits with decrease in carbon emissions rates, poverty levels and greater local environmental protection. Governments should devise such approaches that squeeze the intricacy of the global economic system, and should reach to the targets that achieve national priorities along sustainable development. There are set pathways by the international forums that can assist in achieving the set goals. The concept of green economy has responded to the issues pertaining to global social, economic and financial aspects of an economy by reallocation of natural, social and financial capital for social equity, economic advancement and environmental sustainability. These pathways need option once the Government decides to 'Go Green'.

REFERENCES

- Anshul B., (2018). The Green Economy Barometer, Research and Production team. New Delhi www.greeneconomycoalition.org
- Agenda 21 (1992). United Nations Conference on Environment & Development, Rio de Janerio. Brazil.
- Barbara Unmüßig, et al., (2016). 9 theses on criticizing the green economy. https://www.greeneconomycoalition.org/news-analysis/9-theses-criticizing-green-economy
- Brand U., (2012). Green economy-the next oxymoron? No lessons learned from failures of implementing sustainable development GAIA-Ecological Perspectives for Science and Society 21 28–32
- Bishop P. and Brand S., (2013). Measuring the low carbon economy at the local level: a hybrid approach Local Economy 28 416–28
- Bjørnholt B. and Larsen F., (2014). The politics of performance measurement: 'Evaluation use as mediator for politics' Evaluation 20 400-11
- Banerjee, Payal and Atul S., (2012). The Political Economy of Green Growth in India', United Nations Research Institute for Social Development (UNRISD). Occasional Paper.
- Czech Statistical Office (2014). Green growth in the Czech Republic: selected indicators 2013 Czech Statistical Office. Prague (www. czso.cz/csu/czso/green-growth-in-the-czech-republic-selectedindicators-2013-whvt3a3q88) Accessed 28 June 2016
- Dutta S., (2015). Climate Change and Indian Agriculture. XXXVI(10). World Focus.
- Development Alternatives (2014). Lessons for India's Transition to a Greener Economy-Inputs to the Global Transition Report.
- Economic Surveys (2014-15, 2013-14, 2012-13, 2011-12). Government of India.
- Eurostat 2016 Production, value added and exports in the environmental goods and services sector (http://ec.europa.eu/ eurostat/web/environment/environmental-goods-and-services sector/ database) Accessed 17 March 2016
- European Commission, Organization for Economic Cooperation & Development, United Nations and World Bank 2013 System of environmental-economic accounting 2012: experimental ecosystem accounting Published online by UN Stats (https://unstats.un.org/unsd/envaccounting/eea_ white_cover.pdf) Accessed 17 March 2016
- Eurostat (2002a). SERIEE: environmental protection expenditure accounts: compilation guide Eurostat. Luxemburg Eurostat 2002b SERIEE: European system for the collection of economic information on the environment-1994 version Eurostat, Luxembourg
Volume 8, Issue 2 (III) April - June 2021

- Eurostat (2008). NACE Rev. 2: statistical classification of economic activities in the European Community Eurostat, Luxembourg
- Eurostat (2009). The environmental goods and services sector: a data collection handbook Eurostat, Luxembourg
- Eurostat (2015). Government expenditure on environmental protection Eurostat: statistics explained(http://ec.europa.eu/eurostat/statisticsexplained/index.php/Government_expenditure_ on_environmental_protection) Accessed 19 February 2016
- Eurostat (2016). Production, value added and exports in the environmental goods and services sector (http://ec.europa.eu/ eurostat/web/environment/environmental-goods-and-services sector/ database) Accessed 17 March 2016
- Hood C., (2012). Public management by numbers as a performance-enhanced drug: two hypotheses Public Administration Review 71 S85–S92
- IUCN, (2019). Transitioning to a Green Economy-Building on Nature. Position Paper.
- (IBEF) Indian Brand Equity Foundation, https://www.ibef.org/states/jammu-and-kashmir-presentation.
- Livesey D., (2010). Measuring the environmental goods and services sector Economic and Labour Market Review December 45-58
- National Strategy for Sustainable Development and Action Plan (2011) (2008) https://www.environment.gov.za/sites/default/files/docs/sustainabledevelopment_actionplan_strategy.pdf
- National New Economic Growth Path Framework (2010). http://www.info.gov.za/view/DownloadFileAction?id=135748
- New Growth Path Accord 4: green economy Accord (2011). http://www.info.gov.za/view/DownloadFileAction?id=159756
- Statistical Digest, (2018-19). Directorate of Economics and Statistics J&K.
- Swachh Report, (2018). After Bihar, Jammu & Kashmir has the Lowest Sanitation Coverage. https://swachhindia.ndtv.com/after-bihar-jammu-kashmir-has-the-lowest-sanitation-coverage-but-hopes-to-go-odf-by-2019-12680/
- Susan Mueller (2017). Green technology and its effect on the modern world. Business Information Technology Oulu University of Applied Sciences
- Shakeel A. Ramshoo, et al., (2018). Assessing the impacts of changing land cover and climate on Hokersar wetland in Indian Himalayas. Arabian Journal of Geosciences.
- Shakeel A. Ramshoo, et al., (2010). National Wetland Atlas. Ministry of Environment and Forests. Government on India.
- Office of the Registrar General & Census Commissioner, India Ministry of Home Affairs, Government of India
- The Tribune, (2020). J&K heading for water crisis, losing over 40 per cent in distribution. William Stafford and Kristy Faccer (2014), Steering towards a Green Economy, A quick response Guide, CSIR, GWDMS Stel Gen 13604. https://www.tribuneindia.com/news/archive/j-k-heading-for-water-crisis-losing-over-40-in-distribution-647299
- Wani et al., (2015). Climate Change in Kashmir valley: Is it initiating transformation of mountain agriculture. Indian Journal of Economics & Development

CONCEPTION OF EDUCATION FOR ENVIRONMENTAL SUSTAINABLE DEVELOPMENT OF PROSPECTIVE TEACHERS OF BHOPAL

Gyaneshwari Kurmy¹ and Dr. N. C. Ojha² ¹Ph. D Scholar, ²Associate Professor, RIE, Bhopal

ABSTRACT

Today, there is a need of sustainability which is necessary in this era and this need is continuously arising and uplifting its hands in different modes. Sustainable development is mainly based on the three pillars of sustainability as – environment, society and economy. Environment for sustainability is embedded in the key goals of sustainability. Environmental sustainability is now a responsibility for interacting with the planet needs and to maintain the natural resources for upcoming generations. Now - a-days, all the countries are continuously struggling for their sustainable future and growth. The change in climatic conditions is enhancing the global, national and local environmental problems and leads to as loss of biodiversity, deforestation, etc. Therefore, the Sustainable Development is necessary for the environment to create energy efficient models of self-sufficiency and for the secured surroundings. Many researches proved that the productivity of science is evolving and is increasing in environmental areas and is beneficial for our country's growth. Thus, its really important for all of us those which are interested to work for the improvement of science and from the actual help by suitable products which follows the pathway of sustainability to save our future.

INTRODUCTION

The sustainability is a way of life and to think about our coming future in which the environmental, economic and social considerations are balanced and this improved the quality of life. When we talk and study about the improvement of life and development, one should also take care about the ecology and how to educate the country people to maintain the earth environment healthy for future purposes. Though, Sustainable development is a difficult concept to define; as it is continually evolving, which makes it difficult to define. One original descriptions of the sustainable development has been given by the Brundtland Commission which says that: "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own nee (World Commission on Environment and Development, 1987, p 43)". The Sustainable development is commonly based on three components: environment, society, and economy. The Sustainable development includes the constructivist development of land, projects, etc in the pathway which reduces their impact on the environment and they allow them to create efficient models of selfsufficiency. The Rio Declaration on Environment and Development come out and based on the various definitions, they have listed 18 principles of sustainability, as healthy and productive life in peaceful existence with nature, all nations have the sovereign right to develop their own resources followed by rules and regulations and in order to achieve this development the given standards should be followed. All the nations need to cooperate and restore the health and integrity of the ecosystem of earth. The countries and nations also need to solve the issues of environment and for this all the Environmental policies should not be used as an indefensible means of restricting international trade. All these "Rio principles" gave us parameters for visualizing locally relevant and culturally proper sustainable development for our own nations, regions, and communities.

Environmental sustainability follows the pathway of clean and safe drinking water and the road toward progress that explains the main visions of tomorrow and its victorious scientific vision of environmental sustainability that the environment shall become safe and healthy. The control over pollution, industrial wastes, water wastes and their treatment is the need of today's world. Environmental sustainability is in a tragic state of immense pain. Some human activities like industrialization, desertification, and overutilization of natural resources by exploding population, dispossess agricultural practices and this much more led the environment to the edge of collapse driving world nations to arms to revert on the further deterioration of environment and come forward to follow its stability. There are various and important approaches like recycling the waste materials and superb and excellent treatment systems have been applied to upraise the situations but many of them have not met with the actual success. In the initials, the beginning of agriculture has an eco-friendly and environmental activities, but with the evolotion of the green revolution, and the involvement of weedicides, pesticides, etc have dominated its negative and harmful footprints on our environment. But, during the last 25 years our world has become aware and understood about the various environmental problems. There are lot many things we need to follow up and to become more sustainable. We can reduce our use of energy which comes from the burning of non-renewable fossil fuels and we can use our energy sources more diligently and efficiently. We have

to recycle the waste materials and have to regenerate its limit. We also need to adopt some more environmental friendly forms such as walking, cycling or public transport and at the same pace of time, Governments and industries also need to explore the cleanly ways of generating electricity, the proper use of renewable resources like wind power, solar power, bio fuels, geothermal energy. So, it is the responsibly of our citizens and the govts that by the way of interconnecting with our whole planet due to which it starts to maintain our natural resources and to remove the risk of ability for our coming generations to meet their sustainable needs. Environmental Sustainability prohibits the use of harmful resources, toxic materials which are continuously depleting the natural resources and disturbing the ecological balance. So, all we need to know that how and what we need to do to the save our environmental beauty and to maintain the continuity of the environmental and ecological balance, Thus, to maintain the environmental sustainability it is important to acquire more resources which provide us healthy and clean atmosphere and which follow the sustainability standards to survive quality life on the earth.

Objectives of this study

The following objectives have been designed for this study.

- 1. To study the conception of prospective teachers on Environmental Sustainable Development.
- 2. To study the role of prospective teachers towards Environmental Sustainable Development.

Research Questions

The present study will be going to conduct to find out the answers of the following questions:

- 1. What is the level of conception of prospective teachers on Environmental Sustainable Development?
- 2. What is the effective role of prospective teachers towards Environmental Sustainable Development?

Operational Definition of the terms used

Prospective Teachers: The students studying in B.Ed. courses.

Conception: The conception of B.Ed. students on environmental sustainable development (ESD)

Delimitation of this Study

This study will be conducted under the following constraints:

- 1. The study will be conducted only in the selected colleges of Bhopal.
- 2. The prospective teachers of limited private institutions have selected.
- 3. The study will be limited to the selected components of environment for Environmental Sustainability.

Methodology

Method

Survey method is applied for this study.

Sample

The sample for this study has taken from Private colleges in Bhopal district of Madhya Pradesh. The sample has selected randomly. In each and proper selected colleges, the data are collected from the students which were studying in B .Ed final year and the data has collected from these final year students.

Tools and Techniques

Following tools will be used for the data collection.

Conception for Environmental Sustainable Development tool has administered.

Procedure of Data Collection

The sample has selected randomly. The selected sample has been administered by Conception tool. Those students who have high and low conception towards the environmental sustainability have selected and study has conducted on them.

Analysis and interpretation of data

Mixed method will be employed for analyzing the data. The data has been properly analyzed with the help of the percentages and averages or mean.

Table -1 Responses received between private B.Ed College Students

B.Ed Students Selected	Ν	Calculated Mean	Percentage
Students of Naveen Swami Vivekanand College, Bhopal	15	128	85.3%
Takshshila College, Bhopal	15	122	81.3%

Table -2 Total responses received

Students	N	Average Percentage
Total B.Ed students	30	83.3%

CONCLUSION AND EDUCATIONAL IMPLICATIONS

The present study reveals that the conception of B.Ed final year students towards the Environmental Sustainable Development that is on ESD are favorable.

From table 1, the calculated mean scores are 128 and 122 respectively and this proves and express that there is approx. a similar conception of thoughts. The percentage of 85.3% and 81.3% has achieved and is experiencing the similar thought process of the students.

From table 2, The average percentage of the students reaches to 83.3%. It explains that the environmental sustainability has a great impact on the conception of students. The students' conception is completely going towards the environment saving techniques and all these students have a clear-cut concept to save the environment and are ready to spread the awareness towards the safety of environment so that the environmental sustainability will reach to the aims of development. It also proves that the students have rich knowledge about the environment and eco-system, and they are working on the directions which are helpful for environment and eco-system.

FOR FUTURE OR UPCOMING STUDY

The study can further be elaborated under the following constraints:

- 1. The study can be conducted in the various colleges of different states.
- 2. The prospective teachers of private and government institutions can be selected for the study.
- 3. The study can be elaborated to the various components of environment for Environmental Sustainability.

REFERENCES

- Gibson, J. (1979). The ecological approach to visual perception. Boston, MA: Houghton
- Payne, P. (2005a). 'Ways of doing' learning, teaching and researching. Canadian Journal of
- Environmental Education, 10, 108-124.
- SAGE Publications (Los Angeles, London, New Delhi, Singapore, Washington DC sad
- Melbourne) www.sagepublications.com Vol 10(1): 54 67 10.1177/0973408215625534 ISSN
- 2071-1050 www.mdpl.com/journal/sustainability
- https://alison.com/course/introduction-to-environmental-sustainability-revised
- https://pdf.sciencedirectassets.com/277811/1-s2.0-S1877042812X00272/1-s2.0-S187704281204147X/main.pdf
- https://study.com/academy/lesson/environmental-sustainability-definition-and-application.html
- https://sustainablehighereducation.files.wordpress.com/2016/01/segalas-coral-tejedor-
- papell-2016.pdf
- https://sustainabledevelopment.un.org/processes/post2015/owg/questionnaire
- https://www.economicshelp.org/blog/143879/economics/environmental-sustainability-definition-andissues/

Volume 8, Issue 2 (III) April - June 2021

- http://www.enviropedia.org.uk/Sustainability/Sustainability_Introduction.php
- https://www.environmentalscience.org/sustainability
- https://www.researchgate.net/publication/329736753_IMPORTANCE_OF_ENVIRONMENTAL_SUSTA INABILITY_FOR_BUSINESS_SUSTAINABILITY
- https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/environmental-sustainability

Volume 8, Issue 2 (III) April - June 2021

SUSTAINABILITY IN DAY TO DAY LIFE

Jueelee Patil

Thakur College of Science and Commerce, Kandivali (E), Mumbai

ABSTRACT

"Sustainable Development is defined as the development, which satisfies needs of present generation, without compromising for the needs of future generation". Sustainability in lifestyle is also equally essential just like developmental process. Natural Resources on earth are very scarce. They are limited & thus as valuable as Money & Time. With current rate of exploitation, they will get depleted rapidly & will not be available for future generation. In order to prevent this loss, we need to change our lifestyle. We need to balance, control & adjust our needs. Demand for too lavish kind of lifestyle is harmful for environment, as it requires tremendous exploitation of Natural Resources. Sustainable Lifestyle not only protects Environmental & Human Health, but also it reduces our major costs, helping to maintain & continue Economy. Thus this Research Paper reflects on-Practices of Sustainable Lifestyle in day to day life by taking into consideration variety of areas, such as-Domestic, Agriculture, Education, Tourism, Transport, Festivals & so on.

Keywords:- Sustainability, Resources, Lifestyle, Protect

INTRODUCTION

Sustainability is extremely essential in every aspect, let it be Development, Business, Agriculture, Tourism & even lifestyle. Human Beings require n number of resources, in order to live day to day life such as Electricity, Water, Paper, food etc. But extreme amount of carelessness has been observed in human behavior, which gets reflected in the form of wastage & unnecessary way of consumption. Thus 'Sustainability in Day to Day Life' teaches us to be cautious & watchful towards our wrong habits, by careful use & conservation of Natural Resources.

OBJECTIVES

1) To prevent ongoing wasteful way of consumption pattern in current generation population.

2) To make the current generation aware about variety of sustainability tips to prevent further loss of precious natural resources.

3) To protect life on mother earth by generation of awareness regarding 'Sustainable Lifestyle' in day to day life.

RESEARCH METHODOLOGY

Literature Survey was carried out regarding variety of methods & practices, which conserve our resources, traditions & which make people realize their wrongful, unsustainable way of consumption of natural resources.

RATIONALE

In day to day life, we human beings need number of resources, such as-Electricity, Fuel, Paper, Wood, Plastic, Food, Water etc.But many of us are knowingly or unknowingly going for unsustainable pattern of consumption, by either wastage or excessive utilization beyond basic needs. Such kind of our irresponsible habits are taking us towards gradual process of destruction of life on the surface of earth.Energy & Water Crisis, Global Warming & Climate Change, Man-Animal Conflicts, Acute Poverty, Diseases etc. are all visible impacts of our own behaviour. Thus in order to make today's citizens, well aware about their mistakes, to guide them about right kind of habits & to further prevent ongoing, rapid depletion of Natural Resources, this Research Work has been carried out.

DATA ANALYSIS/ CONTENT

A) **SUSTAINABILITY AT DOMESTIC LEVEL:** i)Generally, in 2 to 3 BHK flat, after lunch or dinner, before going to bed, for the time being, all family members can sit in one single room, rather than sitting in their own separate rooms. It will save a lot of electricity used for fans & lights.

ii) Due to modernization, alongwith Fridge, Television Set, Washing Machine also comes.But washing of clothes can be done by hands also, which requires maximum 15 minutes.It gives our hands also some exercise.In a tropical climate country like India, there is more than sufficient availability of natural sunlight.Thus no machine is needed as such even for drying of clothes.Thus use of washing machine for washing small quantity clothes is a practice of wastage of electricity as well as water.

iii) After entering our own house, we see tremendous wooden furniture needed for-storage of-Footwear, Clothes, Books, Utensils, Show-Case & for Tables like-Study, Dressing & Dining. We need to think

Volume 8, Issue 2 (III) April - June 2021

atleast once, that in order to have this much of wooden furniture, how many trees must have got cut. And how many trees did we plant till now. Wooden furniture can be replaced at few places by steel or Plastic also.

iv) There are few costly outfits, which are not supposed to be washed by water & detergent, but drycleaned.Dry-cleaning needs use of chlorine containing solvents, which causes tremendous water pollution.It simply indicates that in order to clean our clothes, we make our environment dirty.Thus, it is better not to buy only those clothes, which need dry-cleaning.

v)The practice of wearing Khadi clothes, was initiated by our 'Father of Nation', Barister, 'Mahatma Gandhi'.They are made in India & made up of pure cotton like natural fibres.Such clothes are effective in sweat absorbing & give soothing,cooling feel.But instead of that, artificial fibres like-Nylon,Terylene, Rayon are used which are extracted via processing of Petroleum, that results in tremendous pollution.Outfits made up of such kind of synthetic fibres also cause tremendous physical discomfort, thus harmful for skin.

vi) Foam Pillows & mattresses are used, which are manufactured using Chlorofluorocarbon, which is an Ozone Depleting Substance.Rather than that, we can use plain, soft & simple pure cotton pillows & mattresses.

vii)The sight of house-ants is quite irritating to us. BHC (Benzene HexaChloride), which is an agricultural insecticide is utilized in order to keep them away. It is actually a toxin , that we are likely to inhale. Thus allowing toxin entry in our body for the sake of killing ants, sounds quite strange. We can drive away ants easily by strong smell of TurmericPowder & keeping 4 pieces of Cloves in Sugar container.

viii) Having Tulsi Plant (Oscimum sanctum) in front of your house will be quite beneficial. It will not only purify air but also keep mosquitoes away. Thus protecting our health from ill effects of pesticide use as well as Mosquito born diseases.

B) SUSTAINABILITY IN AGRICULTURE: i) Having cow like domestic animal in our cattle wealth, will be quite beneficial. It not only provides us nutrition via milk like food product but also a natural fertilizer in the form of Cowdung (Gobar), Biogas as a source of fuel out of it & Natural Insecticide in the form of Cow Urine (Gomutra). Thus cow is an important component of living system. We need to conserve our cow population.

ii) Cow urine, Neem leaves & Garlic are very effective natural insecticides in Agricultural field. Their frequent use can reduce our dependance on artificial insecticides which are non-biodegradable & harmful for the health of living beings.

C) SUSTAINABILITY IN TOURISM :- People spoil beauty of historic places by writing their names on walls of temples, to display memory of their visit. This kind of practice, literally spoils beauty of those historical, heritage places. Rather than that, in order to create a long lasting memory & instead of throwing garbage at Tourist spots, seeds of variety of fruits & vegetables can be thrown. They will germinate & give rise to new, young plants, creating really long lasting memory.

D) SUSTAINABILITY IN FESTIVALS :- i)On festivals like 'Vatpournima' instead of cutting & bringing Twig of Banyan tree at home for worshipping, same day can be celebrated as 'Tree Plantation Day' as trees release life supporting gas-'Oxygen'.It will be worship of trees & nature in actual senses.

ii) On the day of Festival of- 'Dashehra', instead of distributing Apta plant leaves, (Bauhinia racemosa), same plant can be planted in pots & given as a 'Gold Gift'.

iii) 'Makar Sankranti' is a Solar Festival. Thus apart from 'Tilgul' distribution, on this Day, crucial message of 'Solar Energy Consumption & Pollution Prevention' can be spread.

iv) A lot of electricity is consumed for light based decoration in festivals.Rather than that, colourful Floral decoration can be done.

v) During festivals & functions, a lot of food is wasted by people,Our farmers have worked tremendously hard in order to grow that food. A lot of fuel has been spent in order to cook & transport that food.Wastage of food wastes all these things.We should not let it happen by throwing away food.

E) SUSTAINABILITY IN KITCHEN :-i) Soaking of Dal & Rice in water for half an hour prior cooking, will soften them, thus consuming less amount of fuel required for actual cooking purpose. It will minimize Air Pollution as well resulting from combustion of cooking fuel. By this practice, if we save gas even for 1 minute, it will save gas for 365 minutes throughout the year, thus saving gas consumption per year equivalent to the duration of 6 Hrs.

Volume 8, Issue 2 (III) April - June 2021

ii) We can go for Ecofriendly way of fasting. On the day of fast, rather than eating food cooked out of oil & gas use, we can eat raw food such as fruits, sprouts & salad.

iii) Use of mixer grinder is very common for preparing Milkshakes, Soups, Chutney etc. Use of Mixer consumes electricity, can be risky at some times & causes tremendous noise pollution as well. Rather than that, we can make use of simple, household implements, such as- 'Pata-Varvanta', Khalbatta, Grater. It will save electricity plus give exercise to hands.

iv) Cold Drinks like-Thums Up & Coca cola are harmful for the health of bones & stomach. A lot of electricity is also needed to store them in fridge.Rather than that, it is beneficial to go for pure natural drinks such as-Coconut Water,Buttermilk,Amla & Kokam Sherbat & Aam Panna.

v) Boric Powder & BHC (Benzene Hexachloride) like harmful chemicals are utilized in order to protect cereals & grains from insect attack.Rather than that application of Castor oil, Drying in open sunlight & keeping bitter leaves of Neem & Fenugreek in grains will be a better option from health safety point of view.

F) SUSTAINABILITY IN BATHROOM :-i) Turkish towel is much thicker as compared to traditional khadi 'Pancha' used for body drying purpose. Thicker the piece of cloth, more is the water requirement in order to wash it. As khadi 'Pancha' is quite thinner & made up of cotton, it is comfortable from skin comfort as well as water conservation point of view.

ii) Use of shower is responsible for tremendous wasteful consumption of water.Rather than that, use of single bucketful of water will be convenient for one time bathing purpose.

iii) There are many advertisements related to body beauty products such as Soaps, Shampoos & facewashes.Rather than going for these chemical based products which cause skin allergies & Pollution, natural substances like Gram Flour,Turmeric Powder,RoseWater,Ubtan,Ritha,Shikakai & Amla Powder can be used to beautify skin & hair,both in a better way.

G) SUSTAINABILITY IN EDUCATION :- i) There is a general expectation to have clean-white paper in notebooks, notes & textbooks.But in order to create such kind of paper, a number of bleaching agents are needed in high quantity, which ultimately pollute our water resources.

ii) Use of slate is a very much suitable alternative for frequent use of paper in early education. As it is reusable, it saves a lot of paper requirement & thus deforestation.

iii) Rather than using only one side of paper, both sides of paper can be used. It saves a lot of paper. There is no need to have multiple xerox copies of one single document. Limited 2 to 3 xerox copies can be taken & circulated amongst team members, at the time of crucial meetings.

H) SUSTAINABILITY IN TRANSPORT :- i)Regular maintenance & cleanliness of vehicles will increase vehicular life.Thus, time to time lubrication, Parts Replacement, Vehicle Tuning, PUC (Pollution Under Control),Tuning, Silencer cleaning & Air checking for tiers are some of the really beneficial practices to protect vehicles from getting damaged at earlier stage.

ii) One should not expect that immediately after getting the Road Signal Green, all vehicles in front of you should move at once. More fuel is needed in order to increase or decrease speed of vehicle immediately. It is very indisciplined to bang the horn also in loud, for making drivers ahead of you alert to take forward their vehicles. It causes tremendous noise pollution. Patience is extremely necessary at the time of driving.

ii) Use of cycle is extremely useful to prevent Air pollution as well as for fat burning. It does not require fuel, does not cause noise pollution & gives useful exercise to limbs.

INTERPRETATION :- From above all examples, from different areas of human Lifestyle, we understand that sustainable lifestyle is truly cost cutting & not that difficult at all, but quite simple. It opens our eyes by making us realize the mistakes we did in past in order to have posh & rich kind of lifestyle.

LIMITATIONS

For some people, bringing sustainability in lifestyle means living like poor & stingy people while having sufficient money in pocket. They do not realize that-Money does not mean everything & it cannot buy you everything, including happiness. True happiness lies in conservation, sharing & caring. While adopting this way of living, we have to keep aside our greed & show off, which ultimately leads to destruction. But as all of us do not understand & follow it, as a need of an hour, Sustainable lifestyle is not being followed up globally. And thus Degradation of Environment continues to occur.

Volume 8, Issue 2 (III) April - June 2021

SUGGESTIONS

There is an extreme need to go globally in order spread vast knowledge, education, guidelines & training for making, each & every citizen on earth, aware about importance of Sustainable Lifestyle.NGO's & Mass-Media alongwith Government can play a crucial role in it. There is a need for strict legislatory implementation to prevent it's violation. It is Human Being, who has spoilt this earth & not any other creature. Thus we need to be responsible & watchful towards our greeds, needs & deeds.

CONCLUSION

Implementation of Sustainable Lifestyle is highly beneficial for us, as it keeps our crucial resources, health & money, in fact everything intact. It makes us, a bit, to sacrifice our wants, but it is very much essential for the safe existence of Mother Earth in future. And ultimately, we humans, are not owners but just visitors on this globe. One day we all have to die, but our beautiful planet- Earth needs to survive. Thus there is a need of follow-up of Sustainablity in daily life.

REFERENCES

A) 1) Dainandin Paryavaran (Marathi Edition)-Dilip Kulkarni-Rajhans Publications-Page no.s- 21 to 118

B) WEBSITES

- 1) https://theminimalistvegan.com/live-a-more-sustainable-lifestyle/
- 2) https://en.wikipedia.org/wiki/Sustainable_living
- 3) https://flygrn.com/blog/sustainable-living-tips
- 4) https://repurpose.global/letstalktrash/5-ways-to-start-your-sustainable-lifestyle-journey/
- 5) https://www.wbcsd.org/Programs/People/Sustainable-Lifestyles/News/What-constitutes-a-sustainable-lifestyle
- 6) https://www.sciencedirect.com/topics/social-sciences/sustainable-lifestyle
- 7) http://www.greenewit.com/inmedia/blog/why-it-is-important-to-live-sustainably.html
- 8) https://www.cdc.gov/sustainability/lifestyle/index.htm
- 9) https://www.ericsson.com/en/blog/2020/6/how-to-promote-a-sustainable-lifestyle
- 10) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5401917

SUSTAINABLE TOURISM IN INDIA: NEED FOR PRESENT AND FUTURE

Priti Gupta¹ and Alok Raj Soni²

Assistant Professor¹ and Student², Thakur College of Science and Commerce, Kandivali (E), Mumbai

ABSTRACT

Tourism is one of the largest as well as the fastest growing industry in the world. Tourism become one of the key sectors generating revenue and employment. Being rich in heritage, culture and scenic beauties, India makes one of the most preferred tourist destinations. For developing countries, tourism is also one of the biggest income generators. As per records, India has huge infrastructural and resource scarcity which creates difficulty to tourism industry and may cause severe impacts upon local communities and the environment if it is not timely rectified.

Proper planning and management are the urgent need to support tourism industry, and more importantly, protecting and conserving biodiversity of tourist places. Coping with such serious issues, implementation of sustainable tourism, eco-tourism and rural tourism becomes a need of today, as it is all about conserving the resources, valuing local culture and tradition and, contributing largely in economy.

Sustainable tourism is responsible tourism intending to generate employment and income along with lesser impact on environment and local culture. This has led to great focus on sustainable tourism for the one of the largest industries in the world.

Key Words: Sustainable, Eco tourism, Rural tourism.

INTRODUCTION

'Tourism', as an industry, for any country in the world, is its integral pillar of the economy and plays an important role in overall development. For India, it becomes critical considering the variations in our society, culture, heritage, overall growth and sustainability.

According to United Nation, India is 8th largest tourism economy in the world. It is 9th largest country in terms of cultural resources and business travellers in the world. In the past 4 years (between 2016-2020), 15 million jobs have been created in this industry. Our country has obviously got a great list of achievements and facts for tourism industry to grow and add up to the economy.

But there are numerous questions that need to be awaken before the responsible citizens of India:

- i) Are we utilising our tourism resources in the productive manner?
- ii) Do we consider each section of society and environment in this industry?
- iii) Are we taking good care of ecology while making profits for our needs?
- iv) Are we conserving our rich heritage, culture, historic evidences etc?
- v) Are we moving forth towards sustainable tourism keeping in mind the importance of eco-tourism and rural tourism?

OBJECTIVES

- i) To emphasize the importance of tourism industry.
- ii) To feature the drawbacks of tourism industry.
- iii) To enumerate the dreadful impact being caused to the nation through this industry.
- iv) To put forth the idea of sustainable tourism.
- v) To define and feature the idea of eco-tourism and rural tourism.
- vi) To highlight the need of proper planning and managing the tourism industry.
- vii) To suggest the available effective remedy to rectify the shortcomings of the industry.

METHOD

The outline of this research paper is descriptive and brief in nature. The method of data presentation is based on online research from verified sources and websites. Mostly the data is secondary and provided as by the authorities on digital platforms.

Tourism Industry- A threat to Nation

Here are some the facts which are alarming and need special remedy to safeguard the future of country:

According to UN, a normal resident uses 14 litres of water per day whereas a tourist or a hotel guest uses 1785 litres of water per day. This fact makes tourism a resource-intensive industry or we can say a very 'thirsty business.'

Not only that, we must also calculate the amount of all types of pollution being caused by just a **single tourist**. Hence, tourism causes huge loss to nature.

- ii) The next fact declares tourism as **displacement business** with severe impact on both human and wildlife. There cannot be a single example of infrastructural advancement made for tourism where humans or animals of a particular region or locality would not have been displaced. To name few of such activities, they are **Metro Rail projects** in various states, **construction of airports** in sensitive hilly areas, **animal migration** due to shrinking of forest areas, **tourist festivals**, **business exhibitions** etc. Hence, tourism causes huge loss to habitat.
- iii) It gives a psychological pain tracking the commercialisation and commodification of traditional cultural events and arts and erosion of aesthetical values. This has already led to false cultural expression for the material gain for both local population and tourist. It demonstrates that 'culture can be sacrificed for reasons of economy and thereby creating an additional economic value at the price of losing a cultural value.' Hence, tourism causes huge loss to cultural identity of a place and community.
- iv) It is evident to everyone that tourism has been **core reason and a medium** for numerous **illegal trades of historic object, idols, literature, drugs and animals**. It is not required to explain the loss caused to the nation due to such activities. There is almost no scope of **repercussion** to already losses occurred to the country. Hence, tourism causes huge loss to an economy financially.
- v) Lastly, tourism has created a **distress** among all age group of citizens in regards of **culture**, **fashion**, **beliefs**, **lifestyle and growth**. It should be noted and accepted that only an **elite class of family or person** can only afford travelling to a foreign country or distant place. Their presence makes a typical Indian look at tourist in way that they're inferior to them. To put forth a perfect instance, we cannot forget the 'period of imperialism' which made this beautiful and incredible country a bond slave country since more than 2 centuries. The effect of this demonstration can still be seen in our rich-cultured country. Our **inclination** towards the **western culture** is sorrowful.

Sustainable Tourism- Concept

As per present demand and circumstances, **Sustainable Tourism** may be defined as a tourism that **respects and accepts** local people as well as travellers conversely, **loves and protects** environment, **assists and promotes** cultural heritage, while **rejoicing and experiencing** an **educative and exciting** holiday for both traveller and people in host country, state or city.

Sustainable Tourism promises the **protective way of exploring** our planet in the best manner and retaining its purity and greatness for the coming generations.

Case Study 1

Let us take an example of a family or a person residing in a metropolitan city, looking for a break or holiday in the weekend or stretch for sometimes. What do they expect in their visit- the same high mounting buildings, the noisy and always crowded streets and subways, the polluted air with dust and smoke, the unhygienic food and water on roadside, the same shopping in malls and supermarket with trolley? OR a soothing and calming scenic greenery and beaches, a life away from stress and agitation, an open sky destination, exploring the unfamous community and destination, shopping from local and being vocal for local? There is a new trend that traveller from over the world have started to **avoid visiting zoos** and staring **caged animals** and **prefer jungle safari** and **watching free animals**, **avoid visiting a city** and **preferred going to a village** exploring the life **full of nature and reality**.

Hence, it's in hands of responsible citizens of our country to serve in the platter of tourism what we want to serve and conserve. This digital era is very crucial and will help us setting such trends and promote the real taste of tourism.

Case Study 2

Let us take an example a family or a person residing in a rural place or a village to be specific, looking for a break or holiday. Firstly, we need to understand nature of people of such places. Who resides in a village? A farmer? Mostly! Are farmers that rich or potent to go out and afford a holiday. Not much! Considering the odd

Volume 8, Issue 2 (III) April - June 2021

situation, let us accept that a farmer decides to go on a trip or holiday. What do they expect? Same rural place or an opposite one? Obviously, the latter. They might be willing to see stretched buildings, museums, an artificial and fancy park with all amenities, a theatre which they'd have never seen in their location, wide roads and much fancy foods to eat and beverages to drink.

Hence, we witness both types of travellers and tourists. That's where **sustainable tourism comes into picture.** Sustainable tourism can help us draw and define straight differences among the types of travellers and help the decision makers, locals and travellers make intelligent decision on planning and managing the effective towards Tourism.

Considering the vast stretches of our country and the cultural counterparts of each citizen, sustainable tourism are divided into two sub categories- **Rural Tourism and Eco-Tourism**.

Rural Tourism

Rural Tourism can be defined as any form of tourism that showcases rural life, art, culture, heritage at the rural location. It benefits local community economically, socially as well as boosting the relationship between the local and the tourist for a more enriching tourist experience. It requires promotion of 'haat' (market) of local goodies, rural handicrafts and products into the urban market.

Advantages of Rural Tourism:

- i) It helps to expand the agricultural industry when tourist explore agricultural locations in a planned and organised way by mutual cooperation between the government and local.
- ii) Promoting and inviting rural tourism can help renown the culture of locals. Hosting tourists in a village fair and showcasing culture and heritage in the best manner can provide outstanding results for both the counterparts.
- iii) Provides a recent, alternative or supplementary income and employment in villages and rural hotspots.
- iv) Help to reduce gender and social power encouraging collective community and rejuvenate local culture.

Rural tourism is a growing form of tourism. It is not just remote stay and visit to rural areas. It is more than that. Rural tourism benefits the hosting community of rural areas as well as surrounding natural environment through preserving and conserving natural resources. It installs local pride, self-esteem, and identity contributing to conservation and protection while increasing the living standards of the local community.

Eco-Tourism

Eco-tourism can be defined as a form of tourism that attempts to minimize its impact upon the environment, is ecologically sound, and avoids negative impacts on many large-scale tourism developments undertaken in the areas which have not previously been developed.

World Tourism Organisation (UNWTO) ha defined Eco-tourism as tourism that involves travelling to relatively undisturbed natural areas with the specified objective of studying, admiring and enjoying the scenery and its wild plants and animals, as well as any existing cultural aspects [both of the past and the present] found in these areas. An optimum number of environment friendly visitor activities, which do not have any serious impact on the ecosystem and the local community and the positive involvement of the local community in maintaining the ecological balance are some of its key elements.

The following are benefits of promoting ecotourism in India:

- i) **Conservation** There are quite a large number of endangered the animal and plant species in India. Money collected from parks across the country is used to conserve the environment. Furthermore, the fee is being used to maintain the parks and to build new parks. The money is also being used to protect the neglected regions in the country and implement techniques that may help to reverse or repair the damage that traditional tourism has had on the nation's environment.
- ii) **Protection of endangered species** Ecotourism helps to protect threatened wildlife and plants in India. Investors and builders are encouraged to build hotels and resorts that will not have a negative impact on the environment. Therefore, environmentally conscious travellers can stay in these eco-friendly hotels making sure that the local plant and animal population are not affected negatively by the infrastructural development. Some of the accommodation fees are also used to protect endangered plants and animals.
- iii) **Economic benefits** Ecotourism promotes fair hiring and work practices that have helped to stabilize the economy in India. The locals are trained in tourism management and marketing as well as in hospitality so

that they can get employment in this sector. This way, the local economy can improve, and the local population can benefit from the tourists who visit their area.

iv) **Cultural benefits**-Ecotourism aims to respect and acknowledge the cultures of the host country. Ecotourism NGOs always keep up dialogues with local leaders to ensure that tourism activities do not have any negative impact on the lives of any living organism. Furthermore, tourists are encouraged to interact with the local population and acknowledge their customs. Hence, this is the way the local heritage is preserved, and traditional festivals, crafts, ceremonies and art forms are sustained.

CONCLUSION

Tourism industry is one of the most important income generating source. Tourism resources available in the various countries consist at the same time of space, facilities and values. These are resourcing whose use cannot be left uncontrolled without running the risk of their deterioration, or even their destruction. Conservation of historical, cultural and religious sites represents at all times, and notably at times of conflicts, one of the fundamental responsibilities of the State for which, the State need huge amount for its preservation and conservation.

For all foreign tourists, any visit to India should be a form of Rural tourism and Eco-tourism.

REFERENCES

- i) http://sdt.unwto.org/content/faq-climate-change-and-tourism
- ii) Impacts & Issues 2017
- iii) https://www.gstcouncil.org/about/about-us/
- iv) The Case for Responsible Travel: Trends & Statistics 2017
- v) http://mandalaresearch.com/downloads/role-sustainability-travel-tourism-2016/
- vi) Sustainable Travel International (May 12, 2016). "Why 'Going Green" Pays Off: Sustainable Practices Drive Destination Choice for A Majority of Travelers, New Research Unveils."
- vii) http://www.businesswire.com/news/home/20160825006194/en/COLLOQUY-Research-Shows-76-U.S.-Business-Travelers
- viii) https://www.slovenia.info/en/press-centre/press-releases/7184-2016-another-record-year-for-sloveniantourism
- ix) https://www.responsibletravel.com/holidays/slovenia/travel-guide/responsible-tourism-in-slovenia
- x) World Tourism Organization (2012) Global Report on Food Tourism.
- xi) World Tourism Organization (2015) World Conference on Tourism and Culture: Building a New Partnership Siem Reap.

Volume 8, Issue 2 (III) April - June 2021

GREEN LIBRARY: CONCEPT AND ELEMENTS

Rupesh Sawant

R.V. Jogalekar College of Commerce, Ratnagiri, Maharashtra, Affiliated to University of Mumbai

ABSTRACT

Now are the days of environment protection, ecological balance, sustainability, sustainable development and green initiatives, as every one of us in the world is talking about it. In fact, these are the most commonly used and applied terms around the world. Moreover, it the need of today, which may ensure the survival of today's lives as well as lives of tomorrow. In this context we people can take a lot of initiatives, which may be called as 'Green Initiatives' in the different spheres of our lives. And the 'Green Library' is one of such initiatives.

'Green library' is reasonably the concept of recent origin. Though it is of recent origin it is gaining popularity among the researchers, academicians, and library professionals around the world. The amount of information available on green libraries and green library practices is limited but continues to grow. Environmentally conscious people and library users around the world are looking at and expecting that libraries of today should not only a centre of information but also a green place. Now days various interconnected topics of green libraries and sustainability have received a great deal of coverage in various publications targeted toward world librarians. Even many library and other information professionals are taking action to ensure that their workplaces will be environment friendly.

This conceptual research paper/article essentially highlights and discusses the concept and elements of green or sustainable library.

Keywords: Green or Sustainable Library, Green Library Movement. Sustainability

I. INTRODUCTION

With the advancement of science and technology our life styles are influencing and changing with a greater pace. Today, the demand for anything is increasing rapidly, and we people are harnessing the power of it to fulfil our unending demands. In this scenario we people are forgetting something important, which should be recognized before we people talk about sustainable development in this faster changing world. It is nothing but the word 'Green', which is of a great significance for a healthy survives. We have observed that, over the past few years there are increasing interests towards green revolution in almost every sector and library is one of them.

Today, libraries work as gateways for knowledge are particularly responsible not only for disseminating the idea of sustainability but also for leading by example and thus serving as exemplars. Libraries of today should incorporate green elements into their operations. In fact, there are several reasons why libraries should incorporate green features into their buildings. It is vital for the health of library users and the mother earth on which we people live.

II. CONCEPT

It is to be noted that the concept of 'Green library' is of recent origin. Therefore, there is no univocal definition of the term 'Green Library'. When we say 'Green Library' we necessarily mean by it overall library operations and library building. The concept seems to be much comprehensive. There are a number of central themes that run through all of them, which seek to minimize the negative and maximize the positive effects the building will have on the local environment. Green libraries seek to reduce the use of water and energy by designing the building to maximize the use of natural and renewable resources. They also integrate actual plants into the building design, preferably with drought resistant and/or native vegetation. Furthermore, the maintenance of high standards of indoor air quality to help ensure the health of the people who inhabit the building. It is not merely a term but it is an activity, a process, and a movement. In simple words, green library is nothing but environment friendly or eco-library. Green or sustainable libraries are the structure that is designed, built, renovated, operated, or reused in an ecological and resource efficient manner. It is one of the many collective efforts of all mankind to make green planet by reducing global warming effect. The Online Dictionary of Library and Information Science (ODLIS) defines green library or sustainable library as, "A library designed to minimize negative impact on the natural environment and maximize indoor environmental quality by means of careful site selection; use of natural construction materials and biodegradable products; conservation of resources like water, energy, paper, and use of responsible waste disposal recycling system; etc." Further, according to New World Encyclopaedia green library, also known as a sustainable library is, "A library built with environmental concerns in mind."

Here, the term 'Sustainability' is defined in Online Dictionary of Library and Information Science (ODLIS) as, "The capacity to meet the needs of the present without compromising the ability of future generations to meet their own needs." It has economic, social, and environmental aspects. And sustainable library is one which performs its functions and plays its role in an environment friendly manner. In new construction and library renovation, sustainability is increasingly achieved through Leadership in Energy and Environmental Design (LEED) certification, a rating system developed and administered by the U.S. Green Building Council (USGBC).

Basically, green libraries are a part of the larger green building movement. Also known as sustainable libraries, green libraries are being built all over the world, with many high profile projects bringing the concept into the mainstream. Along with library, green design is an emerging trend, defining the library of the 21st century. Many people view the library as having a unique role in the green building movement due to its altruistic mission, public and pedagogical nature, and the fact that new libraries are usually high profile, community driven projects.

To sum up it can be said that green library can be characterized as environment friendly library or sustainable library. According to one more definition given in Online Dictionary of Library and Information Science (ODLIS), "Green library is a library designed to minimize negative impact on the natural environment and maximize indoor environmental quality by means of careful selection of site; use of natural construction materials and biodegradable products; conservation of resources like water, energy, paper, and use of responsible waste disposal recycling system, etc." Thus, every green library necessarily possesses certain essential features.

III. ELEMENTS

Basically, the 'Green Library Movement' has been emerged in the early 1990s and is gradually gaining popularity in the field of library and information science profession. Many of the library professionals of today are working on the idea of green library, which will use natural and regional construction material, minimize consumption of water and electricity, and also use environment friendly technology. Though it is somewhat in the initial stages of development, we need to understand that green or sustainable library is the structure that is designed, built, renovated, operated, or reused in an ecological and resource efficient manner. There are wide range of ways to promote the idea of green library, such as use of environmentally friendly or recycled and regionally available materials, optimal use and conservation of natural resources, virtual user services and resource-saving copy services, waste separation, elimination of plastic bags, no more paper cups and instead use of recycled/private crockery, fair-trade coffee in the library's coffee shop, green events, choosing library suppliers with green certificates and many more.

While the term 'Green Library' is often used specifically to describe a library building that has built by using standards or guidelines like LLED, it can also be refer to a library, which is becoming more environmentally sustainable in a significant ways, whether by using nontoxic cleaning supplies, reducing energy consumption, or collecting and promoting materials with environmental themes. Basically, green design is an integrated process. No one aspect of a building's architecture makes it a green architecture. Without proper integration right from the early stages of the planning phase, redundancies can occur, and can eliminate many of the potential benefits of sustainable design. Good sustainable design always capitalizes on the synergistic relationships that occur between the various design elements. LEED groups these elements into five categories. Buildings can be designed in a way in which, one category helps another category fulfil its goal of good and sustainable design. These five elements can be discussed as under.

Site selection: Library is the heart of any college or institution or university or any department. It should be at an appropriate site or locality so as to make users concentrate on their reading or study. Accessibility or connectivity through public transportation system is a necessary element, which should need extra attention while searching for site. In this regard various guidelines are given by different agencies and organizations like LEED, USGBC, and Indian Green Building Council (IGBS) to developed green library, which need to be considered.

Water conservation: It is one of the essential resources required everywhere in houses as well in offices. It is scares and valuable, hence, need to use very carefully. A library should undertake proper water management, which help to keep library clean, hygienic and green. There are many different ways for libraries to conserve and make optimum utilisation of water like rainwater harvesting system, use of low flow fixtures, and waterless urinals. Moreover, library can reuse of waste water and rainwater for plantation and gardening, and for flushing in toilets.

Energy conservation: Though the use of energy is unavoidable, its consumption should be reduced. In a library it can be save in many different ways. A library can have sufficient number of windows, glass windows, use of natural light, use of energy efficient bulbs and lights, etc. Even required electricity can be generated using direct sunlight by planting solar system on the roof top of library building. Also the surplus energy can be conserved and used when there is a need of extra energy.

Construction/Building materials: While thinking about a green library the first thing which comes in to our mind is the library building. There are many standards and protocols available in India and outside to make a green building by using recyclable and environment sustained materials. Indian Green Building Council (IGBC) is a part of Confederation of Indian Industry (CII), which offers a variety of services like green building rating programs, training programs, certification service program, etc. LEED is an internationally accepted program planning environmentally compatible high performances green building for a healthy environment. It is necessary to select materials for the library, which lead to minimum waste as possible and causing less damage to the natural environment.

Indoor air quality: Today, fresh, healthy, and breathable air is a most important factor. Particularly, inside the library building there is the need of a quality air. For this proper plantation is needed in the surrounding campus, which provides clean and pure air and also make library a cool place. Basically, trees give pleasant air and controls air conditioner operation during summer season. In hilly area building should be in a sunny place so that it will become little warmer and reduces room heater and blower expenses during winter season. Further, proper arrangement s should be made for air circulation and ventilation. It is to be suggested that a green building need to be designed in a way in which, the air gets recycled and does not stay stagnant.

IV. CONCLUDING REMARKS

To conclude it is to be said that a 'Green Library' or 'Sustainable Library' is a modern library i.e. a place, which uses environment friendly building materials, which make optimum use of natural resources, which minimizes wastages, which make better use of renewable sources and which carries its operations in more cost effective and efficient manner.

Now days it is much more needed for a library to greening the library environment. In this context library professionals of today should make some concrete decisions and take essential steps to make their libraries green and should also take part in green library movement. Many national and international bodies are extending their help making libraries a green place. However, along with these bodies, library users, librarians and government should take initiatives and actively participate in green library movement making it successful. It is to be noted that today's libraries as gateways for knowledge are particularly responsible not only for disseminating the idea of sustainability but also for leading by example. Small steps in going green can produce big results over a period of time. The concept can be develop and bring into reality in cooperation with unpaid partners like NGOs, friends of the library groups, school projects, library suppliers and, last but not least, the library users.

V. ACKNOWLEDGEMENTS

The author of this research paper/article is very much thankful and expresses his deep sense of gratitude to all the individual as well as institutional contributors in the subject area, which helped a lot to get a deep insight in the subject matter.

VI. REFERENCES

The relevant literature has been used, which is duly cited and produced here as the list of references.

- [1] American Library Association (ALA). (2019) Sustainability and Libraries: Green Libraries. Available from: https://libguides.ala.org/SustainableLibraries
- [2] Antonelli, Monika. (2008). The Green Library Movement: An Overview and Beyond. Electronic Green Journal, Vol. and Issue 1(27) 2008. ISSN: 1076-7975. Available from: https://escholarship.org/content/qt39d3v236/qt39d3v236.pdf?t=qe6f5g
- [3] Lamis, A. P. (2003). Greening the Library: An Overview of Sustainable Design. Planning the Modern Public Building: Edited By G.B. McCabe and J.R. Kennedy. Libraries Unlimited: Westport, Connecticut. Landon. Pp. 31–45. Available from: https://books.google.co.in/books?id=NUplCIv1KRYC&printsec=frontcover#v=onepage&q&f=false
- [4] Meher, P. and Parabhoi, L. (2017). Green Library: An Overview, Issues with Special Reference to Indian Libraries. International Journal of Digital Library Services (IJODLS). 63 Vol. 7, Issue 2, April June,

2017, ISSN: 2250-1142 (Online), ISSN 2349-302X (Print). Geetanjali Research Publication. Pp. 62-63. Available from: http://www.ijodls.in/uploads/3/6/0/3/3603729/7ijodls217.pdf

- [5] Nikam, S. S. (2017). Green Library: An Emerging Concept. Knowledge Librarian: An International Peer Reviewed Bilingual E-Journal of Library and Information Science. Vol. 4, Issue 6, November – December 2017. eISSN: 2394-2479. Pp. 190-198. Available from: http:// www.klibjlis.com, https://scholar.google.co.in/scholar?q=Green+Library:+An+Emerging+Concept&hl=en&as_sdt=0&as_vis =1&oi=scholart
- [6] Purohit, S. (2013). Green Library- A New Concept of Library. International Conference on Entrepreneurial Approaches to Librarianship. Manlibnet. Available from: http://www.mugeakbulut.com/bby721/wpcontent/uploads/2017/03/21-09-2013-Prohit.pdf
- [7] Serap Kurbanoğlu and Joumana Boustany (2014). From Green Libraries to Green Information Literacy. ECIL 2014. Springer International Publishing Switzerland. Pp. 47–58. Available from: https://www.researchgate.net/publication/284731109_From_Green_Libraries_to_Green_Information_Liter acy
- [8] Tseng, S. (2008). Green Library Design and Evaluation: The Taipei Public Library, Taiwan. New Library World. Vol. 109 Issue: 7/8. ISSN: 0307-4803. Emerald Group Publishing Limited. Pp. 321–336. Available from: http://www.emeraldinsight.com/doi/abs/10.1108/03074800810888159
- [9] www.igbc.in
- [10] www.usgbc.org

Volume 8, Issue 2 (III) April - June 2021

SUSTAINABLE DEVELOPMENT:- THE PROBLEM OF ENERGY AND THE IMPACT OF ITS CONSUMPTION

Dr. Amardeep D. Jadhav

Assistant Professor, Chhatrapati Shahu Institute of Business Education and Research, (An Autonomous Institute) Kolhapur-Maharashtra

ABSTRACT

Energy is tightly linked to the three dimensions of sustainable development: economic, environmental, and social. Energy services are obviously essential to economic and social development. To contribute to this ongoing development, the main issue in the energy sector will be to control the consumption of natural energy resources. In fact, we must set up a system for better compatibility of current living standards with the conservation of energy resources for future generations. Sustainable development implies the fulfillment of several conditions: preserving the overall balance, respect for the environment, and preventing the exhaustion of natural resources. Reduced production of waste and the rationalization of production and energy consumption must also be implemented.



There is no denying that energy is the driving force, the very essence of modern civilization. Energy services are essential for human well being, and contribute to strengthening social stability thanks to the constant increase in the standard of living. Energy is decisive for the development and prosperity of economic players. Although the energy intensity needs of modern economies are gradually falling, enormous quantities of energy will be required to improve living conditions in the developing countries. The energy sector itself occupies an important place in the world economy in terms of employment, income, and trade.

KEYWORDS: Energy, Environmental Impact, Economic Development, Energy Resources, Essential for human being,

INTRODUCTION:

According to the report 'Our common future' by *Ms. Harlem Brundtland*, sustainable development is defined as development that satisfies the needs of the present without compromising the ability of future generations to satisfy theirs. This report, published in 1987 by the United Nations World Commission on Environment and Development, insists on the need to protect the diversity of genes, species, and all terrestrial and aquatic ecosystems in nature. This is possible in particular via measures to protect the quality of the environment, and by the restoration, development and maintenance of habitats that are essential to species. This implies the sustainable management of the use of the animal and plant populations being exploited. In other words, it is the rational management of human, natural, and economic resources that aims to satisfy the essential needs of humanity in the very long term.

Sustainable development implies the fulfillment of several conditions: preserving the overall balance, respect for the environment, and preventing the exhaustion of natural resources. Reduced production of waste and the rationalization of production and energy consumption must also be implemented. Sustainable development is presented as a more or less clean break from other modes of development, which have led and are still leading to worrying social and ecological damage on both a worldwide and a local scale. In order to be sustainable, development must combine three main elements: fairness, protection of the environment, and economic efficiency. A sustainable development project must be based on a better-developed mode of consultation between the community and the members it comprises. The success of such a policy also depends on consumers accepting certain constraints and citizens observing certain requirements with regard to transparency and participation.

Volume 8, Issue 2 (III) April - June 2021

ENERGY AND POVERTY

Energy and the preservation of resources are currently at the heart of the international debate on sustainable development. Energy occupies a major role in the alleviation of poverty and the construction of sustainable development. This is a basic aspect of the physical and natural world and humanity's socio-economic systems. Energy therefore constitutes one of the critical areas for interaction between technology, economics, and politics. It is definitely at the heart of social and environmental matters, as is its fundamental role in any system for planning or developing a society. As a primary resource, it is crucial for the implementation of all initiatives to combat poverty, and constitutes the engine of socio-economic development.



Access to energy facilitates the enhancement and development of agriculture and other productive economic areas. Energy constitutes a key factor to improve living conditions and reduce poverty. In this area is to allow the greatest possible number of people all over the world to have access to electricity. This responsibility sees it make two kinds of commitment: firstly, solidarity-based involvement in supporting development projects and providing emergency aid, particularly through its partnership with Electricians; secondly, the development of a range of products and solutions tailored to emerging countries. Thanks to appropriate products that are easy to install and which fulfill specific local requirements, the Group works every day at providing access to electrical equipment. We have a true public spirited commitment in this area. If producers have access to energy, local agricultural products can be processed and sold at a reasonable price in cities, allowing rural households to reap greater benefit from subsidized prices. The possibility of funding the supply of energy to the remote countryside and the sustainability of this funding contribute to promoting economic productivity in favour of the poorest segments of the population.

The case of agriculture illustrates how electrical energy can significantly improve living conditions in the rural areas of poor countries. Note also that eliminating poverty is one of the central objectives of modern development policy. Access to energy services is an essential tool to improve the capabilities of poor and underprivileged populations, thus promoting equality. Some schools of thought even argue that access to sustainable energy should be set out as a basic human right. If production does not succeed in fulfilling our growing energy needs, however, the access of poor or rural populations to electricity and other sources could become even more difficult.

CONTROLLING ENERGY DEMAND

Electrical energy is the number one final energy consumed in India. We are particularly concerned by sustainable development. The approach to controlling energy demand starts with better use of the electricity consumed. The goal is not to downgrade user convenience, but to maintain the current level while saving energy. This goal can be achieved through the use of devices that consume little electricity and through the possible intelligent management of the equipment already in place. More and more users are changing their behaviour in the right direction. The energy saved in this way, and therefore not consumed, will not emit any local pollutants or greenhouse gases!

The control of electricity demand involves a set of technologies and methods that aim to optimize the energy expenditure of consumers. This must be achieved while limiting public infrastructure costs and the impact on the environment. This control involves a certain number of actions and choices. Equipment must have the best possible performance (low-energy lamps, insulation of buildings with electrical heating systems, economical household and professional appliances, etc.). It is also preferable to choose devices that can limit the subscribed power demand on the network (power controllers, programmers, etc.). Finally, we must work towards replacing mains electricity used for thermal applications (heating, hot water) with electricity obtained from renewable energy sources.

ISSN 2394 - 7780

Volume 8, Issue 2 (III) April - June 2021

RENEWABLE ENERGY SOURCES

The proportion renewable energy in our energy consumption must inevitably be greatly increased. The use of such energy sources is possible locally, and the methods are better and better mastered. Every citizen can therefore make a contribution to sustainable development by choosing to use renewable energy sources, whether partially or exclusively. The question of the 4 development of renewable energy sources is inseparable from the question of sustainable development. Sustainable energy is abundantly provided by the sun, the wind, the earth's heat, waterfalls, tides, and the growth of plants, and it creates little or no waste or polluting emissions. By using these sustainable sources, we preserve the planet's fossil resources, such as natural gas and petroleum, the reserves of which are naturally limited and will inevitably be exhausted.



Thanks to scientific and technical progress, renewable energy sources can already fulfill a large proportion of the present-day population's energy needs, outside the transport sector. Future progress should further reduce our dependence on non-renewable energy sources. Sustainable development will ensure the perpetuity of the Earth's resources and save fossil fuels for the coming generations. Better management of renewable energy sources is a response to the problem of maintaining the overall balance and the value of our natural heritage. By producing more of our electricity using renewable energy sources, we will reduce the proportion of electricity produced by traditional or nuclear electric power plants. We can therefore directly reduce the production of radioactive waste, which future generations will be obliged to deal with in any case. The very serious accident at Fukushima, Japan on 11th March 2011 has just shown us that nuclear power cannot provide the solution to all of our electricity supply problems.

OTHER ENERGY SOURCES

Energy production using fossil fuels is a polluting process from start to finish. The use of these non-renewable energy sources is a major source of greenhouse gas emissions. Moreover, we will need to find a way to cope with the shortage of fossil resources. For the time being, biofuels are not an acceptable option. They consume a great deal of water, pesticides, and farmable land. They are also a source of greenhouse gases because of the deforestation they cause, the fact that their farming is highly mechanized, and the need to transport them. Biofuels give an overall negative result, and cannot therefore be included in a sustainable development policy.

Nuclear power is produced and controlled in nuclear power plants. It generates much debate, criticism, concern, and danger. It has the advantage, however, of emitting very little greenhouse gas compared to fossil fuels. There is, however, a risk of accidents occurring in nuclear power plants (human error, malicious acts, earthquake, tidal wave, attack, technical fault, etc.).

IMPACT ON CLIMATE CHANGE

As previously indicated, energy in general and electricity in particular are essential factors in the economic development of human societies. On the other hand, although energy sources are a decisive factor in economic and social development, in the current state of knowledge, their exploitation is a source of pollution which undeniably causes a problem. The steady rise in energy consumption is one of the causes of climate change. If humanity does not change its ways, specialists predict that temperatures could rise by 1.4 to 5.8°C between 1990 and 2100. In addition to the increase in average temperature, human activities are likely to have immediately visible consequences on other aspects of the climate. Rising sea levels, major increases in precipitation in certain regions, reduced snow cover at the poles, and the frequency and intensity of extreme weather phenomena would all be signs of impending climate change. In this context, sustainable development is a must.

ENVIRONMENTAL IMPACT

Like any human activity, the production and consumption of energy can affect the entire biosphere. It is clear that certain systems, sectors, and regions will be harder hit than others will, by these large scale phenomena. Certain terrestrial ecosystems (mountain regions, boreal forests, etc.), marine ecosystems (coral reefs, etc.), and

coastal ecosystems (mangroves, etc.) are the most endangered. It is therefore important to anticipate the exhaustion of reserves in order to prevent or limit the impact of this. In terms of sustainable development, energy efficiency is the first lever to reduce the consumption of natural resources. Technological progress must contribute to improving energy performance.



CONCLUSION:

Globally, buildings are responsible for approximately 40% of the total world annual energy consumption. Most of this energy is for the provision of lighting, heating, cooling, and air conditioning. Increasing awareness of the environmental impact of CO_2 and NOx emissions and chlorofluorocarbons triggered a renewed interest in environmentally friendly cooling and heating technologies. One way of reducing building energy consumption is to design buildings that are more economical in their use of energy for heating, lighting, cooling, ventilation, and hot water supply. Passive measures, particularly natural or hybrid ventilation rather than air conditioning, can dramatically reduce primary energy consumption. The increased availability of reliable and efficient energy services stimulates new development alternatives. Anticipated patterns of future energy use and consequent environmental impacts (acid precipitation, ozone depletion, and greenhouse effect or global warming) are comprehensively discussed in this paper. Throughout the theme several issues relating to renewable energies, environment, and sustainable development are examined from both current and future perspectives. It is concluded that renewable environmentally friendly energy must be encouraged, promoted, implemented, and demonstrated by full-scale plant especially for use in remote rural areas.

REFERENCES

- 1. International Energy Agency, World Energy Outlook (OECD, Paris, 1995). Google Scholar
- 2. E. Bos, T. My, E. Vu, and R. Bulatao, World Population Projection: 1994–95 (John Hopkins University Press, Baltimore, 1994) (edition published for the World Bank). **Google Scholar**
- 3. DEFRA, Energy Resources. Sustainable Development and Environment (DEFRA, Doncaster, 2002). Google Scholar
- M. Levine and M. Hirose, Energy Efficiency Improvement Utilising High Technology: An Assessment of Energy Use in Industry and Buildings. Report and Case Studies (World Energy Council, London, 1995). Google Scholar
- 5. United Nations International Panel on Climate Change, Climate Change (Cambridge University Press, Cambridge, 2001) (three volumes). **Google Scholar**
- 6. J. Parikn, K. Smith, and V. Laxmi, "Indoor air pollution: A reflection on gender bias," Economic and Political Weekly, 1999. Google Scholar
- 7. UNIDO, "Changing courses sustainable industrial development, as a response to agenda 21," Vienna, 1997. Google Scholar
- 8. World Resource Institute, World Resources: A Guide to the Global Environment: People and the Environment (WRI, London, 1994). Google Scholar

Volume 8, Issue 2 (III) April - June 2021

- 9. T. Boulet, Controlling Air Movement: A Manual for Architects and Builders (McGraw Hill, New York, 1987), pp. 85–138. Google Scholar
- 10. S. Meffe, A. Perkson, and O. Trass, Fuel **75**, 25 (2006). https://doi.org/10.1016/0016- 2361(95)00171-9, Google ScholarCrossref
- 11. G. Anne and S. Michael, Building and Land Management, 5th ed. (Elsevier, Oxford, 2005). Google Scholar
- 12. G. Randal and R. Goyal, Greenhouse Technology (Narosa, New Delhi, 2018). Google Scholar
- 13. I. Yadav and M. Chauadhari, Progressive Floriculture (The House of Sarpan, Bangalore, 2017), pp. 1–5. Google Scholar
- 14. Energy in Building and Industry, Inside Energy: Magazine for Energy Professional (KOPASS, Watford, 2018), pp. 13–14. **Google Scholar**

EFFECT OF CARBENDAZIM AND PENDIMITHALIN AND THEIR COMBINATION IN THE NITROGEN FIXING EFFICIENCY OF RHIZOBIUM AND RHIZOSPHERE MYCOPHLORA OF

PEA (PISUM SATIVUM L.) Ruchi S. Singh

Thakur College of Science and Commerce, Kandivali (East), Mumbai

1) INTRODUCTION

Pea (*Pisum sativum* L.) of the family Papilionaceae is an important pulse legume and nutritive cool season vegetable crop. Many seed borne fungi are known to produce toxic metabolites in the culture filtrates which influences germination and seedling vigor of pea seeds (Anwar et.al,1994). *Rhizobium leguminosarum* is a bacterium which lives in a mutualistic symbiotic relationship with legumes, and has the ability to fix free nitrogen from the air.

A pea is a most commonly green, occasionally golden yellow, or infrequently purple widely grown as a coolseason vegetable crop. The seeds may be planted as soon as the soil temperature reaches 10 °C (50 °F), with the plants growing best at temperatures of 13 to 18 °C (55 to 64 °F). They do not thrive in the summer heat of warmer temperate and lowland tropical climates, but do grow well in cooler, high-altitude, tropical areas. Many cultivars reach maturity about 60 days after planting. A variety of diseases affect peas through a number of pathogens, including insects, viruses, bacteria and fungi.

2) **OBJECTIVES**

Observations were recorded

- a) to evaluate the effect of selected Carbendazim and Pendimethalin on predominant rhizosphere mycoflora,
- b) to evaluate the effect of selected fungicide and herbicide on nitrogen fixing efficiency of *Rhizobium*,
- c) To evaluate the inhibitory effect Carbendazim and Pendimethalin on the *Rhizobium* and predominant Rhizosphere mycoflora of pea.

3) RESEARCH METHODOLOGY

The composite samples of soil were collected at 30 cm soil depth from the experimental plot after completion of pea cropping sequence in each year. Soil analysis is done mechanically and chemically before and after experiment to acquire knowledge of its physical and chemical properties. Soil organic carbon was determined according to modified Walkey and Blackman's method as described by Jackson (1967). Available Nitrogen was determined by (Modified Kjeldahl method, Jackson, 1950).

a) Fertilizer and Chemical application for seed and soil treatment

The experiment was carried out in RBD design consisting of seven treatments and three replications. The different treatments were allocated randomly in each replication. The required quantities of fertilizers were applied according to the status of soil. These fertilizers were applied to the soil during both the years as per the rates stated:-Nitrogen- 20 kg/ha (3/4 as basal and ¼ as Top dressing at 30 DAS), Phosphorus- 60 kg/ha (Full dose of basal) and Potassium- 20 kg/ha (Full dose of basal). Biofertilizer- *Rhizobium* @ 50 gms /kg seed, Fungicides - Carbendazim 0.2% a.i. /kg seed Herbicides- Pendimethalin 0.2% a.i /kg seed. All the mentioned chemicals and fertilizers were mixed in above mentioned ratios and six different combinations were prepared and mixed with the seeds in each of the conical flask separately. Seeds in one conical flask, which were not treated with any chemical, were considered as control. The seeds were sown in respected block.

Post sowing operation

Various post sowing operations carried out during the course of investigation in both the experimental years and observations were recorded on rhizosphere mycoflora, Plant growth parameters such as shoot height, root length, fresh shoot weight, fresh root weight, root nodulation and yield per plot. Observations were taken on above mentioned parameters at successive stages of plant growth viz.30 DAS, 60 DAS and 90 DAS for accuracy in the assessment of fungicidal action. All observations were recorded in a tabular form. The data included in the table was statistically analyzed for interpretation of results.

b) Analysis of soil for viability for Rhizobia and study of predominant rhizosphere mycoflora

The number of living cells was counted by spread plate methods. Doing spread plate by making serial dilutions from $10^{-1} - 10^{-6}$ or 10^{-7} then three replicates of 0.1 milliliter of broth from 10-6 and 10-5 were spread over the YMA + CR plates. Plates were incubated in an incubator at room temperature for 7 days. Colonies of rhizobial

cells were round, opaque and had smooth margin. They were white and did not absorb red color as well as the other bacteria.

The serial dilution and plate count method described by Johnson et al., (1959) was adopted for this purpose for determining the mycoflora at the presowing stage and at 30 days interval. The room was sterilized with the help of ultra violet lamp for 30 minutes before plating. The identification of rhizosphere mycoflora and rhizobia was done on basis of characteristics observed.

c) Counting of fungal colonies and measurement of radial growth

Counting of fungal colonies was done 5 days after soil plating from the collected soil samples in 30, 60 and 90 DAS. The fungal colonies were identified on the basis of their colony characters given in the book "Manual of soil fungi" written by Gillman, 1957 and illustrated genera by Barnett,(1955). The colonies per plate with similar characters were counted and percentage of cfu/gm of the product estimated as follows (Aneja 2004). The radial growth of the Colony Forming Unit of rhizosphere mycoflora was measured at 24, 48, 72 and 96 hrs after soil plating by using poison plate technique. The results were expressed as percent growth inhibition over the control. The percentage inhibition of the growth was calculated by the formula of Vincent (1927).

I = 100 x (C-I)

С

Where, I= Inhibition of mycelia growth, C= growth in control, T= growth in treatment.

d) Statistical Analysis

All the data were analyzed statistically by ANOVA (Genstat 10.1 version) to evaluate the different treatments and the mean values were compared at significant levels of 1 and 5%.

4) RATIONALE:-

Pulse crop play an important role in the agriculture economy of India by virtue of their ability to fix atmospheric nitrogen in symbiotic association with *Rhizobium*. A large number of fungi causing disease are carried in or on the seed and when the seeds germinate; these fungi also become active and cause either seed or seedling mortality or produce disease at a later stage. Treatment of seed and soil is done with fungicide as a part of plant protection strategy to combat this problem. Fungicides applied to these plants by seed and soil treatment may affect this symbiotic relationship, so while applying such compound to the crop, their inhibitory or stimulatory effect on beneficial or harmful non target organism in the environment of the crop also need to be considered.

Saxena (1992) evaluated the infection percentage and crop loss to be 4-20% due to seed borne infection of pea, these factors contribute reduction in yield. Due to research conducted by various workers seed and soil treatment is concluded as necessities which help in augmenting the yield and decrease drastic loss due to diseases.

5) DATA ANALYSIS AND INTERPRETATION

The observations recorded before and after harvesting at successive stages of plant growth on various parameters viz. seed germination, shoot length, root length, shoot dry weight, effective nodules dry weight, no. of nodules were maximum in treatment combination *Rhizobium* + carbendazim + pendimethalin followed by treatment combination *Rhizobium*+ carbendazim+ Fluchloralin. Minimum values were in treatment combination Fluchloralin in comparison to control. While other parameters such as maximum shoot fresh weight, root fresh weight, root dry weight, effective nodules fresh weight in grams, number of grains was recorded in treatment combination carbendazim followed by treatment combination *Rhizobium*+ carbendazim where as minimum root fresh weight was observed in treatment combination Fluchloralin in comparison to control.

a) Post Harvest Observations

The observations recorded after maturity and harvest of the crop has been included in the text under the parameters viz. test weight, straw yield, harvest index was maximum in treatment combination Rhizobium + carbendazim+pendimethalin followed by treatment combination Rhizobium+ carbendazim+ Fluchloralin. Minimum values were in treatment combination Fluchloralin in comparison to control while maximum grain yield was recorded in treatment combination carbendazim followed by treatment combination Rhizobium+ carbendazim where as minimum root fresh weight was observed in treatment combination Fluchloralin in comparison to control.

b) Identification and counting of predominant mycoflora

At presowing stage Aspergillus niger, Fusarium oxysporum, Alternaria alternata, Rhizactonias solani, Sclerotinia sclerotiorum were predominant and Alternaria alternata was in maximum after that Fusarium

oxysporum was found dominant. Next to Aspergillus niger was Rhizopus solani, Sclerotinia sclerotiorum almost at every stage.

At 90 DAS at 1: 10^{-5} Dilution Factor, least fungal population was found in treatment combination carbendazim followed by treatment combination *Rhizobium*+ carbendazim in comparison to control.

c) Identification and counting of Rhizobia

The CFU/g dry soil of Rhizobial species before and at 30 DAS, 60 DAS, and 90 DAS is shown in table (4.15j). At 90 DAS at $1:10^{-7}$ Dilution Factor highest rhizobial population was found in treatment combination *Rhizobium* + carbendazim+pendimethalin as compared to other treatments and untreated control.

Treatments	30DAS	60 DAS	90 DAS	Total
Control	<mark>9.04</mark>	28.57	<mark>33.53</mark>	71.14
%	12.71	40.16	<mark>47</mark>	100.00
Rhizobium	11.72	43.32	<mark>44.20</mark>	<mark>99.23</mark>
%	11.81	43.65	<mark>45</mark>	100.00
Carbendazim	11.66	43.12	<mark>43.42</mark>	<mark>98.20</mark>
%	11.87	43.91	<mark>44</mark>	100.00
Pendimethalin	11.15	38.65	<mark>43.06</mark>	<mark>92.87</mark>
%	12.01	41.62	<mark>46</mark>	100.00
Rhizobium +	17.65	56.94	<mark>61.35</mark>	135.93
%	12.98	<mark>41.89</mark>	45	100.00
Rhizobium +	12.33	45.30	<mark>47.76</mark>	105.38
%	11.70	42.99	<mark>45</mark>	100.00
Rhizobium +				
<mark>Carbendazim +</mark>	<mark>19.49</mark>	<mark>66.47</mark>	<mark>71.43</mark>	<mark>157.38</mark>
%	12.38	42.24	<mark>45</mark>	100.00
F. Test	S	S	S	
C.D. at 5%	1.119	1.376	1.302	
S. Em. (±)	2.261	2.781	2.632	

Table 6.1–Average Rhizobial CFU Count per gram dry soil in 10-5 dilution factor in 30,60,90 DAS stages of two consecutive years.





Volume 8, Issue 2 (III) April - June 2021

The result of the various combinations on radial growth (mm) and inhibition over control (%) of the predominant mycoflora are as follows:-

At 24, 48, 72 & 96 hrs after plating, the radial growth of predominant rhizosphere mycoflora viz. *Aspergillus niger, Fusarium oxysporum, Alternaria alternate, Rhizoctonia solani and Sclerotinia sclerotiorum* was decreased in treatment combination carbendazim followed by treatment combination *Rhizobium*+ carbendazim except in CONTROL.

DISCUSSION

The observations recorded before and after harvesting at successive stages of plant growth on various parameters viz. seed germination, shoot length, root length, shoot dry weight, effective nodules dry weight, no. of nodules and test weight, straw yield, harvest index are discussed in support of research done by various scientists.

Shukla et al., (2002) observed in chick pea that Bavistin (at a doze of 0.5 gm/kg) seed treatment improved seed germination by 16.5% with also in increase of 23.7 grain yield. All these treatments showed significant effect. Similar observations were made by Dwivedi and Shukla (1989), who have noticed a significant increase in shoot length in seed treatment with Dithane M-45 in *Cicer aretinium*. Patel et al., (1998) reported that application of 50% Wp + *Rhizobium* + PSM increased plant height.

Berendt and Dobrzanski (1979) found that seed dressing with fungicides had a beneficial effect on seed germination and plant growth parameter in peas. Bhorya et al., (1986) explains that the use of *Rhizobium* significantly have positive effect on plant dry weight. While other parameters such as maximum shoot fresh weight, root fresh weight, root dry weight, effective nodules fresh weight in grams, number of grains are discussed in support of research done by various scientists. The probable reason of this type of findings could be because of fungicidal and herbicidal treatment which has decreased the number of rhizosphere mycoflora and weeds, utilization of nutrients, maximum hours of sunlight, optimum temperature, little leaching losses and volatilization. These all played significant role to boost plant growth and development, which resulted in maximum Shoot fresh weight during rabi season (winter season).Similar findings have been reported by Gupta & Pandey (1992). Neureigy et al., (1985) applied 6 fungicides for seed dressing such as Bavistin (Carbendazim) for seed dressing which was most effective in increasing fresh and dry weight in pea plant.

Similarly observations were done by Marayana et al., (1981) in their work on the effect of certain fungicides on nodulation of pea, provided evidence to reveal that Dithene Z-78 stimulated nodulation and N_2 contents. Seed treatment had no adverse effects on nodulation. Similarly Bandopadhyay et al., (1983) reported that the seed treatment with Bavistin did not affect nodulation in green gram and Chick Pea, increased nodulation in soybean and berseem but slightly inherited nodulation in Pea. Similar observation was made by (Curely and Burten, 1975) studied Fungicides-*Rhizobium* interaction and reported that carboxin seed dressing of soya bean have no adverse effect on nodulation.

Pappo and Riquad (1978) who observed that *Rhizobium* bacteria in symbiosis produced substantial quantities of cytokinins. The grain yield of pea in the plots treated with (*Rhizobium*+ carbendazim + pendimethalin) was next in sequence.

Chakraborty et al., (1985) noticed a reduction in nodule number in all fungicidal treatments in leguminous crops compared to control, comparatively less inhibition was obtained in Bavistin, Brassicol, Emisan and Vitavax.

At presowing stage Aspergillus niger, Fusarium oxysporum, Alternaria alternata, Rhizoctonias solani, Sclerotinia sclerotiorum were predominant and Alternaria alternata was in maximum after that Fusarium oxysporum was found dominant.

Gupta (1996), observed better quality in term of lusture, taste, keeping quality and stability in yield of pea in farming with vermicompost. Among various biofertilizer, *Rhizobium* is used to fix atmospheric nitrogen in soil through leguminous crops. These *Rhizobium* bacteria present in small pinkish nodules of legume crops, in symbiotic nature and fix atmospheric nitrogen in soil in form of ammonia. It has been observed that application of *Rhizobium* significantly increased the yield up to 20-25 per cent and also lower the nutrient input by 20-40 per cent.

At 24, 48, 72 & 96 hrs after plating, the radial growth of predominant rhizosphere mycoflora viz. *Aspergillus niger, Fusarium oxysporum, Alternaria alternate, Rhizoctonia solani and Sclerotinia sclerotiorum* was decreased in treatment combination carbendazim followed by treatment combination *Rhizobium*+ carbendazim except in CONTROL which is supported by findings of Ranjan and Chattophadhaya and Raj (1991), Upadhyay

and Pandey (2005), that *Rhizobium* sp. could degrade and utilize dead mycelia of *Aspergillus flavus*, *Aspergillus niger*, *Curvularia lunata*, *Fusarium udum* and *Fusarium oxysporum*.

6) SUGGESTION:-

Keeping in view the soil type, climatic conditions of the area selected for the use of Carbendazim and Pendimethalin may be used to decrease the growth of predominant rhizosphere mycoflora of pea and to enhance the nitrogen fixing efficiency of *Rhizobium*. It may be used for getting better growth, nodulation, yield of pea, nitrogen content in grains and maintaining the soil fertility.

7) CONCLUSION

In the light of above observations, following conclusion has been drawn. The application of *Rhizobium* (50gms/kg seed), Carbendazim (0.2% a.i. /kg seed) and Pendimethalin (0.2% a.i. /kg seed) in combination in soil infested with predominant rhizosphere mycoflora could effectively reduce the amount of fungal population. Among selected fungicides carbendazim was found significant in controlling population density of predominant mycoflora .

8) **REFRENCES**

- Anwar, S. A; R. Bhutta, C. A; Rauf and M. S. A. Khan (1994) Seed borne fungi of pea and their role in poor germination of pea seeds. Pakistan/Journal Phytopath, 6:135-139
- Azam, F. (2001). Legume-bacterium (*Rhizobium*) association-symbiosis, a marriage of convenience, necessary evil or bacterium taken hostage by the legume. *Pak. J. Biol. Sci.*, 4(6): 757-761
- Bandyopadhyay S., Bhattacharjee P., Mukherjee N.(1979) In vitro sensitivity of Rhizobium species to some fungicides and insecticides. Pesticides 13:22–25.
- Berendt, W and Dobrzanshi, and biuletyn, Warzywniezy (1979). A-Effect of applied Herbicides on beans and peas treated with insecticidal and fungicidal seed dressing. 23,321-330, 13 ref.
- Bhorya (1986) composed the effect of four strains and recorded that one among the four showed significantly higher positive effect with respect to shoot, root, total dry matter and grain yield in Pisum sativum.Buletin of Environmental Contamination and Toxicology,2004;73(2);424-431
- Curely and Burten (1975): Carboxin seed dressing of soyabeen have no adverse effect on nodulation, Journal-of-Maharashtra-Agricultural-Universities. 2002; 27(2): 225-226
- Gupta, B.R; Pandey, Ajai. (1992): Effect of herbicides on survival of *Rhizobium* sp in soil and germination of black gram seeds. Journal of the India Society of Soil Science, 40 (3), 569-571.
- Neureigy, N.A (1989). Effect of seed dressing of peas and soyabean seeds on their growth in soil infested with S. rolfsii or a mixture of three pathogenic fungi (*R. solani* + *F. solani* + *S. rolfsii*), annals-of-Agricultural sciences, Moshtahor, 23;3, 1091-1114.
- Pappo, A. and Riquad, J. (1978). Physiology of plant, 42 : 202-206. (Quoted by T.K. Bose, Vegetable Crops in India pp. 502).
- Patel, T.S.; Katare, D.S.; Khosle, H.K. and Dubey, S. (1998): "Effect of biofertilizer and chemical fertilizer in growth and yield of garden pea (*Pisum Sativum* L)" Crop reasearch (Hisar) Vol. 15:1, P, 54-56.
- Ranjan and Chattophadhaya and Raj (1991) soil rhizophere microflora of groundnut Arachis hypogea developed from fungicide treated seeds. Journal of Mycopathological Res 29(1) 83-86.
- Shukla (2002): The 6 fungicides tested during 2 seasons. Baivstin (carbendazim) gave the best control of *Fusarrium oxyporum*, Bulletin of the Institute of Tropica Agriculture, Kyushu University. 1998, 21:1-7; 16 ref.
- Vincent, J.M. (1927). Distortion of fungal hypae in the presence of certain inhibitors. *Nature* 159 : 850.

STUDY OF AMYLASE INHIBITOR ACTIVITY IN SEED EXTRACTS OF SELECTED LEGUMES

Priyanka Shukla¹ and Vibha Gupta²

¹Department of Botany, Dnyanasadhana College, Thane (W), Thane ²Department of Botany, G. N. Khalsa College of Arts, Commerce and Science, Matunga

ABSTRACT

Legume seeds are well known to be the source of amylase inhibitors that inhibit the amylase activity during the seed germination process. The presence of these inhibitors has been exploited widely in the area of insect pest management and in the treatment of diabetes. In the present study 12 legumes collected from the local market were subjected for the assay against amylases (Pancreatic, Salivary, Fungal and Insect). Soaked seed extracts of Green pea, Lima bean, White pea and Red Lentil legumes showed maximum inhibitory activity against Pancreatic and insect amylases. An attempt to purify the enzyme inhibitor was also investigated using Red Lentil legume in the study. Gel filtration followed by SDS PAGE analysis of Red Lentil seed extract revealed a single band of 20 kDa polypeptide. The results indicated that the amylase inhibitor if investigated further holds great promise in the field of agriculture and healthcare.

Key words: amylase inhibitor, legumes, pancreatic amylase, insect amylase

INTRODUCTION:

Plant seeds are known to contain variety of proteinaceous inhibitory enzymes including amylase inhibitors which are known to regulate several biochemical reactions. Alpha amylase inhibitors inhibit the amylases that catalyse the initial hydrolysis of starch into simple sugars which is further assimilated to other biological processes. These inhibitors are widely distributed in Poaceae and Leguminosae family. Several researchers have reported the use of alpha amylase inhibitors in the control of type 2 diabetes (Silano 1987, Mosolov et al 2005, Islamov eta al 2007, Yao 2016) and possible tools to control insect pests (Franco et al 2002, Bonigilla et al 2008, Kokiladevi et al 2005) mainly from cereals. Comparatively less information is available for majority of legumes except *Vigna radiata* and *Phaseolus* species which have been extensively studied in detail (Barrett 2011, Preuss 2009, Kokiladevi 2005).

As legumes are integral part of vegetarian diet, the need to further explore the presence of amylase inhibitor and its activity against various types of amylases holds great potential in the area of food technology and pest management. Keeping above in view, the objective of the present study was to screen legumes which are easily available from the local market for alpha amylase inhibitor activity against Salivary amylase (SA), Pancreatic amylase (PA), Fungal amylase (FA) and Insect amylase (IA, pests infested legumes). Also, an attempt was made to partially purify the enzyme from soaked seed extract of Red Lentil legume.

MATERIALS AND METHODS:

Twelve legumes collected from the local market were subjected to amylase inhibition assay. The chemicals including enzymes (except SA) used in the study were of analytical grade and purchased from SRL and SD fine chemicals Pvt. Ltd. Mumbai.

Sample preparation: 1g of seeds were crushed using extraction buffer (0.1M phosphate buffer pH 6.7) in ice cold conditions and centrifuged at 10,000 rpm for 30 minutes. The filtered supernatant was used for the assay (Ikeda et al 1994).

Enzyme preparation: Four different sets of enzyme solutions prepared. Salivary amylase (fresh enzyme collected and diluted in the ratio 1:4); Pancreatic and fungal amylase (1mg/ml); Insect extract (1g of fresh insects homogenized 5ml of phosphate buffer 6.7 and used as source of enzyme, Figueira et al 2003).

Reducing sugar estimation: The legume samples were subjected to Bernfeld's test (1955) along with proper controls using maltose (10mg/ml) as standard.

Protein estimation: The protein concentration of each seed extract was determined by Lowry's method (1951) using Bovine serum albumin as standard.

Amylase inhibitor assay: 100 μ l of seed extract (10mg/ml) and 50 μ l salivary amylase was added to 200 μ l of 0.1M phosphate buffer pH 6.7 (Ishimoto et al 1999). The mixture was pre- incubated for 10 minutes at 37°C and later was measured for reducing sugar estimation (Bernfeld method 1955). Similarly, the inhibitory activity was calculated against pancreatic amylase (1mg/ml), fungal amylase (1mg/ml) and insect amylase (fresh) enzymes. Proper controls were maintained and each experiment was replicated thrice.

Volume 8, Issue 2 (III) April - June 2021

Agar Gel assay: 1.5% Agar mixed with Starch (0.25%) and 0.1 M Phosphate buffer pH 6.7 was used in preparation of Agar gel assay. The amylase inhibitor preincubated with legume seed extracts for 10 minutes was applied in grooves prepared on Agar plates. Diameter of zone of inhibition was measured (in cm) after staining with Lugol's iodine method (Nolan and Davis 1984).

ENZYME PURIFICATION:

Ammonium sulphate precipitation was performed for Red Lentil legume as it showed maximum inhibition activity among all legumes studied. Overnight stirring with the salt 4°C and saturation percentages 30-60% and 60-80% was performed for the precipitation assay and observed for the maximum inhibition activity (IA). The samples were centrifuged at 10,000rpm for 30 minutes at 4°C. The supernatant and pellet were resuspended in Phosphate buffer pH 6.7 (Purwanto 2016). Dialysis for the ammonium sulphate fraction 30-60% in 200ml Phosphate buffer was carried out with continuous stirring on a magnetic stirrer overnight under cold conditions (El-Khonezy et al 2015). The dialyzed samples were subjected to Gel filtration using Sephadex G50 equilibrated with Tris HCl Buffer pH 8.0. Fractions were collected and pooled on the basis of activity of the enzyme (Brown et al 1984). The molecular weight of purified samples was determined using SDS PAGE using Tris SDS buffer pH 8.2 (Laemmli 1970). The samples were run on 10% gel stained with Coomassie Brilliant Blue G 250 staining and molecular weight was estimated by comparing it with mid-range protein marker (Heussen and Dowdle 1980, Purwanto 2016).

RESULTS AND DISCUSSION:

Amylase inhibitory activity and protein concentration: Quantitative analysis of amylase inhibitory activity for all selected legumes and their protein estimation was estimated and is represented in the figure (1 and 2). The Red Lentil legume showed the highest activity for IA (92%), FA (60%) and PA (40%). White and Green peas and Lima beans also showed more than 60 % inhibition with IA as compared to other legumes. Inhibition with PA was found to be on average 20% with all legumes and below 10% with SA enzyme. Singh et al (1982) also reported high amylase inhibition activity in chick pea extracts against pancreatic amylase as compared to insect amylase. Simultaneously protein concentration was also estimated in all legumes with chick pea showing maximum 88%. The results indicated 60% protein concentration observed in seed extracts when soaked in water for 24 hours. The present study for the first time gives a comparative detail of 12 legumes (commonly used in Indian household) selected for the study against four different types of amylases (PA, SA, FA, IA).

Semi quantitative analysis using Agar gel assay method: The rapid method of detection of amylase inhibition using agar gel method was used for testing all seed extracts against four amylases in the study. The diameter of zone of inhibition (in cm) was measured (Figure 3). The results supported the spectrophotometric analysis though the variation observed among all legumes were marginal.

Purification of the enzyme: Partial purification (table 1) of amylase inhibitor from Red lentil legume was carried out using Sephadex G50 Gel filtration. The samples after purification (Crude extract, ammonium sulphate precipitation and Gel filtration) were analysed on SDS PAGE (Figure 4). The molecular weight of the inhibitor corresponded to 20kDa. Similar work on wheat amylase inhibitor Khakimjhanov et al 2014 was reported with purified protein inhibitor molecular weight of 21kDa. Enzyme inhibitor from *Phaseolus vulgaris* seed extracts (ethanolic fractions) was extensively studied by Ghorbani et al 2018 and reported its use in controlling the level of glycemia.

Most studies concerning inhibition against IA is carried out using Mung bean or *Phaseolus* seed extracts (Kokiladevi et al 2005 and Wissesing et al 2010). The present study reports for the first time the partial purification of amylase inhibitor enzyme from Red Lentil legume.

CONCLUSIONS:

Legumes selected from the local market were subjected for amylase inhibitor activity. Among twelve legumes studied, Red Lentil legumes showed highest inhibition activity against IA, FA and PA. Semiquantitative agar gel assay method also supported the same results. On the basis of the maximum activity, partial purification of the enzyme was conducted from Red Lentil legume successfully and obtained protein with a molecular weight of 20kDa on SDS PAGE. The partial purification from this legume is reported for the first time in the present study. Further characterization of the enzyme inhibitor will help in understanding the nature of the enzyme in detail and holds a great application in integrated pest management strategy.

ACKNOWLEDGMENT:

The authors greatly acknowledge the financial support from the University of Mumbai (17-18). Also, authors are grateful to the Principal, management for providing support and to the Department of Botany, G. N. Khalsa College, Matunga- 19 for providing the necessary facilities for completion of the project.

Volume 8, Issue 2 (III) April - June 2021

REFERENCES:

- 1. Silano V. (1987). Alpha-amylase inhibitors. In: Kruger JE, Lineback D, Stauffer CE (Eds.), Enzymes and their roles in Cereal Technology, American Association of Cereal Chemists, St. Paul, MN: 141-199.
- 2. Mosolov VV and Valueva TA. (2005). Proteinase inhibitors and their function in plants: a review. Appl. Biochem. Microbiol. (Moscow), 41, 261-282.
- 3. Islamov RA and Fursov OV. (2007). Bifunctional inhibitor of αamylase/trypsin from wheat grain. Appl. Biochem. Microbiol. (Moscow), 43, 367-473.
- 4. Yao Y, Hu Y, Zhu Y, Gao Y and Ren G (2016). Comparisons of Phaseolin type and αamylase inhibitor in common bean (*Phaseolus vulgaris* L.) in China. The Crop Journal, 4(1):68-72.
- 5. Franco OL, Rigden DJ, Melo FR and Grossi-de-Sa MF. (2002). Plant α -amylase inhibitors and their interaction with insect α -amylases: Structure, function and potential for crop protection. Eur. J. Biochem. 269, 397-412.
- Boniglia C, Carratù B, Stefano DS, Giammarioli S, Mosca M and Sanzini E. (2008). Lectins, trypsin and amylase inhibitors in dietary supplements containing *Phaseolus vulgaris*. Eur Food Res Technol. 227:689– 693.
- 7. Kokiladevi E, Manickam A and Thayumanavan B. (2005). Characterization of Alpha-amylase inhibitor in *Vigna sublobata*, Bot. Bull. Acad. Sin. 46: 189-196.
- 8. Barrett ML and Udani JK (2011). A proprietary alpha amylase inhibitor from white bean (*Phaseolus vulgaris*): a review of clinical studies on weight loss and glycemic control. Nutrition Journal, 10(1):24.
- 9. Preuss HG. (2009). Bean amylase inhibitor and other carbohydrate absorption blockers: effects on diabesity and general health. Journal of the American College of Nutrition,28(3):266-76.
- 10. Ikeda K, Shida K and Kishida M. (1994). Alpha amylase inhibitor in Buckwheat seed. Fagopyrum 14: 3-6.
- 11. Figueira ELZ, Blanco-Labra A, Gerage AC, Ono EYS and Mendiola-Olaya E. (2003). New amylase inhibitor present in corn seeds active in vitro against amylase from *Fusarium verticilloides*. Plant Diseases, 87:233-240.
- 12. Bernfeld P. (1955). Amylase alpha and beta. Method in enzymology, Academic press, NY, 149-158.
- 13. Lowry OH, Rosebrough NJ, Farr AL and Randall RJ. (1951). Protein measurement with the Folin phenol reagent. Journal Biological Chemistry, 193: 265-275.
- 14. Ishimoto M, Sato T, Chrispeels MJ, Ktamura K. (1966). Bruchid resistance of transgenic azuki bean expressing seed a amylase inhibitor of common bean. Entomol. Experimental Applications, 79: 309-315.
- 15. Nolan M and Davis B. (1984). A Starch-Agar Gel Method for the Localization of Starch Hydrolyzing Enzymes in the Cotyledons and Hypocotyls of Beans. American Journal of Botany, 71 (1): 137-141.
- 16. Purwanto, MGM. 2016. The Role and Efficiency of Ammonium Sulphate Precipitation in Purification Process of Papain Crude Extract. Procedia Chemistry 18(1): 127-131.
- 17. El-Khonezy et al 2015 El-Khonezy M.I, El-Gammal, EW, Atwa NA and El-Abd MA. 2015. Partial Purification and Characterization of an Alkaline Serine Protease Produced by Streptomyces griseus NCRRT and its Antifungal Effect on *Fusarium solani*. World Applied Sciences Journal 33(5): 831-842.
- 18. Brown WE and Ryan CA 1984. Isolation, characterization of a wound induced trypsin inhibitor from alfalfa leaves. Biochemistry, 23, 3422–3428.
- 19. Laemmli EK. (1970). Cleavage of structural proteins during assembly of the head of bacteriophage T.4. Nature, 277(4): 680-683.
- 20. Heussen, C. and Dowdle, E.B. 1980. Electrophoretic analysis of plasminogen activators in polyacrylamide gels containing sodium dodecyl sulfate and copolymerized substrates. Analytical biochemistry 102(1): 196-202.
- 21. Singh U, Kherdekar MS and Jambunathan R. (1982). Studies on Desi and Kabuli Chickpea (*Cicer arietinum* Li) Cultivars. The Levels of Amylase Inhibitors, Levels of Oligosaccharides and In Vitro Starch digestibility. Journal of food science, 47: 510-512.

Volume 8, Issue 2 (III) April - June 2021

- 22. Khakimzhanov AA, Shansharova DA, Umiraliyeva LB, Hřivna L, Šottníková V, Madenova SK and Abdraimova DB. (2014). Some properties of endogenous alpha amylase inhibitor from wheat grain. Journal of Microbiology, Biotechnology and food science. 3 (special issue3): 241-243.
- 23. Ghorbani F, Sadeghi M, Aghaie A, Ghahghaei A, Jalili C and Khodarahmi R. (2018). Study of α-Amylase Inhibitors among Different Bean Cultivars and Evaluation of their Effectiveness Compared with a Commercial Product using In Vitro/In Vivo Experimental Systems. Journal of Research in Medical and Dental Sciences, 6 (1): 381-391.
- 24. Wisessing A, Engkagul A, Wongpiyasatid A and Choowongkomon K. (2010). Biochemical characterization of the α -amylase inhibitor in mungbeans and its application in inhibiting the growth of *Callosobruchus maculatus*. Journal of Agricultural Food Chemistry. 58 (4):2131-7.





Figure 1. Amylase inhibitor activity against different types of amylases studied



Figure 2. Protein concentration of various legumes (Lowry's method)

Figure 3. Semi quantitative method using agar gel assay (diameter of zone of inhibition in 'cm' against all amylase enzymes)

20kDa 1 2 3 4 1: Medium protein molecular weight marker 2. 30-60% ammonium sulphate precipitation 3 : Dialyzed sample 4: Sephadex G 50 Figure 4. SDS PAGE analysis of purified samples

Step	Total	Total	Total	Trypsin	Specific	Yield	Fold
	volume	activity (U)	protein	Inhibitor	activity	(%)	purification
	(ml)		(mg)	activity (%)	(U/mg)		
Crude Extract	300	200	150	82	1.33	100	
30-60%	80	150	104	84	1.44	69.3	1.08
ammonium							
sulphate ppt.							
Gel filtration	15	110	65	90	1.69	62.5	1.17

Table 1. Purification analysis of Red Lentil legume seed extract



EVOLUTION OF AGRICULTURAL MARKETING IN TELANGANA STATE ISSUES AND CHALLENGES –A STUDY

J. Ajay Kumar

Faculty of Commerce, NSS Programme Officer, Vijaynagar Colony, Hyderabad

ABSTRACT

Marketing refers to the economic process by which goods and services are exchanged and their values are exchanged in monetary terms. Agriculture marketing is the process through which the farm produce is marketed and delivered to ultimate consumers. Agriculture marketing involves in all activities such has moving agriculture produce from producer to the final consumer through time (storage) place (transportation) form (processing) and transferring ownership at different levels of marketing channels. The present paper made an attempt to bring into light on various issues and challenges in agriculture marketing in Telangana state. Research methodology is based on primary and secondary data and results were evaluated.

Keywords: agriculture marketing, marketing channels and transformation.

INTRODUCTION:

Agriculture marketing can be termed has the commercial functions which are involved in transferring agriculture products from producer to final consumer. One of the important things to be considered in agriculture marketing is optimum utilisation technology and expects maximum returns for producers. For better agriculture markets it is very essential to have sufficient infrastructure, good transport and communication network and better financial support will be a great achievement of market. Government initiations to strengthen agriculture markets by the agriculture produce marketing committees (APMC) Acts were passed by different states to regulate agriculture marketing.

In the state of Telangana the major crops are rice, maize and cotton more than 71% of the total gross cropped area mango and tobacco are the other local crops of the state. Government of Telangana has introduced several welfare schemes to agricultural farmers in the state. The welfare schemes like Rythu Bandhu pathakam, Rythu Bheema pathakam many other insurance schemes and the new initiative concept of manakuragayalu etc. These welfare schemes and new initiatives in agriculture in Telangana state have drawn attention through out country.

REVIEW OF LITERATURE:

Dr.Gaurav Bissa and Vijay Vyas (2014) the study focused on agricultural production which is very much essential for growth of productivity of land and availability of modern technologies. In the study it is viewed that better infrastructural facilities will reduce the marketing costs.

M.Ramulu and G.Ramakrishna (2014) the study revealed that the small and marginal farmers are benefitted as their earnings have to increased due to the participation in agriculture marketing. Participation in regulated markets paves the ways for the farmers.in the study it viewed that improve standardisation procedures for proper grading.

Shakeel-ul-Rehman and M.Selvaraj (2012)the study focused on agri-marketing initiatives need to be taken up to a large extent and focus made on Indian agriculture moving from commoditization to commercialisation derives it towards market orientation.

OBJECTIVES OF THE STUDY:

- ✤ To study on agricultural marketing system in Telangana state.
- To focus on various challenges and opportunities in agriculture marketing.

NEED AND IMPORTANCE OF STUDY:

- ✤ A good marketing system which protects the interests of both producers and consumers and it is a key to agriculture development.
- * Regulated market facilitate the farmers in getting remunerative price for his farm produce
- Efficient market intelligence is essential for development of agriculture sector
- E-Trading is considered to be a better platform for enhancing farmers income
- Warehousing helps in stabilizing the prices of agriculture commodities by adjusting demand and supply
- To have clear understanding of government new initiatives and welfare schemes.

- Need for good infrastructural support for agriculture development.
- Government has to give some recognition to the farmers who have been working in agriculture sector for more than 60 years to acknowledge his services.

RESEARCH METHODOLOGY:

Research methodology is based on primary data collected through structured questionnaire with a sample size of 80 out of which 70 are fit for study.

S No	Gender	Gender No of Responses	
1	Male	55	78.6
2	Female	15	21.4
Total number	of responses	70	100

(Primary data)

The number of responses from male respondents was 55 and female respondents were 15 and responses were classified according to their respective age groups.

S No	Age group	No of Responses	Percentage
1	18 - 28	51	72.9
2	28 - 38	12	17.1
3	38 - 48	5	7.1
4	48 - 58	1	1.4
5	Above 58 years	1	1.4
Total number	of responses	70	100

(Primary data)

C N-		Strongly Agree	Agree	No opinion	Disagree	Strongly Disagree	Total no of		
S NO	variables	5	4	3	2	1	Respon dents	WA Score	Ranks
1	Establishment of regulated markets solve the problems of agriculture marketing	23	35	8	2	2	70	19	5
2	Socio-economic issues of farmers have impact on agriculture marketing	27	35	3	2	3	70	19.4	4
3	E-trading is considered to be a good platform for enhancing farmer's income	18	25	21	5	1	70	17.6	6
4	Efficient market intelligence is essential for development of agriculture sector	27	34	5	2	2	70	19.466 67	3
5	Efficient marketing information system can manage timely delivery of product and thereby reduce	26	36	6	0	2	70	19.6	2

Volume 8, Issue 2 (III) April - June 2021

	marketing cost and increase production								
6	There is a need to create awareness and educate farmers about government schemes	44	17	3	4	2	70	20.466 67	1

(Primary data)

DATA ANYLSIS:

Qno.6 there is a need to create awareness and educate farmers about government schemes is highest 20.466.E-trading is considered to be a good platform for enhancing farmers income is ranked as 6th and other respondandands have different views.

Suggestions and recommendations:

- Agriculture products are bulky involving higher storage and transportation cost.so increase godowns.
- Most of the agriculture products are relatively perishable in nature and cannot retained for long time and this causes a loss or deterioration in quality. There is a need for cold storages.
- Multiple agencies are involved in the purchase of agriculture produce and government should have an eyevision on private agencies.
- Government should frequently conduct marketing surveys and publish the result for the benefit of the farmers.
- Absence of grading and standardisation may result in quality differences. Proper grading of agricultural produce should be strictly implemented (Grading and marketing Act)
- Effective market intelligence helps the farmers in knowing the market conditions and prices prevailing at their centres.

CONCLUSION:

There is a need for expansion of storage and warehousing. Promotion of crop-insurance schemes and to be focused on agricultural research and training. Regulated markets can create healthy market practices. Many welfare schemes taken by government of Telangana like Rythu Bandhu pathakam and Rythu Bheema pathakam and new initiatives like the concept of Manakuragayalu and got much importance in state and its good initiation by govt of Telangana and many states implemented these schemes with different names. Strict supervision has to be taken up in implementing the various schemes and create awareness to farmers from time to time.

REFERENCES:

- 1. Shakeel-ul-Rehman and M.Selvaraj (2012)Asian journal of agriculture and rural development
- 2. Dr.Gaurav Bissa and Vijay Vyas (2014) Indian journal of Research
- 3. M.Ramulu and G.Ramakrishna (2014) American journal of business ,economic and management
- 4. Vaagdevi publishers ISBN No: 978-93-85132-24-7.

STUDY OF QUALITY OF WATER WITH CLIMATIC CHANGES OF BEACHES IN MUMBAI REGION, MAHARASHTRA, INDIA

Vipul Purohit, Sanjay Shukla and Rajkumar Yadav

Department of Chemistry, Thakur College, Kandivali (E), Mumbai

ABSTRACT

Water undoubtedly is the primary requirement on this earth. It is considered as synonym of life. It has immense uses for all the different species with its application in the industrial as well as the domestic sector. Irrespective of its use, its purity level is utmost important which is essential to decide its quality. This requires the need for the analysis of quality of water with respect to various Physico-Chemical parameters.

The present study involves the assessment of the quality of some of the beaches such as Versova, Marve& Juhu. Since the beaches are tourist attraction, hence from the environmental perspective the quality of water needs to be assessed.

The climatic conditions affects the quality of water. The climatic conditions changes throughout the year, hence periodical assessment of quality of water is required. In the present study the analysis of water was done at quarterly basis with reference to parameters such as TDS, DO, pH, Colour, electrical Conductivity, COD, Total Hardness, Alkalinity. These parameters were analyzed through chemical and instrumental techniques. The present analysis do suggest increased pollution levels in these water bodies under study. The water of the beaches after being treated with processes like Reverse Osmosis and others can be converted into drinking water

Keyword: Reverse osmosis Physico-chemical factors, Chemical and Instrumental techniques.

INTRODUCTION

Water is one of the prime substances available on earth as it holds responsibility for survival of human beings, animals and plants. Hence "Water is Life ". Apart from drinking water

Finds its use in variety of purposes, to name a few washing clothes and utensils, cleaning of the surrounding and thereby keeping it healthy, agriculture, synthesis of various important commercial products and the purposes continues. It is highly essential that the water available for drinking purpose must be devoid of disease causing germs and chemicals. This clean water is known as potable water. The various generally available sources of water are:

Surface water : This water is essentially the one which reaches the surface of the earth in the form of rain , hailstorm. The specific areas developed for the collection of this water are known as catchment areas.

Rivers or lakes : These waters are in general used for irrigation purposes by allowing the movement of turbines. Also these waters can be used for the purpose of producing electricity at cheap rates

Spring waters :This generally occurs near the lower portion of the hill or sloping ground from where underground water flows naturally towards the ground

Bores and wells : the holes are drilled deep into the ground to make available long lasting supply of water. The pipes run through the hole into the water and then through high pressure pumps water is flown towards the surface so as to make it use at the commercial level and not for drinking purposes as it does not meet the desired standards as laid down by the WHO.

If the water from these sources are not suitable for consumption then it demands treatment so that it can be converted to potable water.

NEED OF STUDY

The waters of the beaches located in Mumbai are polluted due to unhygienic activities of human beings and animals, bathing and washing clothes, the remains of the various religious rituals such as flowers, immersion of the idols of various Gods and Goddess. Since the condition of these waters eventually contribute to the healthy environment, hence checking the quality of waters from these sources is an important task

SCOPE OF STUDY

The present work deals with the evaluation of various physico-chemical standards of water with reference to TDS, DO, pH, colour, electrical conductivity, COD, Total hardness.
ISSN 2394 - 7780

Alkalinity through chemical and instrumental techniques. The work involves checking these

parameters and presenting a comparative data at the three beaches located in Mumbai, Maharashtra State, India which are Gorai, Aksa & Juhu

MATERIAL AND METHODS

Water samples were collected from all the three locations quarterly i.e. at an interval of three months in March 19, June 19, September 19 and December 19. The physico-chemical methods were evaluated as per the standard procedure available in the literature as per the American Public Health Association (APHA) and American Water Works Association (AWWA).

Depending on the parameter to be evaluated various bottles of plastic, glass and amber coloured were used.

pH meter was made to use for determining the pH of various samples of water.TDS was measured by means of TDS meter.DO was determined by Winkler titrimetric method.COD was estimated titrimetrically using Ferrous Ammonium sulphate and Ferroin indicator. Total hardness was determined by complexometric titration using Na-salt of EDTA in terms of ppm of CaCO₃Alkalinity was titrimetrically estimated. Electrical conductivity was determined by means of conductometer. The property of colour was determined simply by visual comparative technique.

RESULTS AND DISCUSSION

The results obtained for the various parameters are presented in the following tables for the different samples from Gorai labelled as G, Aksa labelled as A and Juhu labelled as J

MONTHMarch-2019

S.No.	Parameters	Units	Acceptable	G	А	J
			Limit			
			Linnt			
1	Temperature	°C	-	27.5	28.0	27.0
2	pН	-	6.5-8.5	8.21	8.56	8.43
3	TDS	ppm	600	810	765	294
4	DO	Ppm	5	10.2	8.6	5.0
5	COD	Ppm	250	197	210	226
6	Total hardness	ppm	300	350	326	330
7	Alkalinity	ppm	200	265	270	240
8	Conductivity	S/m	5-50	58	52	46





Volume 8, Issue 2 (III) April - June 2021



















TotalHardness



Conductivity

MONTHJune-2019

S.No.	Parameters	Units	Acceptable	G	А	J
			Limit			
1	Temperature	°C	-	27.0	27.2	26.8
2	pН	-	6.5-8.5	8.11	8.19	8.22
3	TDS	ppm	600	710	665	394
4	DO	Ppm	5	7.2	8.4	4.9
5	COD	Ppm	250	175	170	210
6	Total hardness	ppm	300	320	346	320
7	Alkalinity	ppm	200	195	210	215
8	Conductivity	S/m	5-50	48	42	49



10













220

215

210

205

200

195

190

185



GORAI AKSA

JUHU







pН

TotalHardness



Volume 8, Issue 2 (III) April - June 2021

ISSN 2394 - 7780

Alkalinity

Conductivity

MONTHSeptember-2019

S.No.	Parameters	Units	Acceptable	G	А	J
			Limit			
1	Temperature	°С	-	29.5	29.0	29.7
2	pН	-	6.5-8.5	7.21	7.56	7.43
3	TDS	ppm	600	695	615	495
4	DO	Ppm	5	9.2	9.6	7.0
5	COD	Ppm	250	266	278	246
6	Total hardness	ppm	300	360	346	310
7	Alkalinity	ppm	200	285	250	270
8	Conductivity	S/m	5-50	64	55	51





















Volume 8, Issue 2 (III) April - June 2021



Conductivity

MONTHDecember-2019

S.No.	Parameters	Units	Acceptable	G	А	J
			Limit			
1	Temperature	°С	-	26.9	26.4	27.2
2	pН	-	6.5-8.5	8.01	8.23	8.29
3	TDS	ppm	600	610	665	394
4	DO	Ppm	5	10.8	8.9	4.85
5	COD	Ppm	250	214	230	246
6	Total hardness	ppm	300	285	267	310
7	Alkalinity	ppm	200	215	234	239
8	Conductivity	S/m	5-50	52	49	43













Volume 8, Issue 2 (III) April - June 2021



CONCLUSION

From the above data it is observed that the values of the various parameters varies during the year as per the climatic and temperature conditions. Further it can also be concluded that some of the parameters of waters in all these three locations are above the acceptable limits and hence needs to plan and implement the process of water treatment. Comparative studies indicates the quality of water in Gorai beach is more polluted than the other two beaches.

ACKNOWLEDGEMENT

The authors express their sincere gratitude towards the Management and Principal of Thakur College of Sci.& Comm. and C.S's Patkar Varde College for extending their whole hearted support for this research work.

Finally the authors would like to thank their family members for the continuous encouragement which has made this research work possible.

REFERENCES

- Adefemi S. O. and E. E. Awokunmi, (2010), Determination of physico-chemical parameters and heavy metals in water samples from Itaogbolu area of Ondo-State, Nigeria, African Journal of Environmental Science and Technology, 4(3), pp 145-148. 2. Adeyeye EI, (1994),
- ASTM International, (2003), Annual Book of ASTM Standards, Water and Environmental Technology v. 11.01, West Conshohocken, Pennsylvania, pp 6-7.
- Indian Standard Specification for Drinking Water; IS: 10500: 1992. (Reaffirmed 1993
- Kataria, H. C., Quershi, H. A., Iqbal, S. A. and Shandilya, A. K, (1996), Assessment of water quality of Kolar reservoir in Bhopal (M.P.). Pollution Research. 15(2), pp 191-193
- shodhganga.inflibnet.ac.in/bitstream/10603/7486/10/10_chapter%203.pdf
- Dohare D, Deshpande S, Kotiya A (2014) Analysis of ground water quality parameters: Areview. Research Journal of Engineering Science 3: 26-31.
- Shrivastava A, Tandon SA, KumarR(2015) Water quality management planforPatalgangariver for drinking purpose and human health safety. International Journal ofScientific Research in Environmental Sciences 3: 0071-0087.
- Kushtagi S, Srinivas P (2011) Studies on water quality index of ground water of Aland taluka, Gulbarga(India). International journal of applied biology and pharmaceutical technology 2:252-256.
- Rambai W (2013) Dissertation Phase-1, Evaluation of water quality index and computation of environmental health indicators-case study, S.G.S.I.T.S. Indore.
- World Health Organization (W.H.O.) (1998) Guideline for drinking water quality. Healthcriteria and other supporting information, 2nd ed, Geneva, 2: 231 -270

SSN 2394 - 778

Volume 8, Issue 2 (III) April - June 2021

- Chaterjee C and Raziuddin M (2002) Determination of water quality index (WQI) of a degraded river in Asanol Industrial area, Raniganj, Burdwan, West Bengal. Nature Environment and Pollution Technology2:181-189.
- Goher MEM (2002) Chemical studies on the precipitation and dissolution of some chemical element in lake Qarun, Ph.D. Thesis faculty of sciences, Al-Azhar University, Egypt.
- Shastry CA, Aboo KM, Bhatia HL, Rao AV (1970) Pollution of upper lake and its effect on Bhopal water supply. Journal of Environmental Health 12:218-238.
- Solanki HA (2001) Study on pollution of soils and water reservoirs near industrial areas of Baroda. Ph.D. Thesis submitted to Bhavnagar University, Bhavnagar.
- Pandit BR, Solanki HA (2004) Drinking water quality and techniques for recharging urban water system for the industrial city of Gujarat, India. In: Innovative Modelling of Urban Water Systems, Monograph No. 12 Canada, Chapter 33, ISBN.
- Renn C E, Investigating water problems, Educational Products Division, LaMotte Chemical Products Company, Maryland, 1970.
- Rani, D F G, Geetha S and Ebanazar, J Pollut Res., 2003, 22(1), 111-115. Sharma M R, J Pollut Res., 2004, 23(1), 131-134.

A STUDY TO CLASSIFY STUDENTS RECORDS BASED ON ACADEMIC PERFORMANCE USING TREE BASE CLASSIFIERS

Mrs. Prabha Siddhesh Kadam¹ and Dr. Girish Tere²

¹Research Scholar, Computer Science, Shri JJT University, Rajasthan & Assistant Professor, Kirti. M. Doongursee College, Mumbai
²Assistant Professor, Thakur College of Science and Commerce, Kandivali (East), Mumbai

ABSTRACT

In this new era of technology machine learning raise as a sun to analyze the data and bring the hidden knowledge in the light. Base on which decisions can be taken. This study, aim to classify student's records based on academic performance using entry level subjects and final year grade of bachelor program. Analysis was carried out using Random Forest, J48, and REPTree classifiers with the Weka software. The maximum classification accuracy achieved was 93.75 % using Random Forest for sample size 128.

Keywords: Educational Data Mining, Machine learning, Random Forest, REPTree, J48

1. INTRODUCTION

Higher secondary education plays key role in educational journey. It's a main turning point for students. This point, they allowed to select a path for their destination. There exist diverse types of course, but to select a suitable one for bright carrier is a challenging task. Sometime students select one course due to good scope of placement, job opportunity, opening in the industries. In some cases, students like a particular domain or a dream to achieve success in a specific field. Sometimes parents insist their wards to go ahead with a particular choice. Random choice of the course not always gives good results. So, the choice must be proper.

Mathematics and statistics as one of subject at higher secondary education level is one of eligibility criteria for admission to the degree course of Batchelor of Science-Information Technology under university of Mumbai. Even for of Batchelor of Science-Computer Science, while preparing merit list aggregate Marks at H.S.C or equivalent get considered first. If the break situation comes then aggregate marks in science group means physics, chemistry and mathematics considered and still the condition remain same then marks in mathematics and statistics and physics and at the end they supposed to check marks in mathematics and statistics. It's an attempt to classify the student based on his performance at his higher secondary education study and final grade he achieved at the end of three-year integrated bachelor degree course.

The paper organized in 8 sections. Section 2 gives literature review. This section gives base for further study in this topic. Section 3 clears the objective of the study. Section 4 talks about research methods used in study. Section 5 presents data analysis and interpretation. Suggestion mentioned in section 6. Section 7 dedicated for the conclusion of the study. Section 8 gives references.

2. LITERATURE REVIEW

It was traced that earlier academic performance in the subject of mathematics proved to be a good predictor for undergraduate degree program. But researchers detected that entry point students' academic data turn out as a weak predictor for final academic performance. Where S. Anupama Kumar (2011) implemented ID3 and C4.5 tree algorithms to predict student's recital. As a result, ID3 and C4.5 both classified pass student 103 correctly but ID3 classified 12 students as Fail and C4.5 detect 13 Students Fail correctly. Misclassification instances were more in case of ID3 where authors consider only 120 samples for study [7]. In 2012, Surjeet Kumar Yadav (2012) performed study to device model for prediction of student retention where ID3, C4.5 and ADT algorithms used. Out of these three ADT gave best results precision rate of 82.8% and a recall rate of 11.4% without over fitting. But sample size used for this study just 37 which is too small.[9] In the same year Saurabh Pal (2012) generated predictive models for student's dropout management. ID3, C4.5, CART (Classification and Regression Trees) and ADT decision tree methods implemented with WEKA tool. It shows ID3 predicts it in more effective way than other techniques with 85.7% accuracy [10]. Mashael A. Al-Barrak (2016) tried to predict students' final GPA based on their grades in earlier courses. It uses students' transcript data that included their final GPA and their grades in all courses. C4.5 and J48 decision tree algorithm used to discover classification rules [11]. Raheela Asif et al., (2017) attempt to predict students' academic achievement at the end of a four years study program. It's an attempt to study typical progressions and combining them with prediction results. It was achieved with the help of Decision Tree with Gini index.[4] Amit Dutta and A.V. Senthil Kumar (2017) also work with ID3 algorithm to perform analysis and predictions on Students' academic performance which gives 67.33% accuracy for classifying data among four classes. Total number of instances considered

Volume 8, Issue 2 (III) April - June 2021

under study was 150 and 50 rules generated for the classification of new instance [5]. present study investigates the relationship between prior academic performance and student's academic success on an undergraduate architecture programme using machine-learning techniques. The study addresses a gap in the literature by applying machine-learning techniques which have the ability to capture non-linear relationships present in real life data. Also, the estimated relationship is used for prediction.

3. OBJECTIVE

To classify students' records based on academic performance using entry level subjects and final year grade of bachelor program.

4. METHODOLOGY

In the present work carried out using following steps:

1. Data Collection and Pre-processing: The real-world data bases normally leads to missing values, inconsistent data, and sometimes noisy. Specially if collected from heterogenous sources. If passing input is of poor quality then no one can get a good quality result. This is the reason behind data pre-processing [1][2]. It is an essential part of any data driven project. For this study data collection done using online survey method, google forms used as a data collection tool. Total 76 response received from Computer Science graduates while 75 response received from Information Technology graduates. Initially the sample size was 151 but after pre-processing only 128 records used for study. Negative responses present in the data was a small number, so to avoid bias records not considered and dropped from record set. Similarly, records with partial data values not considered under study. Total 7 variables considered for the study namely final grade at the end of all six semester, marks of mathematics and statistics, physics, chemistry, English, average of physics chemistry and mathematics since PCM is also a choice criterion in some courses and HSC passing percentage. While the data received as a course outcome at final semester grade converted into grades O, A, B, C, D where O shows above 80 percentage, A above 60 percentage, B above 50 percentage, C above 405percentage, D above 40 percentage.

- 2. The methods of machine learning and data mining: Historical grades help to predict student performance at final stage can be achieved using datamining techniques and machine learning approach is a known fact. Classification algorithms Random Forest, J48 and REPTree used to study the pattern in this scenario and classify student just using basic educational information at enrolment level. The machine learning approach follows two main steps, first it trains the system using partial data and second it classifies the remaining records known as testing process. The tree base approach helps to understand the ground truth, models normally easy to interpret and explain even the graphical representation of tree says a thousand words and a lame person also bale to understand the decision rules easily [6]
- Random Forest: Random Forest algorithm belong to the supervised learning techniques comes under machine learning domain. It solves the problem of classification as well as regression type. The method known as ensemble technique because it creates multiple trees and use bagging technique to come with the best model out of it.
- J48: It is a type of univariate decision tree algorithm. Univariate means it classify the records with one attribute at a time using info gain at that node. The divide and conquer approach in this algorithm make the tree small compare to other tree base algorithms.
- REPTree: Reduced Error Pruning Tree is the full form of this algorithm. It's a fast-learning algorithm work on information gain and helps to reduce variance. It's possible to overcome the problem of overfitting using this tree base approach.
- 3. The Model designing: This step, experiment performed with machine learning techniques using WEKA tool for data analysis.
- 4. Result Analysis and visualization: Graphical visual representations and result analysis are the two main steps performed in this stage.

5. DATA ANALYSIS AND INTERPRETATION

The total instances considered for the study was 128 with 7 attributes. Test mode was set for 10-fold cross-validation, that means 60 percentage of records was used for training purpose and remaining 40 percentage of records used for testing. Since the record set is of small size, study with complete training set also done which shows same results with REPTree algorithm. In this algorithm bagging with 10 iteration for base learner, the default values selected for study. It gives 92.9688% accuracy and able to classify 119 records correctly while 9 records misclassified by the model with tree size 11. (figure 1, Tree Visualizer -REPTree). As the results says

ISSN 2394 - 7780

Volume 8, Issue 2 (III) April - June 2021

highest accuracy achieved by using Random Forest 93.75% while accuracy with full training set 99.22%. To achieve this 93.75% accuracy bagging with 100 iterations and base learner setting was used and time needed to this model was 0.07 seconds on system with 2 GB nVIDIA GPU, 8GB RAM (Random Access Memory) and 128 SSD. Compared to the results achieved from Random Forest the J48 gives 92.9683% accuracy and with full training set 92.97% which is less, with tree size 16 and number of leaves 13(figure 2, Tree Visualizer -J48).



Figure 1: Tree Visualizer -REPTree



Figure 2: Tree Visualizer -J48

Algorithm	Accuracy with 10-fold cross- validation	Accuracy with full training set
Random forest	93.75%	99.2188%
J48	92.9683%	95.3125%
REPTree	92.9688%	92.9688%

Figure 3: Accuracy of Algorithms

Table 1: Accuracy of Algorithms

But if you check the classification of records Random Forest able to classify 120 records correctly while the J48 and REPTree both algorithms classified 119 correct and 9 records misclassified by both the algorithms. To conclude with which one will be the rightest algorithm for this kind of study, the results show Random Forest can give good result compare to other since accuracy with full training set for this algorithm is high 99.22% while J48 gives 95.31% and REPTree indicates only 92.97%.

В	D	С	А	В	D	С	А
41	1	3	0	43	1	1	0
0	51	2	0	0	51	2	0
1	0	15	0	1	1	14	0
1	1	0	12	1	1	0	12

Table 2: Confusion Matrix for J48 & REPTree Table 3: Confusion Matrix for Random Forest

6. SUGGESTION

The study can be extended to find relationship between the subject grades achieved at the higher secondary educational level and final year grade achieved by the student. This study helps to confirm the policy decision for enrolment of a student at entry level for the course.

7. CONCLUSION

The study shows that classification of students records to predict last semester grade using entry point higher secondary grades is possible but accuracy may increase with more details like semester wise grades achieved by the student before appearing the final examination. The tree structure in both the visualizer makes clear that

mathematics and statistics grades considered first and afterwards classification was done on the grades obtained in physics.

8. REFERENCES

- [1] W. Nor Haizan W. Mohamed, Mohd Najib Mohd Salleh, Abdul Halim Omar, "A Comparative Study of Reduced Error Pruning Method in Decision Tree Algorithms", 2012 IEEE International Conference on Control System, Computing and Engineering, 23 - 25 Nov. 2012, Penang, Malaysia,978-1-4673-3143-2
- [2] Md. Sazzadur Ahamed, NasrinAkterand Md. Zahid Hasan, "A Decision Support System for Classification of Heart Disease Using Data Mining Algorithms", Daffodil International University, International Journal of Computer Science and Information Security (IJCSIS), Vol. 15, No. 1, January 2017, ISSN 1947-5500
- [3] I. I. Sinam, Abdulwahab Lawan, "An Improved C4.5 Model Classification Algorithm Based on Taylor's Series Jordanian", Journal of Computers and Information Technology (JJCIT), Vol. 05, No. 01, April 2019.
- [4] Raheela Asif, Agathe Merceron, Syed Abbas Ali, Najmi Ghani Haider, "Analysing undergraduate students' performance using educational data mining", Computers & Education 113 (2017) 177e194
- [5] Amit Dutta and A. V. Senthil Kumar, "Analysis and Predictions on Students' Academic Performance Using ID3 Algorithm", International Journal of Data Mining and Emerging Technologies Volume 7, Number 2, November, 2017, pp. 107-113, DOI: 10.5958/2249-3220.2017.00014.3
- [6] Abdulsalam Sulaiman, Babatunde Akinbowale, Babatunde Ronke, Hambali Moshood A, "Comparative Analysis of Decision Tree Algorithms for Predicting Undergraduate Students' Performance in Computer ProgrammingA Multidisciplinary Journal Publication of the Faculty of Science, Adeleke University, Ede, Nigeria,2015
- [7] Anupama kumar and Dr. Vijayalakshmi MN, "Implication of classification Techniques in predicting student's Recital", international journal of data mining & knowledge management process (ijdkp) vol.1, no.5, September 2011, doi:10.5121/ijdkp.2011.1504

FUNGAL ORGANISMS AS THE POTENTIAL CATALYST FOR BIOREMEDIATION OF HEAVY METALS

Vinit Vaidya¹, Shruti Papaiya² and Deepak Gupta³

¹Department of Botany, Thakur College of Science & Commerce, Kandivali (E), Mumbai ²Department of Environmental Studies, Thakur College of Science & Commerce, Kandivali ³Content Developer, Manoeuvre Education, Vasai

ABSTRACT

Due to increased industrial activity, there is increase in the various heavy metals such as nickel, cobalt, molybdenum, copper, lead, mercury, manganese, zinc, cadmium, and many more to contaminate the water resources. Current technologies employed to remove metals present in low concentration from the water resources through the process like precipitation and ion exchange are often expensive and inefficient. It was noticed and proved that the fungi have exceptionally good potential to absorb and process the heavy metals. Hence, in the presence study, the fungal organisms, Aspergillus niger and Penicillium chrysogenum were exposed, under laboratory conditions, to the water samples collected from various places in and around Kandivali Village, Mumbai. The samples showed presence of heavy metals such as Nickel (Ni), Cobalt (Co), Molybdenum (Mo), Mercury (Hg) and Zinc (Zn). The impact of the heavy metals on the fungi and interaction of these fungal organisms for their adaptation to the given concentrations of Nickel, Cobalt and Mercury while Penicillium chrysogenum was tolerant to the higher concentrations of Molybdenum and Zinc. Hence, these fungi can be used for bioremediation of the water resources contaminated with the heavy metals. The main aim of this study was to test the fungal organisms as the potential catalyst for bioremediation of the heavy metals from the contaminate water.

Key Words: Fungal Organisms, Potential Catalyst, Bioremediation, Heavy Metals.

INTRODUCTION

The fungal species can be used as remediation in biotechnology to improve the process of detoxification of chronically contaminated habitats with the heavy metals. Fungal association with the plants, is an integral part of the ecosystem (Burgstaller & Shinner, 1993). It has been noted that this association of the fungi with functioning parts of the plants such as roots can enhance the plant growth even in the soil or water contaminated with the heavy metals (W. X. Ren *et. al.*, 2009).

Metals along with their compounds interact with specific fungi in various ways depending on the type of metal, organism, and the available environmental conditions. They show their toxic effects in several ways, either by blocking the functional groups of enzymes or altering the biochemical pathways. All the Microorganisms, especially fungi possess an ability to survive by adapting or mutating even at the higher concentrations of toxicity due to presence of heavy metals (Gadd & Griffiths, 1977). The adaptation of fungi exposed to heavy metal ions has been examined to increase the tolerance of fungi to conduct the bioleaching process (Santhiya & Singh, 2006). It has been generally observed that the fungi adapt two different types of mechanisms for the tolerance towards heavy metals. One is extracellular digestion by implementation of the process of chelation along with binding with the cell wall and the other one is by intracellular process of binding to the proteins or other ligands to prevent it from damaging the cellular targets, which are metal sensitive (M. Bellion, 2006).

The fungi implement extracellular mechanism to avoid the entry of the heavy metal, whereas intracellular systems is meant to reduce the amount of the heavy metal present in the cytosol. In the process of extracellular mechanism, the fungus secrets different types of organic molecules, which do not belong to the matrix of the cell wall and help to chelate the metal ions present around (Valix & Loon, 2003). The process of binding of the molecules to the cell wall is called as biosorption. The cell surface of the fungi is usually negatively charged due to the presence of various anionic structures, such as glucan and chitin (Valix, Tang & Malik, 2001). Due to this phenomenon, the fungi can bind with the metal cations. In case of intracellular mechanism, there is involvement of the proteins in the process of metal transport and thus can provide some amount of metal tolerance. The process of metal repossession in the vacuole (J. Yang *et. al.*, 2009). In the present study, the tolerance of fungal strains of *Aspergillus niger* and *Penicillium chrysogenum* for the heavy metals like Nickel, Cobalt, Molybdenum, Mercury and Zinc was studied. The main objective of this research work is to investigate the effect of heavy metal type, their concentration and adaptive behaviour of the type of the fungus.

Volume 8, Issue 2 (III) April - June 2021

AIM AND OBJECTIVE

Bioremediation is the process of implementation of a living organism, usually bacterium or fungus, which has inherited capacity to breakdown the pollutants from complex organic and inorganic material to convert them into simpler molecules that can be easily assimilated into the environmental system (Paliwal et. al., 2012). This process is dependent upon encouragement of the growth of some micro-organisms that can use the desired pollutants and toxic materials as a source of their food material for nutrition and convert these into simple components such as water and gases which are harmless (Hrynkiewicz and Baum, 2014). The process of bioremediation can be initiated and enhanced by use of optimum temperature and nutrient level with which the growth of the organism can be escalated and the process as a whole. Bioremediation is a long-term process, which can be extended from some months to some years based on the physico-chemical factors of the given location (Abbas et. al., 2014). Bioaccumulation is passive process of metal uptake by living and non-living biomass and it is independent of the regular metabolism. Fungal species and strains have different sensitivity and the protection mechanism towards the heavy metals during the degradation of these heavy metals (Sidiquee et. al., 2015). When various strains of fungi are compared for their interactions with the heavy metals, there was significant interspecific variations as far as the metal tolerance was concerned. We have also checked availability and culturing methods of these fungal organisms in the laboratory. As a result, Aspergillus niger and Penicillium chrysogenum were selected as the fungal organisms to treat the heavy metals in various water samples used in the present studies.

METHODOLOGY

- (1) Collection of the water samples contaminated with heavy metals: The water samples contaminated with the heavy metals were collected from 5 different places in and around Thakur Village, Kandivali, Mumbai, where the water is contaminated with various types of effluents from the industries. The samples were collected with the help of presterilized droppers and stored in presterilized plastic vials till further usage.
- (2) Collection and Growth of Fungal Organisms: The method of exposure petri plate was implemented to collect the samples of the fungal organisms by using sterilized Potato Dextrose Agar (PDA) as the nutrient medium. PDA was preprepared using 400 gms of peeled potatoes, 20 gms of Dextrose and 20 Gms of Agar powder dissolved in 1000 ml of distilled water and adjusting the pH to 5.6. The petri plates and nutrient medium were sterilized by the process of autoclaving at pressure of 15 lb and temperature of 120° C for 20 minutes. The sterilized petri plates were poured with the sterilized nutrient medium @ 20 ml of medium per petri plate and allowed to solidify. The cooled petri plates were exposed to the open environment for 20 minutes and then the petri plates were incubated at 28° C (+ 2) for 5 days. The fungal organisms obtained on the petri plates were purified using subculturing technique and finally purified cultures of *Aspergillus niger* and *Penicillium chrysogenum* were obtained for the experiment. Standard references of colony culture methods, morphological characters and micro techniques were used to identify the fungal organisms.
- (3) Culturing of fungi in the contaminated water: Erlenmeyer's flasks were sterilized and filed with the sterilized Potato Dextrose Broth. Each flask was inoculated with 1% solution of the contaminated water sample. Then the flask was inoculated with *Aspergillus niger* and *Penicillium chrysogenum* and incubated at 28° C (+ 2) for the period of 5 days. Before and after the process of incubation, the qualitative and quantitative analysis of the heavy metals in each flask was carried out by using standard methods and the reading were noted.

(4) Qualitative Analysis of Heavy Metals:

- 1. Nickle (Ni): Nickel can be dissolved by using dilute acids such as Hydrochloric Acid or Sulphuric Acid to form a green solution called as hexaaquanickel (II) ion / [Ni (H2O)6]2+ and hydrogen gas (H2). When an alkali, NaOH is added to this green solution, a green precipitate, [Ni (OH)2(H2O)4] is formed.
- 2. Cobalt (Co): There is formation of blue coloured complex ion, tetraisothiocyanatocobaltate (II) when concentrated solution of ammonium thiocyanate is added to the solution containing cobalt (II) ion.
- **3. Molybdenum** (**Mo**): When the solution containing molybdenum is boiled then the sulfur dioxide gas is removed and finally evaporated to the dryness. The solid is mixed with 6 M hydrochloric acid, and the resulting solution is extracted with ether until the test solution is free from the molybdenum. The last portion of ether used for the extraction serves to indicate when the extraction is clean. In order that the test for molybdenum may be made in the ether phase, the solvent is evaporated over a steam bath, leaving a residue of Molybdenum. The residue is dissolved in hydrochloric acid by adding one or two pieces of

ISSN 2394 - 7780

granulated zinc metal followed by one or two drops of potassium thiocyanate solution. The presence of molybdenum is confirmed by the red coloured solution of Mo O (CN5).

- 4. Mercury (Hg): Take the sample in a porcelain dish and add 10 drops of 3N Nitric Acid. Heat the mixture on hot water bath for 3 minutes. Centrifuge this solution and separate the residue. The centrifugate was discarded and then the residue was dissolved in 4 drops of aqua regia. Add 10 drops of water in the solution and then boil it in water bath for 2 minutes. Cool the solution and add 2 drops of SnCl2 (or BaCl2) solution to it. Formation of white or grey precipitate confirms the presence of mercury.
- 5. Zinc (Zn): Formation of white gelatinous mass of the Zinc Hydroxide Zn (OH)2 with aqueous ammonia confirms the presence of Zinc.
- (5) Quantitative Analysis of Heavy Metals by Flame Atomic Absorption Spectroscopy: The most common and reliable technique for detection of metals and metalloids in the environmental samples is Atomic Absorption Spectrometry (AAS) (V. A. Dauvalter, 1998). The total metal content of the collected water samples was detected by using Flame Atomic Absorption Spectrometry (FAAS). The analysis done by using AAS with flame spectrometers and autosampler, provides a good amount of sensitivity (I. D. Dulama, *et. al.*, 2013). Blank and standard solutions for device calibration were used. Measurement of the concentration of heavy metals in water samples was done with a typical set of standard calibration curves with satisfactory linear regression and better relative standard deviations could be achieved. To verify the validity of these measurements, two standard reference materials, NIST SRM 1643e Trace Elements in Water and NIST SRM 4354 Lake Sediment Powder, were used (Y. Saygi, *et. al.*, 2012).

PREPARATION OF THE SAMPLES

- 1. Nickle (Ni): 1 ml of sample water was taken into a 400-ml. beaker. The beaker was covered, and 35 ml. of 15 M nitric acid was added. The solution was boiled till the red fumes stopped. The care was taken to dissolve all the black particles and the volume was adjusted to about 5 ml. This solution was cooled and 20 ml. 12 M HCl was added. Evaporate it to dryness and then add 10-ml. hydrochloric acid. Boil it again and take it to dryness. Heat the solution at 110° C for one hour. The solution was cooled and 10 ml. HCl was added. Heat it for a few seconds and then transfer to a 100 ml. volumetric flask. The solution was diluted by adding hot deionized water and cooled to the room temperature. The volume was adjusted to the given mark. The flask was stoppered, and the solution was mixed thoroughly.
- 2. Cobalt (Co): A 25 mL aliquot of sample and standard solution containing Co2+ in the range of 2–166 μ g L-1, 1.2 mL of 0.5 mol L-1 acetate/acetic acid buffer solution at pH 5 along with 1.8 mL of 2.5% (m/v) PMBP solution as the chelating agent was taken in a screw-cap conical-bottom polypropylene centrifuge tube. 2 mL of acetone was added as the disperser solvent, which contained 0.3 g of [C6py]. The [PF6] ionic liquid was added as the extraction solvent. The volume of the solution was adjusted to 30.0 mL. The tube was shaken vigorously to obtain a dispersion of the IL in the aqueous media. After shaking, the resultant solution became turbid at room temperature resulting in the extraction of the Co-PMBP complex. The phase separation was accelerated by centrifugation at 4000 rpm for time span of 5 minutes. The IL-phase is settled at the bottom of the centrifuge tube. The upper aqueous phase was removed completely with the help of a syringe centred in the tube. Finally, the viscosity of the IL-phase was reduced, and the sample was made up to 500 μ L by adding the acetone. The resultant solution was used for AAS detection.
- **3. Molybdenum** (**Mo**): 10 g of sample was weighed into a 400-mL beaker and 25 mL concentrated HCl was added. The solution was covered and placed on a hot plate. 15 mL concentrated HNO3 was added drop wise. The solution was digested for time span of 20 min and then 25 mL concentrated HCl and 25 mL deionized water were added to it. The solution was covered and boiled to expel all the gases digested by nitric acid and dissolution of all the available soluble salts. The mixture was cooled and transferred to 100-mL Nessler colour tubes, diluting it to 100 mL by adding cold deionized water. It was mixed well and filtered through No. 44 Whatman filter paper into 125-mL Erlenmeyer flasks, which was fitted with the screw cap fittings.
- 4. Mercury (Hg): The water Sample for Mercury was digested by adding 100 mL of water sample with 5 mL of concentrated H2SO4 followed by 2.5 mL of HNO3. 15 mL KMNO4 solution was added into it and allowed to stand for fifteen 15 min. 8 mL of K2S2O8 solution was added to it and then it was heated for 2 hours in a water bath. The solution was cooled down to the room temperature and then enough NCl-hydroxylamine solution was added to reduce excess KMnO4.

Volume 8, Issue 2 (III) April - June 2021

5. Zinc (Zn): 5 ml of water sample was extracted with 50 mL of 0.01 M CaCl2 solution with a process of agitation for time span of two hours. The solution was filtered using Whatman No. 44. The 10 g of dried soil was extracted by using 50 mL of an extractive solution containing EDTA (0.002 M), ammonium acetate (0.5 N) and acetic acid (0.5 N). The solution was then agitated for 30 min, filtered, and analysed. The pseudo-total MTE (digestion with aqua regia) concentrations was made by using 3 g of soil sample treated with a mixture of 22.2 mL HCl 37% and 7.5 mL HNO3 65% (aqua regia). The resulting solution along with the nitric acid (0.5 M) from the vapor trap were then pooled in a 100-mL vial, by using distilled water. The solution was then filtered by using Whatman No 44-filter paper and analysed.

	. 1	• • • •	1 4 1 4	1
Table 1: Values of heav	y metals present	t in untreated an	id treated wat	er samples

Sr. No.	Heavy Metal	Recommended Values in Drinking Water Samples (ppm)*	Average Observed Values in Drinking Water samples (ppm)	Observed Values after Treatment of Water Samples with the Fungal Organisms (ppm)		
				A. n. °	P. c."	
1	Nickle (Ni)	0.070	2.204	0.083	1.843	
2	Cobalt (Co)	4.000	5.329	4.354	5.148	
3	Molybdenum (Mo)	50.000	75.987	68.945	53.598	
4	Mercury (Hg)	0.006	0.009	0.007	0.008	
5	Zinc (Zn)	3.000	3.800	3.645	3.119	

*WHO/SDE/WSH/03.04/11/Rev/1

[@]Aspergillus niger

[#]Penicillium chrysogenum



Aspergillus niger



Penicillium Chrysogenum

DISCUSSION AND RESULTS

As per Table No. 1, the recommended values by the World Health Organization (WHO), which can be present in water resources for the heavy metals Nickle (Ni), Cobalt (Co), Molybdenum (Mo), Mercury (Hg) and Zinc (Zn) are 0.070, 4.000, 50.000, 0.006 and 3.000 ppm respectively. Average value of these heavy metals in the water resources from Kandivali were 2.204, 5.329, 75.987, 0.009 and 3.800 ppm respectively. When these water samples were treated with the fungal organisms, *Aspergillus niger* and *Penicillium chrysogenum* the corresponding average values were 0.083, 4.354, 68.945, 0.007 and 3.645 ppm for *Aspergillus niger* while average values for *Penicillium chrysogenum* were 1.843, 5.148, 53.598, 0.008 and 3.119 ppm respectively. The water sample treated with *Aspergillus niger* shows drastic decrease in the amount of Nickel, Cobalt and Mercury while the samples treated with *Penicillium chrysogenum* showed considerable decrease in the amount of Molybdenum and Zinc.

CONCLUSION

The samples showed presence of heavy metals such as Nickel (Ni), Cobalt (Co), Molybdenum (Mo), Mercury (Hg) and Zinc (Zn). The impact of the heavy metals on the fungi and interaction of the stated fungal organisms

Volume 8, Issue 2 (III) April - June 2021

from the experiment, for their adaptation to the given concentration of the heavy metals was tested. It was observed that *Aspergillus niger* was tolerant to the higher concentrations of Nickel, Cobalt and Mercury while *Penicillium chrysogenum* was tolerant to the higher concentrations of Molybdenum and Zinc. Hence, it is suggested that the fungi can be used for bioremediation of the water resources contaminated effluents from the industry with presence of the heavy metals.

ACKNOWLEDGEMENT

The authors are very much grateful to the Management and the Principal of Thakur College of Science & Commerce to make all the possible resources available in the College required to complete the research work. The authors also wish to express thanks to Dr. C. P. Shukla, Head, along with all the members of Teaching & Non – Teaching Staff of Department of Botany, TCSC. We wish to express our special thanks to Prof. (Dr.) Sunita Shailajan for her guidance and support for technical analysis of the samples.

REFERENCES

- Abbas, H. S., M. I. Ismail, M. T. Mostafa, and H. A. Sulaymon, "Biosorption of heavy metals: A review," *Journal of Chemical Science and Technology*, vol. 3, pp. 74–102, 2014.
- Bellion, M., Courbot, M., Jacob, C., Blaudez, D. and Chalot, M. "Extracellular and cellular mechanisms sustaining metal tolerance in ectomycorrhizal fungi", FEMS Microbiol. Lett., 254, pp. 173–181 (2006).
- Burgstaller, W. and Schinner, F.J. "Leaching of metals with fungi", J. Biotechnol., 27(2), pp. 91–116 (1993).
- Dauvalter, V. A., Water Res., 25, 451 (1998).
- Gadd, G.M. and Griffiths, A.J. "Microorganisms and heavy metal toxicity", Microbial. Ecol., 4, pp. 303–317 (1977).
- Hrynkiewicz, K. and C. Baum, "Application of microorganisms in bioremediation of environment from heavy metals," *Environmental Deterioration and Human Health: Natural and Anthropogenic Determinants*, pp. 215–227, 2014.
- D. Dulama, I.V. Popescu, C Rădulescu, C. Stihi, I. Ionita, I.A. Bucurica, D.E. Chelarescu, O.V. Nitescu, and R. Stirbescu, Rom Rep Phys, 65, 1519–1527 (2013).
- Paliwal, V., S. Puranik, and H. J. Purohit, "Integrated perspective for effective bioremediation," *Applied Biochemistry and Biotechnology*, vol. 166, no. 4, pp. 903–924, 2012
- Ren, W.X., Li, P.J., Geng, Y. and Li, X.J. "Biological leaching of heavy metals from a contaminated soil by *Aspergillus niger*", J. Hazard. Mater., 167, pp. 164–169 (2009).
- Y. Saygi, S. Yiğit, Environ. Monit. Assess., 184(3), 1379 (2012).
- Santhiya, D. and Ting, Y.P. "Use of adapted *Aspergillus niger* in the bioleaching of spent refinery processing catalyst", J. Biotechnol., 121, pp. 62–74 (2006).
- Siddiquee, S., K. Rovina, and S. A. Azad, "Heavy metal contaminants removal from wastewater using the potential filamentous fungi biomass: a review," *Journal of Microbial and Biochemical Technology*, vol. 07, no. 06, pp. 384–393, 2015.
- Yang, J., Wang, Qu., Wang, Q. and Wu, T. "Heavy metals extraction from municipal solid waste incineration fly ash using adapted metal tolerant *Aspergillus niger*", Bioresour. Technol., 100(1), pp. 254–260 (2009).
- Valix, M. and Loon, L.O. "Adaptive tolerance behaviour of fungi in heavy metals", Miner. Eng., 16, pp. 193–198 (2003).
- Valix, M., Tang, J.Y. and Malik, R. "Heavy metal tolerance of fungi", Miner. Eng., 14(5), pp. 499–505 (2001).

A REVIEW ON POLYCYCLIC AROMATIC HYDROCARBONS: SOURCES, ROUTES OF EXPOSURE AND METHODS OF BIO-REMEDIATION

Kirti S. Kulkarni*, S. D. Ajagekar**, C. P. Shukla***, G. G. Padhye**** *Department of Chemistry, Arts, Commerce and Science College of Jawhar, Dist. Palghar **Department of Chemistry, Thakur College of Science and Commerce, Kandivali (Mumbai) ***Department of Botany, Thakur College of Science and Commerce, Kandivali (Mumbai) ****Department of Physics, Thakur College of Science and Commerce, Kandivali (Mumbai)

ABSTRACT

Polycyclic aromatic hydrocarbons are ubiquitous organic compounds associated with aerosols. They are getting attention due to their carcinogenic and mutagenic properties. At ambient temperature PAHs can remain present in air both in gaseous as well as particulate phase. They get generated from incomplete combustions of organic materials such as wood, fossil fuels, meat and tobacco, during cooking, in cold start of vehicles. They are distributed in the ambient air, soil and water environments. PAHs easily generated especially in thickly populated areas through anthropogenic emissions mostly automobile exhaust, fuel combustion, various industrial activities and through cigarette smoking. These activities are extremely hazardous to health as they tend to cancer. Hence, it is very important to study their sources, mode of transport, routes of exposure to human and especially the methods of remediation. There are conventional techniques such as solvent extraction, chemical oxidation, photo-catalytic degradation, electro-kinetic and thermal remediation technologies for the remediation of PAHs. Over the past few years the physicochemical strategies for remediation are shifting towards the biological tools for remediation. The physicochemical methods have high economic cost and harmful byproducts. The significant bio-remediation techniques are bio-retention, natural attenuation, bio-augmentation, phytoremediation and rhizo-remediation of PAHs.

Keywords: PAHs, bio-remediation, environment, POPs

1. INTRODUCTION

Polycyclic aromatic hydrocarbons (PAHs) are a class of Persistent Organic Pollutants (POPs) containing two or more fused aromatic rings in different possible arrangements which may contain other elements. The group PAHs includes compounds with nitrogen, oxygen or sulfur substituent such as nitro-PAHs, hydroxy-PAHs and heterocyclic compounds. They are formed by the chemical reactions such as sulfonation, nitration or photooxidation. An important group of polycyclic aromatic compounds are the PAH is the one with two or more fused benzonoid rings formed only with carbon and hydrogen. The physical and chemical properties of PAHs are determined by their conjugated π -electron systems. This depends upon the number of aromatic rings and the molecular mass [1]. In atmosphere, they are present in both gaseous and particulate phase. Till date more than 100 PAHs have been characterized in nature, 16 of which are classified as priority pollutants according to the U.S. Environmental Protection Agency. They are reported to be the most carcinogenic.

2. FORMATION OF PAHS

PAHs may be synthesized from saturated hydrocarbons under oxygen-deficient conditions. Pyro- synthesis and pyrolysis are two main mechanisms that can explain through which formation of PAHs take place. Few more possible mechanisms of PAH formation were suggested during combustion, i.e. slow Diels–Alder condensations, rapid radical reactions, and ionic reaction mechanism [2].

3. SOURCES OF PAHS

PAHs are formed from both natural and anthropogenic sources which can be discussed as follows:

- 1. **Natural Sources:** PAH in the atmosphere arises from natural combustion such as forest fires, burning of woodland and volcanic eruptions. This contributes the largest volumes of PAHs from a natural source to the atmosphere. PAHs occur naturally in bituminous fossil fuels, such as coal and crude oil deposits, as a result of digenesis [2].
- **b.** Anthropogenic Sources: The anthropogenic activities responsible for emission of PAHs mainly involve industrial, vehicular, domestic and agricultural activities [3]. A significant mobile source of atmospheric PAHs is the conventional auto -mobiles, powered by spark ignite internal combustion engines. Domestic activities generally include the burning of various fuels during cooking and other household activities; tobacco and cigarette smoking garbage; and burning of garbage and other waste products. Agricultural sources of PAHs include the waste crop burning, burning of brushwood and straw, open burning of land for regeneration of crops and for land preparation. These all procedure emits significant amount of PAHs [3].

ISSN 2394 - 7780

Volume 8, Issue 2 (III) April - June 2021

4. MODE OF TRANSPORT

- 1. Air: The primary natural sources of PAHs are grassland fires and volcano eruptions. The anthropogenic sources are burning of wood, industrial power generation, vehicular exhaust, the production of coke and asphalt and petroleum related activities. Also, there is major contribution of tobacco smoke, gas cooking and heating appliances [3] in PAHs generation.
- 2. Water: PAHs get deposited in waters ecosystems through deposition of airborne PAHs, industrial waste water discharge, residential sewage water, oil spills, and petroleum pressing. They remain there for considerable longtime.
- **3.** Soil: The entry of PAHs in soil ecosystem is through atmospheric deposition and from affected water sources. The potential sources of PAHs in soil include industrial effluents, public sewage treatment plants, vehicular exhaust, soil irrigation and overuse of compost and fertilizers.

5. THE MODES OF EXPOSURE OF PAHS TO HUMAN BODY

The particulate PAHs present in various size ranges and get transport long distances. Due to this they remain present in all mediums in high concentrations. They can enter in human body though,

- 1. Direct inhalation of PAHs in vapors phase though accidents.
- 2. Contaminated air with PAHs in the work place of cooking, coal tar and municipal trash incineration facilities.
- 3. Through cigarette and tobacco smoke.
- 4. Consumption of grilled or charred meats and contaminated foods
- 5. Drinking contaminated water or milk.
- 6. TOXICOLOGICAL AND CARCINOGENIC ASPECTS OF PAHS
- **a. Impact of PAHs on animals:** In water ecosystems, PAH concentrations are rarely high enough to be fetal for the aquatic organisms but, the prolonged exposure to lower levels of PAHs may cause physical and biochemical changes in various manner. Elevated PAH concentrations in may result in liver damage and tumors in fishes and some mammals [4].
- **b. Impact on human beings:** Some of PAHs have been identified as possible carcinogens in human which show the adverse biological effects on human beings like acute and chronic effects. Repeated skin contact to the naphthalene can result in redness and inflammation of the skin. [4].
- **c.** Carcinogenic effects: Various studies show that PAHs, their metabolic byproducts and the products formed as a result of interaction with other air pollutants are highly mutagenic and carcinogenic. Epidemiological studies have shown that people exposed to mixtures containing PAHs through chimneys have increased rates of lung cancer.

7. IMPORTANCE OF REMEDIATION

It becomes extremely necessary to remove the PAHs from ecosystems. Several chemical methods are used remove PAHs from environment. These methods include Solvent Extraction, photo-catalytic degradation [5], chemical oxidation, electro-kinetic remediation and thermal technologies. But, these methods have harmful byproducts and they are comparatively high cost. The "bioremediation" methods are low cost with no secondary pollution. Also, they are useful in sustainable development of environment. Some of the biological remediation methods are discussed below:

BIODEGRADATION BY MICROBES

As far as the sustainability of environment and human health is concerned, the biological treatments of PAHs have come into existence as alternative technologies [5]. The term biodegradation refers to the use of living organisms to degrade environmental pollutants like PAHs to create less harmful byproducts. These processes include aerobic and anaerobic biodegradation.

NATURAL ATTENUATION

A Natural Process for Biodegradation of Pollutants is natural attenuation (NA) or bio-attenuation. In this process the indigenous microbial populations degrade recalcitrant or xenobiotic compounds based on their natural metabolic processes. This type of bioremediation processes includes a series of biological processes that are useful to reduce the number, toxic effect, mobility, and the ill effect of contaminants [6].

Volume 8, Issue 2 (III) April - June 2021

BIO-RETENTION SYSTEMS

A bio-retention system is perhaps a best method of bio-remediation in which the rate of release of POPs is slower down. This increases the quality of affected water runoff to water reservoirs. The bio-retention systems are very cost effective. They are used for nonpoint source pollutants especially in industrial environments [7]. The bio-retention systems for PAHs and heavy metals include sedimentation, filtration, sorption, and microbial decomposition.

BIO-AUGMENTATION BY MODIFIED MICROBES

Bio-augmentation is a method used to enhance the biological degradation of pollutants. Here the transformation rate of xenobiotic is increased by introducing either new type or genetically modified (GM) microbes into soil [8]. This method is the one in which the bacterization of plants seeds is carried out. The new genomics techniques also help in determining of catabolic genes to improve remediation strategies [9]. This way the Mycobacterium species can degrade a variety of PAH in a simpler form with less harmful byproducts [8].

PHYTOREMEDIATION:

Phyto-remediation is the best method to treat a long range of hazardous pollutants in environmental friendly manner. This noninvasive method is also sustainable and useful for eco-restoration of polluted sites [5]. Many organic pollutants including PAHs, TCE (trichloroethylene), heavy metals, and PCBs (polychlorinated biphenyls) are phytoremediated successfully. Phytoremediation also controls the high concentrations of PAHs which inhibit plant growth in situ condition [10].

RHIZO-REMEDIATIOIN

The method of rhizodegradation has the best control over both the plant and the rhizobacteria. The rhizoremediation of PAHs which show plant-microbial interactions in the rhizosphere remediating the PAHs compounds [11]. Rhizo-remediation initiates the stimulation of flavonoids which can reduce the growth of PAH in plants. Plant roots can act as a substitute for the tilling of soil to incorporate nutrients and to improve aeration in soil. It helps in improvement of soil quality and enhances the root growth [12].

CONCLUSION

Increased urbanization has led to increase in releases of anthropogenic pollutants like PAHs into the air. The emission control of PAH into the atmosphere is a serious matter to consider in the context of human health. Bioremediation is recognized as the most effective tool to remove PAHs from environment and to restore PAH contaminated sites. The use of non-traditional energy sources such as natural gases and nuclear power play significant role on reduction of PAH emission. However, the bio-remediation of PAHs is the selection of natural mechanisms instead of conventional methods to retain "sustainability" of the environment.

REFERENCES

- 1. Baek et al. 1991 Baek, S.O. et al., A review of atmospheric polycyclic aromatic hydrocarbons: sources, fate and behavior. Water, air, and soil pollution, 60: 279–300 (1991).
- 2. Grimmer, G. et al., Contribution of polycyclic aromatic hydrocarbons and nitro-derivatives to the carcinogenic impact of diesel engine exhaust condensate evaluated by implantation into the lungs of rats. Cancer letters, 37: 173–180 (1987).
- 3. Li and Lee, B.M., Immunologic measurement of polycyclic aromatic hydrocarbon-albumin adducts in foundry workers and roofers. Scandinavian journal of work & environmental health, 17: 190–194 (1991).
- 4. Neubert, D. &Tapken, S., Transfer of benzo(a)pyrene into mouse embryos and fetuses. Archives of toxicology, 62: 236–239 (1988).
- 5. Singh OV, Jain RK., Phytoremediation of toxic aromatic pollutants from soil. ApplMicrobiolBiotechnol 63:128-135 (2003).
- 6. Widada J, Nojiri H, Omori T., Recent developments in molecular techniques for identification and monitoring of xenobiotic-degrading bacteria and their catabolic genes in bioremediation. ApplMicrobiolBiotechnol 60:45-59 (2001).
- 7. Rezek J, in der Wiesche C, Mackova M, Zadrazil F, Macek T., The effect of ryegrass (Loliumperenne) on decrease of PAH content in long term contaminated soil. Chemosphere 70(9):1603–1608 (2008).
- 8. Kuiper EL, Lagendijk GV., Lugtenberg B Rhizoremediation: A beneficial plant microbe interaction. Mol Plant Microbe Int 17:6-15 (2004).

Volume 8, Issue 2 (III) April - June 2021

- 9. Kiely PD, Haynes JM, Higgins CH et al., Exploiting new systems-based strategies to elucidate plantbacterial interactions in the rhizosphere. MicrobiolEcol 51:257 (2006).
- 10. Huang X-D, El-Alaw YS, Gurska IJ et al. A multi-process phytoremediation system for decontamination of persistent total petroleum hydrocarbons (TPHs) from soils.Microchem J 8:139-147 (2005).
- 11. Chaudhry Q, Blom-Zandstra M, Gupta S. et al., Utilising the synergy between plants and rhizosphere microorganisms to enhance breakdown of organic pollutants in the environment. EnvSciPollut Res 12:34-48 (2005).
- 12. Leigh MB, Fletcher JS, Fu X et al., Root turnover: an important source of microbial substrates in rhizosphere remediation of recalcitrant contaminants. Environ SciTechnol 36:1579-1583 (2002).

THE IMPACT OF 2019 FLOOD ON THE RIVER CHALIYAR OF KERALA

Mohammed Shafi P¹ and Dr. Afeef Tharavattath² ¹Research Scholar Farook Training College ²Assistant Professor, Farook Training College

ABSTRACT

The present investigation reveals that the impact of 2019 floods on the river chaliyar of kerala. Chaliar originates in the lush nilgiris of Tamilnadu and flows steeply down 169 km through many rural areas into the arabian sea. It is the fourth largest river in kerala and flows through malappuram and kozhikode district. Kozhikode corporation, nilambur, manjeri municipalities and 17 panchayath depend on this river for water and irrigation. The river places an important role in shaping the culture of people on the banks of the chaliyar people life, agriculture and handicraft, vernacular, entertainments everything has its own way. It is rich in fish species and many people adopted fishing for their livelihood. There were different species of fish such as riverside animals, birds and butterflies. The divesting rain and unprecedented flood in the month of august 2019 affected the ecosystem of river chaliyar drastically. The impact of the flood brought a disastrous effect on geography, flora and fauna of the river.

INTRODUCTION

William Logan states in the malabar manual that the chaliyar was the only major river that carries a significant amount of water to malabar from the western ghats.

Chaliyar originates in the lush nilgiris of Tamilnadu and flows steeply down 169 km through many rural areas into the Arabian sea. It is the fourth largest river in Kerala and flows through Malappuram and Kozhikode district. Kozhikode corporation, Nilambur, Manjeri municipalities and seventeen panchayats depend on this river for water and irrigation. The chaliyar receives a large number of streams and creeks from different hills of Tamilnadu and Kerala. It becomes a large river with its tributaries like Punnapuzha, Karimpuzha, Kuruvanpuzha, Kanjirapuzha, Neerpuzha, Athirampuzha, Cherupuzha, Iruvanjippuzha and many other tributaries. The river plays an important role in shaping the culture of the people on the banks.

Chaliyar was rich in fish species and many people adopted fishing for their livelihood. There were different species of fish and a variety of riverside animals, birds and butterflies etc. can be seen here. During the south west monsoon in the month of august 2019 heavy rain caused floods in most districts of Kerala and landslides in hilly areas. It was the worst flood in Kerala after the disastrous flood that took place 1924. The population density of kerala is 859/sq km while the national population is just 382/sq km and 41 rivers flow in the Arabian Sea. These rivers could not absorb the incessant rains. The floods have had a major impact on the Chaliyar river.

MATERIALS AND METHODS

The present study is the descriptive survey on the impact of 2019 flood on the river Chaliyar of Kerala.the study is based on primary and secondary data collected from various sources such as interview with environmentalist ,local public, experts in the fields, journals, periodicals and books

RESULT AND DISCUSSION

The change in the Chaliyar was studied directly before and after the floods.based on the information from the senior citizens who lived in the banks in the early days, the rich early Chaliyar and the biodiversity of the river were understood both directly, interview and reading. Some of the major problems facing Chaliyar is loss of biodiversity, depletion of fisheries, unscientific construction and wet land are disappearing.

CHALIYAR COASTAL BIODIVERSITY

Chaliyar coast is a storehouse of different species of medicinal plants and a variety of herbs. Due to the abundance of bamboo, mangroves, forest and kaitha (pandanus canaranus), the springs remain a perennial habitat. It serves as a food and resting place for birds and fish and their habitat. A variety of medicinal plants such as mushrooms, aloe vera, ung (millettia pinnata), adalodakam (Justicia Adathoda) etc. grow along the coast. People also collected bamboo rice from the coastal bamboo for food.

RIVERSIDE FORESTS ARE DISAPPEARING

The coastal areas of Chaliyar are notable for their flora and fauna. Different species of turtles, worms, frogs, curbs are endangered. All the species that used to live in the riverine forests are disappearing with the disappearance of the forest. According to the local public, uncontrolled encroachments and sand mining along

Volume 8, Issue 2 (III) April - June 2021

the coast are another reason for the deforestation. The main trees along the river banks are like bamboo, eeta, ung, cheru (Holigarna Beddomei), poovarasam (Thespesia Populenea), attuvanchi, puzhamanjil, of these riverside trees are home to a wide variety of butterflies and birds. During the two major floods, the river diverted in many places which was the main reason for the loss of the riverine forest.

FISHERIES ARE DEPLETED

The Chaliyar was rich in fish species. There were many people who made a living by fishing. There was a system where farmers bought the fish with their agriculture produce and fishermen bought agriculture produce with fish. Indigenous fishes found in the river such as biral, kadu, poosan, vala, kaduna etc. are declining fast. There were fish that reached the top of the Chaliyar from the sea for breeding but today the advent of regulator bridges are hampering their smooth movements.

The fish which were reared on riverbanks and in water are pools that appear to have reached the river extensively. After the floods of 2018, exotic fish such as tilapia are coming to the river, threatening the very survival of the integenous fish species in the river.

UNSCIENTIFIC CONSTRUCTION AND FLOOD

Until the 1980's the Chaliyar was a year round river. Mass migration into the nilgiris and deforestation have reduced the flow of water to the Chaliyar. The construction of bridges and encroachment to prevent the flow of the river is causing great damage to the river. The kavanakkal regulator bridge was built in 1994. The construction like mambad oodayikkal and pookkottmanna regulator bridges, 17 check dams, minor hydro electric projects etc. obstructs the natural flow of the river.

The agitation against the pollution by Mavoor grasim in fact was the largest public agitation on the banks of the Chaliyar. Today the river is being destroyed by sewage and waste deposits. The presence of widespread blue algae was detected in the river 2018 due to waste deposit.

WETLANDS ARE DISAPPEARING

Chaliyar river is the source of drinking water for many people. There are many swamps and paddy fields in the catchment areas of the river. In the panchayat like areekode, kizhuparamba, urangattiri, mavoor etc. Many paddy fields were leveled for construction work. When the river overflows during the monsoon season the entire storage area is filled with soil or silt with no paddy fields to fill fertile delta.

FINDINGS AND CONCLUSION

The devastating rain and unprecedented floods in the month of august 2019 affected the ecosystem of Chaliyar drastically. The impact of floods brought disastrous effects on geography, flora and fauna of the river. All most all the persons interviewed for this study pointed out the adverse effects of quarrying, sand mining, encroachment, check dams, regulator cum bridges, lack of scientific river management and conservation plans and policies, forceful enactment of environmental legislations and policical will power to protect an all season river which is the only source of drinking water for laksh of people.

REFERENCES

- Anupama,c.and sivadasan ,m [2004].mangroves of kerala
- CEd [2003].survey and inventory of wetlands of kerala for conservation and sustainable management of resources.project report ,kerala forest department ,thiruvananthapuram ,kerala
- https://dcbookstore.com/books/chaliyar-rekhakal
- https://www.loc.gov/books/?all=true&co=150&dates=2000-2099&fa=language:malayalam%7Clo
- https://www.indulekha.com/chaliyar-sakshi-memoir-malik-nalakath
- https://www.amazon.com/GEOCHEMISTRY-MINERALOGY-SEDIMENTS-REFERENCE-OCCURRENCE-ebook/dp/B08FDTSTHZ
- Nujoom ,E.[2004]. Chaliyar rekhakal ;puzhanattariv.publication division MESS college
- Nayar gopinathan[2006] jalam jeevajalam;publication division Kerala ,sasthra sahithya parishad
- Sabu, T., and c. Bhaskaran." MEETING REPORT ; Third kerala environmental congress

CARBON EMISSION-A PROBLEM OF DIGITAL COMMUNICATION

Utkarshkumar Sinha¹ and Shiv Kumar Chandey²

¹Student of B.Sc. Computer Science, Thakur College of Science and Commerce, Kandivali (East), Mumbai ²Assistant Professor, Thakur College of Science and Commerce, Kandivali (East), Mumbai

ABSTRACT:

The way people think about digital data and the way they treat the data is one of the major factors that affects the data storing processes in big data centers. Generally, people think that digital data is immaterial. Using metaphors like "Cloud" misleads the thought process of a common man while they talk about computer and internet networks. Since people think digital data are on cloud which is untouchable and not be seen physically from eyes. They forget that it is a materialistic substrate of wires, cables, servers somewhere on our planet earth. Because of this people also do not think about its environmental impacts. Data is treated as an unlimited and super abundant resource which is wrong because it is same as water, fossil fuel and other non-renewable resources. The quantity is limited and they need to handled carefully. Data relies of limited resources in order to stored and processed and it is not super abundant.

Considering all the above-mentioned statements, "This paper focus on the problem of unnecessarily emails which are getting stored on big data-centers which requires lots of energy to run every second so that data can be easily accessed anytime from anywhere in the world and solves them using a hypothesis of an idea of flash emails".

Keywords- Carbon footprints, Digital Data, Emails

INTRODUCTION:

"Carbon footprint" is amount of total greenhouse gases released in the atmosphere because of a particular activity done by humans. Primarily, the gas which we worry about is Carbon dioxide (CO₂). These footprints are daily generated due to various activities like burning of fossil fuels, manufacturing products, transportation based on burning fuels etc. Everyday people create lots of data in digital format. Storing and maintaining is a tedious task and also it consumes big chunk of energy. One of the concerns for carbon footprints are all the big data centers. They consume tremendous amount of electricity to run the servers.Data can be in the form of video, audio, image, text etc. Therefore, lots of unnecessary data is getting documented every day. According to statistical data available on Statista (German database company) database [3]:

Number of mails sent per day [2017]- 269 billion



Number of mails sent per day [2024]- 361.6 billion (prediction according to trend) Note: This survey data was collected in 2017 to 2019 and released in March 2020. Source- Radical group

Apart from number of mails sent and received, the size of mails also plays a major role while storing it.

According to an article by Heinz Tschabitscher on lifewire.com website [4]:

The average size of an email is **75kb**.

The factors affecting the size of a mail are:

- Formatting
- Duplicate message
- Large email files
- Attachments
- In-message images
- Headers
- HTML
- Quotations

THE PROBLEM:

To analyze the problem at very small level so that we can understand the problem. A small [5]survey was conducted such that the information about emails can be generated at the ground level. Since lowest number of emails are sent and received by are students. So, most of the people taken into consideration in this survey was students. Although most of the corporate and big company use email system on a very vast scale, if we study it at very less scale and identify the problem and solve it. Then it will also prove that problem also exists on big scale and it can also be solved. Total 200 different data was collected.

These were the questions asked during survey:

- Age
- Occupation
- At what age you have started using email facility?
- How many email addresses you have created till today?
- How many email addresses do currently use?
- Number of emails you send per month.
- Number of emails you receive per week. (excluding promotional and advertisement)
- Number of promotional and advertisement emails received per week.
- Number of emails received which is not needed after reading once per week. (thankyou email, verification email, account activation email etc.)
- Number of emails currently left unread in inbox till today

THE DATA COLLECTED WAS AS FOLLOWS:



Volume 8, Issue 2 (III) April - June 2021

ISSN 2394 - 7780



HYPOTHESIS:

The problem of accumulation of emails in inbox can be solved with the help of idea of using "Flash Emails"

Current use of this type of feature is used by mobile carrier network operators as **Class 0 message or Flash message** to provide statistics of data usage according to customer's subscribed plan.

The message comes on screen with two option as:

- Save
- Cancel

If user feels that the flash message is important and can be used in future then user saves the message. Otherwise via choosing the cancel option user accepts that this message is of no use and can be discarded. In this manner the unnecessary message is deleted.

This type of approach can be used in email facilities so that it can help in storing a smaller number of emails messages and also user doesn't need to keep cleaning the inbox.

Features of proposed system (Flash Emails):

Volume 8, Issue 2 (III) April - June 2021

This type of mailing system will be most effective on those mails which are used just once for example: OTP mails, thank you emails, verification emails, account activation emails etc.

- 1. All the commercial email, thankyou mail, verification email, account activation emails should arrive with a header tag "this is a flash mail" and two option:
- (i) Save (ii) Do not save
- 2. If user selects the save feature then the mail will get permanently saved.
- 3. If user selects the Do not save feature then the mail will move to flash message section where it will exist for two days and then it will get deleted from the users id.
- 4. For unread emails: If user doesn't open an email for 15 months it will be deleted automatically with 30 days prior notification that email is getting old and will get delete since it is not used from past 14 months Also, while sending the email the company or individual can set and define the email that it is a flash mail or not.

By applying flash mails rules

Current statistics from the survey:

A] For unread messages:

The total number of participants in survey = 200

Around 55.5% of participants have unread messages from 100 to more than thousand.

55.5% = 111 participants

For rough calculation:

If we consider, maximum number of emails that are unread is 1000

Then range changes to 100-1000

Therefore, average unread mails are:

=(100+1000)/2

=550 emails

Average number of unread messages of majority 55.5% participants is:

=550 emails x 111 participants

=61,050 unread emails

As we know the limit was constrained with maximum unread 1000emails for the easy calculation. So, the original number must be greater than 61,050 unread emails.

Around 57.5% of participants current age from 19 to 25

So, the current mean age = (19+25)/2= 22 years

Around 54% of participants started using email from at the age of 16 to 21

So, the current mean age of starting using emails facility = (16+21)/2=18.5 years

Therefore, that means within 3.5 years around 111 Participants were able to collect 61,050 unread emails. That is 21,803.5 mails in every 15 months.

By applying Flash message system

Since all the mails will arrive on different days final validity of all emails can't be calculated. Assuming all the emails arrives at last day of first 15 months. Then all mails will be deleted by next 15 months. That is maximum full lifetime of unread mails will be 2.5 years. And 21803.5 mails will get deleted. **"That will reduce around 35% unread emails"**.

B] For spam and all emails which are used only once

The total number of participants in survey = 200

Volume 8, Issue 2 (III) April - June 2021

Around 46.5% of participants have one-time used emails from 10 to more than 20.

46.5% = 93 participants

For rough calculation:

If we consider, maximum number of emails that are unread is 20

Then range changes to 10-20

Therefore, average one-time used mails are:

=(10+20)/2

=15 emails

Average number of one-time used emails 46.5% participants is:

=15 emails x 93 participants

=1,395 emails per week

That is 1,395 x 4 X 12= 66,960 mails per year

By applying Flash message system

"These mails will never accumulate and can reduce to almost 100% if user opens once all these types of one-time email".

CONCLUSION:

Before applying flash message technique	After applying flash message technique
61,050 unread emails were accumulated in 3.5	35% of unread emails were deleted within 2.5
years by 111 participants.	years which is 21,803 emails.
66,960 spam emails were collected by 93	Almost 100% of spam mails can be deleted
participants	once opened by user

The survey was conducted on very atomic level compare to actual number of mail users and number of mails sent and received per day. At real scale the numbers will be large and results will be vaster. The calculation proves using flash mails we can reduce the number stored emails on server drastically which decrease the amount of energy used in storing mails and maintain server's temperature. As a result, carbon footprints will also get reduced.

DISCUSSION:

Although the technique introduced in the paper can be very effective. But general awareness among people should be increased to keep maintaining the email inboxes manually. There should also be reduction in storing all types of unnecessary data that mankind is documenting unnecessarily in digital form.

CREDITS:

1] Author- Utkarshkumar Sinha, BSc. Computer Science, Thakur college of science and commerce.

2] Asst. Prof. Shivkumar Chandey, Department of Computer Science, Thakur College of Science and Commerce for helping in collecting data in survey and providing his valuable guidance throughout the case study.

REFERENCES:

- 1] Number of emails: https://www.statista.com/statistics/456500/daily-number-of-e-mails-worldwide/
- 2] Size of emails: https://www.lifewire.com/what-is-the-average-size-of-an-email-message-1171208
- 3] The above survey was conducted specifically for this paper by the author.

ISSN 2394 - 7780

A STUDY ON POLLUTION SPREAD BY DOMESTIC WASTE AND ITS CONTROL PRACTICES IN HARYANA

Anil Kumar Grewal

Research scholar, Faculty of Management & Commerce, BABA Mastnath University, Asthal Bohar, Rohtak Haryana (India)

INTRODUCTION

World is facing a difficult time of COVID-19, and development and industrialisation pace is welcoming more such pandemics if pollution control and sustainable development of resources is ignored continuously. Poorly managed waste and weak controlling measures affects negatively to both living beings and environment. Sustainable development and optimum utilisation of resources is the need for the day. This research review the existing practices adopted by the government of Haryana to manage domestic solid and liquid waste and to control the land, air and water pollution. The aim of the study is to focus on a greener approach, solutions and challenges of waste management and policies implementations.



Today, while the government of Haryana is claiming that Haryana has achieved 100 percent availability of toilets in every house, but the fact is that the many people in villages and towns are still defecating in open, due to which lots of diseases spread in these areas. And in cities where public toilets are available but their cleaning management is a big problem, many of them are too dirty. Also waste from industries, dirty drainage systems, and household waste heaps are commonly found near roads and railway lines. In many places, streets are not visible because of lots of waste and poor overflow drainages. Almost every river is suffering from the pollution because these are treated as the sewerage disposal point of cities and villages, even industrial waste and various festivals' waste is thrown in them.



Pollution due to Crop Residue Burning: In Haryana stubble burning is one of the biggest problems due to which during winters lots of smog is collected in the atmosphere and the air quality of these areas becomes poisonous. There are many alternative uses of this straw left after harvesting of rice crop, but either farmer are not aware of these uses or the economic benefits are not good. Another reason is the time duration between the two crops, i.e. after harvesting rice within two weeks; farmers have to prepare their fields for the next crop of winter. Burning straw is the easiest, timesaving method for them to get rid of this waste, but it is too dangerous for the environment. Only making Laws to punish guilty farmers is not the solution. There is an urgent need for government to adopt a waste management system to provide handsome monetary benefits within the time limit of one week to farmers.



In our research we found a good solution of stubble burning adopted by many farmers. They were **converting stubble into animals' food** as shown in the picture and transport it to the Rajasthan market and earn handsome income.

Materia & Methods: Primary data was collected via Questionnaire and interviews, and secondary from website of Haryana government. Data was analysed using pie charts, and results were interpreted into percentages. 2787 participants took part in the study from various villages and towns of Haryana.

Interviews were also conducted with officers of Swachh Bharat Mission project managers and chief sanitary inspectors to get information regarding various norms and practices adopted by Haryana government for waste management practices. Pictures were taken during the survey to support the reliability of personal observations and research results.

Data Analysis: The analysis and discussion of the collected data is as under:



Interviews were also conducted with chief sanitary inspector and Project manager of Swachh Bharat Mission – Gramin. And they told that in most of the cities and towns' waste collection is done by municipal vehicles with announcement to segregate dry and wet waste in different dustbins. But in most of the rural areas due to shortage of funds and poor controlling authorities with them, it is not in practices. Village Sarpanch is having authority to fine those people who threw waste in open or burn it but due to his political interest he did not impose penalty on anybody.



60% people in Haryana accepted that they always dispose waste into Septic Centre or Municipal vehicles but 16% people told that they burn waste while 24% people have accepted that they threw waste on streets and open area.

Volume 8, Issue 2 (III) April - June 2021



29% people of Haryana are aware about importance of segregation of waste and providing dry and wet waste in different dustbins to Municipal vehicles but 31% people are providing waste in single dustbin while 40% people just threw waste in nearby open space and 15.5% people told that nobody collect waste from their home.

56% people of Haryana have not seen Sweepers in proper uniform and with safety equipment while sweeping or cleaning of drains of their areas. While 44% people agreed that Sweepers are equipped with proper safety equipment and uniforms.



We visit the Rohtak Waste treatment plant and find that none of the waste picker was equiped with any safety equipment or uniform. They were segregating mix waste with their hands. This Picture shows the truth.



49% of people of Haryana did not find any reduction in usage of single use plastic or water bottles, even after these are banned by government of Haryana.



87% people of Haryana told that they are not aware of 3R (Reduce, Reuse and Recycle) workshops as no workshop was conducted in their areas. Only 13% people of Haryana told that workshops were conducted by officers to aware them about the importance of 3R's.



Interviews were also conducted with chief sanitary inspector and Project manager of Swachh Bharat Mission– Gramin. And they told that in most of the cities and towns' waste collection is done by municipal vehicles with an announcement to segregate dry and wet waste in different dustbins. But in most of the rural areas due to shortage of funds and poor controlling authorities with them, it is not in practices. Village Sarpanch is having authority to find those people who threw waste in open or burn it, but due to his political interest he did not impose a penalty on anybody.

All the sweepers and waste collectors are provided with proper safety equipment, uniforms, and as per Swachh Bharat Mission guidelines, all the streets and drains are clean daily at least once in residential areas and twice in commercial areas.

Regular awareness campaigns are conducted to aware people about the importance of 3R (Reduce, Reuse and Recycle) principles. Workshops are conducted on a regular basis till village level. Also rankings are provided as per the cleanliness of all villages, schools, colonies, and markets.

CONCLUSION:

Awareness Spread by Government: Government has done lots of efforts on paper to communicate Swachh Bharat Mission importance and guidelines, but there is a gap in reality. Waste Management Plant of Rohtak district is ignoring all the rules and regulations of Swachh Bharat Mission, and it was found that Maximum waste was landfill. Animal waste was thrown in open along with plastic waste.



Not only this they were burning plastic waste in open in the landfill site.

Both the pictures are showing that the Government officers are not checking the field reality. And the waste contractors are openly breaking all the rules and regulations which were signed by them at the time of taking contract of waste management plant.



Officers are claiming that daily cleaning of streets and roads is done in all villages and towns. But we did not find this practice in reality in any of the villages or residential areas of cities. Only in main commercial areas or VIP areas at some cities sweeping was regular as per norms.

Volume 8, Issue 2 (III) April - June 2021



Drainage and Sewerage system of any district of Haryana is not satisfactory. No administration is willing to manage this. For example, in Jind, Ashrafgarh village 5 ponds system is made with 55 lakhs of investment but no proper provisions were done to manage it as streets and drainage of the village were very dirty. As shown in the above pics

SUGGESTIONS & RECOMMENDATIONS

- As per conclusion, my suggestion is if the government and public workers are seriously working on Swachh Bharat Mission, then there will be no problem to achieve its goals.
- In few problematic areas, Government should implement the rules & regulations of Swachh Bharat Mission very strictly.
- There is also need of strong Law against those who are polluting our country willingly because of their greed.

For achieving the ideal situation, we need to follow 3 R principles:

Reduce: Try environmentally friendly products only as much as possible. Motivate to all vendors, hawkers, and shopkeepers for using environmentally friendly jute or cloth bags only. And ask customers to bring their carry bags from home for shopping. Assist industries producing environmentally friendly products.

Reuse: Reusing all those waste that have alternative uses known to the users can also be a great help in reducing the waste burden on the landfill sites. It also includes the segregation of waste at source. It also includes infrastructure development for material recovery facilities from the source across the cities and villages of the country. Also, establishing a system where citizens will get a refund for providing waste to these recovery points.

Recycle: Recycling waste means converting waste into other useful products or providing waste to them who will transform it into other usable assets. For example, plastic bags can also be used as plastic mats, if the user did not know how to convert it then it must provide it to those who can do or give it to waste merchant who will provide it to those industries which then convert waste into energy or other useful products.

Zero waste, Zero pollution, Zero Landfill and Zero Burning are motto of Swachh Bharat Mission. Awareness spread by the government of Haryana to the public is somewhere limited to achieve the open defecation free status only.

Zero Waste: Better planning, and execution of those ideas and approaches which emphasize waste stoppage and change our bad habits into a good one.

Zero Burning: We should focus on other alternatives suggested by waste management experts, the government, and others. Total elimination of waste burning is required.

Zero Landfill: Landfill is the last option, we should try to minimize waste burden at landfill.

Zero Pollution: Those techniques and innovations need to be welcomed by all people that help in avoiding pollution of water bodies, land and air. Green energy products are the need for the day.

REFERENCES:

- Website: http://haryanadp.gov.in/SCHEMES/Swachh-Bharat-Mission-gramin
- India, I. F. (n.d.-a). *What the Swachh Bharat Mission did not change*. Ideas For India. Retrieved 22 September 2020, from http://www.ideasforindia.in/topics/money-finance/what-the-swachh-bharat-mission-did-not-change.html
- India, I. F. (n.d.-b). *Why doesn't anybody know if Swachh Bharat Mission is succeeding?* Ideas For India. Retrieved 22 September 2020, from http://www.ideasforindia.in/topics/human-development/why-doesn-t-anybody-know-if-swachh-bharat-mission-is-succeeding.html

EFFECT OF INDUSTRIAL AIR POLLUTION ON MICROMORPHOLOGY OF SOME PLANTS GROWING ALONG NAVAPUR ROAD IN TARAPUR INDUSTRIAL AREA. (MIDC), MAHARASHTRA

Manohar Rathinam¹ and Swaranjit Kaur Cheema² ^{1,2}Department of Botany, G.N. Khalsa College, Matunga, Mumbai, India

ABSTRACT

The industrial air pollution is a major environmental issue particularly in the developing countries like India. The increase in the number of industries continuously adds to toxic gases and particulate matter into the atmosphere. In urban surroundings trees play an important role in improving air quality by absorbing gases and particulate matter. They are also effective indicators of air pollution. The present study was carried out to assess the effect of industrial air pollution on leaf micromorphology of some plants growing along Navapur road in Tarapur Industrial Area. Ten plant species viz. Acacia auriculiformis, Artocarpus heterophyllous, Azadirachta indica, Cassia siamea, Ficus benghalensis, Ficus religiosa, Mangifera indica, Polyalthia longifolia, Terminalia catappa and Thevatia nerifolia growing along Navapur road in the MIDC industrial area, Tarapur, Maharashtra, India and Tarapur Atomic Power Station Colony (TAPS) during the year 2015 to 2016 in different seasons. The parameters studied were stomatal index, stomatal ratio, length and breadth of stomata. The results revealed that all the plant species in polluted site (MIDC) exhibited reduction in the leaf length, breadth, petiole length and leaf area, as compared with the control site (TAPS). Thus, present findings show that this could be mainly due to the exposure of plants to air pollutants coming from various industries as the dust particulates remain in the atmosphere for varying length of period and get deposited especially in the leaf surface and thus affect the foliar morphology.

Key words: Air pollution, Tarapur, micromorphology, stomatal index.

INTRODUCTION

Today there is overwhelming evidence that various pollutants do and will continue to affect the life on this world. With the commencement of the 20th century, the range of the atmospheric pollutants has widened drastically. Air pollution is a lot complicated than most alternative environmental challenges. The major cause of air pollution in India is the increase in industrialization, vehicles and domestic sources. According to Central Pollution Control Board (CPCB) guiding principle of ambient air quality monitoring, the cause for high air pollution in India are deprived quality of fuel, unrestrained increase of vehicle pollution and poor design, wrong location and old process technology, no prevention steps in initial setup and poor standard in small and medium-sized industries. Air pollution causes severe damage to plants.

All combustion releases gases and particulate matters in the air which includes oxides of Sulphur and nitrogen, carbon monoxide, soot particles, some toxic metals, organic molecules and radioactive isotopes are also released (Agbaire and Esiefarienrhe, 2009 Industrialization leads to pollution (Odilara et al., 2006). Many researchers have reported that air pollution might result in morphological changes and foliar anatomy changes and it also causes visible injury (Ghouse et al. 1980; Jahan and Iqbal 1992; Pandey and Agrawal 1994; Verma et al. 2006; Joshi and Abhishek 2007). The leaves from trees near air pollution sources can even be 'coated' with particulates (Ricks and Williams 1974; Lerman and Darley 1975). This leads to reduced photosynthesis due to stomatal occlusion (Williams et al. 1971). The various pollutants either adhere to the plant surface or enter the leaf through the cuticle or stomata, where physiological and structural responses are induced. Stomata are believed to represent a major site of pollutant penetration in some plants. Stomatal structure, frequency and distribution have been assumed to be significant variables affecting plant sensitivity and overall leaf resistance. Plants act as the scavengers for many air borne particulates in the atmosphere (Joshi and Swami, 2007). The present study was mainly designed to analyze effect of industrial air pollution on leaf micromorphology and micromorphology of some plants growing in Tarapur Industrial Area.

MATERIAL AND METHODS

Study area

Tarapur is a town in Palghar district of Maharashtra State, India. It is an industrial township situated about 45 km north of Virar, on the Western Railway of the Mumbai Suburban Division which is located at 17.7° N, 75.47° E. It's at an elevation of 456 meters. Tarapur MIDC in-house major Industrial Estate of Maharashtra Industrial Development Corporation which includes many drug manufacturing units like chemical manufacturing units, steel plants, and some textile manufacturing plants.

ISSN 2394 - 7780

Volume 8, Issue 2 (III) April - June 2021

Sample Collection

Leaves samples were collected from MIDC Tarapur, Navapur Road a polluted site (PS). A site nearby with similar ecological conditions, Tarapur Atomic Power Station colony 3 and 4 (TAPS) was selected as a control site (CS). Samples were collected in triplicates in the morning hours from identified trees from these sites in different seasons from 2015 to 2016 They were brought to the laboratory in polythene bags. Samples are preserved in refrigerator for other analysis.

Plants: Plant species studied were Acacia auriculiformis, Artocarpus heterophyllous, Azadirachta indica, Cassia siamea, Ficus benghalensis, Ficus religiosa, Mangifera indica, Polyalthia longifolia, Terminalia catappa and Thevatia nerifolia.

Methods

The effect of air pollution induced changes on leaf micromorphology which was analysed based on:

- 1) Stomatal index (Salisbury 1927)
- 2) Length of stomata in μ m: (using software Image J and it was expressed in μ m.).
- 3) The breadth of stomata in μ m (using software Image J and it was expressed in μ m.)
- 4) Stomatal ratio.

RESULT AND DISCUSSION:

Results pertaining to the study of different micromorphological attributes of the ten plant species are described and discussed as under: -

Sr.	Plant	Polluted site			Control site		
No	Species	Rainy	Winter	Summer	Rainy	Winter	Summer
	Acacia	9.15±1.44	10.01 ± 0.47	9.94±0.79			
1	auriculiformis	(1.75%)	(19.13%)	(10.44%)	9.31±0.66	12.37 ± 1.20	11.10 ± 2.13
	Artocarpus	21.81±2.17	10.83 ± 1.88	25.13±1.29			
2	heterophyllus	(12.96%)	(60.77%)	(2.31%)	25.05±0.36	27.60 ± 1.70	25.72 ± 1.40
	Azadirachta	8.95±0.47	9.45±0.69	10.58 ± 2.40			
3	indica	(23.98%)	(7.57%)	(0.85%)	11.77 ± 1.28	10.22 ± 1.03	10.67 ± 2.33
	Cassia	8.93±1.31	7.01±0.33	11.58±0.27			
4	siamea	(21.45%)	(35.39%)	(9.57%)	11.37 ± 0.20	10.85 ± 2.88	12.81 ± 2.23
	Ficus	16.41±1.44	11.52 ± 1.04	13.22 ± 2.18			
5	benghalensis	(37.99%)	(14.12%)	(5.14%)	26.46±1.99	13.41 ± 2.02	13.93±1.86
	Ficus	11.34 ± 2.28	11.72±0.76	10.55 ± 1.83			
6	religiosa	(14.12%)	(5.20%)	(4.38%)	$13.20{\pm}1.11$	12.37 ± 1.13	11.03 ± 1.74
	Mangifera	17.62 ± 1.42	17.38 ± 3.51	20.12±4.73			
7	indica	(44.02%)	(6.38%)	(12.65%)	31.48±4.06	18.56 ± 2.09	$23.0301.62 \pm$
	Polyalthia	9.98±0.21	13.70±1.53	14.83 ± 1.30			
8	longifolia	(28.55%)	(11.27%)	(0.90%)	13.96 ± 1.51	$15.44{\pm}1.00$	14.96 ± 0.74
	Terminalia	10.56 ± 0.42	13.72±1.65	11.40 ± 0.92			
9	catappa	(66.01%)	(19.31%)	(11.28%)	16.50 ± 0.51	17.00 ± 0.85	12.85 ± 2.61
	Thevetia	10.80±1.37	12.07±0.60	10.82±1.12			
10	nerifolia	(7.64%)	(23.42%)	(3.20%)	11.70 ± 2.63	15.76 ± 3.30	11.18 ± 1.21

Table 1: Seasonal variation for the first year in Stomatal index

Mean \pm Standard Deviation, () = % reduction

Table 2: Seasonal variation for the second year in stomata length (µm)

Sr.	Plant	Polluted site			Control site		
No	Species	Rainy	Winter	Summer	Rainy	Winter	Summer
	Acacia	30.78±3.37	24.76±2.37	30.90±4.39			
1	auriculiformis	(+19.97%)	(- 19.69%)	(+1.23%)	25.66±5.09	30.83±3.28	30.52±3.19
	Artocarpus	36.90±5.33	33.64±5.54	35.89±6.41			
2	heterophyllus	(+9.29%)	(- 1.36%)	(+ 8.66%)	33.77±4.95	34.11±3.22	33.03±3.90
3	Azadirachta	29.08±4.22	30.26±3.93	29.72±4.70	35.93±4.89	28.19±4.56	28.33±4.53

International Journal of Advance and Innovative Research Volume 8, Issue 2 (III) April - June 2021

	[1	1	n		
	indica	(- 19.07%)	(+ 7.33%)	(+ 4.91%)			
	Cassia	23.25±6.13	16.48 ± 4.48	20.68±2.92			
4	siamea	(+ 0.53%)	(- 8.71%)	(+ 3.75%)	23.12±2.69	18.06 ± 3.53	19.93±4.64
		44.27±6.08					
	Ficus	(+	32.02±6.38	33.67±4.76			
5	benghalensis	47.29%)	(- 12.70%)	(- 7.98%)	30.06±3.77	36.68 ± 5.85	36.59 ± 5.76
	Ficus	45.68±5.98	39.47±3.51	49.11±4.61			
6	religiosa	(- 19.33%)	(- 27.60%)	(+ 5.27%)	56.62±3.96	54.51±5.12	46.65 ± 3.57
			14.61±2.74				
	Mangifera	16.74 ± 2.65	(+	10.57 ± 1.74			
7	indica	(+15.82%)	21.86%)	(- 18.65%)	14.45 ± 2.91	11.99 ± 4.28	13.00 ± 2.51
	Polyalthia	31.30±8.34	25.76±4.91	31.66±5.07			
8	longifolia	(- 22.53%)	(- 10.02%)	(+4.81%)	40.40 ± 5.06	28.63 ± 4.43	30.21±3.82
	Terminalia	34.50±5.25	34.76±3.93	37.36±5.29			
9	catappa	(- 18.43%)	(- 0.50%)	(- 1.94%)	42.29 ± 7.02	34.93±3.66	38.10±8.16
	Thevetia	33.75±6.55	32.37±3.49	32.13±4.90			
10	nerifolia	(- 9.94%)	(- 5.16%)	(- 9.16%)	37.48±6.43	34.13±6.07	35.37±5.17

 $n=10, \pm SD, () = \%$ reduction

Table 3: Seasonal variation for the second year in stomata breadth (μm)

Sr.	Plant	Polluted site			Control site		
No	Species	Rainy	Winter	Summer	Rainy	Winter	Summer
	^	10.78±2.05		9.82±1.99			
	Acacia	(+	7.21±1.64	(+			
1	auriculiformis	99.45%)	(- 4.55%)	50.20%)	5.41±2.69	7.55±1.64	6.54±1.35
		13.32±2.19					
	Artocarpus	(+	8.82 ± 1.94	11.51±2.64			
2	heterophyllus	38.09%)	(- 38.33%)	(- 8.09%)	9.64±2.16	14.30 ± 2.47	12.35 ± 3.28
				14.45 ± 2.17			
	Azadirachta	15.22 ± 3.05	9.97±1.62	(+			
3	indica	(- 3.81%)	(- 19.09%)	20.02%)	15.83 ± 3.89	12.31±2.33	12.04 ± 2.25
		5.88±1.35	4.54 ± 1.20				
	Cassia	(+	(+	5.39 ± 2.13			
4	siamea	31.57%)	38.98%)	(+ 2.60%)	4.47±0.77	3.27±0.66	5.25 ± 1.22
	Ficus	15.44±3.11	17.94 ± 4.08	19.55±3.62			
5	benghalensis	(67.22%)	(- 18.18%)	(- 25.99%)	9.23±1.96	21.93±4.43	26.42±4.70
		16.03±2.02					
	Ficus	(+ 20	9.74±1.81	13.91±1.68			
6	religiosa	64%)	(- 42.30%)	(- 3.29%)	13.29±3.00	16.89±3.43	14.38 ± 2.44
		15.03 ± 2.65	12.94 ± 2.61				
	Mangifera	(+	(+	10.41 ± 2.17			
7	indica	32.93%)	29.49%)	(- 10.05%)	11.31±2.11	9.99±1.59	11.58 ± 1.72
	Polyalthia	15.36±5.15	13.49 ± 2.51	14.41 ± 2.81			
8	longifolia	(- 21.45%)	(+ 5.64%)	(+ 3.25%)	19.55±2.64	12.77±3.65	13.96±3.61
	Terminalia	7.49 ± 2.41	6.02 ± 1.17	7.12±2.68			
9	catappa	(- 6.65%)	(- 24.39%)	(- 11.00%)	8.02±2.76	7.97±1.84	8.00±1.96
	Thevetia	8.70±2.76	7.37 ± 2.12	6.05 ± 2.16			
10	nerifolia	(- 15.57%)	(- 29.50%)	(- 38.08%)	10.30±2.39	10.45 ± 2.58	9.78±2.73

 $n=10, \pm SD$, () = % reduction

Table 4: Seasonal variation for second year in stomata stomatal ratio

Sr.	Plant	Polluted site			Control site		
No	Species	Rainy	Winter	Summer	Rainy	Winter	Summer
1	Acacia	5.02±1.46	3.63±0.91	4.97±1.39	2.95±0.50	4.32±1.05	2.06±0.38

Volume 8, Issue 2 (III) April - June 2021

	auriculiformis	(+	(-	(+			
	Ū	70.56%)	15.97%)	141.19)			
		3.90±1.26	4.01±1.02	3.30±0.98			
	Artocarpus	(+	(+	(+			
2	heterophyllus	37.09%)	63.25%)	28.36%)	2.85 ± 0.62	2.46 ± 0.50	2.57 ± 0.37
		1.99 ± 0.48	2.35±0.48	2.45±0.65			
	Azadirachta	(-	(-	(+			
3	indica	15.97%)	25.03%)	70.27%)	2.37±1.17	3.13±0.44	1.44 ± 0.42
		5.40 ± 1.34	5.28±1.62				
	Cassia	(+	(+	4.00 ± 1.35			
4	siamea	29.11%)	19.04%)	(- 9.76%)	4.18 ± 2.33	4.44 ± 0.96	4.43 ± 0.92
		3.41±0.89	1.89 ± 0.61	1.78 ± 0.45			
	Ficus	(+	(+	(+			
5	benghalensis	15.93%)	8.71%)	2.77%)	2.94 ± 0.27	1.74 ± 0.43	1.73 ± 0.53
		2.90 ± 0.47	4.19±0.88	$3.60{\pm}1.08$			
	Ficus	(-	(+	(+			
6	religiosa	35.41%)	25.13%)	81.20%)	4.50±1.00	3.35±0.65	1.99 ± 1.57
		1.33 ± 0.34	1.22 ± 0.46	1.03±0.13			
	Mangifera	(+	(+	(-			
7	indica	16.57%)	1.85%)	59.90%)	1.14 ± 0.58	1.20 ± 1.22	2.53 ± 0.48
		2.15±0.53		2.32 ± 0.64			
	Polyalthia	(+	2.30 ± 0.55	(-			
8	longifolia	2.53%)	(- 4.19%)	27.90%)	2.10±0.63	2.40 ± 0.69	3.22±0.47
			5.96 ± 1.25	5.98 ± 2.26			
	Terminalia	5.68 ± 2.12	(+	(+			
9	catappa	(-1.66%)	29.53%)	59.68%)	5.77±1.54	4.60 ± 1.65	3.74±1.13
		4.13±1.12	4.92 ± 1.94	6.14 ± 2.65			
	Thevetia	(+	(+	(+			
10	nerifolia	10.37%)	47.09%)	49.18%)	3.74±0.34	3.35±0.70	4.12 ± 1.28

n=9, \pm SD, () = % reduction

- 1. **stomatal Index:** As observed from table:1 it can be seen that the average stomatal Index during the different season was 7.01 ± 0.33 to 25.13 ± 1.29 at polluted site. Maximum reduction in the stomatal index in different seasons studied in all the plant species at the polluted site was maximum during the winter season (60.77%) followed by rainy season (44.02%) and summer season (12.65%).
- 2. Length of stomata: As observed in table :2. It can be seen that the average stomatal length during the different season ranged from $10.57\pm1.74 \ \mu m$ to $45.68\pm5.98 \ \mu m$ at polluted site. Seasonally reduction in stomatal length in all the plant species studied at polluted site was maximum in the rainy season (22.53%) followed by winter season (19.69%) and summer season (18.65%).
- 3. Breadth of stomata: As observed from the Table:3 it can be seen that the average stomatal breadth during the different season was $4.54\pm1.20 \ \mu m$ to $19.55\pm3.62 \ \mu m$ at polluted site. Seasonally maximum reduction in stomatal breadth in the present study at polluted site was observed during the winter season (42.30%) followed by summer season (38.08%) and the rainy season (21.45%).
- 4. Stomatal ratio: As observed from table:4 it can be seen that the average stomatal ratio during the different season was 1.03±0.13 to 6.14±2.65 at polluted site. Seasonally maximum reduction in the stomatal ratio in the present study at polluted site was observed during the summer season (59.90%) followed by rainy season (35.41%) and winter season (25.03%). Therefore, it can be concluded from the above results that the stomatal index, length, breadth and ratio was badly affected by air pollutants at the polluted site as compared to the control site. This was considered as a protective measure in reducing any deleterious effect of air pollution. Gupta and Ghouse., 1988 and Chauhan et al., 2004 also reported similar

CONCLUSION

Plants naturally cleanse the atmosphere. They absorb the pollutants through their leaves as they have a large surface area and they function as an efficient device to trap the pollutants. Results obtained from the present study provide evidence that the pollutants affect the micromorphology of the plants with respect to leaf stomatal
ISSN 2394 - 7780

Volume 8, Issue 2 (III) April - June 2021

index, stomatal length, stomatal breadth, and stomatal ratio. To mitigate and reduce air pollution in the industrial area, further planning of the landscape can be undertaken.

REFERENCES

- Agbaire, P. O., and Esiefarienrhe, E., 2009, "Air Pollution Tolerance Indices (APTI) of some plants around Otorogun gas plants in Delta State," Nigeria, Journal of Applied Science and Environmental Management, 13, pp. 11-14.
- 2. Chauhan, S.V.S., Chaurasia, B., and Rana A., 2004, "Impact of air pollution on floral morphology of *Cassia siamea* Lamk," Journal of Environmental Biology, 25(3), pp. 291-297
- 3. Ghose A. K. M., Iqbal M., Khan S., Khan A. H.,1980 "Comparative study on the structure of vascular cambium in some Verbenaceae. Phytomorphology," 30, pp.32-40.
- 4. Gupta, M. C., and Ghouse, A. K. M., 1988, "Effects of coal smoke pollutants from different sources in the growth, chlorophyll content, stem anatomy and cuticular traits of *Euphorbia hirta*. L Environmental Pollution, 47, pp. 221-230.
- 5. Jahan, S. and Iqbal, M. Z. 1992, "Morphological and Anatomical Studies of leaves of different plants affected by motor vehicles exhaust," Journal of Islamic Academy of Sciences, 5(1), pp. 21-23.
- 6. Joshi, P. C., and Abhishek, S, 2007, "Physiological responses of some tree species under roadside automobile pollution stress around the city of Haridwar, India," Environmentalist, 27, pp. 365-374.
- 7. Joshi, P., and Swami, A., 2007, "Physiological responses of some tree species Under roadsides automobile pollution stress around the city of Haridwar, India, "The Environmentalist, 27, pp. 365-374.
- 8. Lerman, S. L., and Darley, E. F., 1975, "Particulates, In. Responses of Plant to Air Pollution," New York: Academic Press, pp. 142-158.
- 9. Odilara, C. A., Egwaikhide, P. A., Esekhegbe, A., and Emau, S. A., 2006, "Air pollution tolerance indices (APTI) of some plant species around llupeju industrial area," Lagos Journal of Engineering Science and Application, 4(2), pp. 97-101.
- 10. Pandey, J., Agrawal, M., 1994, "Evaluation of air pollution phytotoxicity in the seasonally dry tropical urban environment using three woody perennials," New Phytologist, 126, pp. 53-61.
- 11. Ricks, G. R, Williams, R. J. H., 1974, "Effects of atmospheric pollution on deciduous woodland part 2: effects of particulate matter upon stomatal diffusion resistance in leaves of *Quercus petraea* (Mattuschka) Leibl," Environmental Pollution, 6, pp. 87-109.
- 12. Salisbury, E. J., 1927, "On the causes and ecological significance of stomatal frequency with special reference to the woodland floor," Philosophical Transaction of the Royal Society B., 216, pp. 1-65.
- 13. Verma, R. B., Siddiqi, M. T. O., and Iqbal, M., 2006, "Foliar Response of *Ipomea pes-tigridis* L. To Coal Smoke Pollution," Turkish Journal of Botany, 30(5), pp. 413-417.
- 14. Williams R. J. H., Lloyd, M. M., Ricks G. R., 1971, "Effects of atmospheric pollution on deciduous woodland I: some effects on leaves of *Quercus petraea* (Mattuschka) Leibl," Environmental Pollution, 2, pp. 57-68.

Volume 8, Issue 2 (III) April - June 2021

PROBLEMS IN DISPOSING MENSTRUAL WASTE AND EFFECTS OF DISPOSAL PRACTICES ON ENVIRONMENTAL SUSTAINABILITY WITH SPECIAL REFERENCE TO WOMEN IN MUMBAI

Ms. Mamata Madhusudan Tendulkar¹ and Dr. Sushma Raju Ambadekar²

¹Assistant Professor, Department of Environmental Studies, K. J. Somaiya College of Arts & Commerce (Autonomous), Vidyavihar, East ²Associate Professor, Department of Analytical Chemistry, The Institute of Science, Mumbai

INTRODUCTION

Municipal Solid Waste Management is one of the most challenging issues in many developed and developing countries. Growing urban population and urbanisation are increasing the Municipal Solid Waste generation. Major part of this solid waste is occupied by Domestic Waste¹. The domestic waste which collected as Municipal Solid Waste in Mumbai is mixed waste and difficult to treat properly as it is not segregated. Menstrual waste is also mixed with domestic waste as dry waste. This waste is highly infectious waste is highly infectious waste and should be collected and treated as biomedical waste². There is no separate collecting mechanisms available in the heavily crowded city like Mumbai³.

Apart from unavailability of collection mechanism, there are many social and economic reasons due to which this waste is not being disposed and treated properly. This paper focuses on various practices and problems faced by women during disposing the sanitary waste. The menstruating females mainly fall into age group of 13 years to 45 years⁴. This is a very big age group and problems of females will be varying as per the age group, location, occupation and economic background. Among these, females who travels daily either for job or for education and stay out of house for longer period were interviewed and studied the problems faced by them during menses and disposing the menstrual waste.

Objective:-

- 1. To know the various options chosen by women during menses as absorption pad.
- 2. To identify the various practices followed by the women for disposing menstrual waste.
- 3. To understand the various problems faced by the women who are travelling while disposing the menstrual waste.

Hypothesis:-

- 1. Social and Cultural taboos affects the disposal practices of menstrual waste.
- 2. Improper disposing practices of menstrual waste affects the solid waste management.

RESEARCH METHODOLOGY

This paper is based on primary data collected from women residing at Greater Mumbai region (Mumbai, Thane & Navi Mumbai). The following methods were used to collect the data:-

- 1. **Survey Method** The questionnaire was prepared in google form and the link was circulated among various college going girls and travelling women in the Mumbai. The age group of 13 to 45 years was targeted for collecting the data. Total 500 responses were received and screened for the specific age group and location.
- 2. **Personal Interviews**: Personal interviews were conducted after collecting data in form of google form. 50 females (13 to 45 age group) were selected among 500 responses and questioned for the reasons for the specific answers and some females were interviewed who couldn't fill the google form. They were questioned for choosing particular pads, tampons and menstrual cup during menstruation, disposal methods adopted and problems they faced while disposing the menstrual waste. This data was used for further analysing the results.

RATIONALE:-

Female issues are always discussed secretively and it never get any open forum or platforms. Similarly menstruation is never discussed openly due to sociocultural taboos and superstitions in the societies. These social norms affects the disposal practices of menstrual waste. This improperly disposed waste cannot be treated properly and become major hurdle in achieving waste management.

DATA ANALYSIS & INTERPRETATION

1. Survey Result Analysis:-

Volume 8, Issue 2 (III) April - June 2021

- 95% Females use sanitary napkins during menses.
- The females who are using sanitary napkins among them 95.7% females throw napkins in dustbin (home or common dustbin).
- 36% females get proper disposal material from the manufacturer and 54% females don't get proper material disposal material or it is not up to the mark.
- 25.39% females don't face problems while disposing the menstrual waste while 57.98% females either don't get the wrapping material or have compliant that manufacturer is not providing it and 16.63 % females choosing options of flushing in toilets, or cant use dustbin at home or common dustbin dues to hesitation or cultural issues.
- 34.94 % females knows about the material used in the napkins while 65.06 % females either don't know which material is used or can't say about it.



Fig.5. Problesms faced in disposing Menstrual waste



2. **Interview Result Analysis**: - Out of 500 responses 50-60 Females were chosen for personal interview depending on their availability and willingness to answer the question related to menstrual hygiene and disposal methods.

- Females working in modelling or advertising industries are using menstrual cups or tampons as professional demands but many females hesitate to use tampons or menstrual cup.
- Many females also agreed that they are washing the used sanitary napkins before disposing it into dustbins as they believe that menstrual blood is bad blood and if any animal lick it may affect the fertility.
- As women can't use same dustbin for disposing sanitary waste they store it separately and throw it in "NAALA' or burn it. This activities are conducted secretly so that men can't see or know about their menstruation.
- Women are not ready to handover menstrual waste in separate bag to the waste collector as many times waste collectors are male and women hesitate to do so and this will also revealed to waste collector and family that they are menstruating.
- Females are not ready to use reusable napkins as they face the problem of sun drying the napkins at workplace and at home as it can't be dry with other clothes and also want to avoid efforts of washing it.
- Due to improper disposal practices such as burning and flushing into toilets it will affect the waste management system as well as can environmental pollution. This will have negative impact on the Environmental Sustainability.

LIMITATIONS

There are many sociocultural taboos in the society about menstruation due to which elderly females are not ready to talk on this topic easily and don't want to share their information to anyone.

SUGGESTIONS

- 1. Proper awareness programs should be designed to create awareness among all the citizen, especially elderly members of the families who have lot of influence on disposal practices.
- 2. Municipal Corporation of Mumbai should take initiatives in creating awareness about the cultural taboos and effects of improper waste disposal practices. They should also focus on the collection of the sanitary waste at domestic level which is the major part of waste i.e. around 113,000 tons of menstrual waste generated annually in India⁵.
- 3. All the Females should read the instructions given by manufacturer on the packet. They should dispose the sanitary napkins wrapped by paper without flushing it out into the dustbin as it is considered as dry waste⁶.
- 4. Females should avoid flushing of napkins in the toilets which can clog the toilets⁷.
- 5. Government has made sanitary napkin burning machine compulsory at every school and college; the same facilities should be made available for all the office going women too.

CONCLUSION

The study shows that the college going girls and working women usage and disposal of menstrual waste practices are influenced by the cultural taboos. There is lack of awareness about proper methodology of disposing menstrual waste. Women are either not reading the instructions given by producers on the packets or after reading it also they are following the different methods guided by the elderly females of the house. Their decisions are influenced by the cultural norms set up in the society and it is passing from one generation to another generation. This attitude may cause the serious problems in the city's waste management system and clogging of sewer pipes. A proper mechanism should be made and implemented by government to treat this highly infectious waste properly to achieve Environmental Sustainability.

REFERENCES:-

- 1. Davis Bejoy, Solid Waste Management in Mumbai, Understanding Our Civic Issues THE BOMBAY COMMUNITY TRUST
- 2. Guidelines for management of sanitary waste, Central pollution Control Board, Ministry of Environment, Forest & Climate Change, Government of India, Page 7 & 10, May 2018.
- 3. Guidelines for management of sanitary waste, Central pollution Control Board, Ministry of Environment, Forest & Climate Change, Government of India, Page 3, May 2018.

Volume 8, Issue 2 (III) April - June 2021

- 4. Omidvar Shabnam1, Amiri Nasiri Fatemeh1, Bakhtiari Afsaneh1,Begum Khyrunnisa2, A study on menstruation of Indian adolescent girls in an urban area of South India, Journal of Family Medicine & Primary Care, **7** (4), 698-702(**2018**).
- 5. Elledge F. Myles 1,*, Muralidharan Arundati2, Parker Alison 3, Ravndal T. Kristin3, Mariam Siddiqui 4, Anju P. Toolaram3 and Katherine P. Woodward5, Menstrual Hygiene Management and Waste Disposal in Low and Middle Income Countries —A Review of the Literature.
- 6. Guidelines for management of sanitary waste, Central pollution Control Board, Ministry of Environment, Forest & Climate Change, Government of India, Page 1, May 2018.
- 7. Mhaske Pandhurang, Sanitary Pad Clogging sewer pipe Caused Chembur Toilet Blast, Mumbai Mirror, 6thJan 2014.
- 8. Bhor Gautami1, Ponkshe Sayali2, A Decentralized and Sustainable Solution to the Problems of Dumping Menstrual Waste into Landfills and Related Health Hazards in India, European Journal of Sustainable Development,7(3), 334-344(2018).
- Manju Kaundal1, Bhopesh Thakur2 1 Ishar Jyot Degree College, Pehowa, Kurukshetra, Haryana, 2Department of Biosciences, Himachal Pradesh University, Shimla, Himachal Pradesh, India, A Dialogue on Menstrual Taboo, INDIAN JOURNAL OF COMMUNITY HEALTH / VOL 26 / ISSUE NO 02 / APR – JUN 2014.
- Rajanbir Kaur,1 Kanwaljit Kaur,2 and Rajinder Kaur, Menstrual Hygiene, Management, and Waste Disposal: Practices and Challenges Faced by Girls/Women of Developing Countries, Hindawi ,Journal of Environmental and Public Health Volume 2018, Article ID 1730964, 9 pages https://doi.org/10.1155/2018/1730964.

DROP IN POLLUTION DUE TO LOCKDOWN - A BOON TO THE NATURE

Prerna Pande¹ and Ms. Rama Ray²

Student¹ and Guide², Thakur College of Science and Commerce, Kandivali (East), Mumbai

ABSTRACT

The research paper attempts to find out the causes behind the massive drop of pollution that happened due to the novel Coronavirus. As it all started when China reported its first case in the city of Wuhan in March 2020. 2020 has really been a year of uncertainties for the global economy and all of the people living on this planet but somehow, it has turn out to be a blessing in disguise for our mother nature. It has been observed that the nature showed its true beauty due to less pollution and made us feel how important it is to take care of what nature gives. This research paper not only aims on how lockdowns have resulted to be a boon to the nature but also suggests as to why such crucial steps are required not only when there is a pandemic but also whenever the nature demands it. To get a strong grip on the topic, opinions and views of environmentalists have been taken into consideration through interviews. The main focus of this paper is on how the pollution was affecting the life of living beings before lockdown and also talks about its aftermath. The paper concludes with some suggestions for the same.

Key words: pollution, drop, crucial step, environment

INTRODUCTION:

With the outbreak of the global pandemic, Coronavirus, all over the world, a massive destruction to the life of humans has been observed. 2020 was a year full of uncertainties and we could not predict anything related to any aspect of our lives as we all were at a risk of losing our life due to Covid-19. From rural areas to the Multinational companies, every sector except health and food, was shut down. No one would've ever imagined the way 2020 turned out to be.

Taking India into consideration, back in March 2020, the Prime Minister of India announced the very first lockdown for the whole country. At first, all of it seemed to be impossible but when the cases kept of rising rapidly, everyone understood that the only way to stay safe was by being at our homes. Now just imagine, if a country like India with the second highest population in the world and a country that ranked 3^{rd} in emitting the most carbon dioxide in 2018 has been asked to shut itself down due to a pandemic, it has to have a great impact on the various sectors of economy. The economy of India did face a lot of issues relating to finances, loss of employment and most importantly, the loss of millions of lives. But as it is rightly said by Robert Greene –

"Every negative situation contains the possibility for something positive, an opportunity. It is how you look at it that matters."

And with this perception, not only India but the whole world saw something positive out of such a negative situation. The comeback of nature in its true form. Sometimes we don't even think of what nature provides us because it doesn't take anything from us. And anything which is provided for free is often wasted. But because our mother nature was somehow rescued from the interference of humans on a daily basis, it made us all realize that apart from the concrete jungle that produces so much of pollution, exists a world which requires our utmost love, care and attention. We are further going to study the positive impact of Covid-19 on the nature due to a drop in pollution.

Volume 8, Issue 2 (III) April - June 2021



Source: tribuneindia.com

AIMS AND OBJECTIVES-

- 1) To know about the effect of Covid 19 on the nature
- 2) To know the perks of lockdown for the nature
- 3) To study how drop of pollution has created an impact on the environment
- 4) To analyze the importance of preserving the nature

METHODOLGY-

- This study is carried out by the assessment of various research papers based on the topic, published literatures, and information collected through the reports published by the government and non-government organizations.
- From a large number of studies gathered, the study of this research paper complies and presents the data and information which are relevant to the given topic and meet the goals of the study.

FINDINGS-

The findings of this research paper is based on the information collected through secondary sources. These sources were taken into consideration because they help the research to meet with its goals.



Volume 8, Issue 2 (III) April - June 2021

ISSN 2394 - 7780

The above image shows Delhi's air quality that has remarkably improved during the lockdown.

• As all the mediums of transport was suspended to reduce the spread of coronavirus, the most polluted city which had a layer of air pollution turned out to be an azure blue, and the air, unusually fresh. This was a remarkable effect due to loss of pollution.



A notable change in the quality of air was observed in the city of Lucknow which is among the top 20 most polluted cities of India.

• According to Sarath Guttikunda, the head of Urban Emissions, "This was an unprecedented opportunity for us to take a close look at how air pollution levels have responded to an extraordinary development"

A collective chart of the impact of drop of pollution -



SUGGESSTIONS -

- The paper suggests that there should be an alternate solution other than lockdown as it understands that lockdowns do hinder the working of economy as well.
- The Government should make strict laws regarding protection of wildlife and nature.

Volume 8, Issue 2 (III) April - June 2021

- There must be awareness campaigns in schools, colleges and societies about the drawbacks of increasing pollution.
- Citizens should be educated and guided seriously especially in the matters relating to environment.

CONCLUSION-

There has been a drop of pollution due to Covid and it should be taken into consideration that the remarkable changes have made it clear that when we take protect the nature, the nature protects us back. So its high time that we must realize how important it has become to take steps in order to save our own future.

REFERENCES-

- Annual State of the Global Air Report (2019) How clean is your air? https://www.stateofglobalair.org/air Barratt R, Shaban RZ, Gilbert GL (2019)
- Clinician perceptions of respiratory infection risk; a rationale for research into mask use in routine practice. Infection Disease Health 24(3):169–176
- International Journal of Environmental Science and Technology (2020) 17:4655–4666
- https://link.springer.com/article/10.1007/s13762-020-02910-x

ISSN 2394 - 7780

USE OF PLASTIC IN CONSTRUCTION: A CRITICAL REVIEW

Omkar Palande¹, Samiksha Markande² and Doulat M Chainani³

¹Undergraduate Student, Civil Engineering Department, M. H. Saboo Siddik College of Engineering, Mumbai ²Undergraduate Student, Commerce Department, R A Podar College Of Commerce & Economics ³Assistant Professor, Civil Engineering Department, M. H. Saboo Siddik College of Engineering, Mumbai

ABSTRACT

Nowadays tremendous plastic waste is generated and handling this solid waste is a challenging task. Plastic can be recycled & can be used in construction. Plastic greater than 50 microns can be recycled easily but plastic below 50 microns is a threat to the environment as it is difficult to recycle. Plastic waste pollutes the water bodies and ultimately affects aquatic life. Hence, to minimize this effect we are trying to find a way to utilize this waste plastic in construction.

This paper aims to review the waste plastic use in construction so that pollution due to plastic is reduced and to improve the economy in construction.

Keywords: Waste Plastic, Plastic Bricks, Plastic Paver blocks, Plastic Tiles, Light Weight Concrete, Recycling Plastic, Plastic Materials, eco-bricks.

INTRODUCTION

Plastic waste disposal handling is a major problem in solid waste management. Various types of waste plastic are available in the market such as Low-Density Polyethylene (LDPE), High-Density Polyethylene (HDPE), Polyethylene Terephthalate (PETE), Polyvinyl Chloride (PVC-U), Polypropylene (PP), Polystyrene or Styrofoam (PS) etc. some of which are recyclable. Polyethylene is the largest contributor of plastic waste followed by Polypropylene, Polyethylene Terephthalate, and Polystyrene. Majority of domestic plastic waste consists of bags made up of LDPE.

Since plastic is a non-degradable substance, it has become an environmental threat and so an idea of using plastic waste in the making of construction materials has been put forth. Additionally, plastics are cost-effective with lower maintenance and higher flexibility. Plastic materials have qualities viz. transparent, does not absorb moisture, chemically stable, flexibility etc. This idea will result efficient usage of plastic waste and perhaps solve one of the major problems faced today i.e. disposal of waste plastic. The use of plastic materials in construction is a suitable replacement for conventional materials.

Madan Mohan et.al (2012) carried a study on Melt-Densified Post Consumer Recycled Plastic Bags Used as Lightweight Aggregate in Concrete. It is reported that by using Melt Densifined Aggregate (MDA) the weight density of concrete can be reduced, thereby decreasing the dead load and economy in design can be achieved.

They found that with an increase in the plastic amount in concrete above a certain amount the compressive strength decreases.

Materials Used: Ordinary Portland Cement (OPC) of 53 grade, Conventional Aggregates (< 4.75 mm), Melt-Densified Aggregates (MDA).

MDAs are made when the polyethylene bags are given a desirable spherical shape with a diameter of about 40mm and then put into the furnace so the density of the plastic balls increases and their size gets reduced. MDA was replaced with conventional aggregates in different proportions at W/C ratio of 0.32

Replacement	Density	Compressive
%	(kg/mm^3)	Strength
	-	(MPA)
0	2366	44.0
5	2342	40.5
10	2324	36.0
15	2296	29.5
20	2278	25.5

TABLE NO.1 : Compressive Strength of MDA Bricks

FIGURE NO.1: MDA



Dinesh S. et.al (2016) researched on Utilization of Waste Plastic in Manufacturing of Bricks and Paver Blocks. It was observed that the plastic bricks and paver blocks show higher compressive strength than the ordinary ones.

Materials Used: Waste Plastic (furniture, bags, bottles, containers, etc.), river sand, coloring agents (ferric oxide).

Mixing proportions of plastic to river sand were practiced in the ratios of 1:2, 1:3; 1:4, 1:5, 1:6.

Collected waste plastic was cleaned with water and dried. Then plastic was broken down into small sizes. The plastic is then added to the hot mixing drum so that it turns into a hot liquid and then the river sand is added. Setting time of this mixture is very less so precautions must be taken while mixing it. Later, color ferric oxide can be added.

Various tests were conducted where plastic bricks and paver blocks gave good results.

Sr. No.	Types of Bricks	Plastic Sand Ratio	Compressive Strength (N/mm ²)
1	Plastic Sand Brick	1:2	4.65
2	Plastic Sand Brick	1:3	4.78
3	Plastic Sand Brick	1:4	5.12
4	Plastic Sand Brick	1:5	4.92
5	Plastic Sand Brick	1:6	3.17
6	Fly Ash Brick	0	4.19
7	Burnt clay Brick	0	3.15
8	Plastic Sand Paver Block	1:4	8.19
9	Ordinary Paver Block	0	7.17

TABLE NO.02: Compressive Strength results

TABLE NO. 03 Water Absorption Test results

Sr. no.	Type of Brick or Paver block	Water Absorption (%)
1	Fly ash Brick	8.012
2	Burnt Brick	9.086
3	Plastic sand Brick	1.10
4	Plastic Sand Paver Block	1.082
5	Ordinary Paver Block	3.709

B. Shanmugavalli et.al (2017) performed an experiment on the Reuse of Plastic Waste in Paver Blocks. In their experiment it was found that the use of plastic in paver blocks is proved to be cost-efficient and shows good heat resistance.

Materials Used: Plastic Waste/LDPE (50 microns plastic bags), Quarry Dust (<4.75mm), Coarse Aggregates (10mm-12mm), and Ceramic Waste.

Three types of blocks were prepared for each mixing ratio.

Mix Ratio 1-

Plastic Waste: Quarry Dust: Aggregates

1:0.75:0.75

Mix Ratio 2-

Volume 8, Issue 2 (III) April - June 2021

Plastic Waste: Quarry Dust: Aggregates: Ceramic Waste

1:1.5:2:0.75

Mix Ratio 3-

Plastic Waste: Quarry Dust: Gravel: Ceramic Waste

1:1.5:2:0.75

Plastic waste was melted in a heating container and other materials were added as per the ratio. Then this mixture was poured into clean molds and allowed to cool down so that it becomes hard.

Mix Ratio	Compi	Average Compressive Strength		
	Block no. 1	Block no. 2	Block no. 3	-
1	8.47	9.67	9.89	9.33
2	10.34	11.21	9.67	10.40
3	12.17	13.50	13.43	13.03

TABLE NO. 04	Compression	test results
--------------	--------------------	--------------

Mix Ratio	Temperature (°C)	Result
1	50	No change
	100	No change
	150	Melts
2	50	No change
	100	No change
	150	Melts
3	50	No change
	100	No change
	150	Melts

TABLE NO. 05: Oven Test Results

Jibrin Sule et.al (2017) investigated on the Use of Waste Plastic in Cement-Based Composite for Lightweight Concrete Production. They found that for Load Baring structures Light Weight Concrete (LWC) can be the replacement for partition walls, roof materials, tiles, etc. Also, the sound absorption capacity of LWC is more than the conventional concrete blocks which proves to be a good acoustical insulator.

Materials Used: Portland cement, Fine Aggregates (<2.26mm), Coarse Aggregates (<20mm), and Waste Plastic (LDPE).

1:2.3:3.5 Mix Ratio was practiced at a W/C with a ratio of 0.65. Granular plastic with a size <5mm was replaced with fine aggregates in different weight proportions.

Curing	Compressive Strength (N/mm ²)				Density (kg/m ³)							
Days	0%	5%	10%	15%	20%	30%	0%	5%	10%	15%	20%	30%
3	18.20	16.70	16.18	13.91	12.44	7.33	2474	2382	2306	2145	2095	2053
7	18.49	17.07	16.67	14.67	12.93	7.82	2453	2480	2400	2199	2201	2021
14	18.93	18.04	17.69	14.89	14.67	8.22	2516	2492	2317	2204	2323	2024
21	19.60	19.16	18.89	15.82	15.11	9.20	2480	2489	2397	2350	2222	2053
28	20.62	20.44	19.69	16.80	15.90	9.64	2467	2453	2216	2284	2243	2077

TABLE NO .06: Test Results

Ganesh Tapkire et.al (2014) researched on Recycled Plastic Used in Concrete Paver Block. They found that if 20% plastic is used as a replacement to aggregates, the properties of the concrete remain unchanged. The amount of plastic used should not exceed 20% weight of the coarse aggregates. Plastic in concrete acts a good insulator to heat and cold.

Materials Used: Ordinary Portland cement with 43 grade, Coarse Aggregates (<10mm), Fine Aggregates (sand), Recycled Plastic Aggregates (<10mm).

After curing the cubes, the blocks are dried at room temperature for a compression test.

% of Plastic	Average Compressive Strength (N/mm ²)
0	41.10
10	40.07
20	38.97
30	37.77

TABLE NO. 07: Compression Test Results

Passant Youssef et.al (2019) reported in their research on the Manufacturing of Wood-Plastic Composite (WPC) Boards and Their Mechanical and Structural Characteristics. They observed that the recycled HDPE are highly capable of making Wood-Plastic Composite Boards. This WPC has very good water resistance, flexibility, and strength.

Materials Used: Recycled HDPE powder, virgin HDPE, Sawdust.

HDPE and sawdust powder were prepared in a mixer separately. To reduce the moisture content, the sawdust was oven-dried. In a mixer a homogenous mixture of HDPE and sawdust was prepared and boards were made in compression machine.

Various mixing ratios of Wood & HDPE (recycled and virgin) can be taken such as 60:40, 70:30, and 80:20.

% of HE	OPE	20	25	30	35	40
Virgin	2h	83.5	67.8	23.2	6.5	5.1
HDPE	24h	92.4	82.8	64.3	23.1	17.1
(%)						
Recycled	2h	88	79.7	70.5	52.6	10.4
HDPE						
(%)	24h	100	86.8	77.3	60	23.9

TABLE NO. 11: Water Absorption Test

A. A. Momin et.al carried out study on the Plastic Floor Tiles. They found that as a binding agent, plastic can replace cement in tiles manufacturing and in pavements. Transverse resistance of tile with 50% plastic by weight of sand was equal to normal cement tile. Resistance to impact, water absorption and abrasion resistance gave values greater than cement tiles.

Materials: Sand (<600 micron), Plastic Waste (plastic chairs, polypropylene basis).

Plastic waste was collected and crushed. Later, the melting procedure was carried out (150-170° C). The heating sand is added in the same container. Once this is done, the molding and demolding procedures are done.

Sr. No.	Test	Tes Perc 30%	Test Results For DifferentPercentage Of Waste Plastic30%40%50%60%			Normal Cement Tile
1	Water absorption (in %)	3.80	3.50	2.34	1.01	9.5
2	Transverse Strength (N/mm ²)	10.80	13.74	20.80	26.29	22.75
3	Abrasion Resistance (Average Loss in	0.90	0.82	0.72	0.24	0.79
	Thickness in cm)					
4	Impact Resistance (Height of impact	27	30	339	50	
	resistance in cm)					30

TABLE NO. 12: Test Results

M. Achitra et.al (2018) conducted thorough research on Recycled Plastic and Coconut Fibre Used in Concrete Paver Block. They discovered that plastic chips and coconut fibre at 0.5% in concrete blocks give a good split tensile, compressive, flexural strength.

Materials: Coarse Aggregates, Fine Aggregates, Cement, Coconut Fibre, and Plastic Chips at a mixing ratio of 1:1:2.

Sr.	Specimen	Compressive	Flexural	Split Tensile
No.		Strength	Strength	Strength
		(N/mm^2)	(N/mm^2)	(N/mm^2)
1.	Control Mix	25.458	3.91	2.103
2.	0.5% Coconut Fibre + 0.5% Plastic Chips	30.021	5.22	2.567
3.	1% Coconut Fibre + 1% Plastic Chips	28.096	4.70	1.976
4.	1.5% Coconut Fibre + 1.5% Plastic Chips	26.508	4.370	1.791
5.	2% Coconut Fibre + 2% Plastic Chips	23.742	4.01	1.761

TABLE NO.13: Test Results

J. O. Akinyele et.al (2020) carried a research on the Effect of Waste PET on Structural Properties of Burnt Bricks. They determined that due to the low melting point of PET materials, which is about 250° C, the brick gets deformed in shape during the firing process.

Materials: Crushed PET, Lateritic soil, Clay, Concrete and Water.

The soil bricks were prepared by the conventional method with varying composition of PET at 5%, 10%, 15%, and 20% individually with the replacement of concrete fine aggregates. After molding the bricks, air drying was done followed by firing and cooling process.

The sample with 0% PET indicated the lowest shrinkage while the brick samples at 15% and 20% composition collapsed inside the kiln due to the melting of the plastic. A shrinkage of plastic materials was observed in 5% and 10% PET.

The burnt bricks with PET less than 5% gave a performance of third class bricks and kept on degrading with an increase in the percentage.

MB Hossain et.al (2016) found in their study on Use of Waste Plastic Aggregation in Concrete as a Constituent Material that the compressive strength and modulus of elasticity of the block containing 10% PET is higher than even the standard block. But lower performance was given in the Flexural strength, Tensile strength and Shrinkage value by the blocks containing PET. Also a strange behavior was observed in Water Absorption test, it increased with increased in amount of plastic.

Materials; Waste Plastic Aggregates, Fine and Coarse Aggregates, Water and Cement.

In a mixer plastic bottles were cut into smaller pieces. Cleaning and drying process were followed. Plastic aggregates were used as a replacement to coarse aggregates in 5%, 10% and 20%. Various tests were performed.





ISSN 2394 - 7780



TABLENO. 14 Modulus of elasticity of various concrete Specimens.

Specimen	Modulus of Elasticity (Mpa)				
Speemen	7 Days	21 Days	28 Days		
C0PA	2405	5833	14500		
C5PA	2480	6000	15000		
C10PA	6500	8571	40000		
C20PA	340	5000	8333		

S. S. Chauhan et.al (2019) lead an investigation on Fabrication and Testing of Plastic Sand Bricks. They found that as compared to clay bricks, these bricks have high compressive strength and the temperature of these bricks increases quickly than that of plastic brick below 350° C. After that, plastic bricks melt partially.

Materials: Plastic bottles and river sand.

Plastic bottles are crushed into small pieces and melted. The sand is then added into a drum containing melted plastic and mixing is done. Different mixing ratios of 1:2, 1:3, and 1:4 are adopted. Oiled wooden molds were used in this experiment for smooth surfaces.

Plastic Sand Ratio	Avg. Maximum Load	Avg. Compressive	Avg. Water
	(KN)	Strength (kg/cm ²)	Absorption (%)
1:2	505	195.80	1.165
1:3	335	129.89	2.868
1:4	156.67	60.74	4.291

TABLE NO.15: Test Results

R. S. Kongole et.al (2019) investigated on the Utilization of Plastic Waste for Making Plastic Bricks. They found that as compared to third class clay bricks and fly ash bricks, plastic sand bricks performs better.

Materials: Waste Plastic, Stone Dust.

Waste plastic is collected, dried and crushed into tiny particles. Afterwards, heating is done on a furnace and then stone dust is mixed in the molten mixture. Later, molding and drying is carried out.

		-		
Sr.	Waste Plastic	Material	Water	Compression
No.	(g)	(g)	Absorption (%)	(KN)
1.	50	Red Soil (50)	0	15
2.	50	River Sand (50)	0	10.5
3.	50	Stone Crush (50)	0	13.50
4.	750	River Sand (2000)	3%	97.50
5.	750	Red Soil (2000)	-	26
6.	0	Red Brick	5%	14

TABLE NO.16: Test Results

Arvind Singhal et.al (2018) studied on the Utilization of Plastic Waste in Manufacturing of Plastic Sand Bricks.

Materials: Plastic, Stone Dust (<4.75mm)

Moisture content of collected plastic was reduced to zero and converted into particles. A ratio of 3:7 of plastic and stone dust is used. Plastic is converted into a hot molten mixture and stone dust is added. Later, molding and demolding procedure is done.

Test Results:

- 1. Water Absorption Test: 0%
- 2. Efflorescence Test: Not Visible
- 3. Compressive Strength: 5.6 N/mm²

Clay Bricks:

1st Class: 10.5 N/mm²

2nd Class: 7 N/mm²

3rd Class: 3.5 n/mm²

Anand Daftardar et.al (2017) in their study reported about Use Of Waste Plastic as a Construction Material.

Materials: Plastic beads (LDEP) and Fly Ash.

Extruder is used to mold the plastic with fly ash in various ratios as 10:0, 9:1, 8:2 and 7:3 (plastic to fly ash) to form a brick. After molding and demolding, compressive strength is calculated.

Ratio	Compressive Strength (N/mm ²)	
10:0	13.9	
9:1	11.48	
8:2	10.69	
7:3	10.42	

TABLE NO.17: Test Results

Hari Krishnan N. et.al (1974) experimented on Utilization of Waste Plastic in Manufacturing of Bricks Align with Quarry Dust and M-sand. They concluded that bricks made with 20% plastic by weight of Quarry Dust and M-sand are stronger than red bricks.

Materials: Waste Plastic, Quarry Dust and Manufactured Sand.

Compressive Test Results:

- 1. Plastic Bricks (20%): 7.91 N/mm²
- 2. Red Burnt Bricks: 7.32 N/mm²

CONCLUSION

- Plastic and bricks possess more advantages which include cost-efficiency and lower maintenance.
- MDA can be used to replace part of conventional aggregates to reduce the unit weight so that structural dead weight can be reduced
- It can be used in gardens, pedestrian paths, and cycle ways.

Volume 8, Issue 2 (III) April - June 2021

- Plastic sand reduces the use of clay in the manufacturing of bricks. Also, its water absorption is 0%.
- These paver blocks developed can be used for light and medium traffic applications which are based on compressive strength.
- For fire bricks, the use of plastic showed deformation in bricks and gave poor results.

FUTURE SCOPE

It is observed in the review that studied was carried out using various materials with different proportions of plastic. Regardless of various limitations of use of waste plastic in construction, further study can be carried out by altering proportions of waste plastic and other ingredients of concrete for making concrete as light weight and its use in various construction materials.

REFERENCES

- 1. Madan, M. R. K., Ajitha, B., & Bhavani, R. Melt-Densified Post-Consumer Recycled Plastic Bags Used As Light Weight Aggregate In Concrete. *International Journal of Engineering Research and Applications* (*IJERA*) *ISSN*, 2248(9622), 1097-1101.
- 2. Dinesh S., A., & Kirubhakaran, K. (2016). Utilisation of waste plastic in manufacturing of bricks and paver blocks. *International Journal of Applied Engineering Research*, 2(4), 364-368
- 3. Shanmugavalli, B., Gowtham, K., Nalwin, P. J., & Moorthy, B. E. (2017). Reuse of plastic waste in paver blocks. *International Journal of Engineering Research And*, V6, 2, 313-315.
- 4. Sule, J., Sule, E., Ismaila, J., Osagie, I., Buba, Y. A., Farida, I. W., & Emeson, S. (2017). Use of waste plastics in cement-based composite for lightweight concrete production. *Int J Res Eng Technol*, 2(5), 44-54.
- 5. Tapkire, G., Patil, P., & Kumavat, H. R. (2014). Recycled Plastic used in concrete paver block.
- 6. Youssef, P., Zahran, K., Nassar, K., Darwish, M., & El Haggar, S. (2019). Manufacturing of Wood–Plastic Composite boards and their mechanical and structural characteristics. *Journal of Materials in Civil Engineering*, *31*(10), 04019232.
- 7. Achitra, M., Rajasree, R. A., Pandit, R. V., Saranya, V., & Scholar, U. G. (2018). Recycled Plastic and Coconut Fibre used in Concrete Paver Block. *Int. J. Eng. Sci. Comput*, 8(4), 16827-16830.
- 8. Akinyele, J. O., Igba, U. T., & Adigun, B. G. (2020). Effect of waste PET on the structural properties of burnt bricks. *Scientific African*, 7, e00301.
- 9. Hossain, M. B., Bhowmik, P., & Shaad, K. M. (2016). Use of waste plastic aggregation in concrete as a constituent material. *Progressive Agriculture*, 27(3), 383-391.
- Chauhan, S. S., Kumar, B., Singh, P. S., Khan, A., Goyal, H., & Goyal, S. (2019, November). Fabrication and Testing of Plastic Sand Bricks. In *IOP Conference Series: Materials Science and Engineering* (Vol. 691, No. 1, p. 012083). IOP Publishing.
- 11. Kognole, R. S., Shipkule, K., Patil, M., Patil, L., & Survase, U. (2019). Utilization of Plastic waste for Making Plastic Bricks.
- 12. Singhal, A., & Netula, D. O. (2018). Utilization Of Plastic Waste In Manufacturing Of Plastic Sand Bricks. *ICNFESMH*, *JUNE*, 207-210.
- 13. Daftardar, A., Shah, R., Gandhi, P., & Garg, H. (2017). Use of Waste Plastic as a Construction Material. *International Journal of Engineering and Applied Sciences*, 4(11), 257322.

PREPARATIONS OF POLYMER-BASED SENSORS FOR THE DETECTION OF ENVIRONMENTALLY HARMFUL GASES LIKE ETHANOL (C₂H₆OH), BASED ON ORGANIC CONJUGATED POLYMERS LIKE POLYPYRROLE

Dr. Chitte H. K.¹ and Dr. Milind S. Jog² ¹Satish Pradhan Dnyanasadhana College, Opp. Eastern Express Highway, Thane (W) ²Kirti M Doonguress College, Dadar, Mumbai

ABSTRACT:

Polypyrrole (Ppy) was synthesized using Ferric Chloride (FeCl₃) as oxidants. The ratio of Pyrrole to Ferric Chloride was 1 to 2.4. The polymerization was carried out electrochemically at room temperature. Thin films of this Polypyrrole were cast on electrodes to study the variation in conductivity in the presence of ethanol vapors. It was found that when ethanol vapors were allowed to flow in there was a sudden increase in the current, which decreased rapidly when gas was stopped.

Keywords: Organic Conjugated Polymer, Polypyrrole (Ppy), Chemical Sensors, Gas Sensors.

1. INTRODUCTION

Ethanol is an inflammable chemical that meets the ignitability characteristic of hazardous waste as defined by EPA/DOE, thus must be collected for hazardous waste disposal. Reliable sensing of hazardous gases like ethanol gas is required in many applications like detection of leaks, explosives, fertilizer industries, etc. Further, its high toxicity also warrants rapid detection at very low concentrations.[1]

Now a day various government organizations, NGOs, and social media increased the concern of the public over environmental pollution and increased awareness of a need to monitor possible hazardous gases. This has stimulated substantial research and development in the field of gas sensors such as C_2H_6OH , CO, CO₂, NH₃, etc. The design, fabrication, and application of novel amperometric chemical and biological "sensors", has been a topic of considerable interest in recent years [1-3].

Discoveries in the field of electronics, electrochemical and optical transducers are now being used extensively in engineering, computers, robotics, and biochemistry (Enzymology and Immunology) [4]. New principles of chemical sensors are being tested [5] which would revolutionize instrumental methods of molecular analysis mainly on account of small size and favorably cost-performance relationship [6].

The special importance for chemical sensors [7] is environmental protection, where increased public awareness and ever-stricter legislation make it increasingly necessary to set up an' online" monitoring system for environmentally significant hazardous gases such as NO, SO₂, NH₃, CO, or CO₂ [8]. While many methods of gas sensing measurements have been developed in the laboratory and that some have found commercial applications, there remains a continuing requirement for special gas sensors which would have durability, stability, and cheapness. Gas sensors based on semiconductors and metal oxides [7, 9] (e.g. ZnO, SnO₂) have been commercially successful to sense some toxic gases, but they appear to have some disadvantages in continuous monitoring. For example, these sensors need to be operated at 3000 C or above and therefore there is a large power drain. Secondly, these are insensitive to toxic gases at lower concentrations and lack selectivity.

Conducting polymers [10] was found very appalling for use in sensors either as a sensitive component or as a matrix for easy immobilization of specific substrates [11]. Recently the uses of conducting polymers as gas sensing elements have been reported. In particular, mention may be made of the use of polypyrrole for ammonia and alcohol detection [12, 13]. These conducting polymers have certain advantages in that they can be made in the form of thin films, are cheap, and can be operated at room temperature. Polyaniline [14] has been used for sensing moisture. The use of conducting polymers and electrochemical principles are being used for the development of biosensors [15].

There are large numbers of articles available on analytical applications of a conducting polymer since their discovery. These compounds are found useful in gas sensing and the latest research adds to the development of chemical sensors. During the last three decades, conducting polymers have emerged as one of the most interesting materials for the fabrication of electrochemical sensors [2].

GAS SENSORS PREPARED BY CHEMICAL OXIDATIVE METHOD:

In such type of gas sensors, the change in electrical potential is generated from the interaction of gas molecules which are electrically neutral with the sensor. The sample can be a gas or a liquid. The potential difference

Volume 8, Issue 2 (III) April - June 2021

implies charge separation; it implies that there must be some mechanism that links the interaction of the electrically neutral gas to the partitioning of ions or electrons at an interface within the sensor.

Integrated electrodes covered by the Ppy layer have been tested by Miasik et al. for detection of NH_3 , NO_2 , and H_2S gases [12]. Yoneyama et al. have investigated electron-acceptor gases such as PCl_3 , SO_2 , and NO_2 at room temperature, especially when Ppy is reduced electrochemically before exposure. These authors also investigated the gas-sensing properties of PTH film, but they found a more irreversible behavior in the conductivity change after exposure to NH_3 and H_2S . The chemical events are not elucidated. For instance, the increase in conductivity of poly (p-phenylene vinylene) upon exposure to ammonia gas contrasts with the compensation effect (dedoping) behavior observed with Ppy and PTH.

Polypyrrole and Polyaniline are probably the simplest of conducting polymers to be prepared and have been extensively studied. The attraction to these stems from several factors: their chemical and thermal stability, easiness of preparation, and the ability to yield derivatives having a range of conductivities.

The electrical conductivity of conducting polymers changes significantly due to change in pH, applied potentials, or their environments. Doping levels determine the physical properties of conducting polymers, which can be easily changed by chemical reactions with many analytes at room temperatures and this provides a simple technique to detect several gases.

EXPERIMENTAL METHODS AND PREPARATIONS:

Pyrrole (Sisco Research lab / Sepctrochem lab 99%) was distilled before use. All other reagents and solvents obtained from commercial sources were reagent grade purity and were used as received. All solutions were prepared using deionized water. All reactions were conducted at a room temperature of $25^{\circ}C$ [3] The oxidizing agents FeCl₃ are used in the ratio of 1: 2.4 (monomer: oxidants) prepared using deionized water.

The Polypyrrole was prepared by the chemical oxidative method. 1-mole Pyrrole solution is prepared using deionized water and then mixed with oxidizing agents mentioned above, slowly under continues stirring for 30 minutes. The Polypyrrole is kept undisturbed for 24 hours and Ppy powder is allowed to settle down. The settled Polypyrrole powder is then filtered out and purified by washing it with distilled water several times. The Polypyrrole is dried for 2 days at room temperature.

The Polypyrrole was tested for conductivity by preparing pellets of this amorphous powder. The pallets were prepared of the specific area of cross-section and thickness for consistency in observations. The conductivity was tested at room temperature in the voltage range from 0 to 12 V.

Scanning Electron Microscope (SEM) JEOL makes JSM – 5400 model is used to study the morphology of Polypyrrole. The chemical structure was examined by FTIR measurements on Perkin – Elmer Ltd. makes FTIR spectrometer model system 2000 using KBr pellets.

The gas response was measure on interdigitated electrodes separated by 1mm. were prepared on a printed circuit board (PCB) and the slurry of Polypyrrole was spread uniformly over it and dried under vacuum at room temperature. A gas chamber specifically designed for gas sensing is used in which the PCB was fitted inside it firmly. Ethanol vapors were passed through the chamber at room temperature. The variation in the current is recorded at a constant voltage for intervals of 15 seconds each up to 3 minutes. By stopping the gas flow, desorption is also recorded for every 10 seconds till the current is recovered up to 90 % of its original value. The gas response was recorded continuously for several cycles.

RESULT AND DISCUSSIONS:

Characterization of Ppy:

FTIR spectra show the main characteristic peaks at 1558.45 cm-1 to 1540.66 cm-1 and 1467.20 cm-1 correspond to the fundamental vibrations of polypyrrole rings. The peaks at 1685 m-1 and 1315.4 cm-1 represent C = N and C- N bonds. These peaks observed in the present work for oxidant FeCl3 alone agree well with the ones available in the literature, confirming the formation of Polypyrrole.

A typical SEM image of Polypyrrole is shown in Fig.1. The photograph shows a globular structure. The average size of globules is 0.6 µm. The granular morphology is considered to be good for gas sensing applications.



Fig. 1 SEM of Ppy prepared using APS as an oxidant

I-V characteristics:

Typical plots of I vs. V for polypyrrole prepared using FeCl_3 as oxidant is given in Fig. 2. A nearly linear relationship of the I – V curve is noted. The FeCl_3 oxidant was found to be excellent oxidant-producing conductivity in the range of 10^{-3} S /cm to 10^{-2} S/cm.



Fig. 2. I vs V characteristic of Polypyrrole

Gas sensor:

The behavior of all polypyrrole samples was studied for the detection of ethanol vapors. A typical plot of current vs. time for polypyrrole prepared using FeCl₃ as oxidant and exposed to ethanol gas is given in Fig.3.



Fig. 3 Absorption graph of pure Ppy for ethanol vapours

The formula for the Sensitivity factor is

$$S = \frac{R_g - R_o}{R_o}$$

Where Rg and Ro are resistances with ethanol vapors and without ethanol vapors (in the air) respectively. All samples were studied for 3 cycles to check their reproducibility and absorption and desorption process. It may be seen from Fig. 4 that, the I vs t plot for the 2nd and 3rd cycles somewhat drift towards the higher current. This may be because desorption maybe not be completed within the stipulated time.

ISSN 2394 - 7780

Volume 8, Issue 2 (III) April - June 2021



Fig. 4 Response of pure Ppy for ethanol vapors

RESPONSE OF PURE PPY TO ETHANOL VAPORS:

Many researchers have reported that polymetric sensors can be used to detect organic vapors. In the present investigation, it was therefore decided to study the response of polypyrrole films with ethanol vapors.

When pure Ppy was exposed to ethanol vapors, the response was instantaneous. The change in the current was noted when ethanol vapors were allowed to come on polypyrrole films. With the applied voltage of 5 volts, the initial current flowing was noted. The ethanol vapors were allowed to be in the chamber for 3min. and the current was noted every 15 seconds. When ethanol vapors come in contact with the sensor, the current increases instantaneously and takes about 120 sec. to saturate at 286 μ A Fig. 4. It was noted that when the flow of the ethanol vapors topped,

Current started decreasing and reached a steady-state value of 2 μ A. after 220 seconds Fig. 3. The experiment was repeated for various percentages of ethanol from 2.5% to 20% and the optimum response found out to be when 5% ethanol was used and repeated for the testing of reproducibility of the response by measuring the change in the current for every 15 sec. for absorption and desorption Fig. 4.

To check the reproducibility of the response, the current was recorded, at a constant voltage, for every 15 seconds when the flow of ethanol vapors was on. The optimum volume of ethanol was used for this purpose. The flow of ethanol vapors was stopped and the desorption was also recorded for the interval of every 10 seconds till the current recovered up to 90 % of its original value. The gas response was recorded continuously for more than one cycle. It may be seen from Fig. 4 that the i - t plot for the 2nd and 3rd cycles somewhat differ from the first cycle. This may be because the time is given for desorption may be not sufficient to remove the impact completely. This may be the reason for the drift in the graph toward a lower value of current in later cycles. The Sensitivity factor was calculated during the present investigation for sensors is 0.99.

CONCLUSION:

Polypyrrole prepared with oxidants like $FeCl_3$ by the chemical oxidative method can be used for the detection of gases like Ethanol vapors. Even though they cannot be obtained in the film form as they are obtained in amorphous nonsoluble powders, the slurry of it shows good pasted on PCB. The response of all these samples for ammonia and ethanol were very fast and sharp, of the order of few seconds as compared to other sensors used for this purpose. The most important part of it is that all these sensors work at room desorption time is also very small, of the order of few seconds. The reproducibility is marvelous. The dopants improved the electrical conductivity of the sensors as seen from various responses.

So the sensors prepared during this investigation were found to be good for sensing gases vapors like ethanol.

REFERENCES :

- 1. S. Borman, J. Anal. Chem. 59,1091 (1987)
- 2. J. Chem. Soc., Faraday Trans. I, 82, 1033 Electrochemical Sensors"
- 3. A. R. Hillman, R. G. Linford, Electrochemical Sci. And Tech. of polymers, Elsevier, 103 291, (1987)
- 4. T.E. Edmonds, "Chem. Sensors" Blackie (1988)

Volume 8, Issue 2 (III) April - June 2021

- 5. J. Janata, "Chem. Sensors" Anal. Chem. 62,33R (1990)
- R. W. Murray "Chem. Sensors and Micro instrumentation" ACS Symposium series 403. Developed from a symposium sponsored by the discussion of Anal. Chem. At the 19th national meeting of the Anal Chem. Soc. Sept. 1988, 25-30
- 7. D. Schuetzpe and R. Hammerle, (1986) Fundamental applications of Chem. Sensors, Ed. ACS Symposium series 309
- 8. K. Cammann, V. Lemke, A. Rohen, J. Sander, H. Wilken, C.B. Winter, "Chem. Sensors and Biosensors Principals and applications." Angewandte Chem. Inter. Ed. In Eng. 30, 516 (1992)
- 9. N. Yamazoe and N. Miura, Chem. Sensors Tech. 4,9,(1992)
- 10. K. Davidson, "Electic Conductive Polymers". Ed. In Chem. 155 (1991)
- 11. G. Biden, "Electro conducting Conjugated polymers: A new sensitive to build up chem. of electrochemical sensors" Sensors and Actuators- B, 16, 45 (1992)
- 12. J. J. Miasik, A. Hooper, B. C. Garrod, J. Faraday Trans. I, 82, 117 (1986)
- 13. J. M. Charlesworth, A. C. Partridge, N. Garrod, J. Phy. Chem. 97, 5418 (1993)
- 14. J. P. Travers and M. Nechtscchem, Synth. Metal. 2 I, 135 (1985)
- 15. D. G. Buerk, "Biosensors, Theory, and Applications" Technomic, Publishing Co. Inc. Lancaster (1993) ure Polypyrrole

STUDY OF SOME FRESHWATER ALGAE FORM HIMACHAL PRADESH, INDIA

R. K. Dwivedi

Bhakt Darshan Govt P.G. College, Jaiharikhal, India

ABSTRACT

The present paper deals with some green algae (Chlorophyceae) collected and identified from the different places of four districts of the state Himachal Pradesh. Total 52 taxa of belonging to Class Chlorophyceae, Order Volvocales, Chlorococcales, Ulotricales, Cladophorales and Oedogoniales have been reported from both lotic and lentic water bodies of the study areas.

Key words: Freshwater algae, Chlorophyceae, Himachal Pradesh, India.

INTRODUCTION

Himachal Pradesh (H.P.) is the northern state of the India lying in Indo-western Himalayan region. The state has been bestowed with rich heritage of freshwater resources in form of rivers, rivulets, lakes which are yet unexplored for freshwater aquatic biodiversity. Freshwater algae are the backbone for primary production in such habitats and support the growth and diversity of other aquatic fauna in different aquifers. The state is the part of important watershed area of the India by providing water to both the Indus and Ganga river systems. Many small rivers, lakes and other small water bodies make the state rich in aquatic biodiversity.

MATERIAL AND METHODS

Random Sampling Technique was used to collect the freshwater algal samples from district Mandi, Hmirpur, Una, and Shimla of Southern Himachal. The forms present in water bodies as epiphyte were collected by squeezing submerged plants and planktonic forms by using planktonic mesh net (size 40 μ m) in the plastic bottles (250ml.). Detailed study of the taxa and microphotography was done with the help of Nikon labophot II microscope at Phycology Research Laboratory, University of Lucknow, Lucknow, India. The algal taxa were identified by standard monographs and journals. The various genera of Chlorophyceae have been systematized according to Fritsch (1935), except order Chlorococcales, which has been followed after Komarek & Fott (1983), order Oedogoniales after Gonzalves (1981) and order Conjugales which has been treated as the order Zygnematales after Smith (1933). Scale bar on photographs are equal to the 10 μ m or otherwise mentioned on it

RESULT AND DISCUSSION

The district wise algal collection sites, date of collection and samples numbers are mentioned in locality table as given below -

S.N.	District	Collection site	Date of collection	Sample number
1.	Una	Saloh pond, Ghaluwal	04/04/2006	HP/UNA/4c
2.	Una	Mubarakpur pond	01/06/2005	HP/UNA/1c
3.	Una	Jaswal Khad	01/06/2005	HP/UNA/2c
4.	Una	Swan river	01/06/2005	HP/UNA/4c
5.	Hamirpur	Kunah Khad, Dindwi	04/06/2005	HP/HAM/12c
6.	Hamirpur	Gasoti Khad	02/06/2005	HP/HAM/7c
7.	Hamirpur	Raai Khad, Dagroh	02/06/2005	HP/HAM/6c
8.	Hamirpur	Taal pond	02/06/2005	HP/HAM/5c
9.	Hamirpur	Byas river, Nadaun	03/06/2005	HP/HAM/9c
10.	Shimla	Kufri Pond, Kufri	25/05/2004	HP/SIM/15b
11.	Mandi	Nalsar Pond	20/05/2004	HP/MAN/4b
12.	Mandi	Jarol Khad	19/05/2004	HP/MAN/2b
13.	Mandi	Suketi Khad	060/4/2006	HP/MAN/6c

Key to the Genera

1.	Cells not mutually compressed	1
1.	Cells in a flat, plate like colony	Gonium (2)
2.	Colony usually symmetric	2
2.	Cells mutually compressed	Pandorina (3)
3.	Colony fewer-celled (16-256)	3

International Journal of Advance and Innovative Research Volume 8, Issue 2 (III) April - June 2021

_

3.	Vegetative cells all of same sizeEudorina (1)
4.	Colonial envelop lamellated4
4.	Cells not so connectedGloeocystis (4)
5.	Colonial envelop wholly or partially confluent
5.	Colonies spherical, few celled Sphaerocystis (5)
6.	Colonial envelop is copious
6.	Cells fusiform or elongate-cylindric Elkatothrix (12)
7.	Solitary or rarely in small aggregates7
7.	Cell wall with fairly long radiating bristles which are not thickened at the base7
7.	Sexual reproduction not known
8.	Cells in a curved or flat plate
8.	Cells in concentric rings, forming discsPediastrum (7)
9.	Cells not radiating from a common center9
9.	Colony a definite, closed net
10.	Cells separated from one another by a deposit of semi-opaque mucilage which forms cruciately arranged bands about the colony
10.	Space between cells dark
11.	Cells ovoid, ellipsoid or setiferous11
11.	Space between cells colorless
12.	Cells invested by a firm sheath (gelatinized mother cell wall)12
12.	Cells slightly curved or reniform Nephrocytium (11)
13.	Cell body not clearly evident, gradually extended into the processes of the angles
13.	Angles of the cells gradually narrowed to form a spine-like tip, or with the apices tipped with minute spines <i>Cerasterias</i> (19)
14.	Colonies of irregularly spherical or indefinite shape14
14.	Colonies usually with cells in several net like aggregates
15.	Cells connected by remains of mother cell wall15
15.	Cells of a colony all alike in shape Dictyosphaerium (14)
16.	Cells not connected by remains of mother cell wall
16.	Cells of a colony of two different shapes Dimorphococcus (21)
17.	Colony neither plate like or net like17
17.	Cells markedly lunate, apices acutely pointedSelenastrum (16)
18.	Cells in a homogenous, thin mucilage; sharply curved, lunate or sickle- shaped
19.	Protoplasts one, sometimes fragmented19
19.	Cell with one pyrenoid, or none Ankistrodesmus (15)
20.	Cells not forming a flat colony20
20.	Cells forming a hollow sphere

ISSN 2394 - 7780

International Journal of Advance and Innovative Research Volume 8, Issue 2 (III) April - June 2021

21. Cells not radiating from a common center
21. Colony a flat or curved plate
22. Cells forming a flat colony
22. Cells always quadrately arrangedCrucigenia (20)
23. Filaments with conspicuous gelatinous sheath
23. Sheath tough, close fitting; cells often not in a single row Cylindrocapsa (23)
24. Akinetes usually present
24. Thallus not encrusted with limePithophora (24)
25. Filaments without a conspicuous sheath
25. Chloroplast reticulate; with oogonia and antheridia
1. <i>Eudorina elegans</i> Ehrenberg (Pl. 3 , fig. 2, Locality table – S.N. 11)
Iyenger, M.O.P. and Desikachary, T.V., 1981, P. 429, fig. 254 (1, 2, 4)
Diameter of single cell is 10 μ m and diameter of colony 60 μ m.
 <i>Gonium pectorale</i> Mueller (Pl. 3, fig. 1, Locality table – S.N. 3)
Triffany, L.H. and Britton, M.E. (1952), (P.16, Pl. 1fig. 12)
Dia. of cell is 8 μ m and dia. of colony is 35.0 μ m.
3. <i>Pandorina morum</i> (Muell.) Bory (Pl. 3, fig. 3, Locality table – S.N. 1)
Prescott, G.W. 1951, P.75, Pl. 1, fig. 23
Iyenger, M.O.P., and Desikachary, T.V., 1981 P. 417-418, fig. 243
Dia. of single cell is 10 µm and dia. of colony 40 µm.
4. <i>Gleocystis ampla</i> (Kuetz.) Lagerheim (Pl. 3, fig. 4, Locality table – S.N. 6)
Prescott, G.W. 1951, P. 84, Pl. 3, fig. 17;
Tiffany, L.H. and Britton, M.E. (1952), Pg.21, Pl. 3, fig. 23
Cell dia 11-13 μm.; Colony dia 90 μm.
 5. Sphaerocystis schroeteri Chodat (Pl. 3, fig. 5, Locality table – S.N. 5)
Prescott, G.W. 1951, Pg. 83, Pl. 3, fig. 6-7
Cell diameter - 15 µm; Colony diameter - 50 µm
 <i>Golenkinia radiata</i> Chodat (Pl. 3, fig. 7, Locality table – S.N. 10)
Phillipose, M.T. (1967) (Fig. 27, Pg.102)
Cell dia 11 \Box m; Length of the bristle - 20 \Box m
 7. Pediastrum angulosum (Ehr.) Meneghini (Pl. 3, fig. 10, Locality table – S.N. 7)
Phillipose, M.T. (1967) (Fig. 39, Pg.118)
Dia. of cell – 10-12 μ m; Dia. of colony – 104 μ m.
8. P. duplex Meyen

Volume 8, Issue 2 (III) April - June 2021

ISSN 2394 - 7780

(Pl. 3, fig. 11, Locality table – S.N. 8) Phillipose, M.T. (1967) (Fig 43b, Pg.12) Diameter of cell – 15 μ m; Diameter of colony – 55 μ m. P. duplex Meyen var. reticulatum Lagerheim 9. (Pl. 3, fig. 13, Locality table – S.N. 5) Dia. of cell - 8 \Box m; Dia. of colony – 42 \Box m. 10. P. ovatum (Ehr.) Braun (Pl. 3, fig. 12, Locality table - S.N. 9) Phillipose, M.T. (1967) (Fig 37g, Pg.115) Diameter of cell – 12 μ m.; diameter of colony – 72 μ m. 11. P. simplex Meyen var. duodenarium (Bailey) Rabenhorst (Pl. 3, fig. 14, Locality table - S.N. 9) Phillipose, M.T. (1967) (Fig 36 d-h, Pg.115) Dia. of cell $-10 \mu m$; Dia. of colony $-75 \mu m$. 12. P. tetras (Ehr.) Ralfs var. tetraodon (Corda) Hansgirg. (Pl. 3, fig. 9, Locality table – S.N. 11) Phillipose, M.T. (1967) (Fig 45g, Pg.129 Dia. of cell $-8 \mu m$; Dia. of colony $-28 \mu m$. 13. Hydrodictyon reticulatum (Linn.) Lagerheim (Pl. 3, fig. 8, Locality table - S.N. 12) Phillipose, M.T. (1967) (Fig 48-49, Pg.134) Width of Cell $-30 \,\mu m$. 14. Gloeotaenium loitlesbergerianum Hansgirg (Pl. 3, fig. 17, Locality table - S.N. 1) Phillipose, M.T. (1967) (Fig 88, Pg.178) Dia. of cell $-20 \mu m$; Dia. of colony $-62 \mu m$. 15. Oocystis elliptica W. West (Pl. 3, fig. 19, Locality table – S.N. 11) Tiffany and Britton (1952) (Pl. 32, fig 318, 12, Pg. 117) Phillipose, M.T. (1967) (Fig 100a, b, Pg.186) Cell 10 µm broad and 11-19 µm long. 16. O. naegeli Braun A. (Pl. 3, fig. 15, Locality table – S.N. 11) Phillipose, M.T. (1967) (Fig 98, Pg.185) Cell 13 µm broad and 15-20 µm long. 17. O. irregularis (Petkof) Printz (Pl. 4, fig. 1, Locality table - S.N. 1) Phillipose, M.T. (1967) (Fig 95, Pg.184) Cell 15 µm broad and 20 µm long. 18. Nephrocytium agardhianum Naegeli

Phillipose, M.T. (1967) (Fig 103, Pg.189)

Volume 8, Issue 2 (III) April - June 2021

Cell 6 µm broad and 20 µm long.

19. *Elkatothrix viridis* (Snow) Printz (Pl. 3, fig. 6, Locality table – S.N. 1)

Prescott, G.W. 1951, P. 93, Pl. 4, fig. 1-2

Phillipose, M.T. (1967) (Fig. 189b, Pg.293)

Length of cell – 22-24 $\mu m;$ width of cell - 8 $\mu m;$ Colony dia. - 50 $\mu m.$

20. *Botryococcus braunii* Kuetzing (Pl. 4, fig. 2, Locality table – S.N. 11)

Philipose, M.T. (1967) (Fig 108a, Pg. 196)

Cell 5µm broad and 10-12µm long; Colony 60 µm in dia.

21. *Dictyosphaerium ehrenbergianum* Naegeli (Pl. 4, fig. 3, Locality table – S.N. 10)

Philipose, M.T. (1967) (Fig 111a, Pg. 201)

Cell 5 µm broad and 7µm long; Colony 65 µm in dia.

22. D. reniforme Bulnheim

(Pl. 4, fig. 4, Locality table – S.N. 1)

Philipose, M.T. (1967) (Fig 113a, Pg. 202)

Cell 2-4 μm broad and 5-8 μm long; Colony 40 μm in dia.

23. *Ankistrodesmus falcatus* (Corda) Ralfs (Pl. 4, fig. 7, Locality table – S.N. 4)

Philipose, M.T. (1967) (Fig 121e, Pg. 211)

Length of cell - 37 µm, widtah of cell - 3 µm.

24. *A. spiralis* (Turner) Lemmermann (Pl. 4, fig. 6, Locality table – S.N. 1)

Philipose, M.T. (1967) (Fig 119a, Pg. 210)

Length of cell - 40 µm, Width of cell - 2 µm.

25. *Selenastrum gracile* **Reinsch** (Pl. 4, fig. 9, Locality table – S.N. 1)

Philipose, M.T. (1967) (Fig 128, Pg. 219)

Long cell - 20 μ m, Lateral cell – 4 μ m.

26. *Kirchneriella lunaris* (Kirchner) Moebius (Pl. 4, fig. 8 Locality table – S.N. 8)

Tiffany and Britton (1952) (Pl. 31, fig 308, Pg. 116)

Dia. of cell – 3-4 μ m.

27. Coelastrum cambricum Archer var. intermedium (Bohlin) West, G. S.

(Pl. 4, fig. 10, Locality table – S.N. 1)

Philipose, M.T. (1967) (Fig 138 a, Pg. 230)

Dia. of cell – 8 $\mu m,$ dia. of colony – 52 $\mu m.$

28. C. microporum Naegeli

(Pl. 4, fig. 11, Locality table - S.N. 1)

Philipose, M.T. (1967) (Fig 135 a,b, Pg. 228)

Dia. of cell – 5 μ m, dia. of colony – 25 μ m.

Volume 8, Issue 2 (III) April - June 2021

29. C. sphaericum Naegeli (Pl. 4, fig. 12 Locality table - S.N. 4) Philipose, M.T. (1967) (Fig 136, Pg. 229) Dia. of cell $-8 \mu m$, dia. of colony $-30 \mu m$. 30. Cerasterias staurastroides West and West (Pl. 3, fig. 16, Locality table - S.N. 1) Prescott G. W. (1961) (Fig.8, Pl. 56; Fig. 20, Pl. 61; Pg. 271) Dia. of cell - 20 µm; with processes 30 µm. 31. Crucigenia tetrapedia (Kirchner) West & West (Pl. 4, fig. 13, Locality table – S.N. 11) Colony diameter - 13 µm. 32. Dimorphococcus lunatus Braun (Pl. 4, fig. 5, Locality table – S.N. 1) Colony 40 µm broad, 60 µm long. 33. Scenedesmus abundans (Kirchner) Chodat (Pl. 5 fig. 3 Locality table – S.N. 8) Philipose, M.T. (1967) (Fig 184c, Pg. 278) Cell 10 µm long, 3 µm broad. 34. S. acuminatus (Lagerheim) Chodat (Pl. 5 fig. 4 Locality table – S.N. 8) Philipose, M.T. (1967) (Fig 161a, Pg. 251) Cell 20 µm long, 4 µm broad. 35. S. armatus (Chodat) Smith (Pl. 5 fig. 2, Locality table - S.N. 3) Philipose, M.T. (1967) (Fig 171b, Pg. 261) Tiffany and Britton (1952) (Pl. 35, fig 353, Pg. 122) Cell 16-18 µm long, 6-8 µm broad. 36. S. bernardii Smith (Pl. 5 fig. 12 Locality table – S.N. 8) Philipose, M.T. (1967) (Fig 162a, Pg. 251) Cell 36 µm long, 6 µm broad. 37. S. bijugatus (Turp.) Kuetzing var. graevenitzii (Bernard) comb. Philipose (Pl. 5 fig. 10, Locality table - S.N. 1) Philipose, M.T. (1967) (Fig 164a, Pg. 254) Cell 20 µm long, 4 µm broad. 38. S. bijugatus (Turp.) Kuetzing forma irregularis Wille (Pl. 5 fig. 9, Locality table – S.N. 12) Philipose, M.T. (1967) (Fig 164m, Pg. 253) Cell 18-20 µm long, 8-10 µm broad. 39. S. denticulatus Lagerheim var. australis Playfair (Pl. 5, fig. 11, Locality table - S.N. 1)

Philipose, M.T. (1967) (Fig 176hm, Pg. 271)

Volume 8, Issue 2 (III) April - June 2021

Cell 25 µm long, 5 µm broad.

40. *S. incrassulatus* **Bohlin** (Pl. 5, fig. 13, Locality table – S.N. 6)

Philipose, M.T. (1967) (Fig 163, Pg. 252)

Length of cell – 21 $\mu m,$ diameter of cell – 9 $\mu m.$

41. S. obliquus (Turpin) Kuetzing

(Pl. 5, fig. 6, Locality table – S.N. 1)

Tiffany and Britton (1952) (Pl. 35, fig 369, Pg. 123)

Cell 22-28 µm long, 6 µm broad.

42. S. opoliensis Rechter

(Pl. 5, fig. 1, Locality table – S.N. 11)

Tiffany and Britton (1952) (Pl. 35, fig 355, Pg. 122)

Cell 20-22 μm long, 5 μm broad.

43. *S. platydiscus* (Smith) Chodat (Pl. 5, fig. 8, Locality table – S.N. 1)

Philipose, M.T. (1967) (Fig 165, Pg. 256)

Length of cell – 12 μ m, diameter of cell – 5 μ m.

44. *S. quadricauda* (**Turp.**) **Breb. var.** *parvus* **Smith** (Pl. 5, fig. 5 Locality table – S.N. 8)

Philipose, M.T. (1967) (Fig 187 f, Pg. 286)

Length of cell $-12 \mu m$, diameter of cell $-5 \mu m$.

45 *S. quadricauda* (**Turp.**) **Breb. var.** *quadrispina* (**Chodat**) **Smith** (Pl. 5, fig. 7, Locality table – S.N. 3)

Tiffany and Britton (1952) (Pl. 35, fig 358 Pg. 122

Cell 13m long,4-5µm broad.

46. *Cylindrocapsa geminella* **Wolle var.** *minor* **Hansgirg**. (Pl. 5 fig. 14, Locality table – S.N. 1)

Tiffany & Britton (1952) (Pl. 5, Fig. 56, Pg. 30)

Length of cell 15-22 \square m, width 12 \square m.

47. *Pithophora varia* Wille (Pl. 5, fig. 16, Locality table – S.N. 2)

Prasad, B.N. & Misra, P.K. (1992) (Pl. 7, fig. 10, Pg. 55)

48. *P. oedogonia* (Montagne) Wittrock (Pl. 5, fig. 15, Locality table – S.N. 2)

Tiffany, L.H. & Britton, M.E. (1952) (Pl. 12, fig. 86, Pg. 48)

Vegetative cells 60 µm broad.

Akinete 260 \Box m long and 90 \Box m broad.

49. *Oedogonium callindrum* **Hoff.** (Pl. 5, fig. 17 Locality table – S.N. 4)

Gonzalves, E. A. (1981) (Fig. 9.510, Pg. 565)

Vegetative cell dia.14 μ m, oosporangia dia.35 μ m, oospore dia 30 μ m broad.

50. O. cardiacum (Hass.) Wittr. var. carbonicum (Wittr.) Hirn.

Volume 8, Issue 2 (III) April - June 2021

(Pl. 5, fig. 20, Locality table – S.N. 11)

Gonzalves, E. A. (1981) (Fig. 9.141E, F, Pg. 262)

Vegetative cell dia.22 µm, oosporangia dia.40 µm, oospore dia 40 µm broad.

51. O. lemmermannii Tiffany

(Pl. 5, fig. 19, Locality table – S.N. 13)

Gonzalves, E. A. (1981) (Fig. 9.159A, Pg. 281)

Oosporangia dia.49 μ m, oospore dia 45 μ m broad, antheridia 4 μ m long, 18 μ m wide.

52. O. multisporum Wood

(Pl. 5, fig. 18, Locality table – S.N. 1)

Gonzalves, E. A. (1981) (Fig. 9.302, A, Pg. 408)

Vegetative cell 18.0-30.0 µm long, 14.0 µm broad.

Antheridia 20 µm long, 10 µm broad.

Out of four districts of the Himachal Pradesh, maximum number of taxa were reported from district Una (26 taxa) followed by Hamirpur (13 taxa), Mandi (11 taxa), and Shimla (2taxa). Among 52 taxa, 14 were reported from running water habitat while remaining 36 were from stagnant water habitats.

ACKNOWLEDGEMENTS

Author is thankful to the Late Prof. P.K. Misra, Phycology lab and Department Head of the Botany, University of Lucknow for the help in identification and facilities and also to the C.S.I.R. New Delhi, for the financial support.

REFERENCES

- 1. Desikachary, T.V. 1972. Notes on Valvocales I. Current Science. 41. 445-447.
- 2. Dwivedi, R.K., Misra, P.K., Shukla, C.P. & Tripathi S.K. 2008. On some Desmids from Southern Himachal Pradesh of Western Himalaya and its foothills. Phytotaxonomy. 8. 83-86.
- 3. Dwivedi, R.K., Shukla, C.P., Misra, P.K., Shukla, S.K., & Seth, M.K. 2009. On some freshwater desmids from Southern Himachal Pradesh of Indo-Western Himalaya. Feddes Repertorium. 123: 3-4. 236-249.
- 4. Dwivedi, R. K. & Mishra, P. K. 2013. On the occurrence of three new taxa of freshwater algae *Lagerheimia* Chodat (Chlorococcales) from Indo-western Himalaya. Phykos. 43 (1). 46-50.
- 5. Dwivedi R.K. & Misra P.K. 2014. On some freshwater algae of district Una, Himachal Pradesh, India. Phytotaxonomy. 14. 103-106.
- 6. Iyenger, M.O.P. & Desikachary, T.V. 1981. Volvocales, I.C.A.R. monograph on algae, New Delhi. pp 1-524
- 7. Jindal, R. & Prajapat, P. 2005. Productivity and Trophic status of Renuka Wetland (Distt. Sirmour, Himachal Pradesh). Indian Journal of Ecology. 32(2). 180-83.
- 8. Jindal, R. & Thakur, R. K. 2012. Hydrobiology and productivity of Kuntbhyog Lake, (District Mandi, Himachal Pradesh), India. International Journal of Environmental Engineering 6(4) 449-59.
- 9. Jindal R., Thakur R.K., Singh U.B., & Ahluwalia A.S., 2014. Phytoplankton dynamics and water quality of Prashar Lake, Himachal Pradesh, India. Sustainability of water quality and Ecology. 3-4. 101-113.
- 10. Jindal R., Thakur R.K., Singh U.B., & Ahluwalia A.S. 2014. Phytoplankton dynamics and species diversity in a shallow eutrophic, natural mid-altitude lake in Himachal Pradesh (India): Role of physicochemical factors. Chemistry and Ecology. 30(4). 328-338.
- 11. Komárek, J. & Fott, B. 1983. Das Phytoplankton des Süsswasers. Stuttgart. Germany. 1-1044.
- 12. Kumar, R., Seth, M. K. & Suseela, M. R. 2012. Chlorophyceae of district Kangra of Himachal Pradesh. Phykos., 42 (2): 35-38.
- 13. Misra, P.K., Seth, M.K., Prakash Jai, Shukla, M. & Dwivedi R.K. 2009. Fresh water algae from Chandra Lake of District Lahaul and Spiti, Himachal Pradesh, India. Indian Hydrobiology. 12: (1). 105-113

Volume 8, Issue 2 (III) April - June 2021

- 14. Misra, P.K., Tripathi, S.K., Prakash, J., & Dwivedi, R.K. 2009. Some Chlorococcalean Algae from Western Uttar Pradesh, India. J. Ind. Bot Soc, 88 (3-4): pp. 19-23.
- 15. Philipose, M.T. 1967. Chlorococcales. I.C.A.R., New Delhi. 1-365.
- 16. Singh. U. B. and Sharma, C. 2014. Microalgal diversity of Sheer Khad (stream): a tributary of Sutlej River, Himachal Pradesh, India. J. Res. Plant Sci., 3(1): 235-41.

INDIAN AGRICULTURE: PRESENT STATUS AND NEED OF SUSTAINABLE DEVELOPMENT

Santosh S. Pharande

Fergusson College (Autonomous), Pune

ABSTRACT

This research article gives a brief overview on the origins of agriculture and the history of Indian agriculture to date. This article discusses the nature of agriculture in ancient times, green revolution, the challenges facing agriculture in today's situation and need of sustaiable methods for agricultural development of India. Importantly, this research article sets out how the answers to agricultural questions can be found in new scientific alternatives.

Keywords: Agriculture, Green Revolution, Sustaianable Development, Productivity.

1. INTRODUCTION

The discovery of agriculture was an important milestone in human history for finding food in one place rather than hunting and roaming for food. In a sense, it was the beginning of a stable human life. These discoveries have had far-reaching social, cultural and economic implications for human life. He came up with the technique of agricultural food production after realizing that nutritious seeds can be sown in the second year season by retaining them and how much more seeds can be collected after harvesting or harvesting from a single seed tray. Agriculture was in its infancy in the early days. Tillage, sowing and other activities were done by hand. Later, farming started with the help of cattle.

In the early days, some types of grasses, two types of wheat, emmer and einkorn, barley grains and some lentils like lentils were discovered. They were planted and used as food. Along with this, lentils and peas were also discovered in this region. After the discovery of animal husbandry (goat and sheep) in this region, dairy products were also included in the dietFrom this region of the Middle East, agriculture gradually spread to Egypt in North Africa, countries in the Mediterranean region, other countries in Asia, and Europe. It is believed that this method of farming reached India after about 3500 years after the discovery in the Middle East. This means that Indian agriculture has a history of at least 6500 years. According to Russian botanist Nikolai Vavilov, there are eight major independent origins of crops in the world The Indo-Myanmar region (excluding the northwestern part of India) is one of them. The 117 plants that Vavilov recorded were cultivated in the region, including rice, tur, green gram, urad, gram, and chawli; Vegetables like eggplant, radish, cucumber; Fruit crops like Mango, Chinch, Orange, Lemon and also important crops like Sugarcane, Cotton, Sesame, Safflower, Jute, Hemp, Black Mire, Cinnamon, Blue.

2. THE NATURE OF ANCIENT AGRICULTURE IN INDIA

Indian Agriculture 1. Use of cut seeds adapted to local conditions 2. Maintaining soil health and 3. There are three main bases for agricultural biodiversity (especially of crops). It is on this strong foundation that Indian agriculture has survived for the last six and a half thousand years. The villagers were aware of the need to conserve other natural resources - such as water, soil and forests - and had a tradition of doing so in order to sustain the sustainability of agriculture. The villagers also had the responsibility to take care of the 'village forest' as they knew the connection between forests for agricultural production. In South India (also in East Vidarbha in Maharashtra) village level lakes were maintained and flood water was provided for agriculture. Every summer, after the end of the season, sludge was removed from the pond (and the fertile soil was used in the field) or repaired. In places where only dryland farming could take place, there was a method of retaining soil moisture by erecting tree walls around the fields, in a way increasing the air humidity (microclimate). There was also the science of what crops to grow in such arid soils as well as in low rainfall areas.

Crop rotation and use of mixed cropping system was empirical. That is why the productivity of agriculture was very high till the time when the British came to this country and interfered in the agricultural system. Dr. The historian Dharmapal has given the figures of rice and wheat production of that period. For example, wheat production in Allahabad district is 4 tonnes per hectare and paddy production in Madras Presidency is 6 tonnes per hectare. There was a social system to overcome the drought years. It had a grain storage system at the village level that would help in times of 'drinking' crisis. It was also the practice of the rulers to provide seeds to the farmers during the drought years and to provide food to the poor needy people by removing the drought works. That is why in the nearly 2,000 years before the beginning of the British rule, 22 major famines hit the country the record of mass casualties does not appear in our history.

Volume 8, Issue 2 (III) April - June 2021

3. THE TIME OF GREEN REVOLUTION

After India gained independence, the rulers faced different challenges in terms of agricultural policy. Not only was there a shortage of food for the growing population, but the droughts that followed in the years following independence were exacerbated. Against this background, by encouraging the construction of dams in the early days and increasing the irrigation facilities from them, by expanding the foundation of agricultural education, Efforts were made by the Department of Agriculture to increase grain production by encouraging the production of organic manure in rural areas with the help of extension programs to improve agriculture in the villages, but these schemes were slow to succeed and the challenges were severe (according to one study. The post-Green Revolution period was higher than the annual rate of food growth Therefore, there is an opinion that even if the Green Revolution had not taken place, this agricultural development policy would have led to a comprehensive increase in foodgrains which seems to have become more isolated during the Green Revolution). With our own government in power, expectations from the people's government were rising. Although our country has a policy of non-alignment in world politics, it does not produce enough food to feed its people during times of drought. Powerful nations, such as the United States, had to beg for food aid on their own terms. This was an insult to the newly awakened Indian identity after independence. As a solution to this, in the mid-sixties of the last century, the central government adopted a policy of adopting the technology of 'Green Revolution' to make the country self-sufficient in food production.

The 'Green Revolution' started with two important cereals, first wheat and then rice. This technology was later adopted in the case of other crops as well. The widespread adoption of this technology has undoubtedly led to a huge increase in foodgrain production in India in the ensuing period. Grain production, which was around 5.2 crore metric tonnes during 1950, reached 26.3 crore metric tonnes in 2013. In 2013, in the country's grain warehouses food reserves for disasters have gone up to 6 crore metric tonnes. So far we have been able to produce enough grain to meet the growing population. We have also been able to overcome natural disasters like droughts and floods in the post-Green Revolution period due to the country's reserves of food. Not only that, after independence, our country, which was once a food importer, started exporting it for some time.

Therefore, the success of the Green Revolution in this regard is beyond dispute. But the side effects of this technology have also become more pronounced in recent times. They are of three types namely economic, social and environmental. Although the crop yield initially increased for about 20-25 years, then the yield per hectare started declining. We continued to supply chemical fertilizers to the crops with only three types of nutrients - Nitrogen, Phosphorus and Potash However, the decline was due to lack of other nutrients required by the crop, as well as inadequate supply of organic manure to the soil.

Increased supply of chemical fertilizers in the field to maintain the level of production and consequently increased the use of pesticides. In the meanwhile, the prices of all these external inputs also went up sharply. As a result, overall capital expenditure on agriculture increased and production declined. However, the prices of agricultural commodities have not increased much. Since most of the dryland agriculture in India is dependent on rain water, it has to bear the brunt of the monsoon. Agriculture has shifted from a variety of food crops to a single crop of cash crops such as cotton and soybeans. This reduced the safety of having multiple crops in multiple cropping systems due to weather fluctuations. All of this inevitably led to a decline in agricultural profits and an increase in indebtedness. Farmers who are frustrated by not being able to repay their loans on time end up committing suicide. According to government figures, 2,84,696 farmers committed suicide in India during the 18 years from 1995 to 2013, and one study found that one farmer committed suicide every half hour. This is a grim picture of the plight of Indian agriculture.

Although the Green Revolution has led to a significant increase in the production of wheat and rice, the foodgrains have been in short supply due to lack of targets for pulses and edible oilseeds. In addition, the market prices of these foods as well as vegetables and fruits are unaffordable to the general public, so much less food is consumed than required from their diet. This is why malnutrition is so prevalent in our country. 70% of women and children in our country are victims of malnutrition. For example, 42% of children in the country are underweight, 58% of children under the age of two appear to have stunted growth, and 75% of children under 5, 51% of women between the ages of 15 and 59 and 87% of pregnant women suffer from anemia. This means that even though the country seems to be self-sufficient in wheat and rice production, our agricultural management still lags far behind in providing nutritious food to the people. In fact, there seems to be a kind of stagnation in wheat and rice production as well. This is because the annual growth rate of population growth and the annual growth rate of grain production do not match at present and this challenge is likely to become more difficult in the future.

In addition, soil erosion due to the use of this technology, deep groundwater table due to excessive water depletion, salinity of the soil, loss of natural fertility due to depletion of organic carbon in the soil, soil and water pollution due to excessive use of chemicals, toxic food chain, There are many questions about the health effects of pollution. Punjab, once a leader in the use of 'Green Revolution' technology and in terms of grain production, is today being re-identified as the 'Cancer State of India'. This is because excessive use of agricultural chemicals has poisoned the drinking water and this has led to an increase in the number of cancer

4. THE REAL PRODUCTIVITY OF SUSTAINABLE AGRICULTURE

As the world's population continues to grow, the important question is whether enough food can be produced to feed this growing population. Therefore, it is often questioned whether organic farming can actually yield more than chemical farming. Some global studies have been published in this regard. A report by scientist Jules Pretty was published in 2006. It reviewed 286 projects implemented in 57 countries around the world. The project involved 1.2 crore smallholder farmers who had shifted from chemical farming to sustainable agriculture and had 3.7 crore hectares of arable land under cultivation. This is the first study on such a large scale in the world and now compared to chemical farming. Although this includes many crops, the combined productivity of all those crops was found to be 79 per cent higher than that of chemical farming. In addition, the efficiency of water and nutrient utilization has increased significantly.

A 2009 report by the United Nations found that 114 organic farming projects had been implemented in 24 countries in Africa. It found that crop productivity had almost doubled compared to the chemical method. It also showed an increase in soil fertility, water holding capacity and crop drought resistance. Such studies are still rare in India. But under the guidance of the present author, Dharamitra Sanstha in Wardha spread sustainable agriculture among about 750 small dryland farmers in Yavatmal district between 2000 and 2008. It discouraged the farmers from adopting the perennial method on at least one acre of their farm and asked them to continue the chemical method of cultivation in the remaining area for some time. Later, when the benefits of sustainable agriculture became apparent to the farmers, the method reached about three acres per farmer. A comparative study of sustainable and chemical farming practices on their farms also showed that the level of crop production in sustainable agriculture came to the same level after a period of 3 years. Although the production of crops like cotton declined slightly in the first two years, the profit from the first year was higher than that of chemical farming due to savings in the purchase cost of external inputs.

Cuba is the only country in the world to have adopted a national policy on sustainable agriculture. After the collapse of Soviet Russia, the supply of cheap petroleum from Russia to Cuba was cut off. Petroleum products are used to make chemical fertilizers and pesticides. After struggling for some time, Cuba adopted the organic way of sustainable agriculture, and today the program has been very successful in terms of food production. Cuba's experience is a lesson for a country like India, which imports large quantities of petroleum and spends a lot of foreign exchange on it.

5. CONCLUSION

patients in rural Punjab.

In the future, there will be a massive expansion of organic farming in the world for both dual environmental and economic purposes. Given the large number of young people in the country, it will be more convenient to attract this class to the agricultural sector and participate in the development process, to make a strategic move towards a second green revolution.

Discussions so far have shown that sustainable farming with the help of nature-friendly techniques can help us reach the production level we need. This method also has a scientific basis. Also, since this method is less costly, it is more useful for the majority of resource deprived farmers.

The discussion in the present article was mainly done on crop production in agriculture. Other issues such as commodity prices, the impact of national and international agricultural policies on agriculture, the mindset of farmers and consumers have not been touched upon by the writing limit. But these issues are also important in the study of agriculture.

REFERENCES

- 1. Chandler Green, United Nation Foundation, June 22, 2018
- 2. https://www.sduhealth.org.uk/about-us/why-its-important.aspx
- 3. PratapSrivastavaa,RishikeshSingh,bSachchidan and TripathicAkhilesh, SinghRaghubanshib, Ecological Indicators Elsever, Volume 67, August 2016, Pages 611-622

Volume 8, Issue 2 (III) April - June 2021

- 4. Bheemabai S. Mulage "History of Agriculture System in India: ALegal Perspective" International Journal of Humanities Social Sciences and Education (IJHSSE)Volume 4, Issue 7, July2017, PP 25-30.
- 5. Nanwal R K Farming System and Sustainable Agriculture, New India Publishing Agency- Nipa, 2019
- 6. Ben Falk, The Resilient Farm and Homestead: An Innovative Permaculture and Whole Systems-Illustrated, 9 July 2013.
- 7. Sujit Kumar Dutta , Kiyasetuo Vizo, Sustainable Agricultural Development in Nagaland Hardcover 1 January 2016.

CLIMATE CHANGE - A PRAGMATIC APPROACH

Dr. Nutan. P. Madiwal

I/C Principal, SVKM's Pravin Gandhi of College of Law, Mumbai, (Affiliated to University of Mumbai)

ABSTRACT

Global concern for climate change and its impact has made humans realise that they need to work towards sustainable development. UNESCO, a special agency of United Nations has introduced education for sustainable development to mitigate climate change. UNESCO with its focus on` Changing minds not the climate' has introduced environmental related issues in the school curricula and other training programs to create public awareness about sustainable development. The paper attempts to revisit the curricula as there is a gap between the input and output, that is, difference in the mind set of young people. Use of narratives of women environmentalist can inspire young mind to engage in activities related to environment protection and conservation. Why women environmentalist? Women play a significant role in the lives of kids, teenagers and adults. Research studies indicate that narratives impact the brain and can bring about a paradigm shift .The narratives of the women environmentalist will definitely inspire young minds. A common lesson to be discerned from the narratives and Nature is encapsulated in the letter D- duty, devotion, discrimination, determination and discipline. The success of this narrative tool is subject to the type of narrator/ narration and its content and its delivery. [Climate change, education, women environmentalist, narrative]

The global concern for climate change has initiated changes policies and laws. Over the years the focus has shifted from exploiting Nature to protecting Nature for now and for future. All human effort is focused on sustainable development, eco- social competence and education related to environmental issues. Education is an essential element of the global response to deal with *climate change*. *Undoubtedly* Climate change education helps in developing a kind of sensitivity in the minds of the young people of different UN member states to cope with the adverse impact of global warming and make a transition to green economies. Against this background UNESCO, the specialised agency of the UN, committed to contribute to peace and security in the world by promoting collaboration among nations through education, science, culture and communication, has come up with the ESD (Education for Sustainable development), promoting climate change education.

In 2014 UNESCO launched the Global Action Program on Education for Sustainable Development. (ESD).It also promotes climatic change education and public awareness through its various programs.

It is the collective responsibility of the people of the world to pay attention to the preventive measures that are required to address the growing climate risks .The international community has tried to bring about a paradigm shift since 1992. The effort to develop new green pragmatic approaches, to encourage citizens to participate in activities to protect environment and create awareness. UNESCO realised the importance of education in transforming young minds and helped to introduce sustainable development, environmental related issues as a part of school curricula. A few of these need to be mentioned:

United Nation Framework Convention on Climate Change

- 1. Article 6 emphasis need to develop and implement public education and awareness about climatic change and its effect
- 2. COP in 2014 adopted Lima Mi declaration on education which calls for climatic change education in school curricula
- 3. Article 12 of Paris agreement of climatic change signed in 2015, states that parties shall cooperate in taking measures to evaluate climatic change education, training practices, public participation, public access to information.
- 4. Sustainable Development Education goals as mentioned in agenda 2030 explicitly recognises a need to promote the acquisition of knowledge and skill related to sustainable development.
- 5. It calls for countries to improve awareness and institutional capacity on climatic change mitigation.

UNESCO has brought together all its activities related to sustainable development under one banner – changing minds not the climate – a collective responsibility of everyone.

"Changing Minds" because the need of the hour is change, in thinking and values, human habit of consumption, waste generation a use of technology. It also felt the need to incorporate ethical principles along
with scientific understanding. In November 2017, UNESCO adopted a declaration of ethical principles in relation to climate change. Any change is possible if there is commitment. Commitment to a cause implies a strong set of values. Scientific knowledge and political will can bring about change if it has a strong foundation of ethics. UNESCO mentions ethical principles applicable to all members to ensure that nations initiate the required actions based on these ethical principles. The six main principles that will help nation states to take appropriate policy decision to mitigate the adverse effects of climate change are:

- 1. Prevention of harm
- 2. Precautionary approach
- 3. Equity and Justice
- 4. Sustainable Development
- 5. Solidarity
- 6. Scientific knowledge and integrity in decision making.

CLIMATE CHANGE EDUCATION

Education is a powerful tool to initiate change. It enables to individuals to acquire skill and knowledge for living as well as for life. Education can also help in acquiring socio-economic competency for more sustainable societies. The fundamental ethical principles of solidarity, justice and equality can easily be transmitted to future generation through formal and non-formal instruction. UNESCO has taken initiatives to collaborate and launch different innovative programs focusing on technical and vocational education and training.

In 2017, UNESCO and UNFCE, published a book titled 'Action for Climate Empowerment: Guidelines for Accelerating Solutions through Education Training and Public Awareness'. The objective of the book was to bring about behavioural change and a shift towards eco responsible society.

This paper attempts to revisit school curricula and educational program as provided by UNESCO. Though detailed information on environment and issues related to it are imparted in schools/colleges the desired result is not visible. Green initiatives are undertaken but are short lived. A curricula that provides information and skills is not sufficient to mitigate climatic hazard. Along with technological and scientific know-how, it is important to understand the interconnectivity between all living beings and nature. Irrespective of the views about the origin of the world and nature, the harmony, balance and peace is visible in the multi-faceted world. The balance in nature is revealed in the bio diversity, the functioning of five elements - earth, water, fire, air and sky (panch mahabhuta) and the interdependency of the varied species in the ecosystem.

The lessons from nature may be best encapsulate in the letter D. The letter D stands for Duty, Discrimination, Determination, Discipline and Devotion. The Five Ds are interlinked and are discerned from nature and the manner it functions. The laws of nature and uniformity in nature convey that the five D are integral to life. Each of these are essential for sustainable development. To inculcate the five Ds in young minds, we need to revisit the school curricula. Knowledge without skill is of no use and skills without knowledge is no value.

The method to achieve the balance of the two is a challenge. It is necessary to explore innovative techniques to ignite young minds to take action, action to protect environment for now and future.

It is here that narratives/storytelling/role-plays will play significant role in igniting young minds. Story telling is natural to human beings, the narratives give purpose and meaning to human life, actions and identity. Stories serve a number of purposes like

- i] Persuading the audience to participate in the narration,
- ii] Evaluating past experiences,
- iii] Identifying with the characters etc.

Michael Hefferman in his article, 'The Power of Storytelling and how it affects Your Brain' states that narratives activate the auditory cortex of the brain and initiate action and change. Pamela Ruthledge is of the opinion that stories are timeless and connect people to their larger self and universal truth. People empathise and connect with other people. Narratives transform lives and initiate action. Therefore, if narratives of women environmentalists are shared, these will change minds and thereby the generations. To the question why women narratives? The answer is that women play a crucial and major role in the lives of children, teenagers and adults. A peep into history of women environmentalist reveals their passion, devotion, dedication, determination,

Volume 8, Issue 2 (III) April - June 2021

discipline and duty towards their mission /goal that is, safeguarding environment.

NARRATIVES OF WOMEN ENVIRONMENTALIST

The pages of history provide enough evidence to show that as early as 1850 onwards women have fought for various rights and for protection of environment. Some of these change makers have contributed to conservation of forests, animal and bird species, water and its purity, water conservation, land filling with plastic etc.

Introduction of narrative in the curricula will motivate young people and change mind set. Inspiration from lives of personalities who have contributed to the well- being of people, nature etc. can initiate action .The life story of every environmentalist seem to have inspired a member of the next generation. International woman's day was celebrated by remembering some of them.

A few names are mentioned taking into consideration the area of work as they have contributed to different aspects of Nature. It is also interesting to note that socio-economic conditions of some the change makers was not conducive nor encouraging to take action for something beyond the self, for others and Nature. The paper does not delve in detail with the lives of the environmentalist as it is beyond the scope of the paper. A brief reference has been made to their work.

- 1. Anna Botsford Comstock (1854- 1930) developed appreciation for the natural world after marriage. She along with her husband observed and studied insects etc. On completion of her graduation, she became the first female professor at Cornell University. She took science from the class room to the outside world. She is known for her work `the Handbook of Nature Studies' which is still considered as textbook.
- 2. Kate Sessions (1857-1940): She is known as the Mother of Balboa Park. The first woman graduate from the University of California with a science degree. When she moved to San Diego, she noticed that the land is a dry land with no plant life. She started her career as a horticulturalist in 1885 and took the initiative of arranging 30 acres of land and planting 100 trees in the barren park. Gradually the number of trees planted were 300 in a year. Her gardens and parks are visible even today.
- 3. Rosalie Barrow Edge (1877-1962): Her interest in bird watching since 1920 and her observations about the pathetic conditions of birds specially eagles led to the establishment Emergency Conservation Committee to protect birds and animals of various species in the year 1929.In1934, she bought the property to put an end to the shooting of hawks and eagles on the ridges in the Appalachian Mountains. Her work laid the foundation for another research project in 1960 taken up Rachel Carson on the impact of DDT on living beings.
- 4. Marjory Stoneman Douglas (1890-1998): A journalist by profession but a keen observer of Nature has contributed Florida's clean water. In 1915, she had come to Florida to help her father in his new business in journalism. Later she took up the fight against protecting environment. Her active participation in protecting Everglades from contamination and reclamation of marshy land for development is still remembered. Her influence has been best described in the words of the Governor of Florida, "She was not just a pioneer of environmental movement, she was a prophet calling out to us to save the environment for our children and grandchildren".
- 5. Rachel Carson (1907 1964): A marine biologist famous for her book 'Silent Spring', fought against the indiscriminate use of synthetic pesticides. She stood against the chemical industry despite her personal battle against breast cancer that was out pacing her treatments. Her book Silent Spring is considered as one of the most influential work of non-fiction.
- 6. Sylvia Earle (1935): In 1998, the Time magazine called her the Hero of the Planet. She is an American Biologist and Oceanographer who stood for protecting the oceans. In 2009, with the TED prize money she established her non-profit organization, mission blue for creating awareness about the ecological importance of the ocean which she calls "The Blue Heart of the Planet".
- 7. Wangari Maathai (1940 2011): She was one of the 300 Kenyan students selected for Airlift Africa programme. This gave her an opportunity to study in United States. After completing her Master Degree in Biology she returned to Kenya with a new perspective on two issues , one was environmental damage and the other was women's right. She founded the green belt movement by teaching women how to plant new trees in deforested areas and sustainably draw income from the land. In 2004, she was the first African women to receive the Nobel Prize, an award for environmental conservation and advancement of women's right.
- 8. Lois Gebbs (1951): Her life is a story of personal impact in inspiring national activism. Her journey began

ISSN 2394 - 7780

Volume 8, Issue 2 (III) April - June 2021

as a mother in a small suburban locality of Love Canal.

She discovered that the entire neighbourhood was built on top of the toxic waste site. Fearing the health of her son and other kids of Love Canal, she launched a campaign by creating petitions and knocking on doors of her neighbours to create the Love Canal home owners association. After years of grass root activism she was able to draw the attention of the state department of health. She was able to initiate a program to clean up contaminated sites like Love Canal across the country. She is the founder director of the Centre for Health, Environment and Justice.

9. Vandana Shiya (1952): A well-known eco feminist, a scientist and a writer. She established Bija Vidyapeeth, an international college for sustainable living in collaboration with United Kingdom's Schumacher College. In 1991, she started a national movement, Navadanya with the mission to protect diversity and integrity of living resources, especially native seed, the promotion of organic farming and fare trade. Her campaigns focused on issues like intellectual property right, biotechnology, bioethics and genetic engineering. Her famous lines are "You are not Atlas carrying the world on your shoulder. It is good to remember that the Planet is carrying you." The list of Environmentalist starts from an era when public awareness about the environment and its conservation was less known. Social media was not available but their action spoke and inspired other women to join hands with her in the mission. These are women who have contributed to the environmental movement since late 19th century onwards. Some of the women have been jailed, murdered, excluded from working towards environmental progress yet that did not give up. These women are a source of inspiration for others, they ignite the minds with their passion for the better world. The five `D` are not spoken out but their actions speak of their devotion for the cause of protecting, conserving and nurturing environment, that is the goal. Their determination and dedication is inferred from their commitment to the cause, duty towards oneself and the other was their passion of life. Report of the progress of the various programs undertaken and initiated by UNESCO lists the achievements of various program. It also points out the gap in education. There is a need to change mind set, ignite minds to accelerate the pace of work. Research on role of narrative in impacting the brain, emotional development and holistic development indicate that it is a very powerful tool to translate thought into action. What is required is the devotion, dedication, discipline and determination on the part of the stakeholders. The only vision and mission is sustainable development as the 'world is just not your or mine, it is ours'. Though, we are many, the breath is one. Limitation of the research paper is that there is no specific study on narratives of environmentalists and its impact. The type of narration and the narrator also plays a very significant role in effective communication. Research on narration and type of narration is beyond the scope of the paper.

REFERENCES:

- 1. Climate Change Education UNESCO en.unesco.org > education-sustainable-development > cce
- 2. The National Strategies □ Early Years Communication, Language and Literacy Essential Knowledge 00159-2008EPD-01 © Crown copyright 2008. https://www.yorksj.ac.uk/media/content
- 3. Paul J. Zak, Ph.D. (February 2, 2015) Why Inspiring Stories Make Us React: The Neuroscience of Narrative. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4445577/ 4. https://greenpop.org/10-woman-environmentalists-you-should-know-about/ 5. https://www.greenbeltmovement.org/wangari-maathai
- 6. https://en.unesco.org/partnerships/partnering/education-sustainable-development https://www.amightygirl.com/blog?p=11863

7.

UTILIZATION OF FLY ASH IN INDUSTRIAL APPLICATIONS FOR CONTROLLING ENVIRONMENTAL POLLUTION

M. S. Jog^{1*}, H.K.Chitte², D. M. Nerkar³ and Gitesh G. Padhye⁴
 ¹Kirti M. Doongursee College, Dadar (West), Mumbai, India
 ²Satish Pradhan Dyansadhana College, Thane (West), India,
 ³Sathaye College, Dixit Road, Vile Parle (East), Mumbai, India
 ⁴Thakur College of Science and Commerce, Kandivali (East) Mumbai, India

ABSTRACT

Ash produced in small dark flecks by the burning of powdered coal or other materials and carried into the air is commonly known as fly ash, chemical composition of Fly ash particles contains silica, alumina, iron oxides, and alkaline earth elements along with trace amounts of toxic heavy metals. The annual production of fly ash in India is estimated to be around 300 million tonnes in 2022. Already 65,000 acres of land is used as ash ponds -- the land where fly ash is dumped by thermal power plants. Global energy demand is ever increasing and it is set to increase by almost 50% in the period 2016 to 2040. Much of this growth will continue to be concentrated in the developing world, primarily China and India, like industrialization, population growth, and the unprecedented expansion of the middle class will increasse the need for energy in general and coal. The Indian coal is of low grade having a high ash content of the order of 30 - 45% producing a large quantity of fly ash at coal/lignite-based thermal power stations in the country. Though it has effects on the environment the Fly ash can be also useful in various industries and utilization is equally important. This paper explains the utilization of Fly ash in the Building Industry, Agriculture, Floriculture, etc.

Keywords: Fly ash, Chemical composition, utilization of fly ash, effects on the environment

INTRODUCTION:

With increasing population and industrial growth, the power demand has increased many folds all over the world. The current share of energy production from coal-based thermal power plants in India is around 76%. When coal is burnt in boilers, minute particles of ash, commonly known as fly ash, are produced as a byproduct. This is collected using electrostatic precipitators or particle filters and then the flue gases are released from the chimneys. Fly ash particles contain silica, alumina, iron oxides, and alkaline earth elements along with trace amounts of toxic heavy metals like arsenic, lead, mercury, cobalt, and copper [1]. In recent years, the maintenance of ecological balance and a pristine environment is considered to be of utmost importance. Minute particles of fly ash, being light and airborne, can cause serious environmental problems such as pollution of groundwater and air. Being very minute, fly ash tends to remain airborne for a very long duration of time which lead to serious health problems as the airborne ash can enter the body. It can irritate skin, nose, eye, throat, and respiratory tract. Inhaling fly ash dust containing crystalline silica can result in bronchitis and lung cancer. Disposal of slurry in lagoons/ponds can breed harmful insects such as mosquitoes. The annual production of fly ash in India is estimated to be around 225 million tons in 2017. Hence steps have to be taken for the disposal/storage/utilization of large quantities of fly ash produced every year. Enough care has to be taken to product human, wildlife and environment. In this review, the various means of the utilization of fly ash in construction, brick industry, and agriculture are described along with the latest development in this area.

Chemical composition: The color of fly ash particles is either tan or grey depending on their lime/ iron content. Fly ash particles are predominantly spherical with sizes ranging between 0.5-100 μ . They consist of metals like silica, alumina, iron oxides, calcium, and magnesium, and toxic heavy metals like lead, arsenic, cobalt, and copper. The composition of fly ash will depend on the type of coal burnt in a plant, combustion conditions, and the type of collecting devices. The major component of fly ash is oxides of Si, Al, Fe, Ca, and Mg (95-99%) [2]. Generally, the minor constituents are Ti, Na, K, and S along with trace amounts of As, Hg, Cr, Ni, V, Pb, Zn. There are two class of Fly ash, class C and Class F.

When old anthracite and bituminous coal are burnt, Class F fly ash is produced. This fly ash is pozzolanic and contains a minor quantity of lime. To produce cement type of compound, Class F fly ash requires agents like Portland cement, quicklime, or hydrated lime; this is mixed with water to produce the compound. Further, when a chemical activator such as sodium silicate is added to Class F ash, a geopolymer can be formed. When young lignite or bituminous coal is burnt, the fly ash produced is called Class C. This has pozzolanic as well as self-cementing properties. In the presence of water, this hardens and gets stronger with time. This ash generally contains a higher amount of lime (> 20%). It may be noted that, unlike Class F, Class C fly ash does not require an activator to form a cement compound. Sulfate, as well as alkali content, is usually more in this fly ash.

Disposal of fly ash: In the last century, fly ash was generally released into the atmosphere; but air pollution control standards during the last few decades demand that it should be captured before release by pollution control equipment. Nowadays the fly ash is disposed of in the dry or wet form. The common practice is to dump fly ash over wastelands. However, to prevent fly ash particles from being carried out in the air, it is necessary to sprinkle water over the dumping area. These sites need to be lined; otherwise, this can lead to seepage, contamination of groundwater and soil. Dry ash can be transported in trucks/conveyor belts to storage sites. As an alternate method, fly ash is mixed with water and the slurry is transported through pipes and disposed of in ponds or dumping sites.

The utilization of fly ash: Continuous research efforts are being done to convert this waste into wealth [3]. Fly ash is rich in oxides of silicon and aluminum and hence can be used as the raw material in different industries. In developed countries, more than 80% of fly ash is used in road construction, manufacture of bricks, concrete blocks, land filling, ceramics, agriculture, and dam construction. In India, in states like Delhi, Gujarat, Haryana, Jharkhand, and Punjab, about 50% of fly ash is used in the production of cement, asbestos cement, concrete, bricks, tiles, blocks, and also in land development, reclamation of the coal mine. In 2016-17, about 170 million tonne fly ash was produced and 63% of this was used in the above applications [4]. The details of these applications are briefly described below.

(i) **Building industry:** Fly ash F with good Si content is pozzolanic and is ready mixed with concrete and used as a green building material. Precast fly ash concrete can be used for slabs, doors, window frames, and also in flooring and roofing units. When fly ash is mixed with clay, light bricks are made. These bricks find use as building materials. Lime fly ash bricks have high strength with lime as a binder and gypsum as a catalyst. They are mixed in the high-speed mixer; to the slurry with a foaming agent is added. The aerated slurry is set in steel molds and the bricks are removed and autoclaved in steam. This is very good for wall block and floor slabs. Wherever stones are costly, sintered fly ash-light weight concrete can be used for buildings. Portland pozzolanic cement is prepared by partly replacing cement with fly ash (15-30%) reducing the overall cost of the material. This is the major application of fly ash in the U.S.A. In India, fly ash is used for part replacement of cement in mortar and concrete. The Indian Institute of Technology, Delhi has taken taking in this use. The use of fly ash in the construction of roads and embankments has been demonstrated elsewhere and is now gaining acceptance in our country. NTPC [5] (National Thermal Power Corporation) has set up fly ash brick manufacturing plants.

(ii) Mines backfills: By filling mines with fly ash, a large quantity of sand can be saved. Coal recovery also can be enhanced.

(iii) Road construction: a layer of compact pond fly ash can be used at the intersection of sub-grade soil. The addition of lime fly ash to soil decreases dry density and the strength of soil shows improvement.

(ii)Agriculture: Indian fly ash being alkaline, improves soil fertility. Fly ash composition is close to soil composition except for the elements carbon and nitrogen. Being porous, fly ash can give micronutrients (K, Ba, Zn, Fe, Cu, Ca) to the soil, improving its fertility [6]. When porous globules of fly ash are buried around a crop, they retain water for a long time leading to an increase in crop yield (10-40%). Fly ash and chemical fertilizers mixed in equal proportions were found to improve the yield of grain and fodder [7]. If the soil is acidic, fly ash can increase its pH. Along with bio-waste, fly ash supplemented as fertilizer, resulting in increased crop yield. Though fly ash amendment of soil can lead to accumulation of heavy elements like As, Se, etc., research shows that only marginal variation in their levels are observed and hence the technology is safe for humans[8].

Floriculture: Research work in TERI [9,10] showed that by adding suitable organic matter and symbiotic fungi, fly ash dumps can be reclaimed, suggesting the commercial viability of such activities. They have successfully reclaimed a part of an ash pond at the Badarpur Thermal Power Station by introducing a mycorrhizal fungi-based organic bio-fertilizer. As the fungus germinates, it sustains on the partner plant and quickly spreads to the roots and beyond. It improves the plant's water and nutrient uptake, helps in the development of roots and soil-binding, stores carbohydrates and oils for use when needed, protects the plants from soil-borne diseases, and detoxifies contaminated soils[11]. This helps in keeping both air and water pollution under control. It can also help to revive wastelands and save a large quantity of precious water from going down the fly ash slurries. Many flower plants and commercially valuable trees like poplar, Sheesham, and eucalyptus are now grown at the demonstration site of the power station.

The use of fly ash in agricultural applications has been demonstrated and is being adopted by many farmers.

Wood substitute: Fly ash as filler in Jute fiber reinforced hybrid composite results in a product, which substitutes for wood used for doors, windows, partitions, ceiling, and furniture. They are durable and cost-effective.

Distemper: The base material white cement is substituted partially with fly ash, resulting in cost reduction. In the Neyveli power plant, interior surfaces of buildings have been coated with this composite.

Asphalt concrete: Fly ash can be used as a cost-effective mineral filler in hot mix asphalt (HMA) paving applications [12], reducing the amount of asphalt drain down in the mix during construction. Fly ash is hydrophobic, reducing the potential for asphalt stripping; the presence of lime in some fly ashes also reduces stripping.

Adsorbents for pollutant gases/dyes in waste streams: In place of commercial activated carbon or zeolites, fly ash can be used for adsorption of gases such as nitrogen and sulfur oxides, organic compounds, and mercury in the air [13]; similarly it can also be used for removal of cations, anions, dyes and other organic matters in water. Chemically treated fly ash proves to be more efficient adsorbent for gas and water cleaning. The unburnt carbon in fly ash plays an important role in adsorption capacity. Fly ash was reported to be effective for the removal of methylene blue (MB) from an aqueous solution [14]. The suspended solid concentration of a dye effluent sample was reduced 92% by fly ash, due to its high porosity. Removal of malachite green14 and chrome dye from aqueous solutions have also been studied.

Oil pollution in seawater: In their natural state, fly ash particles do not absorb much oil due to their small surface areas and pore sizes. They contain hydrophilic, or water-loving, compounds. This means a bulky, soggy mess is formed when fly ash is placed in the oil-water mixture resulting from wind and wave action on spilled oil. Oil optimized particle surfaces were created using chemical treatment of activated fly ash with sodium hydroxide, resulting in the formation of zeolitic fly ash. Bonded strings from this fly ash attract long-chain hydrocarbons from water-oil mixture and store on their surfaces [15]. Similarly fly ash, organically modified using the cationic surfactant, hexadecyltrimethylammonium (HDTMA), could be used to clean crude oil and weathered oil-contaminated seawater (WOCS).

Metallurgy: Fly ash contains about 20-25% aluminum oxide and about 40% SiO2. Value-added products like zeolites and alumina oxide can be separated from fly ash with suitable cost-effective technology.

Zeolite: Al-Si fly ash dissolved in NaOH/KOH. Subsequently, zeolite precipitated. Best quality Na-X zeolite can be obtained. This can be used for the removal of ammonia from wastewater [16]. *Alumina*: Using magnetic separation, part of iron oxide was separated from fly ash. Later the fly ash was leached with HCl. To the leached liquor, ammonia was added to precipitate hydroxides of alumina and iron; this precipitate was heated at dehydrated at high temperature (1100 °C) to obtain a mixed powder of iron and aluminum oxides. Under optimum conditions (HCl 6 N, (ii) fly ash/ HCl acid (ml) ratio 1:4, leaching at 107 °C, for 5 h., iron oxide and aluminium oxide were recovered (63% /73%) [17]. In another report [18], Aluminum was leached out from coal fly ash by the pressure acid-leaching method. Fly ash with the size of 74 µm and concentric sulfuric acid are mixed in a pressure reaction kettle to react for 4 h at 180°C. Under the optimal conditions, the fly ash can extract nearly 82.4% of aluminum.

Carbon: Separation of unburnt carbon from fly ash (and produce activated carbon). Separation of unburned carbon from fly ash is an efficient way to achieve higher efficiency in the utilization of waste fly ash and greater economic and environmental benefits. Sieving, gravity separation, electrostatic separation, froth flotation, and oil agglomeration are latest methods for separating unburned carbon from fly ash. The recycling process was developed to remove and recover unburned carbon from fly ash using kerosene extraction [19]. The content of unburned carbon decreased successfully to less than 3% under the following conditions; 15 min in shaking time, 10% in pulp density, 30 °C in temperature, 200 rpm in shaking speed, and 0.5 in O/S ratio.

Mosquito control: Fly ash is a carrier for Bti (derived from microbial cultures), a biopesticide for killing larvae of mosquitoes, containing 1% carboxymethyl cellulose **[20]**. (IJMR).

Coatings for concrete structures: Fly ash coated with stearic acid rolled off a surface or stuck to the surface depending on coating [21]. When Fly ash was coated with stearic acid before coating on the surface, the surface was like Lotus leaf -water repellent. When Fly ash was deposited on the surface and then coated with stearic acid, the surface was water attractive- like a rose petal. This finding will be useful for developing water repellent coating/paints.

Volume 8, Issue 2 (III) April - June 2021

CONCLUSION:

Due to the high rate of utilization of fossil fuels like coal for power generation all over the world, a huge quantity of fly ash is produced. The utilization of this ash to the maximum extent possible will reduce adverse effects on the environment, such as pollution of water, air, and soil. The use of Fly ash in cement leads to saving of energy and reduction of greenhouse emission. As fly ash bricks are produced at low temperature compared to clay bricks produced at high temperature. in kilns, leading to less power consumption. Currently, new targets such as heavy metal recovery, and floriculture have been identified. Due to the decelerating real estate industry, it is necessary to identify new areas of utilization of fly ash in the Indian context, such as the production of high added value products such as aluminum oxide and silicon oxide, and ceramic fibers.

REFERENCES

- [1]. Fly ash-waste management and overview: A review, Akash Dwivedi and Manish Kumar Jain, Recent Research in Science and Technology 6,30-35 (2014).
- [2]. Disposal and utilization of fly ash to protect the environment, I.Nawaz, International Journal of Innovative Research in Science, Engineering ad Technology, 2,5259-5266 (2013).
- [3]. The utilization of fly ash for sustainable environment management, Soma Gorai, J.Mater.Environ.Sci.9, 385-393 (2018).
- [4]. Report on Fly Ash Generation at Coal/Lignite Based Thermal Power Stations and its Utilization in the Country for the year 2016-17. Central Electricity Authority, New Delhi (Dec.2017).
- [5]. NTPC guide-users-coal ash.Chapter 5. 28-53(2014).
- [6]. Use of Flyash in Agriculture: A Way to Improve Soil Fertility and its Productivity, Prem Kishore, A.K.Ghosh, Dilip Kumar, Asian J. Agricultural Research, 4, 1-14 (2010).
- [7]. Fly ash composting to improve fertilizer value A review. Hupenyu Allan Mupambwa, Ernest Dube, Pearson N.S.Mnkeni, South African Journal of Science 111, (2015). DOI: 10.17159/sajs.2015/20140103.
- [8]. Q.Li, J.Chen, Y.Li, J. Environ. Sci.Health Part B43,179 (2008).
- [9]. A study of abandoned ash ponds reclaimed through green cover development, Das M, Agarwal P, Singh R, Adholeya A Int J Phytoremediation 15(4):320-329 (2013).
- [10]. Remediation of Fly Ash Dumpsites Through Bioenergy Crop Plantation and Generation: A Review, Madumita Roy, Rupali Roychowdury and Pritam Mukherjee, Pedosphere, 28, 561-580 (2018).
- [11]. Effect of Different Types of Fly Ash on Properties of Asphalt Mixtures, Katarina Mirković, Nikola Tošić, and Goran Mladenović, Advances in Civil Engineering, volume 2019 |ArticleID 8107264 | 11 pages |
- [12]. Application of Fly Ash as an Adsorbent for Removal of Air and Water Pollutants, Jun Cong Ge, Sam Ki Yoon, and Nag Jung Choi, Appl. Sci. 8, 1116-1139 (2018); doi:10.3390/app8071116.
- [13]. Removal of methylene blue from wastewater using fly ash as an adsorbent by the hydro cyclone, K.Rastogi, J.N.Sahu, B.C.Meikap and M.N.Biswas, J.Hazardous Materials 158, 531-540 (2008).
- [14]. Adsorption characteristics of malachite green and methylene blue dye on fly ash generated from kolaghat thermal power plant: a case study, Anupam Mukerjee, Priyam Mitra, Biswadip Das, Ishita Sinha, International Journal of Engineering Research, 3, 30-40 (2015).
- [15]. Treatment of oil spills using organo-fly ash, Shaswat Banerjee, Milind V.Joshi and Radha V.Jayaram, Desalination 195, 32-39 (2006).
- [16]. Solid transformation synthesis of zeolites from fly ash, Min Xiao, Xiaojun Hu, Yan Gong, Dan Gao, Peng Zhang, Qixin Liu, Yue Liu, and Muchi Wang, RSC Advances 122, (2015).
- [17]. Beneficiation of iron and aluminum oxides from fly ash at lab scale, Ram Singh, Laxman Singh, and Satya Vir Singh, International Journal of Mineral Processing 145, 32-37 (2015).
- [18]. Extraction of aluminum by pressure acid-leaching method from coal fly ash, WU Cheng-you, Yu Hongfa, Zhang Hui-fang, Trans. Nonferrous Met. Soc. China 22(2012) 2282–2288.
- [19]. The removal of unburned carbon from fly ash by kerosene extraction, *Hyejin Sung, Kyoungkeun Yoo & Sang-hun Lee,* Geosystem Engineering, 19, 96-99 (2016).

- [20]. Fly ash-based water dispersible powder formulation of Bacillus thuringiensis var. israelensis: Development & laboratory evaluation against mosquito immatures, Saravanan Tamilselvan, Arulsamy Mary Manonmani and Purushothaman Jambulingam Indian J Med Res 146, pp 714-721 (2017).
- [21]. Wetting Transition from Lotus Leaf to Rose Petal using Modified Fly Ash, Urbashi Mahanta, Mudrika Khandelwal, and Arun Deshpande, Chemistry Select 4, 7936-7942 (2019).

SUSTAINABLE DEVELOPMENT – A GREEN APPROACH" ALTERNATIVE ENERGY RESOURCES A STUDY ON GREEN COMPUTING

Mrs. Vijayalaxmi S Suvarna

Assistant Professor, H R College of Commerce & Economics, Churchgate, Mumbai

ABSTRACT

Computers have become an integral part of our lives. Technological revolution has brought about a tremendous change in the way we live; the use of electronic items has increased, resulting in carbon emission, global warming, and climate change. These environmental issues have to be solved. To create a better environment, we need to move towards Green computing. The goals of green computing are to reduce the use of hazardous materials, maximize energy efficiency during the product's lifetime and promote recyclability or biodegradability of defunct products and electronic waste. This paper highlights the impact of green computing on our environment.

Keywords: green computing, technology, environment.

INTRODUCTION:

The impact of Technological revolution in the society is more than Agricultural and Industrial Revolution. Technology plays an important role in our lives. The advent of Internet and the World Wide Web has turned the world into a global village. Technological revolution has brought about changes in every field be it education, health services, transportation, communication system as well as agriculture. In each and every field we use computers so that we can complete our work fast and efficiently. The requirement of computers, laptops are increasing day by day. As long as we are using computers they require electricity to run, not only that they generate heat which requires cooling mechanisms which too requires electricity not only that it is responsible for the production of a relevant portion of overall CO_2 emission, as well as greenhouse gases which are thus released into our atmosphere. We live in a tech savvy environment. More and more products are coming into the market. As newer products come into the market people buy these new products and throw the old products. Because of the rapid growth of technology, the problem that we face today is the disposability of e-waste, some part of these products are not recyclable if left they emit harmful radioactive rays which results in major environmental health hazards. These affect the nature, its greenery, and other species. Here the need of green computing comes into the scenario. Green computing is the utmost requirement to protect our environment and save energy along with operational expenses in today's increasingly competitive world. The following graph shows the trend in E-waste growth in India. The E-waste is clearly shows an increasing trend.



Source: Researchgate.net

LITERATURE REVIEW:

Companies are manufacturing computer devices are more efficient, fast and accurate but they are at the same time consuming more energy and having toxic, dangerous gases and chemicals such as lead, mercury, cadmium etc. which results in increase in pollution rapidly(Farzana Parveen et al., 2015). Green computing is the use of environmentally responsible use of computers and other resources. Which include the implementation of energy-efficient CPUs, servers and other Peripheral devices as well as reduced resource consumption and proper disposal of e-waste

(Chowdhury S N et al.,2015). Going green is not only a fashion statement, it is a real movement that begun back in 1992 with "The Energy Star program" (Brandrick, 2009). Green computing should address environmental sustainability primarily by focusing on design, manufacture, use and disposal of computer and other related devices in an eco -friendly way (Murugesan, San. 2008).

GREEN COMPUTING:

Green computing is an effective study in which disposing, recycling and manufacturing of computers and electronic devices is taken into consideration. The goal of green computing is to lower down the use of hazardous materials, maximize energy efficiency and popularize biodegradability or recyclability of out-dated products and factory waste.

Green computing is the practice of using computing resources efficiently. Modern IT systems rely upon a complicated mix of people, networks, and hardware. A green computing initiative must be systematic in nature and address increasingly sophisticated problems. The main topic of concern in green technology is to reduce the environmental impact of industrial processes. Basically, the efficient use of computers and computing is what green computing is all about. Social responsibility, economic viability and the impact on the environment is also considered. The massive production of computers worldwide has a direct impact on environmental issues, and scientists are conducting numerous studies to reduce the negative impact of computing Initiative (CSCI) is an effort to reduce the electric power consumption of PCs in active and inactive mode. The CSCI provides a catalog of green products from its member organizations and information for reducing PC power consumption. It was started on 2007-06-12.

SIMPLE STEPS TO GO GREEN:

- Simple initiative like setting the power options on one's computer or phones to switch to sleep mode when it's not active. Setting your PC to stand-by mode and turning off the monitor when you're going to be away from your PC for more than a few minutes, will save a huge amount of energy.
- Producers/ manufactures should take the feedback of the consumer and address their needs by manufacturing products which include natural or eco-friendly materials.
- As a consumer, one has to demand more eco-friendly products.
- Virtualization is one of the most effective tools for cost-effective, greener-energy efficient computing where each server is divided into multiple virtual machines that run different applications and in this way companies can increase their server utilization rates.
- More-efficient processors are also critical energy-saving elements, companies such as Intel, Advanced Micro Devices, and Sun Microsystems have adopted this concept.
- Flat panel monitors use less energy than traditional CRT monitors. Avoiding the use of screen savers contributes to energy savings by allowing a monitor to enter in stand-by mode.
- Use of toxic materials like lead can be replaced by silver and copper which make recycling of computers (which is expensive and time consuming at present) easier as we can recycle computer parts separately with an option of reuse or resale.
- A central point of research is to test and apply alternative nonhazardous materials in the products manufacturing process. The idea is to make computers from beginning to end a green product.
- Manufacturer has to produce electronic components, laptops, Desktops and associated components with energy –efficient and environmentally friendly components which will have minimal impact on environment. Restoration and reuse of Old devices and care has to take for proper recycling of old devices and other electronic parts.

Volume 8, Issue 2 (III) April - June 2021

• One of the VIA Technologies ideas is to reduce the "carbon footprint" of users — the amount of greenhouse gases produced, measured in units of carbon dioxide (CO₂). Greenhouse gases naturally blanket the Earth and are responsible for its stable temperature. An increase in the concentration of the main greenhouse gases — carbon dioxide, methane, nitrous oxide, and fluorocarbons is believed to be responsible for Earth's increasing temperature, which could lead to severe floods and droughts, rising sea levels, and other environmental effects, affecting both life and the world's economy

COMPANIES IMPLEMENTING GREEN TECHNOLOGY:

It is important to study about what kind of energy gains and operational gains one can achieve. Hence, analysis of the gap between what we have today and what we'll have to do is essential in order to achieve the benefits of green computing. Currently we are in that stage. Computers are the modern world's most sought-after tool .The features of a green computer of tomorrow are: it should be efficient, recyclable and self-powering. Green computers will be one of the major contributions, which will break down the 'digital divide' - the electronic gulf that separates the information rich from the information poor.

The following major companies are taking initiatives in this direction:

- HP Programs to reduce GHG and Toxic wastes in their products and supply chains.
- Dell Carbon Neutral, Headquarters uses 100% Renewable energy, computer products use 25% less power (by 2010).
- Intel focus is on increasing speed while reducing energy usage in their products.
- IBM Has had formal Environmental policies since 1971, and requires all employees to have environmental awareness training.
- Cisco Systems 80% of their European companies use renewable energy, while 32% of their US companies do.
- Sun Microsystems Requires environment management accreditation from suppliers and posts information about their energy uses and greenhouse consumption on their website.
- Adobe Systems Offset all carbon emissions for their Northern California sites (42% of their total carbon emissions) and are redesigning their software packages to be more environmentally friendly.
- AMD Reducing their GHG and PFC emissions and debuting halogen free products (with lead free products coming next).
- Microsoft New design of Windows uses less energy. Also includes the use of virtualization technologies.
- AutoDesk Makes software products incorporating minimal waste, reduced energy use, and green building design.

CONCLUSION:

The time has come to think about the efficient use of the computer along with its speed and memory capacity. It is not easy to be green, but it's possible. It requires some planning and investment like using gadgets for a longer period of time , if it is necessary then buy a new one. Companies can benefit by taking these challenges as strategic opportunities. The IT sector and its users must develop a positive attitude toward addressing environmental concerns and adopt forward-looking, green-friendly policies and practices.

REFERENCES:

- 1. Agarwal, S. (2014). Impact of Green Computing in It Industry To Make Eco Friendly Environment. Journal of Global Research in Computer Science, 5(4), 05–10. http://jgrcs.info/index.php/jgrcs/article/view/905
- 2. Archana Gokhale, Dharamveer Sharma Green computing: An eco- friendly approach toward computing . Journal of Indian Research (ISSN: 2321-4155) Vol.2, No.2, April-June, 2014, 152-157. (n.d.).
- 3. Brandrick,c. (2009). Green Computing: the good and the badhttps://www.pcworld.com/article/181348/Green_Computing_The_Good_And_The_Bad.html. (n.d.).
- 4. Chowdhury, S. N., Kuhikar, K. M., & Agnihotri, A. (2015). Green Computing: An Overview with Reference to India. 2, 21–29
- 5. Murugesan, San. "Harnessing green IT: Principles and practices." IT professional 10.1 (2008).

Volume 8, Issue 2 (III) April - June 2021

- 6. Parichay Chakraborty, Debnath Bhattacharyya, Sattarova Nargiza Y., and Sovan Bedajna Green Computing: Practice of Efficient and Eco-Friendly Computing Resources International Journal of Grid and Distributed Computing Vol.2, No.3, September, 200, n.d.)
- 7. Parveen, F., Singh, R., & Singh, P. (2015). Green Computing: an Exploration of Approaches & Implementations. 8354(4), 697–702.
- 8. Swasti Saxena Green Computing: Need of the Hour International Journal of Current Engineering and Technology E-ISSN 2277 4106, P-ISSN 2347 5161 ©2015 INPRESSCO®.
- 9. Sanghita Roy and Manigrib Bag Green Computing New Horizon of Energy Efficiency and E-Waste Minimization World Perspective vis-à-vis Indian Scenario
- 10. www.brighthub.com > Environment > Green Computing > Green Computing News

CONDUCTING POLYMERS: AS AN ALTERNATE ENERGY SOURCE

Kirsten Lobo^a* and Dr. PravinPawar^b

^aDepartment of Physics , Institute of Chemical Technology, Matunga , Mumbai ^bDepartment of Physics, Thakur College of Science and Commerce , Kandivali, (E), Mumbai

ABSTRACT:

Conducting polymers (CPs) have been gathering a great interest in academia and industry. It can be developed further by combining the electrical properties of a semiconductor and metals with the traditional advantages of conventional polymers such as easy and low cost preparation. Conducting polymers are new class of materials whose conducting properties demonstrate remarkable optical and electrical properties which were formerly found only in inorganic systems. Electronics properties of conducting polymers differs from all the other polymers.Due to the large interest in the energy field, this theme is discussed in terms of storage by means of the description of supercapacitors and conversion, by showing some recent advances in solar cell-modified electrodes.This article is to briefly discuss the background & theory behind their conductivity as well as to highlight the recent contributions of conducting polymers to the field of energy.

1. INTRODUCTION

The last decade dedicated to synthesized and inventions in different properties of polymers. Amongst this, many researchers contributed in polymers based high electrical conductivity. Though the low electrical conductivity of polymers also has found its immense use in the manufacture of insulators and dielectric substances, the question of producing polymers that exhibit conductivity similar to that of metals has always engaged researchers. During study of electrical conductivity researchers overcome the problem of stability and solubility using different experimentation. A fairly wide range of interesting applications based on these polymers were emerged and are emerging.

Polymers have traditionally been considered good electrical insulators and a variety of their applications have relied on this insulating property. However, for more than a decade now, researchers have shown that certain classes of polymers, which are conjugated, exhibit semiconducting behavior. Polymers, by virtue of their lightweight and greater ease of fabrication, have replaced and are continuing to replace metals in several areas of applications. Today, conducting polymers that are stable even in the doped form have been prepared. By considering importance of alternate energy source, such as thin film transistors [1], polymer light emitting diodes (LEDs) [2], corrosion resistance [3], electromagnetic shielding [4], sensor technology [5], molecular electronics [6], super capacitors [7], and electrochromic devices [8]. We shall highlight some specific examples of such systems and discuss some of their potential applications.

2. MATERIAL

- **2.1 Polyacetylene: Polyacetylene** has received great scientific attention in the last twenty years. This fact has been made possible by its organic nature, such as good environmental and thermal stability, as well as by its wide application perspectives [9].Polyacetylene (PA) was the first polymer exhibiting high conductivity comparable with metals if exposed to oxidizing agents like iodine vapor. Conducting polymers have attracted attention to be used as electrochromic materials due to their inexpensive and potentially process able nature.
- **2.2** Polythiophenes Polythiophene polymer gained significant attention in research and industrial areas because it possesses high environmental stability, better thermal stability, and less band gap energy. It can be easily doped to form electrically conductive materials. Therefore, its electronic and physical properties can be changed by the inclusion of functional groups. Its derivatives has been one of the most extensively studied and is widely investigated computationally and experimentally for use in electronic devices such as light-emitting diodes, water purification devices, hydrogen storage, and biosensors. Various theoretical modeling studies of polythiophene ranging from an oligothiophene approach to infinite chain lengths (periodic boundary conditions) have been undertaken to study a variety of electronic and structural properties of these polymers.
- **2.3** Polyphenyle vinyl Poly(phenylene vinylene) (PPV) is a conducting polymer of the rigid-rod polymer family with high levels of crystallinity. PPV is an important polymer in many electronic applications, such as LEDs and photovoltaic devices which is due to the small optical band gap and its bright yellow fluorescence. In addition, it can be easily doped to form electrically conductive materials. Therefore, its electronic and physical properties can be changed by the inclusion of functional groups.

Volume 8, Issue 2 (III) April - June 2021

- **3. APPLICATIONS** Although several conducting polymers have been prepared, it was soon realized that they cannot compete with metals in traditional electrical applications, like wiring, transmission cables etc. Re- searchers have, therefore, focused on other applications that exploit the existence of extended conjugation in these polymers. A few interesting possibilities are mentioned below. See Box 5 for a novel biomedical application.
- 3.1 Light Emitting Diodes The most popular application that have caught the imagination of both scientists and technologists alike, are the phenomena of photoluminescence and electroluminescence in conjugated polymers. Emission of light upon irradiation is termed as photoluminescence, while the emission on application of a voltage is termed electroluminescence. Light emitting diode is an example of utilization of the latter phenomenon. It was recently demonstrated that PPV films can be used as the emissive layer in electroluminescent devices. Structures for electroluminescent devices are fabricated with the polymer film formed on a bottom electrode, which is deposited on a suitable substrate (such as glass), and the top electrode is deposited on the fully converted PPV film. Electrode materials are chosen with a low work function for use as negative, electron-injecting contact, and with a high work function as the positive holeinjecting contact. At least one of these layers must be semi-transparent for light emission normal to the plane of the device. PLEDs based on PPV are now coming out as commercial products. When compared to inorganic or organic materials for LEDs, the main advantages of the polymer electroluminescence (EL) devices are their fast response times, process ability, the possibility of uniformly covering large areas, low operating voltages, and the many methods were applied to fine-tune their optical and electrical properties by varying the structure. At present, only green and orange LEDs meet the requirements of commercial use, even though all three primary colors (red, green and blue) have been exhibited in LEDs, . Polymers in the electronics industry overtake their long established passive roles as insulating and encapsulating materials to more active new applications. They can be also designed for microlitographic applications. [9-12]



3.2 Solar Cell: By understanding today's need to develop renewable energy sources is the utilization of conjugated polymers for the fabrication of solar cells. It is necessary to look for clean and renewable energy resource, such as solar energy, which is called the really green energy, having nearly unlimited supply capability and being widely distributed all over the earth. In spite of the fact that the direct photovoltaic energy conversion in matters of magnitude is more energy efficient than any of those indirect sources, the global use of photovoltaic (PV) is only emerging at a slow pace. The issue behind is that the cost of PV modules based on traditional PV technology is still too high to be afforded by common energy consumptionIn the case of an LED, the application of an electric potential leads to the injection of electrons and holes from the opposite electrodes in the sandwiched configuration as depicted; the recombination of these leads to the generation of an electronically excited state (an exciton) that decays giving out light. In the case of a solar cell, which is a photovoltaic device, the opposite process occurs. Here, when light is incident on the conjugated polymer it creates an electronic excited state; this state is a highly energetic state and is often willing to give away an electron to a willing acceptor.[13-17]



Volume 8, Issue 2 (III) April - June 2021

3.3 Super capacitor: Conductive polymers can be used as a super capacitor electrode material in different ways due to the different doping forms of conducting polymers and the different kinds of doped conducting polymers capacitor. There are three main types of conductive polymer capacitors. The first type one is composed of a completely identical p type doped conductive polymer. The charge quantity released by this kind of capacitor discharge is only 1/2, and the difference of the potential difference between the two poles is small. The second type capacitors are composed of different kinds of conducting polymers, and both of them can be doped with p type. Due to the different conductive polymer electrode materials, the potential range of doping is different so that the capacitor can have a higher voltage difference in the fully charged state. This kind of the super capacitor is not enough good to distinguish between the positive and negative, and the capacitor cannot be reverse charge which limits the application of capacitors and has an impact on the cycle life of capacitors. The last type one is composed of an n type doped electrode and a doped p type. In the fully charged state, the cathode of the capacitor is in completely n doped state while the positive electrode is in a fully p doped state, increasing the voltage difference between the two electrodes. The main advantage of such a capacitor structure is the capacitor voltage is higher, charge release completely; charging two electrodes were incorporated, charge storage capacity. In addition electrode materials own high conductivity, small internal resistance of the capacitor and output power of large due to the two electrodes simultaneous doping.[18-21] The big problem was unstable especially when it used as a negative electrode, or positive and negative electrodes were also conductive polymers, which is prone to degradation of polythiophene derivatives



- **3.4 Field Effect Transistors :** Conducting polymers' advantages over conventional materials, such as silicon and germanium, include low cost and ease of processing. Organic or polymer-based semiconductors have been applied to fabricate field-effect transistors (FETs) since 1983. There have been many on going efforts to form organic or polymer-based FETs. Organic or polymer based transistors have already found their application, such as in smart pixels and sensors .[22-25]
- 4. CONDUCTING POLYMERS CONTRIBUTING TO THE CONSERVATION OF ENERGY
- 1. The increasing brutal demand for energy has created an urgent need for alternate energy sources that are cost effective and eco friendly.
- 2. OLEDs are energy efficient which can replace fluorescent lighting for illumination, OLEDs now require less amount of input voltage <4volts
- 3. The current primary source of solar technology is silicon based solar energy which isn't the best cost wise. Polymer based organic photovoltaic cells offer the potential to play a significant role as a zero-emission source of energy during the actual power generation process.

Volume 8, Issue 2 (III) April - June 2021

- 4. Organic field effect transistor provide several advantages over field effect transistor, they are low cost, biodegradable hence preferred.
- 5. Also polymers in general are flexible in nature, this has its own advantages. Flexibility of these conducting polymers can be used for biocompatible applications, bioelectronics .
- 6. Due to the various uses conducting polymers provide on all platforms, that is high conductivity at low cost for energy supply.
- 7. Conductivity, compatibility and low-cost process ability with high mobility of charge carriers provide better output with reduced costs.

5. CONCLUSION

Conducting polymers have, thus, come a long way from purely laboratory curiosity to a class of materials that can find end use in a wide variety of commercial products, ranging from batteries to biosensors. Such a development is a classic example that serves to illustrate the wide range of expertise, starting from chemists, physicists, biologists and technologists, that is required to take some invention in the laboratory to the market place

6. **REFRENCE:**

- [1] Halls, J.J.M.; Walsh, C.A.; Greenham, N.C.; Marseglia, E.A.; Friend, R.H.; Moratti, S.C.; Holmes, A.B. Efficient photodiodes from interpenetrating polymer networks. Nature, 1995, 376 (6540), 498-500.
- [2] Kraft, A.; Grimsdale, A.C.; Holmes, A.B. Electroluminescent conjugated polymers-seeing polymers in a new light. Angew. Chem. Int. Edit., 1998, 37(4), 402-428.
- [3] Hepburn, A.R.; Marshall, J.M.; Maud, J.M. Novel electrochromic films via anodic oxidation od carbazolyl substituted polysilaxones. Synt. Met., 1991, 43(1-2), 2935-2938.
- [4] Dubois J.C.; Sagnes O.; Henry F. Polyheterocyclic conducting polymers and composites derivatives. Synt.Met., 1989, 28(1-2), C871-C878.
- [5] Roncali, J.; Garreau, R.; Delabouglise, D.; Garnier, F.; Lemaire, M. Communications modification of the structure and electrochemical properties of poly(thiophene) by ether groups. J. Chem.Soc-Chem., 1989, 11, 679-781.
- [6] Bradley, D.D.C. Molecular electronics-aspects of the physics. Chem. Brit., 1991, 27(8), 719-723.
- [7] Burke, A. Ultracapacitors: why, how, and where is the technology. J. Power Sources, 2000, 91(1), 37-50.
- [8] Sonmez, G.; Meng, H.; Zhang, Q.; Wudl F. A highly stable, new electrochromic polymer:Poly(1,4-bis(2,3(,)'4'ethylenedioxy) thienyl)-2-methoxy-5-2"-ethylhexyloxybenzene. Adv. Funct. Mater.,
- [9] Kutsche, C.; Targove, J.; Haaland, P.J. Microlithographic patterning of polythiophene films. J. Appl. Phys., 1993, 73(5), 2602-2604.
- [10] Hotta, S.; Rughooputh, D.D.V.; Heeger, A.J.; Wudl, F. Spectro- scopic studies of soluble poly(3-alkylthienylenes). Macromolecules, 1987, 20(1), 212-215.
- [11] Mank, P.M.S.; Mortimer, R.J.; Rossensky, D.R.; Electrochromism: Fundamental and Applications, VCH, Weinheim Newyork: 1995.
- [12] Gustafsson-Carlberg, J.C.; Inganas, O.; Andersson, M.R.; Booth, C.; Azens, A.; Granqvist, C.G. Tuning the bandgap for polymeric smart windows and displays. Electrochim. Acta, 1995, 40(13-14), 2233-2235.
- [13] Havinga, E.E.; Mutsaers, C.M.J.; Jenneskens, L.W. Absorption properties of alkoxy-substituted thienylenevinylene oligomers as a function of the doping level. Chem. Mater., 1996, 8(3), 769-776.
- [14] Huang, W.S. Synthesizing and processing conducting polythiophene derivatives for charge dissipation in electron-beam lithography. Polymer, 1994, 35(19), 4057-4064.
- [15] Dodabalapur, A.; Torsi, L.; Katz, H.E. Organic transistors 2- dimensional transport and improved electrical characteristics. Science, 1995, 268(5208), 270-271.
- [16] Shi, G.Q.; Jin, S.; Xue, G.; Li, C. A conducting polymer film stronger than aluminum. Science, 1995, 267(5200), 994-996.

Volume 8, Issue 2 (III) April - June 2021

- [17] Nawa, K.; Imae, I.; Shirota, Y; Noman, N. Synthesis of a novel type of electrochemically doped vinyl polymer containing pendant terthiophene and its electrical and electrochromic properties. Macromolecules, 1995, 28(3) 723-729.
- [18] Panero, S.; Passerini, S.; Scrosati, B. Conducting polymers new electrochromic materials for advanced optical-devices. Mol. Cryst. Liq. Cryst., 1993, 230, 337-349.
- [19] Skothenn, T.A.; Ronald, L.E.; Reynolds, J.R. Handbook of Conducting Polymers, 2nd ed. CRC Press: New York, 1997.
- [20] Kiebooms, R.; Resel, R.; Vanderzande, D.; Leising G. Polymer LEDs based on N-alkylsulfinyl PPV precursor polymers. Chalamala BR; Friend RH; Jackson TN; Libsch FR Ed.; USA, 2000, vol 558, pp. 409-413.
- [21] De Carvalho, L.C.; Dos Santos, C.N.; Alves, H.W.L.; Alves, J.L.A. Theoretical studies of poly(paraphenylene vinylene) (PPV) and poly(para-phenylene) (PPP). Microelectronics J, 2003, 34(5-8), 623-625.
- [22] Sariciftci, N.S.; Braun, D.; Zhang, C.; Srdanov, V.I.; Heeger, A.J.; Stucky, G.; Wudl, F. Semiconducting polymer-buckminster- fullerene heterojunctions - diodes, photodiodes, and photovoltaic cells. Appl. Phys. Lett., 1993, 62(6), 585-587.
- [23] Saraswathi, R.; Hillman A.R.; Martin, S.J. Mechanical resonance effects in electroactive polycarbazole films. J.Electroanal. Chem., 1999, 460(1-2), 267-272.
- [24] Skompska, M.; Peter, L.M. Electrodeposition and electrochemical properties of poly(n-vinylcarbazole) films on platinum electrodes. J. Electroanal. Chem., 1995, 383(1-2), 43-52.
- [25] Skompska, M.; Hillman, A.R. Electrochemical quartz crystal microbalance studies of the electrodeposition and subsequent cross- linking of poly(N-vinylcarbazole) films. J.Electroanal. Chem., 1997, 433(1-2), 127-134.

EFFECT OF CARICA PAPAYA ON SEED GERMINATION AND PHYSIOLOGICAL RESPONSE OF TRIGONELLA FOENUM GRAECUM

Ayesha Maste and ^{*}Dr. D. Meena S. Rao

Post Graduate, Department of Botany, Seva Sadan's R. K. Talreja College of Arts, Science and Commerce, Ulhasnagar

ABSTRACT

Sustainable agriculture is the production of plant and animal product, including food in a way that uses farming technique that protects the environment. Sustainable agriculture allows us to produce and enjoy healthy foods without compromising the ability of future generations to do the same. This study investigated the effect of Carica papaya on seed germination and physiological response of Trigonella foenum graecum (fenugreek/methi). Trigonella foenum graecum seeds were treated with aqueous extracts of leaves, raw and ripe Carica papaya peel, pulp and seeds of different concentration (2%, 4% and 8%) and distill water was taken as control. As compare to control (2.5 ± 0.6 cm) leaf extract of Carica papaya significantly reduced radical length of Trigonella foenum graecum. Maximum reduction was seen at 8% (1.0 ± 0.3 cm) of leaf extract of Carica papaya significantly reduced radical length in all the concentration, while ripe peel extract of Carica papaya significantly reduced radical length in all the concentration. Maximum increase in radical length was seen in 8% raw (5.7 ± 4.2 cm) and ripe (4.6 ± 1.5 cm) seed extract of Carica papaya. The byproduct peel and seed of Carica papaya helps to increase the seedling growth of Trigonella foenum graecum and inhibits the growth of weeds which eliminates the use of chemical fertilizer weedicides. Sustainable agriculture also promotes economic stability for farms and helps farmer to better their quality of life.

Keyword: Carica papaya, Trigonella foenum graecum, sustainable.

INTRODUCTION:

Sustainable agriculture is the production of plant and animal product, including food in a way that uses farming technique that protects the environment. Sustainable agriculture allows us to produce and enjoy healthy foods without compromising the ability of future generations to do the same. *Trigonella foenum-graecum* (Fenugreek) commonly known as methi (in Hindi) has been used as a culinary spice, a flavoring agent and as a medicinal plant from ancient time. *Trigonella foenum graecum* have been reported to possess antibacterial properties (Ahmad et al., 1998). papaya skin showed significantly higher ascorbic acid content (~250 mg AAE/100 g) than seeds (~20 mg/100 g), while pulp had the highest values (~600 mg/100 g). Papaya skin presented higher total phenolic content (~560 mg GAE/100 g) and flavonoids (~1000 mg QE/100 g) than pulp and seeds. Papaya skin had higher carotenoids and α -tocopherol (~1500 µg/100 g and ~4000 µg/100 g, respectively) content than pulp and seeds. Bioactive compound content in each byproduct varied in ripening stage. Therefore, among the papaya byproducts, skin represents a good source of bioactive with good antioxidant properties, which may be used to extract them for its incorporation in functional foods depending on ripening stage (Ovando-Martinez et al., 2018).

MATERIALS AND METHODS:

Collection of plants:

Collection of *Trigonella foenum graecum* seeds:

The plant seeds of Trigonella foenum graecum were collected from Shivaji Nursery Bhiwandi, Thane.

Collection of Carica papaya fruits:

Fresh mature leaves, raw and ripe *Carica papaya* fruits were collected from the local Market of Bhiwandi, Thane.

PREPARATION OF PLANT EXTRACT:

Fresh leaves, raw and ripe *Carica papaya* fruit were collected and rinsed well in distilled water. Seeds were separated, papaya peel and pulp was cut into small pieces. The material was surface sterilized in sodium hypochloride solution for 5 minutes and rinse several times with distill water. Fresh leaves, raw and ripe *Carica papaya* peel, pulp and seeds were weight 2gm, 4gm and 8gm using digital balancer. Fresh plant parts were crushed by using mortar pestle. Fresh grounded materials added to the conical flask containing 100ml of distill water. Flasks were kept on a rotatory shaker for about 24 hours and filtered by whatman's no-1 filter paper. Centrifuge each extract for 20 minutes at 5000 rpm. Aqueous extracts of leaves, raw and ripe *Carica papaya*

Volume 8, Issue 2 (III) April - June 2021

peel, pulp and seeds of different concentration (2%, 4% and 8%) were stored under refrigeration at 4 $^{\circ}$ C for further studies.

GERMINATION AND GROWTH BIOASSAYS:

Sterilized seeds of *Trigonella foenum graecum* were placed on filter paper in a petri dish. Petri plates were moistened with 2 ml/ plate of leaves, raw and ripe *Carica papaya* peel, pulp and seeds (2%, 4% and 8%) extract concentration, distilled water as control were applied and incubated in room temperature till germination. Percentage of germination and radical lengths was measured on the entire seedling in each petri dish for *Trigonella foenum graecum* after seedling.

OBSERVATION:

Table 1: Effect of *Carica papaya* leaves and distilled water (control) on radical length of *Trigonella foenum* graecum.

Treatment	Radical length
	Leaves
control	2.5±0.6 cm
2%	1.9±0.9 cm
4%	1.4±0.5 cm
8%	1.0±0.3 cm

Graph 1: Effect of *Carica papaya* leaves and distilled water (control) on radical length of *Trigonella foenum* graecum.



Fig: 1 X- axis Carica papaya leaves extract, Y- axis concentration

Table 2: Effect of Carica papaya raw	^r Carica papaya peel, pulp	o, seeds and di	istilled water	(control)	on radical
le	ngth of <i>Trigonella foenum</i>	ı graecum.			

Treatment	Radical length			
	Peel	Pulp	Seed	
control	2.5±0.6 cm	2.5±0.6 cm	2.5±0.6 cm	
2%	3.7±2.0 cm	4.0±2.5 cm	3.3±2.8 cm	
4%	4.2±3.5 cm	4.6±3.0 cm	5.0±4.7 cm	
8%	4.9±4.5 cm	5.2±4.1 cm	5.7±4.2 cm	

International Journal of Advance and Innovative Research Volume 8, Issue 2 (III) April - June 2021





Fig: 2 X- axis raw Carica papaya extract, Y- axis concentration

Table 3: Effect of ripe Carica papaya peel, pulp, seeds and distilled water (control) on radical length of Trigonella foenum graecum.

Treatment	Radical length			
	Peel	Pulp	Seed	
Control	2.5±0.6 cm	2.5±0.6 cm	2.5±0.6 cm	
2%	3.5±0.9 cm	2.1±1.0 cm	3.0±1.9 cm	
4%	2.8±0.5 cm	2.5±3.0 cm	4.4±3.0 cm	
8%	1.0±0.3 cm	3.3±30 cm	4.6±1.5 cm	

Graph 3: Effect of ripe *Carica papaya* peel, pulp, seeds and distilled water (control) on radical length of *Trigonella foenum graecum*.



Fig: 3 X- axis rip Carica papaya extract, Y- axis concentration

RESULT AND DISCUSSION:

Trigonella foenum graecum showed seed germination in all the aqueous extract of leaves, raw and ripe Carica papaya peel, pulp and seeds (2%, 4% and 8%) concentration. Leaf extract of Carica papaya significantly

Volume 8, Issue 2 (III) April - June 2021

inhibited radical length of *Trigonella foenum graecum*. As compare to control $(2.5\pm0.6 \text{ cm})$ it show inhibition in radical length at 2% $(1.9\pm0.9 \text{ cm})$, 4% $(1.4\pm0.5 \text{ cm})$, and 8% $(1.0\pm0.3 \text{ cm})$ concentration of leaf extract. Maximum reduction was seen at 8% of leaf extract. Extract of raw peel show increase in radical length in all the concentration 2% $(3.7\pm2.0 \text{ cm})$, 4% $(4.2\pm3.5 \text{ cm})$, and 8% $(4.9\pm4.5 \text{ cm})$. Extract of raw pulp show increase in radical length in all the concentration 2% $(4.0\pm2.5 \text{ cm})$, 4% $(4.6\pm3.0 \text{ cm})$, and 8% $(5.2\pm4.1 \text{ cm})$. Extract of raw seed show increase in radical length in all the concentration 2% $(4.0\pm2.5 \text{ cm})$, 4% $(4.6\pm3.0 \text{ cm})$, and 8% $(5.2\pm4.1 \text{ cm})$. Extract of raw seed show increase in radical length in all the concentration 2% $(3.3\pm2.8 \text{ cm})$, 4% $(5.0\pm4.7 \text{ cm})$, and 8% $(5.7\pm4.2 \text{ cm})$. Ripe peel extract of *Carica papaya* significantly reduced radical length of *Trigonella foenum graecum*. As compare to control $(2.5\pm0.6 \text{ cm})$ it show reduction in radical length at 2% $(3.5\pm0.9 \text{ cm})$, 4% $(2.8\pm0.5 \text{ cm})$, and 8% $(1.0\pm0.3 \text{ cm})$ concentration 2% $(2.1\pm1.0 \text{ cm})$, 4% $(2.5\pm3.0 \text{ cm})$, and 8% $(3.3\pm30 \text{ cm})$. Extract of ripe seed show increase in radical length in all the concentration 2% $(3.0\pm1.9 \text{ cm})$, 4% $(4.4\pm3.0 \text{ cm})$, and 8% $(4.6\pm1.5 \text{ cm})$. Maximum increase in radical length was seen in 8% raw and ripe seed extract of *Carica papaya*.

CONCLUSION:

Extract of raw peel, pulp, seed and ripe pulp and seed show increase in radical length of *Trigonella foenum* graecum in all the concentration 2%, 4% and 8%. Leaf and ripe peel extract at all the concentration show inhibition in radical length. Maximum increase in radical length was seen in 8% raw and ripe seed extract of *Carica papaya*. Application of *Carica papaya* raw and ripe seed extract enhance the radical length growth. This can be used as positive aspect in Indian agricultural system. The byproduct peel and seed of *Carica papaya* helped in increase the seedling growth of *Trigonella foenum graecum*, which can also be useful in agriculture. This application helps in reducing the growth time and thereby providing yield in less than the stipulated time, enabling the farmers to undertake other agricultural activity. It will also be useful in case of drought and famine and eliminates the use of chemical fertilizer. Reduction in the growth of weeds, which eliminates the use of chemical farmer to better their quality of life.

REFERENCES:

- K M Nadkarni (1954) Indian Materia Medica by K M Nadkarni, 1st Edn by A. K. Nadkarni, Popular Prakashan Pvt. Ltd, Bombay, 1954, pp.273-277.
- Duke, J. A. (1996) Carica papaya L. Retrieved from http://www.hort.purdue.edu/ newcrop/duke_energy/Carica_papaya.html.
- Ahmad, (1998) Screening of some Indian medicinal plants for their antimicrobial properties. Journal of Ethnopharmacology 62, 183–193.
- Oyoyede (2005) Chemical Profile of Unripe Pulp of Carica papaya. *Pakistan Journal of Nutrition.* 2005, 4(6): 379-381.
- Hip Seng Yim, (2012) "Antioxidant potential of *Carica papaya* peel and seed" Focusing on Modern Food Industry Vol. 1 Iss. 1, November 2012.
- http://www.ethnoleaflets.com/leaflets/papaya.htm
- Aravind. G, Debjit B, Duraivel. S, Harish. G. (2013) Traditional and Medicinal Uses of *Carica papaya*. *Journal of Medicinal Plants Studies*. 1(1): 7-15.
- Nasroallah M. kor, (2013) "Fenugreek (Trigonella foenum-graecum L.) As a Valuable Medicinal Plant" International journal of Advanced Biological and Biomedical Research Volume 1, Issue 8, 2013: 922-931.
- Orhue P.O. and Momoh A.R.M. (2013), *International Journal of Herbs and Pharmacological Research IJHPR*, 2013, 2(4): 42 47.
- Asha Roshan, (2014) "A Brief Study on Carica Papaya- A Review" International Journal of Current Trends in Pharmaceutical Research (IJCTPR), 2014, Vol. 2(4): 541-550.
- Budhaditya G, Indrani C, Sabyasachi C, (2015) "Fenugreek (*Trigonella foenum-graecum*) and its necessity, Fire Journal of Engineering and Technology.1 (1), 2015, 60-67.
- Ovando-Martinez (2018) Effect of ripening on physico-chemical properties and bioactive compounds in papaya pulp, skin and seeds, Indian Journal of Ntural Products and Resources, Vol.9(1), Marach 2018, pp 47-59.

A CRITICAL ANALYSIS OF THE CITRUS PEEL WASTE VALUE CHAIN FROM A SUSTAINABLE CIRCULAR ECONOMY PERSPECTIVE

Ms. D. Pranita Rao¹ and Dr. D. Meena S. Rao² ¹Agro Paris Tech, France ²R. K. Talreja College, India

ABSTRACT

The demand for environment-friendly, resource-efficient, and sustainable in the long-term kind of processes and products is rising in the world market. A shift of this magnitude will require a paradigm shift from a linear (make-use-throw) based economy to a circular economy. Food and agricultural waste value chain has a potential to be majorly transformed in the following two ways: 1. Non-conventional supply of biomass for valorization and 2. Easy and profitable method of waste disposal. The present work focuses on exploring this avenue using the example of citrus peel waste (CPW). It critically evaluates the environmental impact, technoeconomic assessment studies and feasibility reports from multiple sources to develop a broad overview of the field and specifically to curate the best potential bio-products to be derived from the biorefinery. The main objective of the study is to estimate if the commercialization of such a facility is possible and feasible soon. It also aims to identify the major challenges hampering the scale-up efforts of such biorefineries.

Keywords: circular economy, bioeconomy, sustainability, citrus peel waste biorefinery, value chain assessment

INTRODUCTION:

A circular economy is based on the principles of designing out waste and pollution, keeping products and materials in use, and regenerating natural systems (*What Is the Circular Economy?*, Ellen McArthur Foundation). The valorization of Food Supply Chain Waste into value-added products is the intersection between circular economy and bioeconomy principles. The principles of circular bioeconomy guide us away from the make-use-throw (linear economy) towards a more sustainable consumption strategy.

The European Commission has defined FW as one of the priority areas of the European circular economy action plan. It also calculates that for every $\in 1$ invested in EU-funded bioeconomy research and innovation approximately $\in 10$ of value added will be returned to bioeconomy sectors by 2025 (European Commission, 2012). The use of FW in biorefineries is foreseen as a potential strategy to contribute to the achievement of the required targets and, simultaneously, to reduce the use of both fossil and bio-based resources, supporting the transition to a circular bioeconomy at lower virgin material intensity (Cristóbal et al., 2018). Food waste produced at the manufacturing stage possesses a great deal of compositional heterogeneity which makes it difficult to valorize. On the other hand, FW generated in the food processing stage presents high compositional homogeneity. Therefore, it has high potential to be used for the extraction of high-value products (Cristóbal et al., 2018). Thus, the present work studies the applications of circular bioeconomy and sustainability on the case of Citrus Peel Waste in a biorefinery perspective. The first section deals with the potential products to be manufactured and the next section shares the authors views and suggestions to improve the process and make it greener.

CITRUS PEEL WASTE VALUE CHAIN:

Citrus Peel Waste (CPW) refers to the waste derived from citrus fruits like oranges, grapefruit, lime, lemon, etc. Studies have shown that the peels of all these fruits have the following general composition: free sugar content (20 to 40%), pectin (8 to 15%), cellulose (10 to 20%), hemicellulose (4 to 9%) and lastly lignin (1 to 5%). CPW contains significant amounts of sugars and low content of lignin and is thus a suitable substrate for fermentation processes (Teigiserova et al., 2021). OPW, as biomass feedstock, are richer in free sugars and more prone to transformation due to their open internal structure that permits a faster mass transfer and higher activity of acids, base catalysts, enzymes and microorganisms, reducing the process time in comparison with wood or herbaceous biomass (de la Torre et al., 2019). As a result of the low lignin content, pre-treatment which accounts for 80% of the total operating cost in a lignocellulosic biorefinery can be avoided in a CPW based biorefinery. This gives a CPW biorefinery a substantial margin over other lignocellulosic biorefineries using highly recalcitrant biomass such as wood or cereal byproducts as the raw material.

In the absence of circular economy and attempts to valorize CPW, the waste is either incinerated, land-filled, composted or dried and used as animal feed. Incineration of these peels leads to the release of various Green House Gas (GHG) emissions into the atmosphere which in turn lead to Global Warming and climate change. Incineration offers no valorization of the potential biomass thus leading to a great loss in potential. Landfilling

and compost are the main alternatives used today by different companies to dispose this residue. The price of these uses ranges from 40.92 to 73.03 USD per ton and 25 to 35 USD per m³, respectively (Ortiz-Sanchez et al., 2020). Landfilling leads to methane generation which has around 20 times higher Global Warming Potential as compared to CO₂. There are several factors that limit the use of CPW for composting, some of them are as follows: a very low nitrogen content preventing fast decomposition, the detriment of soil microorganisms due to antimicrobial properties, potential groundwater pollution due to percolation (Teigiserova et al., 2021) and low pH of the compost causing plant root system toxicity (Patsalou et al., 2020). Even though the use as animal feed is coherent with top priorities in the updated food waste hierarchy, low pH of 3.4, anti-nutritional properties, and potential costs for transportation prevents widespread use of CPW in animal feed (Teigiserova et al., 2021). Apart from economic issues for not extracting the essential oils, there are also environmental concerns due to the fact that volatile compounds are emitted to the atmosphere during the drying process of the citrus waste when it is used as animal feed (Vlydis et al., 2017).

VALORIZED PRODUCTS:

This section discusses the potential outputs of the CPW biorefinery. In depth analysis of the well-research options is presented followed by a quick summary of the most notable novel products.

ESSENTIAL OILS

Studies show that 97% of the Essential Oil (EO) fractions in CPW are Limonene. It is a major low volume-high value product produced in a CPW biorefinery. It can be used for a variety of applications in the food, pharmaceutical, and medical industry, from green solvent, natural insecticide, to a chemo-preventive agent with anti-cancer properties (Teigiserova et al., 2021). Due to its antimicrobial properties, limonene extraction is necessary before further fermentation or anaerobic digestion steps. Its inhibitory effect depends on fermentation type, microorganism, and other reaction specific criteria but, in general the inhibitory limonene content can be as low as 0.01% (w/v) for fermentation with S. cerevisiae (Pourbafrani et al., 2010). Many different methods of extraction are possible. Some of the conventional methods are cold-pressing, hydro-distillation, steam distillation and solvent extraction. As reported by Teigiserova et al. (2021) cold press extracts an inadequate amount of EO (average yield 2.85% DW) to ensure suitable fermentation, while solvent extraction contaminates residues for subsequent use. The authors also mention that extractions using water medium such as hydrodistillation (average yield = 2.87% DW) is feasible for the liquid based fermentation process, such as submerged fermentation. They posit that steam extraction is feasible for any type of fermentation. Greener and more sustainable alternatives for EO extraction is the use of microwave assisted heating, ultrasonic heating, supercritical fluid extraction, ionic liquid based solvent extraction and deep eutectic solvent extraction to mention a few. Teigiserova et al. concluded that solvent-free microwave assisted extraction (average yield = 5.29% DW) was the most effective method for EO extraction which provides the highest yield in a short extraction time.

PECTIN

Pectin is a structural polymer encapsulating the cellulose-hemicellulose-lignin structure of the fruit peels. It holds the structure together. It finds many applications in the food and pharmaceutical industries where it can be used as a gelling agent, a stabilizing agent, thickening agent, plasticizer, etc. It is one of the most important low volume-high value products produced but the biorefinery approach. The most common and well-known method of pectin extraction is the explosive expansion (flashing) of CPW to liquidate the pectin from the lignocellulosic structure, extracting it with a solvent, and precipitating it with ethanol or isopropanol. Traditionally, dilute acid treatment with mineral acids (for quicker but environmentally harmful method) or with organic acids, such as citric acid (environment-friendly but less-efficient and considerably more expensive method). The greener approach is to use microwave-assisted solvent extraction where water is used as the solvent. Ethanol/ isopropanol is still required for the isolation and purification step, but the low energy consumption in the process leads to great cost-savings. In the case of an integrated biorefinery, producing bioethanol, the ethanol requirements for precipitation can be met by the indigenously produced bioethanol to partially offset the utility costs.

ETHANOL

Ethanol is the most widely used bio-based fuel. It is also a major platform chemical as it can be transformed into plastic monomers (e.g.: polyethylene, polyethylene terephthalate, etc.), organic acids (e.g.: acetic acid, succinic acid, etc.), acetaldehyde and numerous other day-to-day products. Ethanol can be produced by the fermentation of simple sugars like glucose, fructose, arabinose, galactose, etc. These sugars are freely available in the CPW peels and can also be obtained by saccharification of the abundantly available biopolymers celluloses and

hemicelluloses. There are multiple ways for saccharifying and fermenting the biopolymers. The different methods are summarized using the illustration below:



Figure 1 Different steps and methods of bioethanol production (the three major steps involved in bioethanol production: hydrolysis or saccharification of the hemicellulose and cellulose chains to release pentose (C5 sugars) and hexose (C6 sugars); fermentation of the hexose and pentose sugars. The illustration summarizes the different approaches possible for carrying out these major steps.)

SSCF is when both hexose and pentose sugars are fermented simultaneously in the same reaction vessel by two different or the same microorganism. Great results can be obtained by finding a mutualistic system of microorganisms which work symbiotically to ferment both the sugars. The case reported by Vlydis et al. (2017) where ethanol is produced by the microorganism *Zymomonas mobilis* that can ferment both pentoses and hexoses into ethanol with a yield of 0.34 g/g is an example of the SSCF method. On the other, the construction of de novo strains including all pathways of interest for the synthesis of the desired product with the creation of specific microbial factories as their main objective is known as Consolidated Bioprocessing (CBP) (Diaz et al. 2018).

BIOGAS

Biogas production from agricultural and food waste has been a longstanding practice which is why, the technology required for the process is well developed. In general, the residue after fermentation is directed to the anaerobic digestion unit to produce biogas rich in methane. Vijayaraghavan et al. (2006) reported the use of a novel microflora isolated form cow-dung that digested waste jackfruit peels to produce biogas rich in hydrogen instead of methane. Hydrogen as the main component of biogas instead of methane is an exceptionally green an environment-friendly process, as the only byproduct of hydrogen combustion is water, which can be condensed and reused. Hence, this field warrants further research and development efforts.

Apart from the abovementioned popularly known products, it is also possible to produce some specific chemicals and products. The table below summarizes a few of the noteworthy applications:

Applications	Examples	References
Organic acids	succinic acid, mucic acid, lactic acid, etc.	(Patsalou et al., 2020), (Jeong et al., 2021), (Fazzino et al., 2021)
Agriculture	biofertilizer, biosorbents, biochar, etc.	(Santiago et al., 2020), (Joglekar et al., 2019),

Table 1 Novel	applications	of CPW	valorization f	or value-added	product	manufacturing
	upplications		value ization i	or varue auaca	product	manaractarms

Volume 8, Issue 2 (III) April - June 2021

		(de la Torre et al., 2019)
		(Pathak et al., 2017),
Food and nutrition	Single Cell Protein, Dietary fibres, etc.	(Panwar et al., 2021),
		(Satari & Karimi, 2018)
Biopolymers		(Tsouko et al., 2020),
	Bacterial cellulose, nanocellulose, nylon, etc.	(Panwar et al., 2021),
		(Satari & Karimi, 2018)

OBSERVATIONS AND DISCUSSION:

Suggestions from Sustainability perspective

Based on the results published by Pourbafrani et al. (2013), Cristóbal et al. (2018), Satari & Karimi (2018), Joglekar et al. (2019), Caldeira et al. (2020) and (Teigiserova et al., 2021) it has been observed that a strategic coupling of high value-low volume and low value-high volume products is necessary to make the biorefinery economically feasible and build an economy of scope. This kind of coupling requires great deal of modeling, optimization, and simulation studies to get a complete understanding of the risks, uncertainties and profits derived from the integrated system overall. These hybrid systems are also necessary to maximize the benefits received from socio-institutional policies implemented by the government so that more of the firm's resources are diverted towards research either for the improvement of the existing process or for introducing new products into the market. Considering the case presented in Vlysidis et al. (2017), showing that D-limonene is responsible for more than 70% of the plant's revenues, while, if the production was limited to bioethanol, the plant capacity should increase significantly (becoming higher than 200,000 tons/y) in order to be profitable (Caldeira et al., 2020) provides the necessary proof to see that the suggestion possesses merit and must implemented at the earliest.

There is an urgent need to revamp existing processes by introducing green technologies and reduce the overall environmental impact of production. Green extraction methods are eco-friendly; while, they have developed as powerful tools with the purposes of improving extraction yield with a fast rate, increasing heat and mass transfer, and ease of operation (Satari & Karimi, 2018). Ameta & Ameta (2013) posit that microwave technologies should replace conventional heating methods because of the following reasons: (i) selective heating of specific reaction components, (ii) rapid heating rates and temperature gradients, (iii) the elimination of wall effects and (iv) superheating of solvents. In the context of CPW which has high initial moisture content, microwave assisted extraction (MAE) has the added advantage of little to no solvent requirement for the process. The release of EO during the break-down of the cell wall due to internal pressure as posited by Negro et al. (2016) is another significant advantage. As mentioned by Teigiserova et al. (2021) direct extraction of the EO without the post-treatment steps, which are necessary for conventional extraction. Studies have also shown that microwaves alter the biomass cell structure to make it more porous thereby improving the yields of the chemical and enzymatic treatments succeeding this step. While there are numerous advantages to using MAE, Boukroufka et al. (2015) found that low powers result in low EO recovery, while high powers can degrade the citrus peel matter leading to loss of yield and hence, revenue. Designing a new MAE system that would cater to the needs of both EO and pectin extraction would be a great way to reduce the capital and operating costs associated with MAE while making it more profitable for commercial use.

Since the lignin content of CPW is very low and given the low level of understanding and knowledge available about its valorization to obtain value-added products, gasification of this residue to create syn-gas which may either be used to meet the energy requirements of the plant or sold outside to generate revenue might be an interesting avenue to explore. In a study conducted by Martínez-Ruano et al. (2018) on valorization of banana peels, the aforementioned system was installed. A gas turbine to generate electricity from the hot stream of syngas to cool the syn-gas for further processing was also used. The authors report that the system provided enough electricity to address the energy needs of the plant. A similar study by Dávila et al. (2015) suggests that the prospective plant without electricity generation has a lower environmental impact, because the generation of gases during energy production is not convenient. An in-depth analysis of not just the economic value but also the environmental benefits and eco-tax remedies available to implement such an integrated and self-sufficient unit is recommended.

The CO₂ recovery system built in the Pomacle-Bazancourt biorefinery (*The Bazancourt-Pomacle Biorefinery*, 2020) by Air Liquid to capture and recycle the CO₂ emitted by the biorefinery during the fermentation and anaerobic digestion steps instead of releasing it into the atmosphere is an enormous step towards circular bioeconomy and ensuring that the move towards zero-waste discharge is respected and perpetuated. This recycled CO₂ has the possibility of being used as a solvent (supercritical fluid extraction) or being sold to soft-

Volume 8, Issue 2 (III) April - June 2021

drink manufacturing companies to generate additional revenue. Such innovative approach is necessary to make biorefineries competitive to conventional petroleum refineries.

FUTURE PERSPECTIVES:

Waste-to-energy conversion technologies usually present high Technology Readiness Levels (TRL) and some of them are even applied at the commercial scale such as anaerobic digestion (Ren et al., 2018; Cristóbal et al., 2018), being the cost estimation of the new biorefinery concept relatively easier since real costs are available for the escalation and the validation of the results. On the other hand, biorefineries focused on value-added products and chemicals present a low TRL being the cost estimation difficult and uncertain (Cristóbal et al., 2018; Tsagkari et al., 2016). Thus, the field does not only demand increasing research efforts but also the up-scaling and development of the innovative methods already reported in literature. New policies supporting such ventures need to be enforced. A remarkable example is the use of soft-sensors which use the off-gas data from the fermenter to monitor the process in real time. The fermentation process is reverse-engineered from the off-gas data and deviations in the off-gas measurements are translated to subsequent deviations in the process parameters. This incredible feat is accomplished by using extensive mathematical modelling and machine learning techniques to build algorithms powerful enough to handle these resource-intensive and extraneous processes. These sensors deliver results with astounding speed which gives the operator ample time to take corrective actions thereby increasing the process yield, reducing the process downtime, and eliminating unnecessary losses to boost profits.

According to (Teigiserova et al., 2021) the composition of citrus peels of the citrus cultivar and varieties from the same citrus fruit, can have different EO yields and different EO compositions (including limonene content). Therefore, not only the type of fruit but also the cultivar and varieties represent crucial information. Additionally, the authors also surmise that geographical aspects such as soil quality, nutrient availability, temperature, climate, rainfall also influence the EO content and the phytochemical composition. This combined with the low technology readiness level of these biorefineries suggests that the most profitable options for such refineries are those related to implementing fewer plants, namely concentrating the production and capitalizing on economies of scale while being at risk of increasing externalities, e.g. due to logistics of the feedstocks (Cristóbal et al., 2018). Caldeira et al. (2020) mentioned that the economic viability of food waste biorefinery facilities is greatly favoured when they are integrated into the existing juice production plants, in which case the transportation cost of the raw material is null.

It was observed that there are major inconsistencies between the units used to report the results which hampers the reproducibility of these results or leads to serious confusion in their interpretation. Since this is field is still in its nascent stage, formation of an international system of standardized units as is the case with other more evolved sciences like chemistry, physics, etc. would be go a long way in improving the reach and usability of the existing literature and thus the impact of the science on the whole.

CONCLUSION:

Circular bioeconomy is still in its nascent stage and concerted efforts from governments and private sector are required to boost it and deploy it globally. FW is a great source of raw material for biorefineries and must be utilized to the fullest. CPW is one of the most well-known and commercially viable option. Based on the study, particularly the observations and discussion section, many environment-friendly, sustainable, and economically feasible changes can be introduced in the existing strategies competitive with the conventional petroleum refineries.

REFERENCES:

- Ameta, S. C., & Ameta, R. (Eds.). (2013). *Green Chemistry: Fundamentals and Applications*. CRC Press, Taylor and Francis Group, 284-300.
- Caldeira, C., Vlysidis, A., Fiore, G., De Laurentiis, V., Vignali, G., & Sala, S. (2020). Sustainability of food waste biorefinery: A review on valorisation pathways, techno-economic constraints, and environmental assessment. *Bioresource Technology*, 312(March), 123575. https://doi.org/10.1016/j.biortech.2020.123575
- Commission, E. (2012). Innovating for Sustainable Growth: A Bioeconomy for Europe.
- Cristóbal, J., Caldeira, C., Corrado, S., & Sala, S. (2018). Techno-economic and profitability analysis of food waste biorefineries at European level. *Bioresource Technology*, 259(March), 244–252. https://doi.org/10.1016/j.biortech.2018.03.016

- Dávila, J. A., Rosenberg, M., & Cardona, C. A. (2015). Techno-economic and Environmental Assessment of p-Cymene and Pectin Production from Orange Peel. *Waste and Biomass Valorization*, 6(2), 253–261. https://doi.org/10.1007/s12649-014-9339-y
- de la Torre, I., Martin-Dominguez, V., Acedos, M. G., Esteban, J., Santos, V. E., & Ladero, M. (2019). Utilisation/upgrading of orange peel waste from a biological biorefinery perspective. *Applied Microbiology and Biotechnology*, *103*(15), 5975–5991. https://doi.org/10.1007/s00253-019-09929-2
- Diaz AB, Blandino A, Caro I (2018) Value added products from fermentation of sugars derived from agrofood residues. Trends Food Sci Technol 71:52–64
- Fazzino, F., Mauriello, F., Paone, E., Sidari, R., & Calabrò, P. S. (2021). Integral valorization of orange peel waste through optimized ensiling: Lactic acid and bioethanol production. *Chemosphere*, 271, 129602. https://doi.org/10.1016/j.chemosphere.2021.129602
- Jeong, D., Park, H., Jang, B. K., Ju, Y. Bin, Shin, M. H., Oh, E. J., Lee, E. J., & Kim, S. R. (2021). Recent advances in the biological valorization of citrus peel waste into fuels and chemicals. In *Bioresource Technology* (Vol. 323, p. 124603). Elsevier Ltd. https://doi.org/10.1016/j.biortech.2020.124603
- Joglekar, S. N., Pathak, P. D., Mandavgane, S. A., & Kulkarni, B. D. (2019). Process of fruit peel waste biorefinery: a case study of citrus waste biorefinery, its environmental impacts and recommendations. *Environmental Science and Pollution Research*, 26(34), 34713–34722. https://doi.org/10.1007/s11356-019-04196-0
- Martínez-Ruano, J. A., Caballero-Galván, A. S., Restrepo-Serna, D. L., & Cardona, C. A. (2018). Technoeconomic and environmental assessment of biogas production from banana peel (Musa paradisiaca) in a biorefinery concept. *Environmental Science and Pollution Research*, 25(36), 35971–35980. https://doi.org/10.1007/s11356-018-1848-y
- Ortiz-Sanchez, M., Solarte-Toro, J. C., Orrego-Alzate, C. E., Acosta-Medina, C. D., & Cardona-Alzate, C. A. (2020). Integral use of orange peel waste through the biorefinery concept: an experimental, technical, energy, and economic assessment. *Biomass Conversion and Biorefinery*. https://doi.org/10.1007/s13399-020-00627-y
- Panwar, D., Panesar, P. S., & Chopra, H. K. (2021). Recent Trends on the Valorization Strategies for the Management of Citrus By-products. *Food Reviews International*, *37*(1), 91–120. https://doi.org/10.1080/87559129.2019.1695834
- Pathak, P. D., Mandavgane, S. A., & Kulkarni, B. D. (2017). Fruit peel waste: Characterization and its potential uses. *Current Science*, *113*(3), 444–454. https://doi.org/10.18520/cs/v113/i03/444-454
- Patsalou, M., Chrysargyris, A., Tzortzakis, N., & Koutinas, M. (2020). A biorefinery for conversion of citrus peel waste into essential oils, pectin, fertilizer and succinic acid via different fermentation strategies. *Waste Management*, *113*, 469–477. https://doi.org/10.1016/j.wasman.2020.06.020
- Pourbafrani, M., Forgács, G., Horváth, I. S., Niklasson, C., & Taherzadeh, M. J. (2010). Production of biofuels, limonene and pectin from citrus wastes. *Bioresource Technology*, *101*(11), 4246–4250. https://doi.org/10.1016/j.biortech.2010.01.077
- Pourbafrani, M., McKechnie, J., Maclean, H. L., & Saville, B. A. (2013). Life cycle greenhouse gas impacts of ethanol, biomethane and limonene production from citrus waste. *Environmental Research Letters*, 8(1), 15007. https://doi.org/10.1088/1748-9326/8/1/015007
- Santiago, B., Moreira, M. T., Feijoo, G., & González-García, S. (2020). Identification of environmental aspects of citrus waste valorization into D-limonene from a biorefinery approach. *Biomass and Bioenergy*, *143*, 105844. https://doi.org/10.1016/j.biombioe.2020.105844
- Satari, B., & Karimi, K. (2018). Citrus processing wastes: Environmental impacts, recent advances, and future perspectives in total valorization. *Resources, Conservation and Recycling*, *129*(October 2017), 153–167. https://doi.org/10.1016/j.resconrec.2017.10.032
- Teigiserova, D. A., Tiruta-Barna, L., Ahmadi, A., Hamelin, L., & Thomsen, M. (2021). A step closer to circular bioeconomy for citrus peel waste: A review of yields and technologies for sustainable management of essential oils. *Journal of Environmental Management*, 1–2.

Volume 8, Issue 2 (III) April - June 2021

- *The Bazancourt-Pomacle biorefinery.* (2020). COMMUNITY, GREATER REIMS URBAN. https://www.grandreims.fr/les-competences/enseignement-superieur-recherche-innovation/la-bioraffineriede-bazancourt-pomacle-8604.html
- Tsagkari, M., Couturier, J.-L., Kokossis, A., & Dubois, J.-L. (2016). Early-Stage Capital Cost Estimation of Biorefinery Processes: A Comparative Study of Heuristic Techniques. *ChemSusChem*, 9(17), 2284–2297. https://doi.org/10.1002/cssc.201600309
- Tsouko, E., Maina, S., Ladakis, D., Kookos, I. K., & Koutinas, A. (2020). Integrated biorefinery development for the extraction of value-added components and bacterial cellulose production from orange peel waste streams. *Renewable Energy*, *160*, 944–954. https://doi.org/10.1016/j.renene.2020.05.108
- Vijayaraghavan, K., Ahmad, D., & Ibrahim, M. K. Bin. (2006). Biohydrogen generation from jackfruit peel using anaerobic contact filter. *International Journal of Hydrogen Energy*, *31*(5), 569–579. https://doi.org/10.1016/j.ijhydene.2005.06.006
- Vlydis, A., Koutinas, A., & Kookos, I. (2017). Food waste reduction and valorisation: Sustainability assessment and policy analysis. *Food Waste Reduction and Valorisation: Sustainability Assessment and Policy Analysis*, 1–327. https://doi.org/10.1007/978-3-319-50088-1
- *What Is the circular economy?* (n.d.). Retrieved March 2, 2021, from https://www.ellenmacarthurfoundation.org/circular-economy/what-is-the-circular-economy

GENOME EDITING TO DESIGN MICROORGANISMS FOR BIOREMEDIATION

Dr. Aparna Deshmukh and Paridhi Sharma

Department of Biotechnology, Thakur College of Science and Commerce, Mumbai, India

ABSTRACT

Microbial bioremediation has been in practice since a long time. Recent advances in genome editing techniques have contributed immensely to modify genetic potential of microorganisms for degrading environmental pollutants especially recalcitrant. For example, synthetic pesticides constitute many recalcitrant compounds which do not biodegraded easily. The long persistence of the pesticides in the soil has harmful effects on the soil , crops and hosts of the food web dependent on these crops. In order to eliminate these complex compounds from the soil ecosystem, microorganisms can be designed in such a way that they are able to break down the pesticides using genome editing tools, such as targeted nucleases and CRISPR-Cas systems. CRISPR-Cas systems are used very efficiently for gene editing. Recombinant DNA techniques are used to isolate genes from organisms which have the capability to carry out the breakdown of recalcitrant compounds and insert then into other host microorganisms. During farming, these microbes can be introduced into the soil after the application of pesticides. This paper highlights significant tools to design microbial functional genes for degradation of recalcitrant of interest so as to improve bioremediation potential.

Keywords - Genome editing, recalcitrant, CRISPR-Cas systems, bioremediation

INTRODUCTION

In today's date, due to increased food demands, the agricultural sector has expanded significantly and so has the use of pesticides on the farming lands. It is common knowledge that pesticides have a negative effect on the susceptible pests, however a more negative effect is visible on the soil ecosystem, i.e., on the crops, on the soil microorganisms, which are beneficial for the crops along with the consumers of the crops (animals, humans, birds in the food web). Synthetic pesticides are recalcitrant in nature and so they remain in the soil for a longer time, causing detrimental effects on the ecosystem. They cannot be easily broken down by the soil microorganisms.

There are in-situ bioremediation methods such as biosparging, bioaugmentation, bioventing and ex-situ bioremediation methods such as landfarming, biopiling, composting and bioreactors for removal of these complex molecules from the soil. However, these methods are tedious and time taking.

RECOMBINANT DNA TECHNOLOGY

Recombinant DNA Technology has been used to manipulate genes of microorganisms for degradation of organic compounds. he genes for the degrading enzymes were located on the extrachromosomal part, that is, on the plasmid. The plasmids were isolated and put into a single strain of Pseudomonas. These strain showed a capability to degrade oil by 10-100 times faster than the wild. Deinococcus radiodurans , which is the most radiation-resistant organism known, was genetically engineered for toluene degradation. However, it has not been applied for commercialized bioremediation purposes due to anticipated risks and regulatory controls associated with it. Agent Orange is a toxic defoliant used by the United States military during the Vietnam War. This compound is 1 : 1 mixture of two phenoxy herbicides, 2,4-dichlorophenoxyacetic acid (2,4- D) and 2,4,5trichlorophenoxyacetic acid (2,4,5-T), and it is linked to increased incidences of cancer. In order to degrade this pollutant, an engineered microbe was produced from a strain of Burkholderia cepacia, and it was fi rst tested for the removal of Agent Orange at the US Air Force site in Pensacola, northwestern Florida, where it was stored prior to its shipment to Vietnam (Marwick 2003; Chauhan et al. 2008). Organophosphate- and carbamate-degrading recombinant strain of Sphingomonas sp. CDS-1 was developed by Liu et al. The methyl parathion hydrolase encoding gene (mpd) was cloned with cognate regulator of a methyl parathion (MP)degrading strain Pseudomonas putida DLL-1 using shotgun method. Broad-host vector pBBR1MCS-2 was used to produce pBBR- mpd 202 S. Kumar et al. recombinant plasmid which was transformed in Sphingomonas sp. CDS-1 to fi nally produce CDS-pBBR- mpd recombinant. The methyl parathione-degrading capacity of the recombinant organism was about 7 times higher than the wildtype strain.

CRISPR-CAS SYSTEMS

A better and quick approach can be used for pesticide bioremediation of the farm lands using CRISPR-Cas systems. These systems are highly efficient gene editing tools. Using these systems, new types of microorganisms can be designed which will have the capability to break down the pesticides into simple, non-toxic molecules in the soil which can then be biodegraded.

Clustered regularly interspaced short palindromic repeats – CRISPR-associated (CRISPR-Cas) systems are naturally present in bacteria as a defence mechanism against the attack by pathogens. These systems have Cas proteins which act as nucleases. These nucleases are programmable and can target specific gene(s) to either insert new genes or delete the existing genes. They are guided to the target sequence by the guide RNA (gRNA). The gRNA recognises a PAM (Protospacer Adjacent Motif) on the target sequence and as a result the Cas protein cleaves the sequence at that site. For pesticide bioremediation , genes from organisms which have various mechanisms to break complex compounds can be isolated and inserted in the microorganisms. The screening for such genes can be done using bioinformatic tools and systems biology approach. The newly designed microorganisms can then be introduced into the soils.CRISPR-Cas System can be used to biodegrade the pesticides, after using them for farming.

CONCLUSION:

Various genome editing techniques can be efficiently used to modify genetic potential of microorganisms for degrading environmental pollutants especially recalcitrant. These tools include Recombinant DNA technology, TALENs, ZFN, CRISPR -Cas system.

ACKNOWLEDGEMENT:

We would like to thank Principal Dr. C.T. Chakraborty and Management of Thakur College for providing the opportunity to conduct and the present study.

REFERENCES

- Ashim Chowdhury, Saswati Pradhan, Monidipta Saha, and Nilanjan Sanyal . Impact of pesticides on soil microbiological parameters and possible bioremediation strategies. Published online 2008 May 1. doi: 10.1007/s12088-008-0011-8, Indian J Microbiol. 2008 Mar; 48(1): 114–127
- Dileep K. Singh. Biodegradation and bioremediation of pesticide in soil: concept, method and recent developments, Indian J Microbiol. 2008 Mar; 48(1): 35–40, Published online 2008 May 1. doi: 10.1007/s12088-008-0004-7
- Shweta Jaiswal, Dileep Kumar Singh, and Pratyoosh Shukla1. Gene Editing Systems Biology Tools for Pesticide Bioremediation: A Review, Front Microbiol. 2019; 10:87, Published online 2019 Feb 13. doi: 10.3389/fmicb.2019.00087
- 4. Tinatin Doolotkeldieva,⊠ Maxabat Konurbaeva, and Saykal Bobusheva . Microbial communities in pesticide-contaminated soils in Kyrgyzstan and bioremediation possibilities , Environ Sci Pollut Res Int. 2018; 25(32): 31848–31862 , Published online 2017 Sep 7. doi: 10.1007/s11356-017-0048-5
- Muhammad Kashif Javaid, Mehrban Ashiq, and Muhammad Tahir. Potential of Biological Agents in Decontamination of Agricultural Soil, Scientifica (Cairo). 2016; 2016: 1598325, Published online 2016 May 3. doi: 10.1155/2016/1598325
- 6. Divine N. Tarla , Larry E. Erickson , Ganga M. Hettiarachchi , Sixtus I. Amadi, Madhubhashini Galkaduwa , Lawrence C. Davis , Asil Nurzhanova Valentina Pidlisnyuk. Phytoremediation and Bioremediation of Pesticide-Contaminated Soil.

NEW AGE BUSINESS VENTURES TO SUPPORT TRIPLE BOTTOM LINE – A STEP TOWARDS SUSTAINABLE ENTREPRENEURSHIP

¹Dr. Rupal Shroff and ²Karan Shah

¹BMS Co-ordinator, Thakur College of Science and Commerce, Kandivali (East), Mumbai ²Atharva College of Engineering, Mumbai

ABSTRACT:

We are living in exciting times characterized by major power shifts where there is no need for large and complex infrastructures and organisations to transform an idea into a tangible solution. In today's challenging times, every Individual is capable and powered with entrepreneurial skills, a good idea, determination and commitment to succeed and tools of information technology. This has a new school of young leaders who wish to use their entrepreneurial skills to risk new projects that solve major society sustainable issues. These people are Sustainable Entrepreneurs.

Sustainable entrepreneurs apply imagination to challenging problems to conceive, prototype, and create solutions that deliver environmental, social and economic value. To state the facts, with the awareness of corporate social responsibility, these Business leaders are on a challenging mission to save the world around them, making it a better place. They are out to create an eco-system of like-minded people who harness their skills and initiate ventures wgich are sustainable too. Such an ambitious approach of entrepreneurship contributes to the growth of the society and nation at large.

I propose a framework model called "I The Sustainable Entrepreneur" consisting of need for an awakening amongst the youth for indulging in business activities keeping the triple bottom line (environment, society & economic gains) in mind. This framework model if, incorporated would make the world a more lucrative opportune for sustainable entrepreneurship.

Key Words: sustainability, sustainable entrepreneurs, I model of SE, triple bottom line.

INTRODUCTION:

Sustainability Entrepreneurship (SE), this looks to be Entrepreneurship with a perspective different from the traditional focus. This takes into view all sustainable measures for environment improvement. It takes a slightly different perspective from the traditional focus of business venturing with a twist of promoting sustainable living. The core area of sustainable entrepreneurship involves searching for opportunities for new products or services or new technologies or production processes that develops the societal and environmental conditions, making efficient use of natural resources yet preserving it. Products are comparatively cheaper and more appealing to the young minds. Innovative processes that feed entrepreneurs with low costs, low risks and have the potential to cater to the world crisis of sustainability.

WHAT IS SUSTA INABILITY?

According to Wikipedia" Sustainability is the capacity to endure through renewal, maintenance, and sustenance, or nourishment, in contrast to durability, the capacity to endure through unchanging resistance to change.

It is a broad and complex concept. Technically it speaks of ecology and natural resources protection, it also comprehends economic progress with societal development, it is a combination of these.

Sustainability also means a way of life lived by the whole of society that considers the needs of future generations.

The United Nations created the World Commission on Environment and Development (WCED) in 1983. It aimed to look into the growing concerns about the speedy depletion and deterioration of human environment and natural resources, which compounded economic and societal development. The outputs of this commission known as the Brundtland Report, speaks to the interrelationships between environmental, social, and economic progress and for first time used the term "sustainable development" to describe the concept.

Sustainable development was defined as "development that meets the needs of the present generations without compromising the ability of future generations to meet their own needs."



SD Model

SD Model commonly known as Triple Bottom Line – Social, Economic and Environment - People, Planet and Profits is the answer to a sustainable and green planet. Every company, due diligence of the law is enforcing this model to keep customers, society, planet and the pockets happy too.

WHY SUSTA INABILITY?

There are the three main reasons why the development of sustainable models is so important:

- 1. There is limited availability of natural resources;
- 2. Exponential human population growth, and;
- 3. Current and future generations have necessities to fulfil their needs.

Objective:

- 1. to establish a strong link between sustainable development and entrepreneurship.
- 2. to design a model to enhance the growth of sustainable entrepreneurs across the globe.

Research Methodology:

An exploratory study of some entrepreneurial case-studies collected from secondary data from magazines, published journals, reference books and web-sites.

Entrepreneurship:

Entrepreneurship is the process of identifying new opportunities, creating added value for customers or users and finally commercially launching these opportunities to develop a profitable business. An entrepreneur explores all avenues, develops an idea, takes risk, arranges all resources and initiates a business.

Sustainable Entrepreneurship – he looks at the ecology and natural resources too while developing the innovative business.

WHY SUSTA INABLE ENTREPRENEURS HIP?

It is only recently that we are aware of the relationship between certain human activities and the implications for the planet. The subject has reached such a level of maturity than it is only now that all the pieces of the puzzle are beginning to come together. A new generation of individuals is on the rises that are driven to create an impact in society and leave a heritage of improved environmental and social conditions.

Today large companies are doing much to increase their sustainability footprint. But lack flexibility to develop innovative sustainable solutions. That is why the future of sustainability is in the hands of passionate individuals driven to create environmental, social, and economic value.

SUSTAINABLE DEVELOPMENT AND ENTREPRENEURSHIP

Four Areas are identified as successful strategies of entrepreneurship -

Ecopreneurship,

Social entrepreneurship,

Institutional entrepreneurship and

Sustainable Entrepreneurship.

Comparative analysis of the above concepts is done:

Ecopreneurship	Social entre-	Institutional	Sustainable

Volume 8, Issue 2 (III) April - June 2021

		preneurship	entrepreneurship	entrepreneurship
Core motivation	Contribute to	Contribute to	Contribute to	Contribute to
	solving	solving societal	changing	solving societal
	environmental	problem and	regulatory,	environmental
	problem and	create value for	societal and	problems & earn
	create economic	society	market	profits
	value		institutions.	
Main goal	Earn money by	Achieve societal	Changing	Creating SD
_	solving	goal and secure	institutions as	through
	environmental	funding to	direct goal	entrepreneurial
	problems	achieve this	_	activities
Role of economic	Ends	Means	Means or ends	Means and ends
goals				
Organisational	From focus on	From focus on	From changing	From small
development	environmental	societal issues to	institutions to	contribution to
challenge	issues to	integrating	integrating	large contribution
	integrating	economic issues	sustainability	
	economic issues			

LESSONS IN SUSTAINABILITY FROM INDIA'S ENTREPRENEURS

Saatchi & Saatchi in its reports says: It amounts to a pep talk for a global economy still in the swoon of recession and facing looming shortages of water and power and the spectre of climate change. All corporate citizens face stiff headwinds, but, as the report notes, "the world's sustainability challenges are arriving first and fastest in India." The report highlights Indian companies that have applied some universal principles that other businesses may have forgotten. These principles include self-reliance, looking to people for solutions, thinking in whole systems, and embracing the Indian spirit of "jugaad," a Hindi word that means overcoming limited resources by improvising.

Hot Lunch Delivery: The famous Dabbawalas of Mumbai are a unique example. Employing over 5000 people in the huge Mumbai city, these dabbawala deliver home-made lunch to all offices in every nook and corner of Mumbai. **The "dabbawalla"** — **literally, "a person with** a box" — doesn't make the lunch; he picks it up from the worker's home in a cycle and delivers it in steel containers to the local railway station and then transports the empties back home. They have also been awarded Six-sigma rating of 99.999% efficiency.

Factories without Waste: A famous paint industry – **Asian Paints follows the concept of No waste.** When the government banned the company from dumping its effluent waste, the company had a sustainable idea. It decided to dispose its liquid waste without harming the environment. It uses all the disposal after a thorough cleaning process for the toilets and gardening of the area. This water recycling technology, a one time process cost got them the recognition for sustainable entrepreneur.

Fair Prices for Farmers: ITC e-chaupal is another sustainable entrepreneurship venture that eliminates the middlemen who take away huge share of the farmers worth. Hosted with better market data than the local farmers or distributors, this online marketplace ITC e-chaupal helps the farmers to sell their produce at better prices. E-chaupal is recognised after famous hindi word village market place, this center situated in major areas across the agricultural lands of the country, gives growers access to the latest commodity prices, weather forecasts, and other useful information.

Organic Farming – One of the most environment friendly sustainable ventures that the young generation has adapted and excelled to is Organic Farming. Using all natural resources, avoiding the use of pesticides that support environment, yet yield good biogenic crops is the latest trend. Most of the youth have started this kind of business practices in the open terraces of buildings, in the balconies of their homes or in the gardens of the area. This business opportunity has supported the addition to green environment by more plants being planted & reduced use of chemicals. Moreover the awareness generated with respect to use of natural food products, saving the environment is large. This process has led the entire globe to support Organic food products, Vegan foods as a substitute to artificial and dairy products.

In this paper, I have introduced a framework model of sustainable entrepreneurship

- Ignite: the young minds towards sustainable development
- Infuse : Courses in the education system about SE to create awareness

Volume 8, Issue 2 (III) April - June 2021

- **Invoke :** the corporate world to take actions for value additions to their ventures.
- Innovate : new products, services or ideas to reach all sections of society
- **Include:** bottom of the pyramid to enhance growth to add to sustainable development.
- Implement : Government policies and regulatory framework to encourage SE.



Modes of Innovation in the 4Ps for the Bottom of the Pyramid

Product - • New product forms convenient for the BOP consumers keeping in mind their habits . • Innovative forms of packaging like sachets, dab-on-packs, reusable boxes

Price - • Offering products at affordable prices, slight premium for very famous brands to satisfy the self-esteem needs of the youth. • Providing micro-credit facilities.

Promotion - • Using exciting vehicles of advertisement involving the BOP consumers.

• Innovative modes of communication like community radio and Kiosk marketing.

Place - • Distributed model of physical distribution and Reference group Marketing

ADVANTAGES OF SUSTAINABLE ENTREPRENEURSHIP

By focusing on SE, new ventures can potentially gain in several ways, including:

- harness technology and information to include lower dependency on depletable resources
- higher utilization of regenerating or renewable resources
- effective and efficient production
- lower usage and burden of environmental and social legislations
- A very positive image in the society
- corporate social responsibility and business partnership with other SE across globe.
- awareness to the youth for ideating new ventures on similar platforms

CONCLUSION:

A strong link is identified between entrepreneurship and environment. The entrepreneurial flair of the CEO enables the pursuit of environmental, social and economic goals. The success of these sustainable entrepreneurs stems from the their commitment to ecological development, a focus towards CSR efforts and most importantly be unique in their entrepreneurial offering. The strong economic foundations of the model provide sustainability for the environmental and social objectives of the organisation. **Sustainable Innovation and Ideas would capitalise these unforeseen opportunities and also add profits to the Businesses.** From a SE perspective,

entrepreneurs have a responsibility to their investors and shareholders but also to nature, society, and future generations

The proposed framework model has been designed to inculcate more entrepreneurial activities amongst the young minds keeping in mind sustainable development of the country. To achieve sustainable development in India it is vital to include the Bottom of the Pyramid and grow in a width rather than climbing the triangle. Favourable Regulatory policies and financial funding from Government institutions will ignite the flames which have been sown by the education institutions. Entrepreneurs are required to evaluate the sustainability benefits of a specific venture in terms of its impact on environmental protection, social justice, and long-term human survival, and compare that with the venture's expected profitability and growth. This is often referred to as "managing the triple bottom line"

REFERENCES:

- 1. Prahalad, C.K. and Hart, Stuart L., "The Fortune at the Bottom of the Pyramid", Strategy+Business, 26: 54-67, First Quarter 2002, Booz, Allen & Hamilton Inc.
- 2. Prahalad, C.K.; The Fortune at the bottom of the Pyramid; Wharton School, Pearson Education combined publishing (2005
- 3. Srinivasan, Shiva Kumar, Book Review on "The fortune at the Bottom of the Pyramid: Eradicating poverty through profits" Vikalpa: The journal for Decision Makers, Volume 30, No. 2, April-June 2005.
- 4. Boons, F. and Roome, N. (2005), "Sustainable Enterprise in Clusters of Innovation New Directions in Corporate Sustainability Research and Practice", in Sharma, S. and Aragón-Correa, J.A.
- 5. Larson, A.L. (2000), "Sustainable Innovation through an Entrepreneurship Lens", *Business Strategy and the Environment*, Vol. 9, pp. 304 317.
- 6. Krueger, N.F. Sustainable entrepreneurship: Broadening the definition of opportunity.
- 7. Schumpeter, J.A. 1934. The theory of economic development. Cambridge, MA-HU.
- 8. Shane, S., and S. Venkataraman. 2000. The promise of entrepreneurship as a field of research. Academy of Management Review 25: 217-226.
- 9. Report from Saatchi & Saatchi.

A STUDY ON GREEN INVESTING OPPORTUNITIES IN THE FINANCIAL MARKET

Dr. Sharyn Prabhakar Bangera

Assistant Professor, Usha Pravin Gandhi College of Arts, Science and Commerce

ABSTRACT

Green or climate change investing is a means by which are funds committed towards ecologically friendly investments by providing financial support. Various green investment alternatives are gaining prominence in financial markets globally. This research paper focuses on the understanding of green investment instruments in the financial markets, the status of green investing globally and in India, understanding effectiveness of green investments in reducing CO_2 emissions and challenges associated with green investing.

Keywords – Green investing, Socially Responsible Investing (SRI), Environmental, Social and Governance (ESG), Impact investing

INTRODUCTION

Green investing or climate investing is a field of investing which aims at channelising investments into asset classes or products which reduce, mitigate or manage the adverse impact of climate change and global warming. The emphasis is on investing in those projects or companies or assets which conserve natural resources, protect the environment and give an impetus to sustainable development. At times the term green investing is used interchangeably with Socially Responsible Investing (SRI) which takes into account certain ethical screening criteria such as positive environmental filters or screens for clean (eco-friendly) projects and negative screens for dirty (polluting) projects. Green investing is also linked to Environmental, Social and Governance (ESG) investing, impact investing and sustainable investing.¹ However, the focus of pureplay green investing is predominantly on environmentally conscious opportunities only.

The green investment opportunities can emanate from various avenues such as renewable energy in the form of solar, wind and geothermal energy, resource conservation such as soil and water, pollution control, waste management, organic farming and eco-friendly sustainable agriculture, environmentally friendly automobiles or green vehicles and even from business enterprises which incorporate environmentally conscious business processes such as green supply chain management or energy efficiency. To meet the sustainable development goals and tackle the challenges of climate change, investment into green projects is being channelised not just through domestic public expenditure but also through private individual and institutional investors as well as inter-governmental organisations and foreign investors. They are able to gain exposure to the various green initiatives through the financial market instruments which allow allocation of funds into these eco-friendly businesses and projects.

REVIEW OF LITERATURE

Sekhar (2011) identifies green mutual funds in India and globally and states that they are emerging is an attractive investment alternative for investors.² Voica et al. (2013) mentions that some of the financial considerations that drive green investments incudes risk, return, diversification while extra-financial considerations include ecological, religious and ethical factors.³

STATEMENT OF THE PROBLEM:

The research paper focusses on studying the various green investment products in the financial market and the global and Indian scenario while also attempting to understand whether green investments have been effective in reducing CO_2 emissions.

RESEARCH METHODOLOGY:

The research is exploratory and primarily descriptive in nature using secondary sources of data. It is based on:

Secondary Data Collection:

- a) From newspaper articles and research journals.
- b) From governmental and non-governmental reports such as those of OECD, Economic Survey of India, Climate Policy Initiative Report.

Limitations of the study: Reliance on secondary sources of data only.

RESEARCH OBJECTIVES

1) Identify the various green investment asset classes in the financial market.
Volume 8, Issue 2 (III) April - June 2021

- 2) Understand the current scenario of green investing in global and Indian financial market.
- 3) To study whether green investments have resulted in reduction of CO_2 emissions.

GREEN INVESTMENT ASSET CLASSES

Financing for green or climate change projects is done through various financial instruments. Public sector and private sector are both involved in raising funds and investing them in various projects. Green equity investment is an instrument widely used for green investing wherein investors choose businesses which display either environmentally conscious business values or are involved in eco-friendly projects to purchase equity stake in. These investments can be in publicly listed companies or private entities. Private equity and venture capital funding is also important source of green equity funds. Another investment avenue is green bonds, which are fixed income securities wherein money is borrowed from the debt market from investors to be channelised in climate change and sustainable infrastructure projects. These bonds are being issued by private entities, governmental bodies and intergovernmental entities. Green Mutual Funds and Green exchange Traded Funds, many with an ESG thematic mandate are also popular globally. Some of these funds may not be pure play green funds but have positive environmental screens which ensure investment being channelised towards eco-friendly avenues. Debt-for-climate change swaps are being proposed as another tool wherein sovereign debt obligations would instead be converted to climate change investment obligations. ESG themed hedge funds are also popular investment avenue. To manage and hedge risks associated with green investments and to motivate and drive investments into this segment, green and ESG linked derivative instruments have also evolved. Apart from these investment alternatives, climate change projects are also funded through governmental and intergovernmental grants and project loans from financial institutions,

CURRENT SCENARIO OF GREEN INVESTING IN GLOBAL AND INDIAN FINANCIAL MARKET Green and sustainable investment market has seen a major surge over the past few years globally. Climate related financing crossed 500bn USD globally for the first time in 2017 as per Climate Policy Initiative's flagship analysis, the Global Landscape of Climate Finance 2019. The report also stated that more than 50% of the global climate funds in 2017 and 2018 were being routed towards renewable energy projects while investment in low carbon transport projects also saw a boost. In a 2020 report by CFA Institute, it was found that environmental factor saw the greatest growth, from 2017 to 2020, in terms of being the key deciding ESG factor in investing. The report also highlighted the increasing interest of not just institutional but retail investors, especially driven by younger investors in sustainable investing. Retail investor interest grew the most in the last two years in the United Kingdom, followed by Canada, Germany, Australia, and Hong Kong SAR. Region-wise the maximum interest was in sustainable investing was observed in Asian markets.⁴ A KPMG report which entailed a survey of ESG Hedge funds found that sustainable investing was being driven by institutional investors.⁵ Morgan Stanley Institute for Sustainable Investing analysed more than 3000 U.S. ESG mutual funds and exchange-traded funds (ETFs) and found that they outperformed their non-ESG counterparts and reduced investment risk in 2020 during the Covid outbreak. The Institute has also found that 50% of the individual investors and 80% of institutional investors have integrated sustainability considerations into their investment objective.⁶ As per Climate Policy Initiatives Report, green finance flows in India for FY 2017 was USD 17 billion and USD 21 billion for FY 2018. In, 2016-2017 and 2017-2018, the largest contribution at 63% and 51% respectively, towards green financing was done by domestic private investors through debt and equity instruments. In 2016-17, 54% of the green investments were funded through debt securities and 21% through equity. The major beneficiary of green investments, with around 80% of the finance in 2017 and 2018 in India, being directed towards it was the power sector, mainly solar and wind projects. Sustainable transportation projects saw an increase in investment by 43% from 2017 to 2018. ⁷ As per the Economic Survey of India, India is the 2nd largest emerging market for Green Bonds after China, with USD 10.3bn worth transactions in the first half of 2019.8

EFFECTIVENESS OF GREEN INVESTMENTS IN REDUCING CO2 EMISSIONS Hypothesis testing

 H_0 : Carbon dioxide emissions do not have a significant linear relationship with green investments

H₁: Carbon dioxide emissions have a significant linear relationship with green investments

		Metric
		tonnes
	Green investment	CO2
Year	USD billion	emission
2011	364	32765.65

2012	359	33336.70
2013	331	33544.57
2014	391	33786.45
2015	437	33717.32
2016	383	33699.11
2017	608	34106.79
2018	540	34807.09

Based on the data collected from 2011 to 2018 on climate financing from Climate Policy Initiative's Global Landscape of Climate Finance Reports and GCP's CO₂ emission data spanning 229 countries⁹, the Pearson's Correlation Coefficient was calculated. It was found that green investment and CO₂ emissions are strongly positively correlated r(6) = 0.73 p = .038. The test is statistically significant at l.o.s of 0.05. The null hypothesis is rejected.

This shows that green investments and funding for climate change projects has not been able to bring down reduction in CO_2 emissions, which is the major greenhouse gas. These projects have been not been effective in addressing the goals set by the Paris Agreement showing that there is a greater need for not just channelising more funds but also to ensure that end use of the funds is causing positive climate change impact and reducing or mitigating climate change risks.

CONCLUSION AND SUGGESTIONS

Countries signatory to the UNFCCC have set their Nationally Determined Contributions so that adverse impact of climate change can be mitigated. India alone needs atleast USD3 trillion worth of climate change related investment from 2018-2030. Looking at the current investment in climate change projects, there is a clear shortfall in the funding and in the manner of utilisation of the funds, hence there has been no significant decline in the CO_2 emissions.

These challenges with regards to shortfall in funding can be addressed by making green investments more attractive to not just institutional but non-institutional investors too. Many investors are averse to green investments with the fear of not generating sufficient alpha on their investments. The lack of clear definition of green investments and possibility of funds being routed towards other end uses is also a cause of concern to investors. Greenwashing poses a major challenge as many green projects are just driven by a green PR or marketing objective and do not result in long term value for the investors nor do they serve to resolve climate change issues.

To ensure that the supply of finance into climate change initiatives is able to bridge the gap with actual demand, policy measures globally and at country level, such as Corporate Social Responsibility norms, tax benefits on green investments, development of green derivatives and dedicated green market, green indices and proper monitoring and review of fund utilisation is essential.

REFERENCES

- 1) https://www.oecd.org/environment/WP_24_Defining_and_Measuring_Green_Investments.pdf
- 2) https://www.researchgate.net/publication/256010259_Green_Funds_Green_Investing_A_New_Route_to_ Green_India
- 3) https://reader.elsevier.com/reader/sd/pii/S2212567115002282?token=67AE9E29C5EA5E639DCB036E0D 5B26C0F1FB978C77404E55C08DD198C97C9AB9BE74F8541ECB8D0F5F3A5523730149BE
- 4) https://www.cfainstitute.org/-/media/documents/survey/future-of-sustainability.ashx
- 5) https://assets.kpmg/content/dam/kpmg/xx/pdf/2020/02/sustainable-investing.pdf
- 6) https://www.morganstanley.com/ideas/esg-funds-outperform-peers-coronavirus
- 7) https://www.climatepolicyinitiative.org/publication/landscape-of-green-finance/
- 8) https://energy.economictimes.indiatimes.com/news/renewable/india-becomes-second-largest-market-forgreen-bonds-with-10-3-billion-transactions/73898149
- 9) https://www.climatewatchdata.org/ghg emissions?calculation=ABSOLUTE_VALUE&chartType=line&end_year=2018®ions=WORLD%2C WORLD&source=GCP&start_year=1990

ASSESSMENT OF POLLUTION IN WARD P/N OF GREATER MUMBAI

Prof. Dr. Moushumi Datta

Professor & Vice-Principal, Nagindas Khandwala College, Mumbai

ABSTRACT

The urban spaces in the world are experiencing one common and very serious problem viz. pollution. Initially it was air and water pollution which were the cause of concern, but, at present, noise pollution has also been added to the list and is taken up very seriously. The levels of pollutant sin the air especially the invisible particulate matter is causing great damage to the wellbeing of flora and fauna either directly or indirectly. On the other hand the increasing levels of noise is disturbing the peace and mental health of all species of animals including human beings. As man is progressing, his activities are contributing to air and noise pollution. It is therefore necessary to study the areas which are worst affected by the increased levels of air and noise pollution and find out apt solutions to improve the conditions. The present study studies one area in Greater Mumbai- a global city. The objectives of the study are to analyze the levels of air and noise pollution and represent them spatially and to give applicable solutions. The methodology includes collection of air quality data and noise levels in the study area with the use of collection tools and represent them using appropriate geospatial tools. The analysis is undertaken using spatial software viz. ArcGIS and Ms-Excel. The study concludes that the central part of the ward is highly polluted as compared to the outer areas due to differences in land use and land cover. Some of the constructive recommendations include afforestation, proper planning of land use and awareness drives.

Keywords: urbanization, pollution, impacts, afforestation, planning

INTRODUCTION

Pollution is a major menace in any urban area. Since it is a manmade problem, it needs to be dealt with careful measures so that it can treated in the mot sustainable ways. Hence several studies have been made to understand the prevailing levels of all kinds of pollution in an urban space so that apt solutions can be sought for. The studies have so far revealed that the levels of pollution are high in the urban space as compared to that in the rural spaces. The levels are higher in congested urban spaces as compared to decongested urban spaces. The levels are higher in highly populated areas as compared to moderately populated areas. The present study has taken up an area in Greater Mumbai which is very densely populated, highly congested and has a mixed type of land use viz. housing- of all income levels, industrial, open lands, transportation and others.

REVIEW OF LITERATURE

(Gargava et.al, 1995) The paper provide a critical analysis of urban air pollution trends six specific locations between 2005 and 2011. It also discusses potential health issues that apply to levels. According to the study new building are provided with huge balconies which leads to isolation and heating in the house thus the houses are mend to have centralized air conditioning which harms the environment also for attracting people various schemes and discounts are provided by the builders curtailing the amount to be spent on purchase of building material which further leads to emission of various air borne pollutants. (Rizwan S.A. et.al, 2013) This paper emphasizes on air pollution as it is responsible for many health issues in urban areas. This paper provides an evidence-based view of the air pollution situation in Delhi and its impact on health and established control measures. Vehicle emissions and industrial activities are related to indoor and outdoor air pollution in Delhi. A study of air pollution and mortality in Delhi found that mortality and morbidity caused by natural causes increased with increasing air pollution. In the past decade, Delhi has taken a number of measures to reduce the level of air pollution in the city during the past 10 years. The air we breathe and water we drink are essential elements, consumption of this material leads to various harmful diseases amongst humans and also various new diseases comes into existence. Except few, the plants and animals cannot bear this increasing pollution day by day which has lead threat to their life and future resulting extinction of the species disturbing the ecosystem. The study also suggests each and every individual should pay some gratitude towards the Environment and minimize the pollution. (Guttikunda, 2014) The paper reveals nature of air pollution, emission source, and management in the Indian cities. It presents an overview of the emission sources and control options for better air quality in Indian cities, with a particular focus on interventions like urban public transportation facilities; travel demand management; emission regulations for power plants; clean technology for brick kilns; management of road dust; and waste management to control open waste burning. It ensure that action to tackle air pollution is seen in the context of wider social and economic development policies such as how much can these interventions help reduce the local challenges, like providing safer and reliable public transportation

Volume 8, Issue 2 (III) April - June 2021

systems; cleaner and efficient waste management; dust free roads; and pollution free industries and power plants.

RESEARCH OBJECTIVES

- To assess the levels of air pollution in the study area
- To determine the levels of noise pollution in the study area
- To map and represent the pollution spatially
- To carry out a perception study among the residents
- To give applicable recommendations to improve prevailing the conditions

RESEARCH METHODOLOGY

• Coverage

The area of study is ward P/N of Greater Mumbai. The ward is one of the 24 administrative units of the city. It lies in the northern part of the city. The latitudinal extension is between 19.9° N and 19.13° N and longitudinal extension is between 72.45° E and 72.54° E. It is surrounded by ward R/S in the north, ward P/S in the south, and ward K/W in the south west and Arabian Sea in the west. The ward covers Malad suburb of the city both east and west. The ward is one of the most populated and therefore one of the most congested wards in the city.



Data Collection

The secondary data will be collected to compile the review of literature to understand the topic and the prevailing gap in research. The review of literature has been undertaken from various books, journals, articles and blogs, official websites and other resources available online.

The primary data has been collected in the following ways:

- The data on air quality has been collected using an Air Quality Monitor (AQI) for several points in the study area
- > The data on noise levels has been collected using a decibel meter for several points in the study area
- The perception study has been carried out of 300 randomly selected respondents in the most polluted areas. The perception study is aimed at understanding the health impacts of pollution on the residents of the most polluted areas.

Sr. No.	Highest Air Polluted Locality	No. of Respondents	Highest Noise Polluted Locality	No. of Respondents	
01	Mith Chowkey	50	Marve Rd	50	
02	Rani Sati Junction	50	Govind Nagar Garden	50	
03	Kharodi Lake	50	Rani Sati School	50	
	TOTAL	150	TOTAL	150	

Table No. 01: Details of Respondents Surveyed at Most Polluted Localities

Volume 8, Issue 2 (III) April - June 2021

• Data Processing and Representation

The data has been stored, processed, analyzed and represented in two ways viz. the spatial data has been stored, processed, analyzed and represented using QGIS- a geospatial software and the aspatial data has been stored, processed, analyzed and represented using MS-Excel.

RESULTS, ANALYSIS AND DISCUSSION

The data collected from the 18 locations in the study area. It is observed that all the locations fall under different land use categories and have variation in the quality of air and levels of noise. The lowest quality of air is recorded at Mith Chowkey which is major junction with roads in all directions, heavy traffic and mixed type of vehicles. There is a lot of construction activities like metro rail construction, foot over bridges, and construction of housing, road construction and repair works, etc. there is also a *nalah* flowing in the area. The settlements are also of mixed type viz. slums, low income to high income groups, people living on streets and economic activities like street vending, begging, and hardware shops, flower sellers, etc. are all found along the junction. There is a lot of garbage accumulation and construction in the area. All this leads to pollution of air and increase in noise levels. However, the noise level recorded is comparatively lower than other areas which is because it's a signal where people do not need to honk much. They are made to follow traffic rules strictly as there are traffic policemen always on duty at the junction.

The other locations with poor air quality are Rani Sati Junction, Kharodi Lake, Govind Nagar Garden and other locations.

It must be noted that Rani Sati Junction is another major crossroad which connects the highway to the densely populated area of Malad east. It therefore faces a lot of construction, transportation and industrial activities. The roads are always under repair because the area was developed long ago and needs redevelopment in each corner. Road widening activity contributes largely to the pollution of air and noise. However the levels of noise are low in the area compared to other locations because of trees surrounding the junction with a huge canopy acting as sound absorbers.

Kharodi Lake is a man-made lake built in the Kharodi village of Malad west, a little beyond Mith Chowki and Marve Road. It is surrounded by residences, markets and low income group dwellings. It is faced by solid waste accumulation, mismanagement of environment and construction activities. It therefore has a poor quality of air as a lot of pollutants are released in the air due to these factors.

The least polluted air is recorded at locations where the landuse is open spaces viz. Hamla Bus Stop, Madh Jetty Road and Manori Gorai Road. This is because being open spaces, they are free from traffic, construction and other disturbing activities. The locations are in fact rich in vegetation which help in making the air clean.

It must be understood that PM stands for particulate Matter. PM2.5 refers to atmospheric particulate matter (PM) that have a diameter of less than 2.5 micrometers, which is about 3% the diameter of a human hair (blissair.com). The permissible limit for which is 35.4 μ g/m3 (CPCB) in a span of 24 hours. Though the particulate matter is very small in size, it can be very dangerous for human body as it may be fatal in certain cases. The sources of PM2.5 matter can be industrial processes which leads to emission of carbon, other metal particles, sand particles, domestic waste and others.

These particles are further harmful because they can be easily inhaled and can react inside one's body to cause several allergies and associated diseases. The problem is highest in the urban areas as they are more prone to pollution due to mixed nature of land use and economic activities.

The highest levels of noise is at Marve Road Junction followed by Govind Nagar Garden and Rani Sati School. Marve Road Junction is a congested junction with housing, construction, a power plant, educational institutes, cremation grounds, graveyards, and etc. all in its vicinity. All this leads to increased levels of noise at the junction. Moreover, the traffic policemen are always not present at the junction, due to which people break the signal and honk a lot.

It must be noted that the permissible levels of noise in the residential area is 55dB during the day and 45dB during the night (MPCB). However, at every location, the level of noise is much higher than the permissible limits.

The location around Govind Nagar Garden is also congested due to its proximity to a major road causing traffic noise and some noise is also experienced due to industrial activity.

Rani Sati Junction is the connecting junction between the highway and the inner city. Hence, it is very noisy. Alos it is surrounded by upcoming buildings, road repair and other activities leading to higher noise.

ISSN 2394 - 7780

Volume 8, Issue 2 (III) April - June 2021

The lowest noise levels are found at Madh Jetty Road, Hamla Bus Stop and Manori Gorai Road. Their landuse and decongested roads and locations play a major role in lower levels of noise pollution.

The data thus collected is represented spatially in the map of the study area to understand an overall picture. The area is divided into different zones depicting different levels of noise pollution. The level of noise is represented using located bar diagrams.

It is observed that, the central part of the ward is worst affected by air pollution and the concentration of pollutants in the air decreases with distance from the central region. This is because, the central part of the ward consists of the railway station, the famous market of Malad- a shopping hub of northern Greater Mumbai and many residential and commercial areas. Also, the outer areas in the ward either belong to less developed localities like small hamlets of Koli people exist in the north western part near the beaches and hilly areas in the eastern part of the ward. These factors make it less populated and comparatively less crowded and congested. These areas are high on vegetation as is observed from the land use classification. The central part on the other hand is majorly under built-up area and slum area. There exists a dense network of roads of all hierarchical levels with all possible economic and social activities running in the ward.

Table No. 02: Air Quality and Noise Level Data for the Selected Locations in the Study Area

ID	LOCATION	LULC TYPE	PM_2.5	LOCATION	LULC TYPE	dB levels			
	Mith	Metal Road			Metal Road				
1	Chowkey	Junction	102.5	Marve Rd	Junction	74			
	Rani Sati	Metal Road			Metal Road				
2	Junction	Junction	98	Govind Nagar Garden	Junction	73			
3	Kharodi Lake	Lake	96	Rani Sati School	School	70			
	Govind Nagar	Metal Road			Metal Road				
4	Garden	Junction	96	Liberty Garden	Junction	70			
	Malvani Bus				Residential				
5	Depot	Residential Area	95.7	Malvani Bus Depot	Area	70			
	Malvani	Metal Road							
6	Police Station	Junction	91.5	Appa Pada Road	Slum Area	68			
	Billabong								
	High								
	International								
7	School	School	87.5	Kharodi Lake	Lake	65			
	Rani Sati								
8	School	School	86	Durgadatta Garden	Park	63.5			
	Liberty	Metal Road			Metal Road				
9	Garden	Junction	81	Mith Chowkey	Junction	62			
	Durgadatta								
10	Garden	Park	80	Madh – Marve Road	Slum Area	62			
		Metal Road		Billabong High					
11	Marve Rd	Junction	80	International School	School	57			
	Madh –				Metal Road				
12	Marve Road	Slum Area	70	Rani Sati Junction	Junction	56			
	Sankalp Bus				Residential				
13	Stop	Residential Area	62	Sankalp Bus Stop	Area	55			
	Koliwada				Metal Road				
14	Road	Residential Area	60	Malvani Police Station	Junction	52.5			
	Appa Pada				Residential				
15	Road	Slum Area	60	Koliwada Road	Area	50			
	Hamla Bus								
16	Stop	Open Space	50	Madh Jetty Road	Open Space	40			
	Madh Jetty								
17	Road	Open Space	45	Hamla Bus Stop	Open Space	40			
	Manori Gorai								
18	Road	Open Space	40	Manori Gorai Road	Open Space	30			
	*Source: Collected by the researcher from the field								

Volume 8, Issue 2 (III) April - June 2021



All these factors lead to air pollution due to absence of ecofriendly practices and ignorant attitude of people. There are several industrial estates amidst the residential complexes which not only causes pollution but also harm the health of residents.

The noise levels do not differ much except for in the far off places with maximum vegetation in the decongested and less populated localities of the ward. This is because the trees absorb the noise and people also do not possess many vehicles which would create traffic noise. However, the central part has the highest level of noise.

Thus, it can be said that in an urban space, both air and noise pollution go hand in hand i.e., are in positive correlation. This is primarily due to the contributing factors which are common to both the pollutions.

		Parameters					
Sr. No.	Locality	Feel of Pollution	Pollution Specific Health Issues	Frequency			
AIR POLI	LUTION						
01	Mith Chowkey	Yes (89%)	Yes (53%)	Often (77%)			
02	Rani Sati Junction	Yes (94%)	Yes (67%)	Often (61%)			
03	Kharodi Lake	Yes (76%)	Can't Say (67%)	Can't Say (76%)			
NOISE PC	NOISE POLLUTION						
04	Marve Rd	Yes (81%)	Yes (58%)	Often (78%)			
05	Govind Nagar Garden	Yes (74%)	Yes (50%)	Often (59%)			
06	Rani Sati School	Yes (93%)	Yes (74%)	Seldom (57%)			

Table	No.	03:	The	Perce	ption	Study	- Ma	ximum	Res	ponses
					P	~~~~~				

*Source: Gathered By Researcher

The perception study represents that most of the respondents do feel that there exists a lot of air and noise pollution. At the same it also depicts that people are facing health issues due to the prevailing conditions of air and noise pollution. The various diseases caused by air pollution include allergies of the respiratory tract, skin disorders, allergies and irritation in the other sensory organs, etc. It is also observed that people getting affected by air pollution is higher than people falling sick due to noise levels. It is therefore concluded that residents are facing issues with the noise and air pollution levels, but are still able to survive.

SSN 2394 - 7780

ISSN 2394 - 7780

Volume 8, Issue 2 (III) April - June 2021

CONCLUSION

The study concludes the following:

- All the locations fall under different land use categories and have variation in the quality of air and levels of noise
- The lowest quality of air is recorded at Mith Chowkey which is major junction
- The least polluted air is recorded at locations where the landuse is open spaces
- The highest levels of noise is at Marve Road Junction
- The lowest noise levels are found at Madh Jetty Road
- The central part of the ward is worst affected by air pollution and the concentration of pollutants in the air decreases with distance from the central region
- The noise levels do not differ much except for in the far off places with maximum vegetation in the decongested and less populated localities of the ward.
- Thus, it can be said that in an urban space, both air and noise pollution go hand in hand
- Residents are facing issues with the noise and air pollution levels, but are still able to survive

RECOMMENDATIONS

- Afforestation in the areas with higher noise levels
- Spreading awareness among people through students and NGOs
- Car pooling and us e of public transport
- Following traffic rules to avoid fuel combustion and others' cares.
- Pollution Under Control (PUC) must be done in a stricter way
- Consciously planning the landuse would avoid the congestion of the junctions.

REFERENCE

- Gargava, P., Segupta, B. and Biswas, D. (2000): 'Strategies for Prevention and Control of Air Pollution in India', Proceedings of Conference: Seventh International Conference on Atmospheric Sciences and Applications to Air Quality, January 2000, ResearchGate. Retrieved at: https://www.researchgate.net/publication/236179607_Strategies_for_Prevention_and_Control_of_Air_Poll ution_in_India
- Guttikunda, S., Goel, R. and Pant, P. (2014): 'Nature of air pollution, emission sources, and management in the Indian cities', Atmospheric Environment, 95 (2014) 501-510, Elsevier. Retrieved at: journal homepage: www.elsevier.com/locate/atmosenv
- Rizwan, S., Nongkynrih, B. and Gupta, S. (2013): 'Air pollution in Delhi: Its Magnitude and Effects on Health', Indian Journal of Community Medicine, Gujarat. Retrieved at: https://www.ijcm.org.in/aboutus.asp

SPECTRAL RESPONCES OF C.I.E.1964 R.G.B. DATA USING PYTHON

T. N.Ghorude¹ and M. P. Patil²

¹Department of Physics N.B. Mehta Science College, Bordi – 401701 India ²Department of Physics N.B. Mehta Science College, Bordi – 401701 India

ABSTRACT

Tristimulus colorimetry is based on the three component theory of color vision, according to which the human eye possesses receptors for three primary colors i.e. R. G. B. Any color can be seen as positively weighted sum of these three primaries, in terms of the tristimulus values. [1] The universally standard sets of these values are defined by C.I.E. In this work the various colorimetry aspects are studied by modulation and simulations. The chromaticity diagram is obtained and spectral characteristics are studied using simple Python Algorithm, ColorPy and NumPy. MatplotLib is used to generate plots and Histograms.

Keywords – Tristimulus colorimetry, C.I.E, ColorPy, MatplotLib etc.

INTRODUCTION

Using the programs written in Python some of the aspects of colorimetry are studied. ColorPy is a Python package for handling physical descriptions of color and light spectra. It can convert light spectra of light intensity Vs. wavelength into RGB colors which can be drawn on computer. ColorPy can provide the conversations between 3-D colorspace i.e. RGB ,XYZ ,Luv and Lab. ColorPy uses wavelengths measured in nanometers. It can provide a blank spectrum array , via colorPy...Ciexyx. Empty- spectrum () having rows for wavelengths from 360nm to 830 nm at 1nm increments. The color values are represented as three-component NumPy vectors which are floats with exception of displayable irgb colors, the arrays of integers (range 255).

NumPy contains a powerful N-dimensional array object and the broadcasting function. MATLAB can be replaced for use by Python in combination with Numpy, Scipy and Matplotlib. Numpy means numerical Python, it is an open source extention module for Python which provides fast precompiled functions for mathematical and numerical calculations. Numpy enriches the programming language Python.

Matplotlib is a Python 2-dimentioal plotting library producing figures. It can be used for graphical interface toolkits in Python.

THEORETICAL BACKGROUND:

Before a system to measure and specify color could be developed, it was necessary to understand the nature of the color sensing mechanism in the human eye. While some progress in this direction was made in the late 18th century, the prevalent anthropocentric views contributed to confusion between color vision and the nature of light. The wider acceptance of the wave theory of light paved the way for a better understanding of both light and color. Both Palmer and Young hypothesized that the human eye has three receptors, and the difference in their responses contributes to sensation of color. However Grassmann and Maxwell were the first to clearly state that color can be mathematically specified in terms of three independent variables. Helmholtz explained the distinction between additive and subtractive color mixing and explained trichromacy in terms of spectral sensitivity curves of the three "color sensing fibers" in the eye. (4)

The three CIE standard weights can be calculated by using following equations:

$$X = \sum_{380}^{780} R(\lambda)E(\lambda)\overline{x}d\lambda \qquad \qquad Y = \sum_{380}^{780} R(\lambda)E(\lambda)\overline{y}d\lambda \qquad Z = \sum_{380}^{780} R(\lambda)E(\lambda)\overline{z}d\lambda$$

Where R (λ) is surface reflectance and E (λ) is light source distribution. The weights X, Y and Z define a color in the CIE space x + y + z = 1, the result in a 2D space known as the CIE chromaticity diagram. The coordinates in this space are usually called x & y and they are derived from XYZ using following equations:

$$x = \frac{X}{X + Y + Z} \qquad \qquad y = \frac{Y}{X + Y + Z} \quad z = \frac{Z}{X + Y + Z}$$

$$x + y + z = 1$$
 i.e. $z = 1 - x - y$

Volume 8, Issue 2 (III) April - June 2021

Experimental Work:

The 1964 CIE matching functions are normally used in computer graphics for 10 degree field of view while 1931 functions are used for 2 degree field of view.

Mapping is done as,

 $X = \int I(\lambda) * CIE - X(\lambda) * d\lambda$

 $Y=\int I(\lambda) * CIE - Y(\lambda) * d\lambda$

 $Z=\int I(\lambda)^* CIE - Z(\lambda)^* d\lambda$

Here $I(\lambda)$ is the spectrum of light intensity vs. wavelength, CIE-X(λ), CIE-Y(λ) and CIE-Z(λ) are the matching functions. These matching functions are defined over 360 nm to 830 nm interval & hence are zero for all wavelengths outside this interval. These plots are generated via ColorPy plot spectrum -sub plot (spectrum). Here spectrum is the matching function vs. wavelength. The three matching functions are zero or positive everywhere. The light intensity at any wavelength is not negative means XYZ color values are not negative .The Y matching function corresponds to luminous efficiency of the eye.[3].

The plots and histograms are generated using Matplotlib with just a few lines of codes.[4] .Using the simple algorithm the spectral response of RGB are generated. The CIE standard 1964 tristimulus functions are used for the same.



Spectral responses of RGB using CIE 1964 data.

Python Algorithm and Spectral Responses:

Using CIE standard 1964 data ,RGB spectrum is generated. The Matplotlib in Python is used to generate the histogram with few lines code.

Algorithm:-

- Step 1: import libraries
- **Step 2: initialize variables**
- Step 3: Read the Data from file using csv.reader()
- Step 4: Plot the Axes X and Y
- **Step 5: Plot the graphs and set the color.**

Volume 8, Issue 2 (III) April - June 2021

Step 6: Stop

The luminance RGB are plotted against wavelength within 380nm to 780nm using ColorPy as additive mixture with different weights. The 100% maximum, 33% maximum and different combinational weights of R.G.B. are studied for spectral responses , using Python.



Figure.1 Spectral response of RGB with 100% (maximum) weight



Figure 2: response of RGB with 33% (maximum) weight

Volume 8, Issue 2 (III) April - June 2021

The spectral responses at equal proportions in above two figures cover the complete visible spectrum containing all the wavelengths. In figure 3, the blue maxima of curve indicates maximum weight(50%). The dominating peak occurs towards the highest weighted color wavelength. In figure 4, green dominant peak indicates the highest weight for green (50%). In figure 5, the highest dominating peak for Red Indicates highest weight for red(50%), similarly.



Figure3:Spectral response of RGB with different weights 50% B, 20% G, 30% R





International Journal of Advance and Innovative Research Volume 8, Issue 2 (III) April - June 2021



Figure 5 : Spectral response of RGB with different weights 20% B, 30% G, 50% R The tongue shaped diagram using CIE 1964 chromaticity co-ordinates is generated. The Python program is used to generate this plot.



C.I.E.1964 Chromaticity Diagram [Wavelength in nanometers]

ISSN 2394 - 7780

Volume 8, Issue 2 (III) April - June 2021

RESULT AND DISCUSSION

The descriptive model has been developed to study RGB colorimetry aspects. Using python, the algorithms were used to generate 1964 CIE chromaticity diagram. The RGB spectral responses for equal weights are observed to be covering the entire visible region. The differently weighted spectrums differ in the position of dominating RGB peak. Using NumPy and MatPlotlib ,the histograms are generated with few lines of codes.

REFERENCES:-

- 1 Kirk Othmer, "Encyclopedia of chemical Technology", volume 5, 2nd edn, Inter Science publishers, 1994, color and constitution of organic dyes, PP 763-765, Colorimetry and Fluorometry PP-788-795, Color measurement PP-809.
- 2 Spectral tristimulus functioning of CIE 1964 supplementary standard colorimetric observer.
- 3 http://markkness.net/colorpy/color.py.htm
- 4 www.numpy.org

INFLUENCE OF VAM ON SOME PHYTOCONSTITUENTS IN MEDICINAL PLANTS: REVIEW

Dr. Ajita Kumar

Department of Botany, Wilson College, Mumbai- 400007

ABSTRACT

Medicinal plants have been backbone of Indian traditional medicine systems (Ayurveda, Siddha, Naturopathy etc.) and, are extensively cultivated due to their tremendous potential in modern and traditional medicine. About 25,000 species of medicinal plants belonging to more than 1000 genera are valued for their active constituents in various Indian systems of medicine. They are also source of phytoconstituents for various industries like pharmaceutical, cosmetics, perfumeries and nutraceuticals. Recent studies suggest that symbiotic association of VAM may change the biochemical composition of host plant. Hence the focus, in the recent years has been on enhancing the active constituents present in these plants. There have been reports of vesicular arbuscular mycorrhiza (VAM) influencing the secondary metabolites with medicinal properties.

Key words: Mycorrhiza, symbiotic association, Active constituents, Phytoconstituents.

INTRODUCTION

Ayurvedic knowledge originated in India more than 5,000 years ago and is often called the "Mother of All Healing." Ayurveda, the traditional Indian medicine, remains the most ancient yet living traditions. Near about 80% of the world's population rely on traditional medicines, most of which involve the use of plant extracts for primary health care (Subhose, 2005; Sandhya, 2006). These medicines are not only used by the rural masses for their primary health care in developing countries but are also used in developed countries where modern medicines dominate (Ballabh and Chaurasia, 2007). These days the term "Alternative Medicine" became very common in western culture, it focus on the idea of using the plants for medicinal purpose (Hassan, 2012). These plants and plant products hold a high promise as therapeutic agents and many modern medicines are either directly derived from plants, or extracted from plants or artificially synthesized to copy plant chemical compounds (Shinde et al., 2015). Various phytoconstituents obtained from nature have wide biological activities in chronic diseases and the main advantage of therapies using phytoconstituents is it provides free from adverse effects treatment where none of the other medications can do (Singh, 2015). Medicinal plants are regarded as natural chemical industries for the production of various medicinal compounds and therefore, they are now receiving tremendous attention all over the world for their therapeutic value (Bhale, 2013). The optimization in the production of these biomolecules may be achieved through the inoculation of Arbuscular Mycorrhizal Fungi (AMF) (Hazzoumi et al., 2015; Oliveira et al, 2015). AMF are microorganisms belonging to phylum Glomeromycota (Schübler, 2001).

SIGNIFICANCE OF PHYTOCONSTITUENTS:

Plants generally owe their virtues as medical agents to these active principles (secondary metabolites) present in them and have contributed more than 7000 different compounds that are in use today as heart drugs, laxatives, anti-cancer agents, hormones, contraceptives, diuretics, antibiotics, decongestants, analgesics, anaesthetics, ulcer treatments and antiparasitic compounds (Shinde et al., 2015). The traditional medicine involves the use of different plant extracts or active principles, the secondary metabolites which are responsible for medicinal activity of plants. Secondary plant metabolites are the chemical compounds produced by the plant cell through metabolic pathways derived from the primary metabolic pathways. These phytoconstituents have shown to possess various biological effects like anti-inflammatory, antispasmodic, anti-analgesic and antidiuretic attributed to their high steroids, tannins, terpenoids and saponins (Savithramma et al. 2012). Also they possess antifungal and antiviral properties and therefore protect plants from pathogens. Besides, they constitute important UV absorbing compounds, thus preventing serious leaf damage from the light (Bagyaraj and Manjunath, 2008). Some of the most important secondary metabolites include terpenoids, phenolics, flavonoids, alkaloids and glycosides which act as an important source for single bioactive ingredients in nutraceuticals and modern medicines (Velu et al, 2018). Secondary plant metabolites have played an important role in not only alleviating several aliments in the traditional medicine and folk uses but also, they provided lead compounds in modern medicine for the production of medications for treating various diseases from migraine up to cancer (Rehab et al. 2018). The evolving commercial importance of secondary metabolites has in recent years resulted in a great interest in secondary metabolism, particularly in the possibility of altering the production of bioactive plant metabolites (Vanisree et al., 2004). The roots of most plants are colonized by symbiotic fungi to form mycorrhiza, which play a critical role in the capture of nutrients from the soil and therefore in plant nutrition (Smith and Read, 2010).

Volume 8, Issue 2 (III) April - June 2021

VAM INFLUENCING PHYTOCONSTITUENTS:

Medicinal plants can harbour VAM in their root system, hence the VAM inoculation technology can be used to improve growth and general conditions of medicinal plants. The biosynthesis of these metabolites in plants although controlled genetically is affected to a large extent by various exogenous and endogenous factors, VAM fungal associations being one of them (Selvaraj and Subramanian, 1990). Occurrence of arbuscular mycorrhizal fungi in medicinal plants was noticed by Rao and co-workers (1989). The enhancement of production of bioactive compounds of the medicinal plants is desirable since there is a steady increase in their demand but, corresponding researches on VAM fungi in association in medicinal plants have received very little attention (Mondal, 2012). Rabeta et al. (2013) reported a number of polyphenolic compounds, terpenoids, glycosides and alkaloids present in *Vitex negundo* are responsible for antioxidant effect. According to Sainthia and co-workers (2018) mycorrhizal association playing a vital role in elevating the levels of phytoconstituents and therefore, responsible for potency of plant.

ESSENTIAL OIL

Gupta and co-workers (2002) tested VAM fungus, *G. fasciculatum* on three cultivars of menthol mint (*M. arvensis*) and found that VAM inoculation could significantly increase the root colonization, growth and essential oil yield of mint for obtaining economic production under field conditions. Freitas et al. (2004) also observed an increments of 89% in the essential oil and menthol contents of mint, when inoculated with VAM. Kapoor et al., (2002a) observed that AMF *Glomus macrocarpum* and *G. fasciculatum* inoculation, significantly increased the concentration of limonene and α -phellandrene, respectively in *Anethum graveolens* L. *Coriandrum sativum* L (coriander) and *Foeniculum vulgare* Mill. (fennel) infected by mycorrhiza showed enhanced concentration and quality of essential oils (Kapoor et al., 2002b, 2004). Copetta et al. (2006) tested three AMF isolates and observed that only *Gigaspora rosea* increased the amount of essential oil in *Ocimum basilicum*, significantly. Silva and co-workers (2008) reported that the levels of total oils extracted from *Zingiber officinale* were 2-4 fold higher than control and inoculation with *Scutellospora heterogama* increased the oleoresin yield threefold.

FLAVONOIDS AND TANNINS

Flavonoids are the active constituents that exhibit antifungal and antibacterial activity against some human pathogenic fungi and bacteria (Owoyale et al., 2005). They are the potent antioxidants and possess free radical scavenging activity (Narayana et. al., 2001). There are several reports of VAM inoculation enhancing the concentration of flavonoids and tannins in the bark of the stem of *Libidibia ferrea* (Dos Santos et al., 2017), leaves (Selvaraj et al., 2009; Kapoor et al., 2016), roots of *Glycyrrhiza glabra* L. (Selvaraj and Sumithra, 2011); the shoots of *Viola tricolor* L. (Zubek et al., 2015)and seedlings of native legume species of caatinga biome (Lima et al. 2015; Pedone-Bonfim et al., 2013). In contrast Silva *et al.* (2014)reported no differences in the tannin content in the leaves of treated ironwood seedlings and *L. ferrea*.

PHENOLS

Riter Netto *et al.* (2014) developed a study using screens and reported an increase in the foliar content of total phenols in *Passiflora alata* Curtis while Pedone-Bonfim et al. (2013) and Lima et al., 2015 reported the same in the seedlings of cebil (*Anadenanthera colubrina* (Vell.) Brenan). Similarly, other field studies indicate that inoculation with AMF resulted in increase in the phenolic compounds in fruits (Kara et. Al., 2015), flowers of *Cynara cardunculus* L. var. *scolymus s* (Ceccarelli et al. 2010). Devi and Reddy (2002) found that mycorrhizal and Rhizobium inoculation resulted in a significant increase in the quantities of phenolic compounds in roots and shoots of groundnut plants, as compared to uninoculated plants.

ALKALOIDS

Srimathi and Kumutha (2009) showed that AM inoculation along with plant growth promoting rhizobacteria, augmented plant growth (shoot length, root length, number of leaves, stem girth, dry matter production) and enhanced the tuber yield and yield of the medicinal principle, the alkaloid *forksohlin*. Combined inoculations performed better than individual inoculations in the improvement of *C. forskohlii*. Mycorrhizal inoculation increased ajmalicine and serpentine contents in *C. roseus* roots suggesting that mycorrhization had a greater influence on the accumulation of alkaloids in roots than it did in shoots (Andrade et al. 2013). They also reported that mycorrhization influenced the differential gene expression of some enzymes involved in alkaloid biosynthetic pathways in the leaves and roots of *Catharanthus roseus* and *Nicotiana tabacum* plants.

CONCLUSION

Earlier studies suggested plant secondary metabolism increased due to increased access to nutrients (specifically P) provided by the mycorrhizal-endosymbiont (Gupta et al., 2002; Smith et al. 2003). However, several recent experimental studies suggest that hormonal changes induced by AMF infection may trigger increased

Volume 8, Issue 2 (III) April - June 2021

production of specific secondary compounds(Copetta et al., 2006; Toussaint, 2007). The accumulation of biomolecules of the secondary plant metabolism in response to symbiosis may be attributed to the improvement of the nutritional condition of the host (Zimare et al., 2013; Riter Netto et al., 2014). It may be due to activation of metabolic routes through which the metabolites are produced (Lohse et al., 2005). Zhang et al. (2013) suggest production of signalling molecules and alterations in the activity of key-enzymes for the production of these compounds were responsible for the enhanced production of the phenolic compounds. Mandal et al., (2015b) reported hormonal alterations and increase in the expression of genes involved in the biosynthesis of these biomolecules. Various other studies have also suggested same mechanisms for the elevated synthesis of the secondary metabolites (Oliveria et al., 2015; Lima et al., 2015; Mandal et al., 2015 a).

REFERENCES:

- 1. Andrade, S.A.L., Malik, S., Sawaya, A.C.H.F., Bottcher A., Mazzafera P. 2013 Association with arbuscular mycorrhizal fungi influences alkaloid synthesis and accumulation in *Catharanthus roseus* and *Nicotiana tabacum* plants. *Acta Physiol Plant* 35, 867–880. [Cross Ref.]
- 2. Bagyaraj, D.J. and Manjunath, A. 2008. Response of crop plants to VA mycorrhizal inoculation in an unsterile Indian soil. *New Phytol.* 85: 33-36
- 3. Ballabh B. and O. P. Chaurasia. 2007. "Traditional medicinal plants of cold desert Ladakh-Used in treatment of cold, cough and fever," *Journal of Ethnopharmacology*, vol. 112, no. 2, pp. 341–345, 2007. View at: Google Scholar
- 4. Bhale U.N. 2013. Occurrence of Vesicular Arbuscular Mycorrhizas (VAM) in Medicinal Plants of Marathwada Region of Maharashtra, India. Journal of Chemical, Biological and Physical Sciences. Vol. 3, No. 3; 1912-1919.
- 5. Ceccarelli N., Curadi M., Martelloni L., Sbrana C., Picciarelli P., Giovannetti M. 2010. Mycorrhizal colonization impacts on phenolic content and antioxidant properties of artichoke leaves and flower heads two years after field transplant. Plant Soil. 2010;335:311–323. doi: 10.1007/s11104-010-0417-z.[CrossRef] [Google Scholar]
- 6. Copetta, A., Lingua, G., and Berta, G. 2006. Effects of three AM fungi on growth, distribution of glandular hairs, and essential oil production in *Ocimum basilicum* L. var. *Genovese. Mycorrhiza* 16, 485–494. doi: 10.1007/s00572-006-0065-6 PubMed Abstract | Google Ref. | Google Scholar
- 7. Devi M.C. and Reddy M.N., 2002. Phenolic acid metabolism of groundnut (*Arachis hypogaea* L.) plants inoculated with VAM fungus and Rhizobium. Plant Growth Regulation. 37(2):151-156. [Cross Ref.]
- 8. Dos Santos EL, Alves da Silva F, Barbosa da Silva FS. 2017. Arbuscular Mycorrhizal Fungi Increase the Phenolic Compounds Concentration in the Bark of the Stem of *Libidibia Ferrea* in Field Conditions. Open Microbiol J. 2017;11:283-291. [Google Ref.]
- 9. Freitas MSM, Martins, MA, Vieira IJC 2004. Produção e qualidade de óleos essenciais de *Mentha arvensis* em resposta a inoculação de fungos micorrízicos arbusculares. Pesq. Agropec. Bras. 39:887-894. [Google Ref.]
- 10. Gupta M.L., Prasad A., Ram M., Kumar S. 2002. Effect of the vesicular-arbuscular mycorrhizal (VAM) fungus *Glomus fasciculatum* on the essential oil yield related characters and nutrient acquisition in the crops of different cultivars of menthol mint (*Mentha arvensis*) under field conditions. Bioresource Technology 81: 77-79. [Google scholar]
- Hazzoumi Z., Moustakime Y., Elharchli E.H., Joutei K.A. 2015. Effect of arbuscular mycorrhizal fungi (AMF) and water stress on growth, phenolic compounds, glandular hairs, and yield of essential oil in basil (*Ocimum gratissimum* L).2015. Chem Biol Technol Agric. 2015;2:2–11. doi: 10.1186/s40538-015-0035-3.[CrossRef] [Google Scholar]
- 12. Kapoor R, Giri B, Mukerji KG 2002a. *Glomus macrocarpum*: a potential bioinoculant to improve essential oil quality and concentration in dill (*Anethum graveolens* L.) and carum (*Trachyspermum ammi* (Linn.) Sprague). World J. Microbiol. Biotechnol. 18:459-463. [Cross Ref.]
- 13. Kapoor R., Giri B., Mukerji K.G. 2002b. Mycorrhization of coriander (*Coriandrum sativum* L.) to enhance the concentration and quality of essential oil. J. Sci. Food Agric. 88:1-4. [Cross Ref.]

- 14. Kapoor R., Giri B., Mukerji K.G. 2004. Improved growth and essential oil yield and quality in *Foeniculum vulgare* mill on mycorrhizal inoculation supplemented with P-fertilizer. Bioresour. Technol. 93:3007-311. [Cross Ref.]
- 15. Kapoor, R., Anand, G., Gupta, P., and Mandal, S. 2016. Insight into the mechanisms of enhanced production of valuable terpenoids by arbuscular mycorrhiza. *Phytochem. Rev.* 1–16. doi: 10.1007/s11101-016-9486-9 [Cross Ref.]
- Kara Z., Arslan D., Güler M., Güler S. 2015. Inoculation of arbuscular mycorrhizal fungi and application of micronized calcite to olive plant: Effects on some biochemical constituents of olive fruit and oil. Sci. Hortic. (Amsterdam); 185:219–227. doi: 10.1016/j.scientia.2015.02.001. [CrossRef] [Google Scholar]
- Lima C.S., Campos M.A., Silva F.S. 2015. Mycorrhizal Fungi (AMF) increase the content of biomolecules in leaves of *Inga vera* wild. Symbiosis. ;65:117–123. doi:10.1007/s13199-015-03253. [CrossRef] [Google Scholar]
- Lohse S., Schliemann W., Ammer C., Kopka J., Strack D., Fester T. 2005. Organization and metabolism of plastids and mitochondria in arbuscular mycorrhizal roots of *Medicago truncatula*. Plant Physiol. 2005;139(1):329–340. doi: 10.1104/pp.105.061457. [PMC free article] [PubMed] [CrossRef] [Google Scholar]
- Mandal S., Upadhyay S., Singh V.P., Kapoor R. 2015a. Enhanced production of steviol glycosides in mycorrhizal plants: a concerted effect of arbuscular mycorrhizal symbiosis on transcription of biosynthetic genes. Plant Physiol. Biochem. 2015;89:100–106. doi: 10.1016/j.plaphy.2015.02.010. [PubMed] [CrossRef] [Google Scholar]
- Mandal S., Upadhyay S., Wajid S., Ram M., Jain D.C., Singh V.P., Abdin M.Z., Kapoor R. 2015b. Arbuscular mycorrhiza increase artemisinin accumulation in *Artemisia annua* by higher expression of key biosynthesis genes via enhanced jasmonic acid levels. Mycorrhiza. 2015;25(5):345–357. doi: 10.1007/s00572-014-0614-3. [PubMed] [CrossRef] [Google Scholar]
- 21. Mondal T. 2012. Significance Of VAM/AM Mycorrhizal association with medicinal plants: An overview. Life Sciences leaflets. 11: 103-108. [Google Ref.]
- Narayana K.R., Reddy M.S., Chaluvadi M.R., Krishna D.R. 2001. Bioflavonoids Classification, Pharmacological, Biochemical effects and Therapeutic Potential. Indian Journal of Pharmacology 2001; 33: 2-16. Google Ref.
- Oliveira P.T., Alves G.D., Silva F.A., Silva F.S. 2015. Foliar bioactive compounds in *Amburana cearensis*(Allemao) A. C. Smith. Seedlings : Increase of biosynthesis using mycorrhizal technology. 2015. J. Med. Plants Res. 2015;9:712–718. doi: 10.5897/JMPR2015.5798. [CrossRef] [Google Scholar]
- 24. Owoyale J.A., Olatunji G.A., Oguntoye S.O. 2005. Antifungal and antibacterial activities of an ethanolic extract of Senna alata leaves. J Appl Sci Environ Mgt. 2005;9(3):105-7. [Google Ref.]
- Pedone-Bonfim M.V., Lins M.A., Coelho I.R., Santana A.S., Silva F.S., Maia L.C. 2013. Mycorrhizal technology and phosphorus in the production of primary and secondary metabolites in cebil (*Anadenanthera colubrina* (Vell.) Brenan) seedlings. J. Sci. Food Agric. 2013;93(6):1479–1484. doi: 10.1002/jsfa.5919. [PubMed] [CrossRef] [Google Scholar]
- 26. Rabeta, M. S. and An Nabil, Z. 2013. Total phenolic compounds and scavenging activity in *Clitoria ternatea* and *Vitex negundo* Linn. International Food Research Journal. 2013; 20(1): 495-500.
- 27. Rasool Hassan. 2012. Medicinal Plants (Importance and Uses). Pharmaceut Anal Acta 2012, 3:10. DOI: 10.4172/2153-2435.1000e139. [Google Ref.]
- 28. Rao Govinda, Suresh Y.S., Suresh C.K., Suresh N.R., Mallikarjunaiah R.R., Bagyaraj D.J. 1989. Vesicular arbuscular mycorrhizae fungi in medicinal plants. Indian Journal of Phytopathology; vol. 42: 476-478.
- 29. Rehab A. Hussein and Amira A. El-Anssary. 2018. Pharmacological Actions of Medicinal Plants. [Google Ref]
- Riter Netto A.F., Freitas M.S., Martins M.A., Carvalho A.J., Vitorazi Filho J.Á. 2014. Efeito de fungos micorrízicos arbusculares na bioprodução de fenóis totais e no crescimento de *Passiflora alata* Curtis. Rev Bras Pl Med. 2014;16:1–9. doi: 10.1590/S1516-05722014000100001. [CrossRef] [Google Scholar]

ISSN 2394 - 7780

- Sainthia V., Ashokan A., Dey Y.N., Wanjari M. 2018. Vesicular Arbuscular Mycorrhizae Association Augments Antioxidant activity of Vitex negundo Leaves. Int. J. Res. App. Sci. & Biotec. Vol 5(3): 15-22. Research Gate
- 32. Sandhya, B., S. Thomas, W. Isabel and R. Shenbagarathai, 2006. Complementary and alternative medicines, 3: 101-114.
- 33. Savithramma N., M. Linga Rao and D. Suhrulatha. 2011. Screening of Medicinal Plants for Secondary Metabolites Middle-East Journal of Scientific Research 8 (3): 579-584. [Google Ref.]
- Schübler A., Schwarzott D., Walker C. 2001. A new fungal phylum, the Glomeromycota: phylogeny and evolution. Mycol Res. 2001;105:1413–1421. doi: 10.1017/S0953756201005196. [CrossRef] [Google Schola r]
- Selvaraj, T. and Subramanian, G. 1990. Incidence of vesicular arbuscular mycorrhizal fungi in medicinal plants. In- Proceedings of the Second National Conference on Mycorrhiza, Bangalore, 21-23 November, 1990. pp. 34-35.
- Selvaraj T., Nisha M.C., Rajeshkumar S. 2009. Effect of indigenous arbuscular mycorrhizal fungi on some growth parameters and phytochemical constituents of *Pogostemon patchouli* Pellet. J Sci Technol.; 3:222– 234. [Google Scholar]
- 37. Selvaraj T., Sumithra P. 2011. Effect of *Glomus aggregatum* and plant growth promoting rhizomicroorganisms on growth, nutrition and content of secondary metabolites in *Glycyrrhiza glabra* L. Indian J Appl Pure Biol.; 26:283–290. [Google Scholar]
- Shinde V.M., Das M., Pillai JS. 2015. Enhanced Production of Secondary Metabolites and Synthesis of New Phenolic Compounds Due to VAM Fungus Inoculation in *Ocimum sanctum*. Int. J. Adv. Res. Biol. Sci. 2(10): 170–175. [Google Ref.]
- Silva M.F., F.A., Pescado R., Rebelo R.A., Stürmer S.L. 2008. The effect of arbuscular mycorrhizal fungal isolates on the development and oleoresin production of micropropagated Zingiber officinale. Braz. J. Plant Physiol.vol.20 no.2 Londrina Apr./June 2008. [Google Ref.]
- Silva F.A., Silva F.S., Maia L.C. 2014. Biotechnical application of arbuscular mycorrhizal fungi used in the production of foliar biomolecules in ironwood seedlings. J. Med. Plants Res.; 8:814–819. doi: 10.5897/JMPR2014.5358. [*Libidibia ferrea* (Mart. ex Tul.) L. P. Queiroz var. ferrea]. [CrossRef] [Google Scholar]
- 41. Singh D. 2015. Application of novel delivery system for enhancing the therapeutic potential of phytoconstituents. Asian Journal of Pharmaceutic. 9(4). [Google Ref.]
- 42. Smith, S. E., Smith, F. A., and Jakobsen, I. 2003. Mycorrhizal fungi can dominate phosphate supply to plants irrespective of growth responses. *Plant Physiol.* 133, 16–20. doi: 10.1104/pp.103.024380

PubMed Abstract | Google Ref. | Google Scholar

- 43. Smith S. E., Read D. J. 2010. Mycorrhizal symbiosis. 3rd ed. San Diego, CA: Academic Press. [Google scholar]
- 44. Srimathi L.P. and Kumutha K. 2009. Growth and alkaloid yield of *Coleus forskohlii* with the inoculation of arbuscular mycorrhiza fungi and plant growth promoting rhizobacteria. Mycorrhiza News. Vol 21(3): 24-28. [Google Ref.]
- 45. Subhose V., Pitta S., Narayan A. 2005. Basic principles of pharmaceutical science in Ayurvěda. Bulletin of the Indian Institute of History of medicine (Hyderabad). Vol. 35(2): 83-92 [Cross Ref.]
- 46. Toussaint, J.P. 2007. Investigating physiological changes in the aerial parts of AM plants: what do we know and where should we be heading? *Mycorrhiza* 17, 349–353. doi: 10.1007/s00572-007-0133-6 PubMed Abstract | CrossRef Full Text | Google Scholar
- 47. Vanisree M., Lee Chen Yue, Lo Shu-Fung, Nalawade S.M., Lin C.Y., Tsay Hsin-Sheng. 2004. Studies on the production of some important secondary metabolites from medicinal plants by plant tissue cultures. Botanical Bulletin of Academia Sinica, Vol. 45, 1-21

Volume 8, Issue 2 (III) April - June 2021

- 48. Velu G., Palanichamy V., Rajan A.P. 2018. Phytochemical and Pharmacological Importance of Plant Secondary Metabolites in Modern Medicine. In: Roopan S., Madhumitha G. (eds) Bioorganic Phase in Natural Food: An Overview. Springer. Pp. 135-156 [Google Ref.]
- 49. Zhang R.Q., Zhu H.H., Zhao H.Q., Yao Q. 2013. Arbuscular mycorrhizal fungal inoculation increases phenolic synthesis in clover roots via hydrogen peroxide, salicylic acid and nitric oxide signaling pathways. J. Plant Physiol. 2013;170(1):74–79. doi: 10.1016/j.jplph.2012.08.022. [PubMed] [CrossRef] [Google Scholar]
- 50. Zimare S.B., Borde M.Y., Jite P.K., Malpathak N.P. 2013. Effect of AM Fungi (*Gf, Gm*) on Biomass and Gymnemic Acid Content of *Gymnema sylvestre* (Retz.) R. Br. ex Sm. Proc. Natl. Acad. Sci., India, Sect. B Biol. Sci. 2013;83:439–445. doi: 10.1007/s40011-013-0159-9. [CrossRef] [Google Scholar]
- 51. Zubek S., Rola K., Szewczyk A. 2015. Enhanced concentrations of elements and secondary metabolites in *Viola tricolor* L. induced by arbuscular mycorrhizal fungi. Plant Soil. 2015;390:129–142. doi: 10.1007/s11104-015-2388-6. [CrossRef] [Google Scholar]

MANUSCRIPT SUBMISSION

GUIDELINES FOR CONTRIBUTORS

- 1. Manuscripts should be submitted preferably through email and the research article / paper should preferably not exceed 8 10 pages in all.
- 2. Book review must contain the name of the author and the book reviewed, the place of publication and publisher, date of publication, number of pages and price.
- 3. Manuscripts should be typed in 12 font-size, Times New Roman, single spaced with 1" margin on a standard A4 size paper. Manuscripts should be organized in the following order: title, name(s) of author(s) and his/her (their) complete affiliation(s) including zip code(s), Abstract (not exceeding 350 words), Introduction, Main body of paper, Conclusion and References.
- 4. The title of the paper should be in capital letters, bold, size 16" and centered at the top of the first page. The author(s) and affiliations(s) should be centered, bold, size 14" and single-spaced, beginning from the second line below the title.

First Author Name1, Second Author Name2, Third Author Name3

1Author Designation, Department, Organization, City, email id

2Author Designation, Department, Organization, City, email id

3Author Designation, Department, Organization, City, email id

- 5. The abstract should summarize the context, content and conclusions of the paper in less than 350 words in 12 points italic Times New Roman. The abstract should have about five key words in alphabetical order separated by comma of 12 points italic Times New Roman.
- 6. Figures and tables should be centered, separately numbered, self explained. Please note that table titles must be above the table and sources of data should be mentioned below the table. The authors should ensure that tables and figures are referred to from the main text.

EXAMPLES OF REFERENCES

All references must be arranged first alphabetically and then it may be further sorted chronologically also.

• Single author journal article:

Fox, S. (1984). Empowerment as a catalyst for change: an example for the food industry. *Supply Chain Management*, 2(3), 29–33.

Bateson, C. D.,(2006), 'Doing Business after the Fall: The Virtue of Moral Hypocrisy', Journal of Business Ethics, 66: 321 – 335

• Multiple author journal article:

Khan, M. R., Islam, A. F. M. M., & Das, D. (1886). A Factor Analytic Study on the Validity of a Union Commitment Scale. *Journal of Applied Psychology*, *12*(1), 129-136.

Liu, W.B, Wongcha A, & Peng, K.C. (2012), "Adopting Super-Efficiency And Tobit Model On Analyzing the Efficiency of Teacher's Colleges In Thailand", International Journal on New Trends In Education and Their Implications, Vol.3.3, 108 – 114.

• Text Book:

Simchi-Levi, D., Kaminsky, P., & Simchi-Levi, E. (2007). *Designing and Managing the Supply Chain: Concepts, Strategies and Case Studies* (3rd ed.). New York: McGraw-Hill.

S. Neelamegham," Marketing in India, Cases and Reading, Vikas Publishing House Pvt. Ltd, III Edition, 2000.

• Edited book having one editor:

Raine, A. (Ed.). (2006). Crime and schizophrenia: Causes and cures. New York: Nova Science.

• Edited book having more than one editor:

Greenspan, E. L., & Rosenberg, M. (Eds.). (2009). *Martin's annual criminal code:Student edition 2010*. Aurora, ON: Canada Law Book.

• Chapter in edited book having one editor:

Bessley, M., & Wilson, P. (1984). Public policy and small firms in Britain. In Levicki, C. (Ed.), *Small Business Theory and Policy* (pp. 111–126). London: Croom Helm.

• Chapter in edited book having more than one editor:

Young, M. E., & Wasserman, E. A. (2005). Theories of learning. In K. Lamberts, & R. L. Goldstone (Eds.), *Handbook of cognition* (pp. 161-182). Thousand Oaks, CA: Sage.

• Electronic sources should include the URL of the website at which they may be found, as shown:

Sillick, T. J., & Schutte, N. S. (2006). Emotional intelligence and self-esteem mediate between perceived early parental love and adult happiness. *E-Journal of Applied Psychology*, 2(2), 38-48. Retrieved from http://ojs.lib.swin.edu.au/index.php/ejap

• Unpublished dissertation/ paper:

Uddin, K. (2000). A Study of Corporate Governance in a Developing Country: A Case of Bangladesh (Unpublished Dissertation). Lingnan University, Hong Kong.

• Article in newspaper:

Yunus, M. (2005, March 23). Micro Credit and Poverty Alleviation in Bangladesh. *The Bangladesh Observer*, p. 9.

• Article in magazine:

Holloway, M. (2005, August 6). When extinct isn't. Scientific American, 293, 22-23.

• Website of any institution:

Central Bank of India (2005). *Income Recognition Norms Definition of NPA*. Retrieved August 10, 2005, from http://www.centralbankofindia.co.in/ home/index1.htm, viewed on

- 7. The submission implies that the work has not been published earlier elsewhere and is not under consideration to be published anywhere else if selected for publication in the journal of Indian Academicians and Researchers Association.
- 8. Decision of the Editorial Board regarding selection/rejection of the articles will be final.



www.iaraedu.com

Journal

ISSN 2394 - 9554

International Journal of Research in Science and Technology

Volume 6, Issue 2: April - June 2019



Indian Academicians and Researchers Association www.iaraedu.com

Become a member of IARA to avail attractive benefits upto Rs. 30000/-

http://iaraedu.com/about-membership.php



Membership No: M / M - 1365

Certificate of Membership

This is to certify that

XXXXXXXXX

is admitted as a

Fellow Member

of

Indian Academicians and Researchers Association

in recognition of commitment to Educational Research

and the objectives of the Association





President

Date: 27.01.2020

Director



INDIAN ACADEMICIANS AND RESEARCHERS ASSOCIATION

Membership No: M / M - 1365

Certificate of Membership

This is to certify that

XXXXXXXXXXX

is admitted as a

Life Member

of

Indian Academicians and Researchers Association

in recognition of commitment to Educational Research

and the objectives of the Association



Director

President

Date: 27.01.2020



INDIAN ACADEMICIANS AND RESEARCHERS ASSOCIATION

Membership No: M / M - 1365

Certificate of Membership

This is to certify that

XXXXXXXX

is admitted as a

Member

of

Indian Academicians and Researchers Association

in recognition of commitment to Educational Research

and the objectives of the Association



Date: 27.01.2020





IARA Organized its 1st International Dissertation & Doctoral Thesis Award in September'2019



EF EMPYREAL PUBLISHING HOUSE

www.editedbook.in

Publish Your Book, Your Thesis into Book or Become an Editor of an Edited Book with ISBN

BOOKS PUBLISHED



Dr. Stuti Deka ISBN : 978-81-930928-1-1



Dr. Tazyn Rahman ISBN : 978-81-930928-0-4

D. DRUKANA

A Guide to INJECTION MOULDING TECHNIQUE



Debandhi Segt

Mr. Dinbandhu Singh ISBN : 978-81-930928-3-5



EDUCATIONAL RESEARCH ON Jammu and Kashmir 6 SEASONS OF SUCCESS

Colour by Dr. Israel Therear served

Dr. Ismail Thamarasseri ISBN : 978-81-930928-2-8



Ram Jaladurgam Dr. S. Anand Reddy ISBN : 978-81-930928-5-9



Dr. Sanjeev Bansal, Dr. Vijit Chaturvedi Dr. Tazyn Rahman, Dr. Parikshit Joshi ISBN : 978-81-930928-6-6



Dr. Manas Ranjan Panda, Dr. Prabodha Kr. Hota ISBN : 978-81-930928-4-2

Poornima University ISBN : 978-8193-6264-74 Institute of Public Enterprise ISBN : 978-8193-6264-4-3

Vitamin D Supplementation in SGA Babies



Dr. Jyothi Naik, Prof. Dr. Syed Manazir Ali Dr. Uzma Firdaus, Prof. Dr. Jamal Ahmed ISBN : 978-81-936264-9-8

Research Papers of

Select





Dr. Abhitosh Kedla Dr. Pandian Senthil Kumar

Dr. Abhitosh Kedia Dr. Pandian Senthil Kumar ISBN : 978-81-939070-0-9

Recent ReseaRch

MANAGEMENT



Prof. Dr. Dhananjay Awasarikar ISBN : 978-81-939070-1-6







Dr. C. Samudhra Rajakumar, Dr. M. Ramesh Dr. C. Kathiravan, Dr. Rincy V. Mathew ISBN : 978-81-939070-7-8



Dr. C. Samudhra Rajakumar, Dr. M. Ramesh Dr. C. Kathiravan, Dr. Rincy V. Mathew ISBN : 978-81-939070-4-7



Dr. V. I. Paul, Dr. M. Muthulingam Dr. A. Elangovan, Dr. J. Nelson Samuel Jebastin ISBN : 978-81-939070-9-2







Sajid Jamal Mohd Shakir ISBN : 978-81-939070-8-5



Dr. Vinod S. Chandwani ISBN : 978-81-939070-2-3

Recent ReseaRch

Trends in Social Science



Dr. C. Samudhra Rajakumar, Dr. M. Ramesh Dr. C. Kathiravan, Dr. Rincy V. Mathew ISBN : 978-81-939070-6-1

Project ManageMent





ISBN : 978-81-939070-3-0



Dr. Sarala Barnabas ISBN : 978-81-941253-3-4



AUTHORS Dr. M. Banumathi Dr. C. Samudhra Rajaki

> Dr. M. Banumathi Dr. C. Samudhra Rajakumar ISBN : 978-81-939070-5-4



Dr. (Mrs.) Rohini Kelkar ISBN : 978-81-941253-0-3 Recent Research Trends in Management and Social Science



Dr. Taryn Rahman

Dr. Tazyn Rahman ISBN : 978-81-941253-2-7



N. Lakshmi Kavith

Dr. N. Lakshmi Kavitha Mithila Satam ISBN : 978-81-941253-1-0

Computerised Information System:

Concepts & Applications



Dr. Hiresh Lubar Prof. Arti Sharma

Dr. Hiresh Luhar Prof. Arti Sharma ISBN : 978-81-941253-4-1



Dr. Hiresh S. Luhar Dr. Ashok S. Luhar ISBN : 978-81-941253-5-8



Dr. Babita Kanojia Dr. Arvind S. Luhar ISBN : 978-81-941253-7-2



SK Nathan SW Rejamonaharane

Dr. Sw Rajamonaharane SK Nathan ISBN : 978-81-942475-0-0



Aditi Sharma ISBN : 978-81-941253-8-9

Self-Finance Courses: Popularity & Financial Viability



Dr. Askols S. Lakar Dr. Hirosh S. Lakar

> Dr. Ashok S. Luhar Dr. Hiresh S. Luhar ISBN : 978-81-941253-6-5



Dr. B. Augustine Arockiaraj ISBN : 978-81-941253-9-6



SPOILAGE OF VALUABLE SPICES BY MICROBES

Dr. Kuljinder Kaur

Dr. Kuljinder Kaur ISBN : 978-81-942475-4-8



Cr. Priyanka Malik

Dr. Priyanka Malik ISBN : 978-81-942475-1-7



Dr. Rekha P. Khosla ISBN : 978-81-942475-2-4



Dilip Pandurang Deshmukh ISBN : 978-81-942475-3-1



Dr. D. Kalpana, Dr. M. Thangavel ISBN : 978-81-942475-5-5

Dr. D. Kalpana Dr. M. Thangave



Indian Commodity Futures and Spot Markets



Correlates of Burnout Syndrome Among Servicemen



10-2-11	Ame \$0	(1507+62) H(cosa)	Y. to H. 1 "
Bac .	= (at +b 2	-1	K>1
	int = T	+ 1 2 2 2 =0	
to be a	14- 5-4 1	v2 d/dī	Δτ
TRIGONOMETER	18 - 692 I	C2 Lano	1-3
	The X V. The 10	the lance	500
L .	- >x d	and the first for the stand	2

Dr. Zakir Ahmed ISBN : 978-81-942475-9-3



Dr. Aloysius Edward J. ISBN : 978-81-942475-7-9





Dr. (CA) Ajit S. Joshi Dr. Arvind S. Luhar ISBN : 978-81-942475-6-2



NONLINEAR OPTICAL CRYSTALS FOR LASER Growth and Analysis Techniques

Madhav N Rode Dilipkumar V Mehsra

> Madhav N Rode Dilip Kumar V Mehsram ISBN : 978-81-943209-6-8



Dr. Smita Ameya Wagh ISBN : 978-81-943209-9-9



Dr. Mahesh Mukund Deshpande ISBN : 978-81-943209-7-5



Remote Sensing of River Pollution And

Agricultural Soils

Dr. Saif Said Mr. Shadab Ali Khan



Dr. Saif Said Shadab Ali Khan ISBN : 978-81-943209-1-3

Indian Capital Market and Equity Culture in Maharashtra



Dr. Roopali Prashant Kudare ISBN : 978-81-943209-3-7



M. Thiruppathi R. Rex Immanuel K. Arivukkarasu ISBN : 978-81-930928-9-7



Dr. Th. Anand Singh Dr. Prakash K. Sarangi Dr. Neeta Sarangthem ISBN : 978-81-944069-0-7



R. Rex Immanuel M. Thiruppathi A. Balasubramanian ISBN : 978-81-943209-4-4



Small and medium Enterprises

Dr. Omkar Gadre



Madhav N Rode Rameshwar R. Bhosale ISBN : 978-81-943209-5-1



Dr. Sapna M S Dr. Radhika C A ISBN : 978-81-943209-0-6





Hindusthan College ISBN : 978-81-944813-8-6



Composed by CA Kshitija Kankariya (Jain)

Swing ISSN: 978-81-944813-9-3



Dr. Bhagyashree Dudhade ISBN : 978-81-944069-5-2




Dr. Vijay Prakash Gupta ISBN : 978-81-944813-1-7



Dr. Deepa Vijay Abhonkar ISBN : 978-81-944813-6-2



ISSN: 978-81-944813-4-8



Dr. Anu Varghese ISBN : 978-81-944069-4-5



Dr. Renuka Vanarse

ORGANIZATIONAL COMMITMENT AND JOB SATISFACTION

Dr. Renuka Vanarse ISBN : 978-81-944069-1-4



INDIAN ACADEMICIANS & RESEARCHERS ASSOCIATION

Major Objectives

- To encourage scholarly work in research
- To provide a forum for discussion of problems related to educational research
- To conduct workshops, seminars, conferences etc. on educational research
- To provide financial assistance to the research scholars
- To encourage Researcher to become involved in systematic research activities
- To foster the exchange of ideas and knowledge across the globe

Services Offered

- Free Membership with certificate
- Publication of Conference Proceeding
- Organize Joint Conference / FDP
- Outsource Survey for Research Project
- Outsource Journal Publication for Institute
- Information on job vacancies

Indian Academicians and Researchers Association Shanti Path ,Opp. Darwin Campus II, Zoo Road Tiniali, Guwahati, Assam Mobile : +919999817591, email : info@iaraedu.com www.iaraedu.com

EF EMPYREAL PUBLISHING HOUSE

- Assistant in Synopsis & Thesis writing
- Assistant in Research paper writing
- Publish Thesis into Book with ISBN
- Publish Edited Book with ISBN
- Outsource Journal Publication with ISSN for Institute and private universities.
- Publish Conference Proceeding with ISBN
- Booking of ISBN
- Outsource Survey for Research Project

Publish Your Thesis into Book with ISBN "Become An Author"

EMPYREAL PUBLISHING HOUSE

Zoo Road Tiniali, Guwahati, Assam Mobile : +919999817591, email : info@editedbook.in, www.editedbook.in

Indian Academicians and Researchers Association www.iaraedu.com