Volume 5, Issue 3(III)
July - September 2018

ISSN 2394 - 7780

UGC
University Grants Commission
Journal No.: 63571

International Journal of
Advance and Innovative Research

Indian Academicians and Researchers Association
www.iaraedu.com

International Journal of Advance and Innovative Research

Volume 5, Issue 3 (III): July - September 2018

Editor- In-Chief **Dr. Tazyn Rahman**

Journal - 63571

UGC Journal Details

Name of the Journal :	International Journal of Advance & Innovative Research
ISSN Number :	
e-ISSN Number :	23947780
Source:	UNIV
Subject:	Multidisciplinary
Publisher:	Indian Academicians and Researchers Association
Country of Publication:	India
Broad Subject Category:	Multidisciplinary

International Journal of Advance and Innovative Research

Volume 5, Issue 3 (III) : July – September 2018

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Research Papers

International Journal of Advance and Innovative Research
Volume 5, Issue 3 (III): July - September, 2018
ISSN 2394 - 7780

SOCIAL SUPPORT, EXPRESSED EMOTIONS AND ANXIETY AMONG CAREGIVERS OF MENTALLY ILL INDIVIDUALS

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ABSTRACT
Social Support is the inclination or experience of having other people who love and watch over you, who you can swing to for help during need. Expressed emotions are nothing but how the caregivers behave towards their family members who are mentally ill. Anxiety is a state of distressed mind where one tends to worry about the happenings in daily life. This paper tries to study the relationship between social support, expressed emotions and anxiety among the caregivers of mentally ill patient. The analysis is done on a sample of 120 caregivers of mentally ill individuals aged between 25- 45 years. The tools used to are Multidimensional Scale for Perceived Social Support, Family Attitude Scale and State Trait Anxiety Test. The results indicate a significant relationship between social support, expressed emotions and anxiety among the caregivers of mentally ill individuals. The paper has certain theoretical as well as practical implications.

Keywords: Social support, expressed emotions, anxiety among, caregivers, mentally ill individuals

INTRODUCTION

Expressed Emotions
Expressed emotion (EE) is how the relatives or caregivers of psychiatric patient spontaneously talk about their patients and their attitudes towards them. Theoretically, a high level of expressed emotions in the home can worsen the prognosis in patients with mental illness, such as schizophrenia and social anxiety disorder or act as a potential risk factor for the development of psychiatric disease. If the patient feels that the parents are too protective, or not caring, the patient may feel that his parents don't care about his independence or trust his judgment. This attitude may cause the patient to relapse, and patients that rate their parents poorly in this test have a harder time coping with their illness if too much time is spent with the parent (Kelly 2011). Generally differs from the daily use of the term “expressed emotions”.

Social support
Social support is one of the important elements of social connections. Social support is constantly proposed by the sender to be useful, in this way recognizing it from purposeful negative collaborations, (for example, furious feedback, bothering, undermining). Social support is regularly ordered into four sorts of practice –Emotional, Instrumental, Informational and Appraisal(Hibbs, 2011).

Anxiety
Anxiety, or excessive appreciation of worry, is a typical response to unpleasant circumstances. Yet, at times, it ends up intemperate and can make sufferers fear regular circumstances. This sort of relentless, all-finished anxiety is called Generalized Anxiety Disorder. Other anxiety-related scatters incorporate fits of anxiety—extreme scenes of anxiety which occur because of particular triggers—and over the top habitual issue, which is set apart by steady meddlesome contemplations or impulses to do particular practices, (for example, hand-washing). Anxiety so as often as possible co-happens with misery that the two are believed to be twin countenances of one issue. Like sadness, it strikes twice the same number of females as guys. For the most part, anxiety emerges to start with, frequently amid childhood. Proof recommends that both science and condition can add to the confusion. A few people may have a hereditary inclination to anxiety; be that as it may, this does not make improvement of the condition unavoidable. Early horrible encounters can likewise reset the body's ordinary dread preparing framework with the goal that it is hyper-receptive to pressure. The overstated stresses and desires of negative results in obscure circumstances that encapsulate anxiety are regularly joined by physical manifestations. These incorporate muscle pressure, cerebral pains, stomach issues, and continuous pee.

REVIEW OF LITERATURE
Wang, X., et al (2017) studied on the impact of expressed emotion (EE) among caregivers of schizophrenia patients on their care burden and the ailment hospitalization rate. Noteworthy contrasts were found in the hospitalization rate between patients with high solution adherence and low pharmaceutical adherence at a year and between patients with high expressed emotion (HEE) and low expressed emotion. The hospitalization rate in clients with HEE caregivers was higher than that in those with LEE caregivers. HEE is an indicator of hospitalization rate in schizophrenic patients. The burdens of care scores are high in caregivers of schizophrenic patients. The caregivers with HEE have a high score in burden of care contrasted and those with LEE.

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Liang, X., et al (2016) studied on Caregivers of care-beneficiaries with delicate cognitive hindrances (MCI) or dementia experience high caregiver inconvenience; in any case, the psychological weight of caregivers of care-beneficiaries with subjective cognitive decay (SCD) has not been inquired about. It proposed to research the inescapability of and hazard factors for anxiety and depression reactions among the caregivers of care-beneficiaries with SCD and cognitive inability. Caregiver's depression and anxiety symptoms were connected with their care-beneficiaries' psychological and behavioral disorders

Bailey Grenyer (2016) studied the association between expressed emotions and success for families and caregiver's of a relative with Borderline Personality Disorder. Caregiver's uncovered family circumstances high in expressed feeling, particularly input (and energetic over affiliation .Lifted energetic over incorporation was related with higher weight and mental health problems. Elevated criticism and eager over commitment in family conditions address a dynamic including high conflict, anxious worry, over insurance and enthusiastic closeness. The disclosures suggest that caregiver's may benefit by intercession and support decisions thinking about the tried social dynamic, load and obstructed caregivers thriving point by point in this examination.

Musser, E. et al (2016) investigated on Consideration Deficit/Hyperactivity Disorder Developmental Trajectories identified with Parental Expressed Emotion examined on Levels of parental expressed emotions (EE) are tentatively connected with the symptomatic course of a scope of youth mental scatters. It was found that, in spite of imperative methodological constraints, parental EE is connected reliably to a more injurious course of state of mind, nervousness, and crazy issue in youth. Caregiver singing and ambient melodies can enable the caregiver to enhance the patient's capacity to express constructive emotions and dispositions, and to inspire a feeling of imperativeness with respect to the individual with serious dementia. The outcomes additionally bolster the estimation of caregiver singing as a strategy to enhance the nature of dementia mind.

Treasure, J., et al (2015) studied on the experience of providing care for extreme mental ailment: an examination between anorexia nervosa and psychosis. Caregiver's of individuals with dietary problems who had encountered a episode of inpatient watch over anorexia nervosa were given the General Health Questionnaire and the Experience of Caregiving Inventory. A subgroup of the caregiver's of individuals with anorexia nervosa was gotten some information about their encounters. The clinical examples had a comparable span of sickness, yet the patients with anorexia nervosa were essentially more youthful and a bigger extent inhabited home. The general health scores were altogether higher in the caregiver's of anorexia nervosa and they encountered larger amounts of troubles in many regions of providing care. An assortment of factors from the Caregiving Inventory added to the level of mental distress. The topics of blame and disgrace were extra measurements that were tended to in the letters. Caregiver's of individuals with anorexia nervosa are tested by the troubles their part delivers.

Thoits, P. A. (2011) studied on The Role of Family Expressed Emotion and Perceived Social Support in Predicting Addiction Relapse. Emotional conditions representing the family and patients' apparent social help assume vital parts in the treatment or relapse procedure of the endless sickness. The unmistakable relationship strategy was utilized as a part of the present examination. Results demonstrated a positive connection between family expressed emotions and the recurrence of relapse and a critical negative connection between saw social help and the recurrence of relapse. These outcomes have suggestions for dependent individuals, their families and experts working in compulsion focus to utilize the emotional capability of families particularly their expressed emotions and the apparent social help of addicts to expand the achievement rate of habit treatment

METHODOLOGY

Aim: To study the relationship between social support, expressed emotions and anxiety among caregivers of mentally ill individuals.

OBJECTIVE

1. To study the relationship between social support and anxiety among caregivers of mentally ill individuals.
2. To study the relationship between expressed emotions and anxiety among caregivers of mentally ill individuals.
3. To study Social support as a significant predictor of anxiety among caregivers of mentally ill individuals.
4. To study expressed emotions as a significant predictor of anxiety among caregivers of mentally ill individuals.
5. To study the difference between social support, expressed emotions and anxiety among male and female caretakers of mentally ill individuals.

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HYPOTHESES

The research paper is based on the following hypotheses

H1: There will be a significant relationship between social support and anxiety among caregivers among mentally ill individuals

H2: There will be a significant relationship between expressed emotions and anxiety among caregivers of mentally ill individuals

H3: Social support will be a significant predictor of anxiety among caregivers of mentally ill individuals.

H4: Expressed emotions will be a significant predictor of anxiety among caregivers of mentally ill individuals

H5: There will be a gender difference between social support, expressed emotions and anxiety among caretakers of mentally ill individuals

Sample

SL. NO.	GENDER	AGE	SIZE OF SAMPLE
1	MALE	25-45	60
2	FEMALE	25-45	60
TOTAL			**120**

Variables

- Social support
- Expressed emotions
- Anxiety among caregivers

Procedure

The sample was collected from 120 caregivers of mentally ill individuals. An informed consent form was provided prior the administration of the tools. The MSPSS was administered initially to find the social support among caregivers, followed by FAS to assess expressed emotions and then STAT to study the anxiety level of the caregivers. The administration work was conducted by the researcher only.

Statistical analysis

- Mean
- Standard deviation
- Correlation
- Regression
- T-test

RESULTS

Table-4.1: Descriptive statistics and Independent sample t -test of males and females for expressed emotions, social support and anxiety

VARIABLES	GENDER	N	MEAN	SD	t	df	Sig.(2tail)
FAS	M	60	95.38	28.45	-0.230	118	0.819
	F	60	96.48	23.86	-0.230	114.489	0.819
MSPSS	M	60	49.27	22.44	0.278	118	0.781
	F	60	47.08	24.14	0.278	117.375	0.781
STAT	M	60	41.52	12.7	-1.183	118	0.239
	F	60	46.25	16.84	-1.183	117.707	0.239

Note: FAS= Family attitude scale, MSPSS= Multidimensional scale of perceived social support

STAT= State Trait Anxiety Test

Table 4.1 shows the difference between male and female caregivers of the mentally ill individuals with the help of t-test statistics. The analysis shows no significant relationship between male and female caregivers.

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Table-4.2: Correlation between social support, expressed emotions and anxiety

	Anxiety	Social Support	Expressed Emotions
STAT	1	-0.826*	-0.645*
MSPSS		1	0.718*
FAS			1

Note: * significant at 0.01 level,

FAS= Family attitude scale, MSPSS= Multidimensional scale of perceived social support

STAT= State Trait Anxiety Testc

Table 4.2 and the graph show the correlation between social support, expressed emotions and anxiety. The analysis shows that there is a significant relationship between social support, expressed emotions and anxiety. Anxiety and social support are seen to be negatively correlated (r=0.826, n=120), likewise, anxiety and expressed emotions are also negatively correlated (r=0.645, n=120) and a positive correlation is seen between social support and expressed emotions (r=0.718, n=120)

Table-4.3: Showing regression between expressed emotions and anxiety among caregivers of mentally ill individuals

Variables	R2	F	df	beta
FAS	0.417	84.25*	1	-0.645**

Note: Dependent variable=STAT, *significant at 0.05 level ** significant ay 0.0 5level

Table-4.4: Showing regression between social support and anxiety among caregivers of mentally ill individuals

Variables	R2	F	df	beta
MSPSS	0.682	253.34*	1	-0.826**

Note: Dependent variable=STAT, *significant at 0.05 level **significant at 0.05 level

Table 4.4 and table 4.5 show the regression between social support and anxiety among caregivers of mentally ill individuals. In both the tables it is seen that the three variables have their effect on each other. The regression value for expressed emotions and anxiety (r2=.417) is less than that of social support and anxiety (r2=.682) . The analysis shows that the effect of social support on anxiety is more than the effect of expressed emotions on anxiety among caregivers.

The results obtained from the analysis of the data are discussed in the next chapter.

DISCUSSION

The aim of this study was fivefold. Firstly it sought to study the relationship between social support and anxiety among caregivers of mentally ill individuals. Secondly, to study the relationship between expressed emotions and anxiety among caregivers of mentally ill individuals. Thirdly, to study the effect of social support of caregivers on the level of anxiety among caregivers of mentally ill individuals. Fourthly, study the effect of expressed emotions on the level of anxiety among caregivers of mentally ill individuals and lastly, to study the difference between social supports, expressed emotions and anxiety among male and female caretakers of mentally ill individuals.

The first hypotheses sought to identify a significant relationship between social support and anxiety among caregivers among mentally ill individuals. Results show that there is a significant relationship between social support and anxiety among caregivers. The relationship is adverse. It was seen that both are negatively correlated, which implies that if there is low social support the level of anxiety will be high and vice versa.

Studies show that the more social support one has the less anxiety the person tends to have (Götell, E., Brown, S., & Ekman, S. L. 2009). The obtained result supports the first hypotheses, hence rejecting the null hypotheses.

The second hypotheses sought to identify significant relationship between expressed emotions and anxiety among caregivers of mentally ill individuals. Results show that there is a significant relationship between expressed emotions and anxiety among caregivers. The relationship is adverse. It was seen that both are negatively correlated, which implies that when the expressed emotions is positive there is low the level of anxiety will be high and vice versa.

Studies show that the negative expressed emotions leads to high level of anxiety (Kelly 2011). The obtained result supports the second hypotheses, hence rejecting the null hypotheses.

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If both the hypotheses are being compared that is H1 and H2, there lies a significant correlation among the three variables but it can be seen from the data that there prevails a high correlation between anxiety and social support.

The third hypotheses sought to find significant effect of social support of caregivers on the level of anxiety among caregivers of mentally ill individuals. From the findings it can be stated that there is an effect of social support on the level of anxiety among the caregivers of the mentally ill individuals. Therefore, it can be said that the third hypotheses is accepted, rejecting the null hypotheses. A research showed that the more the social support an individual has , the quality of life tends to be more satisfying .(Bovier et al, 2004)

The fourth hypotheses sought to find significant effect of expressed emotions of caregivers on the level of anxiety among caregivers of mentally ill individuals. From the findings it can be stated that there is an effect of expressed emotions on the level of anxiety among the caregivers of the mentally ill individuals. A significant effect was found among the two variables. Therefore, it can be said that the fourth hypotheses is accepted, rejecting the null hypotheses. Research demonstrates that female parental figures, more terrible than their male partners, detailing larger amounts of depressive and anxiety side effects and lower levels of subjective prosperity, life fulfillment, and physical wellbeing than male guardians. (Atadokht, A., et al 2015).

As indicated by one examination, there is a sensational increment in danger of psychological well-being outcomes among ladies who give at least 36 hours for each seven day stretch of care to a spouse. In a national overview on guardian wellbeing, more than one of every five (21%) ladies reviewed had mammograms less regularly.

If hypotheses three and four are combined and analyses the three variables does not have a combined effect on each other. While if the analysis is done separately there is a significant relationship among expressed emotions, social support and anxiety among the caregivers of mentally ill individuals.

The fifth hypotheses sought to identify a gender difference between social support, expressed emotions and anxiety among caretakers of mentally ill individuals. According to the t-test analyses there is no significant difference between male and female caregivers in their anxiety level. Although no such difference was seen, the score obtained from the male caregivers tend to be low in comparison to the female caregivers of the mentally ill patients.

Götel, E. et al (2009) state that women tend to be ten times more anxious that their male counter parts. In this present study this review is no appropriately supported as there is hardly any difference between male and female caregivers in their anxiety level. Therefore, the fifth hypotheses are rejected as in the population chosen for the study shows no difference between male and female caregivers of the mentally ill individuals. The null hypothesis is accepted in this case.

Therefore, all the four hypotheses(H1, H2, H3 and H4) are significant and accepted except the fourth hypothesis (H5).

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International Journal of Advance and Innovative Research
Volume 5, Issue 3 (III): July - September, 2018
ISSN 2394 - 7780

STUDY OF OPERATORS ON ALMOST KAEHLERIAN SPACES

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ABSTRACT
In this paper, we have defined and studied operators on almost Kaehlerian spaces and several theorems have been derived.

Keywords: Riemannian Spaces, Almost Hermition spaces, almost Kaehlerian spaces, Kaehlerian spaces, Operators.

MATHEMATICS SUBJECT CLASSIFICATION: 53C55, 53B35.

1. INTRODUCTION

Let M^n be a Riemannian spaces, denote its fundamental metric tensor by g_{ij}, and $g = det|g_{ij}|$. In the Greek indices $i, j, k, \ldots$ run from 1 to n, the dimension of the space. Let $\varepsilon^{j_1 \ldots\ldots j_p}_{i_1 \ldots\ldots i_p}$ be the generalized Kronecker's delta, $\varepsilon_{i_1 \ldots\ldots i_p}$ stand for $\varepsilon^{1 \ldots\ldots p}_{i_1 \ldots\ldots i_p}$ and F^p be the algebra of differential p-forms on M^n. Then the exterior differentiation d: $F^p \rightarrow F^{p+1}$ and the adjoint operator $d' : F^p \rightarrow F^{n-p}$ can be written for a *p*-form $u = \left(u_{i_1 \ldots\ldots i_p} \right)$ by (1.1) $(du)_{i_0 \ldots\ldots i_p} = \frac{1}{p!} \varepsilon^{\rho j_1 \ldots\ldots j_p}_{i_0 \ldots\ldots i_p} \nabla_\rho u_{j_1 \ldots\ldots jp}$

(1.2) $$(d'u)_{i_1 \ldots\ldots i_{n-p}} = \frac{1}{p!} \sqrt{g}\, g^{\rho_1 j_1} \cdots\cdots g^{\rho_p j_p} u_{\rho_1 \ldots\ldots \rho_p} \varepsilon_{j_1 \ldots\ldots j_p i_1 \ldots\ldots i_{n-p}}$$

where ∇_j denotes the covariant derivation with respect to the Riemannian connection, The exterior co-differentiation δ: $F^p \rightarrow F^{p-1}$ defined by

(1.3) $$\delta = (-1)^{np+n+1}\ d' d\, d'$$

Can be expressed locally as

(1.4) $$(\delta u)_{i_2 \ldots\ldots i_p} \nabla^\rho u_{\rho i_2 \ldots\ldots i_p}$$

Let Δ be the Laplace-Beltrami operator defined by

$$\Delta = d\delta + \delta d$$

then by means of (1.1) and (1.3) it is easy to verify that for a form u of degree *p*

(1.5) $$(\Delta u)_{i_1 \ldots\ldots i_p} = -\nabla^\rho \nabla_\rho\, u_{i_1 \ldots\ldots i_p} + + \sum_{i=1}^{p} R^\rho_{i_\lambda}\, u_{i_1 \ldots \overset{\lambda}{\hat{\rho}} \ldots i_p}$$

$$+ \sum_{\lambda<\mu} R_{i_\lambda i_\mu}{}^{\rho a}\, u_{i_1 \ldots \overset{\lambda}{\hat{\rho}} \ldots \overset{\mu}{\hat{a}} \ldots i_p}$$

holds, where R_{ijkl} $(or\ R_{ij})$ is the curvature (or Ricci) tensor of the Riemann connection, $u_{i_1 \ldots \overset{\lambda}{\hat{a}} \ldots i_p}$ indicates that the subscript ρ replaces the subscript i_λ and $u_{i_1 \ldots \hat{a} \ldots\ldots i_p}$ indicates that the subscript i_a is deleted.

If a Riemannian space M^n admits an almost complex structure A^j_i satisfying

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(1.6) $$g_{kh}\, A_i^k\, A_j^h = g_{ij}$$

then it is called an almost Hermitian space.

And If in an almost Kaehler space, the Nijenhuis tensor satisfies the condition

$$N_{jih} + N_{jhi} = 0,$$

then we deduce from it $G_{jih} = 0$, i.e.

$$F^h_{i,j} + F^h_{j,i} = 0$$

and the space is an almost Tachibana space. Thus, we have

$$3\, F_{ih,j} = F_{ji,h} = 0.$$

Consequently, the space is a Kaehler space i.e. an almost Kaehler space is a Kaehler space, if and only if the Nijenhuis tensor equation is satisfied.

Let $T^c(M)$ be a complexification of the tangent space of M^n,

and denote by F_c^p the (complexified) differential *p*-forms, that is, the complex-valued functions defined on $T^c(M) \wedge \ldots \wedge T^c(M)$. For non-negative integers r, s we define the projection mapping $\prod_{r,s} : F_c^p \rightarrow F_c^p$ where

p = r + s as follows. At first

(1.7) $$\prod_{1,0}{}_i^j = \left(\tfrac{1}{2}\right)\left(\delta_i^j - \sqrt{-1}\, A_i^j\right)$$

and its conjugate

(1.8) $$\prod_{0,1}{}_i^j = \overline{\prod}_{1,0}{}_i^j = \left(\tfrac{1}{2}\right)\left(\delta_i^j + \sqrt{-1}\, A_i^j\right)$$

which will be abbreviated to $\prod$ *and* $\overline{\prod}$ respectively. Then for a *p*-form **u** of F_c^p, we define

(1.9) $$(\prod_{r,s} u)_{i_2 \ldots\ldots i_p} = \left(\frac{1}{p!}\right) \prod_{r,s}{}_{i_2 \ldots\ldots i_p}^{j_1 \ldots\ldots j_p}\, u_{j_1 \ldots\ldots j_p}$$

$$= \left[\frac{1}{(r!s!)}\right] \varepsilon_{i_1 \ldots\ldots i_p}^{t_1 \ldots t_r h_1 \ldots\ldots h_s} \prod_{t_1}^{j_1} \ldots\ldots \prod_{t_r}^{j_r} \overline{\prod}_{h_1}^{k_1} \ldots\ldots \overline{\prod}_{h_s}^{k_s} u_{j_1 \ldots j_r k_1 \ldots\ldots k_s}.$$

A *p*-form u of F_c^p is called of type (r, s) if it satisfies $(\prod_{r,s} u) = u$.

Now, here following two Lemmas given by Kodaira and Spencer (1957), Ogawa (1970),

Lemma (1.1): In an almost complex space, for any set of functions $u_{i_1 \ldots\ldots i_p}$, we have

(1.10) $$\sum_{v=0}^{p} (\prod_{(p-v,\, v)} u)_{i_1 \ldots\ldots i_p} == u_{i_1 \ldots\ldots i_p}$$

and

(1.11) $$\sum_{v=0}^{p} {}_p C_v\, \varepsilon_{j_1 \ldots\ldots j_p}^{\rho_1 \ldots\ldots \rho_p} \prod_{\rho_1}^{j_1} \ldots\ldots \prod_{\rho_v}^{j_v} \overline{\prod}_{\rho_{v+1}}^{j_{v+1}} \ldots\ldots \overline{\prod}_{\rho_p}^{j_p}\, u_{j_1 \ldots\ldots j_p}$$

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$$== \quad \varepsilon^{j_1 \ldots\ldots j_p}_{i_1 \ldots\ldots i_p} u_{j_1 \ldots\ldots\ldots j_p}$$

holds for any *p*-form $u_{j_1 \ldots\ldots\ldots j_p}$, $1 \leq p \leq n$.

Now we define the operators $d_1 : F_c^p \rightarrow F_c^{p+1}$ of type (1, 0) and $d_2 : F_c^p \rightarrow F_c^{p+1}$ of type (2, -1) in accordance with Kodaira and Spencer (1957) given by

(1.12) $$d_1 = \sum_{r+s=p} \prod_{r+1,s} d \prod_{r,s},$$

(1.13) $$d_2 = \sum_{r+s=p} \prod_{r+2,s-1} d \prod_{r,s}.$$

Here we denote the conjugate operator of d_1 $(or\ d_2)$ by $\bar{d}_1$ $(or\ \bar{d}_2)$.

Lemma (1.2): In an almost complex space, on F_c^p , we have

(1.14) $$\prod_{r+3,s-2} d \prod_{r,s} = 0,$$

Where r + s = p.

From Lemmas (1.1) and (1.2), we have Kodaira and Spencer (1957) given by

(1.15) $$d = d_1 + d_2 + \bar{d}_1 + \bar{d}_2$$

Again the definitions of complex analogues of the real operators d and δ in the sense of Kodaira-Spencer (1957) are as follows

(1.16) $$\partial = 2d_2 + d_1 - \bar{d}_2$$

(1.17) $$\mathfrak{D} = - * \partial *$$

On the other hand, Hsiung (1966) defined them by the following operators

(1.18) $$(\partial u)_{i_0 \ldots\ldots i_p} = \left(\frac{1}{p!}\right) \sum_{r+s=p} \sum_{r+1,s} \prod_{i_0 \ldots\ldots i_p}^{t j_1 \ldots\ldots j_p} \prod_t^h \nabla_h u_{j_1 \ldots\ldots j_p},$$

(1.19) $$(\mathfrak{D} u)_{i_0 \ldots\ldots i_p} = - \sum_{r+s=p} \sum_{r,s} \prod_{t i_2 \ldots\ldots i_p}^{j_1 \ldots\ldots j_p} \prod_h^t \nabla^h u_{j_1 \ldots\ldots j_p},$$

for a *p*-form $u = (u_{i_1 \ldots\ldots i_p})$. After then we shall show that the relation is valid.

(1.20) $$\mathfrak{D} = - * \partial *$$

2. OPERATORS ON ALMOST KAEHLERIAN SPACES

We have study the following properties of the operators

Theorem (2.1): In an almost Kaehlerian space, the operator Γ is a skew-derivation and satisfies

(2.1) $$* \Gamma * = - D$$

Proof: Ogawa (1967) gives that Γ is a skew-derivation and that for any *p*-form $u = u_{i_1 \ldots\ldots i_p}$

ISSN 2394 - 7780

$$(*\,\Gamma * u)_{i_2 \ldots\ldots i_p} = (-1)^{np+n+1}\,(Du)_{i_2 \ldots\ldots i_p}$$

holds, where ***n*** is the dimension of the space. Since ***n*** is even, therefore

(2.1) is proof.

Theorem (2.2): In an almost Kaehlerian space, the operator $\emptyset$ is a derivation and satisfies for any *p*-form u_p,

(2.2) $$* \emptyset * u_p = (-1)^p \emptyset\, u_p .$$

(2.3) $$d\emptyset - \emptyset d = -\Gamma + \Upsilon$$

Proof: From directive calculation with respect to an orthonormal local coordinate system for any *p*-form $u = u_{i_1 \ldots\ldots i_p}$, we have

$$(* \emptyset * u)_{i_1 \ldots\ldots i_p}$$

$$= \left(\frac{1}{(n-p)!\; p!}\right) g\, g^{j_1 j_1} \cdots\cdots g^{j_{n-p} j_{n-p}} g^{k_1 r_1} \cdots\cdots g^{k_p r_p} u_{k_1 \ldots\ldots k_p}$$

$$= (-1)^{p(n-p)}\, (\emptyset\, u)_{k_1 \ldots\ldots k_p}.$$

Since n is even, we have $(-1)^{p(n-p)} = (-1)^p$, and thus (2.2) is proved.

Now, we have

$$(d\emptyset u)_{i_0 \ldots\ldots i_p} = \nabla_{i_0} A^t_{i_r} u_{i_1 \ldots\ldots \overset{r}{\overset{\frown}{t}} \ldots i_p} - \nabla_{i_r} A^t_{i_0} u_{i_1 \ldots\ldots \overset{r}{\overset{\frown}{t}} \ldots i_p}$$

$$- \sum_{r \neq s} \nabla_{i_r} A^t_{i_s}\, u_{i_1 \ldots \overset{r}{\overset{\frown}{i_0}} \ldots \overset{r}{\overset{\frown}{t}} \ldots i_p} + A^t_{i_r} \nabla_{i_0} u_{i_1 \ldots\ldots \overset{r}{\overset{\frown}{t}} \ldots i_p}$$

$$- A^t_{i_0} \nabla_{i_r} u_{i_1 \ldots\ldots \overset{r}{\overset{\frown}{t}} \ldots i_p} - \sum_{r \neq s} A^t_{i_s} \nabla_{i_r} u_{i_1 \ldots \overset{r}{\overset{\frown}{i_0}} \ldots \overset{r}{\overset{\frown}{t}} \ldots i_p}$$

$$(\emptyset du)_{i_0 \ldots\ldots i_p} = A^t_{i_0} \nabla_t u_{i_1 \ldots\ldots i_p} - A^t_{i_s} \nabla_t u_{i_1 \ldots\ldots \overset{s}{\overset{\frown}{i_0}} \ldots\ldots i_p}$$

$$+ A^t_{i_r} \nabla_{i_0} u_{i_1 \ldots\ldots \overset{r}{\overset{\frown}{t}} \ldots\ldots i_p} - A^t_{i_0} \nabla_{i_r} u_{i_1 \ldots\ldots \overset{r}{\overset{\frown}{t}} \ldots\ldots i_p}$$

$$- \sum_{r \neq s} A^t_{i_s} \nabla_{i_r} u_{i_0 \ldots\ldots \overset{s}{\overset{\frown}{t}} \ldots \overset{r}{\overset{\frown}{i_0}} \ldots i_p} .$$

Hence it follows that

$$(d\emptyset u - \emptyset du)_{i_0 \ldots\ldots i_p} = (\nabla_{i_0} A^t_{i_r} - \nabla_{i_r} A^t_{i_0}) u_{i_1 \ldots\ldots \overset{r}{\overset{\frown}{t}} \ldots i_p}$$

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$$- \sum_n (-1)^n \; A^t_{i_n} \nabla_t u_{i_0 \ldots\ldots \hat{n} \ldots i_p}$$

$$+ \sum_{r<s} (-1)^r (\nabla_{i_r} A^t_{i_s} - \nabla_{i_s} A^t_{i_r}) u_{i_0 i_1 \ldots \hat{r} \ldots \overset{s}{\hat{t}} \ldots\ldots i_p}$$

$$= \sum_{n<m} (-1)^n (\nabla_{i_n} A^t_{i_m} - \nabla_{i_m} A^t_{i_n}) u_{i_0 \ldots \hat{n} \ldots \overset{m}{\hat{t}} \ldots\ldots i_p}$$

$$- \sum_n (-1)^n \; A^t_{i_n} \nabla_t \; u_{i_0 \ldots\ldots \hat{n} \ldots\ldots i_p}.$$

$$= (\Upsilon u - \Gamma u)_{i_0 \ldots\ldots i_p}.$$

Now, we have consider the following relation

$$\sum_{s=1}^{p} \varepsilon^{j_1 \ldots\ldots \overset{s}{\hat{t}} \ldots j_p \, j_{p+1} \ldots\ldots j_{p+q}}_{i_1 \ldots\ldots\ldots\ldots\ldots\ldots i_{p+q}} A^{j_s}_t + \sum_{s'=p+1}^{p+q} \varepsilon^{j_1 \ldots j_p \, j_{p+1} \ldots\ldots \overset{s'}{\hat{t}} \ldots j_{p+q}}_{i_1 \ldots\ldots\ldots\ldots\ldots\ldots i_{p+q}} A^{j_s}_t$$

$$= \sum_{n=1}^{p+q} A^t_{i_n} \varepsilon^{j_1 \ldots\ldots\ldots\ldots j_{p+q}}_{i_1 \ldots\ldots \overset{n}{\hat{t}} \ldots\ldots i_{p+q}},$$

Then, we have

$$(\emptyset u \wedge v)_{i_1 \ldots\ldots\ldots i_{p+q}} + (u \wedge \emptyset v)_{i_1 \ldots\ldots\ldots i_{p+q}}$$

$$= \left(\frac{1}{(p!q!)}\right) \Big[\sum_{r=1}^{p} \varepsilon^{j_1 \ldots\ldots\ldots j_{p+q}}_{i_1 \ldots\ldots\ldots i_{p+q}} A^t_{j_r} \, u_{j_1 \ldots\ldots \overset{s}{\hat{t}} \ldots\ldots j_p} \, v_{j_{p+1} \ldots\ldots j_{p+q}}$$

$$+ \sum_{s'=p+1}^{p+q} \varepsilon^{j_1 \ldots\ldots\ldots j_{p+q}}_{i_1 \ldots\ldots\ldots i_{p+q}} A^t_{j_{s'}} \, u_{j_1 \ldots\ldots j_p} \; v_{j_{p+1} \ldots\ldots \overset{s'}{\hat{t}} \ldots j_{p+q}} \Big]$$

$$= \left(\frac{1}{(p!q!)}\right) \sum_{n=1}^{p+q} A^t_{i_n} \varepsilon^{j_1 \ldots\ldots\ldots j_{p+q}}_{i_1 \ldots\ldots \overset{n}{\hat{t}} \ldots\ldots i_{p+q}} \; u_{j_1 \ldots\ldots j_p} \; v_{j_{p+1} \ldots\ldots\ldots j_{p+q}}$$

$$= \emptyset \, (u \wedge v)_{i_1 \ldots\ldots\ldots\ldots i_{p+q}}$$

Thus the operator $\emptyset$ is a derivation. From this, we have the following:

Corollary (2.1): In almost Kaehlerian space, the operator Υ is a skew-derivation.

Corollary (2.2): In almost Kaehlerian space, the relation holds.

(2.4) $$d\,\Gamma + \Gamma d = d\,\Upsilon + \Upsilon d$$

Theorem (2.3): In almost Kaehlerian space, we have

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(2.5) $$* \Upsilon * = -\vartheta - i(\delta A)$$

where $i(\delta A)$ denotes the inner product with respect to a 1-form $\delta A (A = A_{ij})$

Proof: We have the definition of Υ, for a *p*-form *u*,

$$(\Upsilon u)_{i_0 \ldots\ldots i_p} = \sum_{n<m} (-1)^n \, T^t_{i_n i_m} u_{i_0 \ldots\ldots \hat{n} \ldots\ldots \overset{m}{\hat{t}} \ldots\ldots i_p},$$

Where, we write $T^t_{ij} = \nabla_i A^t_j - \nabla_j A^t_i$. Therefore we have

$$(* \Upsilon * u)_{i_2 \ldots\ldots i_p} = \frac{g}{(a-p+1)!p!} \sum_{1 \le r < s \le a-p+1} (-1)^{r-1} T^h_{j_r j_s}$$

$$. g^{t_1 j_1} \ldots\ldots\ldots g^{t_{a-p+1} j_{a-p+1}} g^{h_1 k_1} \ldots\ldots\ldots\ldots\ldots g^{h_p k_p}$$

$$. u_{k_1 \ldots\ldots k_p} \varepsilon_{h_1 \ldots\ldots h_p j_1 \ldots \hat{r} \ldots\ldots \overset{s}{\hat{h}} \ldots j_{a-p+1}} \varepsilon_{t_1 \ldots\ldots t_{a-p+1} i_2 \ldots\ldots i_p}$$

$$= \frac{(-1)^{r(p-1)(a-p+1)}}{(a-p+1)(a-p)p!} \sum_{r<s} T^{t_r t_s}_{\tau} \, \varepsilon^{k_1 \ldots\ldots\ldots k_p \, \tau}_{j_2 \ldots\ldots\ldots j_p t_r t_s} u_{k_1 \ldots\ldots\ldots k_p}$$

$$= -\nabla^l A^t_l \, u_{t \, i_2 \ldots\ldots i_p} - \sum_{n=2}^{p} (-1)^n \nabla^t A^h_{i_n} u_{th \, i_2 \ldots\ldots \hat{n} \ldots i_p}$$

$$= [\, i(\delta A) u - \vartheta u \,]_{i_2 \ldots\ldots i_p}.$$

Similarly, we have proof of the following:

Theorem (2.4): In an almost Kaehlerian space, we have

(2.6) $$\partial = (d - \sqrt{-1}\,\Gamma)/2,$$

(2.7) $$\mathfrak{D} = (\delta - \sqrt{-1}\,\mathrm{D})/2,$$

(2.8) $$\bar{\partial} = (d + \sqrt{-1}\,\Gamma)/2,$$

(2.9) $$\bar{\mathfrak{D}} = (\delta + \sqrt{-1}\,\mathrm{D})/2,$$

(2.10) $$\partial = [d - \sqrt{-1}\,(\Gamma - \Upsilon)]/2,$$

(2.11) $$\mathfrak{D} = [\delta - \sqrt{-1}\,\{\mathrm{D} - \vartheta - i(\delta A)\}]/2,$$

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International Journal of Advance and Innovative Research
Volume 5, Issue 3 (III): July - September, 2018
ISSN 2394 - 7780

USE OF BAGASSE ASH AS POZZOLANIC MATERIAL IN CONCRETE – A REVIEW

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ABSTRACT
Concrete is a composite material consist of cement, fine aggregate, coarse aggregate and water. Recently the cost of construction is very high with the use of conventional building material which is due to the lack of natural materials. This problem can be solved by replacing all the ingredients in concrete with waste materials. Over 3.3 billion tons of cement was consumed globally in 2010 based on survey of world coal association. Demand and consumption of cement is increasing day by day which has led researchers and scientists to search for locally available alternate binders that can replace cement partially and are ecofriendly and contribute towards waste management. In this direction the industrial & agricultural waste play vital role. Sugar-cane bagasse is one such fibrous waste product of the sugar mills and sugar refining industry. The use of such ash in concrete by partial replacement of cement, not only reduces the cost of making concrete, but also improves the properties of concrete and reduces environmental pollution.

A comprehensive overview of the published literature on the use of bagasse ash in concrete and its mechanical and durability properties of concrete produced using partial replacement of cement is being presented

Keywords: Bagasse ash, Cement, CO_2, Durability, Partial replacement,, Strength.

1. INTRODUCTION

Initiatives are emerging worldwide to control and regulate the use of sub-products, residuals and industrial wastes in order to preserve the environment from defilement. A good solution to the problem of recycling of agro-industrial residues would be by burning them in a controlled environment and use the ashes (waste) for more noble means **[1]**. Utilization of such wastes as cement replacement materials may reduce the cost of concrete production and also minimize the negative environmental effects with disposal of these wastes. Silica fume, rice husk ash, fly ash, metakaolin and ground granulated blast furnace slag are well established wastes with pozzolans because of high silica content in their chemical compositions. According to Sirirat **[2]** the calcium hydroxide (unfavourable product from the cement hydration) released during the hydration of OPC reacts with silica present in the pozzolans and water to form additional calcium silicate hydrate which is responsible for the compressive strength in concrete.

Brazil, the largest sugarcane cultivator in the world, generates over 2.5 million tonnes of sugar cane bagasse ash. Sugarcane is main food crop for tropics and subtropics. It is the major raw materials used for sugar production. Bagasse ash, a combustion by-product of sugar cane bagasse in sugar mill industries in India alone 10 million tons of bagasse ash produced as an un-utilized and waste material [3-4]. This production trend will increase sharply every year because sugar cane is one of the primary agricultural crops and is a major raw material used in the production of ethanol. Some authors have reported that SCBA has substantial amounts of silica SiO_2, alumina Al_2O_3 and ferric oxide Fe_2O_3 **[3-5]** and these account for over 70% of the constituents of SCBA, indicating that SCBA can also be used as mineral admixture. Therefore its suitability as cement replacement and its effect on the fresh, hardened and durability properties of concrete have been assessed in this review. Thus the main aim of this review is to update and compile all research works on BA as it relates to its structure and properties uncover gaps and reveal areas that are yet to be covered, so as to provide useful information for users in the built environment and direction for further studies to enhance its sustainability.

1.1 Sugarcane Bagasse ash

Bagasse is a by-product of sugar milling process in sugar industries. Sugarcane is the plant that its juice can be processed into sugar. In the utilization of bagasse as fuel of boiler in sugar plant process, bagasse is burned to heat water in boiler to produce steam that will be used to drive power plants. From the combustion process will be generated bagasse ash that has grey black color. Mostly bagasse is burnt around 550˚C to utilize the fuel value in cogeneration boiler. Two different types of fibrous unburnt particles were observed in raw bagasse ash (Fig1), namely coarse fibrous unburnt particle (CFU) and fine fibrous unburnt particles (FFU). Raw bagasse ash has highly porous because during disposal it is mixed with water to avoid pollution.

ISSN 2394 - 7780

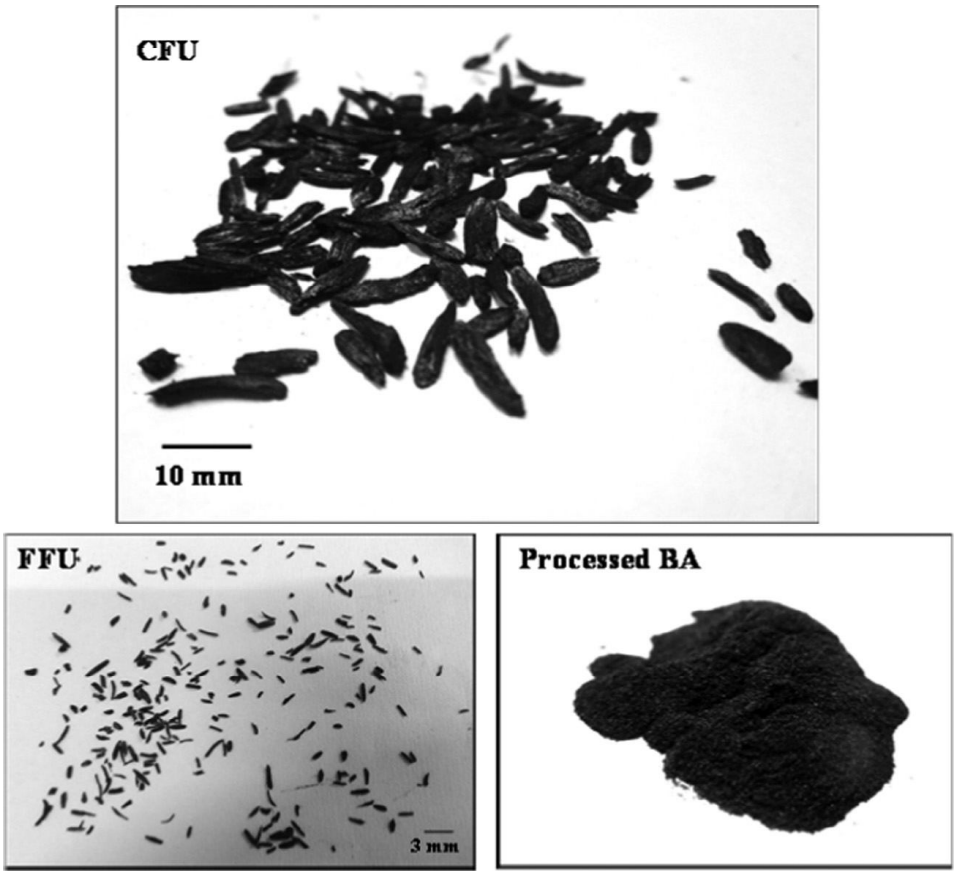

Fig-1: Raw Bagasse Ash (Bahurdeen et al, 2014)

The straw became another solid by product with sugarcane mechanized harvesting and mainly consist of water 15 wt%, ash 2 wt% and biomass fibre 83 wt% J.C.B.Moraes et al, used sugarcane straw ash efficiently in alkali-activated material and concluded that SCSA plays an important role in the development of binding ability of the alkali activated paste. Sodium silicate can be replaced by SCSA dosage as activating solution was proposed to as a way to yield highly sustainable binders.

Sugarcane consists about 30% bagasse whereas the sugar recovered is about 10%, and the bagasse leaves about 8% bagasse ash (this depends on the quality and type of the boiler, modern boiler release lower amount of bagasse ash) as a waste, this disposal of bagasse ash will be of serious concern. Sugarcane bagasse ash has recently been tested in some parts of the world for its use as a cement replacement material. The bagasse ash was found to improve some properties of the paste, mortar and concrete including compressive strength and water tightness in certain replacement percentages and fineness.

The higher silica content in the bagasse ash was suggested to be the main cause for these improvements. Although the silicate content may vary from ash to ash depending on the burning conditions and other properties of the raw materials including the soil on which the sugarcane is grown, it has been reported that the silicate undergoes a pozzolanic reaction with the hydration products of the cement and results in a reduction of the free lime in the concrete.

1.2 Uses of Bagasse ash

Bagasse ash can be utilised in various construction applications and building materials. At present Bagasse ash is used for the following applications:

- ✓ As a filler material for roads and embankments.
- ✓ For manufacturing bricks.
- ✓ Manufacturing of hollow bricks and tiles.
- ✓ Soil stabilisation.
- ✓ Aggregate for concrete manufacturing
- ✓ Fertilizer for agricultural lands

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2. PRODUCTION, STRUCTURE & PHYSICAL PROPERTIES OF BAGASSE ASH

2.1. Production of bagasse ash

Characteristics and properties of bagasse ash are closely related to the parent materials and the method and techniques of its production. The SCBA was extracted directly from the boilers of the sugar factory. For every 10 tonnes of sugar cane crushed, a sugar factory produces nearly 3 tonnes wet bagasse. The high moisture content of bagasse typically 40-50 percent,is reused as a fuel for heat generation which leaves 8-10% of ash, known as sugarcane bagasse ash (SCBA) Modani and Vyawahare, 2013. For instance, cordeiro et al, 2012 reported that SCBA produced with air calcinations at 600˚C and the rate of heating of 10˚C/min presents amorphous silica, high surface area and low carbon content. The mill fired BA burnt under controlled at 650˚C for 1 hour. However, incinerating conditions essentially control the quality of BA, especially amorphous form, which is needed for structural concrete. Cordeiro et al 2009 stated that as received material should be ground in vibratory mill to reduce the particle size and increase the specific surface area, also investigate longest milling time would helps to achieve. This ultrafine grained ash has high pozolanic activity.

2.2. Structure of bagasse ash

E, Arif et al, 2016 investigated majority of particles of BA are irregularly shaped, porous with only a minor number of spherical particles. Sugarcane bagasse consists of approximately 50% of cellulose, 25% of hemicelluloses of ligin. Each ton of sugarcane generates approximately 26% of bagasse (at a moisture content of 50%) and 0.62% of residual ash. The residue after combustion presents a chemical composition dominates by silicon dioxide (SiO2).J.F Martirena et al, 1998 observed from XRD analysis that there is presence of quartz and cristobalite in SCBA and SCSA indicated the temperature of combustion was higher than 800˚C indicates the presence of amorphous silica.

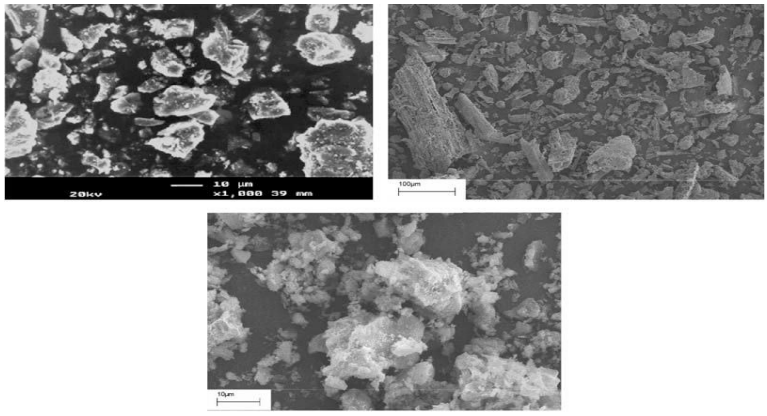
Fig-2: Production of bagasse ash

2.3. Physical properties

Some physical properties of SCBA can affect the mechanical and durability properties of concrete, includes specific gravity, Blaine fineness and mean particle size. Investigation conducted by researchers (Cordeiro et al, K.Ganesan et al, 2007; A.Bahurudeen et al,2014; Tanchirapat et al, S.M.S. kazmi et al,2017; F.C.R. Almeida et al, 2015; showed that the specific gravity of bagasse ash varies from 1.80 to 2.5 which is lower than 3.10 to 3.14, the specific gravity of Type I Portland cement and (K.Ganesan et al, 2007; that is meant to partially replace. This means that density decreases as the percentage replacement is increased. For effectiveness of BA as a pozzolanic material many researchers concluded that material has to be ground before use. (G.C Cordeiro et al,2012; G.C.Cordeiro et al,2009; M.Frias ae al, 2017; F.C.R. Almeida et al, 2015; E.G.A. Ferreira et al, 2017; A.Rerkpiboon et al, 2015; G.C Cordeiro et al, 2017) Grinding does improve SCBA reactivity as the internal amorphous silica is made more available for reaction through mechanical processing. Inorder to present the pozzolanic activity index of 100% the SCBA has to present D_{80} finer than 60 µm and specific surface should be larger than 300m^2/kg. The importance of particle size has a significant effect on the pozzolanic activity of the ash. The smaller the particle size the larger the surface area and therefore a greater reactivity. The particles of BA are nearly four times finer than those of OPC and the finer particles of BA are more uniform in their distribution **[3]** Chusilp et al, 2009; have burnt the sugarcane biomass at the temperature of 600–800˚C. The temperature was lower than its melting point. The obtained ash was partially burnt or unburnt particles of sugarcane biomass, resulting in the formation of spongy particles shown in Fig 2, responsible for the water absorption of SCBA.

Several researchers have used the tumbling mill or vibratory mill for the grinding operation of SCBA. The variation in respect of fineness was observed, the mean particle size and the percentage of SCBA retained on a 45 µm sieve was in the range of 2.7–90 µm and 0.42–5%

ISSN 2394 - 7780



(a) Type I Portland cement (b) Origina bagasse ash (c) Ground bagasse ash

Fig-3: Particle images of Portland cement and bagasse ashes.(N. Chusilp et al.)

3. CHEMICAL PROPERTIES OF SUGARCANE BAGASSE ASH

3.1. Oxide composition

The oxide compositions of bagasse (SCBA) obtained by various researchers are shown in table 2. It can noted that Bagasse ash is primarily comprises of SiO_2 + Al_2O_3 + Fe_2O_3 content of more than 70% of the overall material composition it demonstrates that the BA are in the same category with the Class F fly ash (ASTM C618, 2005) with high pozzolanic characteristics and the proportion of SiO_2 in bagasse ash is more than 60%, suggesting that bagasse ash contains a high content of important oxides suitable for a pozzolanic material **[6]**. This is the measure of reactivity where silica is highly responsible for the structural strength. Another parameter to be considered in the analysis is the value of loss on ignition (LOI) used to determine carbon content. The ACI 116 **[7,8]** defines the LOI value as a mass loss of a sample with constant weight calcinated between 900 and 1000 C. Another disadvantage of a large amount of LOI is that it there is an increased demand of water in fresh concrete and a resultant lower compressive strength.(S.M.S.Kazmi et al, 2017) stated that the LOI can be reduced by effective removal of unburnt particles through sieving during grinding of SCBA. The grinding procedures adopted in improve the pozzolanic activity of BA containing LOI more than 10%. The source of the sugar mill, temperature and time of burning controls the chemical composition of ash. Table 1 shows the comparative study among chemical composition of bagasse ash obtained from different sources.

Table-1: Oxide composition of bagasse ash in %

Researchers	SiO_2	Al_2O_3	Fe_2O_3	CaO	K_2O	Na_2O	SO_3	MgO	LOI
G.C.Cordeiro et al	78.3	8.9	3.6	2.2	3.5	0.1	-	-	0.4
P.Montes et al	56.37	14.61	5.04	2.36	3.29	1.57	-	1.43	10.53
A.Bahurudeen et al (2014)	57.63	1.33	1.50	6.14	7.3	0.22	3.52	1.56	21
A.Rerkpiboon et al	55.04	5.14	4.06	11.03	1.22	0.24	2.16	0.91	19.60
J.C.Arenas-Pierahita et al	66.12	14.99	7.16	2.57	3.52	0.54	0.26	1.19	9.34
K.Ganesan et al	64.15	9.05	5.52	8.14	135	0.92	-	2.85	4.90
Prasant O Modani et al (2013)	62.43	4.28	6.98	11.8	3.53	-	1.48	2.51	4.73
M.Frias et al (2017)BIOI*	60.1	12.5	10.35	3.11	6.0	0.16	0.1	3.35	1.0
BIOL**	49.79	7.53	4.43	11.10	8.45	0.28	1.95	7.43	5.08
S.M.S Kazmi et al (2017)	85.17	1.69	2.73	2.59	0.36	0.53	0.17	0.69	3.55
J.A.Rossignolo et al (2017)	60.14	12.53	10.35	3.11	6.06	0.16	0.11	2.10	1.03
A.Joshaghani et al (2017)	55.7	2.86	3.51	15.34	6.1	0.37	-	4.08	8.92
J.C.BMoraes et al (2017) SCSA***	58.6	9	8.4	4.6	5.4	-	1.9	1.6	6.5
P.Stayesh gar et al (2017)	69.94	3.34	1.25	2.27	5.83	1.49	0.42	6.68	2.35
F.C.R. Almeida et al (2015)	80.8	2.5	5.8	1.6	3.9	0.2	0.1	1.5	0.7
Souza et al (2008)	85.5	5.3	1.3	2.1	3.5	-	-	1.1	-
Sales & Lima (2010)	88.2	2.3	5.1	0.6	1.3	0.1	<0.1	0.4	0.35
S.M.S. Kazmi et al.(2016)	87.97	1.84	2.65	2.65	0.32	0.28	0.15	0.72	10.45
J.F. Martirena Herna´ndez *et al.(1998)*	72.74	5.26	3.92	7.99	3.47	0.84	0.13	2.78	0.77
S. Rukzon, et al (2012)	65	4.8	0.9	3.9	2	-	0.3	-	10.5
N.B,Singh et al (2000)	63.16	9.70	5.40	8.40	-	-	2.87	2.90	6.90

*bagasse straw ash obtained in sugar factory,**bagasse ash produced at laboratory scale, *** sugarcane straw ash

ISSN 2394 - 7780

3.2. Pozzolanic Property

Pozzolanic properties measure the extent of the chemical reaction occurring between the active constituents of pozzolana (that is BA in this case), calcium hydroxide, and water. This property is of utmost importance for it is an indication of its ability to participate in the reaction that leads to the formation of strength in concrete. Strength development ability is a necessary condition for any material to be considered for structural applications. Investigations conducted by (G.C.Cordeiro et al; P.Montes et al; A.Bahurudeen et al, 2014; A; .Rerkpiboon et al; J.C.Arenas-Pierahita et al; K.Ganesan et al; Prasant O Modani et al, 2013) showed that BA is of high pozzolanic activities because of the presence of amorphous silica, its fineness and high specific surface area. Also found out that the pozzolanic activities increased with increase in the degree of its amorphousness but decrease with the particles size of the BA. However, BA with a high carbon content (usually obtained from uncontrolled burning conditions) was found to exhibit low pozzolanic activity (Cordeiro et al., 2009). It is worthy to note that, in measuring the pozzolanic reaction, several methodologies were adopted by various researchers namely; rapid evaluation of pozzolanic activity by conductivity measurement, accelerated pozzolanic strength reactivity index (API), strength activity index (SAI), kinetic diffusive model and Frattini test method (Saad et al, 2015; A. Bahurudeen et al**,** 2014; E. Arif et al, 2016; S.M.S. Kazmi et al, 2017). However, results from Frattini test and SAI method have been found not only to correlate with each other, but also are methods that can be well-controlled (Cordeiro et al.,2009)

4. FRESH STATE PROPERTIES

4.1. Consistency

Consistency of concrete is the degree of wetness exhibited by a freshly mixed concrete, mortar or neat cement grout when the workability of the mixture is considered acceptable for the purpose at hand. Slump test, is a very common test to assess the workability of any kind of concrete. Results of investigation conducted by (N. Chusilp et al, 2009; Modani and Vyawahare, 2013; G. Sua-iam, N. Makul, 2013; A. Bahurudeen et al, 2014; A. Rerkpiboon et al, 2015; J.C. Arenas-Piedrahita et al, 2016)

The slump value was maximum at 0% replacement and then it decreased in further increasing the amount of BA. The increased demand of water was mainly because of the higher specific surface area of the porous and irregular surface of the SCBA particles. The work of A. Bahurudeen et al, 2014 showed that removal of fibrous particles and further grinding to cement fineness led to reduction in the water requirement from 320 ml to 255 ml. It was clearly observed that for better workability, the fibrous particles need to be removed from raw bagasse ash.

4.2. Workability

The property of concrete which determines the amount of useful internal work, necessary to produce full compaction that is workability is the amount of energy to overcome friction while compacting. The results from the investigators (N. Chusilp et al, 2009) on the effect of BA on the workability of concrete concluded that concrete progressively become unworkable as the percent replacement of cement with BA increases unless water-reducing admixtures are used. Bagasse ash will subsequently absorb certain amount of mixing water on its surface resulting in decrease in free water and lower slump. It is worth noting that at a given water to cement ratio, small addition (less than 2–3 by weight of cement) of BA may be helpful for improving the stability and workability of concrete by reducing the tendency towards bleeding and segregation (Mehta, 1983, 1992). It can be inferred that to attain the required workability, mixes containing BA will required higher water content than the corresponding conventional mixes with BA, and this demand increases with content of BA in the mix (A. Rerkpiboon et al,2015)

4.3. Setting Time

Partially replacing cement by SCBA in concrete resulted in a delay in the setting process of blended concrete, resulted in the prolonged initial and final setting times of blended concrete. The setting times of blended concrete (both initial and final setting times) having up to 20% cement replacement level by SCBA was in compliance with the permissible limits given in IS Code 4031 (Part 5) (1988**) [26]** According to (K. Ganesan et al, 2007; A. Bahurudeen et al**,** 2014; A. Rerkpiboon et al, 2015; E. Arif et al, 2016; Mutua et al.) The water required for normal consistency increased with an increase in cement replacement level. As ashes are hygroscopic in nature and the specific surface area of BA is three times higher than cement it needs more water for proper consistency. Increasing the BA level considerably increases the initial and final setting time. However all the values are well within the permissible limits. (V.D. Katare, M.V. Madurwar, 2017) showed that Delay in the setting times of blended concrete was observed mainly due to the cement dilution. Retardation in the hydration reaction rate of cement was observed due to the incorporation of less reactive SCBA into the concrete, contributes to the delay of setting time of blended concrete paste. Prolonged setting times of concrete

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implicate that the concrete paste is workable for longer times. Because of the lesser hydration reaction rate of concrete the development of heat of hydration will also be lesser. It is suitable for the low heat development applications such as mass concrete work.

5. HYDRATION AND MICROSTRUCTURE DEVELOPMENT OF CEMENT BLENDED WITH BAGASSE ASH

5.1. Hydration mechanism and product of cement blended with ash

(N.B.Singh et at, 2000)have explored the hydration mechanisms of cement blended with BA. The general conclusion is that BA containing a considerable amount of SiO_2 will react with $Ca(OH)_2$ to produce the CSH gel; and that due to the fact that the pozzolanic reaction is a lime-consuming reaction,

the paste containing BA has a lower $Ca(OH)_2$ content than the pure Portland cement paste. It also increases the setting time and decreases the free lime. The investigation conducted by (N.chusilp et al, 2009; A.Bahurudeen et al, 2015) showed that the addition of GBA stimulates the hydration of cement at later age, and hence less heat in the GBA-blended concrete are produced also proved that increase in GBA content decreases the heat evolution. But J.C.Arenas et al. (2016) were of the opinion that the porous structure of BA was responsible for this. Also, it has been found that the BA has both hydraulic and pozzolanic properties. Also there is increase in electrical resistivity with the use of untreated bagasse ash of concrete which react with calcium hydroxide to form additional CSH. This reaction directly affects the microstructure because of formation of new products densifies the matrix and decreases porosity. Lourdes M. S. Souza et al., they had investigated on the reactions between calcium hydroxide (CH) and sugar cane bagasse ash (SCBA). The results show that the main product was found to be C-S-H of not specific morphology and that could not be related to the known products C-S-H (I)/C-S-H (II). Calcium alumina silicate hydrates and calcium aluminate hydrate, in the form of fine plates or needles, were also produced. The main product formed in the pozzolanic reactions between SCBA and CH is C-S-H and it appears as a dense net of amorphous agglomerations.

6. HARDENED PROPERTY

6.1. Density

The density of concrete is an important factor in the determination of porosity, assessment of durability and strength. Results of the investigation conducted by (G. Sua-iam, N. Makul, 2013; J.C. Arenas-Piedrahita et al, 2016; K. Ganesan et al, 2007) showed that the density of concrete specimens containing BA decreased with increase in the content of BA at all water-binder ratio. The air content results confirm this reduction because the addition of 10% and 20% of UtSCBA increased the air content values by 10.5% and 26.3%, Investigation carried out by Yuzer et al. (2013), revealed that the presence of ash induces porosity and reduces the density of concrete. By using the total pore volume of each of the concrete series calculated using the results of CT analysis, they demonstrated that the pore volume increased as the amount of added ash is increased.

6.2. Compression Strength

The ultimate resistance offered by the concrete block before yielding to the applied compressive load can be termed as the compressive strength of the concrete. Most of the researchers included compressive strength as one of the parameters of investigation. From the analysis of the results of some of these researchers, the factors affecting the compressive strength of concrete incorporating BA are fineness of the material, curing duration and BA replacement level

N.B. Singh et al. (2000) the compressive strength in the case of control increased with hydration time. In the presence of 10% BA, the values also increased with time and were always higher than that of control may be both due to physical and chemical processes. Further, the pozzolanic reaction between calcium hydroxide and silica and the hydration of silica itself in the alkaline environment will be responsible for the increased compressive strength.

K. Ganesan et al. (2007) claims that the following factors are responsible for the increase of the compressive strength in mixtures containing SCBA. First, the pozzolanic reaction between the silica and CH from the hydration process of OPC, and second, the large surface area of the SCBA which provides substantial sites for the nucleation of additional hydration products. At 25 and 30% BA, the strength decreases to a lesser value when compared to that of control specimens.(A.Joshaghani et al, 2017; A. Rerkpiboon et al. 2015; V.D. Katare, M.V. Madurwar, 2017) results are in agreement with several previous studies that 20% replacement of BA to OPC is considered as optimal limit but high fineness is required. G. Sua-iam, N. Makul (2013) The compressive strength continued to increase over the 91-day curing period. Addition of increasing amounts of BA generally decreased the strength at a given age due to the greater porosity of the material as indicated by the higher water requirement The greatest compressive strength was achieved when the mixture contained a 10% fine aggregate replacement of lime stone improvement stemmed from the void-filling ability of the smaller

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particles and was more pronounced at lower w/c ratios P. Setayesh Gar et al. (2017) The concrete made with sugarcane bagasse ash retains its strength up to a cement replacement of 15%. It is also seen that the strength increases up to a cement replacement of 10%, which may be attributed to the dual role of the pore size and grain size refinement associated with pozzolanic action. At 15% cement replacement, the strength is still level with the reference mix containing Portland cement alone. A further increase in the SCBA content leads to a steady decrease in the compressive strength. G.C. Cordeiro et al (2008) The results indicate than the production of mortar with high cement replacement (35% in volume) by SCBA with the same compressive strength of cement mortar was possible, given that the ash presented D_{50} below 3 μm and Blaine fineness of about 1000 m^2/kg. J.C. Arenas-Piedrahita et al. (2016) a minor detrimental effect on the compressive strength of mortars when 10% of UtSCBA is added to the mortar mixture (reductions of 1.7%, 8.1%, 5.7% and 3.2% at 3, 7, 14 and 28 days, respectively); however, this effect is reversed at 56 days. A similar effect can be observed when 20% of UtSCBA is used in the mixture (reductions of 16.1%, 9.8%, 9.2%, and 3.4%at 3, 7, 14 and 28 days, respectively) but the beneficial effect in this case is observed only after 90 days. This effect can be observed, but only at early ages. At later ages, it is not evident. It is worth noting that at 90 and 180 days no significant difference was observed between mixtures containing UtSCBA (10BA and 20BA) and FA (10FA and 20FA) and the control.

Thus from the above literature review it can be established that in the majority of the cases, the replacement of cement by bagasse ash upto optimum percentage replacement increases the compressive strength of the concrete. The optimum percentage replacement varies for different types of bagasse ash based on its fineness

6.3 Tensile Strength

K. Ganesan et al, (2007) studied tension behaviour of concrete with SCBA up to 20% replacement, the increase in tensile value compared to control concrete and then at 25% and 30% of BA, the value decreases. So optimal level of replacement of cement is 20%. Amin et al, 2011 investigated the influence of SCBA with 5-30% replacement at the interval of 5 % the optimal replacement was found to be 20%.

6.4 Modulus of elasticity

(Rerkpiboon et al, 2015) obtained the modulus of elasticity at the age of 7, 28, 90days. Addition of SCBA upto 50% in concrete has similar results as that of control concrete. Later (P. Setayesh Gar et al, 2017) analysed that these is a gradual decrease in flexural strength with an increase in percentage replacement of SCBA in concrete at room temperature. Also, when the specimens were subjected to sustained elevated temperatures, there was a significant decrease in the strength and this drop ranged from 20% to 40%. The drop in strength in concrete containing cement alone was more when compared with concrete containing SCBA.

6.5 Flexural strength

P. Setayesh Gar et al (2017) There is a gradual decrease in flexural strength with an increase in percentage replacement of SCBA in concrete at room temperature. Also, when the specimens were subjected to sustained elevated temperatures, there was a significant decrease in the strength and this drop ranged from 20% to 40%. The drop in strength in concrete containing cement alone was more when compared with concrete containing SCBA.

7. DURABILITY PROPERTY

Long-term structural capacity of structural members is an important consideration in design stage. The choice and proportion of materials are influenced by the desire to ensure that the designed structure continues to perform satisfactory structurally in service in the domiciled environment. The good concrete must be watertight, provides good mechanical strength, ensures good thermal inertia, and conforms to the health standards imposed by industry, making it a material of choice for many applications.

7.1 Water Absorption

The results of investigations conducted by K. Ganesan et al. (2007) showed that the presence of BA in concrete leads to (50%) reduction in water absorption after 90 days curing and sorptivity which is important factor for long durability. This is due to gradual closing of pores. Obviously with prolonged curing, addition of BA leads to reduction of permeable voids. Da Silva et al. (2008) as when ash present in concrete, as when RHA present in concrete specimen it reduces the inside pores as well as makes in uniformly arranged by finer ash particles. As a result, the water absorption and sorptivity reduced than control concrete. N. Chusilp et al (2009) He found that the water permeability values of all concretes decreased with their curing age. The water permeability ratio (water absorption coefficient) of concrete is lower with increasing ground bagasse ash proportion in concrete.V.D. Katare, M.V. Madurwar (2017) studied the porous structure of a hardened concrete exerts a

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capillary force, so that water gets carried into the body of hardened concrete **[34]** University of Toronto, Canada developed the formula for calculating sorptivity as follows,

$i = St^{0.5}$,

where the cumulative water absorption per unit area of surface in flow is i, sorptivity is S, and the elapsed time is t.

7.2 Chloride Resistance

Methods used by investigators (Nehdi et al., 2003; Saraswathy and Song, 2007; Chindaprasirt and Rukzon, 2008; De Sensale et al., 2008; Salas et al., 2009; Madandoust et al., 2011; Coutinho and Papadakis, 2011; Chopra et al., 2015) to assess the ability of concrete with supplementary material to resist chloride ingress included: ASTM C1152 (2003), AASHTO T259 (1980), AASHTO T277 (1983),

ASTM T1202 (rapid chloride penetration test). Though Ganesan et al. (2007); G.C. Cordeiro et al**.** (2009) their results however agreed that inclusion BA concrete and mortar specimens proved to be more resistance in relation to the control specimens at replacement levels up to 25%-30% and less resistant in increase in percentage of SCBA. This has been attributed to less porosity and finer pore structures of BA specimens. The implication of using BA in concrete is that protection is offered for the embedded steel in reinforced concrete, thereby reducing the risk of concrete deterioration through chloride ingress into such concrete, especially when the structure is located in coastal areas or exposed to de-icing salts. however the value is quite less compared to that of control. No significant change is observed of the penetration of ions in relation to the amount of SCBA used in the concrete

8. CONCLUSION AND RECOMMENDATION

In can be concluded from the reviewed experimental literature analysis

- Bagasse ash suitable for structural applications can be obtained by carefully selection of incineration time, temperature, and environment in the processing of bagasse.
- The chemical composition of BA showed high silica content, acts as the pozzolanic material
- The paste containing BA requires more water to achieve the standard consistence when compared to the samples without BA, and the water demand increased with increase in cement replacement with BA since the specific surface area of ash high.
- The concrete specimens containing BA progressively become unworkable as the percent replacement of cement with BA increases unless water-reducing admixtures are used.
- The densities of concrete containing bagasse ash are within the range for normal weight concrete, and thus can be used for general purpose application.
- The compressive strength of concrete containing BA depend on the water-cement ratio, but at least up to 20% cement replacement with BA will result in strength development comparable to the control specimens.
- The impervious BA-concrete microstructure to agent of degradation like, sulphate attacks, chloride ingress, etc., as well as good shrinkage properties, makes it to produce durable concrete when used.

RECOMMENDATION FOR FURTHER STUDIES

1. Investigation of structural behaviour a material for use for concreting in built environment will not be complete without experimentation on reinforced concrete beams and slabs with BA, where properties like crack formation and propagations, stiffness, stress–strain behaviour, flexural properties, shear properties, etc. are assessed. As these properties were yet to be given attention by researchers in their studies, these properties are therefore recommended further study.
2. Presently, there is a lot of literature on chemical composition, microstructure and compressive strength of concrete with BA, while little literature exist on such mechanical properties like tensile strength (expressed as splitting tensile strength and modulus of rupture), development of ratios between tensile strengths and compressive strength, and elastic modulus. These are thus recommended for more and confirmatory investigations
3. There is not yet agreement among researchers on the effect of BA on the setting times of paste containing bagasse ash (BA). Further investigations need to be conducted to resolve this.

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International Journal of Advance and Innovative Research
Volume 5, Issue 3 (III): July - September, 2018
ISSN 2394 - 7780

XRD, A.C. IMPEDANCE AND FTIR STUDIES ON KAOLINITE NANOCLAY BASED PVDF-CO-HFP/LIBETI COMPOSITE ELETROLYTES FOR LI-ION BATTERIES

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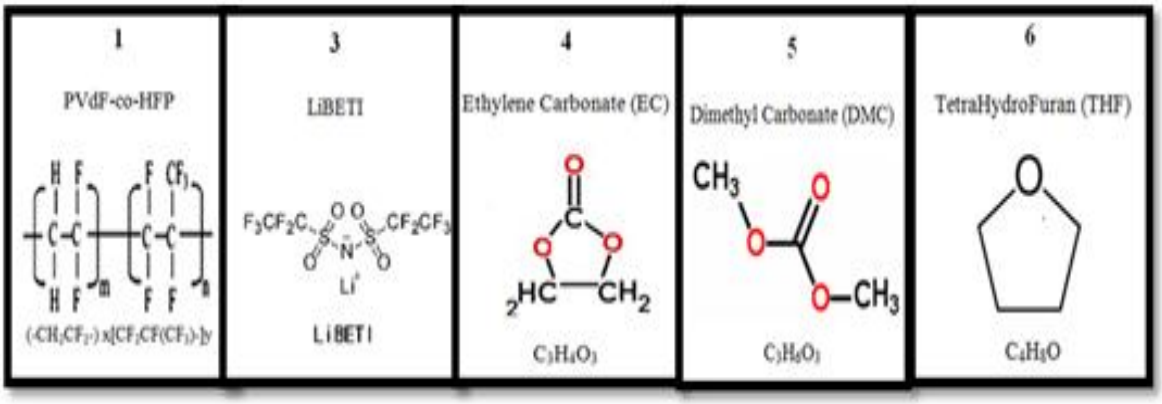
ABSTRACT
In the present study silicate family of phyllosilicates, the Kaolinite nano clay (80-190 nm) effect as a filler in consonance with EC: DMC (1:1) v/v ratio on PVdF-co-HFP – LiBETI matrix has been investigated by a.c impedance, XRD and FT-IR vibrational spectroscopy. The ionic conductivity of the order of 10^{-4} - 10^{-6} Scm^{-1} has been observed at the minimum participation of clay platelets than its huge presence the non-polar phase of the PVdF has been considerably suppressed as noted in XRD. The vibrational bands of characteristics PVdF crystal have gone in intensity variations varydoublets with increase in clay particulates suggestive of the metal complex formation with it has been observed.

1. INTRODUCTION
At the mid of 20th century, a new impetus on energy storage devices particularly Lithium rechargeable batteries have really captivating the electronic gadgets usable in portable and aerospace device applications due to their easy fabrication,flexibility and volume accommodation and so on.

The polymer electrolyte from its discovery by Fenton et al in 1985 to till date have been tailored by circumventing expressed by them while using as separator cum electrolytes. Looking into the basic requisites of polymer electrolyte particularly ionic conductivity (in the order of $10^{-1} – 10^{-5}$ Scm^{-1}), good mechanical strength, good electrochemical stability,compatibility with electrode - electrolyte interface, the metal oxides, ceramic oxides have been attempted. However it ends up with certain discrepancies notably low order of conductivity and good mechanical strength.In this line, the polymer silicate nanocomposites has rapidly been increasing at an unprecedented level, both in industry and in academia, due to their potential for enhancing physical, chemical, and mechanical properties compared to conventionally filled composites [1-6]. They have the potential of being a low-cost alternative to high-performance composites for commercial applications in both the automotive and the packaging industries. It is well established that when layered silicates are uniformly dispersed and exfoliated into a polymer matrix, the polymer properties can be improved to a dramatic extent. These improvements may include increased strength [7], higher modulus [8-13], thermal stability [5,14,15], barrier properties [16,17], and decreased flammability [18-21].

2. MATERIALS AND METHODS
2.1 Materials
Poly(vinylidene fluoride) (PVDF) with 12 mol% of hexa fluoro propylene (HFP) has supplied by Solvay (solexis), France with trade name solef of molecular weight$5.34X10^5$ g/mol was used.The plasticizers ethylene carbonate (EC) and dimethyl carbonate (DMC) were obtained from Aldrich, USA and used as such. The **Kaolinite** particle size 80- 190 nmand molecular weight 258.2 g/mol, purchased from Nanoshel LLC, Intelligent materials pvt. Ltd. The solvent tetrahydrofuran (THF), HPLC grade was purchased from E.Merck, India and used without further purification. Lithium bis(perfluoroethanesulfonyl) imide (BETI) of molecular weight 387.13g/mol was purchased from Fluka, USA and used as received. Polymer NanoClay Composite Electrolytes (PNCCEs) (membranes) were prepared as per the composition given Table 4.1 by solution casting technique



Fi-1: Materials Structure

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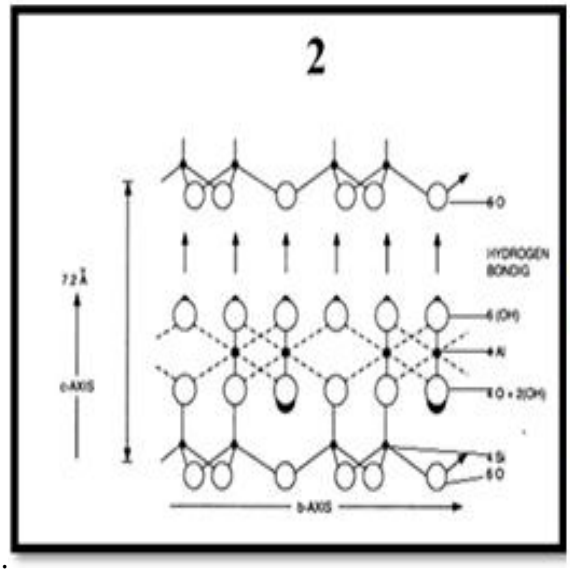

Purity	: 99%
Particle size	: 80- 190 nm
Purchase	: Nanoshel LLC
Molecular Formula	: Al2Si2O5(OH)4
Molecular Weight	: 258.2 g/mol
Appearance	: White powder
pH	: 4.0 - 6.0
Specific Gravity	: ~2.6
Melting Point	: > 1500°C
Solubility	: Insoluble in cold water

Fig-2: Kaolinite Structure

KAOLINITE NANOCLAY

Kaolinite[22] the 2:1 clay minerals (e.g., smectite group minerals) only contain siloxane surfaces whilethe 1:1 clay minerals (e.g., **Kaolinite** group minerals) contain both the two kinds of surfaces show in Fig 2.

2.2 SAMPLE PREPARATION

The preparation of PNCCEs had been carried out using solution casting technique. The required quantities of polymer, filler, salt and plasticizer in wt% shown in Table 1 were mixed in a common solvent tetra hydro furan (THF). The ingredients were allowed to full dispers and swell requires 24hrs. After 24 hrs. the particular composition of the every solution had been sonicated for 15 – 30 minutes, in order to ensure high homogeneity of solution. Immediately after the sonification, the stock solution of particular composition had been stirred and monitored at room temperature till the formation of viscous solution was obtained. The semisolid viscous solution was poured onto circular petty dishes, so as to evaporate the THF Complete drying had taken place about 48 – 78 hrs. The peeled off free standing films were incubated in vacuum oven at 100^0C with the pressure of 10^{-5} to. Further remove some traces of solvent. Thus the complete free standing films as prepared were kept in vacuum controlled desiccator for further characterization studies.

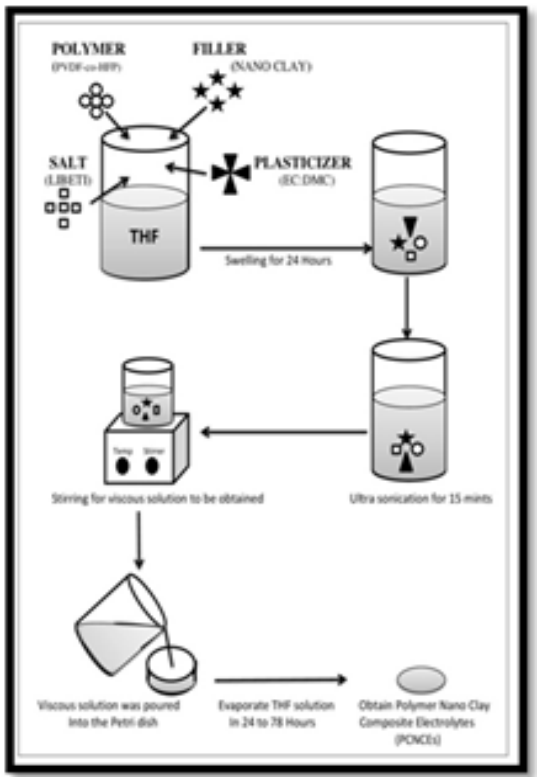

Fig-3: Sample preparation Technique

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2.3 METHODS

Ionic conductivities of PNCCEs were studied by using HIOKI 3532-50 LCR Hi-tester in the frequency range 50 Hz - 5MHz with conductivity cell consisting of two circular stainless steel blocking electrodes (SS/PNCCEs/SS) of 1cm^2 cross-sectional area. FTIR spectra of PNCCEs were recorded using perkinelmer/spectrum 2 spectrophotometer in the wave number range from 4000 to 400 cm^{-1} at a resolution of ±5cm^{-1}. XRD analysis was carried out to investigate the crystalline nature of PNCCEs using a PAN-Analytical X'Pert PRO powder X-ray Diffractometer Cu Kα(λ=1.54060 A°), over the range of 2θ=10^0-80° at 25^{0}C temperature.

3. RESULT AND DISCUSSION

3.1 Ionic Conductivity Studies

PVdF-co-HFP/LIBETI/ **KAOLINITE**:EC: DMC composite electrolytes (PNCCEs) KAO

The ac. impedance measurement on polymer nanoclay composite electrolytes (**PNCCEs**) membranes has been carried out by sandwiching them in between the two stainless steel electrodes otherwise known as blocking electrodes constitutes electrochemical cell arrangement at various frequencies ranging from 50 Hz - 5 MHz .The Nyquist plot, a kind of a plot is used for evaluating A.C impedance data in this dissertation.

Thus A.C impedance studies begin by considering the blocking electrode setup. An A.C voltage is applied to the cell and the frequency is varied. The equivalent circuit representing the A.C response of the cell is shown in Fig.4.4. The electrodes become alternatively positively and negatively charged and the alternating field across the electrolyte causes the lithium ions to migrate back and forth in phase with the voltage. The migration of the lithium ions is represented by the resistor R_g.At the same time, the immobile polymer chains become polarized in the alternating field, just as they would if the polymer film were devoid of mobile charges and, this dielectric polarization may be represented by a capacitor C_b.

$$C_b = \frac{\varepsilon \varepsilon_0 A}{l}$$

The bulk polarization and ionic migration are physically in parallel therefore their representative components, R_b and C_b, are connected in parallel, both are in series with the electrode capacitance C_e. For a cell with electrode separation l=1 cm, and electrode area A=1cm^2, the bulk and electrode capacitances are typically ≈ 10^{-12} and 10^{-6} F respectively. C_b is simply related to the dielectric constant of polymer. Since C_e is in series with the parallel combination of R_b and C_b, the equation for the total impedance is obtained simply by adding the impedance of the capacitor C_e to that of the parallel RC combination as derived.

$$Z^*_{total} = R_b\left[\frac{1}{1+(\omega R_b C_b)^2}\right] - j\left(R_b\left[\frac{\omega R_b C_b}{1+(\omega R_b C_b)^2}\right] + \frac{1}{\omega C_e}\right)$$

The complex impedance plot predicted by this equation is given in fig.4.4 Because of the frequency – dependent impedance of capacitor, the full equivalent circuit of fig.4.4 reduces to simpler equivalent circuits over limited frequency ranges. At the high frequencies, when the impedance of the bulk resistance and capacitance are of the same magnitude $1/\omega C_b \approx R_b$ both the bulk resistance and capacitance contribute significantly to the overall impedance whereas the impedance of the electrode capacitance, C_e, is insignificant ($C_e \approx 10^6$ C_b). Therefore at high frequencies the equivalent circuit reduces to a parallel R_bC_b combination which gives rise to the semicircle in the complex impedance plane. At low frequencies $1/\omega C_b \ll R_b$ and hence C_b makes a negligible contribution to the impedance, the equivalent circuit thus reduces to a series combination of R_b and C_e appearing as a vertical spike displaced a distance R_b along the real axis. At very low frequencies the equivalent circuit would simply to the electrode capacitance C_e only.

It generally true that the high-frequency response yield information about the properties of the electrolyte. For example, the high-frequency semicircle yields the bulk resistance R_b and, knowing R_b and ω_{max}, the bulk capacitance, C_b, from $\omega_{max}R_bC_b=1$. The low-frequency response on the other hand carriers information on the spike, $C_e=1Z\omega$. Overall, the magnitude of all the fundamental electrical properties of the cell may be obtained from the complete impedance data. In particular, R_b is the effective D.C resistance of the electrolyte, therefore simply by sandwiching a polymer electrolyte between two blocking electrodes, the D.C conductivity of the electrolyte may be very easily determined[23].

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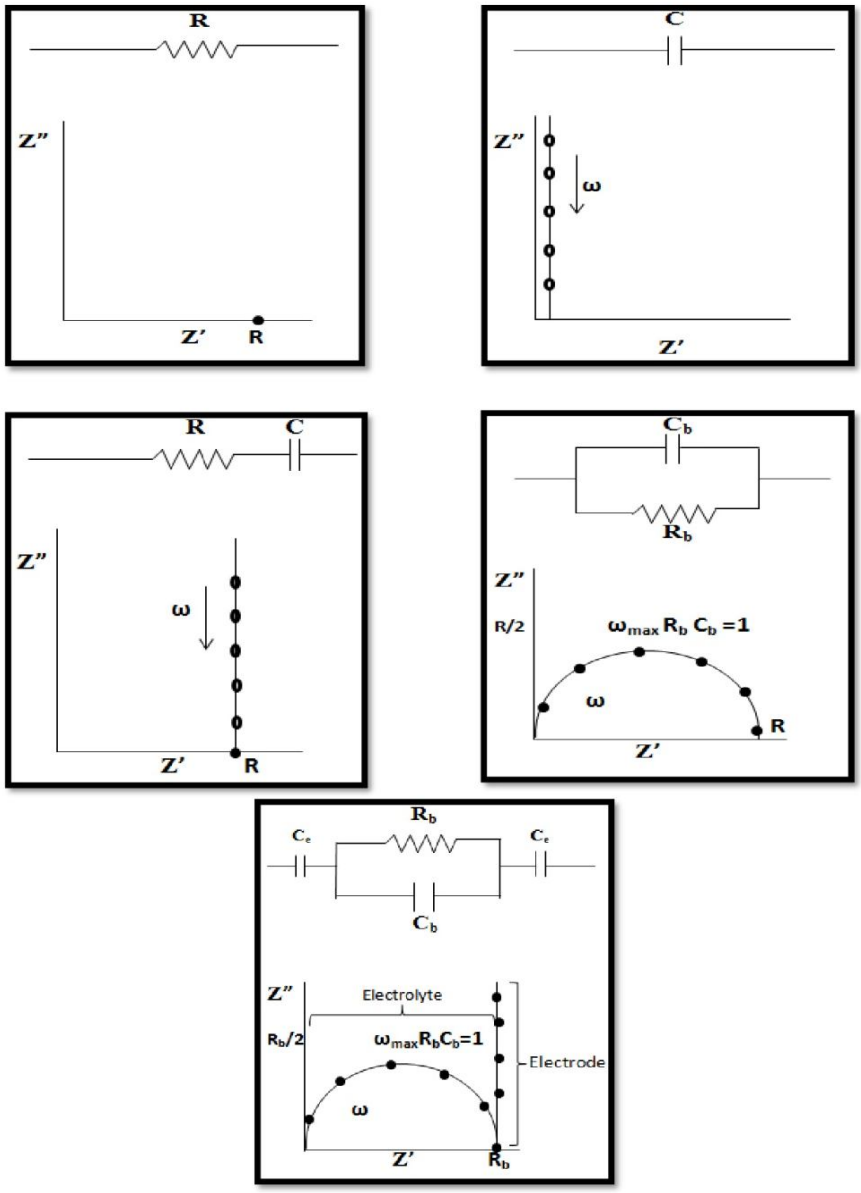

Fig-4: Equivalent circuits

Ionic conductivity measurements on the prepared PNCCEs have been carried out in two stages.In the first stage PVdF **Kaolinite**, Kaolinite and LiBETI composite has been subjected to the conductivity measurements which is followed by incorporating EC and subsequently DMC. These samples are labeled respectively KAO 3, KAO 4, and KAO 5 with the conductivity in the order of 10^{-5} Scm^{-1}, the first one and 10^{-6} Scm^{-1} for the later are noted. The results reveal that the plasticizing effect of EC and DMC have not been shown any appreciable variations whereas the filler dispersoid dry polymer electrolyte as showed an increase in the order of conductivity suggestive of the high dissoluting ability of the nano clay platelets on LiBETI into Li^+ cation and the corresponding anion. The role of clay platelets in the polymer coils constricts the ion-pair formation and permeating Li^+ cation mobility only via single ion conduction favorably controlling the bulkier anion domains for ionic conductivity is good.

In stage two, PNCCEs KAO 6, KAO 7, KAO 8, KAO 9, KAO 10, and KAO 11 have been prepared by varying filler/plasticizer wt%. While keeping polymer and salt content as constants (by keeping the overall composition of all the ingredients of polymer nano-clay composite electrolytes to 100 wt % (Table 4.1)).

The PNCCEs without **Kaolinite** showed the order of conductivity in 10^{-4} Scm^{-1}. The addition of minimal decreased the conductivity order to 10^{-5} Scm^{-1} but the subsequent addition of nano clay in steps of 1.5 wt% increment enhanced the conductivity to the order of 10^{-4} Scm^{-1} till the clay concentration goes to 6 wt% and beyond which further addition resulted in a very drastic decrease in conductivity are noted. The reason for the increase (or) decrease in ionic conductivity can well be attributed to the availability of free Li^+ cations as well as their mobilities.

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The concentration of the free ions may be provided in this case up to 6 wt% of the clay platelets presents irrespective of the membrane matrix. But the shorten transit of the decrease of the order of the conductivity from 10^{-4} Scm^{-1} to 10^{-5} Scm^{-1} of filler free to 1.5 wt% may be thought of a shortening the charge imbalance between the polar groups of polymer interaction with the charged layers of the clay platelets[24].

SAMPLE CODE	PVdF-co-HFP wt%	KAOLINITE wt%	LIBETI wt%	EC : DMC wt%	Ionic conductivity Scm-1
KAO 1	**25**	0	0	0 : 0	_
KAO 2	**25**	**5**	0	0 : 0	_
KAO 3	**25**	**5**	**5**	0 : 0	$1.05x10^{-5}$
KAO 4	**25**	**5**	**5**	**35 : 0**	$4.38x10^{-6}$
KAO 5	**25**	**5**	**5**	**32.5 : 32.5**	$1.97x10^{-5}$
KAO 6	25	**0**	5	**35 : 35**	$1.01x10^{-4}$
KAO 7	25	**1.5**	5	**34.25 : 34.25**	$6.66x10^{-5}$
KAO 8	25	**3**	5	**33.5 : 33.5**	$3.08x10^{-4}$
KAO 9	25	**4.5**	5	**32.75 : 32.75**	$2.35x10^{-4}$
KAO 10	25	**6**	5	**32 : 32**	$1.54x10^{-4}$
KAO 11	25	**7.5**	5	**31.25 : 31.25**	$5.6x10^{-6}$

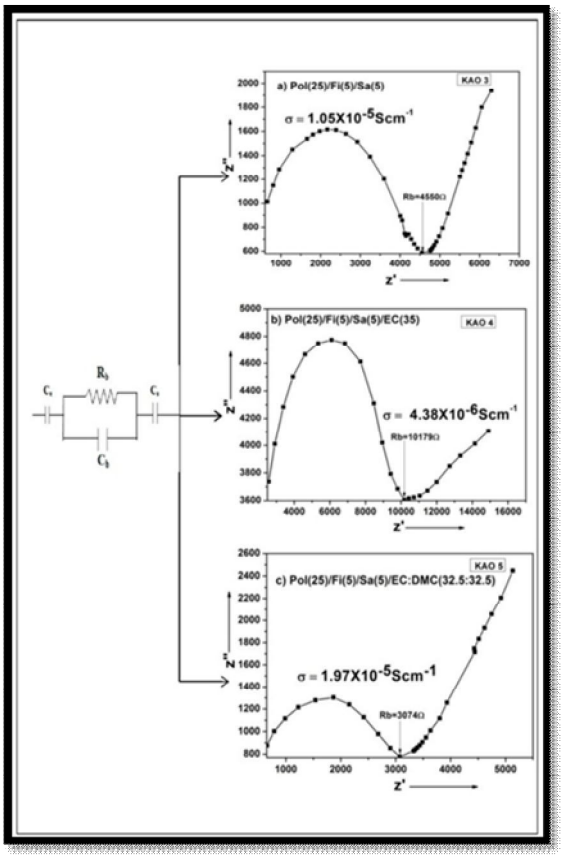

Fig-5: A.C. impedance Studies of a) KAO 3, b) KAO 4, c) KAO 5

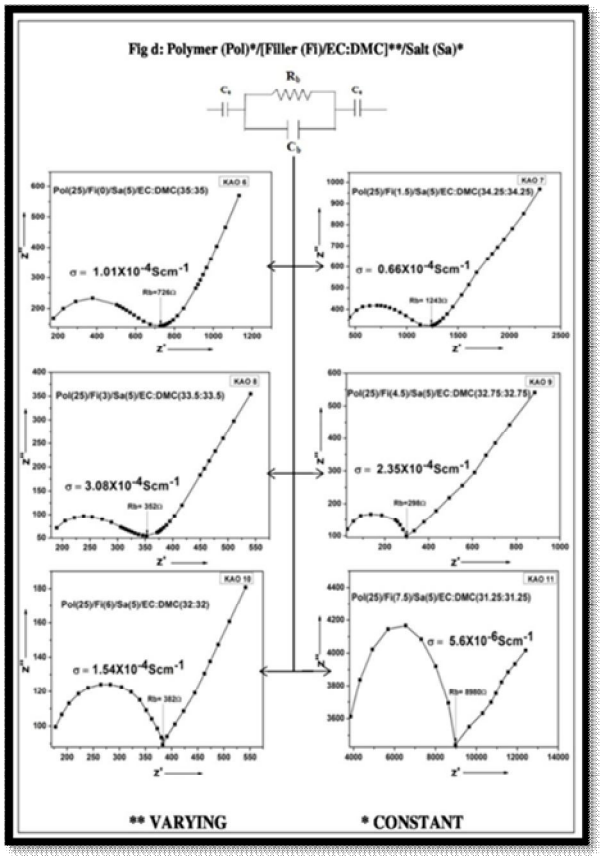

Fig-6: A.C. impedance Studies of KAO 6, KAO 7, KAO 8, KAO 9, KAO 10 and KAO 11

In this dissertation different clays in nano less than or equal to 82-100 nm have been dispersed as a solid plasticizers to dissociate into lithium (Li^+/cations) and Li^- anions gives rise to the no of charge carriers and also facilitating their mobility through the process called intercalation and exfoliation. In the intercalation process, the gallery spacing between the layered silicates due to the protrusion of chain molecules of PVdF widened. This widening and the interaction between the polar group of the polymer and the charge effects of the surface clays provides pathway for the lithium (Li^+) cations for gaining momentum provides the mobility and as a result ionic conductivity variations are observed on the other hand in the exfoliation process due to the increase in the concentration of clay platelets, in the present study 3wt%, 4.5wt%, 6wt% and 7.5wt% their distorted intercalation or exfoliation takes place wherein the PVdF molecules have coiled down the layered sheets and distorting them in such a way that the Li^+ cations thus generated in our case 1.5wt% are have been masked or constricted their movement result in decrementing ionic conductivity.

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Thus the intercalation and exfoliation are said to be phenomena of interaction between layered silicates and the polar polymers PVdF interactions between them have showed the polymers nano composite clay electrolytes change in their crystallinity and amorphousity. The crystallinity and amorphousity of the membranes have been subjected to XRD studies, by varying the compositional dependence of plasticizer and clay concentration. In general plasticizer when it is added with the polymer it gives rise to the flexibility to the polymer chains enabling Li^+ cations transit by hopping mechanism through the end points of chain segments. In our case, the plasticizer are used to do the process of flexing the polymer host as well as dissoluting Li^+ salts for generating charge carriers for conductivity and converting certain crystallites phase of PVdF into amorphous phase. In this study the plasticizer rich phase with clay poor phase have not profusely changed their intensity of their characteristics phases of PVdF and the filler rich phase with poor plasticizer phase have also not contributed much in the change of phase of PVdF.

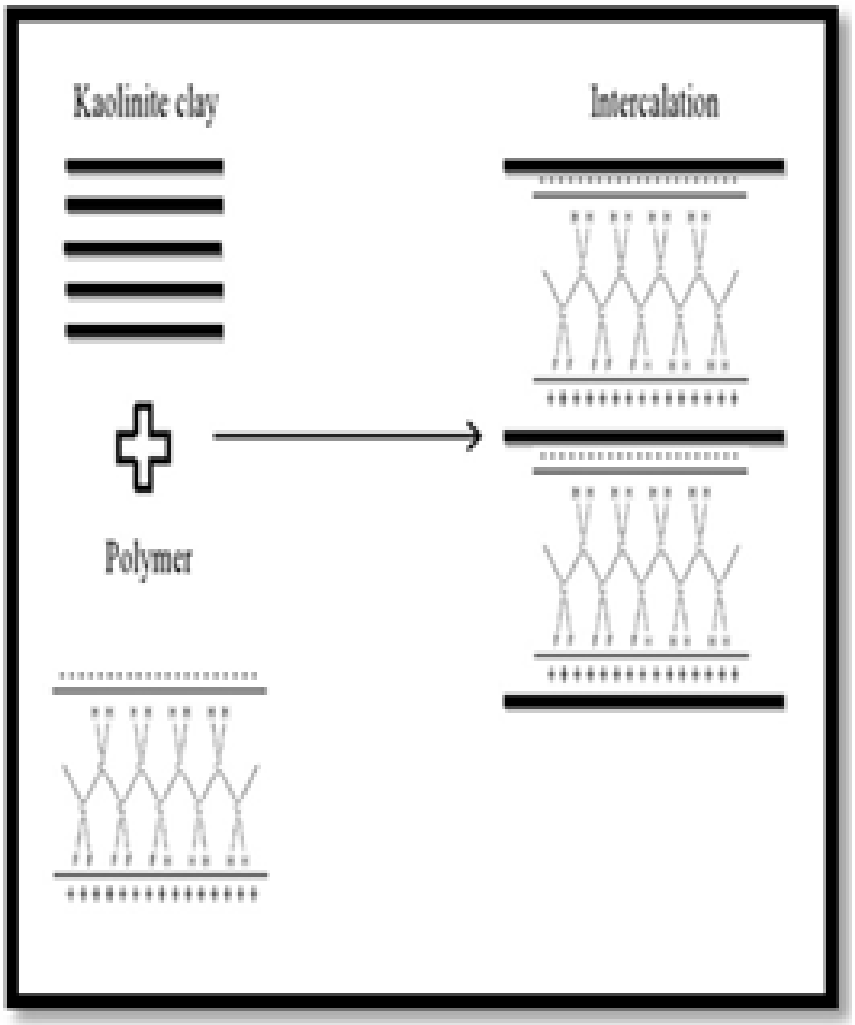

Fig-7: Schematic representation of polymer intercalation in clay platelets

3.2 XRD Studies

The XRD study on pristine PVdF-co-HFP is labeled as (KAO 1) in this chapter. The characteristics peaks observed at $17.8^0(110)$[25], $18.24^0(020)$[26], $19.82^0(110)$[27] corresponds to VdF crystals of α-phase. These α phase crystallites have all disappeared rather no trace of them while adding **Kaolinite** is noted in 10^0-20^0 range however their performance have well been defined in 20^0- 40^0 (Table 4.2)reveal α-phase crystals are located at differently localized in the chain segment is noted.When nanoclay is added to this sample no trace of α-phase crystallites in 10^0-20^0 and repeatability of them 20^0-40^0 as similar to (KAO 2) are noted. When EC is added (KAO 4) certain characteristic peaks in 10^0-20^0 disappeared. Suppressed, except 19.97^0 in 10^0-20^0 and 38^0[28]in 20^0-40^0, α crystal plane is absent.This, similarly in crystalline planes are noted while adding DMC to the matrix. From this above observation, it is evident that the plasticizing effect could be seen in 20^0-40^0.

The crystalline and amorphous phase presence have been examined by varying filler/plasticizer wt%. Of all the samples starting from filler free membrane to 6wt% of it have shown that increase in amorphous phase which resulted in enhanced conductivity as noted support A.C impedance measurements.

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SAMPLE CODE	PVdF-co-HFP wt%	KAOONITE wt%	LIBETI wt%	EC : DMC wt%	XRD 2Θ in degree	
					10^0-20^0	20^0-40^0
KAO 1	25	0	0	0 : 0	17.80(110-α) 18.24(020-α) 19.82(110-α)	26.01(021- α)
KAO 2	25	5	0	0 : 0		26.12(021- α) 28.26(020 - α) 38.97(002- α)
KAO 3	25	5	5	0 : 0		26.68(021α+γ) 28.23 39.28
KAO 4	25	5	5	35 : 0	19.97(110-α)	26.52(021- α+γ) 28.28
KAO 5	25	5	5	32.5 : 32.5	10.67	20.49(110-α+γ) 39.57
KAO 6	25	0	5	35 : 35		20.21(110 α+γ)
KAO 7	25	1.5	5	34.25 : 34.25		20.32(110/200 β) 39.59
KAO 8	25	3	5	33.5 : 33.5		20.10
KAO 9	25	4.5	5	32.75 : 32.75		20.27(110 α+γ)
KAO 10	25	6	5	32 : 32	10.81	20.22(110 α+γ)
KAO 11	25	7.5	5	31.25 : 31.25	19.84(110-α)	28.24

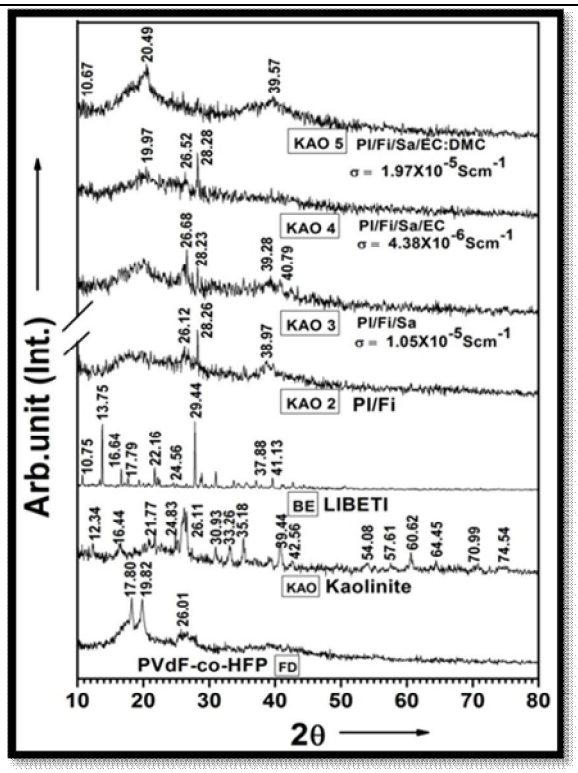

Fig-8: XRD diffractogram of FD, KAO, BE, KAO2 and PNCCEs(KAO3,KAO4,KAO5)

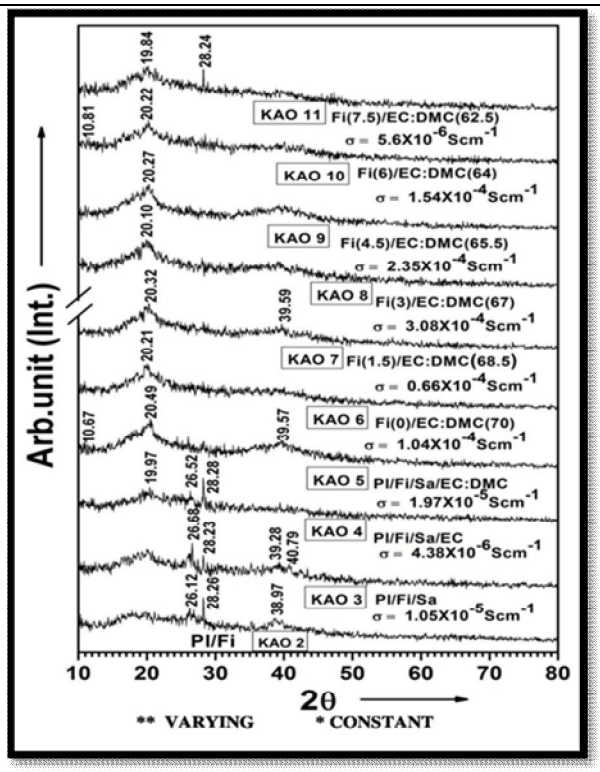

Fig-9: XRD diffractogram of PNCCEs KAO2, KAO3, KAO4, KAO5, KAO6, KAO7, KAO8, KAO 9, KAO 10 and KAO 11

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4. FT-IR STUDIES

FT-IR vibrational spectroscopy studies on PNCCEs have been carried out to elucidate the complexation of various constituents at the molecular level in the IR region of 400-4000cm^{-1} wave number. All the pristine nature ofconstituentsof PNCCEs have been recorded. As a first step the pristine PVdF-co-HFP has shown the characteristics vibrational bands such as 488cm^{-1} (sharp), 513cm^{-1}(a small kink like appearance not as a band at all) and a medium sharp peak at 610cm^{-1}, then 759cm^{-1}(a distinct singlet, medium)/874cm^{-1}(strong singlet, sharp), and in 1000 cm^{-1} -1200cm^{-1} region the doublet one with a very minimum intensity 1068cm^{-1} co-folding with very sharp 1159cm^{-1} and 1396cm^{-1} corresponds to the α-phase of VdF crystals and C-F grouping (stretching, wagging on) amenable to the vibrational modes reported elsewhere[29, 30].

When **Kaolinite** is dispersoid and, as prepared polymer clay binary system showed the variation in intensities and with slight shifts in vibrational bands could well be noted ie. a 488cm^{-1} drastically reduced in intensity, the 513cm^{-1} kink like appearance well formed, the medium sharp 610cm^{-1} drastic reduction and the reduction in intensities of 1068cm^{-1} /1179cm^{-1} doublet and 1396cm^{-1} intensity detection have all correspond to intercalation of nanoclay platelets with polymer is very well noted. The subsequent addition of LiBETI and as prepared trinary have shown that intensity variations in the characteristics vibrational band as that of the binary system.

When EC is added to trinary system, to process the flexibility to the chain segments of the host matrix as well as dissoluting lithium salts and as a result the 488cm^{-1} sharp band appeared at 430 cm^{-1} towards the lower wave number region (broadened), the well grown 610 cm^{-1} peak in trinary system is highly suppressed and emergence of two short peaks appeared. As far as the 1068cm^{-1}/1170cm^{-1} doublet is concerned the intensity of them as grown with the symmetry and the new appearance of C=O carbonyl band as noted. Thus the role of EC with the host matrix has been understood.When DMC is added and as prepared penta system as again shows the intensity variations of the vibrational bands particularly the well grown 1072 cm^{-1}/1186cm^{-1} and the symmetric and asymmetric stretching modes of C=O, thus starting up with mono system of polymer host thatbinary, trinary, tetra, and penta system have highlighted the degree of interaction of the polar group of the polymer C-F and the conformational phases of host.

When the PNCCEs has been examined by varying filler plasticizer weight ratio (Table 4.3) while keeping polymer and salt content as constant some phenomenological observation has been noted that very minimal nanoclay particulate has enormously improved the intensity contours of the doublets 1072cm^{-1}/1186cm^{-1} with shifts 1069cm^{-1}/1158cm^{-1} and the carbonyl band symmetric and asymmetric capping's has been very appreciably enhanced suggest that the plasticizer has well been interacted with the very less minimal dispersoid 1.5wt% but the increase the loading of clay platelets till to 7.5wt% from 3wt% has profusely reducing the intensity detection with the consistency as shown that the nanoclay concentration has an important role regarding the complexation of the constituents of PNCCEs have well been noted.

Table-3: Vibrational Bands of PNCCEs

Wave Number Cm^{-1}	KAO 1	KAO 2	KAO 3	KAO 4	KAO 5		KAO 6	KAO 7	KAO 8	KAO 9	KAO 10	KAO 11
	Medal Oxide Region											
400	438		483	431	430		482	485	484	482	482	
500												
600	610											
	Finger Print Region											
700	759	752						773	774			
800	874	872	877	876	877		834 878	878	879	878	878	877
900			979									
1000	1062	1062	1077	1072	1072		1073	1069	1070	1071	1072	1072
1100	1179	1180	1170	1166	1166		1164	1158	1158	1160	1163	1167
1200												
1300	1396	1396					1399	1395	1396	1398	1396	
1400			1400	1400	1400							1400
1500												
	Functional Group Region											
C=O			1775	1775	1805		1774	1801	1801	1802	1803	1776

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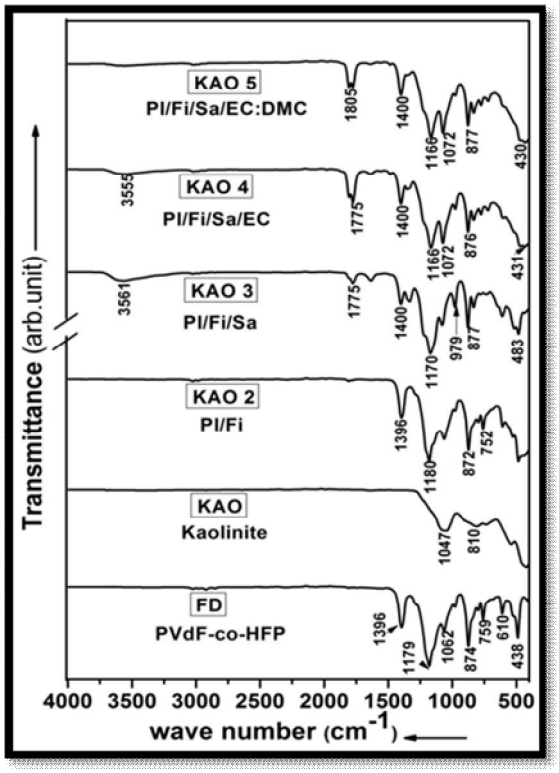

Fig-10: FT-IR studies of FD, KAO, KAO 2, and PNCCEs (KAO 3, KAO 4, KAO 5)

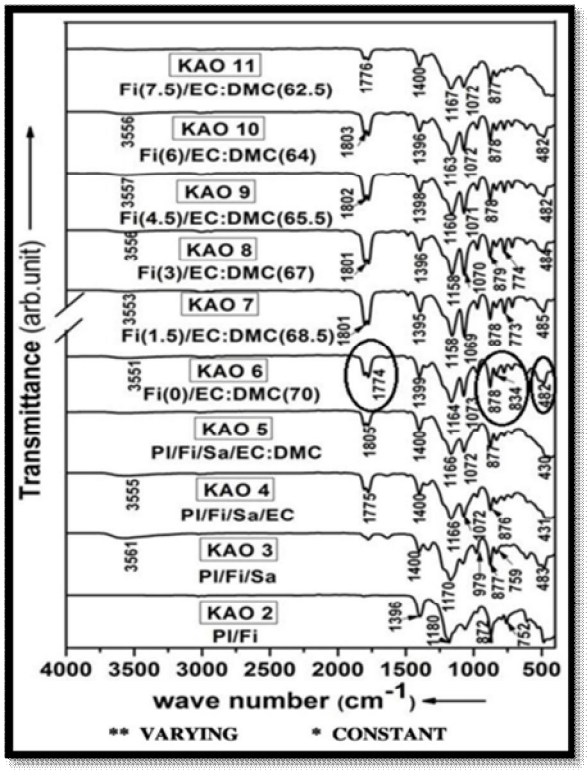

Fig-11: FT-IR studies ofPNCCEsKAO 2, KAO 3, KAO 4, KAO 5, KAO 6, KAO 7, KAO 8, KAO 9, KAO 10 and KAO 11

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International Journal of Advance and Innovative Research
Volume 5, Issue 3 (III): July - September, 2018
ISSN 2394 - 7780

A STUDY ON ROLE EMPOWERMENT THROUGH ROLE DEFINITION AND CAREER PATH

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Role definition is also called as "Role description" which describes the role and consists of job requirements i.e. Technical (Function) and Behavioral (Foundational) parameters that are expected to perform by an individual. It serves as a tool in goal setting that helps in the attainment of individual and organization goals.

Role definition plays a vital role in describing the individual role and responsibilities by eliminating the additional tasks that the employees perform.

OBJECTIVES OF THE STUDY

- ✓ To review the existing role definition of project manager.
- ✓ To understand the employee attitude towards the present role description.
- ✓ To create awareness of role packages to employees and seek inputs to create role packages.
- ✓ To analyze the future requirement of employee for empowering the role that drives towards the career path.

PROBLEM STATEMENT

No clarity of roles in the organization leads to organizational conflicts and duplication of job.

Role empowerment is possible only if roles are defined.

LITERATURE REVIEW

Empowerment can support the notion of management trustworthiness, which is an essential element of organizational commitment. Thomas R. George, December 16, 2011)

Empowerment, makes organization's needs for high-performance of employees, and also the answer to demands of employees based on independence and introduction. (Shahram Gilaninia, Sep. 201) Employee empowerment is considered as an important issue in human resource management organizations and it is important that each of the individuals feel about their competence. Human resources consider as strategic asset of the organization and empowerment of employees, is a new approach in order to human resource development that cause increase productivity improve quality, and profitability of products and services of organizations.

(R. Ramesh, K.Shyam Kumar, October, 2012) Employee empowerment starts with the concept of strategic fit between people, tasks, technology, information processes, rewards and organization structure for which all must be in alignment before the organization can work efficiently. (Sitaram Das, November 11, 2011) Experiencing change and intense competition in the business world, organizations need to adapt to changing conditions and generate new ideas to subsist. (Ahmet Burhan Cakıci, April 2014) Employee empowerment practice motivates employees to share their innovative ideas and use their skills in order to contribute to the companies' success. (Sarra Berraies, 2014)

DEFINING THE ROLE

It is a process of defining the roles to give the role clarity to the employees and the organization.

The clear role description enables the individual to understand what is expected from them in the workplace. The organization will have a clear framework on the roles that the individual as to perform and in which in turn help in the process of recruitment, selection, performance management and compensating the employees.

Framework of hierarchy for the authorization of work

The role definition tells the individual that who are his reports, to whom he/she has to report to, the co- workers who are aligned with his/her work etc., It is an exercise made to give a hierarchical framework that the employees are authorized for their work.

Framework of Key Result Areas

This framework involves in the identification of technical functions and the behavioral foundational of the owned positions.

The Job description consists of the list of functions and activities, which are crucial or critical for performing the job role. These activities form the KRA's of the individual.

Framework of Key Performance Indicators

Key performance indicators (KPIs) are ways to periodically assess the performances of organizations, business

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units, and their division, departments and employees. Accordingly, KPIs are most commonly defined in a way that is understandable, meaningful, and measurable.

It follows the **SMART** criteria. This means the measure has a Specific purpose for the business, it is Measurable to really get a value of the KPI, the defined norms have to be Achievable, the improvement of a KPI has to be Relevant to the success of the organization, and finally it must be Time phased, which means the value or outcomes are shown for a predefined and relevant period.

A number of organizational changes would require redefining the roles to support the change, and stop doing the existing roles that may no longer be relevant.

The existing role definition exercise can be modified whenever the following changes are incorporated in the system:

- ✓ Development of new strategy by the organization.
- ✓ Change in the technology, IT system or process.
- ✓ Create a new structure to support the new strategies of the organization.
- ✓ Introduce new projects and project teams to support the new strategy or vision.
- ✓ Change in the organizational structure or in design.
- ✓ Introduction of performance management process.
- ✓ Develop different levels of leadership in the organization.
- ✓ Change in the organizational culture so people are more responsible or accountable.

Evaluate Employee Performance
Employers can use a role definition to evaluate the performance of each employee. Job descriptions can also determine how to make a pay raise and promotion decisions. Employers can evaluate the employee's performance against the job description, and provide corrective guidance if an employee is performing at a sub-par level.

Provide clear Employee Expectations
Employees are provided with their job roles which clearly states what is expected from them. Thus it gives clarity to employees to focus on their roles and responsibilities and helps in eliminating the additional tasks that they perform in the workplace.

Serves as Blueprint for Hiring
A role definition can also serve as a blueprint for desirable, qualified candidates that the organization can put the right person at right place on right time. It helps the recruiters to select the candidates that match the requirement.

Reduces stress
The employees are provided with the clarity on their roles and responsibilities, there are clearly stated expectations from the organization to the employees.

Hence the stress of employees can be reduced by delivering the expected rather than performing what is not asked for.

Cost efficiency to the company
A clear role description enables the organization to analyze and identify the developmental areas of the employees and provide trainings in the particular role to meet the organizational requirement.

Enables to measure the role success
By having a clear understanding of what is involved and expected of role holders, organization can make better selection decisions and ensure that performance management and development is appropriate, focused and accurately measured.

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Enables to measure the role success
By having a clear understanding of what is involved and expected of role holders, organization can make better selection decisions and ensure that performance management and development is appropriate, focused and accurately measured.

Data Interpretation
Majority of the respondents express that skill sets are correctly aligned with the job role based on the role definition stated by the organization.

CHI-SQUARE ANALYSIS
H_0=Respondents are not satisfied with the above statement.

H_1= Respondents are satisfied with the above statement.

Particulars	Observed value	Expected value	(O-E)	$(O-E)^2$	$(O-E)^2/E$
SA	13	10	3	9	0.9
A	17	10	7	49	4.9
N	18	10	8	64	6.4
D	2	10	-8	64	6.4
SD	0	10	-10	100	10
TOTAL	**50**				**28.6**

Given

Degree of freedom= (n-1) (r-1)

(2-1) (5-1)

1*4=4

Calculated value=28.6

Tabulated value=9.48

So, Calculated value >Tabulated value

So we accept the alternative hypothesis that is respondents agree that skill sets are correctly aligned with the job role based on the role definition stated by the organization.

Disagree	5	10
Strongly Disagree	0	0
TOTAL	**50**	**100**

ANALYSIS
The above table indicates that 38% of respondents strongly agree that empowering the roles through various skills leads to career development, 34% agree, 18% are neutral and 10% disagree.

Most of the respondents strongly agree that empowering the roles through various skills leads to career development.

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CHI-SQUARE ANALYSIS

H_0=Respondents are not satisfied with the above statement.

H_1= Respondents are satisfied with the above statement.

Particulars	Observed value	Expected value	(O-E)	$(O-E)^2$	$(O-E)^2/E$
SA	19	10	9	81	0.9
A	17	10	7	49	4.9
N	9	10	-1	1	6.4
D	5	10	-5	25	6.4
SD	0	10	-10	100	10
TOTAL	**50**				**25.6**

Given

Degree of freedom= (n-1) (r-1)

(2-1) (5-1)

1*4=4

=4@5% level of significance

Calculated value=28.6

Tabulated value=9.48

So, Calculated value >Tabulated value

CONCLUSION

- Organizations can recruit more female employees for project manager role to provide opportunity equally.
- The expectations of the new roles have to be clearly defined in the earlier stage, rather than explaining during the appraisals.
- Enforcement of clear roles and responsibilities in the role definition helps the employees to understand what is expected out of them.
- The training courses, awareness sessions and knowledge programs should be provided to the onsite employees, to motivate and make them perform better.
- Providing motivation and sense of recognition for the achievement helps the organization to retain the employees.
- The company can give a learning opportunity to employees to develop their aspired skill sets to increase their efficiency in the current role and empower their role.

The concept of Role definition describes the role of an individual consisting of job requirements i.e. Technical (Function) and Behavioral (Foundational) parameters which are expected to perform. Generally, it serves as a tool in goal setting that helps in the attainment of individual and organization goals.

Finding and suggestions are based on survey conducted and these points are to be looked into the steps which can be taken in this regard for the higher growth.

From the analysis, it conclude that the existing role descriptions are effective to the offshore project managers which are applicable in their current roles but not to the onsite project managers. The onsite managers have the different flavors and requirements hence roles are to be identified, analyzed and defined specifically.

It is also noted that majority of the managers are satisfied with the current role description, but also have the requisites to empower their roles to perform better and firm up the existing current definition.

The organization can concentrate on employee requisites to empower their skills sets and development for their career paths which in turn increases the efficiency of organization with the increase in productivity.

In the ultimate analysis it can be concluded that the organization’s performance is efficient in defining the roles and can make an attempt to firm up better with the provided inputs by the employees and that which can be best suitable to organizational system.

International Journal of Advance and Innovative Research
Volume 5, Issue 3 (III): July - September, 2018
ISSN 2394 - 7780

ANALYTICAL HIERARCHY PROCESS - A TOOL TO ELIMINATE BIASES IN WARE HOUSE LOCATION DECISION-MAKING

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ABSTRACT
This paper presents analytical hierarchy process approach to eliminate bias in warehouse location decision. AHP is used to determine the weights of criteria and sub-criteria because it can effectively determine various criteria's weights in a hierarchical structure. We apply the integrated approach in real case to demonstrate the application of the proposed method.

Methodology –The model uses the Analytical Hierarchy Process, a multiple attribute decision tool that provides structure to decisions where there is limited availability of quantitative information. This methodology uses a framework that determines and prioritizes multiple criteria by using qualitative data and it scores each alternative based on these criteria. The optimal alternative will be the one that has the highest weighted score.

Findings – An empirical study is presented at the end of the paper to illustrate the application of the proposed method on selecting the proper warehouse location strategy. According to the results, gaining a competitive advantage is the primary purpose of location strategy implementation and the most critical issue for the management.

Keywords: Hierarchy, Alternatives, Criteria, Pair wise Comparisons, Eigenvector, Biases

INTRODUCTION
Cognitive biases in decision making include more deviations from purely rational judgment and decisions. According to Von Winterfeldt, D. and Edwards (1986), "A cognitive bias is a systematic discrepancy between the "correct" answer in a judgmental task, given by a formal normative rule, and the decision maker's or expert's actual answer to such a task". There is a vast literature on cognitive biases and excellent compilations of papers are provided in Kahneman et al. and Gilovich et al. Many of these biases concern judgments about facts, events, and uncertainties. According to Kunda (1993), motivational biases are those in which judgments are influenced by the desirability or undesirability of events, consequences, outcomes, or choices.

Many of the behavioural patterns that have been discovered do seem to be relevant to broader areas of multicriteria decision analysis (MCDA). In this paper, we look specifically at the judgemental inputs required in implementing Analytical Hierarchy Process (AHP) models. Suggestions for practice and recommendations for follow-up research are derived from the AHP results.

Analytical Hierarchy Process (AHP) is one of Multi Criteria decision making method that was originally developed by Prof. Thomas L. Saaty. In short, it is a method to derive ratio scales from paired comparisons. He demonstrated mathematically that the eigenvector solution was the best approach. Using pair wise comparisons, the relative importance of one criterion over another can be expressed. A short computational way to obtain this ranking is to raise the pair wise matrix to powers that are successively squared each time. The row sums are then calculated and normalized. When the difference between these sums in two consecutive calculations is smaller than a prescribed value, then we can stop the calculations. The warehouse location selection is a processing of selecting allocation center in economic region where there are some supply stations and the certain demand point.

RATIONALE OF THE STUDY
The **analytical hierarchy process** (**AHP**) is a structured technique for organizing and analyzing complex decisions, based on mathematics and psychology. It was developed by Thomas L.Saaty in the 1970s and has been extensively studied and refined since then. It has particular application in group decision making, and is used around the world in a wide variety of decision situations, in fields such as government, business, industry, health care, ship building and education. The advantages of AHP over other multi criteria methods are its flexibility, intuitive appeal to the Decision makers and its ability to check inconsistencies. Generally, users find the pair wise comparison form of data input straightforward and convenient.

Additionally, the AHP method has the distinct advantage that it decomposes a decision problem into its constituent parts and builds hierarchies of criteria. Here, the importance of each element (criterion) becomes clear (Macharis et al. 2004). AHP helps to capture both subjective and objective evaluation measures. While

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providing a useful mechanism for checking the consistency of the evaluation measures and alternatives, AHP reduces bias in decision making. The AHP method supports group decision−making through consensus by calculating the geometric mean of the individual pair wise comparisons (Zahir 1999). AHP is uniquely positioned to help model situations of uncertainty and risk since it is capable of deriving scales where measures ordinarily do not exist (Millet & Wedley 2002).

REVIEW OF LITERATURE

In the article titled "USING THE ANALYTIC HIERARCHY PROCESS (AHP) TO SELECT AND PRIORITIZE PROJECTS IN A PORTFOLIO", the author Ricardo Viana Vargas says to present, discuss and apply the principles and techniques of the Analytic Hierarchy Process (AHP) in the prioritization and selection of projects in a portfolio.

In the article titled "CONSISTENCY IN THE ANALYTIC HIERARCHY PROCESS- A NEW APPROACH", JOSÉ ANTONIO ALONSO found a statistical criterion for accepting/rejecting the pair wise reciprocal comparison matrices in the analytic hierarchy process.

In the article titled "POSSIBILITIES OF UTILIZING THE METHOD OF ANALYTICALHIERARCHY PROCESS WITHIN THE STRATEGY OF CORPORATE SOCIAL BUSINESS", the author Katarína reveals that the analysis of the theory of corporate social responsibility, risk management and the exact method of analytic hierarchic process that is used in the decision making processes. and focus on presentation of the experience with the application of the method in formulating the stakeholders´ strategic goals within the Corporate Social Responsibility (CSR) and simultaneously its utilization in minimizing the environmental risks

In the research paper titled "SOLVING A DISTRIBUTION FACILITY LOCATION PROBLEM USING AN ANALYTIC HIERARCHY PROCESS APPROACH", the author Jesuk Ko reveals that in today's dynamic and volatile global economy, many researchers underline the importance of facility location factors. Issues associated with distribution facility location include political, economic, legal, social and cultural environments. Facility location decisions involve a substantial capital investment and result in long-term constraints on distribution of goods. These problems are complex and, like most real world problems, depend upon a number of tangible and intangible factors that are unique to the problem.

In the article titled "HOW TO GET RESPONSES FOR MULTI-CRITERIA DECISIONS IN ENGINEERING EDUCATION–AN AHP BASED APPROACH FOR SELECTION OF MEASURING INSTRUMENT" , the author K.G. Viswanadhan says that the Analytic Hierarchy Process enables people to make decisions involving many kinds of concerns including planning, setting priorities, selecting the best among a number of alternatives, and allocating resources.

In the research paper titled "Using the Analytic Hierarchy Process Method in reconfiguration of Supply Chain Network", the author Sangheon Han says that within new important strategies for the cost reduction and the problem of environmental protection, logistics plays a key role in the corporate competition.

In the research paper titled "Decision-Making using the Analytic Hierarchy Process (AHP) and SAS/IML", the author, Melvin Alexander says AHP helps decision-makers choose the best solution from several options and selection criteria.

In the paper titled "Analytic hierarchy process- An overview of applications", the author, S. Vaidya says that a literature review of the applications of Analytic Hierarchy Process (AHP). AHP is a multiple criteria decision-making tool that has been used in almost all the applications related with decision-making.

In the research paper titled "Analytic Hierarchy Process: An Application in Green Building Market Research1, the author, Sharmin Attaran says that one of the ways to develop effective marketing strategies, is to understand what the occupants value the most among many aspects of green buildings thus develop focused marketing solutions

In the research paper titled "The Application of Fuzzy Analytic Hierarchy Process Approach for the Selection of Warehouse Location", the author, Maysam Ashrafzadeh reveals that the conventional methods for warehouse location selection are inadequate for dealing with the imprecise or vague nature of linguistic assessment. To overcome this difficulty, fuzzy multi-criteria decision-making methods are proposed. His paper shows a successful application of fuzzy analytic hierarchy process to a real warehouse location selection problem of a big company in Iran.

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SCOPE

Companies deciding where to locate a warehouse must often turn to outside experts to help them make an effective choice. Perceptions about where to locate are often incorrect, so companies may choose to rely on a broker who knows an individual sub market, and can guide them in the right direction. Companies feel increasing pressure to reduce inventories and increase inventory turns. Companies must work to find the best locations for their warehousing centers. Corporate supply chains are organic in nature and must ebb and flow with fluctuating demand and inventory levels. Consequently, it has always been imperative that companies size and design their warehouses correctly. Placing warehouses, Distribution Centers, and other distribution facilities correctly, however, has grown increasingly more complex. For this study a confectionery company is selected. Research area is Kerala.

METHODOLOGY

Analytical Hierarchy Process

It is a multiple attribute decision tool that provides structure to decisions where there is limited availability of quantitative information.

To make a decision in an organized way to generate priorities we need to decompose the decision into the following steps.

Define the problem and determine the kind of knowledge sought.

1. Structure the decision hierarchy from the top with the goal of the decision, then the objectives from a broad perspective, through the intermediate levels (criteria on which subsequent elements depend) to the lowest level (which usually is a set of the alternatives).
2. Construct a set of pair wise comparison matrices. Each element in an upper level is used to compare the elements in the level immediately below with respect to it.
3. Use the priorities obtained from the comparisons to weigh the priorities in the level immediately below. Do this for every element. Then for each element in the level below add its weighed values and obtain its overall or global priority.
4. Continue this process of weighing and adding until the final priorities of the alternatives in the bottom most level are obtained.
5. To make comparisons, we need a scale of numbers that indicates how many times more important or dominant one element is over another element with respect to the criterion or property with respect to which they are compared.

This methodology uses a framework that determines and prioritizes multiple criteria by using qualitative data and it scores each alternative based on these criteria. The optimal alternative will be the one that has the highest weighted score.

THE WAREHOUSE LOCATION SELECTION MODE

Four things are to be considered while choosing warehouse locations

- **Location**

Let us take current shipping locations of the suppliers, as well as the delivery locations that are for customers. We need to analyze the following questions.

Where are most of those deliveries being made?

Are the warehouses located in the optimal zones to minimize the costs for both the company and the client?

So location is one of the important factors.

- **Access**

Access is another important factor because any public warehouse we are thinking about contracting or considering as a major distribution center will need to be easily accessible from major highway arteries.

Additionally, if we will be importing or exporting a great deal of material, they should also be close to major port locations with strengths aligned with our product type.

- **Storage Area**

Will their storage area provide the capacity you require?

It’s important to not only ask about their storage area, but more specifically, what is presently available to you.

Do they anticipate any storage becoming available in the future in order to accommodate your growth?

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- **Availability of skilled labour**

Fully understand the labor force available at our new warehouse location. Knowing our labor needs and seeing how they stack up against the facilities is essential to ensure on-time delivery and future growth.

Will the warehouse facility operate 2nd and 3rd shift (24 hour operation)?

Are there competing businesses in proximity that will become a barrier to growth by limiting available labor capacity?

By taking the time to consider the above, we can limit frustration and ensure that we have found the perfect fit for both of us and the warehouse we are selecting.

So **criteria** taken for this study are

Location, Access, Storage Area and Labour

The following **alternatives** are taken for the data analysis.

Calicut, Palghat, Kasargod and Kannur

Pair wise comparisons

	Location	**Access**	**Storage Area**	**labour**
Location	1	2	3	2
Access	1/2	1	2	3/2
Storage Area	1/3	1/2	1	1/3
labour	1/2	2/3	3	1

Converting into Decimals

	Location	**Access**	**Storage Area**	**Labour**
Location	1	2	3	2
Access	0.5	1	2	1.5
Storage Area	0.333	0.5	1	0.333
Labour	0.5	0.667	3	1

Squaring the matrix

	Location	**Access**	**Storage Area**	**Labour**
Location	3.999	6.834	16.000	7.999
Access	2.416	4.001	10.000	4.666
Storage Area	1.083	1.888	3.998	2.082
Labour	2.333	3.834	8.834	4.000

Now, first eigen vector is calculated as follows

	Location	**Access**	**Storage Area**	**Labour**	**Row sum**	**Eigen vector**
Location	3.999	3	6	12	24.999	0.2999964
Access	5.332	4	8	15.999	33.331	0.3999832
Storage Area	2.667	2	4.001	8.001	16.669	0.200033601
Labour	1.333	1	2	3.999	8.332	0.0999868
					83.331	1

This process must be iterated until the eigen vector solution does not change from the previous iteration. Continuing our calculation,

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Again, Step 1: Squaring the above matrix, we get the following matrix

68.493	115.548	266.955	129.183
41.044	69.288	159.865	77.478
18.079	30.486	70.584	34.124
37.492	63.298	146.322	70.943

Again step 2: Computing the eigenvector, we get

				Row Sum	**Eigen Vector**
68.493	115.548	266.955	129.183	580.179	0.4146558489
41.044	69.288	159.865	77.478	347.675	0.2484844716
18.079	30.486	70.584	34.124	153.273	0.1095447197
37.492	63.298	146.322	70.943	318.055	0.2273149597
				1399.182	

Computing the difference of the previous computed eigenvector to this one
0.1146594489

-0.1514987284

-0.09004888813

0.1273281597

To four decimal places there is much difference.

Continuing the calculation,

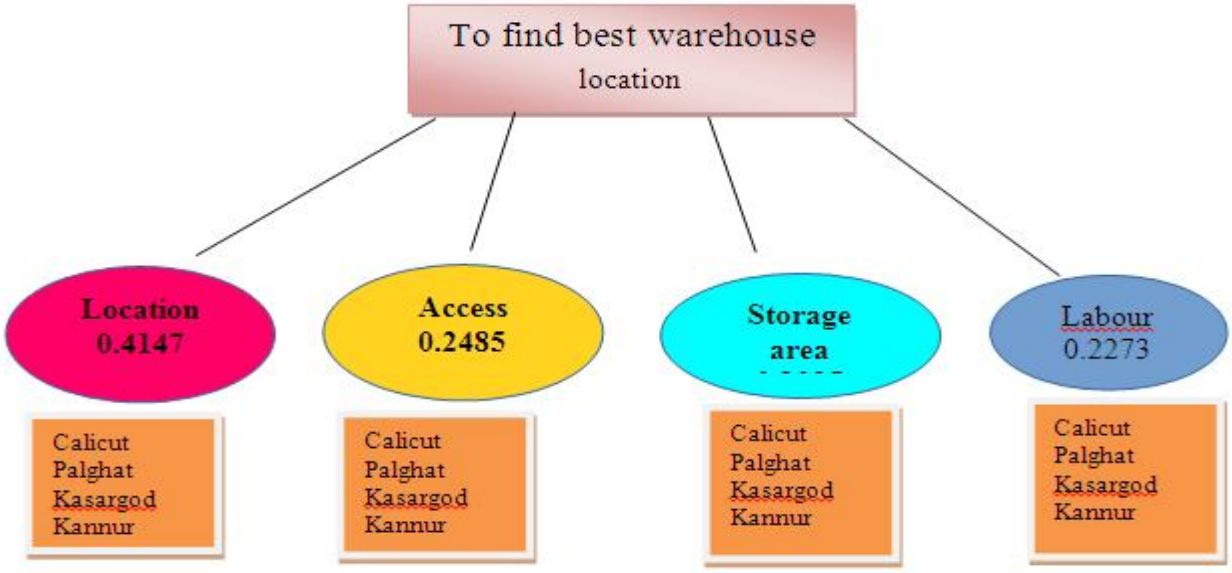
Again step 2: Computing the eigen vector

				Row Sum	**Eigen Vector**
19103.452	32235.735	74501.696	36074.761	161915.64	0.414664483
11450.088	19321.226	44654.274	21622.238	97047.826	0.248538594
5045.017	8513.111	19675.117	9526.961	42760.206	0.109508496
10471.093	17669.24	40836.325	19773.533	88750.191	0.227288427
				390473.87	

Compute the difference of the previous computed eigenvector to this one:

To three decimal places there's not much difference

Here's the tree with the criteria weights



In terms of, location, pair wise comparisons determine the preference of each alternative over another. Here is the pair wise matrix with the criteria "location"

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	Calicut	Palghat	Kasargod	Kannur
Calicut	1	4/3	4	2
Palghat	3/4	1	3	3/2
Kasargod	1/4	1/3	1	1/2
Kannur	1/2	2/3	2	1

Converting into decimals

1.000 1.333 4.000 2.000

0.750 1.000 3.000 1.500

0.250 0.333 1.000 0.500

0.500 0.667 2.000 1.000

Squaring the above matrix

4	5.332	15.999	8
3	3.999	12	6
1	1.333	3.999	2
2	2.667	8.001	4.001

Computing the eigen vector

				Row sum	Eigen vector
4	5.332	15.999	8	33.331	0.3999832
3	3.999	12	6	24.999	0.2999964
1	1.333	3.999	2	8.332	0.0999868
2	2.667	8.001	4.001	16.669	0.200033601
			Total	83.331	1

In terms of access, pair wise comparisons determine the preference of each alternative over another. Here is the pair wise matrix with the criteria “ACCESS”

	Calicut	Palghat	Kasargod	Kannur
Calicut	1	3/2	¾	3
Palghat	2/3	1	½	2
Kasargod	4/3	2	1	4
Kannur	1/3	1/2	¼	1

Converting into decimals

1.000 1.500 0.750 3.000

0.667 1.000 0.500 2.000

1.333 2.000 1.000 4.000

0.333 0.500 0.250 1.000

Squaring the above matrix

3.999 6.000 3.000 12.000

2.667 4.001 2.000 8.001

5.332 8.000 4.000 15.999

1.333 2.000 1.000 3.999

Computing the eigen vector

				Row sum	Eigen vector
3.999	6	3	12	24.999	0.2999964
2.667	4.001	2	8.001	16.669	0.200033601
5.332	8	4	15.999	33.331	0.3999832
1.333	2	1	3.999	8.332	0.0999868
			Total	83.331	1

In terms of storage area, pair wise comparisons determine the preference of each alternative over another. Here is our pair wise matrix with the criteria "Storage area"

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	Calicut	Palghat	Kasargod	Kannur
Calicut	1	1/4	½	1/3
Palghat	4	1	2	4/3
Kasargod	2	1/2	1	2/3
Kannur	3	3/4	3/2	1

Converting into decimals

1.000	0.250	0.500	0.333
4.000	1.000	2.000	1.333
2.000	0.500	1.000	0.667
3.000	0.750	1.500	1.000

Squaring the above matrix

3.999	1.000	2.000	1.333
15.999	4.000	8.000	5.332
8.001	2.000	4.001	2.667
12.000	3.000	6.000	3.999

Computing the eigen vector

				Row sum	Eigen vector
3.999	1	2	1.333	8.332	0.0999868
15.999	4	8	5.332	33.331	0.3999832
8.001	2	4.001	2.667	16.669	0.200033601
12	3	6	3.999	24.999	0.2999964
				83.331	1

In terms of labor, pair wise comparisons determine the preference of each alternative over another. Here is our pair wise matrix with the criteria “Labor”

	Calicut	Palghat	Kasargod	Kannur
Calicut	1	3/4	3/2	3
Palghat	4/3	1	2	4
Kasargod	2/3	1/2	1	2
Kannur	1/3	1/4	½	1

Converting into decimals

1.000	0.750	1.500	3.000
1.333	1.000	2.000	4.000
0.667	0.500	1.000	2.000
0.333	0.250	0.500	1.000

Squaring the matrix

3.999	3.000	6.000	12.000
5.332	4.000	8.000	15.999
2.667	2.000	4.001	8.001
1.333	1.000	2.000	3.999

Computing the eigen vector

				Row sum	Eigen vector
3.999	3	6	12	24.999	0.2999964
5.332	4	8	15.999	33.331	0.3999832
2.667	2	4.001	8.001	16.669	0.200033601
1.333	1	2	3.999	8.332	0.0999868
				83.331	1

	Location	Access	Storage Area	Labour
Calicut	0.3999832	0.2999964	0.0999868	0.2999964
Palghat	0.2999964	0.2000336	0.3999832	0.3999832
Kasargod	0.0999868	0.3999832	0.2000336	0.2000336
Kannur	0.2000336	0.0999868	0.2999964	0.0999868

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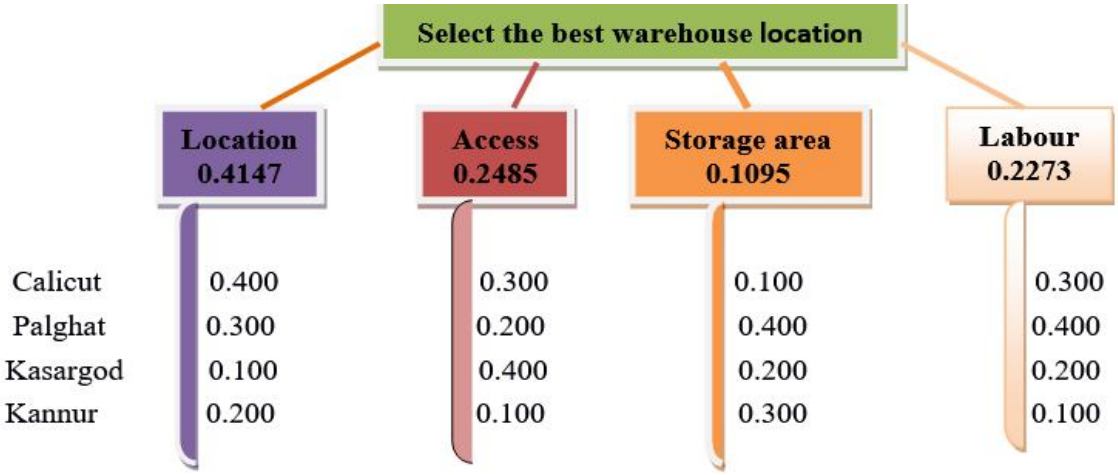
$$\begin{pmatrix} 0.400 & 0.300 & 0.100 & 0.300 \\ 0.300 & 0.200 & 0.400 & 0.400 \\ 0.100 & 0.400 & 0.200 & 0.200 \\ 0.200 & 0.100 & 0.300 & 0.100 \end{pmatrix} * \begin{pmatrix} 0.415 \\ 0.249 \\ 0.110 \\ 0.227 \end{pmatrix} == \begin{matrix} \text{Calicut} \\ \text{Palghat} \\ \text{Kasargod} \\ \text{Kannur} \end{matrix} \begin{pmatrix} 0.230 \\ 0.309 \\ 0.208 \\ 0.163 \end{pmatrix}$$



In summary, the analytic hierarchy process provides a logical framework to determine the benefits of each alternative. Although costs could have been included, in many complex decisions, costs should be set aside, until the benefits of the alternatives are evaluated.

Using benefit to cost ratios

	Cost	Benefit	Normalized costs	Benefit cost ratio
Calicut	100	0.32	0.4	0.8
Palghat	25	0.309	0.1	3.09
Kasargod	50	0.208	0.2	1.04
Kannur	75	0.163	0.3	0.5433
	250			

The above table represents the cost-benefit ratio of all alternatives. In this analysis Palghat has got the highest ratio so we can confidently say that Palghat is the best place to locate the warehouse compared to all the other alternatives.

CONCLUSION

The study suggests that large scale retailers can determine their warehouse location and design using the four labels or factors identified to predict reasons for making warehouse decisions. The most dominant challenges in warehouse location and design decisions include: lack of people with expert knowledge in warehouse location and design, inability to access reliable sources of information, scarcity of space in Kerala and financial resources. For a better and successful warehouse location and design decisions, large scale retailers need to develop strategies in meeting customer satisfaction, improving operational performance, and value added at the lowest cost in overcoming these challenges. Finally the study suggests that Palghat is the best place to locate the warehouse by considering the all factors. This area will satisfy all factors with high benefit ratio.

SUGGESTIONS FOR FURTHER RESEARCH

This study was only able to address warehouse location and design decisions among large retailers in Kerala. It will be necessary to carry out a study featuring other areas outside Kerala in order to find out if there are any similarities and differences in the findings of this study.

It will also be important to do a comparative study with another country both in the developed and developing country to ascertain the similarities and differences in warehouse location and design decisions. Firms do not necessarily own warehouses but do at times outsource the service. There is need to carry out a study on the warehousing trends among large retail in India. Cognitive and motivational biases can occur in Multi-Criterian Decision Analysis (MCDA).

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Motivational biases are very important in MCDA, ranging from issues related to obvious conflicts of interest to subtle influences of professional association or preferences for outcomes of an analysis. Motivational biases can lead to excluding alternatives that are possible competitors of a preferred alternative, adding objectives that favor a preferred alternative or eliminating objectives that favor others, and, perhaps most importantly, manipulating weights to favor an alternative. Therefore, much more research is needed to better understand the effect of motivational biases in MCDA and how to reduce these biases. There is a huge opportunity for researchers to explore new best practices and to test their effectiveness in reducing cognitive and motivational biases.

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International Journal of Advance and Innovative Research
Volume 5, Issue 3 (III): July - September, 2018
ISSN 2394 - 7780

PHYSICAL AND CHEMICAL PARAMETERS OF SOILS OF JALGAON REGION THROUGH ELECTRICAL CONDUCTIVITY

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ABSTRACT
The dielectric properties of material are function of its chemical constituents and physical properties. This paper presents the measurement of dielectric properties of soil samples of Jalgaon region. The soils were categorized as loamy sand, sandy loam and clay loam. The soils were analysed for the status of available nutrients. The pH and Electrical Conductivity of soil samples were measured by using soil testing kit. An automated X-band microwave set-up at frequency 9 GHz is used for measuring dielectric constants. Further, the data on the physical and chemical properties of these soils are also reported .These properties are important in better understanding of soil physics, agricultural application and analysing the satellite data in remote sensing.

Keywords: Physical and chemical properties of soil, electrical conductivity.

I. INTRODUCTION

The study of earth's surface is important for remote sensing applications. Soil analyses are useful for giving indications about deficiencies of nutrients and providing information on soil acidity, alkalinity and organic matter content. such type of data may be useful for the management of nutrients of these soils.

Different studies predict that the dielectric properties of soil at microwave frequencies are the function of its physio-chemical constituents. EC, PH, OC N, P, K, deficient soil is recommended rich fertilizer [1]. The physical capacities of a soil are influenced by the size, proportion, arrangement and composition of the soil particles [2]. Rapid measurement and monitoring of soil nutrient Variability is needed to satisfy the precision farming requirements. These problems can be solved by measuring electrical conductivity (EC) of soil [3]. Characterization of soil helps in determining soil potentials and identifying the constraints in crop production besides giving detailed information about different soil properties [4].

II. RESULTS AND DISCUSSIONS

1. Bulk density and Porosity

The bulk density of soil indicates the degree of compactness of the soil and is defined as the mass per unit volume which includes space occupied by solids and pore space [5]. Bulk density of studied region varied from 1.05 to 1.42 gc m-3.

2. Soil pH and Electrical conductivity

It is very important because soil solution carries its nutrients such as Potassium (K), Phosphorus (P), and Nitrogen (N) that plant need in specific amount to grow and fight off diseases [6. The pH value of analysed soil sample ranged from 5.92 to 8.42. The electrical conductivity of a soil solution increases with the increased concentration of ions [7]. Conductivity depends upon the dilution of soil suspension. The EC values ranged from 0.06to 0.42 dSm-1.

3. Organic Carbon

The source of organic carbon in the cultivated soil included crop residue, animal manure, cover crops, green manure and organic fertilizers, etc. Most living things in soils, including plants, insects, bacteria & fungi are dependent on organic matter for nutrients& energy [8]. OC values were recorded in between 0.32 and 1.25 %.

4. Calcium carbonate

The presence of calcium carbonate in the soil is due to climatic factors. The effect of carbonate on soil fertility is not uniform. The calcium carbonate values ranged from 0.75 to 7 %.

5. Organic Matter

The organic matter is a vital store of available nutrients. The available nitrogen in the soil ranges from 124 to 406 kgha-1. The available potassium ranges from 124 to 194 kgha-1. All soil samples have higher content of available potassium. In the present study available phosphorus ranges from 1.66to 20.51 kgha-1. In the present study available iron ranges from 0.98 to 13.04 ppm, available manganese ranges from 4.93 to 12.89 ppm and available zinc ranges from 1.13 to 9.07 ppm, available copper ranges from1.39to 10.62 ppm.

ISSN 2394 - 7780

Physical Properties of Soils

Sample No.	CaC molm(P) K/g	Mg C molm(P) K/g	Bulk Density gc/m3	Sand %	Silt %	Clay%	Texture Class
1	16.8	24.1	1.08	28.3	25.05	46.65	Clay
2	12.5	33.5	1.05	26.35	26.17	47.48	Clay
3	25.7	20.8	1.19	34.5	18.67	46.83	Clay
4	23.2	21.3	1.33	45.55	19.72	34.73	Sandy Clay Loam
5	21.4	22.7	1.31	51.02	22.83	26.15	Sandy Clay Loam
6	22.7	21.1	1.42	56.87	27.4	15.73	Sandy Loam
7	22.7	20.4	1.4	65.47	23.85	10.68	Sandy Loam
8	4.9	34.5	1.3	50.15	24.2	25.65	Sandy Clay Loam
9	11.6	34.4	1.12	28.25	19.52	52.23	Clay
10	16.2	33.1	1.21	31.25	46.1	22.65	Loam
11	8.1	23.4	1.44	77.6	15.17	7.23	Loamy Sand

Chemical Properties of Soils

Sample No.	pH (1:2.5)	E.C. dS/m	C %	CA %	N Kgh/a	Ph Kgh/a	P Kgh/a	Fe ppm	Mn ppm	Zn ppm	Cu ppm
1	8.31	0.06	0.32	4.25	124	20.51	132	1.06	4.93	1.56	10.19
2	8.36	0.07	0.55	5.5	124	5.54	124	0.99	5.24	1.13	9.97
3	8.42	0.06	0.46	4.25	135	6.65	118	0.98	8.54	7.07	2.49
4	7.78	0.32	0.36	6.75	135	2.49	125	1.13	11.56	2.36	5.04
5	6.4	0.14	0.75	3.75	203	10.25	133	13.04	12.17	4.33	2.82
6	6.72	0.12	0.65	5.75	203	7.21	144	9.99	11.99	8.85	2.86
7	7.8	0.11	0.66	5.25	226	3.88	155	6.35	12.75	6.17	7.37
8	6.83	0.06	0.4	1.25	169	2.22	157	11.97	12.52	9.07	1.39
9	6.92	0.17	0.81	0.75	158	1.66	165	9.78	11.74	8.56	9.91
10	5.92	0.42	1.25	1	406	3.05	172	11.58	12.89	5.53	10.62
11	7.39	0.22	0.59	7	124	18.85	194	1.15	10.86	8.27	7.08

III. CONCLUSION

The study helps in determining the values of different physicochemical parameters and nutrient concentrations of soil from Jalgaon region. The bulk density ranged between (gc m-3) 1.05to 1.44, pH ranged between 5.92 to 8.82. Electrical conductivity ranged between (dSm-1) 0.06 to 0.42 is also in recommended range. Organic carbon ranged between (%) 0.32 to 1.25, calcium carbon ate ranged between (%) 0.75 to 7, available Nitrogen ranged between (kgha-1) 124 to 406, available Phosphorus ranged between (kgha-1)1.66 to 20.51. Available Potassium range between 124 to 194. Soil texture has remarkable effect on the dielectric properties.

All these parameters are useful for researchers working in the field of agriculture and microwave remote sensing. The physico-chemical properties, physical parameters are useful to prepare soil health card which may be further used to predict the soil fertility.

ACKNOWLEDGEMENT

The authors are very much grateful to UGC, New Delhi, and Principal, Z.B. Patil College, Dhule for providing a facility of microwave bench to our Research Laboratory through CPE scheme. The authors are also very much thankful to Prof. OPN Calla for his kind suggestions during the course of this research work.

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International Journal of Advance and Innovative Research
Volume 5, Issue 3 (III): July - September, 2018
ISSN 2394 - 7780

PROSPECTS OF ICT INTEGRATION IN SCHOOL EDUCATION: AN ANALYTICAL STUDY OF THE GOVERNMENT SCHOOLS IN WEST BENGAL, INDIA

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ABSTRACT
Information & Communication Technology (ICT) is recognized as an important catalyst for social transformation, and an important tool for education. This paper attempts to analyse the role and performance of ICT in enhancing quality of school education in the state of West Bengal in India. The study covers 75 government run secondary schools encompassing 100 respondents of West Bengal. It has proven that adoption of ICT as a strategic management tool is a welcome sign for all the surveyed schools. The study result indicates that ICT was successful in predicting the future of new technology for the purpose of teaching-learning and transaction of curriculum and thereby enhancing quality of education. The 'Kendell's Coefficient of Concordance' shows a significant association between ICT and qualitative upliftment of education. The study result revealed a close association among the factors like 'relative advantage' of ICT and quality of education. However, the magnitude of quality of education lies in its ability to organize ICT through establishment of proper infrastructure in the school. This study also showed barriers and challenges of ICT integration along with important policy recommendations and how ICT has received extensive recognition as a strategy for up-gradation of quality of education through acquired relative advantage, compatibility, demonstrability and image by overcoming the factors avoidance and complexities of new technology (ICT).

Keywords: ICT Technological innovations, quality of education, barriers, policies.

1. INTRODUCTION

Education is the backbone of any nation. The introduction of ICTs in the education has profound implications for the whole education process especially in dealing with key issues of access, equity, management, efficiency, pedagogy and quality. Information and communication technology (ICT) is a force that has changed many aspects of the way we live in 21st century. In developing countries, education is also linked to a whole batch of indicators of human development. Education of women influences the health of children and family size. The experience of Asian economies in particular in the past two decades has demonstrated the benefits that public investment in education can bring. Therefore, Integrating ICT in teaching and learning is high on the educational reform agenda of any country. India is no exception. The ancient education system of India was primarily based on the 'Gurukul System'. But now-a-days Indian education has undergone various stages from the Vedic age to the post-independence period. Modern education is not restricted within the classroom. The recent development of technology has brought out the whole world outside the classroom. Information and Communication Technology (ICT) plays a crucial role in this respect. It is treated as the integral part for educational reforms and innovations at secondary and higher secondary level schools (Mondal & Roy, 2010). The National Policy on Education (1986) has modified 1992, stressed upon employing educational technology to improve the quality of education. The policy statement led two major centrally sponsored schemes, namely, Educational Technology (ET) and Computer Literacy and studies in School (CLASS) paving the way for a more comprehensive Centrally sponsored scheme- Information for a more communication Technology (ICT in short) of schools in 2004. ICT stands for information and communication technologies and are defined, for the purposes of this primer, as a "diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information." These technologies include computers, the Internet, e-mail, web based PC, Mobile phone, wireless sets, projectors, interactive boards, broadcasting technologies (radio and television) and different interactive boards (Wikipedia Internet, 2010). Thus ICT is a system that gathers different information or data to communicate over some distance with the help of modern technology. The integration of ICT into education has been assumed as the potential of the new technological system. ICT is not only the backbone of the Information Age, but also an important catalyst and tool for inducing educational reforms that change our students into productive knowledge workers(Bonk et. al.,1989).

It is generally argued that knowledge obtained by the students is formal and the level of grasping new concepts is very low. Therefore, we are facing a potentiality of application of ICT and thinking of how this alarm situation could be improved society's educational systems as constructivist's theory both teachers and students develop the necessary knowledge and skills sought in this digital age. Hence, most countries around the world are focusing on approaches to integrate of ICT in learning and teaching to improve the quality of education by emphasizing competencies such as critical thinking, decision making, and handling of dynamic situations,

ISSN 2394 - 7780

working as a member of team, communicating effectively (Fife & Pereira, 2003). Several studies have been conducted by different educationists, 5-13 to evaluate the role of ICT on quality of education in secondary and higher secondary levels. All these studies though touched upon the issue of ICT in education, however to our knowledge no comprehensive attempt has yet been made to make the impact assessment of ICT in school education. An attempt has been made in this paper to analyse scientifically the impact of ICT in the enhancement of quality of school education in West Bengal. This paper aims to focus on ICT integration in teaching-learning process. Barriers and challenges are identified based on current literature, and policy recommendations are provided for policy makers and key stakeholders to better integrate ICT in teaching and learning in the future.

2. OBJECTIVES

The following objectives are formulated in our study

- To find out the impact of ICTs in school education.
- To compare the views of teachers educator regarding effect of ICT in improving quality of education.
- To find out the barriers in the path of successful ICT integration in school education system.
- To suggest the best possible policy recommendations to enhance the effectiveness of ICT in school education.

3. RESEARCH METHODS

3.1 Hypotheses

At first, the study is indented to examine the role of ICT on the quality of school education in West Bengal. For this, the hypothesis can be framed as follows: ICT has a tremendous potentiality to enhance the quality of education in secondary level.

On the basis of the above hypotheses the specific hypothesis is H_o: There exists no association between ICT and quality of education. The alternative hypothesis can be written as H_1: There exists significant association between ICT and quality of education.

3.2 Material and Methods

In an attempt to scientifically establish that ICT has a tremendous potentiality to enhance the quality of education in secondary level the following analytical study is made. A well structured questionnaire has been used to collect primary data from 75 secondary schools in several districts in West Bengal during the year 2017. A sample size of 100 respondents is drawn in order to throw some light on the impact of ICT on quality of education (QE) in West Bengal. The measurement of QE has been done by using the descriptive statistics like mean and standard deviation. We have also estimated the determinants of QE using multiple regression models. The estimated Ordinary Least Square (OLS) equation of QE is of the form:

$QE = a + b.RAD + c.COM + d.COP + e.IMG + f.DEM + g.AVOID$

where RAD = Relative Advantage, COM = Compatibility, COP = Complexity, IMG = Image, DEM = Demonstrability, AVOID = Avoidance, a = Arbitrary Constants; b, c, d, e, f and g are regression coefficients.

We have estimated 'Kendell's Coefficient of Concordance' to examine relationship between ICT and quality of secondary school education. The materials and techniques used for the study are as follows:

- Structured questionnaire,
- χ^2 table,
- Excel package of computer,
- Mean and standard deviation,
- Concordance analysis,
- Multiple regression models.

3.3 The Conceptual Framework

Information and communication technology (ICT) are defined as all devices, tools, content, resources, forums and services, digital and those that can be converted into or delivered through digital forms, which can be deployed for realizing the goals of teaching, learning, enhancing access to and reach resources, building of capacities, as well as management of the educational system. ICT will not only include hardware devices

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connected to computers, and software applications, but also interactive digital content, internet and other satellite communication devices, radio and television services, web based content repositories, interactive forums, learning management systems and management information systems. They will also include processes for digitization, deployment and management of content, development and deployment of platforms and processes for capacity development and creation of forums for interaction and exchange (Euller & Seufret, 2003).

The term ICT is a multidimensional concept. It can be measured in different ways. In our study, we specifically utilized Roger's (1995) Diffusion of Innovations (DOI) theory in modified form to examine the role of ICT in school education. For this we have selected set variables for explaining the role of ICT in school education. These are – 'relative advantage', 'compatibility', complexity', demonstrability', 'image' and 'avoidance' (Janardhanam et. al. 2011). The variables and their explanations can be expressed in terms of the table no -1.

Table-1: Selected variables and their explanations influencing quality of education through ICT

Variables	Explanation
Relative Advantage	It indicates the degree to which an innovation will offer benefits surpassing those of its predecessor
Compatibility	It implies the level at which the new innovation acts in accordance with previously existing values, attitudes, experiences of using predecessors
Complexity	It indicates the degree to which an innovation is difficult to understand or use.
Demonstrability	This means the extent to which an innovation may be experimented with on a limited basis and observable to others
Image	It means positive image of school in short and long run due to introduction and implementation of ICT
Avoidance	It is defined as the degree of the potential version or avoidance reaction to an innovation like ICT

4. RESULTS AND DISCUSSION

4.1 Impact of ICT on Quality of Education: A Concordance Analysis

The study has attempted to make an assessment of ICT on quality of secondary education on the basis of a set of selected indicators using 'Kendall's coefficient of concordance'. Actually Kendall's Concordance measures the fact that whether any significant association exists between ICT and the extent of quality of education. In our study, we have derived Kendall's coefficient statistic (W) and observed value of non-parametric 'chi-square' with the help of the field perception of ranking of several selected indicators assigned by the respondents. The indicators are- Relative Advantage (RAD), Compatibility (COM), Complexity (COP), Image (IMG), Demonstrability (DEM), and Avoidance (AOID). The Concordance analysis can be explained in terms of the following table (table- 2).

Table-2: Relationship between ICT and Quality of Education: Kendall's Coefficient of Concordance

Indicators / Estimators	RAD	COP	COM	DEM	IMG	AVOID
TR	145	160	241	172	104	354
AR	2.23	2.46	3.71	2.65	1.6	5.45
GA	18.09					
$(AR_i - R)$	-15.86	-15.63	-14.38	-15.44	-16.49	-12.64
$(AR_i - R)^2$	251.54	244.30	206.78	238.39	271.92	159.77
$\sum(AR_i - R)^2$	1372.7					
W	0.052					
χ^2	16.9					

Source: Author's calculation based on field level data, 2017, N.B.-Total Number of Respondents (P) = 75, number of indicators (n) = 6, TR = sum of rankings, AR = average rankings (TR/P), GA = grand average ($\sum$ TR/ P), $\chi 2 = p\ (n-i)\ .W$

It is obvious (vide table- 2) that the observed value of chi-square (χ^2) i.e., 16.9 is greater than the table value at 5 % and 1 % level of significance (i.e., $\chi^2_{.05,\ d.f.\ 5} = 9.236$ and

$\chi^2_{.01,\ d.f.\ 9} = 15.086$) for degrees of freedom 5, therefore the null hypothesis is rejected and the alternative hypothesis is accepted. So, we can conclude that there exists significant association between ICT and quality of secondary education in West Bengal.

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4.2 Multiple Regression Analysis

The regression analysis of ICT on quality of education shows (as evident from table-3) that the coefficient of the variable 'Relative advantage' is found to be positively associated with the quality of school education. This means that higher the extent of relative advantage of innovation in the form of ICT, higher would be the quality enhancement potentiality of school education. In fact, greater the extent of relative advantage of ICT, more effective operation of educational activities through appropriate curriculum, management, administration, teaching learning strategies etc. The values of other variables like compatibility (0.935), demonstrability (2.614) image (2.327) have positive impact on quality of education through application of ICT with the exception of complexity (-0.127) and avoidance (-1.912). The latter is due to the increase in difficulties in application of innovation through ICT. This result is consistent with the study of Koza (1989) in comparison of mathematics and reading levels and attitude toward learning of high risk secondary students through the computer aided instruction. Again the estimated values of descriptive statistics especially mean and standard deviation (S.D.) of the respondents are explained in terms of table-4. The mean score is found to be high in case of relative advantage compared to other attributes. It is interesting to note that average mean of all the respondents is more than 3 except in case of complexity (i.e., 1.1715) and avoidance (i.e., 1.9530) which means that most of the respondents are in favour of the introduction of new technology in school education (i.e., ICT)

Table-3: Regression results showing impact of ICT on quality of education depending on selected variables

QE = a + b.RAD + c.COM + d.COP + e.IMG + f.DEM + g.AVOID			
Dependent Independent	**Quality of Education**		
	Co-efficient	**t value**	**Level of significance**
Constant	1281.326	1.017	-
RAD	0.084	2.510	0.01
COM	0.58	0.935	0.05
COP	-0.020	-0.127	0.05
DEM	0.081	2.624	0.01
IMG	0.053	2.327	0.01
AVOID	-0.004	-1.912	0.05

Source: Author's calculation based on field level data, 2016-17, N.B.-Total number of observations (N) = 100, R2 = 0.594, Scale: Strongly Agree = 1 and Strongly Disagree = 0

Table-4: Descriptive Statistics

Variables	Mean	S.D.
RAD	4.1674	1.05461
COP	3.4731	0.7334
COM	1.11725	0.3023
DEM	3.45532	0.7214
IMG	4.5034	1.0837
AVOID	1.9530	0.7052

Source: Author's calculation based on field level data, 2017, N.B.-Total number of observations (N) = 100. Scale: Strongly Agree = 1 and Strongly Disagree = 0

5. BARRIERS AND CHALLENGES OF ICT INTEGRATION

From the above study it is evident that ICT has a tremendous potentiality to enhance the quality of education in secondary school level in the concerned areas. But still there are so many barriers that pose serious challenge to its effective implementation. Twenty years ago, Marcinkiewicz (1993) has pointed out that "full integration of computers into the educational system is a distance goal unless there is reconciliation between teachers and computers". Based on the research, two levels of barriers have been recognized as barriers for teachers' ICT integration efforts: external barriers and internal barriers (Ertmer, 1999). External barriers include those that are often seen as key obstacles, such as inadequate access to technology facilities, insufficient training and support in terms of using ICT. Internal barriers are closely related to teachers' philosophy of teaching and learning, and they are deeply rooted in daily practices. Hew and Brush (2007) analysed existing empirical studies of technology integration from 1995 to spring 2006 in the United States and other countries, and they found at least two categories of barriers were related to teachers' behaviour: the lack of specific knowledge and skills about technology integration, and attitudes and beliefs toward technology. Bingimlas (2009) also found that even many teachers have strong desires for integrating ICT into teaching, they encountered significant barriers, such as lacking confidence and competence, or having negative attitude and inherent resistance.

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Not only teachers' passive attitudes can cause barriers, but students can also pose challenges to ICT integration process. New generations, which are also called the Millennials, are much more skilled and adept at using technology than their teachers. Under this circumstance, students have different patterns of thinking and communication, notions of learning, needs for control, and even personal and social values with their teachers. For instance, multitasking in ICT is taken for granted by new millennium students as a normal social practice. As a result, teachers keep receiving a kind of "social pressure" in the teaching and learning process as the usage of ICT keeps growing, and students' ICT skills keep developing (Gu & Guo, 2013).

The society in whole and teachers, in particular, express doubts about the effectiveness of using ICT applications in collaboration, independent learning and self-directed learning in schools. Differences are identified in ideas of teachers, when compared with teachers of developed countries, about teacher-student and student-student interactions. Moreover, most Indian teachers regard themselves more of an authority role when compared to Western teachers. The authority figure hinders the interactive use of ICT, as this is not consistent with the formal traditional education. Until now, the dominant pedagogy in Indian basic education system is still teacher-centered and rote learning based. Especially in most of government run schools in sub-urban and rural areas, neither teachers nor students are well prepared to adopt the student-centered pedagogy in an ICT rich environment.

6. POLICY RECOMMENDATIONS

A number of policy recommendations can be valuable for Indian policy makers and key stakeholders for fruitful integration of ICT in school education. Overall, much focus should be put on teachers' roles and beliefs. Government and schools should make every effort to support teaching and learning process as well as introduce new pedagogy as a way to better integrate ICT into classrooms. The main policy recommendations are as follows:

Keep investing ICT infrastructure construction.
Until now, the number of ICT facilities and qualified teachers still cannot support the development of ICT in Indian school education. Investment and financial support from Chinese government is needed in both rural and urban areas.

Teacher roles should change from authority models to active mediators.
Teachers are the key factors affecting the usage of ICT in education because they are organizers, guiders, and coordinators in teaching and learning. How well teachers can engage themselves into these roles can determine how effective ICT is integrated in classrooms. Teacher should understand the essence of constructivist learning and encourage students to use ICT in self-directed learning and collaboration activities.

Teacher education should reconsider its training approaches in ICT integration.
Since many researches have shown that teachers' negative attitude and lacking confidence can cause challenges to ICT integration, teacher education should be carried out in a conducive and less-threatening environment. This will allow teachers to gain competence in using ICT for teaching and learning in a confident manner (Teo, 2008). Teacher education in ICT integration can also improve teachers' understanding of ICT and equip them with the latest teaching and learning theories.

Improve the quality and quantity of online-based educational resources by building resource-sharing platforms.
ICT integration can never be achieved without easy accessible online resources and resource sharing platforms. By building up resource platform and sharing online learning resources, teachers with basic Internet access can get teaching materials with high quality, such as videos, pictures, and curriculum instructions. Teachers in remote areas can get training in teaching pedagogy, while teachers in urban areas can learn from their peers with better teaching skills and form online learning groups to communicate and learn from each other.

Introduce blended learning as a new way to rebuild Indian future education system.
Some researchers argue that integration is in fact a part of the blended learning. The central philosophy of blended learning is to use ICT and other instructional media to improve learning and teaching performances. However, the concept of blended learning has not been widely accepted by most Indian teachers, as there is rare policy attention, unsystematic curriculum and insufficient teaching pedagogy specifically designed for this new trend.

Evaluation systems are needed to measure ICT integration outcomes.
Evaluation is important for researchers and key stakeholders to find out how well the integration process works. In the school level, an evaluation system should be built in order to measure teachers' performance in ICT

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integration; in the government level, evaluation systems can measure the gap between different regions and help policy maker better distribute resources.

Add shared vision into schools' development strategy.
Some researchers pointed out that an appropriate level of school strategy planning is needed in order to enhance the successful integration of ICT in classrooms (Baylor & Ritchie, 2002). Teachers would be more willing to integrate ICT into teaching and learning when schools underpin and strengthen the importance of using ICT in daily teaching.

More literature focuses on practice and quantitative evaluation of ICT integration is needed.
When we looked at available literature in terms of ICT integration in Indian education, we found most of the research was written on theory rather than practice, a few practical researches just focus on micro level issues such as classroom practices and teacher attitudes. An overview picture of ICT integration from the national policy level is not adequately described. Influencing factors and quantitative evaluation of ICT integration should be given more attention.

7. CONCLUSION

This paper highlights the role of ICT in enhancing quality of life of secondary level schools of West Bengal. The result reveals that there has been significant positive influence on quality of education through ICT by taking into consideration the factors – 'relative advantage', 'compatibility', 'demonstrability', 'image', 'complexity', and 'avoidance'. It is interesting to note that the calculated value of the factors like demonstrability and image has been found to be satisfactory. This is because the application of ICT has been properly addressed in these schools which dominate the complexity and avoidance factors dampening quality of education associated with ICT. Finally, the 'Concordance' model proves significant association between ICT and quality of education. This paper aims to bring together the findings and key points from the available literature associated with ICT integration in the Indian school education and particularly the school education of West Bengal. ICT provides opportunities for effective communication between teachers and students that has never been achieved before. In the second section, some barriers and challenges of ICT integration are identified. Studying the barriers of ICT in teaching and learning environments is important, as this knowledge can provide "guidance for ways to enhance technology integration" (Schoepp, 2005) and encourage better use of ICT. In the third section, we come up with policy recommendations based on current scenario. The recommendations aim to provide policy makers, teachers and other key stakeholders with possible approaches to overcome barriers and successfully integrate ICT into teaching and learning process in the future.

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International Journal of Advance and Innovative Research
Volume 5, Issue 3 (III): July - September, 2018
ISSN 2394 - 7780

SANITATION IN URBAN SLUM AREA IN GUJARAT

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ABSTRACT
This paper aim is to show the sanitation condition in urban slum area of Gujarat. Here researcher has used secondary data from the world bank and other authentic report to analyse the real position of Gujarat state in case of urban slum sanitation facilities.researcher has indicate the sanitation condition prevailing in urban area in chronological way, starting from world level, then condition in India and at last mention the prevailing sanitation condition in Gujarat State. Researcher has analysed the problem of urban sanitation in Gujarat.

Keyword: Urban, Slum area, Sanitation

INTRODUCTION

India has great history in sanitation, In India manywe have good example of it Lothal civilization and Haddapian culture, which indicates the better sanitation facilities.Now in India every government have tried to focus on sanitization under various schemes but still we read in newspaper about unavailability of the sanitation facility more than 60% area. It indicates we have to think about what facility available with the people.In 2008 India have national policy for the sanitization.In India Gujarat is developed state, so researcher wants to analyse sanitization facility available in Gujarat State.Under Swachcha Bharat Mission every one talk about the cleanliness and sanitation issues prevailing in India. In last budget Central Government have allocated 9000 crore for the sanitation and out of this amount 2300 were allotted for the urban sanitation development. India has taken many steps to develop this infrastructure at rural as well as urban level.

According to the evaluation study on Total Sanitation Campaign, which was done by government in year 2013 government have selected 20 states for sanitation campaign evaluation. It is found out that there were four categories in performance Sikkim is first with 100 % sanitation and Gujarat comes under the Good category with 68.6%.

SANITATION IN URBAN AREA IN ALL OVER WORLD

Now whole world became village after this internet access, it growing fast overall there is decrease in growth ratio of slum area population. As per WHO and UNICEF in year 2015, 2.4 billion people don't have improved sanitation facilities, which around 13% of population of all over world. Among all the country sub-Saharan Africa and South Asia continue to have the lowest sanitation coverage. The following table is about the sanitation facilities available in different part of the wolrd.

Table-1: Sanitation in different region of world:

Global Regions	% Urban population with access to improved sanitation
Caucasus and Central Asia	96.3
Developed Countries	96.8
Eastern Asia	87.3
Latin America and the Caribbean	87.3
Northern Africa	92.2
Oceania	75.9
South-eastern Asia	80.8
Southern Asia	64.6
Sub-Saharan Africa	40.3
Western Asia	95.0

(Source: Joint Monitoring Programme for Water Supply and Sanitation (2015)

BACKGROUND OF INDIA

India is second largest in population in all over the world as per the World Bank data it indicates constant decrease in slum area from 1990 to 2014 which listed below

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Table-2: Population live in slum area

Year	Population live in slum area (%)
1990	54.9
1995	48.2
2000	41.8
2005	34.8
2009	29.4
2014	24

(Source: Compile from World Bank Data)

The above data indicates the constant decrease in population percentages lives in slum area is decreasing, but still 24 % people are living in slum area. These people have many problems regarding water, sanitation, hygiene, education and so on.

BACKGROUND OF GUJARAT STATE

According to the Census 2011results, the total population of the State is 6.03 Crore which accounts for 5% of the total population of India. Gujarat is the 10th largest state in the country based on population excluding (UTs). Gujarat is one of the most urbanized states in India with 43% of the State population living in urban areas. Gujarat is seventh position in the India for urbanization. Gujarat has 36 % urbanization growth rate while national level urbanization growth rate is 31.6% (Urban Management Center, Ahmedabad 2015) People are moving from rural to urban area so it create space problem and decrease standard of living in case of land area. People have to leave in slum area. As per the urban management center report in year 2015 it indicates decrease in population live in slum area. As per census 2001 9.9% urban people were live in slum area and as per census 2011 6.5% urban people live in the slum area. Now there is decrease in slum area is good fact but here need is find out the quality life of slum area people.

Table-3: Urban households with individual toilets: Gujarat and peer states

State	Urban Households		Urban HH with individual toilet within premises		Percentage of HH having individual toilet	
	2001	2011	2001	2011	2001	2011
Andhra Pradesh	4173639	6778225	3258511	5838383	78.1%	86.1%
Gujarat	3758028	5416315	3026968	4750063	80.5%	87.7%
Karnataka	3556960	5315715	2675767	4514862	75.2%	84.9%
Kerala	1652656	3620696	1520747	3527650	92.0%	97.4%
Maharashtra	8069526	10813928	4686532	7707096	58.1%	71.3%
Tamil Nadu	5898836	8929104	3794901	6709788	64.3%	75.1%
All-India	53692376	78865937	39571281	64162119	73.7%	81.4%

(Source: Urban Management Center Report, 2015)

Gujarat is developed state in India still state facing many problems in urban sanitation issues. Average 81.4% urban households have individual toilet. While in Gujarat 87.7 % have individual toilet facility in urban area of state. It indicates that still Gujarat has to move towards the 100 % toilet facilities in urban as well as rural area.

ACCESS TO SANITATION FACILITIES: GUJARAT AND PEER STATES

In Ahmedabad two major slum areas were studied and found out that only 7 % people used open defecation, 24% people used common and Sulabh Shauchalaya and 68 % were using flushed toilets.(Trivedi & Gaurav 2015).

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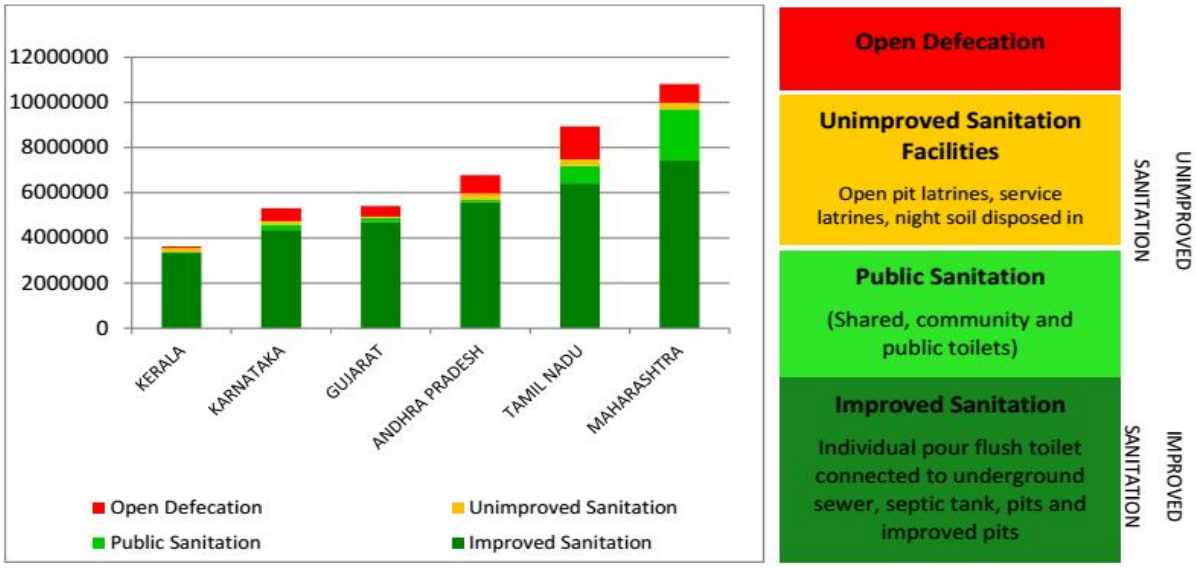
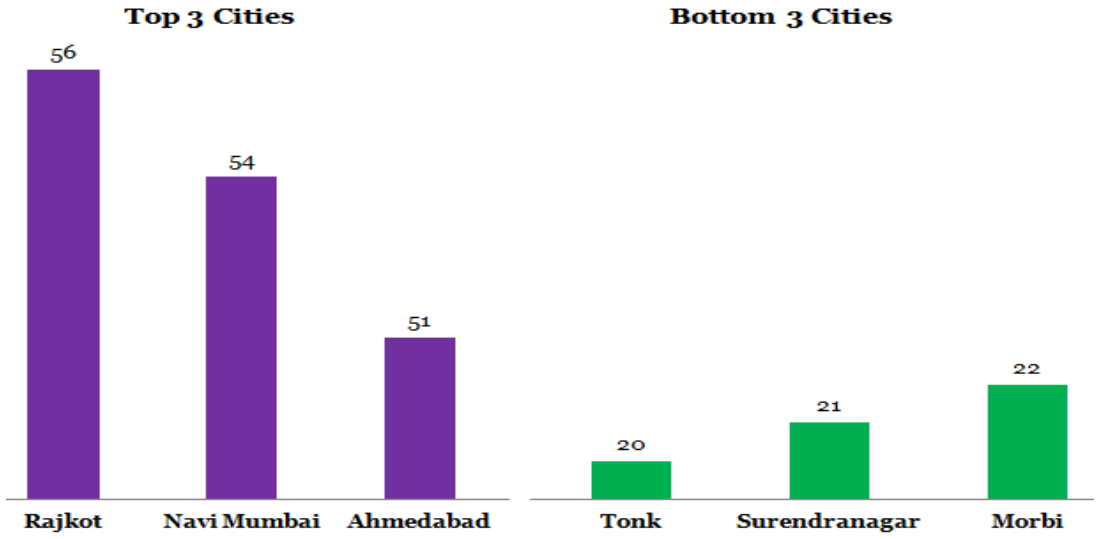
Figure-1: Open Defecation in Gujarat and Peer States



(Source: Urban Management Center Report, 2015)

The above data indicates there is still open defecation in India, what government and corporate can do for the society growth, this is the need of an hour to think about it as an academician.

Figure-2: Urban Sanitation in west zone of India



Source: Ministry of Urban Development, Govt. of India

The above data indicates the sanitation facilities available in west zone of India, top cities include Rajkot and Ahmedabad and bottom cities include Surendranagar and Morbi in sanitation facility available in urban area.

SANITATION PROBLEMS IN URBAN AREA

Shared Sanitation

Most of the slum area have common sanitation facilities and shared by whole area. There is always problem of maintenance, cleanliness and hygiene. People generally used as public property so less concern about the cleanliness and maintenance, they are unaware about the health and hygiene issues related to sanitation

Unavailability of sanitation facility on construction site

Many small and medium constructioncompanies are not providing facility of sanitation and this people have to go for open defecation.

Lack of awareness and illiteracy

People are not aware about the problems and disease due to unhygienic sanitation, education level among this entire group of people is very low so it is very difficult to convince them about the hygiene and sanitation.

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Perception about the Toilet
People are having a perception about the toilet is not good thing, it is symbol of dirty things. They are not considering it as natural process and in-house toilet creates dirt.

Health Issues
This people have high infant mortality rate, malnutrition(Banerjee et al. 2012; Pierce 2017).but sometimes slum urban area have less problem of mortality and malnutrition compare to rural area(Fink et al. 2014)

No space for open defecation
If we consider the rural area people can do open defecation easily as there are no issue about space, generally rural people do open defecation outside far away from house, But in urban area there are problem of space and land for living and open defecation done near to living area so it will create more hygiene issues.

CONCLUSION
Researcher has read all the data about the sanitation facilities available in urban area of world level, India level and Gujarat level, overall performance of Gujarat state is good compare to world and India. But still Gujarat doesn't have enough urban improved sanitation facility. It can be improved slowly and gradually by creating awareness among slum area residents and by creating enough infrastructures for them.

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International Journal of Advance and Innovative Research
Volume 5, Issue 3 (III): July - September, 2018
ISSN 2394 - 7780

FACTORS ASSOCIATED WITH SUCCESSFUL CESSATION OF SMOKING HABIT IN SMOKERS OF AHMEDABAD

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ABSTRACT
The research objective of present study is to monitor and investigate cessation patterns in most conveniently available legal street drug tobacco users and especially in smokers of Ahmedabad because the information regarding combusted tobacco use, exposure and successful cessation is one of the major sources of prevention of increasing morbidity and premature mortality caused by smoking in men and women and new born children who get highly affected by the tobacco smoke. The study sample of 605 former and current smokers (age 15 to 64 Years) was selected by self organized population based survey from the population of Ahmedabad. An un-weighted dataset is part of survey design and rates and ratios are estimated with 95% CI. For the evaluation of cessation patterns, different characteristics of respondents such as socio-demographic factors awareness of ill effects of tobacco use and individual perceptions were selected as covariates. For the data collection a pretested questionnaire was prepared in two languages English and Gujarati. The whole statistical analysis of the collected data was carried out by means of SPSS 21.0 using logistic regression for selection of the risk factors.

Keywords: Combusting tobacco, smokers, Logit model (Logistic regression), cessation.

1. INTRODUCTION
Gujarat is a state where tobacco use is not an addiction but a tradition. People enjoy consuming tobacco and got habituated with the deadly monster. Tobacco is the ninth most harmful legal street drug to humans. It get utilised more frequently as it is easily available in the market. Tobacco is explicitly exempted from drug scheduling, despite their detrimental impacts on individual health and society as a whole, due to economic and cultural reasons. Smoking and pose a serious risk of death and disease. Consumption of tobacco products is the largest preventable risk factor for morbidity and mortality in developed and developing countries. Government always keep trying to motivate people for quitting the deadly habit of consumption of tobacco. Recognizing the importance of tobacco cessation, 13 tobacco cessation clinics (TCCs) were started in 2002 by the Ministry of Health and Family Welfare, Government of India, with the support of the World Health Organization India Country office, and increased subsequently to 19 to provide tobacco cessation interventions. But it was not very successful planning due to two major limitations of less interest of quitting in users and mass of illiterate rural users. The objective of this study is to provide information regarding successful cessation and factors affecting it which can help in evolving cessation strategies for smokers and to generate experience in tobacco cessation interventions and find out the feasibility of scaling up these intervention strategies.

2. MATERIAL, METHODS AND DATA COLLECTION
Design of study: It was a self organized cross sectional population based survey which includes 605 adult smokers as participants with age between 15 to 64 years from Ahmedabad city.

Selection of participants: To select the participants or respondents from population of Ahmedabad city a random selection is used.

Data collection: The face to face survey was conducted to collect required data using a predesigned and pretested questionnaire (prepared in local language Gujarati). It was given to selected participants of age between 15 to 64 years who are smokers and residents of Ahmedabad city. An unbiased assistance was provided to those respondents who were unable to fill questionnaire at their own (e.g. illiterates, physically unable etc.). Non responses were excluded from the sample.

3. STATISTICAL ANALYSIS
The whole statistical analysis of the collected data was carried out by means of SPSS 21.0 using binary logistic regression.

3.1 Binary logistic regression with multiple independent variables
For m explanatory variables

$$\text{logit}(p(Y)) = \alpha + \beta_1 X_1 + \beta_2 X_2 + \ldots\ldots\ldots + \beta_m X_m \ ,$$

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Where logit (p) = $\ln\left(\frac{p}{1-p}\right) = \alpha + \beta_1 X_1 + \beta_2 X_2 + \ldots\ldots\ldots + \beta_m X_m$

and the odds = $\frac{p}{1-p}$

Here parameter β_i = effect of covariate x_i on the log odds that Y assumes 1, controlling other covariates x_j , for instance, exp (β_i) is the multiplicative effect on the odds of a unit increase in covariate x_i , at fixed levels of other covariates x_j .

3.2 Selection of the variables

3.2.1 Response variable: The present study focuses on the phenomenon of combusted tobacco dependency cessation therefore it was considered as response variable with two categories successful cessation (code 1) and unsuccessful cessation (code 0).

3.2.2 Explanatory Variables: Following is a list of explanatory variables which we believe the responses are affected by.

Table -1: Explanatory Variables

Groups	Categories	Groups	Categories
Gender	Female	DK	
	Male	DA	
		SDA	
Age	55-64(A-1)		
	45-54(A-2)	Visible health effects of smoking on your own or others help in quitting smoking habit(VHE)	SA
	35-44(A-3)		A
	25-34(A-4)		DK
	15-24(A-5)		DA
			SDA
Religion	Other religion(OTH)		
	Christian(CHR)	Effects of environmental tobacco smoke help in quitting smoking habit(ETS)	SA
	Sikh(SIKH)		A
	Muslim(MUS)		DK
	Hindu(HIN)		DA
			SDA
Cast	Other backward Class (OBC)		
	Schedule tribe (ST)	Restriction or support of family and wellwishers help in quitting smoking habit(ROF)	SA
	Schedule cast(SC)		A
	General(OPEN)		DK
			DA
Occupation	Professionals(PRO)		SDA
	Employers(EMP)		
	Employees(EMPL)	The youth access measure help in quitting smoking habit(YAM)	SA
	Self employed workers /street vendors(SE/SV)		A
	Students(STD)		DK
	Unemployed / Unpaid workers/ Housewives(UEM/UPW/HSW)		DA

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	Labourers(LAB)		SDA
Level of Education	16 or more years of education(ED-1)	Adverse effects of smoking on Professional dealing help in quitting smoking habit(AOP)	SA
	13-15 years of education(ED-2)		A
	8-12 years of education(ED-3)		DK
	1-7 years of education(ED-4)		DA
	No education(ED-5)		SDA
Annual Income:	10 lakhs or more(I-1)	Religious restriction n spirituality help in quitting smoking habit (RE)	SA
	5-9.99 lakhs(I-2)		A
	2.5-4.99 lakhs(I-3)		DK
	0-2.49 lakhs(I-4)		DA
			SDA
Awareness of health effect of active smoking	NOT AWARE(ASN)		
	AWARE(ASY)	Advise of a doctor or a well wisher help in quitting smoking habit(AOD)	SA
			A
Awareness of health effect of passive smoking	NOT AWARE (PSN)		DK
	AWARE (PSY)		DA
			SDA
Awareness of health effect of smokeless tobacco use(tobacco chewing)	NOT AWARE (SMLN)		
	AWARE (SMLY)	Text or pictorial warnings on packages help in quitting smoking habit(PW)	SA
			A
Tobacco price increase helps in quitting smoking habit(TPI)	Strongly agree(SA)		DK
	Agree(A)		DA
	Don't know(DK)		SDA
	Disagree(DA)		
	Strongly disagree(SDA)	knowledge of ill effects of smoking given by seminar, campaigns or mass media help in quitting smoking habit(SCM)	SA
			A
Own will power helps in quitting smoking habit(OWP)	SA		DK
	A		DA
			SDA

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ANALYSED DATA

Table – 2: Odds ratios and percentages of successful cessation in smokers of Ahmedabad					
Explanatory variables		**Proportion**	**Odds ratio**		
Groups	**Categories**	**%**	**Odds Ratio**	**Upper bound**	**Lower bound**
Gender	Female	12.1	0.653	0.227	1.885
	Male	15.4	1	-	-
Age	A-1	11	9.489*	1.278	70.460
	A-2	4.7	23.771*	6.496	86.986
	A-3	11.2	9.009*	2.736	29.659
	A-4	22.2	2.222	0.804	6.145
	A-5	25.7	1	-	-
Cast	OBC	13.2	1.129	0.458	2.781
	ST	10.6	1.257	0.297	5.313
	SC	7.1	2.425	0.967	6.085
	OPEN	21.6	1	-	-
Occupation	PRO	28.1	0.858	0.088	8.395
	EMP	18.6	0.987	0.111	8.790
	EMPL	13.8	2.459	0.321	18.816
	SE/SV	6.1	3.841	0.382	38.658
	STD	12	0.358	0.026	4.981
	UEM/UPW/HSW	21.1	0.817	0.124	5.403
	LAB	6.6	1	-	-
Level of Education	ED-1	22.7	2.402	0.262	22.009
	ED-2	23.9	0.369	0.048	2.816
	ED-3	9.6	2.901	0.458	18.381
	ED-4	11	2.769	0.540	14.184
	ED-5	8.6	1	-	-
Annual Income:	I-1	12.1	2.184	0.440	10.849
	I-2	24.8	0.257	0.064	1.029
	I-3	16.3	0.318	0.084	1.200
	I-4	8	1	-	-
AS	ASN	6	0.786	0.123	5.013
	ASY	15.7	1	-	-
PS	PSN	10.9	0.319*	0.125	0.814
	PSY	18.8	1	-	-
SML	SMLN	5.9	3.652*	1.090	12.233
	SMLY	17.9	1	-	-
TPI	SA	13.8	0.452	0.125	1.626
	A	7	2.027	0.603	6.815
	DK	18.2	2.839	0.249	32.306
	DA	6.2	3.795*	1.440	10.004
	SDA	21.4	1	-	-
OWP	SA	19.1	1.057	0.129	8.637

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	A	11.5	0.931	0.116	7.473
	DK	11.4	0.140	0.012	1.579
	DA	4.5	1.311	0.104	16.536
	SDA	11.8	1	-	-
VHE	SA	34.3	0.090*	0.024	0.340
	A	11.9	0.770	0.220	2.687
	DK	13.6	0.415	0.112	1.539
	DA	8	0.497	0.132	1.876
	SDA	8.5	1	-	-
ETS	SA	25	0.196*	0.044	0.876
	A	17.2	0.938	0.319	2.760
	DK	19.6	0.215*	0.060	0.770
	DA	14.7	1.113	0.480	2.583
	SDA	12.1	1	-	-
ROF	SA	19.8	0.698	0.212	2.303
	A	17.6	0.883	0.242	3.218
	DK	11.5	0.956	0.121	7.569
	DA	4.6	7.161*	1.537	33.356
	SDA	10.8	1	-	-
YAM	SA	20	0.721	0.036	14.571
	A	13.3	2.053	0.153	27.552
	DK	7.4	1.631	0.333	7.994
	DA	14.9	1.338	0.619	2.888
	SDA	16.3	1	-	-
EOP	SA	36.7	0.888	0.228	3.467
	A	18.3	1.563	0.478	5.114
	DK	9.5	8.210*	2.069	32.581
	DA	12.3	1.859	0.655	5.276
	SDA	12.2	1	-	-
RE	SA	16.7	0.834	0.174	3.998
	A	18.6	0.306	0.076	1.223
	DK	13	1.410	0.482	4.130
	DA	14.4	0.981	0.445	2.161
	SDA	15.1	1	-	-
AOD	SA	10.4	2.231	0.582	8.551
	A	20	1.725	0.651	4.572
	DK	9	2.974*	1.000	8.845
	DA	14.9	1.777	0.642	4.915
	SDA	17.7	1	-	-
PW	SA	22.2	0.064*	0.005	0.780
	A	18.8	1.903	0.239	15.158
	DK	16.7	0.482	0.054	4.335
	DA	10.1	0.777	0.275	2.193
	SDA	15.6	1	-	-
SCM	SA	20	1.227	0.277	5.437
	A	21.7	0.647	0.217	1.926

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	DK	9.3	2.612	0.910	7.494
	DA	11.9	1.260	0.489	3.247
	SDA	19	1	-	-

4. DISCUSSION

Present study is a statistical study of Cessation of combusted tobacco dependency in smokers (participants or respondents) as effects of different predictors. The proportions given in table 2 give a rough idea of cessation pattern of smoking in smokers of Ahmedabad. But these proportionate study results may not clear the picture of combined effects of set of predictors as they are individual proportions. To overcome this problem an advance statistical analysis is needed. Like all other regressions, Logit model or Logistic regression is also a predictive analysis. Logistic regression is used to predict membership of categories of response variable. It can be considered as a zoomed profile of simple proportionate values of tobacco cessation in combusted form according to their socio-demographic characteristics, awareness of ill effects and individual perceptions. Table 1 presents detailed review of explanatory variables which we believe have an effect on responses and Table 2 presents estimated odds ratios for successful cessation of combusting (smoking) tobacco use in participants using MLR model. It can be seen that some of the categories of predictors are not statistically significant (without *). Odds ratios or EXP (b) of the independent variables are predicted changes in odds for the unit increase in respective dependent variable. The values greater than 1, less than 1 and equal to 1 of odds ratio represent corresponding increase, decrease and no effect on response variable respectively.

5. RESULTS

Table 2 summarizes the analysis of data of estimates of successful cessation among addicts of combusting tobacco products of different categories residing in Ahmadabad.

EXPLANATION OF ODDS RATIOS OF TABLE 2

Odds ratios of users between age 35-44, 45-54 and 55-64 successfully quit habit of tobacco consumption are 9.009*, 23.771* and 9.489* times that of odds of users between the age of 15 to 24 successfully quit tobacco. Old age and middle age users of combusting tobacco products are significantly more likely to successfully quit tobacco smoking than young age users. Combusting tobacco users who are aware of ill effects of passive smoking and smokeless tobacco use are more likely to successfully quit tobacco habit than smokers who are not aware with odds ratios 0.319* and 3.652* respectively. Smokers who disagree with the statement that "Tobacco price increase helps in quitting smoking habit" are significantly more likely to successfully quit tobacco habit than smokers who strongly disagree with the statement with odds ratio 3.795*. Smokers who strongly agree with the statement "Visible health effects of smoking on your own or others help in quitting smoking habit" are significantly less likely to successfully quit tobacco habit than smokers who strongly disagree with the statement with odds ratio 0.090*. Smokers who strongly agree and don't have any opinion about the statement "Effects of environmental tobacco smoke help in quitting smoking habit" are significantly less likely to successfully quit tobacco habit than smokers who strongly disagree with the statement with odds ratios 0.196* and 0.215* respectively. Smokers who disagree with the statement "Restriction or support of family and well wishers help in quitting smoking habit" are significantly more likely to successfully quit tobacco habit than smokers who strongly disagree with the statement with odds ratio 7.161*. Smokers who don't have any opinion about the statement "Adverse effects of smoking on professional dealing help in quitting smoking habit" are significantly more likely to successfully quit tobacco habit than smokers who strongly disagree with the statement with odds ratio 8.210*. Smokers who don't have any opinion about the statement "Advise of a doctor or a well wisher help in quitting smoking habit" are significantly more likely to successfully quit tobacco habit than smokers who strongly disagree with the statement with odds ratio 2.974*. Smokers who strongly agree with the statement "Text or pictorial warnings on packages help in quitting smoking habit" are significantly less likely to successfully quit tobacco habit than smokers who strongly disagree with the statement with odds ratio 0.064*.

PREDICTING RESPONSE PROBABILITIES

Log odds (p) = 0.513 - 0.426(Female) + 2.250(A-1) + 3.168(A-2) + 2.198(A-3) + 0.798(A-4) + 0.121(OBC) + 0.229(ST) + 0.886(SC) - 0.154(PRO) - 0.013(EMP) + 0.90(EMPL) + 1.346(SE/SV) - 1.026(STD) - 0.202(UEM/UPW/HSW) + 0.876(ED-1) - 0.997(ED-2) + 1.065(ED-3) + 1.018(ED-4) + 0.781(I-1) - 1.359(I-2) - 1.144(I-3) - 0.24(ASN) - 1.144(PSN) + 1.295(SMLN) - 0.795(TPI-SA) + 0.707(TPI-A) + 1.043(TPI-DK) + 1.334(TPI-DA) + 0.055(OWP-SA) - 0.072(OWP-A) - 1.967(OWP-DK) + 0.271(OWP-DA) - 2.407(VHE-SA) - 0.262(VHE-A) - 0.889(VHE-DK) - 0.699(VHE-DA) - 1.628(ETS-SA) - 0.064(ETS-A) - 1.537(ETS-DK) + 0.107(ETS-DA) - 0.359(ROF-SA) - 0.125(ROF-A) - 0.045(ROF-3) + 1.969(ROF-4) - 0.327(YAM-1) + 0.719(YAM-2) + 0.489(YAM-3) + 0.291(YAM-4) - 0.118(EOP-1) + 0.446 (EOP-2) + 2.105(EOP-3) + 0.620(EOP-4) - 0.182(RE-1) - 1.185(RE-2) + 0.344(RE-3) - 0.019(RE-4) + 0.803(AOD-1) + 0.545(AOD-2) +

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1.090(AOD-3) + 0.575(AOD-4) - 2.750(PW-1) + 0.644(PW-2) - 0.730(PW-3) - 0.252(PW-4) + 0.205(SCM-1) - 0.435(SCM-2) + 0.960(SCM-3) + 0.231(SCM-4)

Let's have an example to find probability of the following smoker subject successfully quit smoking habit

GENDER	AGE	CAST	OCCUPATION	EDUCATION	INCOME	AS	PS	SML	TPI
MALE	37 YRS	OPEN	SE	8 YRS	2.4 LAKHS	ASY	PSY	SMLY	DA

OWP	VHE	ETS	ROF	YAM	EOP	RE	AOD	PW	SCM
SA	SA	SA	DA	SDA	DK	DA	DK	SA	A

Log odds = 0.513 + 0(1) + 2.198(1) + 0(1) + 1.346(1) + 1.065(1) + 0(1) + 0 (1) + 0(1) + 0(1) + 1.334(1) + 0.055(1) - 2.407(1) - 1.628(1) + 1.969(1) + 0(1) + 2.105(1) - 0.019(1) + 1.090(1) - 2.750(1)+ - 0.435(1)

= 4.436

Odds = EXP (4.436) = 84.44

Predicted Probability = 84.44 /1+84.44 = 0.988

This value 0.988 is the probability of the considered case successfully quit smoking.

6. CONCLUSION

From the study results we can conclude that old age and middle age users of combusting tobacco products are significantly more likely to successfully quit tobacco smoking than young age users. Combusting tobacco users who are aware of ill effects of passive smoking and smokeless tobacco use are more likely to successfully quit tobacco habit than smokers who are not aware. Individual perceptions are significantly more effective in successful cessation. Very less prevalence rates found in study indicate the vulnerable groups where still encouragement of cessation is needed.

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International Journal of Advance and Innovative Research
Volume 5, Issue 3 (III): July - September, 2018
ISSN 2394 - 7780

THE CONGRUITY BETWEEN INTERANNUAL VARIATIONS OF RAINFALL, OLR AND TEMPERATURE MAXIMA – MINIMA IN THE CONTEXT OF INDIAN SUBCONTINENT

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ABSTRACT
Most of the rainfall in Indian Subcontinent occurs from June to September and the variability of summer monsoon has a tremendous socio-economic impact on India, especially in the fields of agriculture and health. The study is based on the interannual variation of Indian rainfall and examining its relationship with temperature maxima-minima and Outgoing Longwave Radiation. The data used in this study are the monthly rainfall and temperature data of Indian Subcontinent – period 1951-2013 and the monthly Outgoing Longwave Radiation data of 9 subzones des cribed on the global basis – period 1979-2013. The Anomaly method, Monte Carlo method of correlation and Bootstrapping method of Confidence Interval were employed in analysis. A negative correlation was found when rainfall and maximum temperature were analyzed on a seasonal basis showing that increase in temperature decreases rainfall, which is likely to impact on water resources availability. The North Sub Tropic and the South Sub Tropic regions show a strong negative relation with rainfall for the season March-April-May. Whereas, for the monsoon months (June to Septmebr), the North Tropic region shows a strong negative correlation with rainfall.This lead to the fact that high convective activity of some regions represents high precipitation in Indian Subcontinent.

Keywords: Monte Carlo; bootstrapping; Rainfall; temperature; correlation

1. INTRODUCTION

According to a **report [20]** on the environment, the two essential atmospheric elements which describe climate are air temperature and precipitation, by absolute effects on human life and ecosystems. For example if air temperature increases, heat waves increases causing deaths and illness; the variation in rainfall with reference to time and amount, affects the availability of water sources for drinking, irrigation and industry. Further the annual and seasonal patterns of the two elements also determine the types of flora and fauna of particular region. Due to rise in the average temperature at the earth's surface, there is an increase in precipitation but some areas are experiencing more warming but less precipitation hence, precipitation varies across the world. In the context of Indian monsoon, Sir Gilbert Walker establishes the correlation of Indian rainfall with variables observed at various global locations and viewed that the Indian monsoon is a global phenomenon, **Krishnamurthy and Kinter III (2002)**.

Globally, a co-variability of monthly mean surface temperature and precipitation was determined from ERA-40 and GPCP data respectively, for the period 1970-2002. Further the results were compared from NCAR CAM3 and CCSM3 by **Trenberth and Shea (2005)**. In view of Climate models, it shows a slower rate of precipitation increase in spite of the rise in global warming, hence, for a comprehensive review, a 90-year analysis of surface evaporation was studied through a multimodel ensemble of simulations under the A1B forcing scenario, **Richter and Xie (2008)**. With the help of correlation technique **Pingping and Arkin (1998)** found a relationship between two data sets on the global basis namely, OLR from NOAA polar-orbiting satellites and precipitation.

By taking the other parts of the globe, **Karabulut et al. (2008)** focused on the Samsum region located in the Black sea region of Turkey and examined a trend analysis in precipitation and temperature with the help of Non-parametric tests (such as Mann-Kendall and Sen's Slope), linear regression and cumulative deviation curve techniques. **Nkuna and Odiyo (2016)** studied the Levubu sub-catchment and investigated the relationship between monthly temperature and rainfall variability for the period 1964/65-2009/2010 with the statistical techniques as the Standardization Procedure; Pearson's correlation analysis and Cross-correlation. The daily rainfall data of 50 sites across southern Ontario were used by **Zhenhao et al. (2005)** to investigate the association of summer regional rainfall with OLR and moisture convergence from 1991 to 2000. A spatially dependent formula was derived by **Yoo and Carton (1988)**, to estimate rainfall from satellite-derived OLR data and the height of the base of the trade-wind inversion and this formula was constructed by comparing rainfall record from twelve islands in the tropical Atlantic with 11 years of OLR data. A good explanation is given by **Allan et al. (1999)** on the dependence of clear sky outgoing longwave radiation (OLR) on surface temperature and relative humidity based on a simulation of the earth's clear-sky longwave radiation budget; uses European Centre for Medium-Range Weather Forecasts global reanalysed fields to calculate clear-sky OLR for the period

ISSN 2394 - 7780

January 1979 to December 1993. Another investigation was made by **Charlock et al. (1990)**, to see the relationship between low-frequency variations in extratropical fields of OLR and geopotential Teleconnection patterns in the Northern Hemisphere with the help of principal components analysis.

Other important aspects to understand Indian monsoon, is the monsoon in South Asian regions. **Neng et al. (2005)**, used Monte Carlo method to study the relation between South Asian Summer Monsoon and All India Summer Monsoon. **Kothawale et al. (2010)** focused on the recent trends in extreme temperature events for the pre-monsoon season using daily data on maximum and minimum temperatures for the period (1970-2005). The pre-monsoon season (Mar-Apr-May) are the hottest part of the year over the entire South Asian region during which the heat waves are recurring natural hazards having serious societal impacts, particularly on human health.

In the context of Indian Subcontinent, **Roy and Balling Jr. (2005)** analyzed the seasonal trends in the maximum and minimum temperature, diurnal temperature range (DTR) and cloud cover for the time period 1931-2002. A trend analysis was carried out by **(Arora et al. 2005; Jain and Kumar 2012**; **Addisu et al. 2015; Khavse et al. 2015)** of variables like mean maximum and mean minimum temperatures and rainfall which was confirmed by Mann-Kendall trend test. **Jain et al. (2013)** examined, trends in monthly, seasonal, and annual rainfall and temperature on the subdivision and regional scale, basically, northeast India, for the period 1871–2008. **Balachandran et al. (2006)** examined the local and teleconnection association between Northeast Monsoon Rainfall (NEMR) over Tamil Nadu and global Surface Temperature Anomalies (STA) with a monthly gridded STA data set for the period 1901–2004. Another relationship was analyzed between Outgoing Longwave Radiation over tropical Asia and Indian Summer Monsoon (June to September) by **Prasad and Bansod (2000)** using data from June 1974 to September 1993.

The main objective of the paper: to see the interannual variation in rainfall, temperature, and OLR with the help of anomaly method; to perform correlation analysis between rainfall and temperature across India; to find a relationship between Indian rainfall and OLR of 9 subzones which are described in material and methodology section. Apart from taking single monsoon months data authors try to analyze all the three seasons: pre-monsoon (March-April-May), monsoon (June-July-August-September), post-monsoon (October-November-December). Instead of using Pearson's Correlation technique, Monte Carlo Simulation method for correlation and Bootstrapping methods are used in this study. Further, the study will be beneficial to understand the variation in Indian rainfall with reference to temperature and OLR, hence, further in forecasting.

2. MATERIAL AND METHODOLOGY

Abbreviations used: MAM-March-April-May; JJAS-June-July-August-September; OND-October-November-December; OLR-Outgoing Longwave Radiation; RF-Rainfall; NT-North Tropic; NST-North Sub Tropic; NTemp-North Temperate; NSP-North Sub Pole; ST-South Tropic; SST-South Sub Tropic; STemp-South Temperate; SSP-South Sub Pole.

This is an observational analysis based on the monthly Outgoing Longwave Radiation from NOAA NCEP CPC GLOBAL; monthly Indian rainfall, maximum and minimum temperature data obtained from Indian Meteorological Department. The full report on the development of the Indian Meteorological Dataset is described by **(Rajeevan et al. 2006; Rajeevan et al. 2008)** and **Srivastava et al. (2009)** respectively. It discusses the high resolution (1° * 1° lat. /long.) daily gridded rainfall dataset for the Indian region with the full detail of data used, quality control adapted and methodologies of interpolation. For analysis, the period taken for rainfall and temperature data is from 1951 to 2013. The period for monthly OLR data is from 1979-2013. The packed description of OLR data can be obtained from the site below:

https://iridl.ldeo.columbia.edu/index.html?Set-Language=en

To study the interannual variation with reference to OLR, nine subzones are taken around the globe, on the basis of climatology, except the Polar Regions. The subzones are divided as: *Equator from 2.5^{o}N- 2.5^{o}S; North Tropic from 2.5^{o}N- 25^{o}N; North Sub Tropic from 25^{o}N- 45^{o}N; North Temperate from 45^{o}N- 67.5^{o}N; North Sub Pole from 67.5^{o}N-80^{o}N; South Tropic from 2.5^{o}S- 25^{o}S; South Sub Tropic from 25^{o}S- 45^{o}S; South Temperate from 45^{o}S- 67.5^{o}S; South Sub Pole from 67.5^{o}S-80^{o}S.* The months are divided into seasons on the basis of Indian Subcontinent seasons as: January-February, March-April-May, June-July-August-September and October-November-December, **Ranade et al (2007)** and hence used in analysis. For the correlation with OLR only three seasons are analysed i.e. March-April-May, June-July-August-September and October-November-December.

The authors try to analyse the variation of Indian Rainfall with the help of anomaly method. The relationship of Indian rainfall is examined with the maximum and minimum temperature data of Indian Sub-continent and

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OLR data of the above defined regions. The anomalies for meteorological elements like RF, maximum and minimum temperature and OLR for the specified regions, was calculated according to the method as described by **Nkuna et al. (2016)**. The positive and negative anomaly signifies the warming and cooling condition in reference to temperature respectively. Whereas, in case of rainfall and OLR it refers to the increase and decrease in the respected parameters. The most widespread method to make out the relation between the variables i.e. correlation technique is applied to the variables but with the help of "*Monte Carlo Simulation*". The main theory behind this approach is that a randomly chosen sample tends to exhibit the same properties as the population from which it is drawn, **(Raychaudhuri 2008)**. For the Monte Carlo method of correlation, the random numbers were generated from a normal distribution with the help of mean and standard deviation of our data, with reference to **(Raychaudhuri 2008)**. A confidence interval was set up for the data and it was estimated by the method known as "*Bootstrapping*". It is often assumed to make more sense than testing a null hypothesis, **(Wood 2004)**. Also, the method Bootstrap confidence interval has a number of advantages over conventional methods which are thoroughly explained in, **(Wood 2004)**.

3. RESULTS AND DISCUSSION

3.1 Analysis OLR anomaly data and its relation with Indian rainfall.

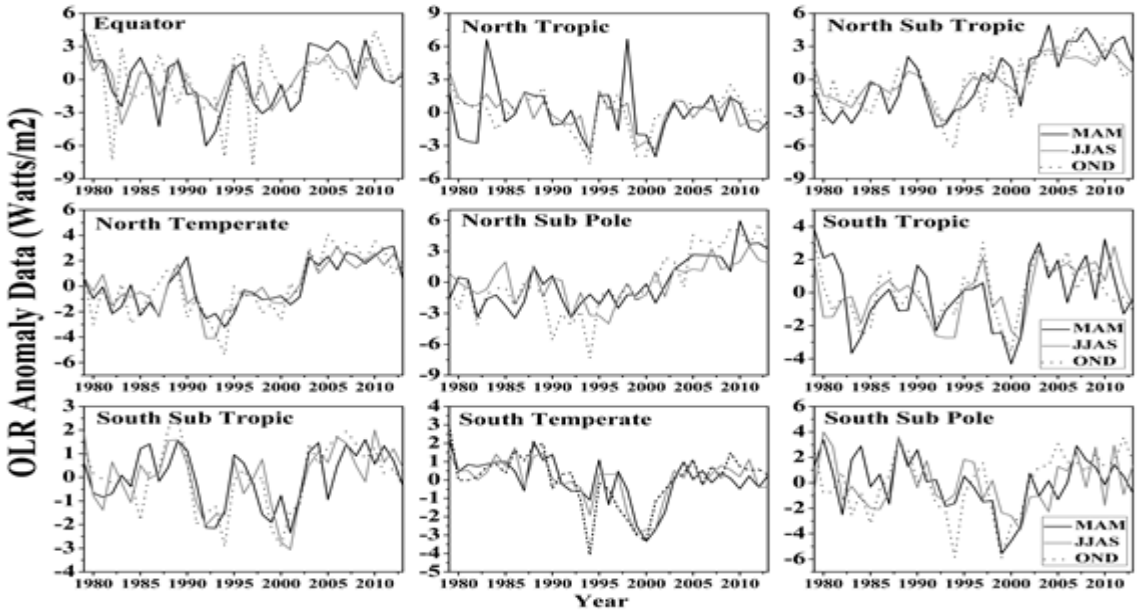

Figure-1: Interannual variability of OLR Anomaly of three Seasons for 9 subzones

Figure 1 describes the Interannual variability of OLR anomaly for MAM, JJAS, and OND of nine subzones. The **Equator** region shows a large variation in all the three seasons. A highest positive OLR anomaly of +4.5 can be seen for MAM and OND, whereas JJAS shows the highest positive OLR anomaly of +3. The season OND shows the highest negative anomaly of -7.5 during the years 1982-83, 1993-94 and 1997-98. The highest negative anomaly for the season MAM is of -6 during the year 1992-93 and for the season JJAS is off -4.5 around 1983-84. The **North Tropic** region shows a constant range of positive and negative anomaly for all the three seasons except, the two high peaks of the positive anomaly of the season MAM of about +7 during 1983 and 1997. The range of OLR anomaly for all the three seasons are -4 to +4. An increasing trend can be seen in all the three seasons in the **North Sub Tropic** region. The range of OLR anomaly for MAM, JJAS, and OND are -4 to +5, -3.5 to +3 and -6 to +5 respectively whereas the **North Temperate** shows -3 to +3, -4 to +3 and -5 to +4 respectively. An increasing trend in all the seasons can be seen in the **North Sub Pole** region with the highest peak of a positive anomaly in MAM of about +6 during the year 2010 and the highest negative anomaly in OND of about -7.5 during the year 1994.

A large constant variation of OLR anomaly is seen in MAM, JJAS and OND of the **South Tropic** region and **South Sub Tropic** regions with ranges -4.2 to +3.8; -3 to +3; -3 to +3.2 and -2 to +1.5; -3 to +2; -3 to +2.5 respectively. For the **South Temperate** region, a high negative anomaly is seen during the years 1994 and 2000 in all the three seasons. A high positive anomaly of +3 is seen in the season OND during the year 1979. For the **South Sub Pole** region, the year 1994 shows a high negative anomaly for the season JJAS of about -6 and the year 1998 shows a high negative anomaly -6 for the seasons MAM and OND. It can be discerned that for the last 10 years (2003-2013) in all the nine subzones during most of the period, the three seasons i.e. MAM, JJAS and OND seasons shows a positive OLR anomaly i.e. above than normal.

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Table-1: Monte Carlo Correlation and Confidence Interval between RF and OLR

	Mar-Apr-May	Jun-Jul-Aug-Sep	Oct-Nov-Dec
Equator	0.40 [-0.27 0.41]	0.34 [-0.35 0.36]	-0.37 [-0.39 0.25]
North Tropic	0.34 [-0.28 0.35]	-0.42 [-0.43 0.10]	-0.42 [-0.44 0.27]
North Sub Tropic	-0.60 [-0.60 -0.02]	0.44 [-0.14 0.50]	-0.43 [-0.50 0.15]
North Temperate	-0.35 [-0.36 0.25]	0.48 [-0.15 0.50]	-0.55 [-0.56 0.07]
North Sub Pole	0.33 [-0.28 0.34]	0.54 [0.11 0.55]	-0.50 [-0.50 0.01]
South Tropic	0.32 [-0.33 0.35]	0.33 [-0.33 0.34]	-0.40 [-0.45 0.38]
South Sub Tropic	-0.38 [-0.39 0.19]	0.46 [-0.11 0.48]	-0.47 [-0.47 0.19]
South Temperate	0.54 [0.05 0.54]	0.32 [-0.24 0.33]	-0.44 [-0.47 0.28]
South Sub Pole	0.52 [-0.11 0.53]	0.41 [-0.12 0.42]	-0.51 [-0.52 0.10]

For the pre-monsoon season MAM, the regions South Temperate, South Sub Pole and The Equator shows a strong positive relation with Indian RF. Whereas, the regions North Sub Tropic and South Sub Tropic shows a strong negative relation with RF. For the monsoon season JJAS, all the defined regions shows a good positive relation with RF except the North Tropic region which shows a strong negative relation. For the post monsoon season OND, all the regions show a negative relation whereas some regions like NST, NTemp, NSP, SST, STemp and SSP shows a strong negative relation with RF.

3.2 Analysis of Rainfall and Temperature data

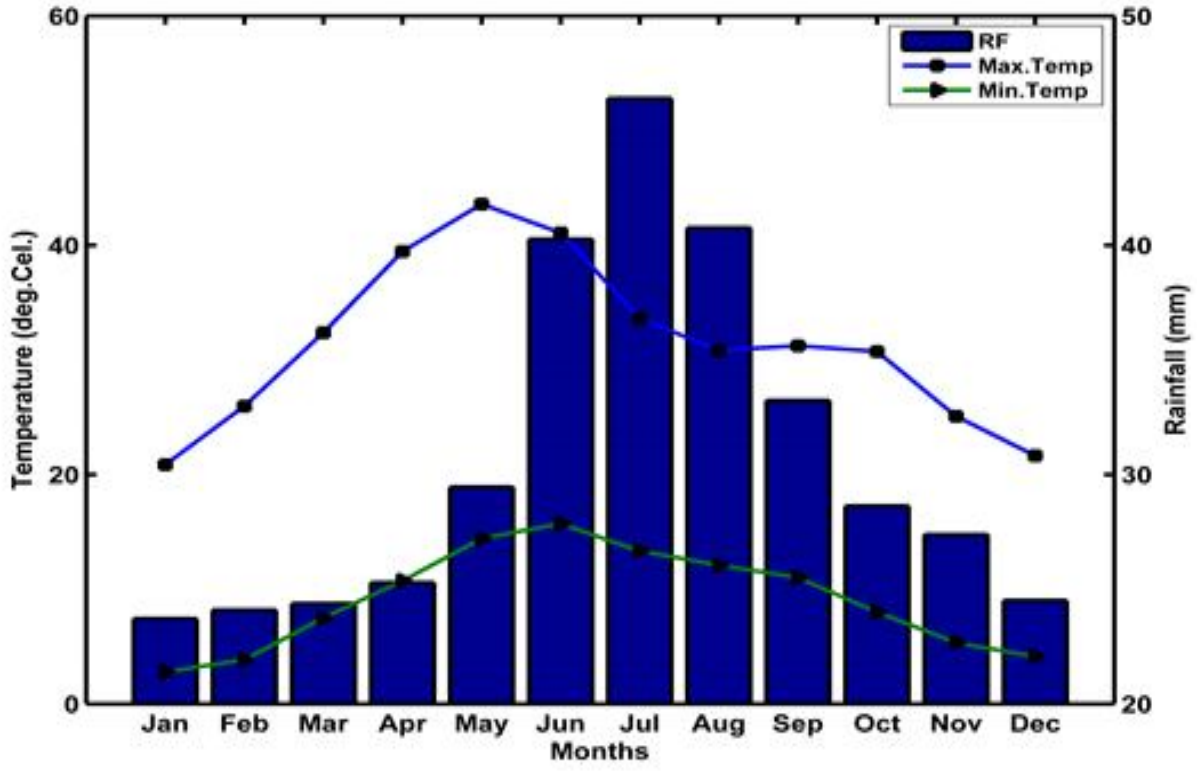

Figure-2: Average monthly maximum and minimum temperatures and rainfall for the period 1951 to 2013

The maximum and minimum temperature for the Indian sub-continent are from May to July whilst the lowest are from the months December to March (Figure 2).The rainy season occurs from June to September and the least rain is experienced in the months January to March.

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3.3 Analysis of Anomalous Years for the period 1951-2013

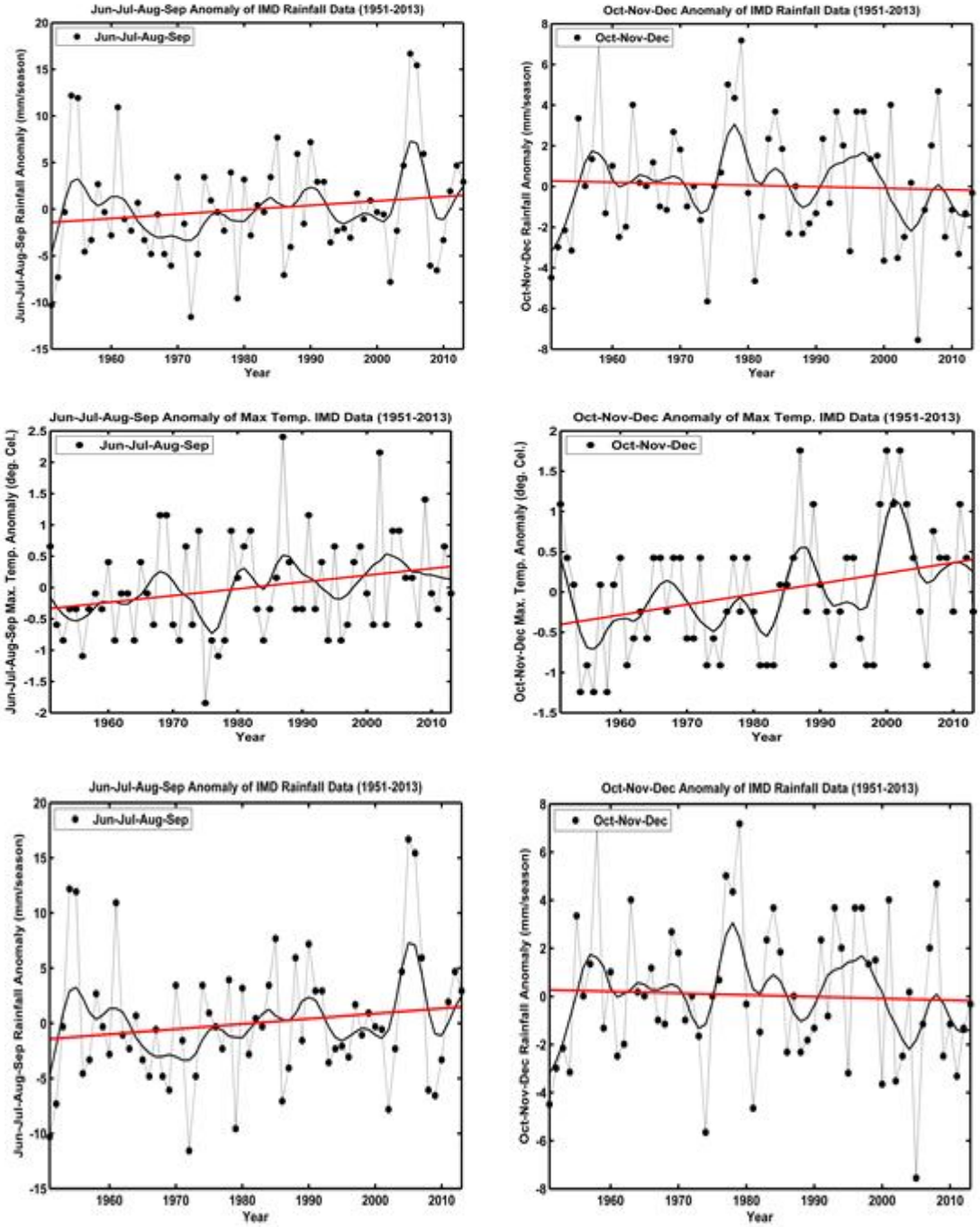
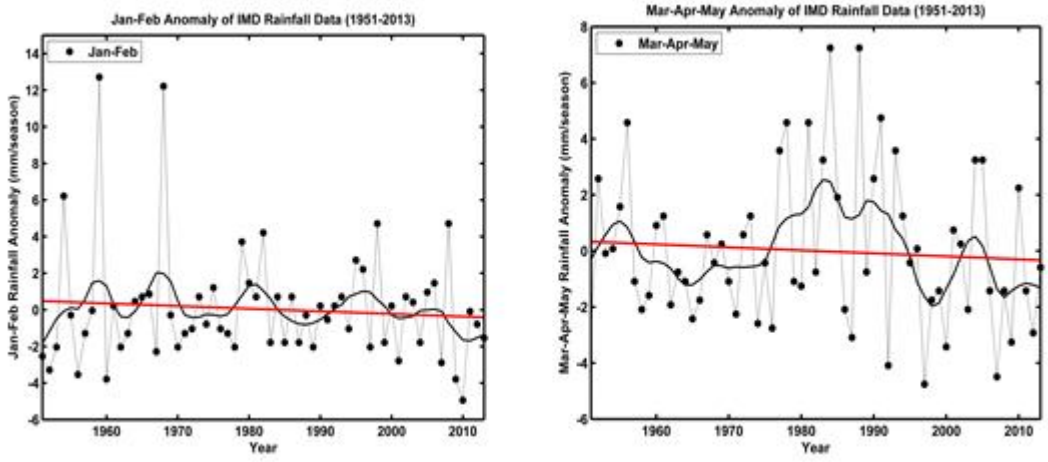


Figure 3: Interannual variability of anomaly of RF, Max. and Min. Temp. for the seasons JJAS and OND



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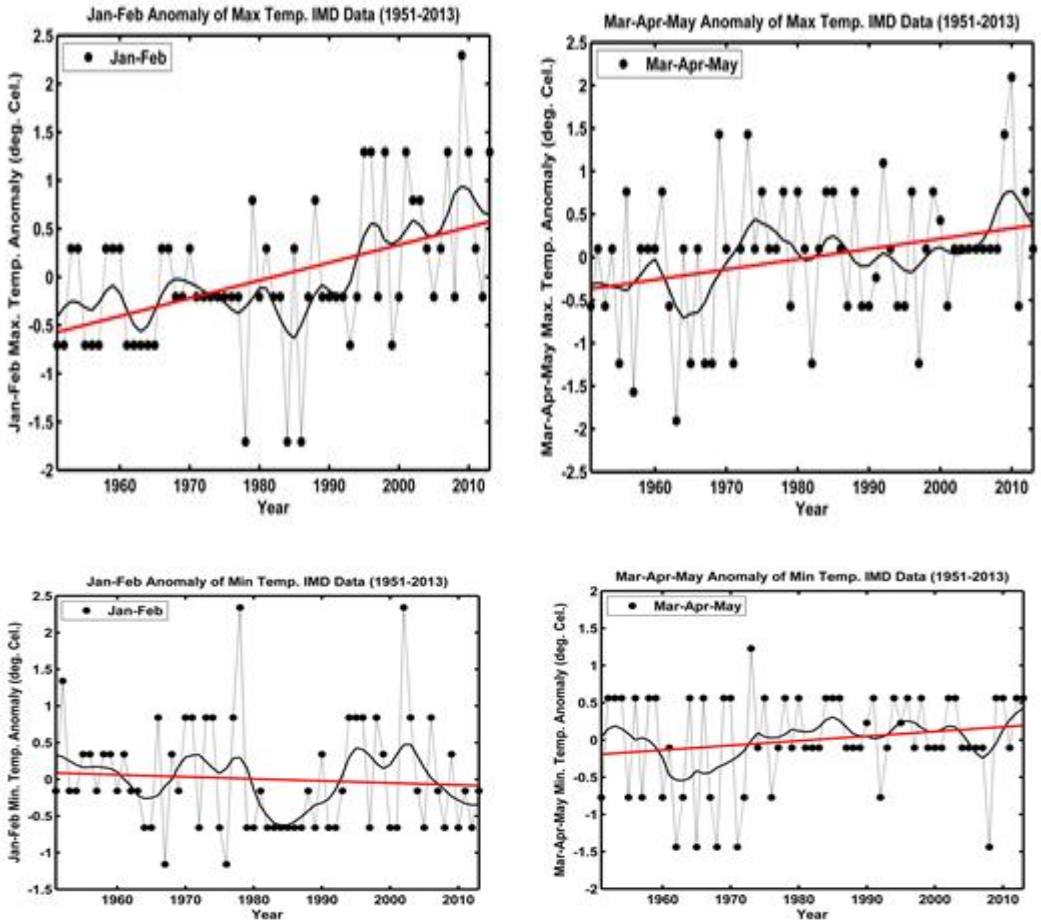

Figure-4: Interannual variability of anomaly of RF, Max. and Min. Temp. for the seasons JF and MAM

The interannual variability of seasonal rainfall and maximum and the minimum temperature of all the defined four seasons are shown in Figure 3 and Figure 4. The season JJAS show a high rainfall, a positive anomaly of about +12 which is more than the normal, during the years 1953, 1954 and 1961, whereas the years 2005 and 2006 show the positive anomaly of +16. The years 1972 and 1979, faces a less rainfall than the normal of about -10. For maximum temperature, the highest positive anomaly is seen during the year 1987 of about +2.5 and of +2.2 during the year 2002, which signifies the increase in temperature. The highest negative anomaly is seen during the year 1975 of about -2 from the normal showing the warming condition in temperature. The minimum temperature shows the highest positive anomaly during the years 2002 and 2012 of +1, whereas the highest negative anomaly of -1.3 is seen during the year 1976. For the season OND, rainfall is more than the normal during the years 1958 and 1979, having the highest positive anomaly of about +7, whilst the highest negative anomaly of -7 is seen during the year 2005. The highest positive anomaly in maximum temperature is seen during the years 1986, 2000 and 2002 of +1.8. Whereas, the years 1954, 1956 and 1958 shows the highest negative anomaly of about -1.3. For the minimum temperature, the highest positive anomaly of +1.2 is seen during the years, 1951, 1969, 1977, 1982, 1987, 1989-90, 1992-93, 1996-98 and 2001-03. The highest negative anomaly of about -1.6 is during the year 1967.

The season JF shows a very high rainfall above than normal, a positive anomaly of about +12, during the years 1959 and 1968 while the year 2010 show rainfall less than the normal with the highest negative anomaly of about -5. The maximum temperature shows the highest positive anomaly during the year 2009 of about +2.4 whereas the highest negative anomaly shows during the years 1978, 1984 and 1986 of -1.8. The highest positive anomaly in minimum temperature is seen during the years 1978 and 2002 of about +2.4 and the highest negative anomaly of about -1.3 during the years 1967 and 1976.

There is a rainfall more than the normal during the years 1978-79, 1981, 1983-84 and 1989-90 in the season MAM, on the other side the years 1992, 1998 and 2008 show a low rainfall than the normal. The highest positive anomaly in maximum temperature is seen during the year 2010 of about +2.2 and the highest negative anomaly is seen during the year 1963 of about -2. In minimum temperature, the highest positive anomaly is seen during the year 1973, whereas, the highest negative anomaly is seen during the years 1962, 1965, 1968, 1971 and 2008 of about -1.5.

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3.4 Comparison of RF, Max. Temp and Min. Temp. for the period 1979-2013 Year

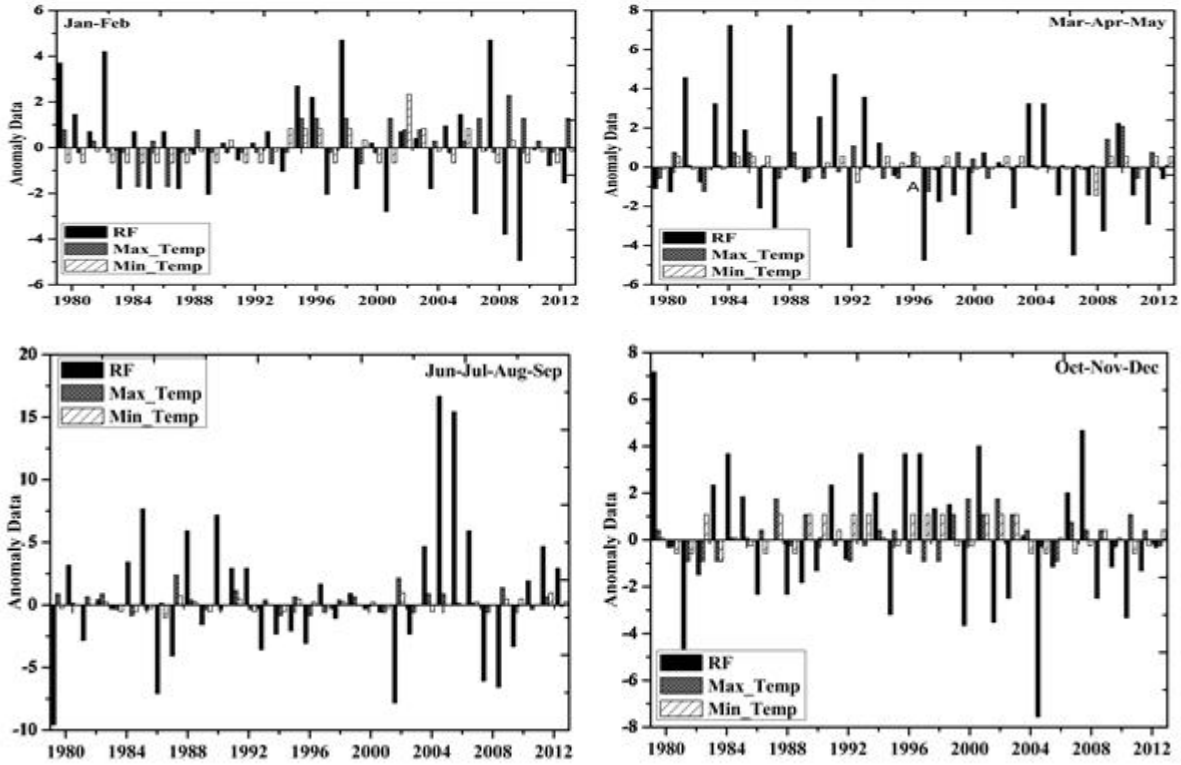

Figure-5: Comparison of anomaly of RF, Max. and Min. Temp. of all the four seasons for the period 1979-2013.

A comparison is seen in Figure 5 of rainfall, maximum and minimum temperature for the period 1979-2013. For the season Jan-Feb, the year 2009 shows the high negative anomaly in rainfall but a high positive anomaly is seen in maximum temperature. The years 1997 and 2007 shows a positive anomaly both in rainfall and maximum temperature. The years 1984-85 and 2009 a good positive anomaly is seen in all the three defined variables for the season Mar-Apr-May. In the season Jun-Jul-Aug-Sep the year 2003-04 shows a positive anomaly in rainfall and maximum temperature. The year 1979 shows a high negative anomaly in rainfall but a positive anomaly is seen in maximum temperature. In the season Oct-Nov-Dec, the year 1979 shows a good positive anomaly in rainfall and also a positive anomaly is seen in maximum and minimum temperature. The years 1981 and 2005 a good negative anomaly is seen in rainfall, also a negative anomaly is seen in maximum and minimum temperature.

Table-2: Correlation and Confidence Interval of RF with Max. and Min. Temperature

	Jan-Feb	Mar-Apr-May	Jun-Jul-Aug-Sep	Oct-Nov-Dec
Max. Temp.	-0.46	-0.36	-0.33	-0.31
	[-0.51 0.27]	[-0.21 0.41]	[-0.45 0.23]	[-0.43 0.17]
Min. Temp.	0.42	0.30	-0.33	0.40
	[-0.13 0.48]	[-0.17 0.41]	[-0.40 0.25]	[-0.14 0.48]

Table 2 shows the correlation and confidence interval of rainfall with maximum and minimum temperature for all the seasons i.e. Jan-Feb, Mar-Apr-May, Jun-Jul-Aug-Sep, and Oct-Nov-Dec. A good negative correlation is seen between rainfall and maximum temperature for all the seasons. Whereas, the minimum temperature shows a positive correlation with rainfall for the seasons Jan-Feb and Mar-Apr-May and Oct-Nov-Dec and a negative correlation is seen for the season Jun-Jul-Aug-Sep.

4. CONCLUSION

The maximum temperature shows an increasing trend in all the four seasons Jan-Feb, Mar-Apr-May, Jun-Jul-Aug-Sep and Oct-Nov-Dec. The minimum temperature shows an increasing trend in the season Oct-Nov-Dec. A good positive and negative correlation were found when the monthly averages for rainfall and temperature maxima-minima were correlated on the seasonal basis. The minimum temperature and rainfall show a positive correlation for pre-monsoon (MAM) and post-monsoon (OND) season clarifying the fact that the monthly data for temperature and rainfall behave in the same manner, furthermore, for the cool years the rainfall increases. Whereas, a negative correlation is seen for the maximum temperature and rainfall for pre-monsoon and post-monsoon seasons concluding that the monthly data behave in the opposite manner, hence, warm years and less

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rainfall. In consideration to the monsoon season (JJAS), a negative correlation is seen for rainfall and temperature maxima-minima. Thus, the study reveals that increase in temperature is not always an increase in rainfall, henceforth, impact on water resources availability. Thus, a careful management of water resources is a high priority because of variability in annual temperature and rainfall. Therefore, water and municipal managers, farmers and communities need to come forward with other replacement of water sources.

The other parameter which is OLR of the nine subzones shows a good relationship with Indian rainfall. There is a strong positive correlation for the pre-monsoon season MAM with the regions South Temperate, South Sub Pole and Equator which accomplishes that high OLR represents high rainfall in Indian Subcontinent. Further, the regions North Sub Tropic and South Sub Tropic shows a strong negative relation with RF. Considering the monsoon months JJAS all the regions shows a good positive relation with RF except the North Tropic region showing the strong negative correlation. The nine subzones show a strong negative relation with RF for the post-monsoon season OND. This determines that low OLR (or high convective activity) represents high RF over the Indian Subcontinent. By associating the last 10 years of OLR and RF from the anomaly plots (Figure 1, Figure 3 and Figure 4), an increase in OLR can be seen and a decrease in Indian rainfall can be observed.

The result looks perfect by taking the parameters like maximum and minimum temperature and OLR and incorporating the Monte Carlo method of correlation for the analysis. The accuracy can be more if other parameters and regions are added and compared with Indian rainfall variability. The researchers want to extrapolate the findings and the analysis report to review and analyze the effect on the aforesaid region which might influence the various aspects and variables.

ACKNOWLEDGMENTS

We thank IRI Data Library which is a powerful and freely accessible online data repository and helps the user to view, download and analyse the reanalysis climate data. We are very thankful to Indian Meteorological Department for providing us the Rainfall data and Maximum and Minimum Temperature data. We thank Dr. Ashwini Ranade for her support and guidance. We thank Dr. Gnanseelan for his motivation. We would also like to thank the Department of Physics and the Department of Civil and Environmental and Engineering, B.I.T, Mesra, Ranchi for this cooperation.

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International Journal of Advance and Innovative Research
Volume 5, Issue 3 (III): July - September, 2018
ISSN 2394 - 7780

BEHAVIOR OF POLYPROPYLENE FIBRE ON STRENGTH OF CONCRETE

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ABSTRACT
Concrete is the composition of coarse aggregate, fine aggregate, cement and water. Sometime admixtures also added in the concrete mix for the improvement of the various properties like workability, strength. Concrete is strong in compressive strength but limited to certain extent due to poor tensile strength, brittleness, poor resistance to impact load and low ductility.Now a day's different types of fibres used in concrete mix to improve the strength of concrete mix. The polypropylene fibres can be used in place of steel and glass fibre in concrete mix due to its good binding property which can slow down the settlement of aggregate. In present study polypropylene fibres are added as an additive in M-30 grade concrete mix and various laboratory experiment are performed on different percentage of fibre i.e. 0.5%, 1.0%, 1.5%. The investigation include compaction factor, compression test, split tensile test and flexural strength test and reveals that 1.5% addition of polypropylene fibre gives optimum result.

Keywords: compressive, fibres, split, tensile, workability

1. INTRODUCTION
Since the plain, unreinforced concrete is a brittle material, with a low tensile strength and a low strain capacity, strength and durability of concrete produced can be changed by making suitable changes in its ingredients like cementitious material, aggregate and water and by adding some special ingredients like fibres as polypropylene fibre, steel fibres, plastic fibres and glass fibres etc. The function of randomly dispersed fibres is to bridge across the cracks that provides some post cracking ductility. If the fibres like polypropylene fibres which are strong enough and perfectly bonded to the material, permits the FRC to carry noteworthy stresses over a relatively large strain capacity in post cracking state. Different types of polypropylene fibres can be used to reinforce concrete. Addition of fibre in concrete is carried from a very long time. First reinforced concrete is invented in 1849 by Joseph Monier. After that, in 1950 fibre reinforced concrete was became the field of interest. First paper on FRC was published in 1963 by Romualdi and Batson. Since steel, glass and polypropylene were used.

Sometimes concrete structures have to survive in adverse conditions under chemical attacks like chloride attack, sulphate attack and acid attack. These chemical attacks affect the durability of concrete structure. For hardened reinforced concrete chloride attack is considered as a cause for corrosion. Chemicals percolate through the cracks developed in the concrete structures and corrode the reinforcement provided in the concrete and thus the deterioration of structure starts and the durability of structure get affected. Use of polypropylene fibres reduced the generation of cracks. Mostly the chloride attack is seen in structures those are immersed in saline water or situated near saline water.

2. MATERIAL AND METHODOLOGY
2.1 Cement and its characterization
Cement used in present study is of 43 grade Ordinary Portland Cement (IS: 8112-2000) most widely used for construction work.

Specific gravity of cement = 3.16

2.2 Aggregates
Aggregates are important constituent of concrete mix. Aggregates are generally inert filler within a concrete mix. But a closer look reveals the major role and influence aggregate plays in the properties of both fresh and hardened concrete. There are some factors which affect the character and performance concrete mix such as changes in gradation, maximum size, unit weight, and moisture content.

2.2.1 Fine Aggregate
Fine aggregate is which satisfied the required properties of fine aggregate required for experimental work and the sand conforming to grading Zone II of Table 4 of IS 383:1970.

a) Specific gravity = 2.65

b) Fineness modulus = 2.74

c) Moisture content = 1.0%

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2.2.2 Coarse Aggregate

The coarse aggregate used conforming from IS 383: 1970. Coarse aggregates of different sizes may be combined in suitable proportions so as to result in an overall grading conforming to Table 2 of IS 383:1970 for particular nominal maximum size of aggregate.

Crushed gravel of 20 mm & 10 mm maximum size has been used as coarse aggregate in proportion of 3:2. The sieve analysis of combined aggregates confirms to the specifications of IS 383: 1970 for graded aggregates.

a) Specific gravity = 2.74

b) Fineness Modulus = 6.9

c) Moisture content = 0.6%

2.3 Polypropylene Fibre

Polypropylene fibre used in the present experimental study is fibrillated 100% virgin PPF and multifilament combination in 10mm length. Specifications & mechanical Properties of this polypropylene fibre given by manufacturer are given in Table 1.

Table-1: Cheracterization of Polypropylene Fibre

Parameter	Properties
Length	10mm
Thickness	2mm
Tolerance for length and thickness	±15 %(ASTM C 1116)
Melting point	165ºc
Absorption of water	Nil
Elongation	19%

2.4 Water

Water is an important constituent of concrete as it actively participates in the chemical reaction with cement. It helps to form the strength giving cement gel. Water which has undesirable organic substances or inorganic constituents in excessive proportions does not use foe mixing. In this project clean potable water was obtained from water tap in concrete laboratory of Poornima University for mixing and curing of concrete.

2.5 Methodology followed

Concrete is the base of any construction, without concrete no construction could ever exist. Concrete consists of Cement, Sand (Fine Aggregate), Gravels (Coarse Aggregate), Water, Admixtures, Additives. Here addition of various percentages of polypropylene fibre (0%, 0.5%, 1% & 1.5%) in concrete.

In this study M-30 grade Mix-Design is done, the effect of Concrete with addition of polypropylene fibres has been investigated with casting of total 48 specimens. It includes 6 controlled mix concrete cube specimens (0% polypropylene fibre), 4 controlled mix concrete cylinder specimens (0% polypropylene fibre) and 2 controlled mix concrete beam specimens (0% polypropylene fibre) and specimens with above percentage of polypropylene fibre. The specimens have been prepared of the Mix-Design M30 grade concrete based on IS 10262:2009. Cube specimens of the dimensions 150×150×150 mm, cylinder specimens 300mm (length) × 150mm (dia.) and beam specimens of dimensions 100×100×500 mm were cast. Normal curing in tap water is done. Strengths tests at two different ages 14 & 28 days were conducted. Following tests are conducted for different materials (cement, coarse aggregate and fine aggregate), fresh concrete and harden concrete as given in table 2.

Table-2: IS Code followed

S. No.	Tests	IS CODE
1.	Test for specific gravity & water absorption of aggregate	IS 2386 (Part-3) :1963
2.	Specification for coarse and fine aggregates from natural sources for concrete	IS 383:1970
3.	Concrete compacting factor test	IS 1199:1959
4.	Methods of test for aggregates for concrete: part 1 particle size and shape	IS 2386 (part-1):1963
5.	Specification for concrete slump test apparatus	IS 7320:1974
6.	Specification for 43 grade ordinary Portland	IS 8112:1989
7.	Compressive strength test of concrete	IS 516:1959
8.	Splitting tensile strength of concrete	IS 5816:1999
9.	Flexural strength test of concrete	IS 516:1959

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3 EXPERIMENTAL INVESTIGATIONS

3.1 Workability of Concrete

Workability of concrete is an important property to determine before placing of concrete. A concrete is said to be workable if it is easily transported, placed, compacted and finished without any segregation. Concrete with high compaction factor is said to be more workable.

Table 3 – Compaction factor of mixed samples

PPF percentage	Compaction factor
0%	0.93
0.5%	0.89
1%	0.87
1.5%	0.84

Table 3 shows values of compaction factor for the different values of polypropylene fibre content in concrete. Concrete without fibre has high compaction factor whereas concrete with maximum fibre content showed lowest compaction factor.

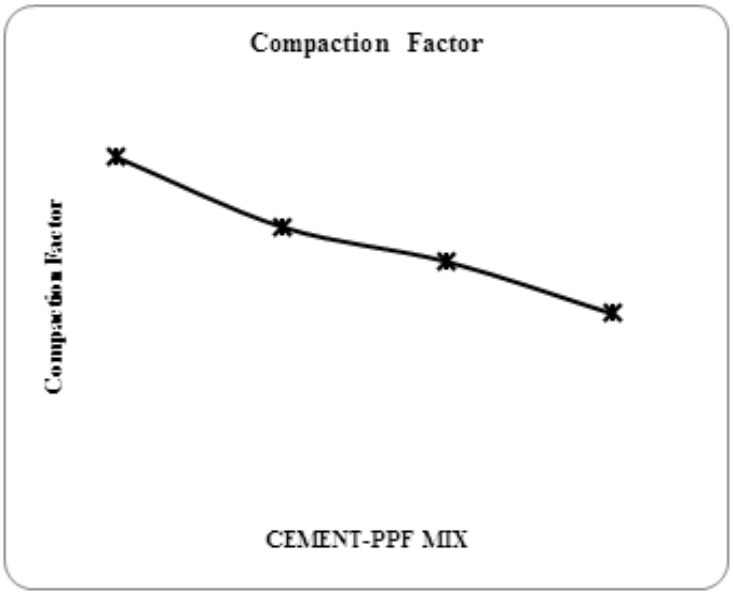

Fig-1: Compaction Factor test Cement-PPF mixes

Figure 1 shows the comparison of Compaction factor for various fibre content percentages. It is observed that as the polypropylene fibre content in concrete increases compaction factor of concrete decreases accordingly hence the workability decreases. So concrete with 0% fibre has high workability and concrete with 1.5% has lowest workability.

3.2 Compressive strength of concrete

Compressive strength of concrete is utmost property of concrete. Cubes of dimensions 150×150×150 mm were cast and testes for compressive strength on compression testing machine.

Table-4: Compressive Strength

Polypropylene Fibre %	14 Days			28 Days		
	No. of Cubes	Compressive Strength	Percentage Increased	No. of Cubes	Compressive Strength	Percentage Increased
0%	3	27.55	-	3	29.67	-
0.5%	3	31.12	15.25%	3	33.47	11.5%
1%	3	37.86	40.22%	3	42.06	40.02%
1.5%	3	40.06	48.37%	3	46.12	53.7%

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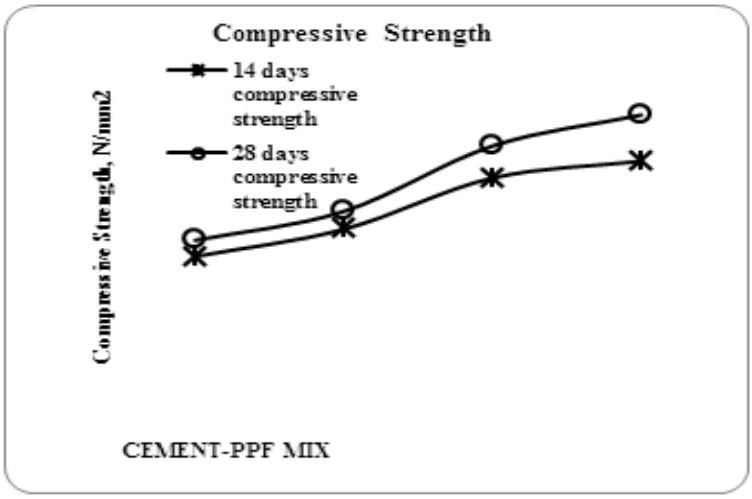

Fig-2: Compressive Strength Cement-PPF mixes

It was observed from figure 2 that minimum compressive strength was obtained at 0% addition of polypropylene fibre while optimum compressive strength was obtained at 1.5% addition of polypropylene fibre at 14 days curing of cubes.

It was also observed from figure 3 that minimum compressive strength was obtained at 0% while optimum compressive strength was obtained at 1.5% addition of polypropylene fibre at 28 days curing of cubes.

It was observed form table 4 that optimum percentage increment in compressive strength of concrete was 48.73% (form 0% to 1.5% addition of polypropylene fibre) at 14 days of curing. While it was also observed that optimum percentage increment in compressive strength of concrete was 53.7% (from 0% to 1.5% addition of polypropylene fibre) at 28 days curing.

3.3 Split Tensile Strength of Concrete

Concrete is weak in tension so the testing of cylinder specimen for tensile strength is required. Cylinders of dimension 150mm (dia.) and 300mm (length) were cast and tested for split tensile strength on universal testing machine.

Table-5: Split Tensile Strength

Polypropylene Fibre %	14 Days			28 Days		
	No. of Cylinders	Split Tensile Strength	Percentage Increased	No. of Cylinders	Split Tensile Strength	Percentage Increased
0%	2	2.68	-	2	2.8	-
0.5%	2	3.89	50.84%	2	4.32	54.28%
1%	2	3.31	23.5%	2	3.67	31.07%
1.5%	2	2.92	8.95%	2	3.13	11.78%

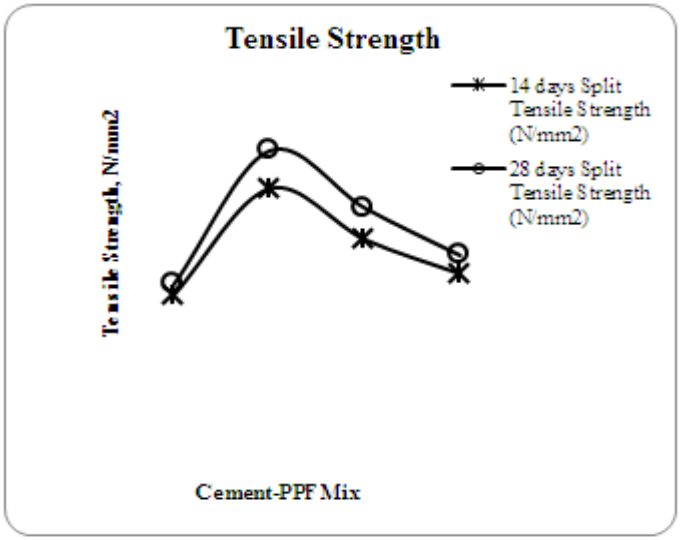

Fig-4: Tensile Strength of Cement-PPF mixes

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It was observed from figure 4 that minimum split tensile strength was obtained at 0% addition of polypropylene fibre while optimum split tensile strength was obtained at 0.5% addition of polypropylene fibre at 14 days curing of cubes.

It was also observed from figure 5 that minimum split tensile strength was obtained at 0% while optimum split tensile strength was obtained at 0.5% addition of polypropylene fibre at 28 days of curing.

3.4 Flexural Strength of Concrete

Flexural strength is one measure of the tensile strength of concrete. It is a measure of an unreinforced concrete beam or slab to resist failure in bending. For flexural strength test beams of dimensions 100×100×500 mm were cast and tested on flexural testing machine.

Table 6: Flexural Strength

Polypropylene Fibre %	28 Days		
	No. of Beams	Flexural Strength	Percentage Increased
0%	2	3.2	-
0.5%	2	4.51	40.93%
1%	2	3.86	20.62%
1.5%	2	3.42	6.875%

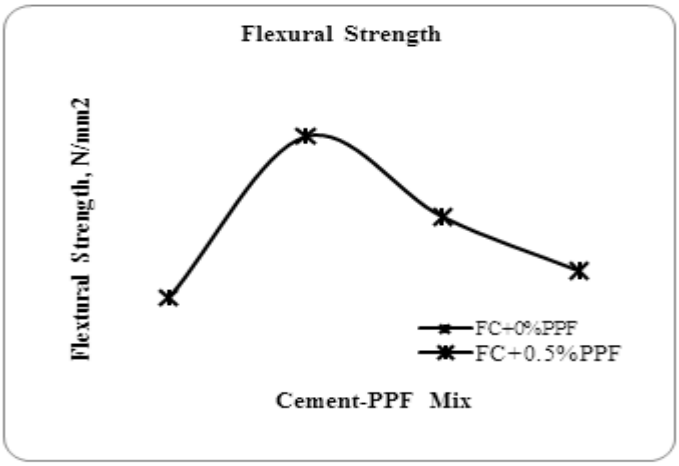

Fig-5: Flexural Strength of Cement-PPF mixes

It was observed from figure 6 that minimum flexural strength was obtained at 0% PPF while optimum flexural strength was obtained at 0.5% addition of polypropylene fibre at 28 days or curing.

It was observed from table 6 that optimum percentage increment in flexural strength of concrete was 40.93% (from 0% to 0.5% addition of polypropylene fibre) at 28 days curing.

CONCLUSIONS

From the study it was observed that compressive strength increased as increase the percentage (%) of polypropylene fibre (0% to 1.5%) after 14 days & 28 days. it was also observed that optimum percentage increment in compressive strength of concrete was 48% for 14 days curing and 53% after 28 days curing (from 0% to 1.5% addition of polypropylene fibre).

The optimum percentage increment in split tensile strength was 50.84% for 14 days curing and 54.28% for 28 days.

It was also noted that flexural strength of concrete increase gradually with addition of polypropylene fibre (0% to 1.5%) and minimum flexural strength was obtained at 0% (3.2 N/mm2). 4.51 N/mm2 optimum flexural strength was obtained with addition of 1.5% polypropylene fibre after 28 days of curing.

The polypropylene fibres (PPF) reduce early age shrinkage of the concrete mix even when low volume fractions of PPF are used. From the result of this research, it was found that the use of fibre in the concrete decreases the workability of the fresh concrete. However, it also reduced the bleeding and segregation in the concrete mixture. It was also seen that the loss/gain in compressive strength of the cube specimens improved with age.

ACKNOWLEDGMENT

This study is supported by the Civil Engineering department of Poornima University Jaipur. The authors would like to acknowledge this support.

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International Journal of Advance and Innovative Research
Volume 5, Issue 3 (III): July - September, 2018
ISSN 2394 - 7780

RURAL-URBAN RELATIONS IN AHMEDNAGAR DISTRICT: A GEOGRAPHICAL ANALYSIS

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1.0 ABSTRACT

An attempt has been made to examine rural-urban relations in Ahmednagar district to the geographical point of view. The entire paper is based on secondary source of data which obtained from census 2011 report. Data has been processed and analyzed by applying statistical techniques such as mean, standard deviation, coefficient of variability and coefficient of correlation. Some assumptions and four indices have been adjudged for investigation of rural-urban relations. It is investigated that role of 'commodity and service exchange' in rural urban relation refers relatively so stronger than that of the 'rural-urban commuting'. Therefore, 'density of towns' and 'agricultural commodity arrival in market' determinants levels of rural-urban interactions.

Five tahsils viz. Nagar, Rahata, Rahuri, Shrirampur and Kopargaon indicate high level of rural-urban interaction. Contrasting to this, tahsils namely Jamkhed and Karjat are designated as low level of rural urban interaction due to low density of towns and low percentage of agricultural commodity arrival in market. There are four tahsils namely Sangamner, Akole, Pathardi, and Shrigonda refers moderate level of rural-urban interaction. Thus, there is need to increase area under irrigation to enhance agricultural productivity and agricultural commercialization in tahsils having low and moderate level of rural-urban relation.

Keywords: Rural and Urban areas, Rural-Urban Relation, Spatial interaction.

1.1 INTRODUCTION

The rural and urban areas interact in many ways and this forms their relations with each other due to interdependence. The 'rural' and 'urban' areas identified in present paper as per criterion used by census of India 2011. The term 'spatial interaction' coined in first by E. L. Ullman. It indicates interdependence between two geographical areas. The urban areas depends on the rural area for water, food grains, perishable products like milk, vegetables, poultry goods, industrial raw materials, labour and market for the goods manufactured in urban industries. Urban centers provide market for the surplus agricultural commodities and goods manufactured in household industries produced in the rural area. The rural areas also depends on urban areas for the materials such as modern agricultural equipments, construction material such as steel, cement etc, news papers, bus services, medicines and so on. Thus, the relationship between the urban and rural is mutual and essential for the development of both the area. Urban-rural relationships are also commonly considered in regional and sub-regional planning and development strategies. Present paper examines the nature of urban-rural relations in Ahmednagar district.

1.2 STUDY AREA

Ahmednagar district of Maharashtra state has been selected for the study of present research work. There are fourteen tahsils in study area, in which three tahsils namely Parner, Nevasa and Shevgaon are rural in character and remaining eleven tahsils are urbanized as per census 2011. Ahmednagar district is one of the big districts in Maharashtra states which situated partly in the upper Godavari basin and partly in the Bhima basin. In Ahmednagar district, percentage of population which resides in urban area increased only from 9.54 percent in 1901 to 20.10 percent in 2011. Ahmednagar district is one of the drought prone districts due to it has located east of Sahydris.

Map 1 shows location of Ahmednagar district in Maharashtra state. It extends between 18^0 2' North and 19^0 9' North latitudes and 73^0 9' East and 75^0 5' East longitudes. Ahmednagar district placed a somewhat central position in Maharashtra state. It is surrounded by the Igatpuri, Sinnar and Yeola tahsils of Nasik district to the north, Vaijapur, Gangapur and Paithan tahsils of Aurangabad district to the north-east, Ashti, Patoda, Shirur Kasar and Gevrai tahsils of Beed district to the east, Paranda and Bhum tahsils of Osmanabad district and the Karmala tahsil of Solapur district to the **South**, Daund, Shirur (Ghodnadi) and Junnar tahsils of Pune district to the west.

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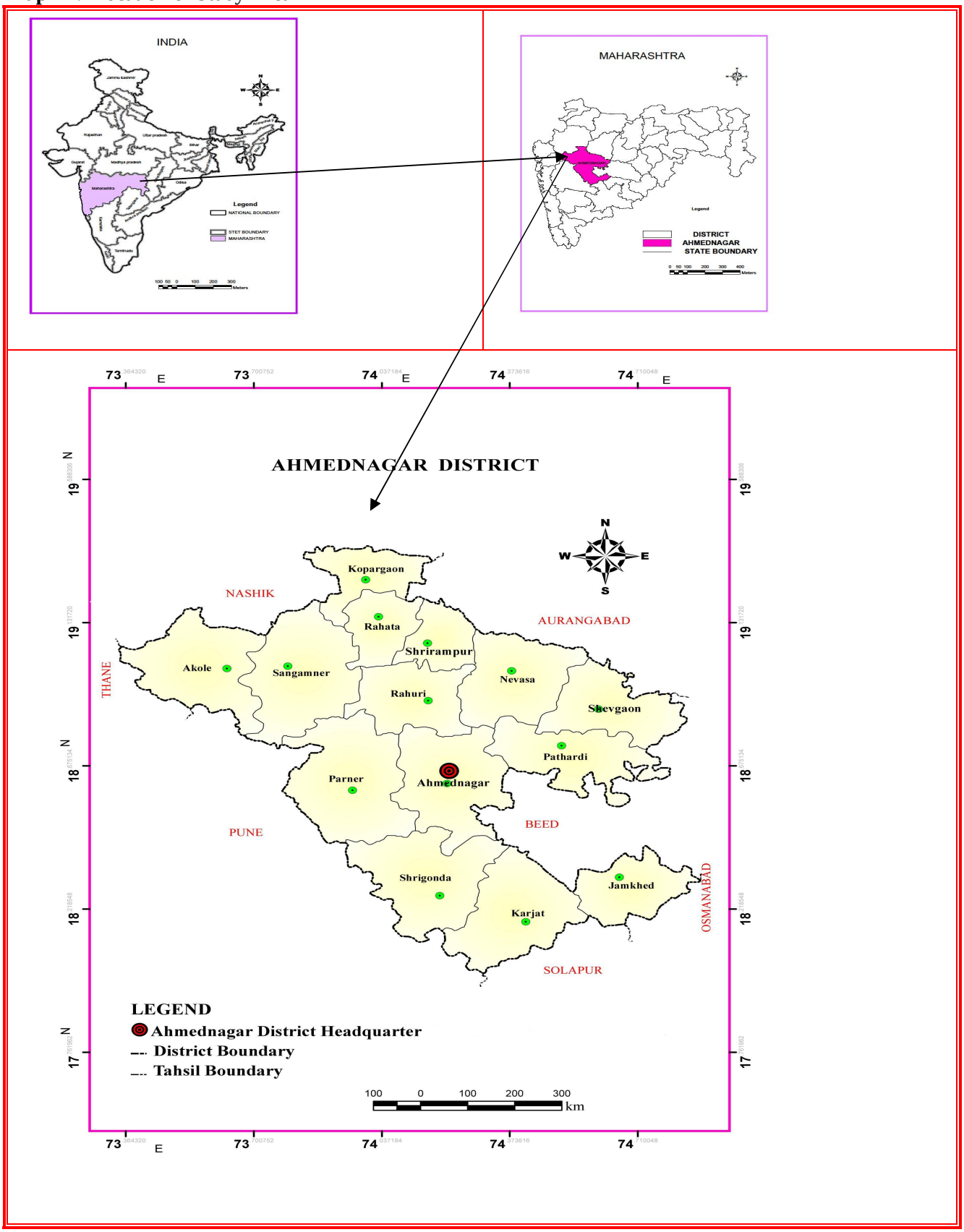
Map - 1: Location of Study Area



1.3 AIMS AND OBJECTIVES:

Main aim of the work is to investigate magnitude of rural-urban relations in Ahmednagar district. Therefore, following objectives are kept in mind to achieve the aim of study.

- To analyze rural-urban commuting in study area.
- To analyze commodity and service exchange in Ahmednagar district.

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1.4 ASSUMPTION

Focusing on the above aims and objectives of the study basic assumption is that higher the degree of urban-rural commuting and commodity and service exchange, stronger will be the rural-urban relations in study area.

1.6. DATA SOURCE AND METHODOLOGY:

Research study mainly applied secondary data sources. Hence, secondary data collected from (i) Census of India, Census reports of Ahmednagar District 2011 and (ii) Governments of Maharashtra, Department of Agriculture-Marketing Strategy Supplement (MSS) District - Ahmednagar.

Kaur's (1995) three indicators and other one (sr. no. 4) indicator have been used for present investigation of rural-urban relations in study area. Following four indicators were adjudged to analyze urban-rural interactions in study area.

Broad Indicators	Indicators of Rural-Urban Relation
(i) Rural-Urban Commuting	**1.** Proportion of Rural Non-Agricultural Workers
	2. Percentage of Villages Connected By Pucca Roads.
(ii) Commodity and Service Exchange.	**3.** Density of Towns Per 10,000 Sq. Km.
	4. Agricultural Commodity Arrival in Market.

It is assumed here that above indicators of sr. no. (1) and (2) represented the magnitude of **rural-urban commuting.** Sr. No. (3) and (4) represented **commodity and service exchange.**

Percentage of rural non-agricultural workers and percentage of villages connected by pucca roads in rural areas represents the magnitude of rural-urban interaction. Rural non-agricultural workers such as barber, potter, blacksmith, carpenter, weaver, oilman, washer man, priest and the likes were traditionally there to provide goods and services required by village farming community in rural areas. Their relationship vis-a-vis farm community was governed under 'Yajmani system'. In post-independence period ,welfare oriented Indian state has provided a numbers of modern services such as medical, educational, postal and community services. Besides, development of infrastructure pertaining to rural roads and power, banking, and marketing have also been broadened under various schemes and programmes of rural community development initiated during five year plans.

Density of Towns per 10,000 Sq. Km. and agricultural Commodity arrival in market would refer of rural population being served by the urban centers. It is expected that as the density of towns increases the rural-urban interactions also increases. Thus, density of towns makes a vital indicator of urban rural interaction. Agricultural productivity per unit of area indicates that agricultural commodity arrival in market to that surplus agricultural products promote commodity flow and service exchange. Thus, spatial pattern of commodity and service exchange is analyzed with the help of density of towns per 10,000 sq. km and agricultural commodity arrival in market. Here, it is essential to note that tahsil level data in terms of mobility of people is not available. Therefore, it is not considered for analysis of rural urban commuting.

Thus, the overall picture of rural urban interactions analyzed on the basis of examination of respective indicators of urban rural interaction. An attempt has been made to present an overall picture in this regard. The score values for individual indicators are prepared by using simple summation method. Composite index of indicators has been used to analysis of urban rural interactions. The composite index values arrived from the summation of the four indicators. On the basis of the composite score, tahsils have been categorized (i) high; (ii) moderate and (iii) low levels of rural-urban interactions.

1.7 INTERPRETATION OF RURAL-URBAN INTERACTIONS IN AHMEDNAGAR DISTRICT

In the following discussion, the magnitude of **(i) rural-urban commuting and (ii) Commodity and service exchange has been examined to interpreted rural-urban interactions (**table 1**).** On the basis of the composite score, tahsils have been categorized into three groups in table 2. Out of 14 tahsils, the top ranking five have been assigned 'high', the next two 'moderate' and the remaining nine 'low' in the levels of rural-urban interactions (table 2 and map 2).

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Table 1: Composite index of rural-urban interaction and their indicators - 2011

S. No.	Tahsil	% of rural Non Agri. Workers	% of Villages connected by Pucca Road	**Commuting = (Col. 1+2)**	Density of Towns 10,000 Km^2	% of Commodity Arrival in Market	**Commodity & service Exchange= (Col. 4+5)**	**Composite Index = (Col. 3+ 6)**
		1	2	**3**	4	5	**6**	7
1	Nagar	26.22	97.17	**123.39**	37	18.28	**55.28**	178.67
2	Rahata	35.09	89.41	**131.64**	29	5.34	**34.34**	165.98
3	Rahuri	20.32	89.58	**109.90**	18	20.23	**38.23**	148.13
4	Shrirampur	25.56	96.36	**121.92**	06	8.31	**16.84**	136.23
5	Kopargaon	20.88	93.75	**114.63**	13	3.91	**16.91**	131.54
6	Sangamner	17.83	89.41	**107.24**	12	10.34	**22.34**	129.58
7	Akole	13.94	94.74	**108.68**	06	2.52	**8.52**	117.20
8	Pathardi	12.68	95.52	**108.20**	07	1.7	**8.70**	116.90
9	Shrigonda	13.40	91.23	**104.63**	06	0.06	**6.06**	110.69
10	Jamkhed	10.8	86.05	**96.85**	09	1.63	**10.63**	107.48
11	Karjat	12.68	82.50	**95.18**	07	0.53	**7.53**	102.71

Source: Compiled by Authors based on Ahmednagar District Census Handbook 2011.

Table 2: Tahsils arranged according to index values on rural-urban interaction 2011.

Sr. No.	**Tahsil**	**Composite Index**	**Level**	
1	Ahmednagar	178.67	**High**	**Average =152.11** **Standard Deviation = 17.83** **Coefficient of Variability = 11.72**
2	Rahata	165.98		
3	Rahuri	148.13		
4	Shrirampur	136.23		
5	Kopargaon	131.54		
6	Sangamner	129.58	**Moderate**	**Average = 118.60** **Standard Deviation = 6.86** **Coefficient of Variability =5.78**
7	Akole	117.20		
8	Pathardi	116.90		
9	Shrigonda	110.69		
10	Jamkhed	107.48	**Low**	**Average = 105.10** **Standard Deviation = 2.38** **Coefficient of Variability = 2.26**
11	Karjat	102.71		
Average		**131.37**		
Standard Deviation		**23.30**		
Coefficient of Variability		**17.74**		

Source: Compiled by Authors based on table 1

In the table 2 and fig. 1 tahsils have been arranged in descending order of their composite score and grouped into the 1) high, 2) moderate and 3) low level. The top ranking five tahsils have been assigned 'high', the next four 'moderate' and the remaining two bottom assigned 'low' in the level of rural urban interactions.

Table 2 and fig.1 illustrate that wide variations are observed in the level of urban rural interaction. Composite index of four indicators varies from a highest of

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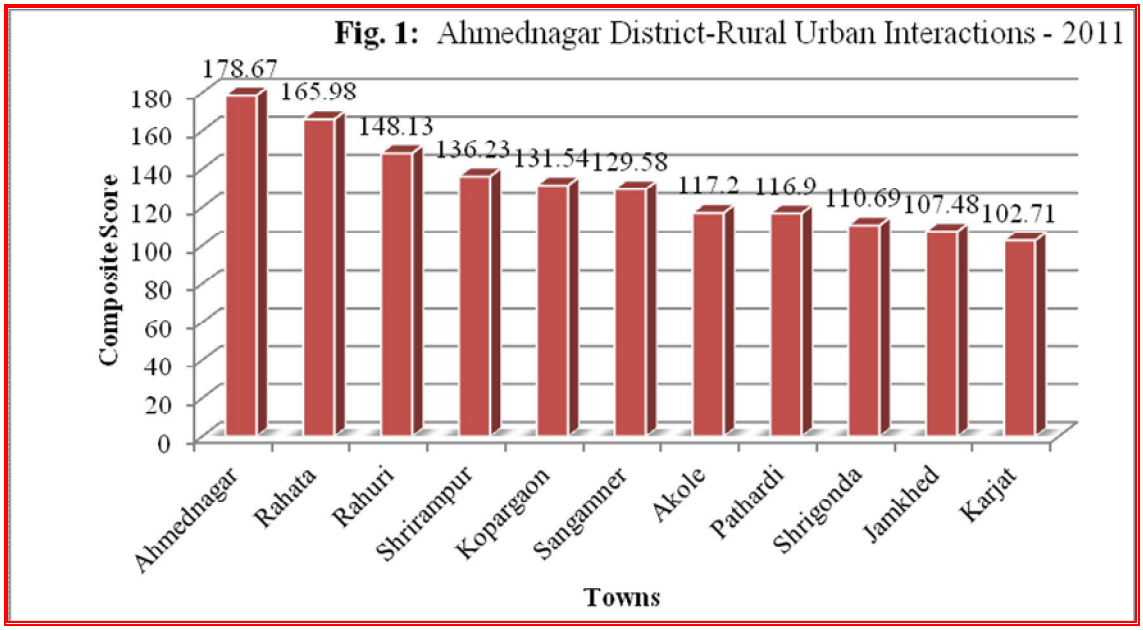

178.67 in Ahmednagar is a headquarters of district to lowest of 102.71 in Karjat. The range difference is 51.25. In other words, the tahsil at the top has interaction index value that is around 1.75 times higher than that of the tahsil at bottom. The coefficient of variability is 17.74 per cent. Ahmednagar, Rahata, Rahuri, Shrirampur, and Kopargaon assigned as 'high' level interactions. The average value of composite index is 152.11. The composite index varies from a highest of 178.67 in Ahmednagar to a lowest of 131.54 in Kopargaon. The range difference is 47.13 and the coefficient of variability is 11.72 per cent which is higher than that of moderate and low category.

1.7.1 LEVELS OF RURAL-URBAN INTERACTION:

Tahsils having high, moderate and low rural-urban interactions categorized on the basis of mean and standard deviation of composite index for the systematic interpretation.

1) Tahsils Having High Level of Rural-Urban Interaction: Out of 11 urban tahsils five are Nagar, Rahata, Rahuri, Shrirampur and Kopargaon tahsils included in this category which are given in table 2. The composite index varies from a highest of 178.67 in Nagar to a lowest of 131.54 in Kopargaon tahsil. The range difference is 47.13. The coefficient of variability is 11.72 percent which is higher than that of moderate and low category of tahsils. High levels of rural-urban interactions were combine result of high level of rural-urban commuting and high level of commodity and service exchange.

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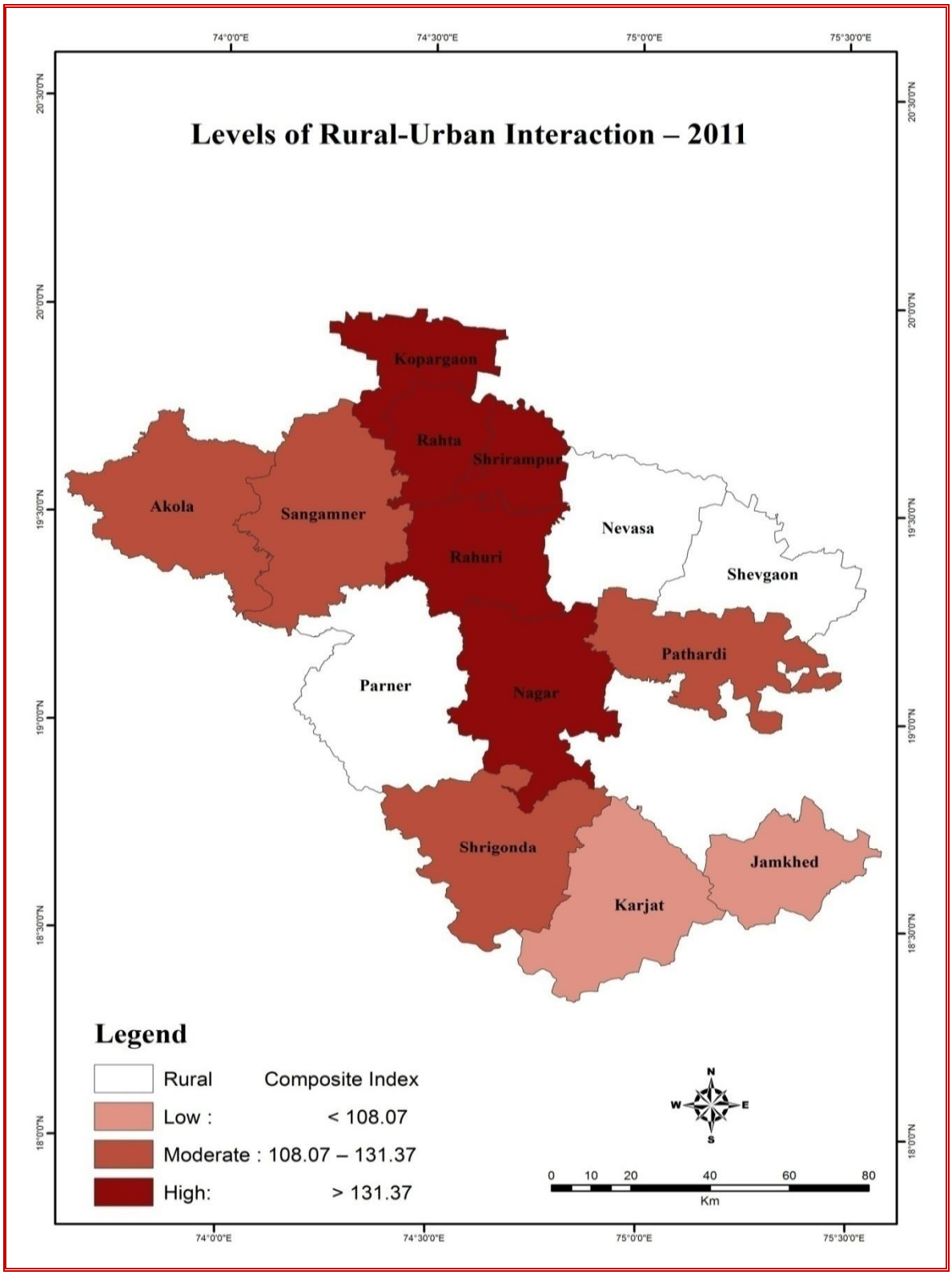
Map - 2



2) Tahsils Having Moderate Level of Rural Urban Interaction: The tahsils including in moderate level of interaction are Sangamner, Akole, Pathardi, and Shrigonda. The composite index varies from a highest of 129.58 in Sangamner to a lowest of 110.69 in Shrigonda tahsil. The range difference is 18.89. The coefficient of variability is 6.86 per cent which is higher than that of low category of tahsils.

3) Tahsils Having Low Level of Rural Urban Interaction: The tahsils namely Jamkhed and Karjat are designated as low level of rural urban interactions. Composite score varies from highest of 107.48 in Jamkhed to a lowest of 102.71 in Karjat. The range difference is only around 5. The coefficient of variability is only 2.26 percent which is lower than that of high and moderate category.

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1.8 ANALYSIS OF RURAL-URBAN INTERACTIONS

For the purpose of analysis, correlation of coefficient (r) has been computed with the help of table 1.1. Computed 'r' values put in table 3 for analysis of rural-urban

Table 3: Correlation Matrix of Rural-Urban Interaction And Selected Indicators - 2011

Correlation of Coefficient	Composite Index of Rural-Urban Interaction	% of Non-Agriculture Workers	% of Villages connected by Pucca Road	**(i) Commuting**	Density of Towns per 10,000 Km2	% of Commodity Arrival in Market	**(i) Commodity & Service Exchange**
Composite Index of Rural-Urban Interaction	1						
% of Non Agricultureworkers	0.8770	1					
% of Villages connected by Pucca Road	0.4288	0.3033	1				
(i) Commuting	0.8624	0.9401	0.5907	1			
Density of towns per 10,000 Km^2	0.9172	0.7340	0.1931	0.6717	1		
% of Commodity Arrival in Market	0.7548	0.4760	0.2722	0.4232	0.6450	1	
(ii) Commodity & Service Exchange	0.94318	0.7093	0.2654	0.6465	0.9341	0.8731	1

Source: Compiled by Authors.

interactions. At this stage, it is essential to examine correlation between rural-urban interactions on the basis of composite index values of selected indicators.

As evident from table 3 that, 'r' value of 'density of towns' is highest of 0.9172 among the individual indicators. Therefore, density of towns indicates strongest association with overall rural urban interaction. Followed by 'non agriculture workers' closely associated with correlation value of 'r' = 0.8770, 'commodity arrival in market' with 'r' =0.7548. Rural non-agricultural workers have the lowest of 'r' = 0.4288 indicates weak association between overall rural urban interaction and 'rural nonagricultural workers'.

Both the dimensions of interaction have a vital role in strengthening the rural urban relation in district. It is evident from the above table 3 that 'r' value of 'commodity and service exchange' is 0.9432 and 'r' value of 'rural–urban commuting' is 0.8624. thus, both indicate high level of association. However, the role of 'commodity and service exchange' refers relatively so stronger than that of the rural- urban commuting in high level of rural urban relation.

1.9 CONCLUSION

It is concluded and to draw result from foregoing discussion that role of 'commodity and service exchange' in rural - urban relation refers relatively so stronger than that of the 'rural-urban commuting'. Therefore, 'density of towns' and 'agricultural commodity arrival in market' are main indicators of level of rural-urban interactions. Five tahsils are Nagar, Rahata, Rahuri, Shrirampur and Kopargaon indicate high level of rural-urban interaction. Contrasting to this, tahsils namely Jamkhed, and Karjat are designated as low level of rural urban interactions due to low density of towns and low percentage of agricultural commodity arrival in market. There are four tahsils namely Sangamner, Akole, Pathardi, and Shrigonda refers moderate level of rural-urban interaction.

It is recommended that, there is need to increase area under irrigation to improve agricultural productivity and resultant agricultural commercialization in tahsils having low level of rural-urban relation. It is also need to establish industrial estates within district in all the tahsils to increase workers in non-agriculture sectors i.e secondary and tertiary for enhance rural urban interaction in Ahmednagar district.

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International Journal of Advance and Innovative Research
Volume 5, Issue 3 (III): July - September, 2018
ISSN 2394 - 7780

CAPITAL MARKET DEVELOPMENT AS A CONSEQUENCE OF PRIVATIZATION: A STUDY OF KAZAKHSTAN AND INDIA

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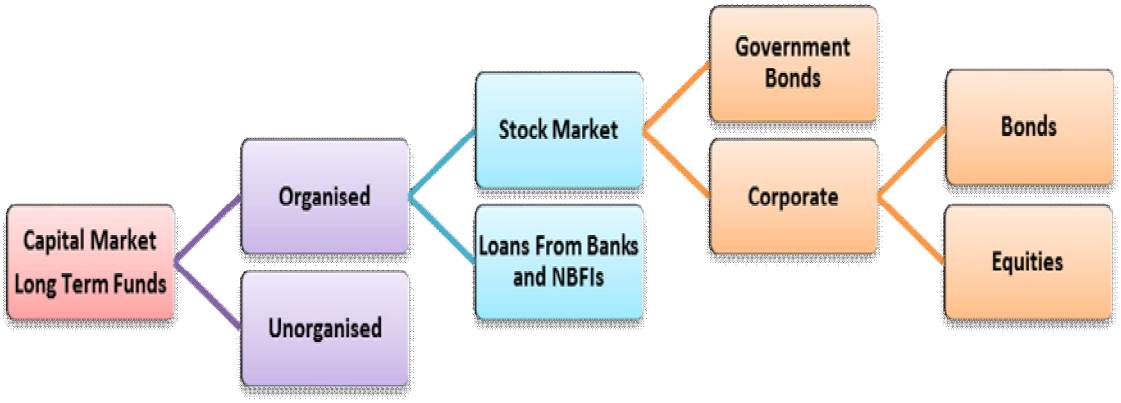
ABSTRACT
Privatization broadens and deepens the capital market resulting from the tremendous boost to the total equity market capitalization, increased listings and market size, improved liquidity and regulatory infrastructure, improved awareness and enlarged investor base. Privatization has also provided opportunity for risk diversification, enhanced professionalism and increased government attention. Although the capital market has been beneficial to privatized companies, it is important to note that the companies themselves have not fared much better. The transaction or floatation costs make it expensive to raise money from the market and the shallowness of the market limits the amount of money that can be raised there, even by companies with the best financial records. Price volatility and the existence of the large informal market in quoted securities cast a pall on the efficiency of the capital market as a frame work for the resource allocation and the mobilization in spite of the identified shortcomings the privatization programme gas enhanced the development of capital market almost world over inclusive of Kazakhstan and India. A modest attempt in this backdrop has been made in this paper to present the correlation between the privatization programme as a part of economic reform package in Kazakhstan and India and the impact of said programme on capital market development.

Indexwords: privatization, capital market, SIP, stock market, government securities, Bimodal Banking System, NBK, KASE, DBK, DoD, CPSE, Economic liberalization, Capitalization.

Capital market is a market where buyers and sellers engage in trade of financial securities like bonds, stocks, etc. The buying/selling is undertaken by participants such as individuals and institutions. Capital markets in this way promote economic development and growth by facilitating and diversifying firms' access to finance thereby reshaping the developing world. One of the objective economic features of a nation is the level of capital market development, which aims at providing sustainable intersectional reallocation of financial resources and creating an effective mechanism for capital investment in the production sphere.[i] Capital market is an indispensable tool of economic development, purchase and sale of securities.[ii]One final benefit from the development of capital markets in developing countries is their ability to diversify firms' sources of finance. Such diversification can help create not only faster but also more stable economic growth by ensuring that shocks to the supply of bank credit do not have disproportionate effects on that growth.[iii]



FUNCTION CUM INSTITUTIONAL CLASSIFICATION OF CAPITAL MARKETS
Both externally introduced and home-grown development strategies all over the developing world emphasize the development of capital markets (Stiglitz 2004).While firms in emerging markets can and do raise capital abroad, Policymakers have their own reasons for encouraging the growth of domestic capital markets. Most important, of course, are the benefits to economic growth from a more efficient matching of savings with productive investment. Nonetheless, improved governance and accountability, especially among dominant private firms, are also part of their motivation. Economic planning is much easier if a great deal of a country's output, employment and tax revenues are linked to firms that are transparent and/or accountable to the public. In order to do this they rely on institutions, including sound financial reporting and assurance, and these in turn depend on the accounting profession. The perceived strength of accounting and auditing standards is a leading indicator of the health of capital markets and a strong predictor of the growth effect of market liberalization.

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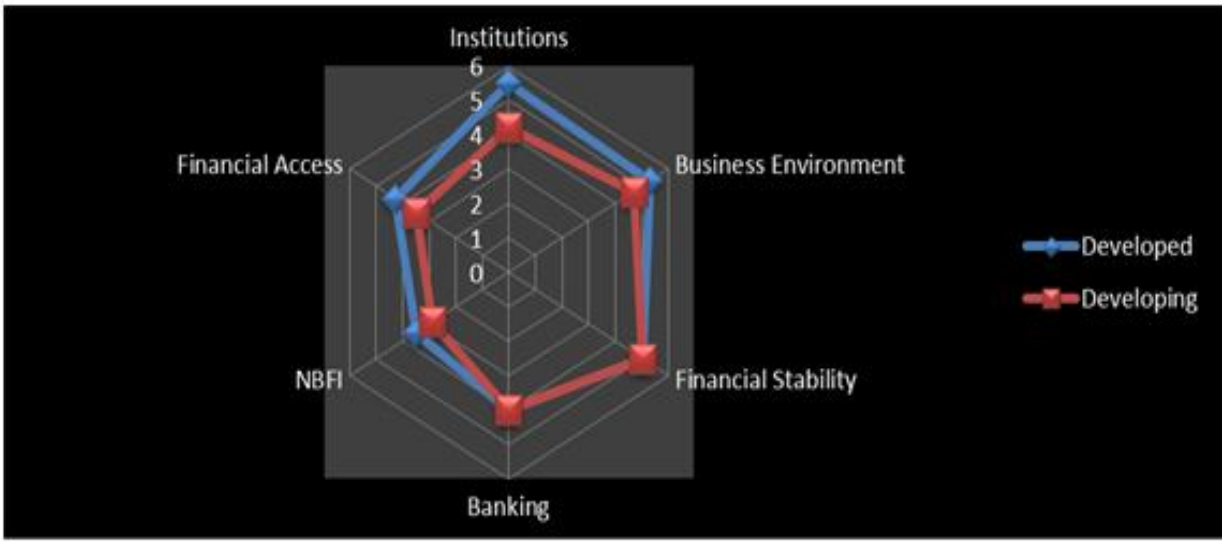
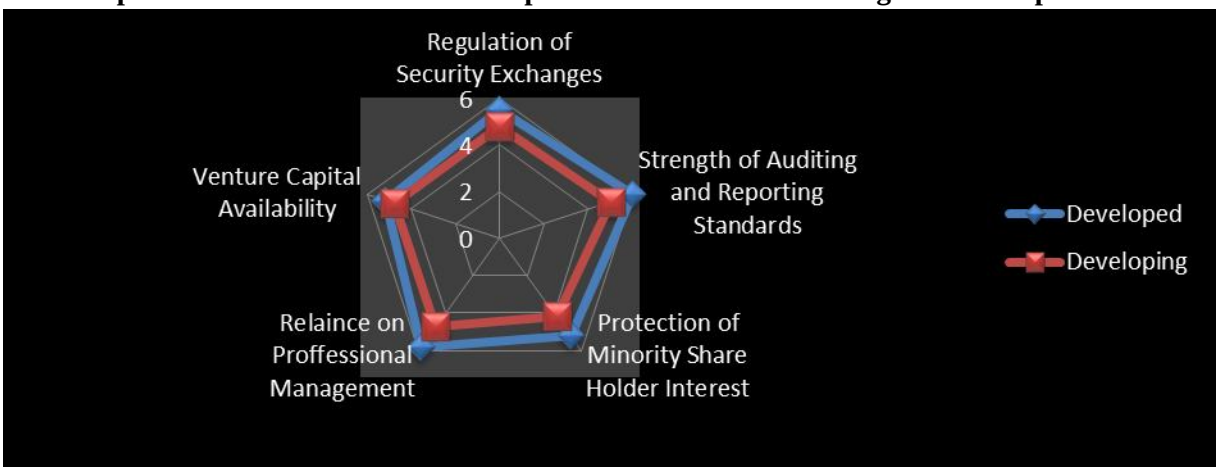
Capital Market Characteristics and Performance at Different Stages of Development 1



Capital market characteristics and performance at different stages of development 2



Note: scores are on a scale of 1 (lowest possible strength of development) to 7 (highest possible strength of development). ***Source***: Sala-i-Martin et al. (2011) and Bilodeau (2010).

While the assumption is often made that developing countries have the most to gain from such reforms, their effect depends on how much additional investment markets can unlock and how productive this investment can be. Therefore, in practice, it is those countries with the highest-quality institutions that benefit the most in terms of growth. In emerging markets, this means that the benefits accruing to national economies as capital markets grow depend on a host of other institutional reforms in order to deliver benefits. For instance, Bekaert et al. (2005) note that countries with high-quality institutions reap three times the benefit from liberalization than those with low-quality institutions, while those benefiting from a regulatory and policy environment that encourages investment tend to see more than four times the benefit that others do. Moreover capital market liberalization yields higher benefits for incumbent firms in sectors and markets in which competition is low; new entrants generally benefit only if liberalization is accompanied by pro-competition reforms.[iv] One final benefit from the development of capital markets in developing countries is their ability to diversify firms' sources of finance. Such diversification can help create not only faster but also more stable economic growth by ensuring that shocks to the supply of bank credit do not have disproportionate effects on that growth.[v] The reason for government's support for privatization has been capital market development this can be measured by several indicators such as increase in the number of listed companies, in market capitalization and in market liquidity. In fact, insufficient liquidity is very often cited as the primary barrier to capital market development. It is, however, important to note that overall market liquidity is not an end in itself. Hearn et al. (2007) find, for instance, that investors demand a premium from smaller firms listed in key emerging markets above and beyond what would be justified by market liquidity. This finding echoes the findings of Demarigny (2010) in Europe, where a small number of firms with the largest capitalization were shown to benefit from almost all equity market liquidity. Thus there is a case for policies that ensure that capital markets not only attract liquidity, but also direct it towards the most productive firms, regardless of size. Although governments usually

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adopt privatization programs primarily to raise revenue, and in order to improve the (often dreadful) economic efficiency of former state-owned enterprises, most also hope that privatizations implemented through public share offerings will develop their national stock markets. Recent economic research (Levine (1997), Demirgüç-Kunt and Maksimovic (1998), Levine and Zervos (1998), Rajan and Zingales (1998), Subrahmanyam and Titman (1999) and Henry (2000a,b)) has given added impetus to this objective by conclusively documenting a direct link between capital market development via privatization and economic growth. It is easy to assert that privatization programs have been largely responsible for the growth, of stock and bond markets in developed and in a good chunk of developing nations as well. A careful examination of the historical evolution of non-U.S. stock markets since 1980 suggests that large SIPs have indeed played a key expansive role almost everywhere, especially because they are generally among the largest firms in national markets SIPs have worked a security offerings—and as catalysts for the growth of today's global investment banking industry. Governments have adopted share issue privatization programs inclusive of other means as well, as a means to jump-start the growth of capital markets thereby embracing the importance of its development. In many emerging economies, the creation or deregulation of emerging capital markets, especially stock exchanges, has gone hand-in-hand with programmes for the privatization of state-owned enterprises (SOEs).[vi] Historically, the development of capital markets in developing countries has been driven to a great extent by such offerings, with large-scale privatization programmes typically being followed by substantial increases in market capitalization and trading volumes as well as the strengthening of regulatory and corporate governance frameworks.

CAPITAL MARKET DEVELOPMENT IN KAZAKHSTAN

Post independence Kazakh republic adhered to transform over to market economy via different reform packages of which privatization is one. Kazakhstan launched the said program with a modest pace in 1991.The only mode of privatizing the economy in first phase 1991was through auctions(contest or transferal of industrial or social infrastructure to the labor collective ,while in second phase 1994 vouchers were used . though the returns of the first phase were at large reaped by the common people (employees of privatized small enterprises, groups of people) the second phase of privatization aimed at attaining economic stabilization and was a vigorous privatization. Starting in 1996, the government securities market began dominating financial markets of Kazakhstan. While issuance of government securities was able to finance 2 percent of the budget deficit in 1994 and 9.5 percent in 1995, in 1996 this indicator was at the level of 17.7 percent. The figure stood at 19% in 2013.In the mix of government securities, the ratio of securities with longer maturities is gradually increasing. Issuance of government securities with a 12-month maturity (MEKAM- 12) began in the second half of 1996, and issuance of securities with a two-year maturity - 14 in 1997 government securities financed 16.8 percent of the budget deficit. In Feb. 1997 a decree 'state support of direct investments in Kazakhstan ', was been prepared in no time. The system of privileges for foreign investment has been significantly expanded by this decree,. During the third stage of privatization (1996-1998) the full edged domestic investors were formed .the fourth stage of privatization has begun since 1999and lasts at the present time, characterized by the new approaches to distribution of authorities between the levels of state management in the issues of regulation and disposal of state property. The programme of privatization and increase in the effectiveness of state property governance for 1999-2000 should be called as a document, which initiated the beginning of the fourth privatization stage .the state saved participation in definite strategically important spheres of economy, including those providing for production of significant goods and services, reformation of banking system. The establishment of Kazakhstan's own bank was started from December 1990.the law "on banks and banking activity in Kazakh SSR", promoting the creation of basement of bimodal banking system was adopted in January ,1991.the republican state bank was reformed into national bank of republic of Kazakhstan with regional departments and administration. so, to the moment f introduction in November 1993 bank system of Kazakhstan underwent significant transformation –all specialized banks were reorganized into joint stock ones, and the national bank was allotted to the range of the functions of the central bank. the decree, "on the national bank of republic of Kazakhstan' signed by the president N.A.NAZARBAYEV in march 1995 and having the power of law had a principally important meaning for status setting of the national bank. Now Kazakhstan has a two tiered banking system, the first tier is composed of national bank of Kazakhstan which reports to the president and is subordinate to him .the second tier includes the 38 commercial banks tier (with the exception of the Development Bank of Kazakhstan, which as a state development bank has a special status and belongs to neither tier) The banking sector of Kazakhstan is relatively large with total assets equivalent to 45 percent of GDP and relatively concentrated, with the top five banks accounting for 56 percent of banking system assets (as at November 1, 2013).[vii] The banking sector accounts for 77 percent of total financial system assets and 44 percent of GDP. Public sector assets represent 60 percent of total banking assets at end-February 2014.[viii] Here are 17 banks operating in Kazakhstan, including 14 foreign subsidiaries. Kazakh banks have a presence in neighboring countries and in Europe.[ix] It is evident that banking dominates the financial system of Kazakhstan

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Source: NBK

Note: Figures in parentheses indicate the number of institutions in each sector.

The national bank became independent and accountable to the head of the state..Thus modern banking system was created in Kazakhstan in the 1990s in the course of economic reforms .still By and large, direct lending to economic agents by the National Bank and second-tier banks, the practice of the previous years, did not result in output recovery. The GDP continued to decline, contracting by 11.4 percent in 1993, 17.8 percent in 1994, and 8.9 percent in 1995 relative to the corresponding period of the previous year. Under these conditions the emphasis was put on achieving macroeconomic and financial stabilization. During subsequent years, the thrust of economic reforms implemented by the Government and the National Bank of the Republic of Kazakhstan has been mainly shaped by the need for creating and developing the institutions of a free market economy. In particular, destatization and privatization proceeded vigorously, the country's financial institutions were strengthened, and the necessary legislative, normative and regulatory framework for development of the Kazakhstan economy's private sector was established. The issuance of National Savings Bonds commenced with a goal to attract the disposable cash of the public and of small investors, and their annual yield was determined on the basis of three-month government securities' yield (MEKAM-3). Beginning in January 1998, the Ministry of Finance debt owed to the National Bank of Kazakhstan was converted into long-term obligations and issued in the form of 10- year fixed-yield government securities (MEAKAM-10). In 1996-1997, the demand for government securities regularly exceeded supply. The investors' share in MEKAM purchases increased from 21.7 percent in 1996 to 26.7 percent in 1997, to the level of 14.3 billion tenge. Despite the relatively low yield and the consequences of the Asian financial crisis in late 1997, the nonresidents' share in the total volume of all issued government securities increased from 2.4 percent in 1996 to 9 percent in 1997. The total volume of MEKAM, MEOKAM (at a discount) and National Savings Bonds in circulation as of the year's end was 22.6 billion tenge. In 1997, the Ministry of Finance issued government securities amounting to 55 billion tenge. For the purposes of operational management of the money supply, the National Bank of Kazakhstan issues short-term notes with a maturity of 5 to 63 days. Short-term notes with a 14-day maturity represented the largest share, 31.1 percent, of the total volume, while 28-day notes accounted for 30 percent, and 7-day notes for 21.2 percent. In 1997, the National Bank issued notes in the total amount of 77.6 billion tenge, and the

Volume of notes in circulation as of the year's end was 6.8 billion tenge. Kazakhstani banks have since 1998 placed Eurobonds on international markets and obtained syndicated loans to support domestic lending. Leading Kazakhstani banks were able to obtain reasonably good ratings from international credit assessment agencies until the global financial crisis struck. As of February 1, 2014, the five largest banks (KazKommertsBank, HalykBank, BTA bank, Bank Center Credit and Sberbank-Kazakhstan) held assets worth approximately $46.8 billion, or about 54% of the banking sector's total assets. Although Kazakhstan's banking system remains stable, it has not yet recovered due to the poor and deteriorating quality of many banking assets, capital constraints, and the aggressive growth of consumer lending, in 2013 in particular. In spite of the government's efforts, local banks have been unable to overcome a high rate of toxic assets. Loans overdue by more than 90 days reached nearly $23.7 billion as of February 1, 2014, and comprised just over 32% of the total. BTA bank, which has defaulted on its debt obligations twice in the past few years, "leads" Kazakhstan's banks with $11.4 billion worth of non-performing loans on its books. Kazakhstan's Stock Exchange (KASE) is the organized market which has operated since 1993, is the key indicator of the securities market in Kazakhstan is an insignificant source of investment. The number of listed companies dropped from 354 in 2010 to 131 in 2013 to

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81 at present.[x] The government's 2013 decision to consolidate all pension savings into a single state-owned pension fund practically froze the stock market, as private pension funds, which until that time were Kazakhstan's main institutional investors, ceased to operate. Trading is dominated by block trades, and the spreads are extremely wide. In 2013, 57% of KASE trades were in foreign exchange, repo transactions comprised a further 37%, and government securities trading accounted for roughly 4% of KASE volume.[xi] In December 2013, the stock market capitalization was $28.2 billion, and bond market capitalization was $35.2 billion. The newly created Single Pension Fund has accumulated nearly $22 billion. Its largest investment positions are in Kazakhstani government securities (47.4%) and corporate bonds of Kazakhstan-based companies (21.4%). The Single Pension Fund is not listed, and does not trade, on the KASE. The securities exchange (KASE) is quite small, with very limited activity in equities and corporate debt. As the KASE is not fully developed, decreased capitalization and diminished transaction volumes have not impacted financial markets or the overall economic situation. As there are relatively few publicly traded firms, few hostile takeovers have occurred in Kazakhstan. Defensive measures against takeovers are not targeted toward foreign investors in particular. The Civil Code requires a company that has purchased a 20% share in another company to publish information about the purchase.

SECURITIES ADMITTED TO TRADING ON KASE

Sectors	Number of issues	Number of issuers
Shares	101	78
Debt securities	231	72
Securities for investment funds	1	1
Depository receipts	0	0
Securities of international financial organizations	2	1
Government securities	198	3
Derivative sector	0	0
Alternative site	0	0
Total	533	129
Data taken from the official site of the Ministry of economy and budget planning of the Republic of Kazakhstan		

By law and in practice, foreign investors can participate in privatization projects. The government and parastatal National Welfare Fund "Samruk-Kazyna" (SK) are currently preparing 103 SOEs for privatization from 2014-2016. These companies are mostly subsidiaries of large national companies operating in the energy, mining, transportation, and service sectors. SK plans also to conduct so-called People's Initial Public Offerings (IPO) from 2014-2016, the terms of which would allow citizens and institutional investors to buy up to 10% of the stock of national companies, such as those that operate Kazakhstan's electrical grid (KEGOC) and national railway system (Kazakhstan Temir Zholy) Kazakhstan has created a sound financial system and stable macroeconomic framework. Official policy supports credit allocation on market terms and the further development of legal, regulatory, and accounting systems that are consistent with international norms. Most domestic borrowers obtain credit from Kazakhstani banks, although foreign investors often find margins and collateral requirements onerous, and it is usually cheaper and easier for foreign investors to use retained earnings or borrow from their home country. A DBK was established in 2001 to assist in the development of non-primary industries and facilitate foreign and domestic investments into the national economy. As of today, DBK, a recognized leader in implementing strategically important investment projects in Kazakhstan, operates in a specific segment of the market, offering financing to complex and large-scale Greenfield projects which form the basis of industrial development of our country. DBK finances large-scale investment projects in priority sectors of the economy such as energy, transportation, metallurgy, chemicals and petro-chemicals, pharmaceuticals, oil processing and manufacturing. DBK's projects produce a significant multiplier effect for the economy with jobs created, additional tax revenues for the state budget and export revenues as we see from the experience of the leading foreign development institutions, national development banks often act as 'pioneers' in introducing innovative financial instruments into domestic capital markets. Thanks to guaranteed state support, solid capitalization and liquidity position, high and stable credit ratings on par with the sovereign rating, DBK maintains its status of a benchmark issuer of Kazakhstan. This is especially crucial in the absence of international issue of the sovereign, when DBK issues set a pricing guidance for the rest of the corporate sector.

Inefficiency of the stock market of Kazakhstan and its inconsistency to the needs of the domestic economy, along with a belated response of financial supervisory authorities are the reasons for the country's economic development slowing. Stock Exchange operating in the country unfortunately demonstrated a lack of interest in attracting issuers and processing industries investors, especially small and medium-sized businesses to the

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operations on the stock market. It is well known that the most effective financing and the best government support in any sphere is the creation of competitive environment with equal conditions best guaranteed by privatization as honest competition leads to more efficient sector development. Domestic stock market, unfortunately, is also characterized by low liquidity of the financial instruments secondary market related mainly with the lack of financial instruments traded in the market, underdeveloped market of derivative securities and the insufficient development of the stock market. Many Kazakh issuers are still unwilling to disclose financial information and allow outside shareholders to company management. Therefore, an indispensable condition for the stock market development and competitiveness is its innovativeness. And there is no doubt that it is impossible to create an innovative economy without significant investment. However, innovation is always a risk. Investors also do not want to risk. However, many qualified investors having substantial equity with significant package of highly liquid securities and acquired great experience in transactions on the stock market may not have been averse to risk investing surplus funds in new, fast-growing high-tech industries. Such investments bring higher revenue from companies' shares ownership. But not all issuers implementing innovative projects are at an early stage access to this market. The task of the securities market developing has always been the center of the President and Government attention, as one of the priorities in the complex of measures of state economic policy. One of The ultimate goals of the privatisation is to expand the range of financial instruments to remove administrative barriers to entry of the company into the organized securities market. Creating conditions and introduction of new types of securities into circulation will diversify risks on the organized securities market, but also will help increase market liquidity and the active involvement of retail investors. Innovations in government securities are represented by the release of their various embedded options: protection against inflation option, option to protect against exchange rate changes, and denominated in foreign currency to attract savings. Admission to the securities new types trading also allows investors to hedge risks associated with operations in the securities market. For example, in order to attract foreign investors in the Central Asian region and the creation of index funds, derivatives market, a new index Renaissance Capital Central Asia Equity Index was introduced which includes stocks of the Central Asian region. The mechanism of securitization is underutilized. The law "On securitization" is poorly developed; there are no clear mechanisms for its implementation. While in crisis and widespread default securitization could be a decision. Securitization is the tendency of funds' transition from their traditional forms (savings, cash, deposits, etc.) to the form of securities which functions are the union of small or illiquid assets and their inclusion in the RCB turn supported by reputable financial institutions and companies; trend of converting greater mass of capital in the form of securities; trend of transition some forms of securities in other forms more accessible to a wide circle of investors.[xii]

CONCLUSION

There is fierce competition between different capital markets in the world for issuers and liquidity. The only chance for Kazakhstan to develop its own capital market and become the financial centre of central Asia is, as a minimum, to put in place a friendly legal framework for investors and issuers and to create the appropriate infrastructure. The main problems of securitization in Kazakhstan are: the need to change the regulatory framework, the lack of available infrastructure, low level of awareness among sellers of assets, the lack of standardized pools of assets. Securities market demands technological and functional improvement of the market infrastructure and modern information systems and networks, implementing new securities market, new types and forms of securities, the processes of globalization and the availability of any securities market for investors. To solve these problems, one should proceed from the following ways to solve them: adaptation of Kazakhstan legislation; business platform for loan securitization, the formation of uniform requirements for the portfolio; pooling standardized portfolios. This has indeed been the concern of the financial regulator and the government of Kazakhstan and more reforms are expected under the framework of a state programme called "Road Map of Development of Pension Saving System and Securities Market of the Republic of Kazakhstan", as approved by the government of Kazakhstan. The economic slowdown in 2015-16, coupled with the major devaluation in February 2014 has put Kazakh banks under renewed pressure .a combination of ongoing state support , consolidation and a gnarl ride in capital and equity buffers should eventually produce a more stable financial sector. It would be generally recommend an approach that concentrates on motivating market participants to raise finance locally (for example, providing a tax exemption for a company whose shares are listed and traded on KASE), rather than on making this process abroad more bureaucratic and complicated. Experience shows that a balance between the "carrot and the stick" approach is always preferable.

CAPITAL MARKET DEVELOPMENT IN INDIA

The history of Indian capital market dates back to the eighteenth century with East India Company. In the post-independence period also, the size of the capital market remained small. The strict regulations demotivated

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many companies from going public for almost four and a half decades. Prior to the onset of reforms in 1991, the capital market structure in India was subject to several controls and opaque procedures. The trading and settlement system was outdated and not in tune with international practices. Rising of capital from the market was regulated by the capital issues act, 1947 which was administered by the controller of capital issues in the ministry of finance, government of India. Similarly the securities contract act was administered by the directorate of stock exchanges also in the ministry of finance. It empowered the government to recognize/ derecognize stock exchanges, stipulate rules and bye-laws for their functioning, compel listing of securities by public companies etc. taking up the banking system SBI enjoys the monopoly of government business ,it was formed under the SBI Act in 1955.the government holds 93%of the equity and 7% to private ownership. The efforts are being made by the SBI to privatize its non banking subsidiaries like, SBI caps, SBI funds management etc, where SBI's holding is about 85% of the equity. moreover Indian government has announced to reduce its stakes in public sector banks to 33%.in early 1980's the Indian banking system was dominated by the public sector banks characterized by-high intermediation cost, overstaffing and over branching, huge portfolio of nonperforming loans (bad loans)[xiii],poor customer services, undercapitalized, undue interference in lending/loan recovery and personnel. With its foundations laid in socialist based economy of four decades, with strict government control over private sector participation, foreign trade and foreign direct investment, India opened its gates to the outside world in the early 1990s. The depleting foreign currency reserves in 1991 forced India to start the process of economic liberalisation. The reforms were accomplished by allowing increasing competition and greater foreign participation to provide fillip to the troubled economy. The capital markets reforms in 1991 were preceded by a regime which ensured almost complete control of the state over the financial markets. Initial Public Offerings (IPO) were controlled through the Capital Issues Control Act. The Controller of Capital Issues (CCI) controlled the price and quantity of IPO and trading practices were short of transparency. The banking sector too was significantly controlled. There were few private banks and those faced challenges on their expansion plans. The banking sector suffered from lack of competition, low capital base, low productivity and high intermediation cost. After the nationalization of large banks in 1969 and 1980, the government-owned banks dominated the banking sector. The Reserve Bank of India (RBI) controlled the interest rates and the financial sector was replete with entry barriers, significantly restricting opportunities for the establishment of new banks, insurance companies, mutual funds and pension funds. The Unit Trust of India (UTI) created in 1964 was the only mutual fund and it enjoyed complete monopoly of the mutual fund business up until 1988. The resource mobilization by mutual funds demonstrates UTI's dominance in the early 1990s. The early 1990s therefore, was a time when the primary role of the financial system in India was to channel resources from the excess to the deficit. The role of technology was limited and customer relationship and service was not a priority. Risk management procedures and prudential norms were weak, affecting asset portfolio and profitability.

Since then its economy and financial markets underwent radical changes, largely in response to the economic crisis of the late 1980s.The establishment of National Stock Exchange (NSE), a state-of-the art exchange, with sophisticated technology to improve trading practices and reduce unethical dealings, supported by a strong legal framework and technological base to strengthen the governance structure, has been the highlight of the Indian capital market in the last decade. The opening up of the economy has increased the flow of Foreign Direct Investment (FDI) and has put India on the global map, as a new-age economic force to reckon with.

Privatization was envisaged to foster the competition, ensure greater capital investment, competitiveness and modernization resulting in enactment of employment and provision of better quality of products and services to the consumers and reduction in fiscal burden. Fiscal deficit reached as high as 8.5% of GDP in 1987-88 and hence the loss making public sector enterprises were a burden. Therefore state owned enterprises were sold to different parties to foster competition and enhance efficiency. Privatization was thought to result in strengthening and deepening of capital markets when some percentage of the shares was sold via stock exchanges. The nee was felt to put some control over nationalized banks privatization of banks was one such step. Although all political parties are committed to privatization is in the no. of bank branches after privatization branches in rural/semi-urban sectors increased from 25 to 40%.agricultural credit has increased from 162-446496 cores. More job opportunities has been raised. Credit from private sector banks is much higher than public sector banks. Moreover there has been an increase the efficiency in banking business still somehow there is no exhibition of requisite pace. it is time to be taken in by the a revolution called "privatization of ownership".

Indian stock market marks to be one of the oldest stock market in Asia. It dates back to the close of 18th century when The East India Company used to transact loan securities. The Bombay Stock Exchange (BSE), the oldest and the largest stock exchange in India, traded for two hours in a day with an open outcry system.

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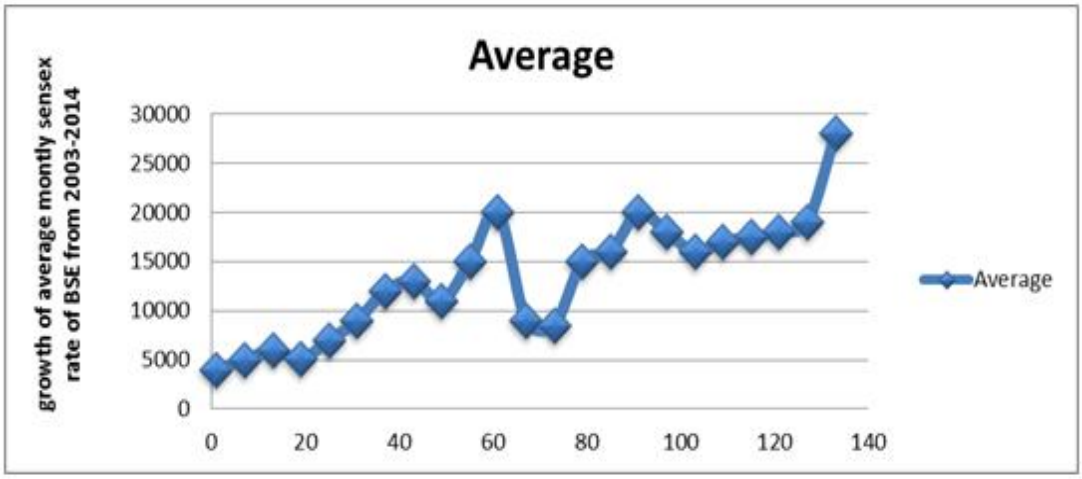
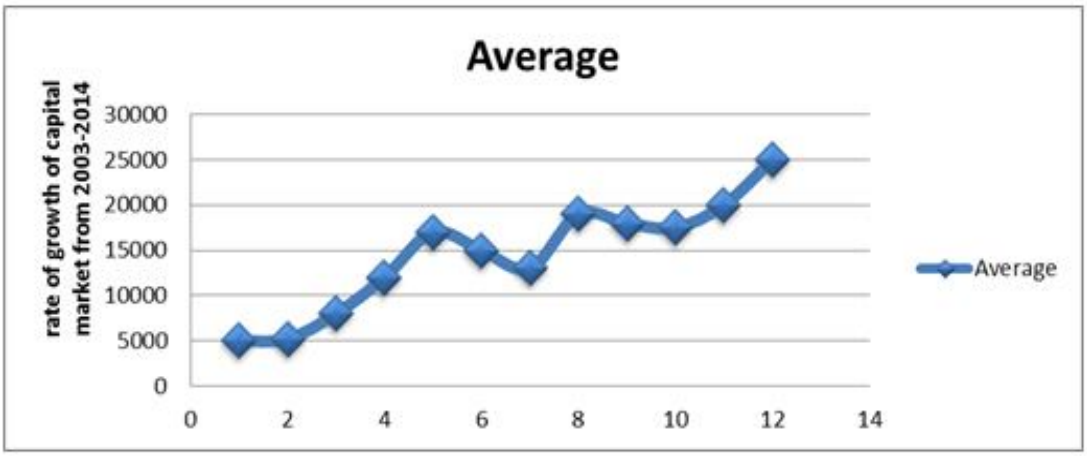
There were regional exchanges which were unconnected and engaged in open outcry system of trading. Each exchange had a board representative nominated from the Capital Markets division of the Ministry of Finance, the then regulator of the capital markets. There are two leading stock exchanges in India which help us trade are: National Stock Exchange: National Stock Exchange. Which created an electronic marketplace was incorporated in the year 1992 Bombay Stock Exchange*:* BSE on the other hand was set up in the year 1875 and is the oldest stock exchange in Asia. Also BSE has the largest number of scripts which are listed. There have been significant reforms in the regulation of the securities market since 1992 in conjunction with the overall economic and financial reforms. A key element of the reform strategy was building a strong independent market regulator. The SEBI Act, which came into force in early 1992, established SEBI as an autonomous body. The apex capital market regulator was empowered to regulate the stock exchanges, brokers, merchant bankers and market intermediaries. The Act provided SEBI the necessary powers to ensure investor protection and orderly development of the capital markets. IPO is the major source of raising finance for a corporate. Investor sentiment towards the corporate as well as the share price plays a major role in the success of IPOs. Stock Derivatives are introduced in the year 2000. This paved the way for the entry of FIIs and Domestic Institutional players in Indian Market. The current policy envisages development of people's ownership of Central Public Sector Enterprises (CPSEs) so as to share in their wealth and prosperity, while ensuring that the Government equity does not fall below 51% and Government retains management control.



The above figure shows the growth in the average monthly SENSEX rate of BSE from 2003Till 2014. The rising curve shows the growth of the capital markets and increase in the volume of trades. The time span from 2008-2010 shoes a dip and slow growth there after due to world economic slowdown.



The above figure simply shows the rate of change and growth of BSE SENSEX from 2003- 2014 annual data and growing rate showing growth in capital markets.

For 2015-16, the Department of Disinvestment (DoD) has to accelerate the disinvestment process by taking the following measures[xiv]

i) In case of profit making minority stake sale disinvested (49% of equity of Central Public Sector Enterprises) management control of Central Public Sector Enterprises (CPSEs) will remain with the government;

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ii) Various factors such as different equity structure, financial strength, fund requirement, sector of operation etc, do not permit uniform pattern of disinvestment; therefore, disinvestment to be considered on merits and on a case-by-case basis;

iii) Citizens have a right to own part of the shares of PSEs; that should result in increased retail shareholding;

iv) The listed profitable CPSEs (not meeting mandatory public shareholding of 10% which now stands revised to 25%) to be made compliant through sale of shares by Government or by the CPSEs through issue of fresh shares or a combination of both.

OFFER FOR SALE THROUGH THE STOCK EXCHANGE MECHANISM

Year	No. of Companies	Total Allotted Value (crore)
2014-15	22	26,875
2015-16	16*	19,817

Source: BSE and NSE.

Note: * Indicates companies undertaking 18 issues.

It is evident that the privatization of PSU's has been and will be done with capital markets playing a decisive role. As There are inherent advantages in the listing of shares of profitable CPSEs on the stock exchanges as it triggers multilayered oversight mechanism which enhances corporate governance as well as provides for level playing field to CPSEs vis-á-vis private companies in regard to accessing the resources through the capital market. The process enhances shareholder value in the listed CPSEs. The process of listing of CPSEs on stock exchanges facilitates development and deepening of capital market and spread of equity culture. During 2015-16, the all-India turnover at the stock exchanges in terms of number of shares traded decreased by 6.9 per cent on top of a rise of 60.2 per cent during 2014-15.

CONCLUSION

There is nothing bad with the public sector banks the difference because of the loopholes in their policies. Private sector banks boost the Indian economy as they have a higher degree of efficacy .but still there is a long road for privatisation private sector banks still have to cover rural sector with more penetration as it contributes large in growth of Indian economy. Since the Modi government assumed office' a slew of economic reforms has had led to a partial revival of investor sentiment'.[xv] Union budget 2016-17 has also wished to go for strategic disinvestment plus a move of privatizing public sector banks starting with IDBI bank. Union budget 2017-18 presented by a Arun jaitley has announced the shares of railway PSCs like IRCTC will be listed on stock exchanges including a revision in the mechanism to ensure time bound listing of CPSCs.[xvi] The future of Indian capital market is expected to have a steady and long term growth potential. A few reforms are also in the pipeline under the consideration of the new government. A clear policy decision from government, vigilant eye from the regulators, transparency from the stock exchanges and prudent action by the brokers and financiers is the requirement of the day to maintain the growth rate on the Securities Market. A strong capital market provides the foundation for a developed economy

BOTTOM LINE

Evidences show that in most countries privatization has served as a vehicle for promoting and developing capital market objectives such as broader share ownership, and increasing the depth and liquidity of equity markets and bringing about transparency and good corporate governance. Development of securities market requires increase in the amount of capital, increase in investment opportunities, development and integration of trading systems. Also, keeping in mind the information age, one should introduce modern technology, in particular, the eTrade system.[xvii] One more aspect of privatization programs which attracts interest is its observed capacity to tremendously increase the total number of shareholders usually in countries with little tradition of share ownership by individual investors that goes for both India and Kazakhstan though with varying degree. SIPs impart a great degree of liquidity to the capital market.[xviii] public offerings of shares through floating into the stock exchange, as a means of privatization, is the most transparent method of privatization and hence it encourages good corporate governance practices and a society and the economy that is open, transparent, inclusive and prefers disclosures. In Kazakhstan the sheer size of privatisation through share issues provided a real opportunity to start up an equity culture. While in India, with already well-developed capital markets, privatization has sought to augment what was already available in stock markets. There is an obvious importance of capital market development and of privatization's potential role therein. The main perspectives of modern securities market at this stage are: the concentration and centralization of capital,

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internationalization and globalization of the market, increasing the level of organization and strengthening of state control; computerization of the securities market; innovations in the market; securitization; "People's IPO" program; interaction with other capital markets.

Not all privatization, however, is a boon to the capital markets. Voucher or mass privatization taken at a large scale has generally hindered the development of secondary markets that are crucial to financial sector deepening and has led to increased ownership by insiders. Moreover, the patterns of wide share ownership created by such schemes have been shown to be unstable.[xix] n the absence of institutional mechanisms of state regulation and trust, markets become arenas for political contests and economic manipulation.[xx] While it is very easy to treat privatized SOEs as a special case, the evidence shows that they are at the core of the development of capital markets and even more so during times of excess liquidity. This means that work on improving financial disclosure needs to consider the implications of SOE privatization and that reporting and management practices in parts of the public sectors of emerging economies need to be gradually aligned with the needs of potential investors.

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viii The government owned 22 percent of KKB, 51 percent of Alliance Bank, 97.3 percent of BTA Bank, and 89.9 percent of Temir Bank at end-February 2014. KDB (a development bank) is also owned by the government.

ix As of January 2014, Kazakh banks have a presence in Kyrgyzstan, the Netherlands, Russia, Tajikistan, Luxembourg, Belarus, Georgia, Armenia, and Ukraine.

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