Vol.VII / Issue XIV Sep-2018 ISSN:2278-4187

अAnusandhan

Science Technology & Management Journal

Approved by UGC Indexed by Copernicus
Online version (eISSN 2457-0656) http://aujournals.ipublisher.in/Default

Rabindranath TAGORE UNIVERSITY
Rabindranath TAGORE University: Village-Mendua, Post-Bhojpur, Distt.-Raisen (M.P.)
India Pin-464993, Ph-0755-6766100, 07480-295707
E-mail-aisectjournal@rediffmail.com, info@rntu.ac.in
Web site : www.rntu.ac.in

RABINDRANATH TAGORE UNIVERSITY

UGC Approved Journals

Anusandhan (AUJ-AN)

- Technology & Management

Indexing and Impact Factor :

INDEX COPERNICUS : 48609 (2018)

Assessment of Changes in Land Use and Land Cover Patterns Using RS and GIS: A Case Study of Upper Beas Basin of Kullu Valley in Western Himalayas, India

Nandini Thakur[1], Madhuri Rishi[2], Tirumalesh Keesari[3], Diana A. Sharma[4], Rakhi Singh[5]

[1,2,4,5]Dept. of Environment Studies, Panjab University, Chandigarh (Punjab) India.
[3]Isotope and Radiation Application Division, BARC, Trombay, Mumbai (M.S.) India.

ABSTRACT

This study evaluates the LU/LC changes using RS and GIS tools. The study area, upper Beas river basin of Kullu Valley, falls in the middle Himalayas of Himachal Pradesh, India. The images of Land sat TM of 1991, Landsat ETM+ of 2001 and Landsat OLI of 2016 at 30 meters spatial resolution were used for the study. Both anthropogenic and environmental factors that are responsible for the changes in land use and land cover are evaluated. The study indicated positive changes in bare rock (20%), agriculture (1.72%), open forest (0.34%), settlement (built-up: 0.05%) and river (0.02%) and whereas negative changes are observed in snow cover (-18.3%), grass (-3.18%) and forest (-0.53%) during the years 1991-2001, and the trends remained similar with different magnitudes during 2001 – 2016. The decline in forest area and grass cover with parallel increase in agricultural area and associated urbanisation clearly infer the dominant role of manmade activities in controlling the LU/LC changes in this region. Depletion in snow cover of this region between 1991 and 2016 could be a consequence of the recession of the colder climatic belt to higher altitudes.

Keywords: Land use/cover, Remote Sensing and GIS, high altitude mountain region, human impact, climate change

I INTRODUCTION

Mountain systems constitute a significant fraction of continental area of about 20% and provide life support to 10 % of world's population. These systems typically display a rapid change in vegetation, hydrology and climate in relatively small scales. Snow, glaciers and permafrost in cold mountains are highly sensitive to climatic change and thus provide crucial information on the climate change and its impacts of natural resources and the socioeconomic condition of people. In addition, the dynamic changes in land use and land cover (LU/LC) are important for monitoring, evaluating, protecting and planning of the natural resources for sustaining the ecosystem on the bio-physical surfaces (Rawat et al. 2013). Land cover is the culmination of various attributes like green cover, hydrological components, biota, topography, soil, groundwater and anthropogenic structures on the earth's land surface and immediate subsurface (Lambin et al. 2003) whereas land use is the purposive engagement of land management approach put on the land cover by deliberate human expansion. Studies on the detailed understanding of the impact of anthropogenic and natural factors on land use pattern and its influence on ecology inferred that human dominated factors are widely accepted factors influencing the LU/LC (Munsi et al. 2010).

With the advent of geospatial techniques like remote sensing and GIS, the mapping of LU/LC and its analysis have become less complicated. Remote sensing and GIS tools were employed in many studies to deduce the industrial, agricultural and residential areas for better management of resources (Malczewski 2004; Rawat and Kumar 2015; Butt et al. 2015; Marina and Bogdan 2016). Applying RS and GIS techniques by means of digital change detection can help to assess the temporal changes over few decades in land use and land cover that is being witnessed due to shifting cultivation, deforestation and other environmental changes (Gibson and Power 2000). Atmosphere and land-use changes are two noteworthy worldwide ecological changes anticipated for the future. Changes in land cover patterns can straightforwardly affect energy and mass transitions. For illustration, when extensive regions of forest are cleared, reduced transpiration brings about less cloud development, less precipitation, and expanded drying. Simulations of the deforestation of Amazonia demonstrate that evapotranspiration and forest would be replaced by either desert or field (Dickinson 1992). Both field studies (Segal et al. 1988) and model simulations (Pielke et al. 1997) suggest that spatially alternating groups of vegetation with dry soil on a size of many kilometres can impact atmospheric dissemination and cloud arrangement and this would have larger impacts on climate (Dickinson 1991). Changes in land cover can modify the reflectance of the world's surface and actuate neighbourhood warming or cooling. Numerous resources are being applied to examine causes and, impacts of climate change (Houghton et al. 1990) and still there is a concern that the consequences of these studies may not be important to the decision makers as the researches do not include main considerations affecting climate change impacts (OTA 1993).

Recent studies in the Himalayan region have shown that land use and land cover have changed significantly in both time and space (Chandel et al. 2011; Singh 1998). Studies also indicated that in high altitude Himalayan region of Kullu valley covering upper Beas basin, the vulnerability to natural hazards is closely associated to anthropogenic interventions especially due to changes in land use and land cover (Chandel et al. 2011; Vijay et al. 2016). Using geospatial tools, the impact of tourism on land use/land cover during 1989-2012 and natural slope in the Manali town of the study area have been studied (Vijay et al. 2016). The change detection analysis has shown a continuous increase in the built-up area especially on landslide prone area (Vijay et al. 2016). A study by Nandy et al. (2015) on the environmental vulnerability of Kullu district during the period 1990-2010 reported that factors such as LU/LC changes, hydropower plants, transport connectivity, natural resources exploitation, forest canopy density, forest fire play a crucial role in impacting the land resources. The mountain systems of Kullu region are fragile environments and provide valuable natural resource support not only to upstream areas but also to downstream areas (GOI 2010; ICIMOD 2010) and any alteration to these ecosystem can pose long standing impacts on the hydrological and climatic facets (Vishwa et al. 2013; Bakke et al. 2016).

The selected area for this study is a part of Pir Panjal range of western Himalaya, which has envisaged tremendous developmental activities in the recent past (Vijay et al. 2016). In spite of the tremendous growth in the valley in recent years and its negative impacts on the land and water resources, there are no systematic studies on the quantification of the land use and land cover changes. In this study, an attempt has been made to apply the remote sensing and GIS techniques to assess the changes in land use/land cover in upper Beas river Basin of Kullu valley in Himachal Pradesh, India over the last 25 years. Understanding the impact of anthropogenic activities to land use changes and its implication on ecosystem's capacity to maintain an uninterrupted supply of services can help in planning better management of the resources.

II STUDY AREA

The study area is part of the upper Beas River Basin of Western Himalaya, which encompasses an area of about 1419 km^2 and spans between Rohtang in the North and confluence of river Parvati and Beas in the south of the Kullu Valley, Himachal Pradesh, India (Fig.1). It lies between North Latitudes 31°50' and 32°20' and East Longitudes 76°50' and 77°20'. Geomorphologically, the district is categorised into 5 geographic units namely mountainous area, snow covered area, denuded hills, valley area and terrace area. The topographic elevation of the study area ranges from 1000 to 6000 m above mean sea level and the terrain comprises deeply incised river valleys interspersed with high mountain ridges and massifs of very high, glacier mountain peaks (Prasad et al. 2016). Drainage in Upper Beas basin is mostly constituted by the glacial/ snow fed perennial rivers and tributaries covering an area of 80% of the study area (Sah and Mazari 2007). Climatically the region lies in the temperate zone extending to the tundra zone due to its higher elevation (~ 6000 m amsl).

A varied lithotectonic group exists in the study area comprising a variety of rocks from Precambrian to Quaternary (Sah and Mazari 1998). The upper basin of river Beas locally termed as Rohtang Gneissic Complex constitutes gneisses, granites and magmatites of the Vaikrita Group area (CGWB 2013). In the middle and gorge sections of the valley corridor, slates, garnetiferous schist, quartzite and limestone of the Jutogh Group dominate. Quaternary alluvial fans, fluvial terraces and relict periglacial slope deposits make up the shallow geological strata. The entire area of Kullu district can be divided into porous and fissured formations. Porous formation includes the unconsolidated sediments that are basically fluvial channel deposits, valley fill deposits, terrace deposits and alluvial fans. These sediments form the potential aquifers. Unconsolidated sediments underlie Kullu valley, Garsa valley, Manikaran valley, Lag valley and longitudinal valley all along the major rivers and khads. Fissured formation includes the semi-consolidated to consolidated sediments and are sedimentary, metamorphic and igneous in origin. This formation forms low to high hill ranges throughout the study area (Prasad et al. 2016).

The human interventions have changed the landscape of the study area to a great extent. The population density of the study region has increased from 28 to 69 persons/ km^2 during 1961 to 2001, which is about 300% growth (Sah and Mazari 2007). A comparison of the land use data of 1994-95 with 2000-01 indicate that the barren and non-agricultural land decreased to about 6% and land for non-agricultural uses increased to about 8% in 2000-01 (Sah and Mazari 2007). This clearly demonstrates the impact of increased urbanization in the study area. Depletion in water level of shallow aquifer was also reported in this district due to increased exploitation of the groundwater to augment growing needs of the population (Bhatti 2016).

III METHODOLOGY

Landsat TM dated 16 November 1991, Landsat ETM+ dated 18 October 2001 and Landsat OLI dated

19 October 2016 at 30 meters spatial resolution along with the Survey of India topographical sheet were used for LU/LC analysis. Toposheets of 1:50,000 resolution (143*3, 143*4 and H43F1) were used to prepare the base map for reference. The images were corrected geometrically to Universal Transverse Mercator (UTM) coordinate system (Kumar et al. 2016). Images were selected from same season to minimise the influence of seasonal variation. Images of October and November months were chosen because during this period the ice and snow cover is minimum and the area is relatively cloud free so that various geomorphologic and surface features are clearly visible for identifying and demarcating boundaries and calculating the corresponding areas. The LU/LC classification and mapping was carried out using ERDAS Imagine 2014 and ArcGIS 10.4 software (Mengistu and Salami 2007). Global Positioning System (GPS) readings were taken throughout the study area, this helped to obtain accurate location points for each LULC class and creation of training sample points for maximum likelihood classification in ArcGIS 10.4.

The LULC classes were studied by assigning perpixel signatures to the satellite data and differentiating the area on the bases of the specific Digital Number (DN) value of different landscape elements. The delineated classes were viz., (1) forest (2) open forest (3) grass (4) agriculture land (5) settlement (built-up) (6) river (7) snow and (8) bare rock. For each of the predetermined land cover/use type, training samples were selected by delimiting polygons around representative sites. Spectral signatures for the respective land cover types derived from the satellite imagery were recorded by using the pixels enclosed by these polygons. A satisfactory spectral signature is the one ensuring that there is 'minimal confusion' among the land covers to be mapped (Gao and Liu 2010). After that maximum likelihood algorithm was used for supervised classification of the images. To improve classification accuracy, reduction of misclassifications and to detect the changes in ERDAS IMAGINE 2014 post- classification comparison technique was used (Mengistu and Salami 2007).

The problem of mixed pixels was addressed by visual interpretation. With the help of GPS readings, topographical sheets and google earth maps, ground verification was done for doubtful and unclear areas. In this study, the visual analysis, reference data, as well as local knowledge was used to improve the results obtained using the supervised algorithm. For the accuracy assessment of land cover maps extracted from satellite images, stratified random method was used to represent different land cover classes of the area. The overall accuracy for the years 1991, 2001 and 2016 was 90%. Quantitative areal data of overall LU/LC changes as well as gains and losses in each category between 1991 and 2016 were then compiled.

IV RESULTS AND DISCUSSION

The satellite images of LU/LC from 1991, 2001 and 2016 have been taken to identify the changes occurred during the last 25 years in the study area. Images are classified based on eight LU/LC classes mentioned in methodology (section 3). Visual interpretation of images indicated that major portion is covered by forest followed by snow, bare rock, grass, agriculture, open forest, settlement and river in all the three images. The statistics of area (km^2 and %) in different land use/cover categories in upper Beas river Basin of Kullu Valley in the year 1991, 2001 and 2016 are given in Table 1. Fig. 3 depicts the LU/LC status of three study periods i.e., 1991, 2001 and 2016. The brief account of these results is discussed below.

(a) LU/LC Status

The year 1991 was taken as base year for the study because post 1991 the anthropogenic activities started rising significantly compared to previous years (Singh, 1989; Sah and Mazari, 1998). Table 2 and Figure 3(a) reveal that in the year 1991 about 34.3% (487 km^2) of the area was under forest, 22.6% (321 km^2) under snow, 20% (282 km^2) under bare rock, 13.8% (197 km^2) under grass, 6.1% (86.7 km^2) under agriculture, 2.7% (38.9 km^2) under open forest, 0.12% (1.7 km^2) under river and 0.34% (4.9 km^2) under built-up area. The order of dominance of land cover can be represented as;

Forest> snow>bare rock> grass> agriculture>open forest>settlement>river

(b) LU/LC Change

Results indicate that both positive and negative changes have occurred in the LU/LC pattern in the upper Beas Basin of Kullu valley during the last 26 years (Table 1 and Fig. 3). The detailed inventory of LU/LC in km^2 is shown in figure 4 while the % change of the attributes is shown in figure 5 for the year 1991, 2001 and 2016.

- During 1991-2001, positive changes are visible in open forest, agriculture, settlement, river and bare rock whereas negative changes are seen in forest, grass and snow.
- During 2001-2016, positive changes are noticed in agriculture, settlement, snow and bare rock whereas forest, open forest and grass showed negative change.

(i) Positive changes

- **Bare rock area**

In 1991 the bare rock in study area was 282 km^2, which shows an increasing trend between 1991 and 2001 (Fig. 4). From 2001 to 2016 (15 years) the area under bare rock has shown an increasing trend. The images of the year 1991, 2001 and 2016 displayed an increase in bare area 20% (1991 to 2001), 1.5% (2001 to 2016) shown in Fig.5. The possible reason that can be attributed to this growth in the bare rock area is reduction in snow cover in higher elevations. Studies have suggested decrease in snow fall as well as enhanced snow melting due to climate change related processes (Ming et al. 2008; Ramanathan and Carmichael, 2008). The reduction in snow cover from 90% to 55% was reported even at lower altitudes of 2480 m amsl by Kulkarni et al. (2010).

- **Agriculture area**

During the year 1991 to 2001, increase in agriculture area witnessed a 1.72% growth (24.4 km^2) while during the period between 2001 and 2016 it witnessed a 0.67% growth (9.5 km^2) as shown in Fig. 5. The expansion of agricultural land in the valley can mainly be attributed to increased need for food due to population rise and expansion of horticulture. In addition to local food needs, market forces also act in increasing the agriculture in this region. Expansion of agriculture land has resulted in diversion of forest land and grass cover areas. The increased area under agriculture is mostly related to extending the horticulture area to higher elevations which can be possibly related to socioeconomic factors (Sah and Mazari, 1998).

- **Settlements**

The settlement or total built-up area has shown a positive trend. It is 4.9 km^2 in 1991, 5.7 km^2 in 2001 and 6.7 km^2 in 2016 (Fig. 4). The areas such as Manali, Patlikuhl, Naggar and Bhuntar were urbanised due to tourism growth in addition to Kullu, which is the oldest urbanised town of the valley. The valley as a whole has witnessed a tremendous expansion in settlement area owing to population growth of both incumbent and temporary residents. The village core areas have expanded due to growth in tourism activity in relation to home stays in rural areas. Developmental activities in the Kullu valley have gained momentum from rest of the Kullu because of which rampant urbanization is mushrooming from the floor of the valley towards higher elevations. Better road connectivity to higher altitude is also augmenting the settlement growth and encroaching of the agricultural area for concretization in the study area. The study period reveals an increase in settlement in accordance with the population growth, which is evident from the data that the population growth of 14.7% between 2001 and 2011 (Census of India, 2001, 2011) and tourism growth of 241% between 1993 and 2001 in the study area and can be attributed to the regional influx of the tourism induced urbanization on the valley floor.

- **River**

The area under the river has increased from 0.12% to 0.14% between 1991 and 2001.The change was found to be very less, which can be interpreted as variation in flow of the river. In addition, the inundation of river in 1995 floods can be one of the main reasons for increase in river area. Melting of snow cover would lead to increase in glacial fed river flows, which will also increase the spread (area) of the rivers. It is also possible that high amount of rainfall in a given year can increase the river discharge and enhance the bank erosion leading to spread in the river area.

(ii) Negative change

- **Forest cover**

Between the period 1991 and 2001 the forest cover was reduced from 34.3% to 33.7% which further went down by 1.8% between 2001 and 2016. The decrease in forest cover is cumulative effect of deforestation for tourism activity and an altitudinal shift of agriculture and horticulture areas in the valley. Various studies have pointed out that both environmental factor such as climate change (IPCC, 2001) and anthropogenic factors (Negi et al. 2012) such as deforestation can affect forest cover.

- **Grass cover**

Area under the grass cover from 1991 to 2016 showed a declining trend (Fig. 4). Between 1991 and 2001 the decrease in grass cover was about 3.18% which further declined by 1.55% between 2001 and 2016 (Fig. 5). Change in grass cover can be attributed to anthropogenic factors, mainly to environmental changes. The growth of grass is temperature and climate dependent, and the changes in these factors can cause reduction in grass cover. A detailed study on the human caused environmental changes and its impact on plant diversity is carried out by Tilman and Lehman (2001).

(iii) Mixed change

- **Open forest**

All lands with a tree cover or canopy density between 10% and 40% are termed as open forests. Both positive and negative changes in open forest have been noticed (Fig. 5). During the period between 1991 and 2001 the open forest has been increased from 2.7% to 3.07% whereas between 2001 and 2016 a negative change is seen from 3.07% to 2.6%.

- **Snow cover**

The area under snow cover shows a decrease from 22.6% (in 1991) to 4.26% (in 2001). Global warming could be the reason for the decrease in the snow cover. The global warming has a significant impact on the reduction of snow cover. It was estimated that 18.3% of snow cover has been lost during one decade (1991-2001). A marginal increase of 5.81% in snow cover was observed during 2001 to 2016 (Fig. 5), which could be ascribed to the local climatic conditions. Snow cover is related to atmospheric

temperature and studies by Shekhar et al. (2010) and Kulkarni et al. (2010) has detailed the seasonal temperature variations and its impact on snowfall in Indian Himalayan region. There is likelihood relationship between increase in snow cover and decrease in bare rock area and vice versa. Glacier retreat at different rates is reported in many studies on the adjacent district of Himalayan glaciers where changes in the permanent snow cover retreat has been witnessed but retreat rates were markedly more in the Parvati valley of Kullu district (Kulkarni et al. 2004). Global warming, climate change (Ming et al. 2008; Ramanathan and Carmichael, 2008) area are considered as principal contributors for glacial melt in Western Himalaya irrespective of the differences in the retreat of glaciers (Negi et al. 2012).

(c) Precipitation trends – LULC variations

Rainfall data of this region over the same period as that of the investigated period was plotted to identify correlation between LULC changes and amount of rainfall, if any. The range of annual rainfall varies from 644 to 1733 mm with an annual average of 1049 mm. It can be observed that there are no particular decrease or increase trends noticed over the investigated period. There was always a deficit in the rainfall as compared to average value of 1405 mm (source: CGWB 2013) excepting in 2010. Very high variations in rainfall are observed. The area of major classes of LULC, viz., forest, grass, agriculture, snow and bare rock were plotted against the corresponding year rainfall (Fig. 6). No direct linkage could be discerned between the rainfall and the variations in the areas for these classes, which indicate the contribution of other climatic factors as well as human activities. From the rainfall pattern and its correlation with LULC parameters, it can be inferred that the local climate can be the main driver for the LULC change, a similar observation was reported by Soheb et al. (2015).

Table 1

Statistics of area (km^2 and %) in different land use/cover categories in upper Beas river Basin of Kullu Valley in the year 1991, 2001 and 2016

Area	1991(Km^2)	1991(%)	2001(Km^2)	2001(%)	2016(Km^2)	2016(%)
Forest	487	34.3	480	33.7	453	31.9
Open forest	38.8	2.7	43.7	3.07	37.2	2.6
Grass	197	13.8	152	10.7	130	9.14
Agriculture	86.7	6.1	111	7.82	121	8.50
Settlements	4.89	0.34	5.7	0.39	6.7	0.47
River	1.71	0.12	1.9	0.14	2.0	0.14
Snow	321	22.6	60.6	4.26	82.6	5.81
Bare rock	282	19.9	565	39.8	587	41.3
Total	1419	100	1419	100	1419	100

Table 2

Statistics of amount of change in different LU/LC categories in upper Beas river Basin of Kullu Valley in year 1991, 2001 and 2016

Area	**Change in LU/LC**			
	1991-2001(%)	1991-2001**(**km^2)	2001-2016(%)	2001-2016(km^2)
Forest	-0.5	-7.6	-1.9	-26.6
Open forest	0.4	4.8	-0.5	-6.5
Grass	-3.2	-45.1	-1.5	-21.9
Agriculture	1.7	24.4	0.7	9.5
Settlements	0.05	0.8	0.08	1.1
River	0.02	0.25	0.005	0.07
Snow	-18.3	-260	1.6	22.0
Bare rock	20	283	1.6	22.4

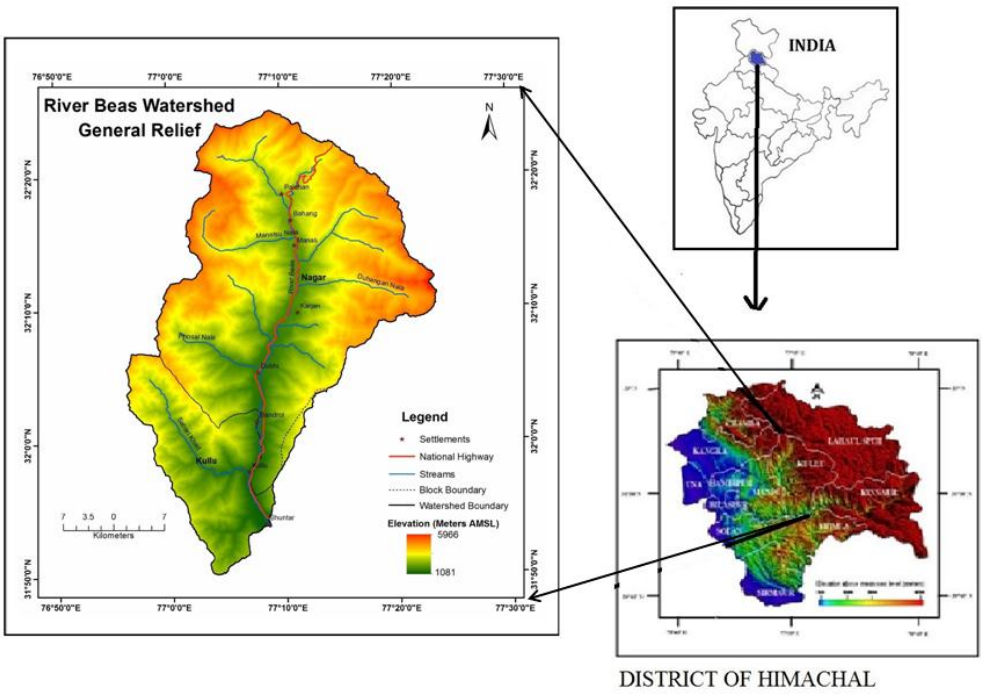


Fig.1 Location map of the study area

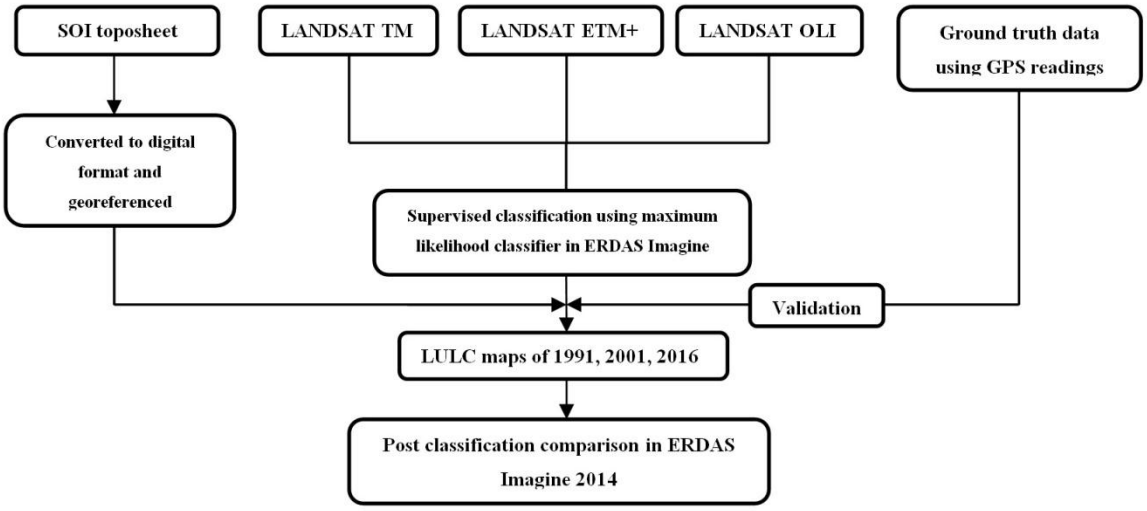


Fig. 2 Flow chart of land use/cover mapping

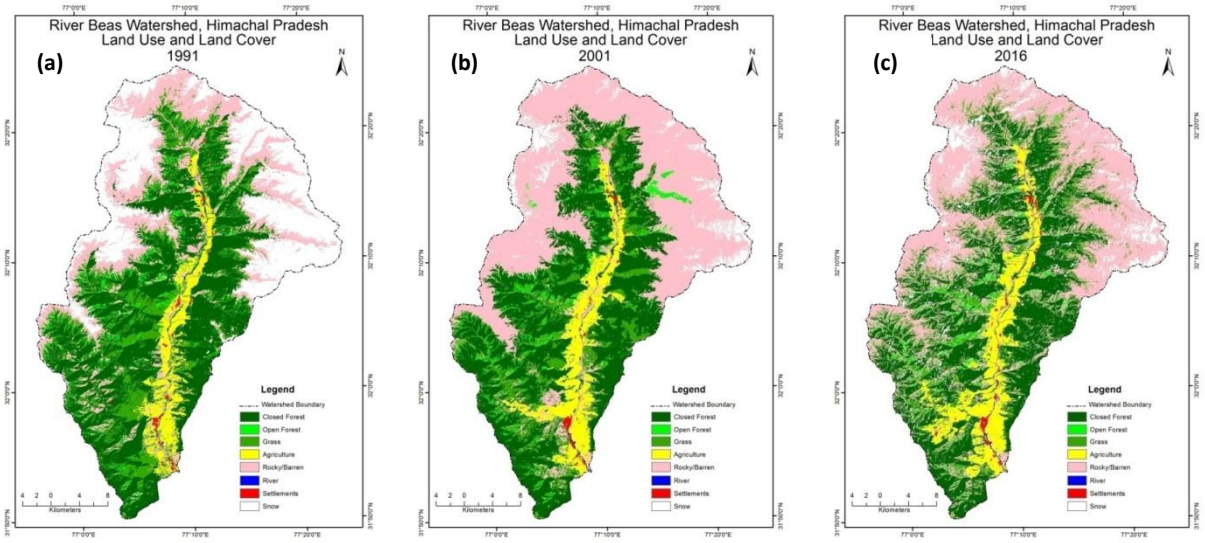


Fig.3 Classification results for Kullu region a) 1991, b) 2001 and c) 2016

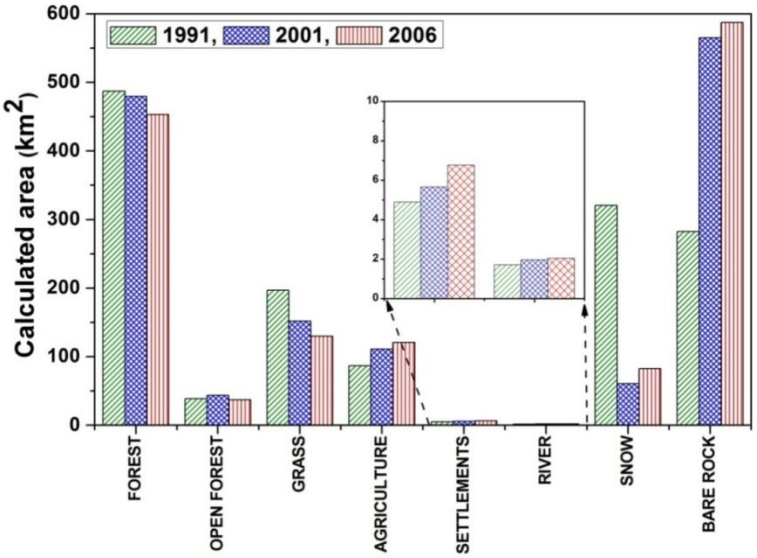


Fig. 4 Inventory of LU/LC in the study area

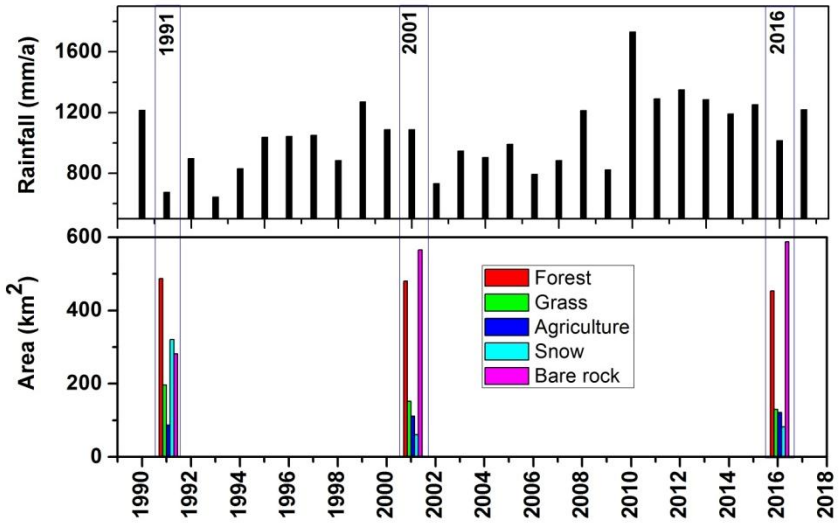


Fig. 5 Amount of change in different LU/LC categories

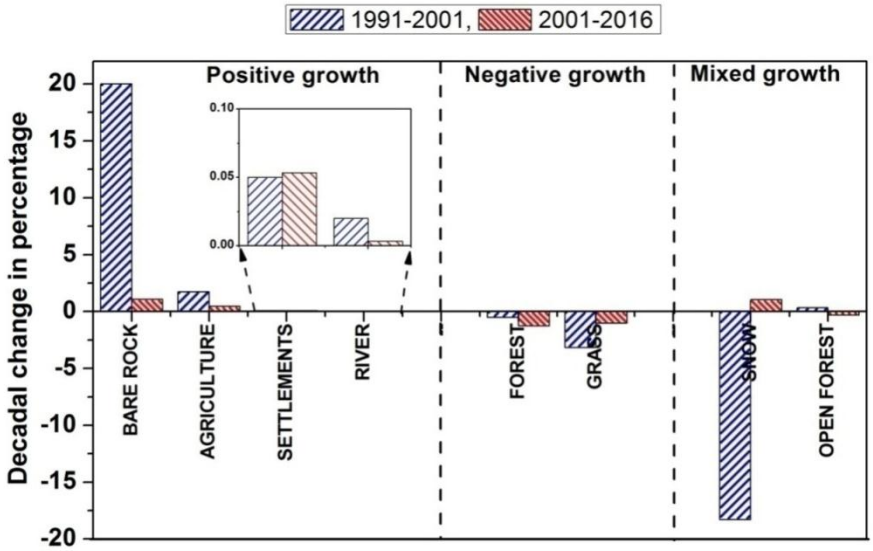


Fig. 6 Annual rainfall and the areas of major LULC classes of the study area

V CONCLUSION

The study conducted in upper Beas river basin of Kullu Valley in the middle Himalayas of Himachal Pradesh employs multi-temporal satellite data to detect the changes in LU/LC patterns in an accurate manner. The study reveals that both positive and negative changes are witnessed during the period of 26 years (1991-2016). During 1991-2001, the percent changes indicate a decrease in the snow (-18.3%), grass (-3.18%) and forest (-0.53%) while bare rock (20%), agriculture land (1.72%), open forest (0.34%), settlement (0.05%) and river (0.02%) show increased values. During the 2001-2016 the percent change in forest (-1.9%), grass (-1.55%), snow (-1.55%) and open forest (-0.46%) show a decrease while bare rock (1.58%), agriculture land (0.67%), settlement (0.08%), river (0.005%) show increased values.

The decline in the forest area and grass clearly signify the deforestation and an increase in the agricultural, horticulture and other anthropogenic activities. Settlement area has increased between 1991 and 2016 due to increased urbanization as a consequence of tourism. Depletion and retreat of snow cover between 1991 and 2016 can be attributed to the recession of the colder climatic belt to higher altitudes. No systematic pattern is observed in the rainfall of this area, however inter annual rainfall fluctuations are found to be high. This study displays the potential of remote sensing and GIS tools in monitoring the LU/LC changes in temporal and spatial scales that could help suggest pragmatic planning of various resources in sustainable manner.

VI ACKNOWLEDGEMENT

The authors wish to express their thanks to DST-Promotion of University Research and scientific Excellence, GOI for providing the necessary financial support to carry out this study. Authors also thank the anonymous reviewers for their technical inputs.

REFERENCES

[1] Bakke, J., Vasskog, K., Ramanathan, A. L., Mandal, A., Kumar, O., & Nesje, A. (2016). "The Water Tower of India in a Long-term Perspective–A Way to Reconstruct Glaciers and Climate in Himachal Pradesh during the last 13,000 Years" Journal of Climate Change, 2(1), pp.103-112.

[2] Butt, A., Shabbir, R., Ahmad, S.S., & Aziz N. (2015). "Land use change mapping and analysis using Remote Sensing and GIS: A case study of Simly watershed, Islamabad, Pakistan" The Egyptian Journal of Remote Sensing and Space Sciences, 18, pp.251–259.

[3] Chandel, V. B., Brar, K. K., & Chauhan,Y. (2011). "RS & GIS based landslide hazard zonation of mountainous terrains a study from Middle Himalayan Kullu District, Himachal Pradesh, India" International journal of Geomatics and Geosciences, 2(1), pp. 121.

[4] Census of India (2011). Provisional Population Totals.Series-3 (http://censusindia.gov.in).

[5] Central Ground Water Board (CGWB) (2013). "Groundwater Information Booklet Kullu district, Himachal Pradesh" Ministry of Water Resources, Government of India.

[6] Dickinson, R.E. (1991). "Global change and terrestrial hydrology: a review" Tellus 42AB:176–181.

[7] Dickinson, R.E., & Kennedy, P. (1992). "Impacts on regional climate of Amazon deforestation" Geophysical Research Letters, 19(19), pp.1947-1950.

[8] Gao, J. & Liu, Y. (2010). "Determination of land degradation causes in Tongyu County, Northeast China via land cover change detection" Int. J. Appl. Earth Obs. Geoinf., 12 (1), pp.9–16.

[9] Gibson, P. J. & Power, C. H. (2000). "Introductory remote sensing: Digital image processing and applications" London: Routledge. 249 p.

[10] Government of India (GOI) (2010). "National Mission for Sustaining the Himalayan Eco-System. National Action Plan on Climate Change, Department Of Science & Technology" New Delhi: Ministry of Science & Technology.

[11] Houghton, J.T. & Jenkins, G.J. & Ephraums, J.J. (1990). Climate change: the IPCC Scientific Assessment.

[12] ICIMOD (2010).Climate Change Impact and Vulnerability in the Eastern Himalayas – Synthesis Report. Kathmandu, Nepal: International Centre for Integrated Mountain Development.

[13] IPCC (2001). https://www.ipcc.ch/ipccreports/tar/wg1/pdf/WGI_TAR_full_report.pdf

[14] Kulkarni, A. V., Rathore, B. P., & Alex, S. (2004). "Monitoring of glacial mass balance in the Baspa basin using accumulation area ratio method" Current science, pp.185-190.

[15] Kulkarni, A.V., Rathore, B. P., Singh, S. K., Ajai, Prof. (2010). "Distribution of seasonal snow cover in central and western Himalaya" Annals of Glaciology, 51(54), pp.123-128.

[16] Lambin, E. F., Geist, H. J., & Lepers, E. (2003). "Dynamics of land-use and land-cover change in tropical regions" Annual review of environment and resources, 28(1), pp.205-241.

[17] Mahagaonkar, A., Wangchuk, S., Ramanathan, A. L., Tshering, D., & Mahanta, C. (2017). "Glacier Environment and Climate Change in Bhutan—An Overview" Journal of Climate Change, 3(2), pp. 1-10.

[18] Malczewski, J. (2004). "GIS-based land-use suitability analysis: a critical overview" Progress in planning, 62(1), pp.3-65.

[19] Marina-Ramona Rujoiu-Mare & Bogdan-Andrei Mihai (2016). "Mapping Land Cover Using Remote Sensing Data and GIS Techniques: A Case Study of Prahova Subcarpathians" Procedia Environmental Sciences, 32, pp. 244 – 255.

[20] Mengistu, D. A., & Salami, A. T. (2007). "Application of remote sensing and GIS inland use/land cover mapping and change detection in

a part of south western Nigeria" African Journal of Environmental Science and Technology, 1(5), pp.99-109.

[21] Ming, J., Cachier, H., Xiao, C., Qin, D., Kang, S., Hou, S., & Xu, J. (2008). "Black carbon record based on a shallow Himalayan ice core and its climatic implications" Atmospheric Chemistry and Physics, 8(5), pp. 1343-1352.

[22] Munsi, M., Malaviya, S., Oinam, G., & Joshi, P. K. (2010).A landscape approach for quantifying land-use and land-cover change (1976–2006) in middle Himalaya.Regional Environmental Change, 10(2), 145-155.

[23] Nandy, S., Singh, C., Das, K. K., Kingma, N. C., &Kushwaha, S. P. S. (2015). "Environmental vulnerability assessment of eco-development zone of Great Himalayan National Park, Himachal Pradesh, India" Ecological indicators, 57, pp.182-195.

[24] Negi, G. C. S., Samal, P. K., Kuniyal, J. C., Kothyari, B. P., Sharma, R. K., &Dhyani, P. P. (2012). "Impact of climate change on the western Himalayan mountain ecosystems: an overview" Tropical ecology, 53(3), pp. 345-356.

[25] OTA (Office of Technology Assessment) (1993). Preparing for an uncertain climate. United States Government Printing Office, Washington, DC.

[26] Pielke, R. A., Lee, T.J., Copeland, J.H., Eastman, J. L., Ziegler, C.L., & Finley, C.A. (1997). "Use of USGS-provided data to improve weather and climate simulations" Ecol. Appl., 7, pp. 3–21.

[27] Prasad, A. S., Pandey, B. W., Leimgruber, W., & Kunwar, R. M. (2016). "Mountain hazard susceptibility and livelihood security in the upper catchment area of the river Beas, Kullu Valley, Himachal Pradesh, India" Geoenvironmental Disasters, 3(1), pp.3.

[28] Bhatti, R. (2016). Ground Water Year Book Himachal Pradesh (2014-2015) Northern Himalayan Region Dharamshala (H.P).

[29] Ramanathan, V., & Carmichael, G. (2008). "Global and regional climate changes due to black carbon" Nature geoscience, 1(4), pp.221.

[30] Rawat, J. S., & Kumar, M. (2015). "Monitoring land use/cover change using remote sensing and GIS techniques: A case study of Hawalbagh block, district Almora, Uttarakhand, India" The Egyptian Journal of Remote Sensing and Space Science, 18(1), pp. 77-84.

[31] Rawat, J. S., Biswas, V., & Kumar, M. (2013). "Changes in land use/cover using geospatial techniques: A case study of Ramnagar town area, district Nainital, Uttarakhand, India" The Egyptian Journal of Remote Sensing and Space Science, 16(1), pp. 111-117.

[32] Sah, M. P., & Mazari, R. K. (1998). "Anthropogenically accelerated mass movement, Kulu Valley, Himachal Pradesh, India" Geomorphology, 26(1-3), pp. 123-138.

[33] Sah, M. P., & Mazari, R. K. (2007). "An overview of the geoenvironmental status of the Kullu Valley, Himachal Pradesh, India" Journal of Mountain Science, 4(1), pp. 003-023.

[34] Segal, M., Avissar, R., McCumber, M.C., & Pielke, R. A. (1988). "Evaluation of Vegetation Effects on the Generation and Modification of Mesoscale Circulations" Journal of Atmospheric Sciences, 45 (16), pp. 2268-2292.

[35] Shekhar, M.S., Chand, H., Kumar, S., Srinivasan, K., & Ganju, A. (2010). "Climate-change studies in the western Himalayas" Annals of Glaciology, 51(54), pp.105–112.

[36] Singh, R. B. (1998). "Land use/cover changes, extreme events and eco hydrological responses in the Himalayan region" Hydrological Processes, 12, pp. 2043-2055.

Identification of Genotypic Similarities Having QTLS for Drought Tolerance by Using SSR Markers

Aakash Kumar
Dept. of Agriculture, AU, Hazaribagh (Jharkhand) India.

ABSTRACT
Rice is one of the most important crops, providing staple food for about half population of the world. Rice production must be increased 60% so as to meet for the contention by the year 2025.Rice belongs to the ***genus Oryza*** *and has* ***two cultivated*** *and* ***22 wild species.*** *The cultivated species are Oryza sativa and Oryza glaberrima. Oryza sativa is grown all over the world while Oryza glaberrima has been cultivated in west Africa for the last ~3500 years. Rice is the principal food for over half of the production of the world. Drought is the most important abiotic stress limiting rice yields in almost all major ecosystems where it is presently grown. Drought is a critical abiotic stress that severely restrict crop production, under drought conditions plant accumulate reactive oxygen species.****Abiotic stress*** *is defined as the negative impact of non-living factors on the living organisms in a specific environment. The region within genome that contains gene associated with a particular trait are known as quantitative trait loci (QTLs).Different SSR markers are associated with different QTLs for drought tolerant.RM 3825 is associated with QTL* $_{DTY\ 1.1}$*,RM 279 is associated with QTL* $_{DTY\ 2.2}$*. Microsatellites are simple repeated motifs consisting of 1 to 6 base pairs, and they can be found in both coding and non-coding regions. The mutation rate of this type of genetic marker has been estimated to be between* 10^{-2} *and* 10^{-4} *per generation. The primary advantage of microsatellites as genetic markers is that they are inherited in a Mendelian fashion as co dominant markers. High polymorphism rates, high abundance and a broad distribution throughout the genome have made microsatellites one of the most popular genetic markers for use in plant breeding programs. Microsatellites are also known as simple sequence repeats (SSR), and they are typically composed of 1–6 nucleotide repeats[16].Recent advances in rice genomics have now made it possible to identify and map a number of genes through linkage to existing DNA markers. The ideal type of genetic marker should be highly polymorphic, show*
Co-dominant inheritance and be evenly distributed throughout the genome. A number of factors should be considered when choosing between the various molecular markers[16]:
(a) Marker system availability.
(b) Complexity of the technique and time investment.
(c) Estimated polymorphism levels within the study population.
(d) Quantity and quality of available DNA available.
(e) Transferability between laboratories, populations, pedigrees and species.
(f) The size and structure of the population to be studied.
(g) Availability of skilled workers and equipment
(h) Cost per data-point and funding availability.
During this experiment we got some of rice varieties from CRURRS-CRRI, Hazaribagh, Jharkhand. In which few of the samples having known QTL while the few of the samples which has unknown QTL. These all samples are known by this experiment.

I INTRODUCTION

Rice is one of the most important crops, providing staple food for about half population of the world. Rice production must be increased 60% so as to meet for the contention by the year 2025. Rice belongs to the **genus Oryza** and has **two cultivated** and **22 wild species.** The cultivated species are Oryza sativa and Oryza glaberrima. Oryza sativa is grown all over the world while Oryza glaberrima has been cultivated in west Africa for the last ~3500 years. Rice is the principal food for over half of the production of the world. With a compact genome spanning approximately 430 MB pairs, an extensive genetic map (Harushima et. Al. 1998) and established synteny with other cereal crops (Gale & Devos 1998), the cultivated rice species Oryza sativa represents a model for cereal as well as other monocot plants. Drought is one of the most important constraints in crop resulting in large yield losses and limiting the average yield increase. Rice is central to the lives of billions of people around the world. Rice provides 21% of global human per capita energy and 15% of per capital protein. Calories from rice are particularly important in Asia, especially among the poor, where it accounts for 50-80% of daily caloric intake. Asia accounts for over 90% of the world's production of rice, with China, India and Indonesia producing the most.

Soil moisture deficit that leads to reduction in growth, development and yield of crops.

Drought tolerance mechanism is genetically controlled and genes or QTL responsible for drought

tolerance have been discovered in several crops which opens avenue for molecular breeding for drought tolerance.

The region within genome that contains gene associated with a particular trait are known as quantitative trait loci (QTLs).Several QTLs were identified at IRRI and breeding programmes at Hazaribagh focused on the transfer of these QTLs to productive background, in collaboration with IRRI.
Molecular tools facilitate the identification and genomic locations of genes controlling traits related to drought tolerance using quantitative trait loci (QTL) analysis.

Agriculture is the backbone of Indian economy and rice crops undoubtedly occupies a pivotal position in Indian agriculture.

Rice is the important crop of India occupying 23.3% of gross cropped area of the country and contribution 43% of the total food grain production. Rice is cultivated under diverse agro climate conditions, as its cultivation extends from 8-35^{o}C latitude and 0 to 3000 m altitude. The productivity as well as pests and disease in different ecosystems are likely to be influenced by climate variability and climate change. it is necessary to understand the basics of the climate change and its projections .The effects of climate change on productivity and pests/disease of crops in general and rice in particular.

India being mainly an agricultural country the economy and further its growth purely depends on the vagaries of the weather and in particular the extreme weather events. In this paper present a factual and a brief review of the extreme weather events that occurred in India during the last 100 years (1991-2004).**Drought also occurs in this year 2016**, almost 70% of Indian states. The table show below is the table of temperature. The socio-economic impacts of the extreme weather events such as floods, droughts, cyclones, hail storm, thunderstorm, heat and cold waves have been increasing due to large growth of population and its migration towards urban areas which has led to greater vulnerability. In recent years as per WMO review global losses from such extreme weather events is about US $ 50-100 billion annually with loss of life of about 2,50,000. Thus, greater efforts are needed to improve the forecast skill and use these better forecasts in disaster management.

Table:-1
(in 2016),Different temperatures that cause drought in India, Red shows high temperatures.

Lucknow	47^{o}C
Delhi	47^{o}C
Agra	45^{o}C
Nagpur	49^{o}C
Kota	48^{o}C
Hyderabad	45^{o}C
Pune	42^{o}C
Ahemdabad	46^{o}c
Mumbai	42^{o}c
Gwalior	40^{o}c
Khandwa	42^{o}c
Nashik	40^{o}c
Bangalore	40^{o}c
Chennai	45^{o}c

The drought, in particular, an unusually dry, is matter of concern for scientists and planners.

Of all the major natural disasters, droughts account for nearly 22% of significant damages though the number of deaths is only 3% worldwide (De & Joshi 1998).

Droughts have a wide range of effects on the masses in a developing country like India. The impact of droughts is specifically conspicuous in view of the tropical monsoon character of the country. Rainfall by the south-west monsoon is notorious for its vagaries.

II IMPACT ON AGRICULTURE

Indian agriculture still largely depends upon monsoon rainfall where about two-thirds of the arable land lack irrigation facilities and is termed as rained. The effect is manifested in the shortfalls of agricultural production in drought years. History is replete with examples of serious shortfall in cultivated areas and drop in agricultural productivity.

Severe shortage of food-grains had been felt and the country had to resort to import of food-grains to save the poor people from hunger and starvation. However, India has been able to build a buffer stock of food–grains and threat from droughts is not as serious as it used to be before the Green Revolution.
It is worth mentioning here that the shortfall in agricultural production may be the direct impact of meteorological droughts but the succeeding hydrological and agricultural droughts have a long range and far reaching impact on agriculture. This impact may be in the form of changes in the cropping patterns and impoverishment in cattle.

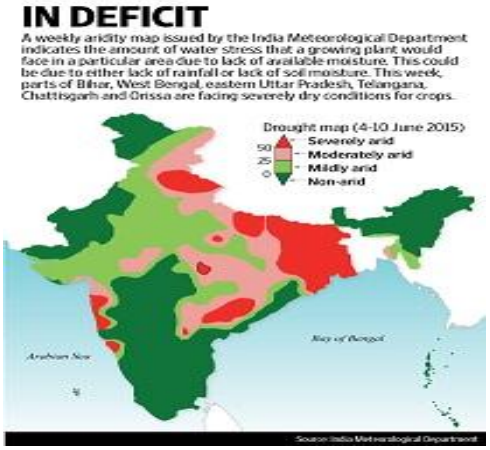


Fig. 1:- Effect of drought in year 2015.

Fig. 2:- Effected land by drought.

III EFFECT OF DROUGHT ON RICE ORYZA SATIVA (RICE)

Rice (Oryza sativa L.), the major staple food crop of the world, faces a severe threat from widespread drought. Drought is the most important limiting factor for crop production in many regions of the world. It is often unpredictable and does not occur in all years in a target environment. Rice (Oryza sativa L.) is a major staple crop on which about half of the world's population depends. Drought stress during the vegetative growth, flowering, and terminal stages of rice cultivation can cause spikelet sterility and unfilled grains. Usually, drought during the grain-filling process induces early senescence and shortens the grain-filling period, but increases remobilization of assimilates from the straw to the grains. Thus, the manner in which drought influences grain yield is not straightforward and it is necessary to understand the mechanism of plant responses to drought conditions, with the ultimate goal of improving crop performance for the vast rice cultivation areas of the world where rainfall is unreliable.

IV QTLS FOR DROUGHT IN RICE

Drought is a key factor affecting food security worldwide; its effect 70% in crop`s yield generally. Conventional plant breeding approaches for yield improvement under drought condition is time consuming and laborious, because carefully managed field conditions are required. Selection for a well-developed root system with long thick roots should improve the drought tolerance in upland rice because the plant would avoid water stress by absorbing stored water in the deep soil layer. Phenotypic selection for root morphological trait in conventional breeding programs is unfeasible. The use of molecular marker could provide a useful tool to support phenotypic selection. So several mapped population were developed to detect QTLs influencing root morphology and other drought related traits that could be used in marker assisted selection to improve upland rice varieties.

V QTL`s FOR ROOT CHARACTERS

Root is a vital organ for absorbing soil moisture and nutrients and influence drought resistance. The root provides, among others, anchoring and water/ nutrients absorption to the plant. Breeding for strong root systems is an important strategy for improving drought avoidance in rice. A quantitative trait locus (QTL), controlling root thickness and root length. Atchley and Zhu (1997) demonstrate that the genetic mechanism of controlling complex quantitative trait changed distinctly. Conditional QTL mapping may be a valid way to reveal dynamic gene expression for the development of quantitative traits, especially the epistatic effect. Mapping QTL with genetic main effects and QTLs X environmental interaction effects could help understand the nature of the quantitative trait.

The methods of soil chambers and hydroponics under greenhouse conditions played an important role for morphological characterization for root traits, but these methods are were insufficient to estimate environment effects on root traits.

VI PHYSIOLOGICAL PARAMETERS ASSOCIATED WITH DROUGHT IN RICE

Drought is one of the major limitations to plant productivity worldwide. Identifying suitable screening tools and quantifiable traits would facilitate the crop improvement process for drought tolerance. The physiological and biochemical experiments are in good agreement with the classification into

drought-tolerant and drought-sensitive genotypes based on field experiments under natural drought stress. The results, especially the measurements of the osmotic potential and chlorophyll fluorescence, were close to and in some cases even better than those of the tolerant cultivars. The lack of agreement with the field trials in this case could be due to the effect of stress conditions other than drought working simultaneously on the plant. In field conditions, it is impossible to eliminate the effects of other negative environmental factors and the indicator of tolerance examined for example the crop yield, is a resultant indicator of the influence of many stress factors during the growth and development of plants.

(a) Materials and Methods

(i) **Methods**

- DNA Extraction.
- DNA Purification.
- NANO Drop.
- PCR.
- 2-D Gel Electrophoresis.

(ii) **Materials**

- Rice Leaf Samples.
- Motar & Pistal.
- Liquid Nitrogen.
- CTAB Extraction Buffer and other chemicals

Table 2:-
List of samples provided by CRURRS, Hazaribag, Jharkhand.

S.NO.	SAMPLE`S
1	CRR-693-28-B-1-B-B
2	CRR-696-42-B-1-B-B
3	CRR-616-1005-B-1-B-B
4	CRR-616-1022-B-1-B-B
5	CRR-697-76-B-1-B-B
6	ABHISHEK
7	CRR-708-1-B-2-B-B
8	CRR-708-7-B-1-B-B
9	VANDANA
10	VANDANA NIL
11	ANJALI
12	ANJALI NIL
13	SAHBHAGI DHAN
14	CR DHAN 103
15	IR 64 NIL
16	CRR680
17	Virendra
18	Sneha
19	MTU 1010
20	KALINGA 3
21	CR DHAN 40

VII PCR CONDITION

Initial denaturation 94°C for 2 minutes

- 35 cycles of
- Denaturation 94°C for 30 seconds
- Anneling** for 45 seconds
- Elongation 72°C for 45 seconds
- Final elongation 72°C for 10 minutes
- **Storage** 4°C for initiate

**Annealing temperature depends on primer used. (Due to GC content of provided primer).

2-D Gel Electrophoresis

Milli Q = 130ml
Agarose (HI- PURE) = 2.5 %
Mix them and add 1.7 µl of Ethidium Bromide.
Mixed agarose transferred to casting gel plate.

Results

Table 3:-
Positions of rice samples with respect to electrophoresis well.

First two electrophoresis result	
DNA Ladder	L
Sahbhagi dhan	1
3.CR Dhan 40	2
Abhishek	3
Virender	4
Sneha	5
Kalinga 3	6
IR64 NIL	7
MTU 1010	8
Vandana	9
Vandana NIL	10
Anjali	11
Anjali NIL	12

List of primers have used to detect QTLs are as follows:-

1. RM 3825

2. RM 279.

RM 279 associated with $QTL_{DTY\ 2.2}$ and RM 3825 associated with $QTL_{DTY\ 1.1.}$

RM 431 Annealing temperature is **51.8** for forward and **51.8** for reverse.

REVERSE SEQUENCE: - 5` **AGAGCAAAACCCTGGTTCAC**

FORWARD SEQENCE: - 5` **TCCTGCGAACTGAAGAGTTG**

VIII RESULTS

RM 3825 which having $QTL_{DTY1.1.}$ Out of 12 samples only four samples contain $QTL_{DTY1.1,}$ CR Dhan 40 [2], Vandana NIL[10], Anjali[11]and Anjali NIL[12] and DNA ladder used for this electrophoresis is of 100kb.

RM 3825 electrophoresis result	
DNA Ladder	L
Sahbhagi dhan	1
CR Dhan 40	2
Abhishek	3
Virender	4
Sneha	5
Kalinga 3	6
IR64 NIL	7
MTU 1010	8
Vandana	9
Vandana NIL	10
Anjali	11
Anjali NIL	12

RM 279 associated with $QTL_{DTY\ 2.2}$ and only one sample IR 64 NIL contain $QTL_{DTY\ 2.2.}$

RM 279 electrophoresis result	
DNA Ladder	L
Sahbhagi dhan	1
CR Dhan 40	2
Abhishek	3
Virender	4
Sneha	5
Kalinga 3	6
IR64 NIL	7
MTU 1010	8
Vandana	9
Vandana NIL	10
Anjali	11
Anjali NIL	12

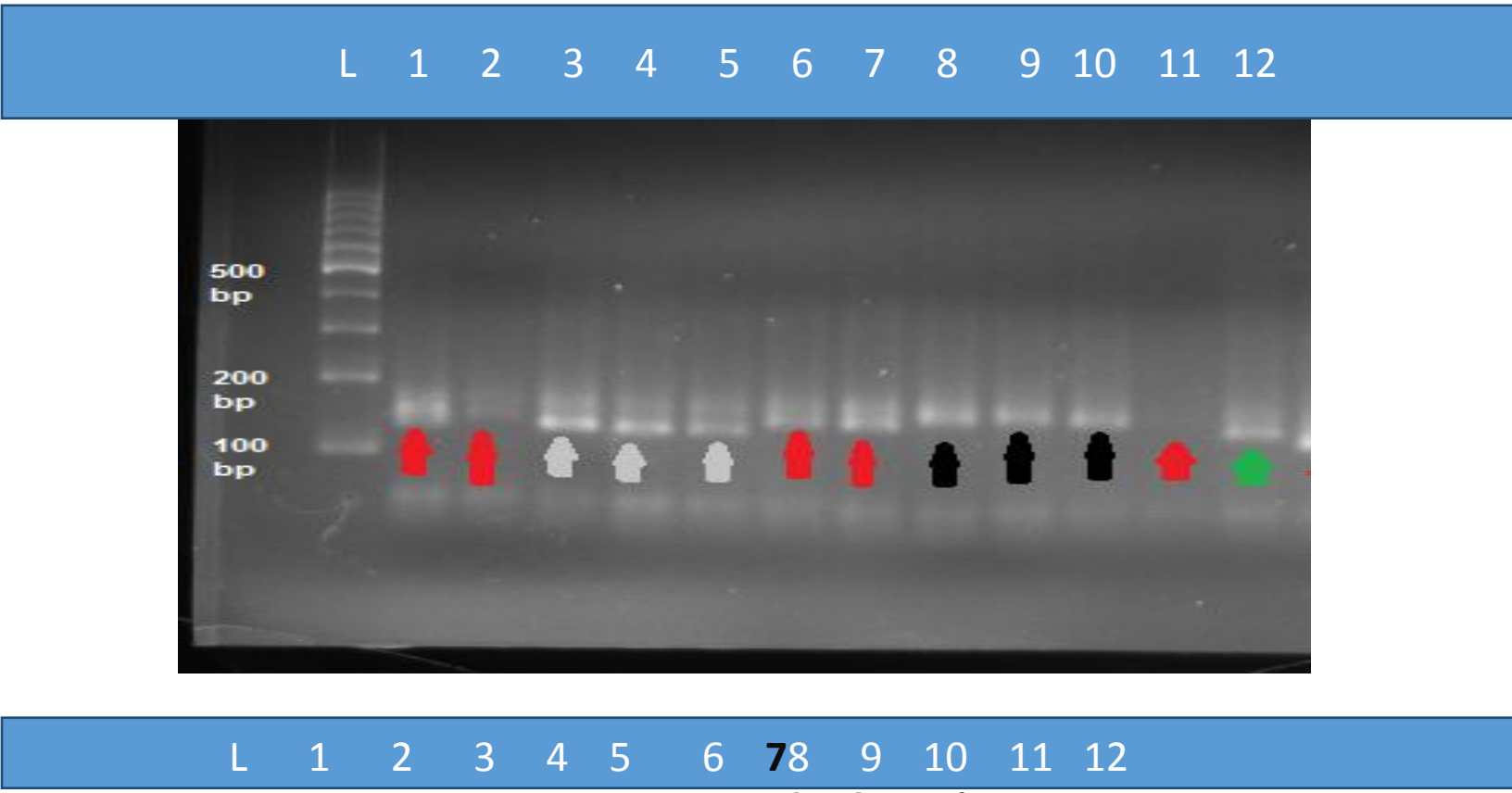


Fig 3. Primer RM 3825 :-Five varieties showed positive for QTL DTY 1.1

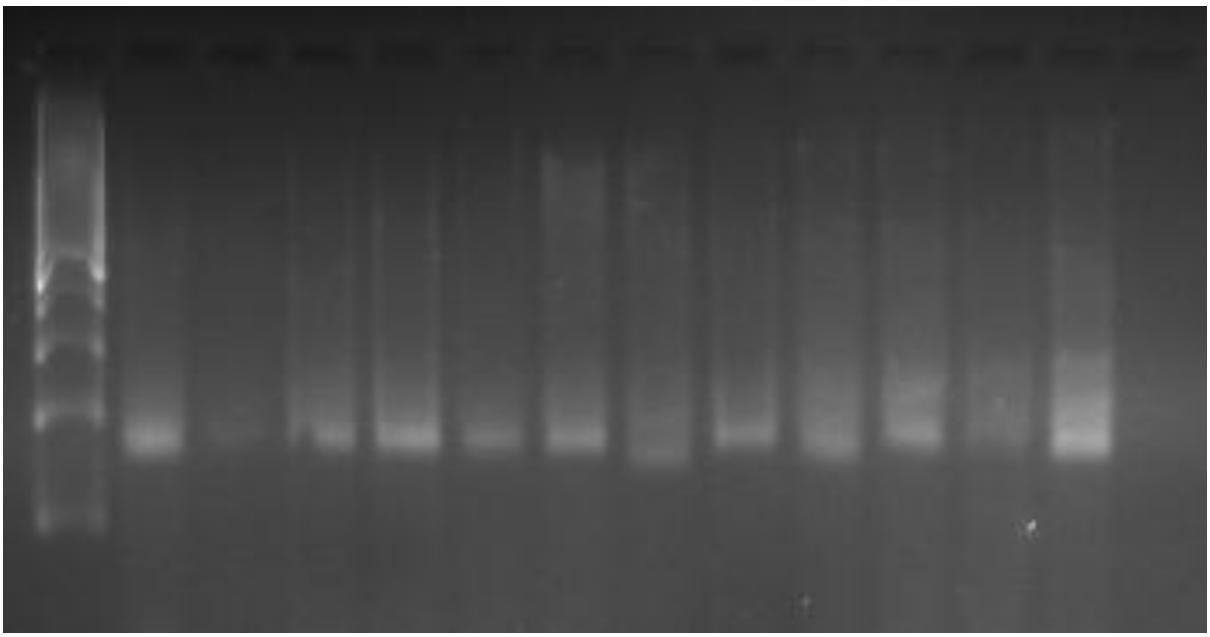


Fig. 4 RM 279 :-Out of 12 varieties tested, only IR64 NIL(No.7) possesses QTL DTY 2.2

IX DISCUSSION AND CONCLUSION

All markers are associated with its specific QTL, in this experiment we are using two markers RM 3825 which is associated with $QTL_{DTY\ 1.1}$ and another is marker RM 279 which associates with $QTL_{DTY\ 2.2}$, here we identified only four popular rice samples having $QYL_{DTY\ 1.1}$ and these are CR Dhan 40, Vandana NIL, Anjali and Anjali NIL. RM 279 associated with $QTL_{DTY\ 2.2}$ and only one sample has $QTL_{DTY\ 2.2}$ which is IR 64 NIL.

REFERENCES

[1] Phillips, R.L.; Vasil, I.K. DNA-Based Markers in Plants. In DNA-Based Markers in Plants;Kluwer Academic Publishers: Dordrecht, The Netherlands, 2001; p. 497. Int. J. Mol. Sci. **2013**, 14 **22519**

[2] Kumar, P.; Gupta, V.K.; Misra, A.K.; Modi, D.R.; Pandey, B.K. Potential of molecular markers in plant biotechnology. Plant Omics J. **2009**, 2, 141–162.

[3] Benali, S.; Bencheikh, M.; Henni, J.E.; Claire, N. Advances of molecular markers application in plant pathology research. Eur. J. Sci. Res. **2011**, 50, 110–123.

[4] Kalia, R.K.; Manoj, K.R.; Sanjay, K.; Rohtas, S.; Dhawan, A.K. Microsatellite markers:An overview of the recent progress in plants. Euphytica **2011**, 177, 309–334.

[5] Jarne, P.; Lagoda, P.J.L. Microsatellites, from molecules to populations and back.Trends Ecol. Evol. **1996**, 11, 424–429.

[6] Sakai, H.; Ikawa, H.; Tanaka, T.; et al. Distinct evolutionary patterns of Oryza glaberrima deciphered by genome sequencing and comparative analysis. Plant J. **2011**, 66, 796–805. Int. J. Mol. Sci. **2013**, 14 **22521**

[7] Parida, S.K.; Mukerji, M.; Singh, A.K.; Singh, N.K.; Mohapatra T. SNPs in stress-responsive rice genes: Validation, genotyping, functional relevance and population structure. BMC Genomics **2012**, 13, 426.

[8] Saarinen, E.V.; Austin, J.D. When technology meets conservation: Increased microsatellite marker production using 454 genome sequencing on the endangered Okaloosa darter (Etheostoma okaloosae). J. Hered. **2010**, 101, 784–788.

[9] Churbanov, A.; Ryan, R.; Hasan, N.; Bailey, D.; Chen, H.; Milligan, B; Houde, P. HighSSR: High-throughput SSR characterization and locus development from next-gen sequencing data. Bioinformatic **2012**, 28, 2797–2803.

[10] Squirrel, J.; Hollingsworth, P.M.; Woodhead, M.L.; Russell, J.; Lowe, A.J.; Gibby, M.; Powell, W. How much effort is required to isolate nuclear microsatellites from plants? Mol. Ecol. **2003**, 12, 1339–1348. Int. J. Mol. Sci. **2013**, 14 **22524**

[11] Selvaraj, I.C.; Pothiraj, N.; Thiyagarajan, K.; Bharathi, M.; Rabindran, R. Identification of microsatellite (SSR) and RAPD markers linked to rice blast disease resistance gene in rice (Oryza sativa L.). Afr. J. Biotechnol. **2011**, 10, 3301–3321.

[12] Koide, Y.; Kawasaki, A.; Telebanco-Yanoria, M.J.; Hairmansis, A.; Nguyet, N.T.M.; Bigirimana, J.; Fujita, D.; Kobayashi, N.; Fukuta, Y. Development of pyramided lines with two resistance genes, Pish and Pib, for blast disease (Magnaporthe oryzae) in rice (Oryza sativa L.). Plant Breed. **2010**, 129, 670–675.

[13] Ashkani, S.; Rafii, M.Y.; Harun, A.R.; Latif, M.A. Genetic dissection of rice blast resistance by QTL mapping approach using an F3 population. Mol. Biol. Rep. **2013**, 40, 2503–2515.

[14] Gous Miah 1, Mohd Y. Rafii 1,2,*, Mohd R. Ismail 1,2, Adam B. Puteh 2, Harun A. Rahim 3,Kh. Nurul Islam 4 and Mohammad Abdul Latif 2,5. A Review of Microsatellite Markers and Their Applications in Rice Breeding Programs to Improve Blast Disease Resistance.

[15] Amelia HenryA,C, Shalabh Dixit A, Nimai P. Mandal B , M. S. Anantha B , Rolando TorresA and Arvind KumarA, Grain yield and physiological traits of rice lines with the drought yield QTL qDTY12.1 showed different responses to drought and soil characteristics in upland environments, **2014**.

[16] Zhu, M.; Wang, L.; Pan, Q. Identification and characterization of a new blast resistance gene located on rice chromosome 1 through linkage and differential analyses. Phytopathology **2004**,94, 515–519.

[17] Song, W.Y.; Wang, G.L.; Zhu, L.H.; Fauquet, C.; Ronald, P. A receptor kinase-like protein encoded by the rice disease resistance gene, Xa21. Science **1995**, 270, 1804–1806.

Green Audit: A Case Study of Saifee Golden Jubilee Quaderia College, Burhanpur, M.P., India

Iftekhar A. Siddiqui

HOD, Botany Dept., S.G.J. Quaderia College, Burhanpur, (M.P.) India.

ABSTRACT

Green Audit is a requirement of "NAAC" committee to the college. The concept of Green audit, industries are using it as a management tool to evaluate the environmental standards, industries can perform better and better for the sustainable development of the organization. The Experiments on the nature by avoiding natural rules, this can be one major reason behind that is green Audit. The term 'Green' means eco- friendly or not damaging the environment. Green Accounting can be defined as systematic identification, quantification, recording, reporting & analysis of components of ecological diversity & expressing the same in financial or social terms drivers of green audit, future scope, benefits and advantages are necessary to understand, A total of 267 species (Angiosperms-256, Gymnosperms-11) and 56 families (Dicot-48, Monocot-08), have been reported from the study area. As part of green audit of study area, we carried out the environmental monitoring of campus includes waste management. (Vermicomposting, Bio-waste management), greenhouse effect, aquarium, mushroom culture water conservation, tree plantation, paperless work, vegetative propagation, butterfly garden, ventilation paperless work system and mapping of Biodiversity. Noise level in the campus is well within the limit i.e. below 50 dB at day time. This may lead to the prosper future in context of Green Campus & thus sustainable environment and committee development. Further we hope, this will boost the new generation to take care of environment and propagate these views for many generations to come.

Keyword: NAAC, Eco-friendly, sustainable Development, Ecological diversity.

I INTRODUCTION

The green audit is conducted to improve the environmental conditions of the college as protection of environment is a prime necessity in the present era. It is meant for ensuring ecological balance and bio-proliferation. The objective of carrying out green audit in the college is to create awareness among the students as to real concerns of environment. It helps as an indicator of the deterioration in environmental conditions and provides a fillip to the programs and policies of the institute. The college is established in the year 1962 and is affiliated to the DAVV Indore, MP, India. It is situated in the salubrious bank of river Tapti and covers an area of 6 $^{1/2}$ % acres of which 60% area is fully under green umbrella and 40 % is partially covered with green trees and plants.

In scenario people are not caring of nature, they are directly or indirectly damaging the environment and it causes problems like: global warning, difficulties in maintaining ozone layers, air pollution, water pollution etc. Green Audit in the most efficient and ecological war to solve such a environment problem. For protecting the nature as a human being we have to show our sense of humor towards the mother earth. The Green Audit of is requirement of NAAC committee to the college. A report on green audit has been prepared by department of Botany, S.G.J. Quaderia College, Burhanpur, MP, India. This college was established in 22 July, 1962 and accredited with Grade 'B' by NAAC, Bangalore.

II REVIEW OF LITERATURE

In 2008, Adeniji is the first who primarily concerned with environment audit of the companies to the growing importance of green issues. **In 2008, Porter, Simon and Hatchery** is the first who clearly mention exactly what is the green audit? And after his explanation about the green audit this concept "Green audit" as "Environment management system" (EMS) that is continuous increase in environment and communication of the result of the EMS activity with organizations directors.

III MATERIALS AND METHODOLOGY

In order to perform green audit, the methodology included different tools such as preparation of questionnaire, physical inspection of the campus, observation and review of documentation, interviewing key persons and data analysis, measurement and recommendations. So this study is conceptual study. The methodology is adopted for this paper by collecting the information from secondary sources, personal views and opinion also included in this study. Qualitative and quantitative analysis of flora and fauna was done by biostatical central tendencies and survey methodology recorded species were identified with the help of expert, local floras and using standard literature & other sources.

IV OBSERVATION ACTUAL CASE STUDY

(a) Name of College- S.G.J. Quaderia College, Burhanpur, MP, India (Near the historical Shahi Qila)

S. No.	Name and area of the unit	Total area (in Sq. Ft.)
1.	Total Campus area	25981
2.	Built up area of the building	3418
3.	Built up area of administrative Block (Office)	360
4.	Room E Class	400
5.	Botany Lab area	1600
6.	Computer Dept. + Lecture theater + chemistry Dept.	4500
7.	Microbiology + Biotechnology	2400
8.	Zoology lab	3125
9.	Physics Lab	560
10.	Library (Varandah front back)	2125
11.	Class Room (with Varandah)	2240
12.	Staff Room	360
13.	Girls Common Room	400
14.	NAAC office	360
15.	Secretary office	450
16.	Principal office	450
17.	Toilet Block 1	105
	Toilet Block 2	110
	Toilet Block 3	126
18.	Principal	450
19.	NSS room	400
20.	Hall	2625
21.	Old Building	2100
22.	Home Science Dept.	3000

(b) Water Consumption

S. No	Water used for	April 2017 to March 2018
1.	Domestic Purpose	5000 Lit / day
2.	Gardening	15000 Lit / day
3.	Laboratory Purpose	**MMMMM / DAY**

(c) Electricity consumption

Electricity consumption	Uses
Per day	680 Unit kwH
Per Month	2147 Unit kwH
Per Year	25764 Unit kwH

(e) Solid Wastes

S.No	Source of Waste	Total Quality	Method of Disposal
1	Solid waste from trees dropping & Lawn	10 kg/ day	Vermi composting + Organic Manure
2.	Solid waste from Chemistry Botany and Zoology lab	04 kg/ day	
3.	Plastic waste	0.2 kg/ day	

(f) E- Waste Management

The total No. of Computers in the institute – 52
Printers-06
Xerox machine-02

(g) Plantation Awareness Program:

The institute has organized "Tree Plantation program" at college campus and surrounding village (Chandni) through

student Red Cross & NSS unit. The plantation program includes Plantation of various types of family (family- 56, Species angiosperms -256 and species Gymnosperm-11 total 267) and also maintaining green house, Botanical garden including butterfly garden. This program helps in maintaining "eco-friendly" environment as well as provides pure oxygen within the institute.

S.No	Biodiversity Local Name	Total No of Plants			Popular Name Famous Name	Botanical Name	Family
		2015-16	2016-17	2017-18			
Small Size Trees							
1	Amaltas	01	02	02	Amaltas	Cassia fistula	Caesalpinoideae
2	Arandi	01	01	01	Arandi	Ricinus communis	Euphorbiaceae
Medium Size Tress							
3	Babool	01	02	02	Babool	Acacia arobica	Mimosoideae
Large Size Tress							
4	Imli	01	01	02	Imli	Tamarindus Indica	Caesalpinoideae
5	Casurina	19	20	21	Casurina	Casurina equisitifolia	Casurinaceae
6	Jamun	01	01	01	Jamun	Syzygium Cuminii	Myrtaceae
Bushes							
7	Aak	01	02	02	Aak	Calotropis Procera	Aselepiadaceae
8	Karonda(Kakronda)	01	01	03	Karonda	Carissa Spinarum	Apocynaeeae
Undergrowth							
9	Ashwgandha	03	05	06	Ashwgandha	Withania Somnifera	Solanaeae
10	Lazni	04	10	12	Lazwanti	Mimosa Pudica	Mimosoidae
11	satawari	01	01	01	Satawar	Asparagus recemosus	Liliaceae
12	Gudhal	01	01	01	Gudhal	Hibiscus rosa, Synansis L.sp.pl.	Malvaceae
Small Bushes							
13	Kala Datura	01	04	06	Datura	Motel	Solanaceae
14	Madaar Parasite	02	04	07	Aak	Calotropis Procera	Aselepiadaeeae
15	Amarbel Herbs	01	01	02	Amarbel	Cuseuta reflexa	Convolvulaceae
16	Gokru	05	10	15	Gokru	Tribulus terresteris terresteris	Zygophyllaceae
17	Tulsi	03	10	19	Tulsi	Ocimum Sanctum	Labiatae
18	Bhata (Brinjal)	01	05	08	Began	Solanum Melongena	Solanaceae
19	Safed Musli	00	05	01	Safed Musli	Chlorophytum tuberosum	Orchidaceae
Climbers							
20	Kankarwa	01	04	05	Kankarwa	Ditoria turnata	Papilionaeeae
Bamboo							
21	Bamboo	00	01	01	Bamboo	Dendrocalamus strictus	Poaceae
Grass							
21	Duba	00	00	08	Doob	Cynodon daetylon	Graminae(poaceae)
22	Common Ghass	00	00	03	Ghass	Pennicum Indicum	Poaceae
Small Size Tress							
23	Gul Mohar	02	07	09	Gul Mohar	Delonix indicum	Caesalpinoideae

24	Nimbu (citrno)	01	03	04	Neebu	Citrus Lemonia	Rutaceae
25	Nagfani	01	04	05	Nagfani	Opuntia Dillenii	Cactaceae
26	Baer (Zizipus)	01	01	01	Ber	Zizyphus moureitiana	Rhanaceae
27	Mithi Neem	01	05	07	Mithi neem	Murraya Koenigii	Miliaceae
28	Willayati Babool	01	01	01	Willayati Babool	Parkinsonia Aculeota	Caesalpinoideae
29	Willayati Imli	01	01	02	Willayati Imli	Pithecolobium dulce	Papilionaceae
30	Shehtoot	01	01	01	Shehtoot	Morus alba	Moraceae
31	Sejha	01	01	02	Munga	Moringa elleffera	Moringaaceae
32	Sitafal	03	10	16	Sitafal	Annona squamosa	Annonaceae
33	Selfund	01	01	05	Nivarang	Euphorbia nivulia	Euphorbiaeeae
Medium Size Trees							
34	Sheeshum	07	08	10	Sheeshum	Dalbegia Latifolia	Papilionateae
35	Deshi Badam	03	06	08	Deshi Badam	Terminala catappa	Combretaceae
36	Neem	10	20	25	Neem	Azadirachta indica	Meliaeeae
37	Neelgiri	01	01	02	Neelgiri	Eucalyptus teretecornis	Myrtaeeae
38	Peepal	15	20	25	Peepal	Ficus religiosa	Moraceae
39	Badh	01	01	02	Bargad	Ficus bengalensis	Moraceae
40	Saggon	01	01	01	Sagoon	Teetona Grandis	Verbenaceae
Medicinal Plants							
41	Safed Musli	04	05	01	Safed Musli	Chlorophytum tuberosum	Amonillidaeeae
42	Jangli Tulsi	05	10	15	Jangli Tulsi	Ocimum basilicum	Labiateae
43	Bhat Kattiya	03	04	05	Bhat Kattiya	Solanum zanthoearpum	Solanaeeae
44	Aadha Sisi	03	04	10	Gokhru	Tribulus terrestris	zygophyllaceae
45	Bhindi	04	10	11	Okra	Abelmosecus eseulentus	Malvaceae
46	Pudina	09	10	25	Mentha	Mentha sp.	Lamiaceae
47	Rose	04	05	45	Gulab	Rosa damascena	Rosaceae
48	Pyaz	01	10	15	Onion	Allium Sepa	Liliaeeae
49	Pili Sarsoo	03	05	10	Yellow mustard	Brassica campestris	Cruciferae
50	Kewra	01	01	01	Kewra	Pandanus odoratissimus	Pandanaceae
51	Ajwain	01	02	05	Ajwain	Prachyspermum ammi	Apiaceae
52	Pan	19	20	25	Betel	Piper betle	Piperaceae
53	Euphorbia	02	03	15	Euphorbia	Euphorbia hirta	Euphorbiaceae
54	Hatjod	04	06	02	Hatjod	Cissus quadrangularis	Vitaceae
55	American chili	19	20	10	American Mirch	Capsicum annuum	Solanaceae
56	Patthar chatta	03	04	05	Patthar chatta	Bryophyllum pinnatum	Crassulaceae
57	Insulin	01	02	02	Insulin	Chamauostus cuspidatus	Costaceae
58	American aloe	08	09	10	American aloe	Agave Americana	Agavaceae
59	Safed siris	01	01	01	Safed siris	Albizia procera	Mimosaceae
60	Boogan bel	08	10	11	Boogan bel	Bougainvillea glabra	Nyctaginaceae

61	Ber	01	01	01	Ber	Ziziphus mauritiana	Rhamnaceae
62	Lahsun	08	20	25	Lahsun	Allium sativum	Alliaceae
63	Chiku	01	01	01	Chiku	Manilkara zapota	Sapotaceae
64	Railway creeper	01	01	02	Railway creeper	Ipomea cairica	Convolvulaceae
65	Coat buttons	08	20	22	Coat buttons	Tridex procumbens	Asteraceae
66	Giloy	03	05	06	Giloy	Tinospora cordifolia	Menispermaceae
67	Salvadora	01	01	01	Salvadora	Salvadora persica	Salvadoraceae
68	Ashoka	04	05	08	Ashoka	Saraca asoca	caesalpiniaceae
Ornamental Plants							
69	Bottle Brush	01	01	01	Bottle brush	Callistemon sp.	Myrtaeeae
70	Firebush	02	03	04	Firebush	Hamelia Plants Jacqenum pl.	Rubiaceae
71	Sadabahar	05	10	11	Sadasuhagan	Vinka rosea	Apoeynaeeae
72	Euphorbia	02	03	05	Euphorbia	Euphorbia pulchrryma	Euphorbiaeeae
73	Kaner	08	13	13	Kaner	Thevelia peruviana(pers)schum	Apocynaeeae
74	Kamal	02	04	06	Lotus	Nymphia sp.	Nymphiceae
75	Genda	08	10	12	Genda	Tagetes ereetal	Asteraceae
76	Petunia	08	10	15	Petunia	Petunia sp.	Solanaeeae
77	Kagaz ke phool	09	10	18	Kagaz ke phool	Polygonum sp.	Polygoniaceae
78	Mehndi	03	04	04	Mehndi Heena	Lewsonia inermus(L.)	Lythraceae
Family							
79	Satyanashi	07	10	10	Pilicatai	Arqimone mexsikiana	Papaveraceae
80	Makoli	06	10	10	Makoli	Solanum nigram	Solanaceae
81	Dhaniya	01	02	03	Dhaniya	Coriandrumsp.	Umbelliferae
82	Peeli Kaner	09	13	14	Peeli Kaner	Casebella thevetia (L.)	Lippid
83	Palm	02	03	03	Palm	Chamaerops humilis L.	Areceaceae
84	Euphorbia	02	03	05	Euphorbia	Euphorbia hirta	Euphorbiaceae
85	Papita	04	06	07	Papaya	Carica Papaya	Caricaceae
86	Touch me not Chuimui	03	05	06	Lajwanti	Mimosa pudica Linn.	Mimosoideae
87	Khatti Buttti	04	05	06	Khatti Butti	Oxalis Achalypha indica	Euphorbiaceae
88	Chaullai	06	10	11	Chaulai	Amaranthus	Amaranthaeeae
89	Sitab	03	04	15	Sitab	Ruta graviens	Rutaeeae
90	Andosa	04	05	06	Aadusa	Adhatoda vasica	Aconthaeeae
91	Champa	00	01	01	Champa	Michelia champaea Linn	Magnoliaceae
92	Mango	01	01	02	Aam	Mangifera indica L.	Myrtaeeae
96	Amrood	01	02	02	Jaam	Psidium gujava L.	Anacardiaceae
97	Amla	01	02	02	Amla	Phyllanthus fraternas	Enphorbiaeeae
98	Beel	01	01	02	Beel	Aegle marmelos (L.)	Rutaeeae
99	Agave	23	04	06	Agave	Agave amiricana	Agavaceae
100	Bottlepalm	19	20	21	Bottlepalm	Hyophorbe lagenicaulis	Arecaceae
101	Gwarpatha	04	10	10	Gwarpatha	Aloe vera L. Burm L.	Liliaceae
102	Gulmohar	04	07	08	Gulmohar	Delonix regia	Caesalpinoideae
103	Nirgundi	00	01	01	Nirgundi	Vitex- migundol	Verbenaeeae
104	Croton	02	03	03	Croton	Codicum Varigatum(L.)BLBijp.	Euphorbiaeeae
105	Kaner	02	03	04	Kanher	Nerium indicum Nill	Apocynaeeae
106	Vidhya	10	20	22	Thuja(Morpan	Platy eladus orientalis(L.)	Cupressaceae

					kh)		
107	Gulab	02	02	03	Gulab	Rosa indica L.sp.	Rosaceaae
108	Gulab	00	01	02	Gulab	Rosa domoscena Mill.	Rosaceae
109	Gulab	00	01	03	Gulab	Rosa multiflora thunb.	Rosaceae
110	Yellow rain lily	09	20	23	Zephyranthes	citring baker.bot.	Amaryllidaceae
111	Madhumati	03	04	06	Gelphimia	Gracilis (Bart c)	Malphigaceae
112	Giant	02	02	02	False agave	Furcraea gracilis(Barti)	Malphigaceae
113	Kelly	01	02	04	Kardal	Canna indica L.sp.pl.	Cannaceae
114	Sultan	04	05	06	Sultan	Aealypha hispida Jpg.	Euphorbiaceae
115	Kamal	02	04	06	Kamal ka phool	Nymphaea nouchali burm	Nympheae
116	Hydrilla	08	10	11	Hydrilla	Hydrilla Verticillata(L.f.)Royle	Hydrocharitaceae
117	Hydrilla	01	02	03	Hydrilla	Ipomoea pes-tigridis L.	Convolvulaceae
118	Hydrilla	00	02	04	Hydrilla	Ageratum Conyzoides L	Compositae
119	Hydrilla	00	02	06	Hydrilla	Boerhavia repens L.var.diffusa(L.)	Moorthy
120	Dawal	01	02	04	Anjan Lokariya	Tephrosia purpurea(L.) Pres.	Liguminosae
Gymnosperm							
121	Cycus	01	02	05	Cycus	Cycus revolute	Cycadaceae
122	Cycus	01	02	06	Cycus	Cycus circinalis	Cycadaceae

Statistical analysis of Biodiversity

S. No.	Groups	Families	Species
1.	Angiosperms -Dicot	48	256
	Angiosperms -Monocot	08	
2.	Gymnosprm	-	11
Grand Total		**56**	**267**

Summary (Biodiversity of plants)

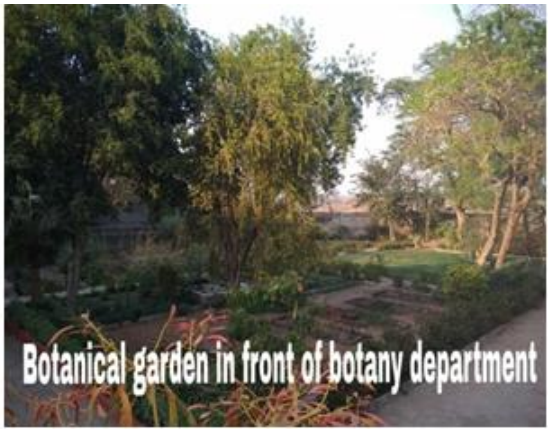
Small size trees	-	24	Medium size trees	-	55
Large size trees	-	24	Bushes	-	05
Undergrowth	-	20	Small Bushes	-	58
Parasites	-	01	Herbs	-	04
Climber	-	06	Bamboos	-	01
Grass	-	11	Medicinal	-	27
Ornamental	-	20	Gymnosperms	-	11
Total	**:**	**106**		**:**	**161**

Grand total: 106+161= 267

Elevation of Main College Building

Infrastructure and Greenbelt Area

TYPES OF ETHNOMEDICINAL PLANTS



Types of Ethnotaxonomical Plants

Types of Divergent Plants

Butterfly Garden (Indicator of Environment)

(h) Vermiculture composting Culture:

The institute is has started vermiculture composting culture in campus during 2017-18 on 3×8 sq. meter land. The main purpose of this is to reduce disposable waste in the college campus and after complete process of vermicomposting it is used as manure and awareness in students & farmers. The main benefits of the process are to reduce the waste in the environment and also it is cost savings process.

a. Aquarium

A aquarium is a transparent container in which aquatic animals are kept along with aquatic plants, rocks, gravels, artificial decorative etc. Simulating natural environment. It enables the students to have a close view of the fishes of different varieties. Which caters to our objective of providing practical knowledge along with theoretical knowledge to the students and brings students closes to natural environment.

(i) Mushroom culture:

We are also cultivating mushroom of oyster variety.

(j) Noise level limits in the campus:

As a part of green audit of campus, through one day seminar & workshop on "NOISE

POLLUTION and IT'S EFFECT ON HUMAN HEALTH ", the students were asked to check the noise level in the campus by using sound level meter and they observed that the noise level in the campus is well within the limit i.e. below 50 dB at day time.

(k) Environment awareness program:
While maintain the environment awareness program in the campus it is compulsory subject to all second year student which is irrespective to particular branches (In foundation course)

(l) Awareness of carbon consumption:
In the college campus almost 90% of students are using bicycle. Due to awareness program in the campus air quality within it is non-polluted.

V RESULT AND DISCUSSION

The environmental awareness initiatives are substantial. Paperless work system and vermicomposting practices are noteworthy. Besides, environmental awareness programs initiated by the administration shows how the campus is giving green. As part of green audit of campus, we carried out the environmental monitoring of campus includes noise level, ventilation and indoor air quality of the class room. It was observed that illumination and ventilation is adequate considering natural light and air velocity present.

VI CONCLUSION

Green audit is the most efficient & ecological way to solve such a environmental problem. It is necessary to conduct a green audit in college campus because student aware of the green audit, its advantages to save the planet & they become good citizen of our country. Further we hope this will boost the new generation to take care of environment and propagate these views for many generations to come.

REFERENCES

[1] Adeniji, A.A. (2008) Audit and Assurance services, Lagos: Value Analyst concept of Green Audit.

[2] Anandraj, Sahu (2012), "Green Audit: How Practically facing of changing business perspective towards nature."

FPGA Implementation of Chaotic Generator Using Numerical Algorithms

Subodh Kumar Pandey[1], Dr. Sanjeev Kumar Gupta[2]
[1,2]Dept. of ECE, Rabindranath Tagore University, Raisen (M.P.) India.

ABSTRACT
Now a day's chaotic systems have an important role in secure communication and cryptography. As FPGA implementation have certain advantages over analog one, different chaotic system like chaotic oscillator, True random number generators and chaotic systems used in image processing, optical circuits for secure communications were successfully realized in FPGA. This paper presents methodology of FPGA implementation of any chaotic system using different numerical algorithm. In study the Numerical solution of Differential equations given in Pandey-Baghel-Singh system were obtained and coded in Verilog and tested with XilinxVivado 17.3 design suites in Artix-7 Nexus 4 DDR and Basys3. Performance of the FPGA based chaotic generator using Heun and RK4 algorithmsare analyzed using 10^6 data sets with the maximum operating frequency achieved up to 359.71MHz.

Key Words **-** Chaotic Generators, Heun, RK4 algorithm, FPGA

I INTRODUCTION

Chaos generator is a fundamental block of any chaos based system. Basically chaos based system are used in secure communication and cryptography.Recently implementation of FPGA based real time chaotic systems were presented. Due to parallel processing capabilities the processing speed of FPGA is much higher. Analog based chaotic generatorsare sensitive to initial conditions and acquires a large chip area hence it may be interesting to see the performance of FPGA based chaotic generators to avoid these problems.Digital based design of chaotic generators using FPGA can be implemented as FPGA implementation is more flexible architecture and have low cost test cycle and found more useful in chaos based engineering applications [1-7].

In II section of the paper presented the Pandey-Baghel-Singh Chaos System (PBSCS) is described along with their x,y and z signals and their attractors [8]. In the III section the mathematical models of PBSCS is numerically obtained using Heun and RK4 algorithms and FPGA models of PBSCS is introduced. In sectionIV simulation results of different numerical algorithm based design has been presented and analyzed. In section V conclusion is given.

II INTRODUCTION TO PANDEY-BAGHEL-SINGH CHAOS SYSTEM

Pandey-Baghel-Singh Chaos System (PBSCS)is defined by the set of differential equation (1).

$$\begin{aligned} \dot{x} &= y \\ \dot{y} &= z \\ \dot{z} &= -ax - by - cz - x^2 \end{aligned} \qquad (1)$$

In the system two equilibrium points as (0, 0, 0) and (-1, 0, 0)were shown forthe constants a = 1, b = 1.1, and c = 0.4.The equilibrium point (0, 0, 0) have the Eigen values -0.745, 0.162+j1.147and 0.162-j1.147. For the equilibrium point (-1, 0, 0) the Eigen values shown are 0.589, -0.504+j1.20, and -0.504-j1.20. The initial condition for the system is taken x = 0.1, y = 0 and z = 0.The time domain representation of x, y and z waveform are given in Fig.1 and attractors generated are given in Fig. 2 (a-c).

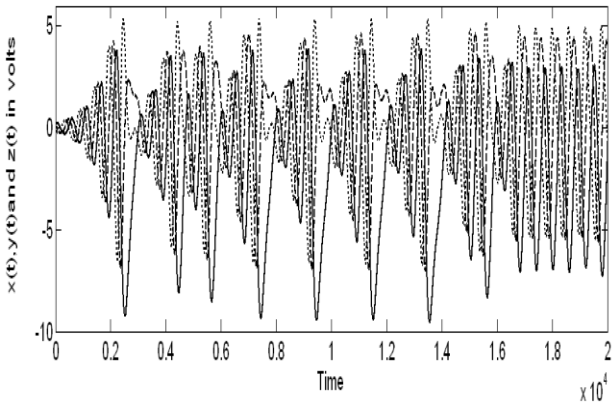
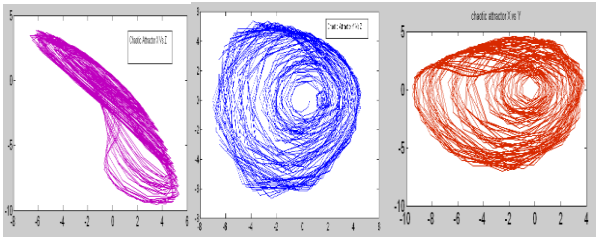


Fig 1: Time domain representation of x, y and z signals of PBSCS.



(a) (b) (c)

Fig 2: (a) x-y attractor, (b) y-z attractor, (c) x-z attractor

III NUMERICAL MODELS OF PBSCSAND THEIR FPGAIMPLEMENTATION USING DIFFERENT NUMERICAL ALGORITHMS

For FPGA implementation of the system the numerical model of PBSCSis obtained using Heun and RK4algorithm and coded in Verilog.

(a) Numerical model using Heun algorithm

For the numerical model using Heun algorithm initial value of x (n), y (n) and z (n) are taken as x (t_0) = x (n) = 0.1, y (t_0) = y (n) = 0 and z(t_0) = z(n) = 0, The Heun algorithm have two successive stages. In the first stage $x(n^0+1)$ is calculated and $x(n+1)$ the value after steps h is calculated using previous values $x(n^0+1)$ and$x(n)$. The mathematical model of PBS chaotic system is described by the following Equation (2).

$$x(n^0+1) = x(n) + h.y(n)$$

$$x(n+1) = x(n) + h\{y(n) + x(n^0+1)\}/2 \quad (2)$$

$$y(n^0+1) = y(n) + h.z(n)$$

$$y(n+1) = y(n) + h\{z(n) + y(n^0+1)\}/2$$

$$z(n^0+1) = z(n) + h\{-a.x(n) - b.y(n) - c.z(n) - x(n)^2\}$$

$$z(n+1) = z(n) + h.[\{-a.x(n) - b.y(n) - c.z(n) - x(n)^2\} + z(n^0+1)]/2$$

(b) Numerical model using RK4 algorithm

To construct the mathematical model of the PBSCS using RK4 algorithm, the system equation are represented as a function of $f, g and \delta$ as equation (3)

$$\dot{x} = f(t,x,y,z) = y$$
$$\dot{y} = g(t,x,y,z) = z \quad (3)$$
$$\dot{z} = \delta(t,x,y,z) = -ax - by - cz - x^2$$

With respect to above equation the mathematical model of the system using RK4 algorithm is given in equation (4). The parameter $K, \lambda and \xi$ in equation (5) defined as the coefficients of the first, second and third equations given in equation (3) and are placed in equation (4) to calculate $x(k+1)$, $y(k+1) and z(k+1)$ which are the values of the system afterh steps.

The values$x(k+1), y(k+1) and z(k+1)$are the output of the system after each interval which are used as initial conditions of the algorithm to calculate the values for the next cycle.

$$x(n+1) = x(n) + \frac{1}{6}h[k_1(n) + 2k_2(n) + 2k_3(n) + k_4(n)]$$
$$y(n+1) = y(n) + \frac{1}{6}h[\lambda_1(n) + 2\lambda_2(n) + 2\lambda_3(n) + \lambda_4(n)]$$
$$z(n+1) = z(n) + \tfrac{1}{6}h[\xi_1(n) + 2\xi_2(n) + 2\xi_3(n) + \xi_4(n)] \quad (4)$$

$$k_1 = f[x(n), y(n), z(n)]$$
$$\lambda_1 = g[x(n), y(n), z(n)]$$
$$\xi_1 = \delta[x(n), y(n), z(n)]$$
$$k_2 = f[x(n) + \frac{1}{2}hk_1.y(n) + \frac{1}{2}h\lambda_1.z(n) + \frac{1}{2}h\xi_1]$$
$$\lambda_2 = g[x(n) + \frac{1}{2}hk_1.y(n) + \frac{1}{2}h\lambda_1.z(n) + \frac{1}{2}h\xi_1]$$
$$\xi_2 = \delta[x(n) + \frac{1}{2}hk_1.y(n) + \frac{1}{2}h\lambda_1.z(n) + \frac{1}{2}h\xi_1]$$
$$k_3 = f[x(n) + \tfrac{1}{2}hk_2.y(n) + \tfrac{1}{2}h\lambda_2.z(n) + \tfrac{1}{2}h\xi_2] \quad (5)$$
$$\lambda_3 = g[x(n) + \frac{1}{2}hk_2.y(n) + \frac{1}{2}h\lambda_2.z(n) + \frac{1}{2}h\xi_2]$$
$$\xi_3 = \delta[x(n) + \frac{1}{2}hk_2.y(n) + \frac{1}{2}h\lambda_2.z(n) + \frac{1}{2}h\xi_2]$$

$$k_4 = f[x(n) + hk_3y(n) + h\lambda_3z(n) + h\xi_3]$$

$$\lambda_4 = g[x(n) + hk_3y(n) + h\lambda_3z(n) + h\xi_3]$$

$$\xi_4 = \delta[x(n) + hk_3y(n) + h\lambda_3z(n) + h\xi_3]$$

(c) FPGA Implementation of Autonomous Chaotic Generator

The PBSCS which have been modeled usingHeun andRK4 algorithm are implemented with 32- bit IEEE 754-1985 standard on FPGA. Mathematicalmodeling is done in VerilogusingVivado design suite. The Top-level diagramwhich is same for both models using Heun and RK4algorithm have been shown in Fig. 3. For the synchronization purpose one bit start, reset and clock signal is used. A 32-bit input has been used and initial conditions are set in the beginning phase. The 32-bit signal are used as input parameter. There is three 32-bit output signals (Xn_out), (Yn_out) and (Zn_out)and ready signal is taken as one bit control signals for the proposed chaotic generator.

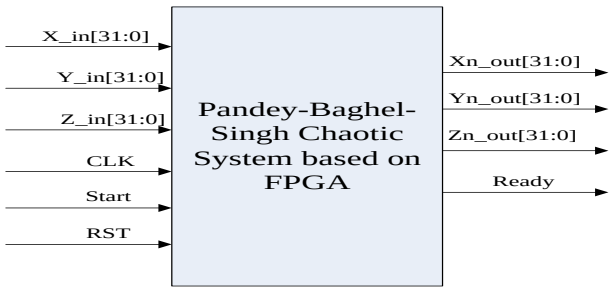


Fig.3 Top level diagram of PBS Chaotic System based on FPGA

The second level block diagram of the chaotic generator is presented in Fig. 4 It have one multiplexer and a chaotic generator unit whichis FPGA based. The multiplexer is used to provide initial condition signals. For successive operation it is provided by the output signals. When enable is at logic high, the output generates chaotic signal.

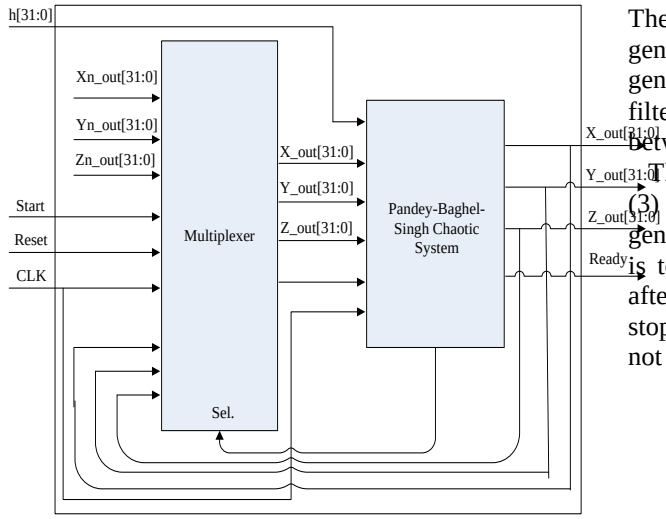


Fig.4 second level diagram of PBSCS based on FPGA

The third level block diagram of the Heun based chaotic generator is given in Fig.5. The proposed generator consist of multiplexer, function f^0, multiplier, adder, f, Divider and filter stages. The PBSCS equation are calculated by f^0 stage with the help of MUX unit which provides control signal. After multiplication with h the output is added with the previous generated signal $x(n), y(n) and z(n)$ by the generator unit. The output of this adder stage is applied to f stage which calculate the equation of PBSCS. The output of this stage and output of f^0 are adder-II stage. Further the output of the adder-II stage divided in the divider stage. In adder-III stage output of the chaotic generator from MUX stage and divider stage are added. The Heun based chaotic generator works in sequential order which generates the first value after 118 clock cycles.

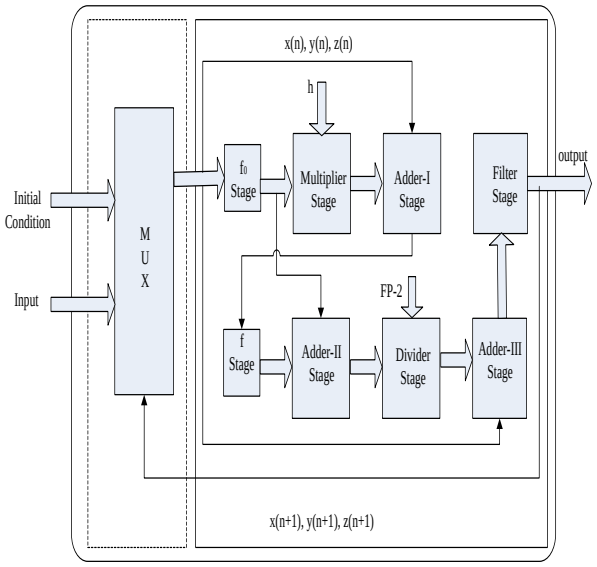


Fig. 5 Third Level diagram of Heun based PBSCS Generator Unit

The thirdlevel block diagram of the RK4 based chaotic generator is given in Fig. 6. The proposed chaotic generator consist of multiplexer, K_s units, Y_s block and filter stage.K_s units calculate $k_s, \lambda_s and \xi_s$ where s varies between1 to 4.

The $x(k+1), y(k+1) and z(k+1)$given in equation (3) are Calculatedat Y_s block. The first value is generated after 142 clock pulses and a feedback system is to be employed so that output is feedback to MUX after 142 clock pulses to generate next cycle. Filter unit stops undesired signal to reach output if generator does not generate any result.

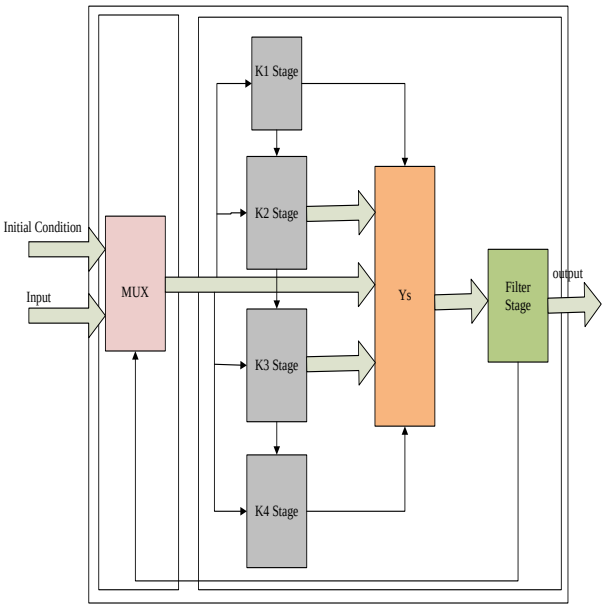


Fig. 6 Third Level diagram of RK4 based PBSCS Generator Unit

IV SIMULATION RESULTS OF PBS CHAOTIC GENERATOR

The numerically modelled (Heun and RK4) PBS Chaotic generator have been synthesized on Nexus-4 DDR XC7A100TCSG-1 (Artix7) and Basys-3 (Artix7) from the Xilinx Vivado v.2017.3 design suite. The simulation results of numerically modelled PBSCS andFPGA chip related Parameters and clock speed of the system is presented in the Fig. 7and Fig. 8. The summery of the FPGAchip speed and other statistics which are obtained for both the algorithm based system is given in table 1. Among the two numerically modelled system the RK4 based chaotic generator gives optimize result with the use of 2637 LUT's and 4692 registers with set clock period 2.78 ns which corresponds to maximum frequency achieved 359.71 MHz.The attracter of the system is generated by the data set are given in fig. 9 (a-c) which are similar to PBSCS designed on analog platform

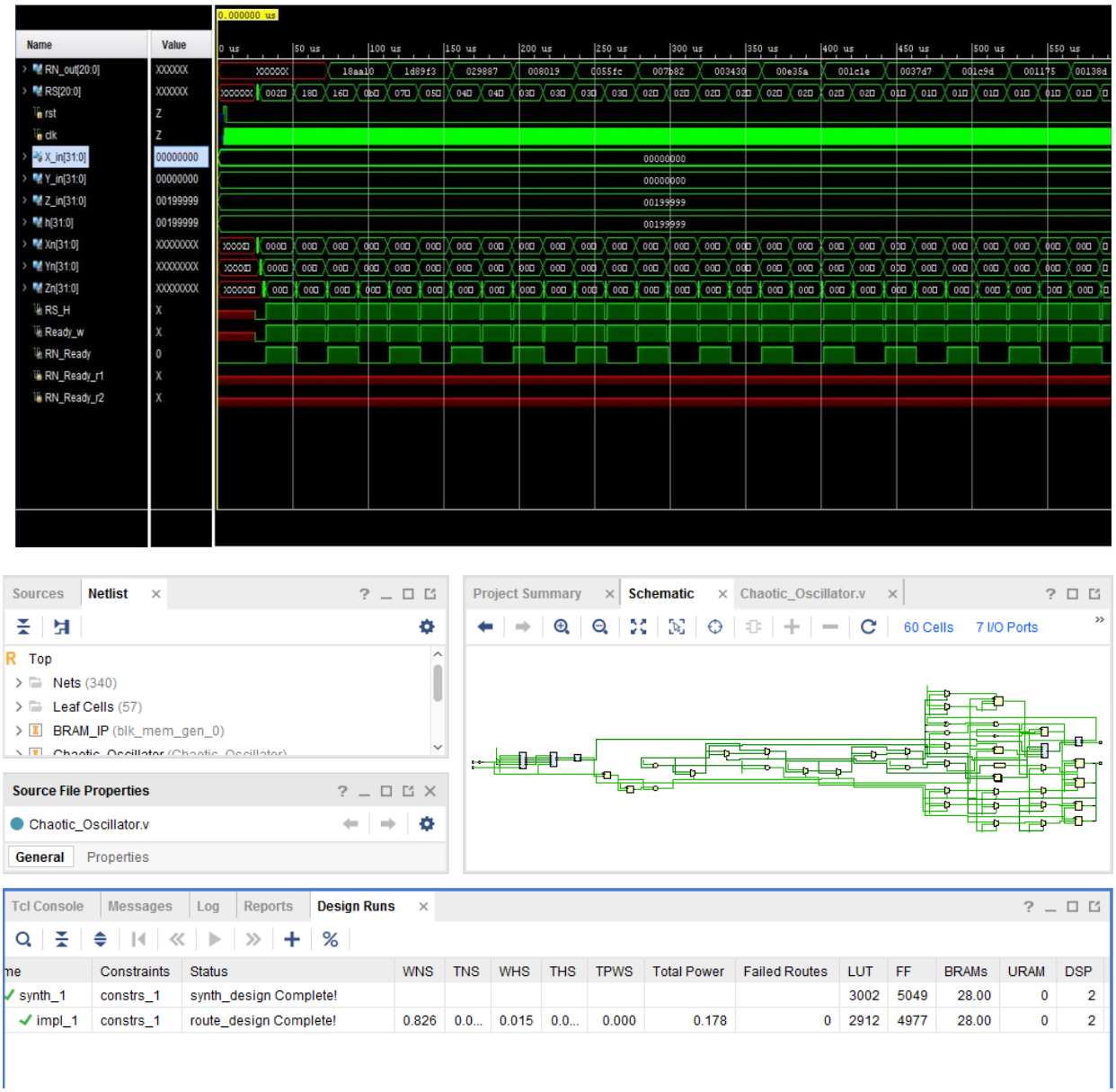


Fig.7 Simulation result of Heun based PBSCS on Vivado 17.3

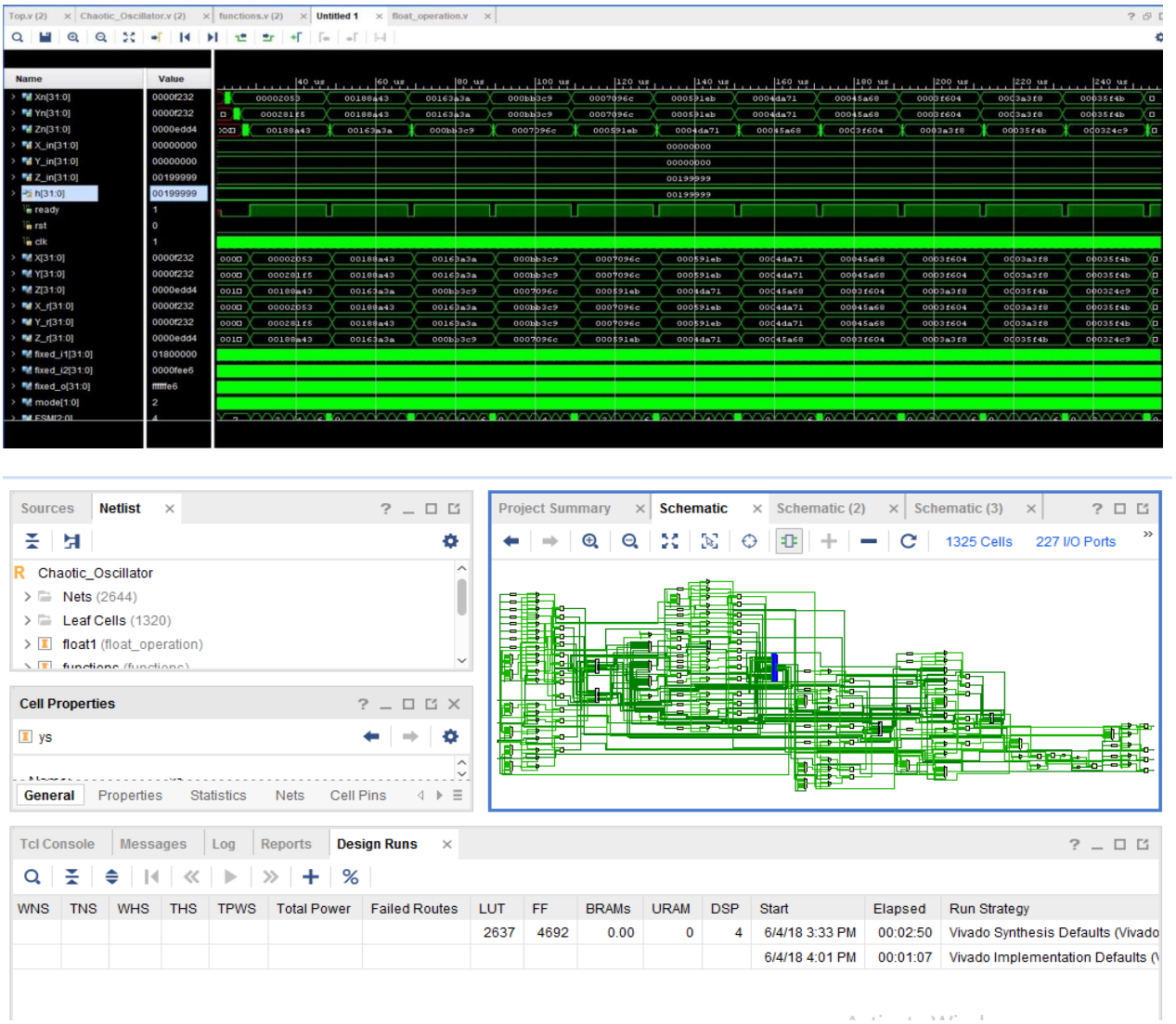
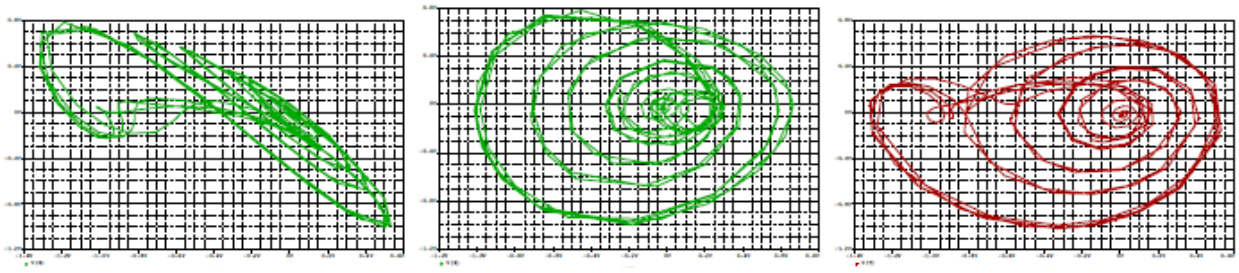


Fig.8 Simulation result of RK4 based PBSCS on Vivado 17.3



(a) (b) (c)

Fig. 9 (a) x-y attractor, (b) y-z attractor, (c) x-z attractor

Table 1
Final report of the resources consumption

Parameter	Heun-based	RK4-based
Maximum frequency (MHz)	359.71	359.71
No. of DSP	2	4
Number of 4 input LUTs	2912	2637
Number of bonded IOBs	32	32
Number of Slice Flip Flops	4977	4692
Total On-chip Power(W)	0.178	0.179

V CONCLUSION

The Heun and RK4 algorithm basedPBS Chaotic generator have been synthesized using the Nexus 4 DDR XC7A100TCSG-1 (Artix7) and Basys3 (Artix7) from the Xilinx Vivado v.2017.3 design suite. RK4 based chaotic generator gives optimize result with the use of 2637 LUT's and 4692 registers with set clock period 2.78 ns which corresponds to maximum frequency achieved 359.71 MHz.The attracter of the system is generated by the data setare given in fig. 10(a-c) which are similar to PBSCS designed on analog platform.

REFERENCES

[1] Ismail K., A. Tuaran O, IhsanPehlivan, "Implementation of FPGA-based real time novel chaotic oscillator", Nonlinear dynamics (2014); pp. 49-59.

[2] Murat Tunaa, Can BülentFidan, "Electronic circuit design, implementation and FPGA-basedrealization of a new 3D chaotic system with singleequilibrium point", Optic ElsevierOptik(2016) pp. 11786–11799.

[3] S. Banerjee, J. Kurths, "Chaos and cryptography: a new dimension in secure communications", Eur. Phys. J. Spec. Top. , (2014) pp. 1441–1445.

[4] I. Koyuncu, A.T. Ozcerit, I. Pehlivan, "An analog circuit design and FPGA-based implementation of the Burke-Shaw chaotic system", Optoelectron. Adv. Mater. Rapid Commun. (2013) pp. 635–638.

[5] L. Merah, A. Ali-pacha, N.H. Said, "A pseudo random number generator based on the chaotic system of Chua's circuit and its real time", FPGA Implementation (2013) pp. 2719–2734.

[6] S. C¸ ic¸ ek, A. Ferikog˘lu, I˙. Pehlivan, "A new 3D chaotic system: dynamical analysis, electronic circuit design, active control synchronization and chaotic masking communication application", Optik – Int. J. Light Electron Opt. (2016) pp. 4024–4030.

[7] M. Tuna, I. Koyuncu, C.B. Fidan, I. Pehlivan, "Real time implementation of a novel chaotic generator on FPGA", in: 2015 23rd Signal Processing andCommunications Applications Conference (SIU), IEEE, 2015, pp. 698–701.

[8] Alpana Pandey, R. K. Baghel, R.P. Singh, "Analysis and Circuit Realization of a NewAutonomous Chaotic System", International Journal of Electronics and Communication Engineering.ISSN 0974-2166 Volume 5, Number 4 (2012), pp. 487-495.

Analysis of Congestion Using Advanced Traffic Instruments – A Case Study of Chandigarh, India

Ankit Bansal[1], Tripta Goyal[2], Har Amrit Singh Sandhu[3]
[1,2,3]PEC University of Technology, Chandigarh (Punjab) India.

ABSTRACT
In present scenario, transportation network provides the way for movements and medium for reaching destinations. It is the backbone of urban activity undergoing in cities.Inadequate transportation system hampers economic activities and creates hindrances for development. In most of the developing countries like India, obsolete methods like manual counting and stopwatch methods are being used for traffic related studies. Presently, there are more advanced and reliable traffic instruments like Metro Count, Radar Gun etc. available which can collect vast road usage information and can give large traffic data output in comparatively less time. These advanced methods are being used extensively in developed countries, but very few studies are available which shows use of these instruments in India. This paper presents amethodology to study the traffic flow characteristics and to analyse congestion on major roads (V-2 roads) of Chandigarh City using such advanced instruments. Traffic in Chandigarh has been increasing at much higher pace in tune with the vastly increasing commercial, industrial and manufacturing needs. Thus, with the help of advanced traffic survey instruments like Metro Count and Radar Gun, volume and speed study has been carried out to estimate congestion at various points on major roads of Chandigarh and Level of Service (LOS) was also determined for the same roads. The speed study has also been done using both Metro Count as well as Radar Gun for its comparative analysis. The findings of this study have revealed heavy congestion on approximately all the roads with Volume/ Capacity (V/C) ratio less than one but as traffic is increasing, they may approach their saturation point soon. LOS has been found out to be either 'C' or 'D' indicating stable flow conditions for now but small increase may cause a considerable reduction in the 'performance' or 'service' which demand efforts to be taken to maintain the existing performance. The speed study has shown that roads are not satisfying the present prescribed speed limits arising the need to either revise speed limits or to adopt remedial measures to lower the speed of moving traffic within speed limits. It has been observed that Metro Count and Radar Gun give more reliable and accurate data and results as compared to other conventional methods available. Therefore, the authors propose to use such instruments only in order to carry out different traffic studies.

Keywords: Congestion, Metro Count, Radar Gun, Level of Service

I INTRODUCTION

India being developing country has enormous need of infrastructure growth for improving the socio-economic status and productivity of the country, in which transport infrastructure plays a key role. In lieu of this, transport industry is being expanding rapidly fast to fulfil the present demands of the people of developing nation. As population is increasing rapidly, transport sector has also grown manifold in many metropolitan cities of India like Chandigarh, along with becoming source of other problems like pollution, health problems and other environment problems being faced by residents of those cities daily. The main factor behind is abrupt increase of congestion of vehicles on roads as number of vehicles are increasing promptly as compared to facilities need to accommodate them, either because of limitation of resources or scarce utilisation of new advanced resources/techniques although being used by the various developed nations. So, this study reflects upon the new methodologies and techniques being adopted for conducting volume studies and speed studies in order to augment/abate congestion from the well-planned city of India i.e. Chandigarh situated at the foothills of Shivalik. Despite being the most planned city, Chandigarh is now facing acute problem of congestion which is mainly due to increase in flow of traffic within and from tricity i.e. Chandigarh, Panchkula and Mohali. So, there is dire need of carrying out the traffic studies with the help of advanced instruments being available at our disposal for more accurate analysis and more precise implementation of the results.

II LITERATURE REVIEW

The literature is available on traffic studies like volume and speed studies for heterogeneous traffic but it is quite difficult to analyse heterogeneous traffic [20], which arises the need of converting heterogeneous traffic into equivalent passenger cars known as PCU. Various authors have analysed the problem of measuring large heterogeneous traffic volumes and converting different types of vehicles into equivalent passenger cars known as PCUs [14]. The PCU estimates have been done through simulation techniques for different types of vehicles of heterogeneous traffic in a wide range of traffic

volume and roadway conditions [18,20].An empirical study has found that for a given road width, an increase in volume level of heterogeneous traffic causes more density on the road resulting in reduced uniform speed of vehicles [19]. The lower speed difference between cars and subject vehicles yield smaller PCU value for the vehicle type and authors have also developed a mathematical equation and a computer program relating PCU [2]. Mathematical models have been developed to derive PCU values for vehicles on urban roads based on different aspects of road geometrics, traffic and environmental conditions. These values may be tentatively adopted on urban roads in India until more rational and variable design vehicle unit's dependent on roadway and traffic factors are developed [6]. Once PCU values being determined, next step is to calculate speed of road segments which affects the capacity and LOS of roads. The speed distributions of vehicles have been observed to follow the normal distribution with co-efficient of variation for car, buses and two wheelers being 0.11, 0.13, and 0.16 respectively obtained from modeling which helps in deciding speed limits of any road [1,7]. The authors have adopted advance instruments such as traffic counter-cum-classifier and Radar Gun to collect traffic and speed data as analysis of data is much easier [3].For finding the capacity, the authors have emphasized on the need of developing highway capacity norms [11].In this context, an insight has been provided into a new technical approach, the 'enveloping curve technique', for developing suitable capacity norms by adopting an appropriate level of service concept for Indian conditions [9,10]. Using the capacity of the road depending upon the nature of road, Level of Service (LOS) is being found out which is a qualitative measure used to relate the quality of traffic service. LOS is used to analyze highways by categorizing traffic flow and assigning quality levels of traffic based on performance measure like speed, density etc. [16].Level of service (LOS) is found to be the key index in analysing congestion on roads. The level of service and congestion indices for different segments between destination points facing heaviest traffic problems have been determined by various researchers using different approaches and techniques [15,12].LOS cannot provide a continuous range of values of congestion and these methods provide no distinction between different levels of congestion once congested conditions are reached[8]. It has been observed that the reason behind the congestion could be increase in trips by personal mode of transportation by using heterogeneous traffic, decrease in width of road by BRTS, improper management of traffic along the intersection, illegal parking along the carriage way, merging of traffic from different directions and lack of public awareness after performing analysis of congestion [21,22]. This leads to potential improvement of traffic in the form of either expansion of width of roads, construction of fly over or by-pass, improvement of signal design. Thus, an attempt has been made to analyse congestion in Chandigarh, one of the planned city of India and thereby to recommend certain congestion mitigation measures.

III SCOPE AND OBJECTIVES

The scope of the present study is to understand the existing traffic situation on various major roads of Chandigarh city i.e. V-2 roads using advanced equipment's and to study the traffic flow pattern for determining various traffic flow characteristics. It also includes collection of traffic data which includes collection of volume data and speed study data using various techniques as per IRC: 9 and further comparing those to techniques in order to find the better one. Data collected is further to be analyzed to find Level of Service (LOS) at various points on study area as per IRC: 106. After studying various traffic characteristics, recommendations are to be provided for the improvement of geometrics and removal of congestion problems of the roads and the futuristic levels of service are to be determined.

Thus, the objectives of this study are:

(a) To collect Traffic data of all V-2 roads for different parameters like Traffic Volume, Speed on hourly /weekly / seasonal basis.
(b) To perform comparative analysis of various equipment's used in the study to find the more accurate one.

IV STUDY AREA

The present study is carried out on the midblock sections of all V-2 roads (which includes Madhya Marg, Himalaya Marg, Dakshin Marg, Jan Marg, Purv Marg, Udyog Path etc.) of Chandigarh whichare the major arterial roads. Each sector is surrounded by V-2 roads with number of buildings opening on to them. These V-2 roads are the major avenues of Chandigarh, with important institutional and commercial functions running alongside. One mid-block section is to be considered for study from each road.

The various study points on the roads are as follows: -

(a) Madhya Marg - Section is in between GHSC (Sector 10) and GMSH (Sector 16).
(b) Dakshin Marg - Section is in between Sector 21 and Sector 34. It is in front of JW Marriot.

(c) Jan Marg - Section is in between Sector 16 and Sector 17. It is in front of Zakir Rose Garden.

(d) Himalaya Marg - Section is between Sector 22 & Sector 21. It is in front of Aroma.

(e) Purv Marg - Section is in between Sector 29 and Industrial Area. It is in front of Centra Mall.

(f) Udyog Path - Section is in between Sector 15 and Sector 24. It is in front of ParkView Hotel.

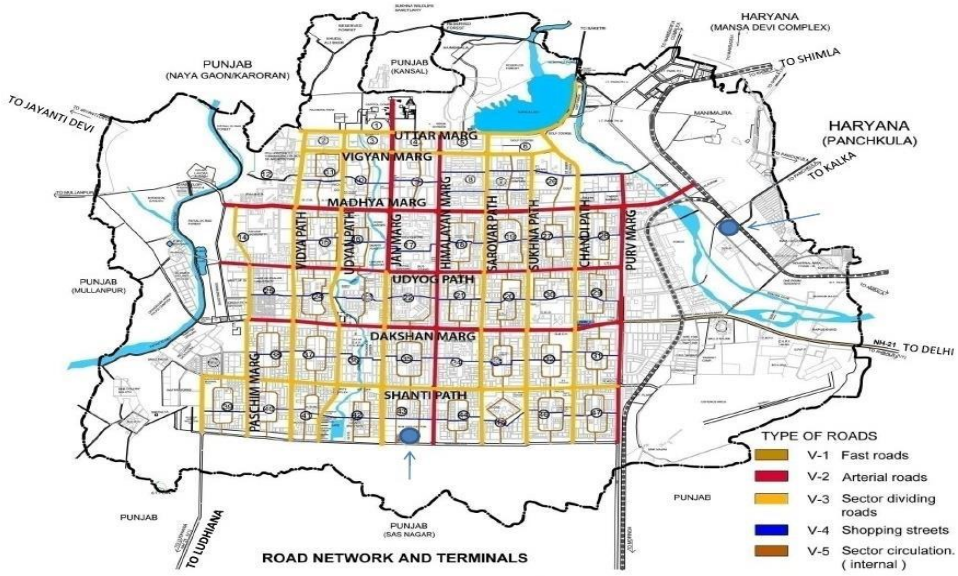


Fig. 1. Map of Chandigarh showing Study Area
(Source: www.chandigarh.gov.in)

V METHODOLOGY

The methodology includes in this study mainly focuses on the use of advanced instruments i.e. Metro Count or Radar Gun for carrying out traffic characteristics and then analysis of data using bar charts and histograms. The steps followed in sequential order to study the area are described in figure given below.

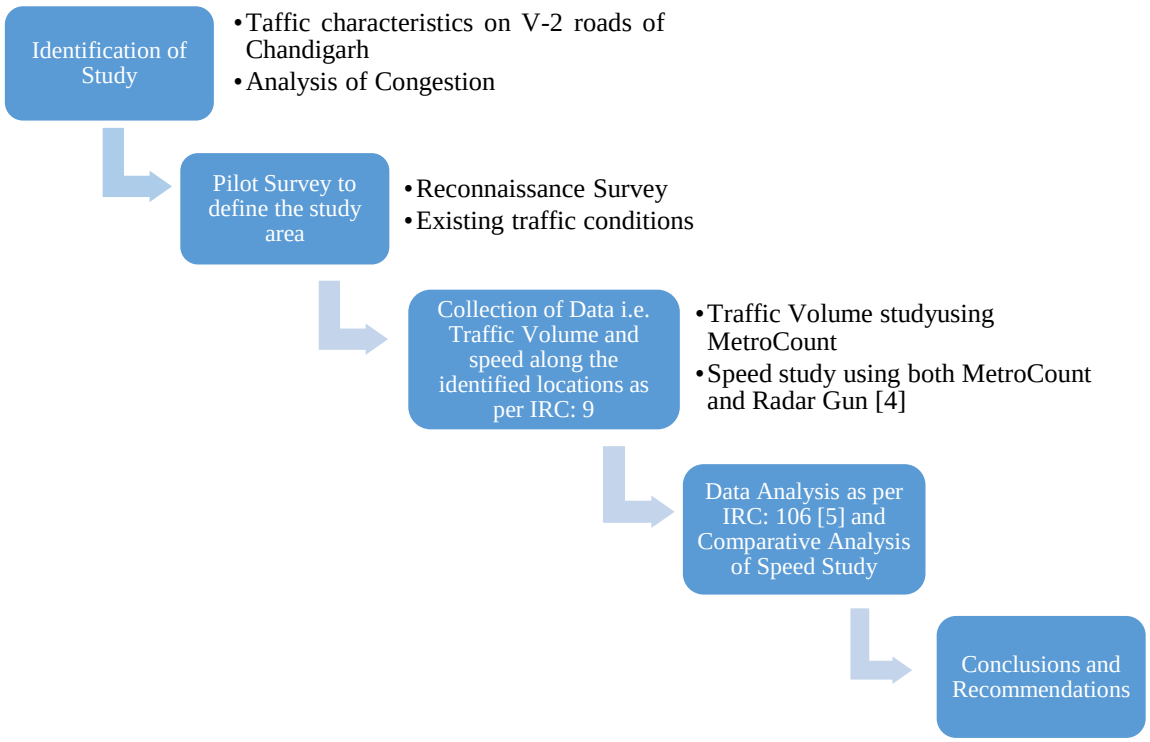


Fig. 2 Flow Chart with Study Methodology

VI TRAFFIC DATA COLLECTION AND ANALYSIS

The data collection is done on mid-block sections of all the major V-2 roads of Chandigarh which are the arterial roads of Chandigarh with important institutional and commercial functions running alongside. The roads identifiable as V-2 are Madhya Marg, Dakshin Marg, Purv Marg, Himalaya Marg, Jan Marg and Udyog Path. All the roads are divided carriageways; thus, the volume data and speed data is collected on a mid- block section of these roads for both directions of traffic using Metro Count aka Automatic-Traffic Counter-Cum-Classifier.

(a) Volume Data Collection and Analysis-For collection of traffic volume data, in spite of manual counting, advanced traffic instrument traffic-counter-cum-classifier (Metro Count) is used. Two Metro Counts are installed simultaneously on the road section for both direction of traffic and data is collected for approximately 12 hours. Data automatically gets stored in the Metro Count. Metro Count Software generates a report after extraction of data into computer using an external source. This Metro Count report is further analysed to find peak hour and LOS of each road section taken in study which is presented in tabular form as shown in table 1.

Table 1:
Capacity and LOS of each road section

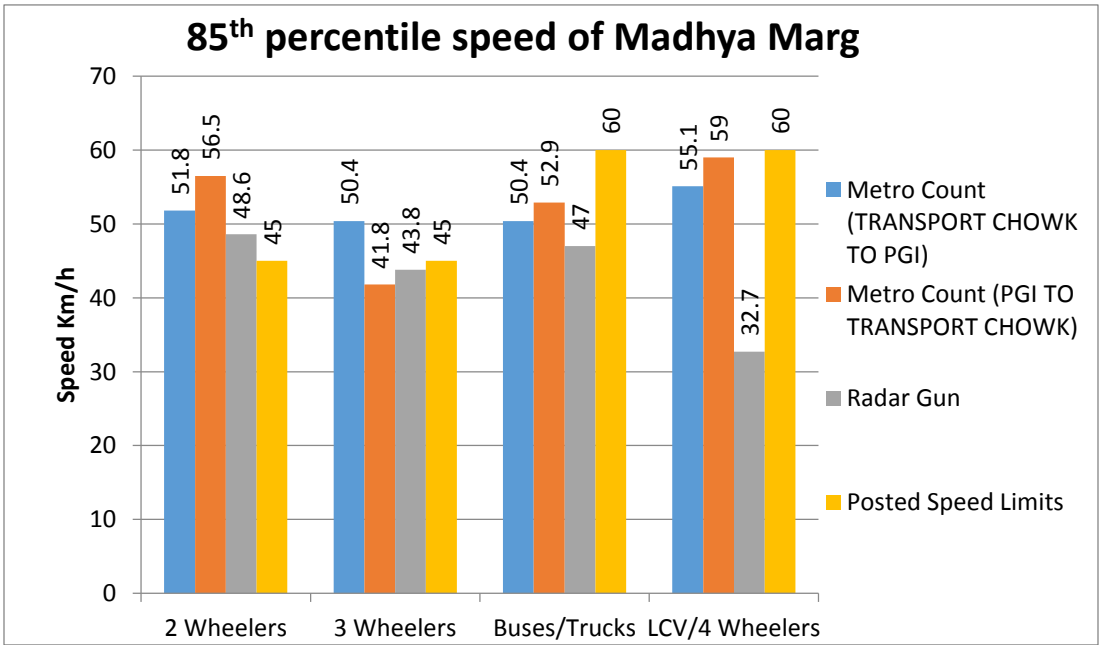
Location	Direction	Time	(V) PCU/h	Width of road per lane (m)	No. Of lanes	Design Service Volume (C) in PCU/h as per IRC:106	V/C	LOS
MADHYA MARG	TOWARDS PGI	Morning peak hour (9.00am - 10.00am)	2224	3.5	3	3600	0.6	C

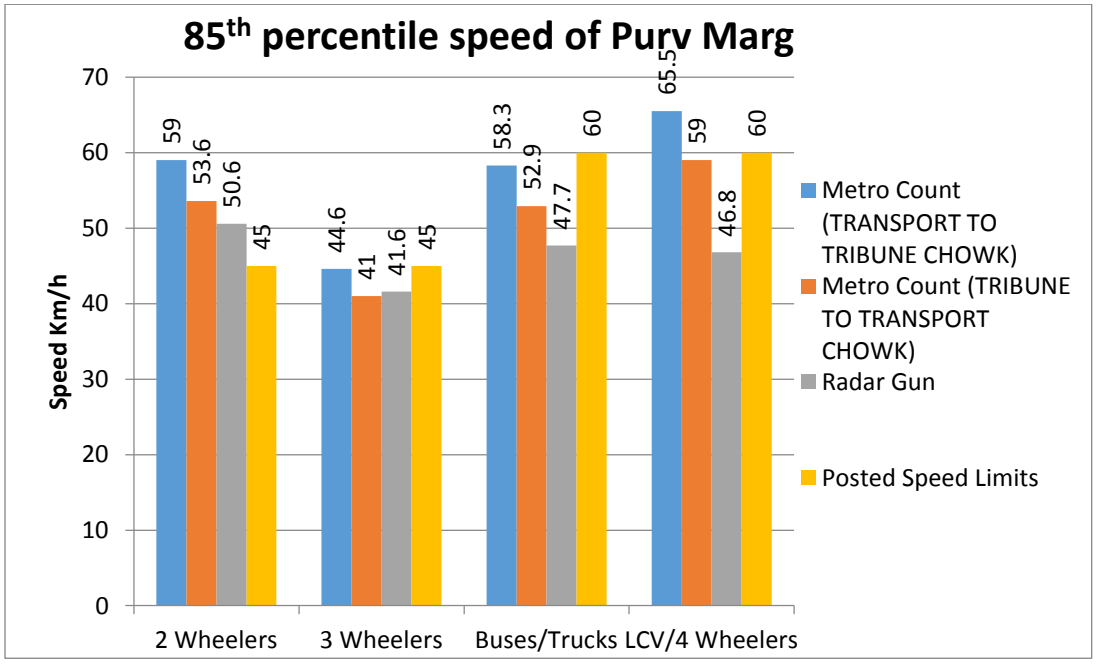
		Evening peak hour (6.00pm - 7.00pm)	2578	3.5	3	3600	0.7	D
	TOWARDS TRANSPORT CHOWK	Morning peak hour (9.00am - 10.00pm)	2344	3.5	3	3600	0.7	D
		Evening peak hour (12.00pm - 1.00pm)	2006	3.5	3	3600	0.6	C
PURV MARG	TOWARDS TRIBUNE CHOWK	Morning peak hour (9.00am - 10.00am)	2957	3.5	4	4800	0.6	C
		Evening peak hour (1.00pm - 2.00pm)	2109	3.5	4	4800	0.4	B
	TOWARDS TRANSPORT CHOWK	Morning peak hour (9.00am - 10.00pm)	2423	3.5	4	4800	0.5	C
		Evening peak hour (5.00pm - 6.00pm)	2210	3.5	4	4800	0.5	C
DAKSHIN MARG	TOWARDS KISAN BHAVAN	Morning peak hour (9.00am - 10.00am)	2371	3.5	3	3600	0.7	D
		Evening peak hour (5.00pm - 6.00pm)	1685	3.5	3	3600	0.5	C
	TOWARDS PICCADILY	Morning peak hour (11.00am - 12.00pm)	1821	3.5	3	3600	0.5	C
		Evening peak hour (6.00pm - 7.00pm)	2046	3.5	3	3600	0.6	C
HIMALAYA MARG	TOWARDS 21 (AROMA)	Morning peak hour (9.00am - 10.00am)	1982	3.5	2	3000	0.7	D
		Evening peak hour (12.00pm - 1.00pm)	1884	3.5	2	3000	0.6	C
	TOWARDS 34 (PICCADILY)	Morning peak hour (11.00am - 12.00pm)	1800	3.5	2	3000	0.6	C
		Evening peak hour (5.00pm - 6.00pm)	2263	3.5	2	3000	0.8	D

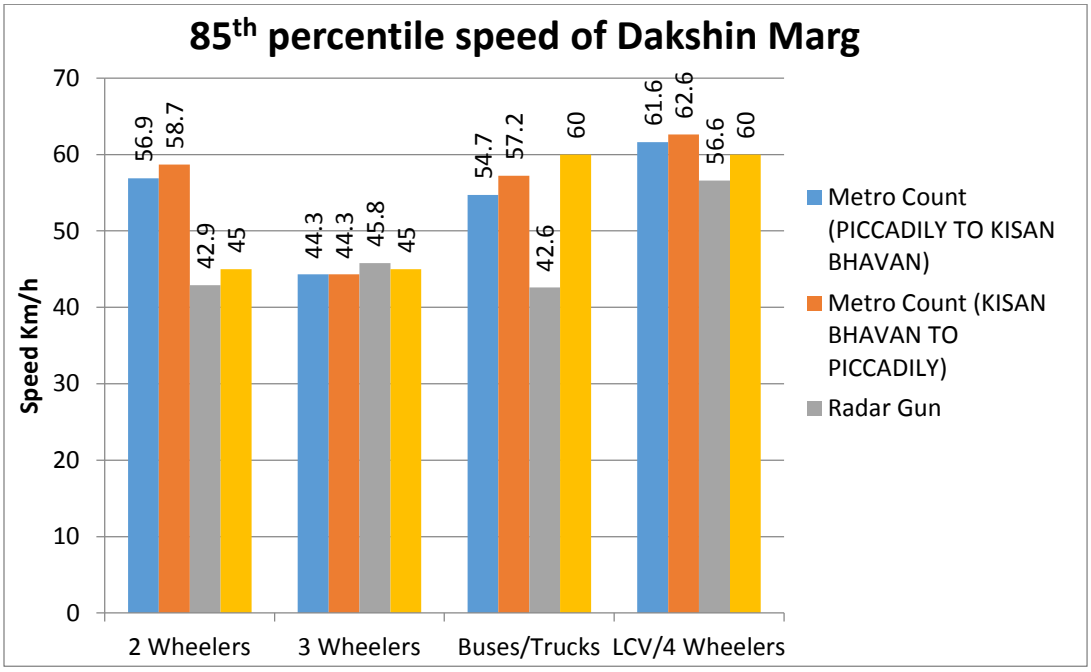
JAN MARG	TOWARDS 9 (MATKA CHOWK)	Morning peak hour (9.00am - 10.00am)	2651	3.5	3	3600	0.7	D
		Evening peak hour (12.00pm - 1.00pm)	2057	3.5	3	3600	0.6	C
	TOWARDS 17 (ISBT)	Morning peak hour (11.00am - 12.00pm)	1405	3.5	3	3600	0.4	B
		Evening peak hour (5.00pm - 6.00pm)	1968	3.5	3	3600	0.5	C
UDYOG PATH	TOWARDS ISBT	Morning peak hour(9.00am - 10.00am)	2792	3.8	2	3000	0.9	E
		Evening peak hour (12.00pm - 1.00pm)	1621	3.8	2	3000	0.5	C
	TOWARDS UIET	Morning peak hour(9.00am - 10.00am)	1417	3.8	2	3000	0.5	C
		Evening peak hour (5.00pm - 6.00pm)	2046	3.8	2	3000	0.7	D

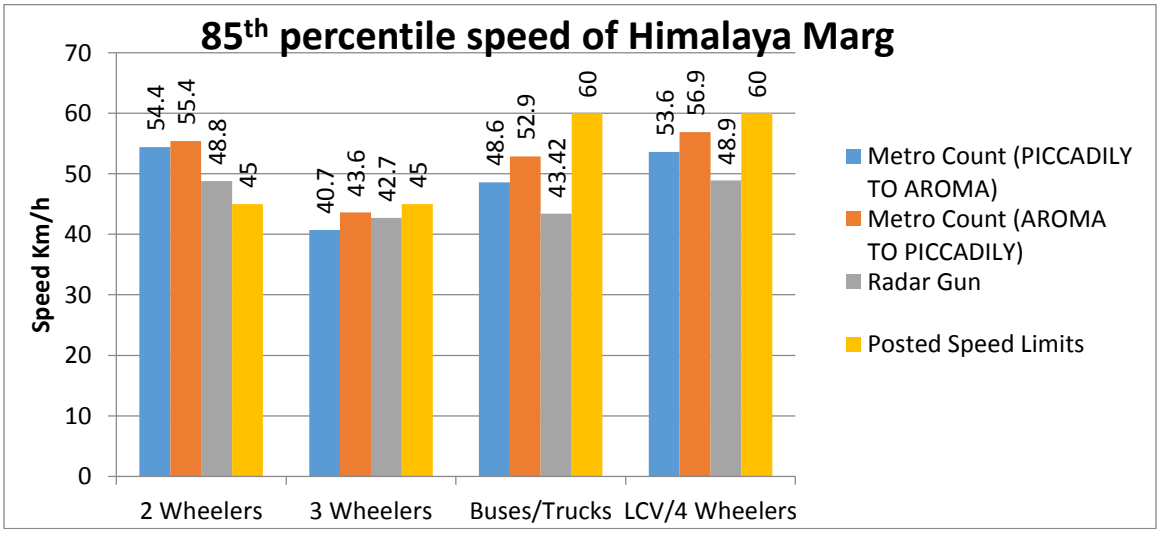
In Table 1,volume count has been presented for the morning and evening peak hours for all the roads and Level of Service (LOS) for Purv Marg, Dakshin Marg and Udyog Path is found to be 'C' which shows stable conditions with volume of traffic less than the practical capacity of roads whereas for Madhya Marg, Himalaya Marg and Jan Marg, LOS comes out to be 'intermediary of C or D' which indicates that flows are at a level where small increase may cause a considerable reduction in the performance or 'service'.

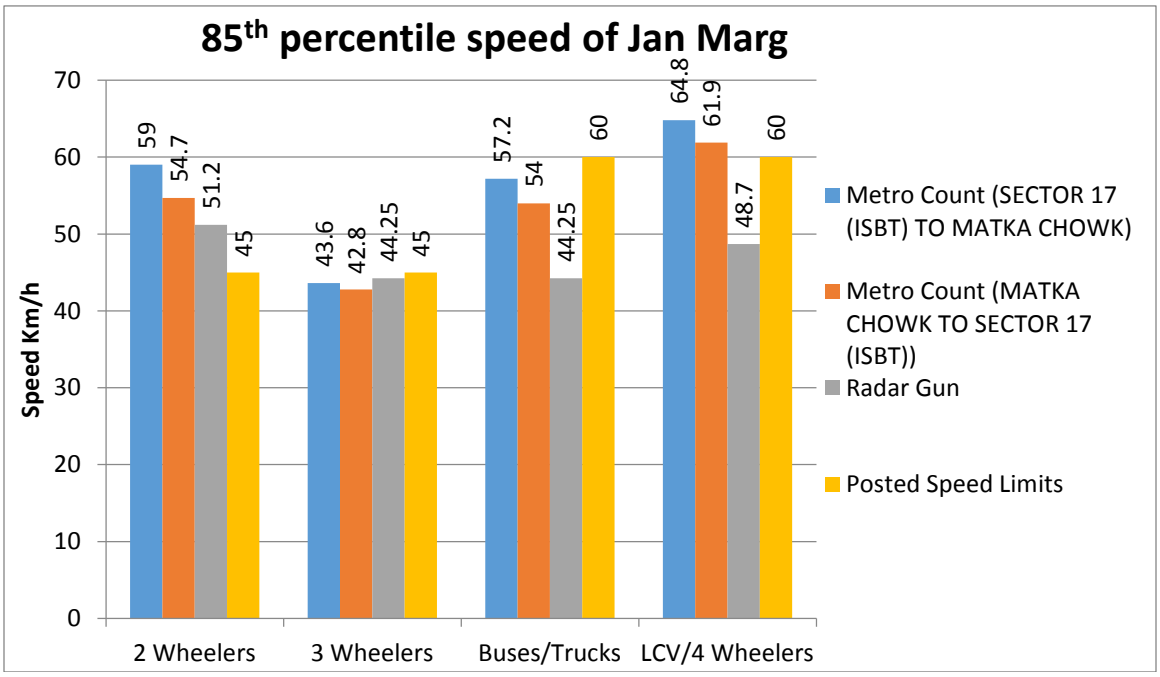
(b) Collection of Speed Data and Its Comparative Analysis-The speeds on the various mid-block sections are observed using both Metro Count as well as Radar Gun aka Speeder. With Metro Count, 12-hours data has been observed whereas with Radar Gun, limited numbers of vehicles have been observed. The analyzed speed percentile (85^{th} percentile) found from data collected using both the instruments are compared with prescribed speed limits for heterogeneous traffic on each road section undertaken in study and shown in form of bar charts in figure 3.


85th percentile speed of Madhya Marg
Speed Km/h
70
60
50
40
30
20
10
0
51.8
56.5
48.6
45
50.4
41.8
43.8
45
50.4
52.9
47
60
55.1
59
32.7
60
2 Wheelers
3 Wheelers
Buses/Trucks
LCV/4 Wheelers
Metro Count (TRANSPORT CHOWK TO PGI)
Metro Count (PGI TO TRANSPORT CHOWK)
Radar Gun
Posted Speed Limits


85th percentile speed of Purv Marg
Speed Km/h
70
60
50
40
30
20
10
0
59
53.6
50.6
45
44.6
41
41.6
45
58.3
52.9
47.7
60
65.5
59
46.8
60
2 Wheelers
3 Wheelers
Buses/Trucks
LCV/4 Wheelers
Metro Count (TRANSPORT TO TRIBUNE CHOWK)
Metro Count (TRIBUNE TO TRANSPORT CHOWK)
Radar Gun
Posted Speed Limits


85th percentile speed of Dakshin Marg
Speed Km/h
70
60
50
40
30
20
10
0
56.9
58.7
42.9
45
44.3
44.3
45.8
45
54.7
57.2
42.6
60
61.6
62.6
56.6
60
2 Wheelers
3 Wheelers
Buses/Trucks
LCV/4 Wheelers
Metro Count (PICCADILY TO KISAN BHAVAN)
Metro Count (KISAN BHAVAN TO PICCADILY)
Radar Gun


85th percentile speed of Himalaya Marg
Speed Km/h
70
60
50
40
30
20
10
0
54.4
55.4
48.8
45
40.7
43.6
42.7
45
48.6
52.9
43.42
60
53.6
56.9
48.9
60
2 Wheelers
3 Wheelers
Buses/Trucks
LCV/4 Wheelers
Metro Count (PICCADILY TO AROMA)
Metro Count (AROMA TO PICCADILY)
Radar Gun
Posted Speed Limits



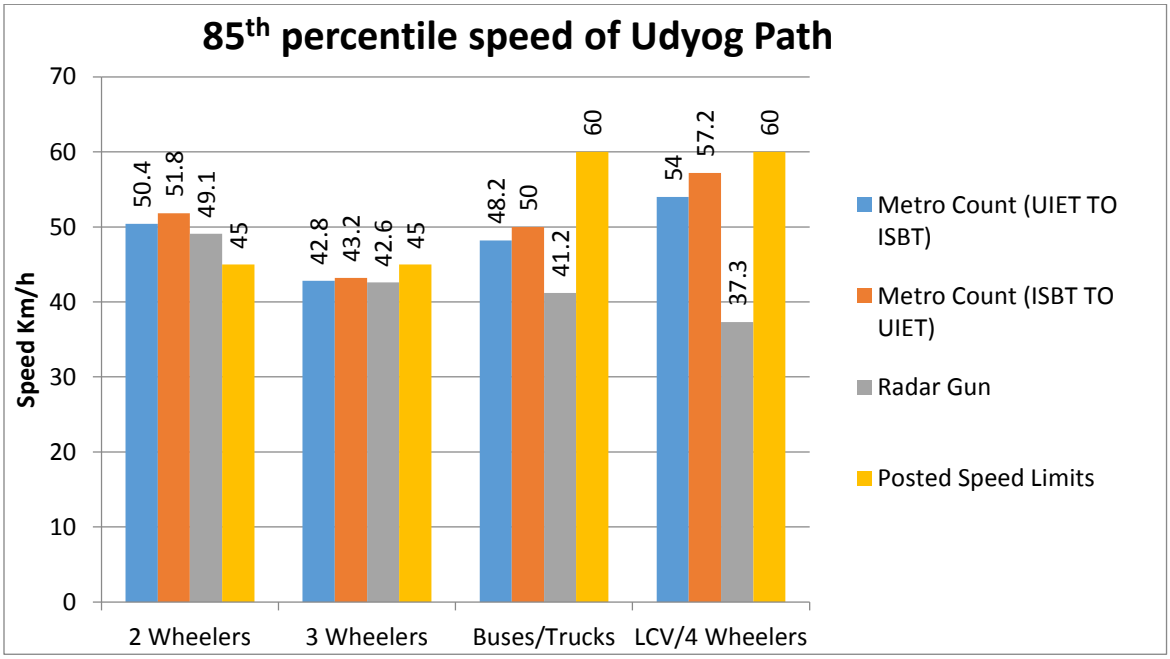


Fig. 3 Comparison of Speed Limits of All V-2 Roads

In Figure 1, it is observed that the speeds found using Radar Gun is relatively low as compared to Metro Count and these are further compared with that of the posted speed limits on the various roads for bi-directional traffic flow. The average speed percentiles as observed in the figure falls within range of posted

speed limit i.e. 60 km/h in case of 4 wheelers/LCVs and Buses/Trucks whereas for 2-wheelers and 3-wheelers, the speed percentiles are observed to be higher than posted speed limit i.ee 45 km/h. This is occurring because percentage of 4-wheelers and buses/trucks are more in number as compared to 2-wheelers and 3-wheelers due to which there is lot of interaction to be faced by the 2-wheelers and 3-wheelers.

VII RESULTS AND CONCLUSIONS

The present study has been conducted to analyse the traffic characteristics of V-2 roads i.e. Madhya Marg, Purv Marg, Dakshin Marg, Himalaya Marg, Jan Marg and Udyog Path of Chandigarh using automated and advanced instruments such as Metro Count for traffic volume study and Radar Gun for traffic speed study. The following conclusions have been drawn from the study:

(a) Mid-block counts indicate that V-2 roads usually have very high PCU and at present Volume/ Capacity (V/C) ratio are less than one for all V-2 roads but as traffic is increasing, they may approach their saturation point soon.

(b) Level of Service (LOS)is computed using Volume/ Capacity (V/C) ratio for all the roads during peak hours of the day which comes out to be 'C' for Purv Marg, Dakshin Marg and Udyog Path which delivers stable flow conditions and for Madhya Marg, Himalaya Marg and Jan Marg; LOS comes out to be 'intermediary of C or D' which indicates that flows are at a level where small increase may cause a considerable reduction in the performance or 'service' of the highway and drivers are restricted in freedom to select speed or change lane.

(c) Speed study data is observed with both Metro Count and Radar Gun and after its comparative analysis it has been deduced that results of Metro Count are more reliable as compared to Radar Gun. Metro Count range (10-200 km/h) is also higher than Radar Gun (19-150 km/h).

(d) Analysis of data in Metro Count is very easy as it directly gives speed distribution graphs but the installation of instrument on road section/site is difficult task whereas Radar Gun although easily operated, its analysis has to be done manually which is somewhat tedious task.

(e) Various speed percentiles for different composition of vehicles are observed and the average 85th percentile speed (speed limit) has been found out to be 55.5 km/h for Madhya Marg, 59.8 km/h for Purv Marg, 61.4 km/h for Dakshin Marg, 53.5 km/h for Himalaya Marg, 60.7 km/h for Jan Marg and 53.5 km/h for Udyog Path for all classes of vehicles which indicates that there is appreciable difference between the percentiles speed found in the study and the already prescribed speed limits on the respective road sections for different classes of vehicles.

Taking into account the study, authors recommended certain suitable measures like road pricing, odd-even system (as adopted in developed countries) [17], to be adopted to check congestion on V-2 roads of Chandigarh and as far as speed study is concerned, authors proposed either to adopt strict traffic control measures like challenging for over speeding or installation of speed breakers on Dakshin Marg, Jan Marg and Udyog Path so that people can follow the prescribed speed limits or revising speed limits of these road sections.

REFERENCES

[1] Al-Ghamdi,A.S. (1998). "Spot speed analysis on urban roads in Riyadh."Transportation Research Record: Journal ofTransportation Research Board, Vol. 1635, pp.162–170.

[2] Chandra, S. and Kumar, U. (2003). "Effect of lane width on capacity under Mixed Traffic Conditions in India."Journal of Transportation Engineering, ASCE, Vol. 129(2), pp.155-160.

[3] Goyal, T. and Pal, B. (2016). "Analysis of Traffic Study Using Automatic Traffic Counter-Cum-Classifier – A Case Study." NCSID, NITTTR, Chandigarh.

[4] IRC. (1972).Traffic Census on Non-Urban Roads, IRC: 9, New Delhi.

[5] IRC. (1990).Guidelines for Capacity of Urban Roads in Plain Areas, IRC: 106, New Delhi.

[6] Justo, C.E.G. and Tuladhar, S.B.S. (1984). "Passenger Car Unit Values for Urban Roads."Journal of Indian Roads Congress, Vol. 26(12), pp.33-41.

[7] Kadiyali, L.R., Lal, N.B., Sathyanarayana, M. and Swaminathana, A.K. (1981). "Speed-Flow Characteristics on Indian Highways."Journal of Indian Roads Congress, Vol. 52(2), pp. 233-262.

[8] Padshala. A. (2014). "Traffic Studies of Urban Mid-Block Section: A Case Study of Pragatinagar to Akhbarnagar&Akhbarnagar to Ranip Cross road."International Journal of Research in Engineering and Technology, Vol. 3(6), pp.383-385.

[9] Rao, A.M. and Rao, K.R. (2014). "Measuring Urban Traffic Congestion – A Review." International Journal for Traffic and Transport Engineering, Vol. 2(4), pp. 286-305.

[10] Rosenbloom, S. (1978). "Peak-period traffic congestion: a state-of-art analysis and evaluation of effective solution."Transportation, Vol. 7(2), pp.167-191.

[11] Sarna, A.C., Jain, P.K. and Chandra, G. (1989)."Capacity of Urban Roads - A Case Study of Delhi and Bombay."Highway Research Bulletin, No. 4, Indian Roads Congress,New Delhi, pp. 1-38.

[12] Skabardonis, A.; Varaiya, P.; Pety, K.F. (2003). "Measuring recurrent and non-recurrent traffic congestion." Transportation Research Record: Journal of the Transportation Research Board. Vol. 1856, pp. 118-124.

[13] Somanathan, P. and Thamizh V. (2013). "Influence of Traffic Mix on PCU Value of Vehicles Under Heterogeneous Traffic Conditions." International Journal for Traffic and Transport Engineering, Vol. 3(3), pp. 302 – 330.

[14] Thamizh, V. and Krishnamurthy, K. (2008)."Study of the Effect of Traffic Volume and Road Width on PCU Values of Vehicles Using Microscopic Simulation."Journal of the Indian Roads Congress, Vol. 69(2), pp.133-149.

[15] Thurgood, G.S. (1995). "Development of freeway congestion index using an instrumented vehicle."Transportation Research Record: Journal of the Transportation Research Board, Vol. 1494, pp. 21-29.

[16] TRB (Transportation Research Board). (2000). Highway capacity manual, Washington, DC.

[17] Victoria Transport Policy Institute (VTPI). (2005). "Congestion reduction strategies: Identifying and Evaluatingstrategies to reduce congestion."Retreived fromhttp://www.vtpi.org/tdm/tdm96.htm.

[18] William, R. and Reilly, P.E. (1992). "Operational Aspect of Highway Capacity."Traffic Engineering Hanbook, 4th Edition, Institute of Transportation Engineers,Prentice Hall, Englewood Cliffs, New Jersey, pp. 117-153.

[19] Yagar, S. and Aerde, M.V. (1983). "Geometric and Environmental Effects onSpeeds of 2-Lane Highways." Transportation Research-A, Vol. 17(4),pp. 315-325.

[20] Yamuna, S. (2015). "Study of Traffic Flow Characteristics for Heterogeneous Traffic."IOSR Journal of Engineering (IOSRJEN), Vol. 4(5), pp. 41-51.

[21] Zhang, S.; Gang, R. (2009). "Quantitative Analysis Modelof Urban Traffic Congestion State." Proceedings: 2nd International Conference on Transportation Engineering, pp. 1051-1056.

[22] Zhengyu, D.; Liu, L; Sun, W. (2009). "Traffic CongestionAnalysis of Shanghai Road Network Based on FloatingCar Data."Proceedings: 2nd International Conferenceon Transportation Engineering, pp. 2731-2736.

Association of Herding Bias with Age and Experience of Investors a Study in Kanpur

Anurag Shukla
PSIT College of Engineering, Kanpur (U.P.) India

ABSTRACT
An investor would be exhibiting Herding behaviour when he or she relies more on information validated by a crowd, rather than on his own judgment, owing to popular perception that the crowd cannot be wrong. If investors are heavily influenced by other investors, analysts and other people, the ability to come up with their own analysis and judgments get hampered. The investors follow others rushing to buy (or rushing to sell) housing, property, shares or other investments. But simply going with the herd is not likely to be a well-thought through investment strategy. And the followers can end up paying the price. This paper provides a comprehensive study of herding behaviour and association of herding behaviour with age and experience of investors in stock market.

Key words: Herd Behaviour, Age, Experience, Investor

I. INTRODUCTION

When sheep or other animals are in a herd, they move together at the same time. Often one or two leaders start, then momentum builds as more and more join until a large group are all heading in the same direction. A similar idea holds true when investors follow the herd. Individuals are known to be influenced by others in their decision making. When deciding which restaurant to make reservations at or which school to attend people frequently imitate the actions of their predecessors. Restaurants with a greater number of guests or schools with more students tend to appear more appealing to the observer. This is generally referred to as herd behaviour. The same reasoning can be applicable to the financial markets. Investors frequently follow the direction of the market or the advice of financial gurus. Understanding the behaviour of investors in financial markets is essential.

Herd investing is said to have contributed to many dramatic movements in markets over hundreds of years. Among the most famous examples are the Dutch tulip bulb mania of 1630s, the Japanese asset bubble of the late 1980s, the "dot-com" boom in the late 1990s and the housing market dynamics that contributed the global financial crisis from 2007 onwards.

Herding in financial markets has been typically described as a behavioural tendency for an investor to follow the actions of others. Practitioners are interested in whether herding exists, because the reliance on collective information rather than private information may cause prices to deviate from fundamental value and present profitable trading opportunities. Herding has also attracted the attention of academic researchers, because the associated behavioural effects on stock price movements may affect their risk and return characteristics and thus have implications for asset pricing models.

II. MOTIVATION AND LITERATURE SURVEY

Investment behaviours are differing from individual to individual based on the acceptance of return and risk and psychological and behavioural and demographic factors. Motivation for this study is to find out that is there any relation between age and experience of investors and their investment decision making. In this paper i have tried to find out that how herd behaviour is associated with age and experience of investors.

The existence of investor herds is one frequently used explanation for the volatility of stock returns (Christie and Huang, 1995, p 31). Investors are considered to be part of a herd if they are conscious of and influenced by the actions of others' (Bikhchandani and Sharma, 2001, p 280).Herding in financial markets can be defined as mutual imitation leading to a convergence of action (Hirshleifer and Teoh, 2003). This is the most common mistake where investors tend to follow the investment decisions taken by the majority. That is why, in financial markets, when the best time to buy or sell is at hand, even the person who thinks he should take action experiences a strong psychological pressure refraining him to do so. The main reason for this is pressure from or influence by peers. The Reliance Power IPO, 2008 is an example of an instance where many investors subscribed without having full information on the issue. Investors apply to "herd behaviour" because they are concerned of what others think of their investment decisions (Scharfstein and Stein, 2000).

Private investors tend to be influenced by recommendations of popular analysts. Welch (2000) in his study found out analysts could be exhibiting Herding behaviour too. It was not confirmed due to lack of micro level data. Whenever and analyst revised his recommendations, it had a positive

correlation with the next two analyst's revisions. The revision was found to be heavily influenced by the prevailing market consensus, and to recent information updates (Welch, 2000).Economou, Kostakis and Philippas (2010) examined herd behaviour in extreme market conditions using daily data from the Greek, Italian, Portuguese and Spanish stock markets for the years 1998- 2008 i.e. the existence of asymmetric Herding behavior associated with market returns, trading volume, and return volatility. Along with this, they also investigated the presence of herd behaviour during the global financial crisis of 2008. The results of the study showed that Herding is found to be stronger during periods of rising markets in these stock markets. Herding is present in the Portuguese stock market during periods of down returns and there is no evidence of Herding in the Spanish stock market. Finally, it is said that there is evidence of Herding during the global financial crisis of 2008 only for the Portuguese stock market and evidence of anti-Herding for the Spanish and the Italian stock markets. Investor behaviour seems to have been rational for the Greek stock market during the global financial crisis.

III. RESEARCH METHODOLOGY

Research Design is Descriptive in this paper: The sample profile was created based on two judgment criteria: age of the respondent and years of investment experience in the stock market. After an analysis of the sample, the following groups were found to be optimal:

(a) Experienced: Investors aged above 30, with at least 7 years of investing background
(b) Young: Investors aged 30 or below, with less than 7 years of investing background

The valid number of responses collected by the questionnaire survey was 60. When the judgment criteria were applied, the sample was trimmed down to 51 primarily owing to few inexperienced respondents aged above 30. In total, there were 23 young investors and 28 experienced investors. In order to keep the sample profile even between the two groups, 5 incomplete observations, where answers to more than 6 questions were missing, were filtered and eliminated from the experienced investor sub-sample to reach the final sample profile of 46.

The study includes only primary data which was gathered using the questionnaire which was distributed offline to reach out to wider audience in Kanpur city.

IV. DATA ANALYSIS AND HYPOTHESIS TESTING RESULTS

(a) Hypothesis 1-

H0: Both investor types do not depend on similar factors while making judgments/analysis

H1: Young and experienced investors behave differently while making judgments/analysis

The data collected was tabulated for analysis and chi square tests were applied as given in Table 1 to 4

Table 1
Age Of Investors * Basis of Judgement Cross tabulation

			BASIS OF JUDGEMENT			
			SELF	Broker/Friends	Media/Expert opinions	Total
AGE OF INVESTORS	0-29	Count	6	13	4	23
		% within AGE OF INVESTORS	26.1%	56.5%	17.4%	100.0%
	30-100	Count	4	6	13	23
		% within AGE OF INVESTORS	17.4%	26.1%	56.5%	100.0%
Total		Count	10	19	17	46
		% within AGE OF INVESTORS	21.7%	41.3%	37.0%	100.0%

Table 2
Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.744[a]	2	.021
Likelihood Ratio	8.060	2	.018

Linear-by-Linear Association	4.564	1	.033
N of Valid Cases	46		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 5.00.

Table 3
EXP of Investors * Basis of Judgement Cross tabulation

			BASIS OF JUDGEMENT			
			SELF	Broker/Friends	Media/Expert opinions	Total
EXP OF INVESTORS	0-6	Count	6	13	4	23
		% within EXP OF INVESTORS	26.1%	56.5%	17.4%	100.0%
	7-20	Count	4	6	13	23
		% within EXP OF INVESTORS	17.4%	26.1%	56.5%	100.0%
Total		Count	10	19	17	46
		% within EXP OF INVESTORS	21.7%	41.3%	37.0%	100.0%

Table 4
Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.744[a]	2	.021
Likelihood Ratio	8.060	2	.018
Linear-by-Linear Association	4.564	1	.033
N of Valid Cases	46		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 5.00.

(b) Test Result of Hypothesis 1

From the tables 1 to 4 we can clearly observe that majority of young investors (56.5%) trust on judgement analysis of brokers' and friends' and majority of experienced investors (56.5%) trust on judgement analysis of Media/Experts.

From above Chi Square table we can observe that we reject Null hypothesis. Hence, Alternate hypothesis holds true i.e. "Young and experienced investors behave differently while making judgments/analysis"

(c) Hypothesis 2-

H0: Trading volume of shares is not having any impact on investment decisions of both types of investors'.

H1: Trading volume of shares is having impact on investment decisions of both types of investors'.

The data collected was tabulated for analysis and chi square tests were applied as given in Table 5 to 8

Table 5
Age of Investors * Decision Based on Trading Volume Cross tabulation

			DECISION BASED ON TRADING VOLUME			
			YES	SOME TIMES	NO	Total
AGE OF INVESTORS	0-29	Count	5	14	4	23
		% within AGE OF INVESTORS	21.7%	60.9%	17.4%	100.0%

	30-100	Count	4	19	0	23
		% within AGE OF INVESTORS	17.4%	82.6%	0.0%	100.0%
Total		Count	9	33	4	46
		% within AGE OF INVESTORS	19.6%	71.7%	8.7%	100.0%

Table 6
Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.869[a]	2	.088
Likelihood Ratio	6.417	2	.040
Linear-by-Linear Association	.707	1	.401
N of Valid Cases	46		

a. 4 cells (66.7%) have expected count less than 5. The minimum expected count is 2.00.

Table 7
EXP of Investors * Decision Based on Trading Volume Cross tabulation

			DECISION BASED ON TRADING VOLUME			
			YES	SOME TIMES	NO	Total
EXP OF INVESTORS	0-6	Count	5	14	4	23
		% within EXP OF INVESTORS	21.7%	60.9%	17.4%	100.0 %
	7-20	Count	4	19	0	23
		% within EXP OF INVESTORS	17.4%	82.6%	0.0%	100.0 %
Total		Count	9	33	4	46
		% within EXP OF INVESTORS	19.6%	71.7%	8.7%	100.0 %

Table 8
Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.869[a]	2	.088
Likelihood Ratio	6.417	2	.040
Linear-by-Linear Association	.707	1	.401
N of Valid Cases	46		

a. 4 cells (66.7%) have expected count less than 5. The minimum expected count is 2.00.

(d) Test Results of Hypothesis 2

From tables 5 to 8 we can clearly observe that less no. of young investors' (21.7%) decision totally based on trading volume of shares and less no of experienced investors' (17.4%) decision also based on trading volume of shares.

From above Chi Square table we can observe that we fail to reject Null hypothesis hence, we can say that

"Trading volume of shares is not having any impact on investment decisions of both types of investors'.

(e) Hypothesis 3-

H0: Both investor types purchase behaviour regarding shares is not affected by peer group decision making.

H1: Both investor types purchase behaviour regarding shares is affected by peer group decision making

The data collected was analyses and tabulated at Table 9 to 12

Table 9
Age Of Investors * Decision Impacted By Peer's Decision Cross tabulation

			DECISION IMPACTED BY PEER'S DECISION			
			POSITIVE	NEGATIVE	NO CHANGE	Total
AGE OF INVESTORS	0-29	Count	12	5	6	23
		% within AGE OF INVESTORS	52.2%	21.7%	26.1%	100.0%
	30-100	Count	14	6	3	23
		% within AGE OF INVESTORS	60.9%	26.1%	13.0%	100.0%
Total		Count	26	11	9	46
		% within AGE OF INVESTORS	56.5%	23.9%	19.6%	100.0%

Table 10
Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.245[a]	2	.537
Likelihood Ratio	1.264	2	.531
Linear-by-Linear Association	.852	1	.356
N of Valid Cases	46		

a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is 4.50.

Table 11
EXP of Investors * Decision Impacted By Peer's Decision Cross tabulation

			DECISION IMPACTED BY PEER'S DECISION			
			POSITIVE	NEGATIVE	NO CHANGE	Total
EXP OF INVESTORS	0-6	Count	12	5	6	23
		% within EXP OF INVESTORS	52.2%	21.7%	26.1%	100.0%
	7-20	Count	14	6	3	23
		% within EXP OF INVESTORS	60.9%	26.1%	13.0%	100.0%
Total		Count	26	11	9	46
		% within EXP OF INVESTORS	56.5%	23.9%	19.6%	100.0%

Table 12
Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.245[a]	2	.537
Likelihood Ratio	1.264	2	.531
Linear-by-Linear Association	.852	1	.356
N of Valid Cases	46		

a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is 4.50.

(f) Test Result of Hypothesis 3

From tables 9 to 12 we can clearly observe that majority of young investors' (52.2%) attitude is positively affected by peer group's decision making and majority of experienced investors' (60.9%) attitude is also affected by peer group's decision making.

From above Chi Square table we can observe that we fail to reject Null hypothesis hence, we can say that "Both investor types purchase behaviour regarding shares is not affected by peer group decision making.

V. CONCLUSION

This research investigates the behavioural patterns of investors in Kanpur City and tries to understand how these patterns guide investment decision. This research offers many useful insights for students, instructors, academedicians concerned with financial markets. It facilitates financial advisors to become more effective by understanding their clients psychology. It aids them in developing behaviourally modified portfolio, which best suits their clients' predisposition.

It can be concluded from first hypothesis that majority of young investors trust on judgement analysis of brokers and friends and majority of experienced investors trust on judgement analysis of Media/Experts and "Young and experienced investors behave differently while making judgments" .It can be concluded from second hypothesis that less no. of young investors and experienced investors 'decision totally based on trading volume of stocks and "Trading volume of shares is not having any impact on investment decisions of both types of investors". It can be concluded from third hypothesis that majority of young investors and experienced investors attitude is positively affected by peer group's decision making.

REFERENCES

[1] Nizar Hachicha, New Sight of Herding Behavioural through Trading Volume, Economics-The open access, open assessment e-journal

[2] Christie, W.G. & Huang, R.D. 1995, "Following the Pied Piper: Do Individual Returns Herd around the Market?", *Financial Analysts Journal*, vol. 51, no. 4, pp. 31-37.

[3] Bikhchandani, S. and Sharma, S. (2001), "Herd Behavior in Financial Markets" *IMF*

[4] *Staff Papers* 47(3), 279-310.

[5] Hirshleifer, David., and Teoh, Slew Hong. 2003. *Herd Behavior and Cascading in Capital Markets: a Review and Synthesis*. European Financial Management 9(1): 25 – 66.

[6] Scharfstein, David S., and Stein, Jeremy C.2000. *Herd Behavior and Investment*. The American Economic Review 80(1) : 465 – 479.

[7] Welch, Ivo. 2000. *Herding Among Security Analysts*. Journal of Financial Economics 15(3).

[8] Economou, Fotini., Kostakis, Alexandros., Philippas, Nikolaos. 2010. *An Examination of Herd Behavior in Four Mediterranean Stock Markets*. Athens: 9th Annual Conference, European Economics and Finance Society.

[9] Rahul Subash, Role of Behavioral Finance in Portfolio Investment Decisions: Evidence from India(Ph.D. Thesis, Charles University,2011-12)

[10] https://www.ezonomics.com/whatis/herd_behaviour

Workflow of Machine Learning Based Sentiment Classification: A Review

Poonam Choudhari[1], Dr. S. Veena Dhari[2]
[1] Research Scholar, Dept. of CSE, RNTU, Bhopal (M.P.) India
[2] Associate Professor, Dept. of CSE, RNTU, Bhopal (M.P.) India

ABSTRACT
Sentiment Analysis is the process of understanding the meaning of feelings expressed by an individual online about entities such as products, services, organizations, individuals, issues, events, topics, and interpreting them in positive, negative and neutral classes in a automated way. The paper explains the workflow of Machine learning based approach classification for Sentiment Analysis .It gives an overview of common techniques that are used at different phases of classification with their strength and weakness. This study would help in solving research problems that are encountered in Sentiment Analysis. The understanding of the phases would help in developing efficient classifier and ultimately improving the performance of the Classification algorithm. A study of techniques adopted by researchers at different phases of Sentiment Analysis and brief analysis of study is also presented.

Keywords:-Sentiment Analysis, Feature Vector, Customer Reviews, Text preprocessing, Machine Learning based Classification.

I INTRODUCTION

Sentiment Analysis (also called as Opinion Mining) is the process of classifying whether a piece of writing (online review, tweet, etc.) expressed by opinion writer is positive, negative or neutral. The process is performed by analyzing the different customer online reviews .It is a way of identifying customer attitude, sentiments towards company's product, brand, or service [1]. The online review helps the new customers to take purchase decisions by reviewing the customer feedback reviews. The companies can measure the customer's satisfaction and give a better picture where they stand against their competitors in the market. Since for popular products, a thousand of reviews are available, the analysis cannot be done manually, so an automated way of analyzing the sentiment is required, which is called as Sentiment Analysis.

II LITERATURE SURVEY

A lot of research work has been done in the field of Sentiment Analysis and it is an ongoing research. Pang et al.(2002)[2] used machine learning approach for sentiment classification They experimented with unigrams, bigrams, position based features, POS Based features adjectives, adverb and their combination as features.

They used naïve bayes, SVM and maximum entropy as classification algorithm. Their experimental results showed that unigram features perform best among these features with SVM as classification algorithm with accuracy 82.9%. Pang et al(2008)[3] explained in the paper the research challenges ,applications of sentiment analysis The author provide a brief overview on classification, feature extraction in sentiment analysis, opinion summurization and a list of datasets used by researchers in sentiment analysis. Bing Liu (2012)[4]provides a broad overview of different approaches and techniques in sentiment analysis. The author encourages solving challenges in the field and openly makes resources available for the required work. Narayanan et al.(2013)[5] used text preprocessing technique like use of negation handling, for feature extraction used bag of n-grams and for feature selection used mutual information and observed a significant improvement in accuracy with Naive Bayes classifier. They achieved an accuracy of 88.80% on the popular IMDB movie reviews dataset. Jose et al(2015)[6] present the results for classifying the sentiment of movie reviews which uses a chi-squared feature selection mechanism, machine learning algorithms such as Naive Bayes and Maximum Entropy can achieve competitive accuracy . It analyze accuracy, precision and recall of machine learning classification mechanisms with chi-squared feature selection technique and The method also uses a negation handling as a pre-processing step in order to achieve high accuracy. Kaur et al.(2016)[7] presents an empirical study of efficacy of classifying product review by semantic meaning The authors hereby propose completely different approaches including spelling correction in review text, and then classifying comments employing hybrid algorithm combining Decision Trees and Naive Bayes algorithm. Mubarok et al (2017)[8] experimented on aspect based sentiment classification on product reviews. They used Part-of-Speech (POS) tagging, feature selection using Chi Square, and classification of sentiment polarity of aspects using Naïve Bayes with its highest F1-Measure of 78.12%. The Chi Square also has been proven to speed up the computation time in the classification process of Naïve Bayes although it degraded the system performance.

III WORKFLOW OF SENTIMENT ANALYSIS

The basic steps of sentiment analysis are as follows [9][10]:

(i) Text preprocessing
(ii) Feature vector construction
(iii) Feature Extraction
(iv) Feature Selection
(v) Feature Weighting
(vi) Machine learning based Classification on Feature vector

A brief description of how the different steps contribute in building the sentiment classifier. It also gives a description of techniques used in the phases, with their strength and weakness.

(a) Text preprocessing

In this phase, the text is cleaned by removing the irrelevant things from the text and makes it ready for its next phase.

The texts are pre-processed by following methods:

(i) **Tokenization**

Text data is converted to a block of characters called tokens. The tokens/words which will be used as feature vector are used for further processing.

(ii) **Strength of Tokenization**

- Tokenization is the first major step in text pre-processing which convert the raw data into identifiable data known as tokens.

(iii) **Weakness of Tokenization**

- Tokenization is one of the crucial steps in pre-processing of text. The major issue here is to recognize the correct tokens. For e.g. splitting on white space can split the word which should be regarded as single token like Los Angles.

(iv) **Removal of Stop Words**

Stop words are the words that occur so often in the text, but support no information for classification. For e.g. In English language 'a', 'an', 'the' are considered as Stop Words.

(v) **Strength of Stop Words**

- Stop words removal helps to reduce the dimensionality of the data space. Thus learning becomes faster classification can be more accurate as the noise in the form of stop words are removed.

(vi) **Weakness of Stop Words**

- The list of stop words may vary according to domain/language, as some of the words may have relevance in some domain than in other domain. So there is no definite stop word list which works in all type of domain applications.

(vii) **Stemming**

The tokens are reduced to their stem. In this technique, the suffix /prefix are removed from the words for e.g. 'watched' becomes 'watch'.

(viii) **Strength of Stemming**

- Stemming optimize the performance of algorithm by reducing the size of data space.

(ix) **Weakness of Stemming**

- Stemming should be done carefully. If not, it may lead to over stemming or under stemming. Over stemming means two words with different stems are rooted to same word which may give false positive. Under stemming means when two words that should be stemmed to same word are not which may give false negative?

(b) Feature vector construction

When the cleaned text is obtained as output from pre-processing phase, the feature vector is constructed which will be given as input to next phase i.e. classification. This step is subdivided into following sub steps:

(i) **Feature Extraction**

First features are extracted from the pre-processed tokens i.e. tokens are chosen that are considered as feature vector which will go in next phase for classification data is obtained. The common feature extraction methods are bag- of- words, bag -of- n-grams (bigrams, or more), POS (Parts of Speech) Based features.

(ii) **Bag-of-Words**

The feature vector can be represented by a simple approach called bag-of-words in which the text is consider as a group of words stored in a bag in which order of words are not considered.

Thus, the sentence is represented as feature vector

$$d_i = (wi_1, w_{i2}, \ldots, wi_j, \ldots, wi_n)$$

where wi_j is the weight of feature w_i in the sentence d_i, n is number of features in the sentence.

(iii) **Strength of Bag-of-Words**

- It is a simple technique to understand and implement.

(iv) **Weakness of Bag-of-Words**

- The technique represents no spatial relationship between features.
- In BoW, an unordered list of unigrams (single one word) is obtained without any information like related to syntax, semantics etc .So it is less usable, where such informative features are required.

(v) **Bag-of-N-grams**

When feature vector is represented as bag of N-grams, the n contiguous sequence of words in the text from text corpus is together called a n-gram. For n = 1, the n-gram is called "unigram"; for n = 2, the n-gram is called "bigram", for n = 3, the n-gram is

called "trigram", for n> 3, we simply replace the letter n by its numerical value, such as 4-gram, 5-gram, etc. A vector of unigrams is often called the Bag-of-Words model. Consider the sentence "he bought iphone and ipad ". That can be represented as a vector of unigrams [he; bought; iphone; and; ipad]. Besides, this sentence can be represented also be represented as vector of bigrams [[he bought]; [bought iphone]; [iphone and]; [and ipad]].

(vi) **Strength of Bag-of-N-grams**

- The local positioning information can be obtained by extracting n-grams instead of individual words.

(vii) **Weakness of Bag-of-N-grams**

- It is necessary to have a optimum length of n-gram .If length of n-gram is too short, it may not get the important differences, if length is too long, it may get only particular cases and may not generalize well.

(c) POS (Parts of Speech) Based features

When feature vector is represented by POS tagging, it means that each word in the text will be assigned a tag which represents its role in the grammatical context i.e. text is considered as group of verb, noun, adverb or adjective (POS tagged words). The general POS tags are JJ to denote adjectives, RB to denote adverbs, VB to denote verbs, and NN to denote nouns. The combination of adjectives, adverbs, and nouns performed better than individual tokens when considered as feature vector. Adjectives play an important role as indicators of opinions. So they performed the best among the three (i.e. Adjectives, adverbs, and nouns) individual POS tagged features.

(i) **Strength of POS Based features**

- The POS based features can help to deal with the problem of word sense disambiguation. If the correct sense of word/feature is known, it would help in improving the performance of classification.

(ii) **Weakness of POS Based Features**

- When POS tagging is done, many words can have more than one tag, to know the correct meaning according to the context of word/feature can be a tedious job.

(iii) **Feature Weighting**

Apart from using efficient feature extraction method, it is important to assign correct weight to the feature used. In this step weights are assigned to the features according to the importance of sentiment. The common feature weighting schemes are term frequency, binary-weighting scheme, term frequency-inverse document frequency (tf-idf).

(iv) **Term frequency**

It is a feature-weighting technique in which the features are weighted by term frequencies (TF). For example, if a term happy appears in the document 5 times, then the feature term happy is weighted with number 5.

(v) **Strength of Term Frequency**

- It is one of the simplest methods of knowing of feature importance.

(vi) **Weakness of Term Frequency**

- The feature weighting technique does not work when the term features are not just concentrated in only one particular document, but they are frequent in other documents in the corpus. Due to this precision of classification may get affected.

To overcome the above limitation, another feature weighting technique TF-IDF can be used.

(vii) **Binary-weighting scheme**

Another commonly used feature weighting values are binary numbers, which indicate the presence/ absence(1/0) of term in the text corpus, Here the presence/ absence of term is more important than frequency . It means that if a term (feature) appears in the document or sentence, then its weight value in that document or sentence is 1, else is 0. For example, if a term happy appears (no matter how many times) in the document, then the feature weight value of happy is 1, else the value is 0.

(viii) **Strength of Binary -weighting**

- It is a feature weighting technique which can be used in classification where numeric value of term frequency is not used.

(ix) **Weakness of Binary -weighting**

- The binary representation may underperform than other weighting technique where term frequency plays an important role in measuring the importance of feature.

(d) Term Frequency -Inverse Document frequency (TF-IDF)

In this scheme, weights are assigning to each term according to how these terms occur in other document. Rare terms could have high idf score, which means that rare terms may be good indicators for text classifications, depending on how it could balance well with tf scores .Its weights are computed by :

$w_{ij} = tf_{ij} * idf_i$

where tf_{ij} is the term frequency i.e. Frequency of term 'i' in document 'j'

idf_i is the inverse document frequency which is equal to $\log(N/n_i)$,N is the total number of documents in the corpus, and n_i is the number of documents containing the term 'i'.

For e.g. suppose a review contain 100 words wherein the word great appears 6 times. The term frequency (i.e., TF) for great is (6 / 100) = 0.06. Again, suppose there are 1 million reviews in the corpus and the word great appears 1000 times in whole corpus Then, the inverse document frequency (i.e. IDF) is calculated as log(1,000,000 / 1,000) = 3. Thus, the TF-IDF value is calculated as: 0.06 * 3 = 0.18.

(i) Strength of TF-IDF

- The formula required to calculate is easy to understand and implement.
- It gives a different perspective for considering the feature weight age .i.e. it gives importance to not only the terms in the document but in other documents too.

(ii) Weakness of TF-IDF

- As it is a term frequency based weighting measure, it does not provide information about the position of features, semantic-related information.
- Another limitation is that it is not able to recognize the singular and plural form of the word (feature), and consider the singular and plural form of word as two different features.

(iii) Feature Selection

In this step the features extracted in previous sub step are analyzed to select the important features that are not redundant, noise-free and are relevant for classification, since the irrelevant/redundant input feature vector will induce greater computational cost. Feature selection methods are techniques that select important features out of a given set of features using some goodness of a term formula, top features are selected above the threshold criteria and other irrelevant features are dropped. If the length of feature vector is high, the dimension of feature vector is also reduced. The common feature selection methods are Document Frequency (DF), Information Gain (IG), Chi –square (CHI).

(iv) Document Frequency(DF)

This is a simple feature selection method where we find the number of documents in which the feature appears at least once, which is called document frequency of the feature. The terms that are less than a pre-determined threshold are removed.

(v) Strength of DF

- One of the simplest techniques for feature reduction.
- Scalability to a large corpus can be done easily.

(vi) Weakness of DF

- It happens sometimes that low DF feature tends to more informative.

(vii) Information Gain(IG)

Information Gain is frequently employed as a term-goodness criterion in the field of machine learning .The heuristic considered is to select those attribute that is more pure than other attributes in the group. To achieve this entropy of attributes is calculated**,** i.e., of the degree of disorder of the system.

IG(A) is the reduction in the entropy that is achieved by learning a variable A:

$$IG(A) = H(S) - \sum_i \frac{S_i}{S} H(S_i)$$

where H(S) is the entropy of the given dataset and $H(S_i)$ is the entropy of the ith subset generated by partitioning S based on feature A. A feature with high information gain should be ranked higher than other features because it has stronger power in classifying the data.

(viii) Strength Of Information Gain

- As information gain is a good measure for deciding the importance of attribute in the feature vector .It can be used to decide sequence of attributes in the nodes of decision tree.

(ix) Weakness Of Information Gain

- One of the major disadvantages is that information gain is more prone to the attributes with large number of instances in compare to attribute with less number of instances. So accuracy gets affected if the data is unbalanced.
- The above disadvantage can lead to over fitting of data i.e. due to information gain bias; the non-optimal attribute may get selected for prediction.

To overcome this bias, information gain ratio can be used. This method uses the value of split info to normalize the value of information gain. Split info gives information about what proportion of the information gain is actually valuable for that split. The attribute with the greatest information gain ratio is selected.

(e) Chi-Square(CHI)

In this feature selection technique the independence between the two events (class) is examined. The test is used to rank all our terms by their independence with respect to classes and then set a threshold to select only top n features with the highest value of the Chi-square statistic.
It can be calculated as

$$\chi^2 = \sum_i \frac{(O_i - E_i)^2}{E_i}$$

Where Oi is the observed number of cases in category i,
Ei is the expected number of cases in category i.

(i) Strength of Chi Square

- A chi square test can be applied for measuring the 'goodness of fit 'of an actual data that is observed with an expected sample distribution to test the independence of criteria of classification. It gives information that how accurate is the sample data is a representation of actual data.
- The formula required to calculate chi-square test is easy and interpretation of output is also easy to understand.
- The Chi-square statistic is a non-parametric (distribution free) test designed to analyze and test the group differences.

(ii) Weakness of Chi Square

- One weakness or Limitation is with respect to its sample size requirements i.e. a sufficient size of sample is required to get correct approximation from chi-square test.
- Another limitation is the requirement is the data format. The input data must be in the form of frequency table (i.e. data samples with their respective frequencies).

(f) Machine learning based Classification on Feature vector

After the construction of feature vector in the previous phase, the optimal features obtained are classified by applying suitable machine learning classification algorithm. The main classification algorithm considered by researchers in sentiment analysis is Naïve Bayes [11], Decision Tree [12], Maximum Entropy [13], Support Vector Machine [14].

(i) Naïve Bayes

Naïve Bayes classification predicts the probability of a given feature belong to a particular class label by using Bayes theorem. The classification is considered naïve because it is assumed that the features have no dependence on each other i.e. one feature does not affect the other in classifying whether or not the review is positive, negative or neutral.

The Bayes theorem for finding probability, is defined, for a given data point x(i.e .word) and class 'c'(here in case of SA ,c = positive ,negative or neutral):

$$P(c|x) = \frac{P(x \mid c)\, P(c)}{P(x)}$$

P(c|x) =Posterior probability(i.e. the resultant probability of attribute x in test set belong to class label 'c') P(x|c)= Maximum Likelihood or Conditional Probability(i.e. overall probability of attribute x in training set belong to class label 'c')
P(c)=Class Prior Probability
(i.e. probability of c' in training set)
P(x)=Predictor prior probability (i.e. probability of attribute x in all the class labels in training set)

(ii) Strength of Naïve Bayes

- It is simple to implement .i.e. easier to predict class label on test data.
- Training time and prediction time required is less as compared to other text classification algorithms.
- If textual data for training is fairly little, then high bias/low variance classifier i.e. Naïve Bayes classifiers does well in such circumstances. As the interactions between the attributes are ignored in the model, there is no requirement of examples of these interaction and therefore less data is required than other text-classification algorithms.
- The performance of classifier is good with independent feature vectors.

(iii) Weakness of Naïve Bayes

- The performance of algorithm can degrade if the data contains highly correlated features.
- One of the problem encountered in Naïve Bayes is Zero Observation problem .i.e. if a categorical attribute has a value in the test set that was not there in the training set .Then the model will assign a zero probability and be unable to make a prediction .But Some techniques like laplacian smoothing can be applied to overcome zero observation problem.

(g) Decision Tree

Decision Tree is a non-parametric supervised method used for Sentiment Analysis text classification. It classify the given feature to a particular class label by developing a tree model where the given data is divided recursively(according to some condition) until the leaf nodes which contain the nodes for the classified class label. The performance of algorithm depends on choosing the best splitting node which

means choosing the feature which gives maximum information**.**

(i) Strength of Decision Tree

- Simple to understand, visualized and to interpret even by non programmers. Decision trees are white-box classification algorithm means they are able to generate understandable rules in human readable form.
- Simplifies complex interaction between input variable and target output by dividing the original input variables into significant sub-groups.
- Decision tree gives a clear indication of which are the attributes feature i.e. words are most important for classification.
- Decision tree are non-parametric means no specific data distribution is necessary.
- It can easily handle feature interactions and they are robust to outliers.

(ii) Weakness of Decision Tree

- Decision tree learners can create over-complex trees that may not generalizes well this is called over fitting problem. The over fitting decision tree require more space and other computational resource. Pruning helps in handling the over-fitting problem.
- It does not work well with continuous attribute as compared to categorical one.

(iii) Maximum Entropy

Maximum entropy classification algorithm is a probabilistic classifier based on the principle of Maximum Entropy. Here the classifier select the feature goes to a class label that maximizes the entropy. The algorithm does not assume that features are independent with each other.

(iv) Strength of Maximum Entropy

- Perform well with dependent features.
- Ability to combine different kind of statistical dependencies in one uniform framework.

(v) Weakness of Maximum Entropy

- The Performance degrades when the feature vectors applied are independent.
- The Max Entropy requires more time to train comparing to Naive Bayes, primarily due to the optimization problem that needs to be solved in order to estimate the parameters of the model.

(vi) Support Vector Machine

The SVM classifier is a non-probabilistic classifier which classifies the data by mapping the feature vector into a high dimensional vector space and plot a separating line between the class labels. Here the goal of SVM is to find a optimal separating Linear hyper plane which maximizes the margin between the two class labeled data points. Margin is the distance of the closest point of each class from the separating hyper –plane. In order to calculate the margin, two parallel hyper planes are constructed on each side of hyper plane. If the classes are not linearly separable in the high dimensional space, the algorithm will add a new dimension in an attempt to further separate the classes. It will continue the process until it is able to separate the training data into two separate classes using the hyper plane.

(vii) Strength of SVM

- It can deal with documents with high dimensional input space and pick out many of the irrelevant features.
- It has the ability to produce high classification accuracy compared to other text classification algorithm.

Weakness of SVM

- To choose the values of parameters in SVM is hard
- To choose the best kernel function in SVM is also a difficult problem.

(viii) Analysis of Workflow of Sentiment Analysis

The study shows the important phases that need to be considered while performing Machine learning based Sentiment Analysis. The phases such as text pre-processing, feature vector selection affect the performance of any classification algorithm. Different techniques that can be applied with their pros and cons are discussed. The choice of method may vary depending on the application, domain and language used.

In sentiment analysis, in the first phase the decision of how to represent the text is important. For this, it is important to know what type of tokenization to use. If stop word removal technique is to be used, then what stop words need to be considered as list of stop words vary in different domain and language .If stemming is used ,care need to be taken that it may not lead to over or under stemming. For feature vector extraction, if a simplest method is required then bag –of-words is used. A more improved version of bag-of –words is bag- of -n grams, but here length of n should not be too short or too long. POS tagging is also used for feature extraction which provide grammatical context of features.

Feature weighting techniques are also used to rank the features based on their frequency. A simple method known as term frequency is used, when the features are concentrated to a single document, if the terms are distributed in other documents then TF-IDF feature weighting technique is used.

Feature selection method chooses the features that are more relevant than other features. Two commonly used feature selection algorithms in Text Classification are the information gain and the Chi-square test. Each algorithm evaluates the features in a different way and thus leads to different selections. Information Gain is used as goodness of measure by measuring the entropy of the attributes. If the instances of attributes are unbalanced, then the problem of over fitting may be encountered. Chi-Square method is it measures how well the observed distribution of data fits with the distribution that is expected if the variables are independent.

The final step is to classify the data using classification algorithm. Four classification algorithms were discussed .Naive Bayes is a probabilistic classifier based on Bayes Theorem whose performance is good with independent feature vector. The performance of algorithm can degrade if the data contains highly correlated features. Decision tree are simple to understand and can be interpreted by non-programmers. Sometimes decision trees may create over-complex trees that do not generalize well. Maximum entropy classification algorithm work well with dependent features. The Max Entropy may require more time to train comparing to Naive Bayes, primarily due to the optimization problem that needs to be solved in order to estimate the parameters of the model .SVM can deal with documents with high dimensional input space and pick out many of the irrelevant features. To choose the best kernel function in SVM is a difficult problem. As there is no free lunch theorm i.e. there is no single classification algorithm that performs well in all topics/domains/applications. It can't be concluded that SVM are always better than decision trees or vice-versa. The accuracy of a classifier can be as high as 95% in one domain/topic and as low as 40% in some other. It is hoped that by understanding the different phases in the study would help in selection of the classification algorithm, feature selection technique and other configurations to improve the accuracy, precision and recall of algorithm.

IV CONCLUSION

Sentiment Analysis is the process of extracting opinion from textual data. This paper presents a study of workflow of sentiment analysis which would help the researchers in improving the performance of automated Sentiment Analysis system.

REFERENCES

[1] Bing Liu (2010) Sentiment Analysis and Subjectivity, Handbook of Natural Language Processing, Second Edition.

[2] Bo Pang Lillian Lee, and Shivakumar Vaithyanathan, (2002).Thumbs up?: sentiment classification using machine learning techniques. Proceedings of the ACL-02 conference on Empirical methods in natural language processing- Association for Computational Linguistics. Volume 10.

[3] Bo Pang and Lillian Lee,(2008) Opinion Mining and Sentiment Analysis , Foundations and Trends_ in Information Retrieval, Vol. 2, Nos. 1–2 DOI:10.1561/1500000001.

[4] Bing Liu., (2012) Sentiment Analysis and Opinion Mining. Morgan & Claypool Publishers.

[5] Vivek Narayanan, Ishan Arora, Arjun Bhatia(2013). Fast and accurate sentiment classification using anenhanced Naive Bayes model. Intelligent Data Engineering and Automated Learning 14th International Conference, Hefei, China.

[6] Rincy Jose, Varghese S Chooralil. (2015). Accurate Sentiment Analysis using Enhanced Machine Learning Models. International Journal of Science and Research (IJSR) Volume 4 Issue 9 ISSN (Online): 2319-7064.

[7] Gurneet Kaur, Abhinash Singla.(2016).Sentimental Analysis of Flipkart reviews using Naïve Bayes and Decision Tree algorithm International Journal of Advanced Research in Computer Engineering & Technology (IJARCET) Volume 5 Issue 1, ISSN: 2278 – 1323.

[8] Mohamad Syahrul Mubarok, Adiwijaya, and Muhammad Dwi Aldhi(2017). Aspect-based sentiment analysis to review products using Naïve Bayes International Conference on Mathematics: Pure, Applied and Computation AIP Conf. Proc. 1867, 020060-1–020060-8; doi: 10.1063/1.4994463.

[9] Walaa Medhat, Ahmed Hassan, Hoda Korashy(2014) Sentiment analysis algorithms and applications: A survey. Ain Shams Engineering Journal.

[10] S.Vanaja, K.Ramesh kumar (2014).Analysis of Feature Selection Algorithms on Classification: A Survey. International Journal of Computer Applications (0975 – 8887) Volume 96– No.17.

[11] A.McCallumK. Nigam.(1998)A Comparison of Event Models for Naive Bayes Text Classification , and Learning for Text Categorization.Papers from the AAAI Workshop.

[12] J.R. Quinlan (1986) Induction of Decision Trees.Machine Learning 1,pp-81-106.

[13] Adam L. Berger Stephen A. Della Pietra ,and Vincent J. Della Pietra, (1996).A Maximum Entropy Approach to Natural Language Processing, Association for Computational Linguistics Volume 22, Number 1

[14] Simon Tong and Daphne Koller,(2001) Support Vector Machine Active Learning with applications to Text Classification. Journal of Machine Learning Research, pp-45-66.

Estimating Pre-Seismic Peril for Middle and South India

Jeevan Kumar C. M.[1], Dr. Suryanshu Choudrary[2]
[1,2] Dept. of Physics, Rabindranath Tagore University, Bhopal (M.P.) India

ABSTRACT
This manuscript present probabilistic pre-pre-seismic peril evaluation of south middle India (south of 28° N), and which is characterized by crustal inter plate pre-seismic activity in craton and rifting zones. It also brings more than a few updates including: 1) peril evaluation in middle India 2) estimating resource zone-specific pre-seismicity parameters, 3) use of more than a few recently obtainable GMPEs both in terms of PGA and SA at dissimilar frequencies for incorporating the unpredictability in the ground movement for pre-seismic peril associated with dissimilar zones in middle and south India.

***Keywords*:** Pre-seismic peril, Probability, Logic Tree, Gridded Pre-seismicity.

I INTRODUCTION

In a previous study, the authors have developed probabilistic pre-seismic peril map in terms of peak ground accelerations incorporating spatial characteristics of pre-seismic resource zones of peninsular India (south of 28° N). More than a few combination models that are uniform, background, geo-based and reservoir induced pre-seismicity to capture epistemic uncertainties in the pre-seismic peril (Jaiswal 2006, Jaiswal and Sinha, 2007). In the present investigation we estimate pre-seismic peril extending resource zones further to North India (south of 32° N) but excluding foothills and Himalayan belt in north, highly pre-seismic north-eastern part and Hindukush region in northwest as most of these belongs to either inter-plate or continental-continental thrust, extended margins or plate boundary area. Such area need to be modelled with additional constraints such as knowledge of tectonic domain, accurate delineation of faults, pale pre-seismic and geologic investigation to understand active faults and their mechanism slip rates and rupture properties and is beyond the scope of this investigation. Middle and south India covers more than 50% of the country and approximately 50% of country's 1.1 billion population lives in this region. The mainly current version of pre-seismic zoning map of India obtainable in building design codes (IS 1893: 2002) has not measured detailed pre-seismic peril analysis of the region using moreover deterministic or probabilistic approaches, rather it is based on limited earthquake catalogue data, pre-seismic of large historical earthquakes and limited analysis (Krishna,1992). More than a few researchers have highlighted the issue of urgent upgrade of existing pre-seismic zoning map of India (Jain and Nigam, 2000, and Khattri, 2006) in the wake of recent earthquake disasters (Latur 1993, Jabalpur 1997, Chamoli 1999, Bhuj 2001 and Kashmir 2005) which has resulted in the death of over 20,000 people in India and left millions homeless and causing enormous impact on regional and country's economy.

II METHODOLOGY

We make use of gridded pre-seismicity move toward proposed by Frankel (1995) and has been used generally for the estimation of pre-seismic peril in Middle and Eastern United States (CEUS) region as a division of national pre-seismic peril maps in 1996, 2002 and the most recent 2008 revision (Petersen et al., 2008). The come within reach of is particularly appropriate for modelling craton and rift zone exact pre-seismicity in stable continental area of peninsular India (Jaiswal, 2006). Probabilistic pre-seismic peril evaluation consists of: a) establishing seismic reappearance activity in each grid cell or resource using earthquake directory data and developing magnitude-frequency relations (Gutenberg-Richter parameters *a* and *b*-values), and estimating pre-seismicity rates for each grid cell or resource, b) determining resource-specific (grid cell, fault or area resource) maximum magnitude potential, c) estimating ground shaking at site or grid cell from each of the earthquake resource-specific earthquake along with its associated rate and developing peril curve, d) estimating ground movement at a site or grid cell for certain predefined exceed levels (e.g., 10% or 2% probability of exceed in 50 years, corresponding to an average recurrence of ~475 or ~2500years, respectively), and e) developing pre-seismic peril map in terms of peak ground parameters (accelerations, velocities) and pseudo spectral accelerations at dissimilar frequencies (3 and 5 Hz). Supplementary information about probabilistic pre-seismic peril evaluation can be originated at other literature (for example, Cornell, 1968, Frankel, 1995, McGuire, 2004).

III GEOLOGIC ZONING AND PRE-SEISMICITY

Stable continental area are often characterized by short history of macro or micro pre-seismic data and limited knowledge in terms of active tectonic features and thus remain area of wonders in terms of future

pre-seismic activity. Reactivation of inactive pre-seismic resource or production of earthquakes from original unguided pre-seismic resource in steady protect masses has frequently caused revelation earthquakes (for example, Latur earthquake of 1993). However, it is obvious that pre-seismic peril linked with SCRs is significantly lesser than active tectonic area such as Himalayas in the north, Hindukush northwest and Andaman region in the eastern part (Figure 1). Seeber et al. (1999) proposed pre-seismic scheme for peninsular India while estimating the pre-seismic peril for the state of Maharashtra in India. We slightly modify the original zoning by spatially mapping the various tectonic settings in the region, covering broad geologic feature within zone (for example, extending Narmada Lineament further to the west, straightening and expansion of western unreceptive edge to east, extending eastern unreceptive margin zone further northeast, etc.) and including additional north-western area to better characterize pre-seismic peril associated with western part of upper craton (NC) zone. It is clear that the elevated pre-seismic movement linked with upper part of India further north to the border of Upper Craton is not included in estimating pre-seismicity parameters potentially owing to unlike tectonic domain and settings. Clearly it will result in underestimation of pre-seismic peril for Upper Craton. Pre-seismic peril associated with Himalayan belt will most likely dominate in this region.

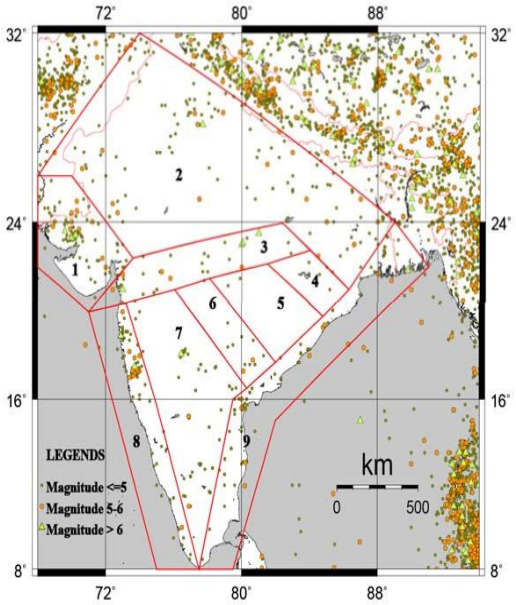


Fig 1. Pre-seismic activity in India and adjoining area

The nine broad pre-seismic zones are: 1) Rann of Kutch (ROK), 2) Upper Craton (NC), 3) Narmada Lineament (NL), 4) Mahanadi Graben (MG), 5) Eastern Craton (EC), 6) Godavari Graben (GG), 7) South Craton (SC), 8) Western Passive Margin (WPM), and 9) Eastern Passive Margin (EPM).

The information specific to the geologic and tectonic characteristics of each pre-seismic zone, their historic and recent pre-seismic activity can be found at Jaiswal (2006). whole until 2002 for peninsular India to receive earthquakes in upper part of India (south of 32° N) and extending it in anticipation of the year 1600 via Bapat et al. (1983) which covers information from 1459, GSHAP earthquake directory by Bhatia et al. (1999) and toting up the majority current activity until the year 2005, from NEIC Preliminary Determination of Epicentres (PDE) data (NEIC 2007). The raw data has been processed by removing foreshock and aftershock data and then converting it into moment magnitude using the procedure described in Jaiswal (2006). Figure 1 illustrates the epicentres of historical pre-seismic activity associated with India and adjoining area between the years 1600 to2005.

IV GROUND MOVEMENT EQUATIONS

Due to the lack of well-defined ground movement prediction equations for the region, we used four crustal intra-plate relationships, which include two simulation-based relationships for Middle and Eastern United States (CEUS). Both Eastern North America and Peninsular India area share similar features in terms of observed seismogenic activities and known seism tectonics, as discussed by Schweig et al. (2003) and Cramer and Kumar (2003). We have used newly developed ground movement equations for Middle and Eastern North America and weighted them based on the categories as explained below: We used Frankel et al. (1996) single corner model along with the new model developed by Toro et al. (2005) which is a single corner, extended resource model, and Atkinson and Boore (2006), a dynamic corner frequency resource model which accounts for magnitude saturation and variable stress drop and Silva et al. (2002), a constant stress drop with magnitude saturation model. The weights are assigned to solitary place restricted error representation (accounts for magnitude saturation; wt 0.25), on its own place position resource, dynamic corner occurrence sculpt (accounts for size infiltration and changeable anxiety drop, i.e., 140 and 200 bar; wt 0.125 each) and the remaining weight for a constant stress drop model by Silva et al. (2002). We have converted hard-rock attenuation relations to approximate ground movements for a site with shear velocity on the NEHRP B/C boundary using kappa (typically assumes value of 0.01). It is a single key parameter that defines the high frequency near-surface site attenuation of the ground movement. Information specific to the ground movement predictions equation used in this

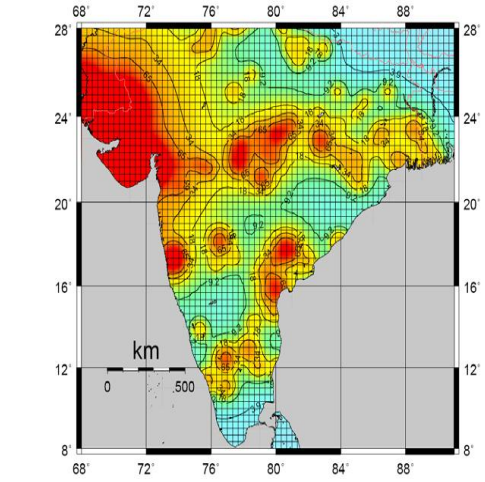
investigation, its distance metric and uncertainties in ground movements are discussed in detail by Petersen et al. (2008).

V PERIL ESTIMATION

For the application of gridded pre-seismicity approach, the entire region is divided into smaller grid cells of size 0.1° ×0.1° i.e. approx. 11 km × 11 km area. A minimum magnitude M_W = 4.5 has been chosen for the peril estimation based on the observation that earthquakes of that magnitude can be damaging to the existing vulnerable building stock (Sinha et al. 2001). In case of gridded pre-seismicity approach, we estimate number of earthquakes greater than minimum cut-off magnitude in each grid cell and then estimate the incremental rate for each grid cell. Spatial smoothening of 50 km incorporates errors associated with epicentre locations of pre-instrumental earthquake events, catalogue incompleteness in low magnitude ranges and variability in grid patterns. The mean rate of peril at the centre of each grid is evaluated using all the *a*-values associated with all grid cells that are within the smoothening distance range (Frankel, 1995). The estimated ground movements are typically quantified in terms of a median value (a function of magnitude, distance, site condition, and other factors) and a probability density function of peak horizontal ground accelerations or spectral accelerations (McGuire, 2004). Ground movement maps have been produced by considering the ground movement distribution from each of the potential earthquakes that can affect the site and that have 2% probability of exceed in 50 years. The pre-seismic peril maps contain been ready by means of a orientation site situation that is particular to be the margin among NEHRP classes B and C, with a shear-wave speed in the higher 30 m of the outer layer of 760 m/s.

VI DEVELOPMENT OF PRE-SEISMIC PERIL MAP

The authors have earlier presented peril map in terms of 10% probability of exceed of peak ground accelerations in 50 years for peninsular India (Jaiswal and Sinha 2007). The pre-seismicity model consisted of uniform; geo-based, reservoir induced and background pre-seismicity with equal weights. We observed that the background pre-seismicity model with 25% weight considerably reduced the ground movement associated with Rann of Kutch and Narmada lineament zone. In this investigation we derive the pre-seismicity rates for each zone independently (Figure 2) from the catalogue data and then model the Gaussian smoothed pre-seismicity for each zone in such a way that the overall modelled pre-seismicity of the zone directly reflects the historical pre-seismicity rates. By using advanced Gaussian smoothening space of 51 km to extend the recorded pre-seismicity at larger space to account for errors in the epicentre place, uncertainties in the resource characterization (for example, lack of data on active vs. inactive faults within each zone). The resource of the Bhuj earthquake of 2001 was not associated with any previous large historical earthquakes and similarly the occurrence of Killari earthquake of 1993 in a region that had not experienced notable pre-seismicity in the past.



PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	<.17	.17-1.4	1.4-3.9	3.9-9.2	9.2-18	18-34	34-65	65-124	>124
PEAK VEL.(cm/s)	<0.1	0.1-1.1	1.1-3.4	3.4-8.1	8.1-16	16-31	31-60	60-116	>116
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

Fig. 2 Probabilistic pre-seismic peril map showing peak ground acceleration peril in dissimilar zones of middle and south India for 2 % probability of exceed in 50 years using Shake Map style colour palette (Wald et al., 1999).

In Figure2 provides pre-seismic peril map for 2% probability of exceed in 50 years, i.e., corresponding to estimation of ground movement at a site in terms peak ground acceleration that have an average recurrence of 2500 years or also termed as maximum considered earthquake (MCE) ground movement. Most of the building code uses this peril value to define the pre-seismic peril and then reduce it by correction factors to estimate design basis earthquake (DBE) ground movement (i.e., ground movement corresponding to 10% of probability of exceed in 50 years or return period of ~475 years).

The map shown in figure 4 indicates peak ground acceleration estimates shown using Shake map colour palette scheme that provides an interpretation from peak ground movement parameters to shaking intensity. In case of Rann of Kutch, we estimate ground movement to be much higher than peninsular India.

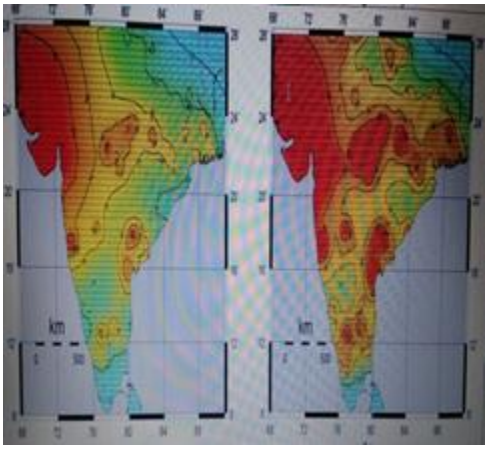


Fig. 3 Probabilistic pre-seismic peril map showing pseudo spectral acceleration at a) 3 Hz and b) 5Hz in dissimilar zones of middle and south India for 2% probability of exceed in 50 years.

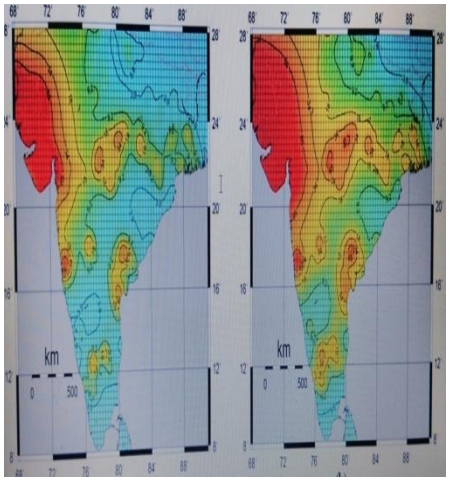


Fig. 4 Probabilities pre-seismic peril map showing a) peak ground acceleration and b) pseudo spectral acceleration at 5 Hz in dissimilar of middle south India for 10% probability of exceed in 50 years.

The higher pre-seismic peril estimates appear to be consistent with the three devastating earthquakes (M $\geq$ 7.5, shaking intensity IX and above) in this region during relatively shorter catalogue duration (e.g., 1668 earthquake that destroyed the town of Samaji, 1819 earthquake of M_W 7.7 that killed 1500 people in Bhuj and 500 in Ahmadabad; Bhuj earthquake of 2001 that killed over 13000 people). We also develop peril map in terms of pseudo spectral acceleration at 3 and 5 Hz frequencies (figure 5a and 5b, respectively), which is generally very useful to structural engineers for earthquake resistant design. The MCE stage land movement linked with Koyna area appears to be in the range of 0.66 g in conditions of PGA, that corresponds to instrumental shaking intensity VIII and above, whereas the spectral acceleration at 3 Hz ranges from 0.35 to 0.65 g. Pre-seismic peril map developed in terms of peak ground acceleration for 10% probability at 50 years (see Figure 6a) in general, indicates higher peril for Rann of Kutch which corresponds to shaking intensity IX and above. Likewise the peril linked with Narmada lineament region and eastern inert periphery ranges from 0.18 g to 0.3 g equivalent to instrumental trembling intensity VII as shown in figure 6(a). This matches the trembling intensity related with present 1997 Jabalpur volcanic activity in NL zone of Madhya Pradesh and 1969 Bhadrachalam volcanic activity in eastern Andhra Pradesh correspondingly. The plan basis land movement increases by 1 intensity entity for the 5 Hz phantom acceleration map as shown figure 6(b) in these zones.

VII CONCLUSION

The paper presents probabilistic pre-seismic peril map of middle and south India in terms of peak ground accelerations and spectral accelerations at dissimilar frequencies. Some of the important features of this study are use of more than a few newly developed ground movement prediction equations for peril assessment, re-assignments of maximum magnitude potentials to the zones, re-alignment of zone boundaries, estimation of zone specific pre-seismicity parameters and development of a peril map in terms of spectral acceleration parameters at dissimilar frequencies which would be useful for engineering applications. It is important to note some of assumptions and idealization that are inherent with this assessment, such as a) estimated historical rate of pre-seismicity will represent future pre-seismicity, b) geo-based maximum magnitude potential is applicable, c) similarity of ground movement characteristics between CEUS and peninsular India, and finally d) earthquake occurrence in peninsular India is Poisson process. Although, the investigation utilizes the 400+ years of earthquake data along with similarity hypothesis of seism tectonic characteristics elsewhere to deduce the recurrence characteristics of future earthquakes and zone-specific maximum magnitude potential, rigorous geological and pale pre-seismic studies are necessary in this area before such data could be used to constrain these parameters for future updates of the map. The newly developed pre-seismic peril map shows higher design pre-seismic forces than currently used in earthquake zoning map of India of IS code. The authors feel that it is possible to

carry out further improvements in the zoning map presented in the paper based on emerging multi-disciplinary research before a definitive zoning map can be developed.

REFERENCES

[1] Atkinson, G.M. and Boore, D.M. (2006). Earthquake ground movement prediction equations for Eastern North America. Bulletin of the Seismological Society of America 96:6, 2181-2205.

[2] Bapat, A., Kulkarni, R. C. and Guha, S. K. (1983).Catalogue of Earthquakes in India and Neighbourhood from Historical Period up to 1979, Indian *Society* of Earthquake Technology, Roorkee, India.

[3] Bhatia, S. C., Ravikumar, M. and Gupta, H. K. (1999).a probabilistic pre-seismic peril map of India and adjoining area. *Annali Di Geofisica* **42-6**, 1153–1164

[4] Cornell, C.A. (1968).Engineering Pre-seismic Risk Analysis. *Bulletin of the Seismological Society of America* **58:5**, 1583-1606.

[5] Cramer, C.H. and Kumar, A. (2003). 2001 Bhuj, India, Earthquake Engineering Seism scope Recordings and Eastern North America Ground-Movement Attenuation Relations. Bulletin of the Seismological Society of America 93:3, 1390-1394.

[6] Frankel, A. D. (1995).Mapping pre-seismic peril in the Middle Eastern United States. *Seismol. Res. Lett.* **66**, 8–21. Gutenberg, B.,and Richter, C. F. (1944).Frequency of earthquakes in California.

[7] Jaiswal, K. S., and Sinha, R. (2007).Probabilistic pre-seismic peril estimation of Peninsular India.

[8] Khattri K. (2006).a need to review the current official pre-seismic zoning map of India. *Current Science* **90:5**,634-636.

[9] Krishna, J. (1992). Pre-seismic zoning maps of India. *Current Science* **62:1&2**, 17-23.

[10] McGuire, R.K. (2004). *Pre-seismic peril and risk analysis:* Earthquake Engineering Research Institute MNO-10, 221 p, National Earthquake Information Center (NEIC) (2007).

[11] Petersen, Mark D., Frankel, Arthur D., Harmsen, Stephen C., Mueller, Charles S., Haller, Kathleen M., Wheeler, Russell L., Wesson, Robert L., Zeng, Yuehua, Boyd, Oliver S., Perkins, David M., Luco, Nicolas, Field, Edward H., Wills, Chris J. and Rukstales, Kenneth S. (2008). Documentation for the 2008 Update of the United States National Pre-seismic Peril Maps: *U.S. Geological Survey Open-File Report* 2008–1128, 61 p.

[12] Rajendran K. and Rajendran C. P. (2003). Seism genesis in the stable continental area and implications for peril assessment: Two recent examples from India. *Current Science* **85:7**, 896-903.

[13] Bhuj Earthquake: Global Lessons for Earthquake Peril in Intra-plate Area. *Journal of the geological Society of India*, **61:3**, 277-282.

[14] Silva, W., Gregor, N., and Darragh, R. (2002). Development of hard rock attenuation relations for middle and eastern North America, internal report from Pacific Engineering, November 1, 2002, http://www.pacificengineering.org/CEUS/Development%20of%20Regional%20Hard_ABC.pdf

[15] Sinha, R., A. Goyal, R. Shaw, H. Arai, J. Saita, K. Pribadi, M. Chaudhari, and K. Jaiswal (2001). The Great Bhuj earthquake of January 26th 2001, consequences and future challenges, a joint report based on reconnaissance studies prepared by IIT Bombay and EdM Japan, http://www.civil.iitb.ac.in/BhujEarthquake/OpenPage.htm.

[16] Toro et al. (2005). Modification of the Toro et al.(1997), attenuation equations for large magnitudes and short distances (http://www.riskeng.com/PDF/atten_toro_extended.pdf).

[17] Wald, D. J., Quitoriano, V., Heaton, T., Kanamori, H. (1999). Relationships between Peak Ground Acceleration, Peak Ground Velocity and Modified Mercalli Intensity in California. *Earthquake Spectra* **15:3**, 557-564.

Power Generation Utilizing Solar Heat and Wind Kinetic Energy

Dr. Shri Ram Nigam
Rabindranath Tagore University, Raisen (M.P.) India

ABSTRACT
This paper presents an integrated approach of electricity generation by combining the kinetic energy of wind and solar thermal energy by using specifically designed wind tunnels and solar thermal energy storage system in a solar chimney power plant. The tunnels are designed to control wind velocity in the vicinity of the solar chimney whereas thermal energy storage system enhances the rate of energy generation. This paper describes the design and working of a prototype. The parameters for the prototype were derived by using simple flow equations. The design incorporates a coaxial turbine installed inside the solar chimney and wind flows through specifically designed static tunnels from all the directions. This Design enables to overcome the drop in power generation capacity of solar energy based power station when cloudy and rainy conditions persist. It was observed that due to tunnels the wind velocity increases and can be controlled, While thermal energy and chimney effect adds to wind velocity. Therefore electricity generation appreciably increases for larger time, besides the ease in maintenance and protection from storm.

Keywords-Solar chimney; solar heat power generation; Renewable energy; Wind energy; up draft tower

I INTRODUCTION

Earth receives energy from Sun as light and heat. This energy is mainly responsible for life on Earth. Most of the solar energy thus received from sun is reflected back to atmosphere and some of its part is absorbed on Earth. Solar thermal energy plays significant role in increasing the kinetic energy of the wind. At present, commercially clean power is generated by using photovoltaic cells or by using wind turbines.

Wind turbines due to large inertia and long blades cannot rotate if wind velocity is below 5 m/s and needs to shut down when wind velocity is in excess of 25 m/s. This restricts the electricity generation by wind turbines only when wind velocity is in the range of 8 m/s to 20 m/s. This further complicates the task of selecting a suitable site for erecting a wind turbine. Very few places are suitable on earth, where these turbines can be installed. Since horizontal wind turbines are to be mounted on a tower of about 40 m height along with generator which makes its maintenance a difficult task.

Earth receives more heat from Sun as compared to light. This fact led to many authors to use heat for generation. The idea of converting heat to electricity is quite old [1]. In 1983 a prototype plant was constructed and tested. It worked for 8 years successfully. Presently, two commercial plants one in China and other in Australia are under construction with a capacity of around 200 MW, using turbines and synchronous generator [2]. These power plants require a very high chimney (around 200m height) and large land area (around 10 hectare per MW) for heat storage (6). These power plants work for 20 hours a day. If special techniques are used for heat storage such as water or black granules or molten salt, .these power plants can work 24x7 supplying base loads in tropical countries and deserts(7). The need of large land area and height of solar chimney has restricted the wide spread use of the solar chimney based power plants [3] [4].

To overcome this limitation with same capacity of generation a new concept of integrating solar heat and wind energy was given by Nigam et al [5]. However the paper does not describe the heat storage techniques on land. They have used less efficient vertical axis turbine, giving low energy recovery.

An integrated approach can be used to generate power, utilizing wind and solar thermal energy simultaneously, with reduced thermal storage area and chimney height. The proposed power plant should use more efficient coaxial turbine .This approach will reduce the size and cost of the solar chimney power station for the same amount of power generated.

II DESCRIPTION OF THE PROPOSED POWER PLANT

The integrated approach described utilizes kinetic energy of wind and solar thermal energy simultaneously to generate clean and green electricity. The power plant based on this integrated approach is termed as Solar Heat and Wind Power Plant (SHWPP). Fig.1 shows a schematic diagram of SHWPP. Its design consists of a hexagonal base with suitably designed wind tunnels in all its six arms. Area of input duct is gradually reduced so that input area of wind tunnel is five times larger than the area of outlet. However it is not necessary to keep ratio of input to output cross sectional area fixed at five and can be altered suitably as per requirement. The wind velocity is therefore increased five times from inlet to outlet of the tunnel due to this reduction. [5].

Bottom of the tunnels are made of aluminium or steel and rest on black granules and sand which are filled below them as shown in fig(1). Top and side walls of the tunnels are made of glass. These glass panels transmit heat received from sun to bottom metallic plates and then to sand and granules for storage.

All these six tunnels arms are arranged in hexagonal form and thus provide 360^0 access for wind to enter the chimney from any direction. These tunnels bend upwards and open inside the hexagonal metallic chimney. The use of low friction surface enables to achieve smooth air flow. The chimney is covered all around its periphery by glass panels up to 80% of its height. The air between chimney and glass panels stores the heat which is coming inside through glass panels.

A coaxial wind turbine is preferably mounted at half the height of the chimney. The other end of the shaft is connected to generator located in a control room to generate power as shown in Fig 1.

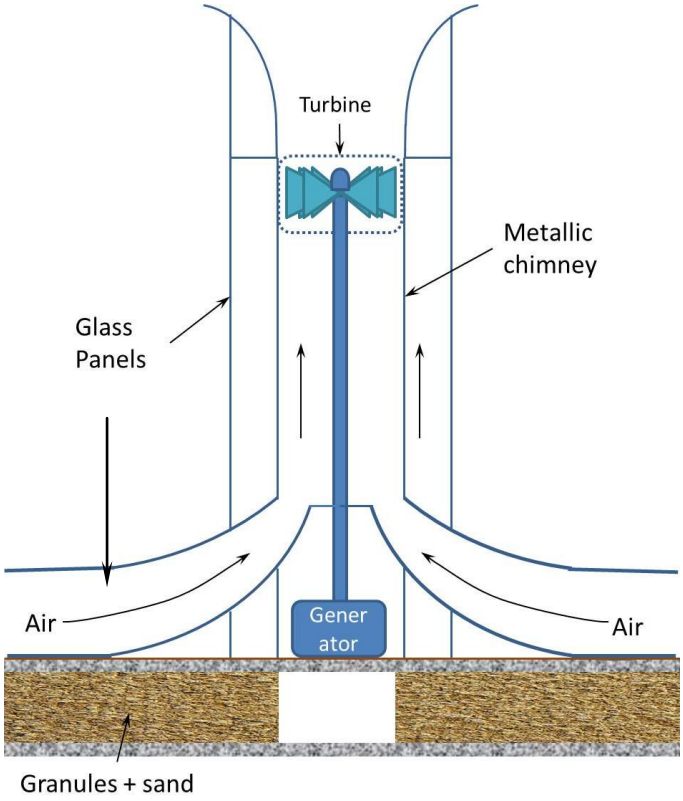


Fig. 1 Schematic Diagram of the Integrated Solar Heat and Wind Power Plant (SHWPP)

III WORKING PRINCIPLE

Six tunnels are spread around the chimney. The top surface of the tunnels carries solar glass panels owing to which solar heat gets transferred to bottom metallic plate of chimney from where it passes (Through conduction) to sand and granules stored below it. The heat is absorbed by air in the tunnels and by sand and granules on the ground, raising their temperature. Glass panels are provided around chimney up to 80% of its height. The air between glass and chimney stores heat, from where it is conducted to the air flowing through it, thus increasing the draft.

Winds blowing in the area from any direction may enter from one or two tunnels. Since tunnels are opening inside the chimney, air will be sucked due to chimney effect .Since, the inlet area A_i is kept 5 times the outlet area A_o. Therefore, the air moving through tunnels will accelerate and final velocity at the outlet of the tunnels will be five times the inlet velocity (see table). The incoming air gets heated while moving through the tunnels (i) due to solar rays falling on it and (ii) via conduction from sand and granules stored at the bottom of the chimney.

The ratio of input to output cross sectional area of the tunnels can be varied to regulate the velocity of the air in the chimney. If required, input cross sectional area may be kept smaller than outlet cross-sectional area to reduce the wind velocity. Thus the velocity of air can be kept within desired limit through chimney for smooth functioning of the turbine. Amount of air

intake can also be controlled during low and high velocity winds.

The air moving through chimney will further accelerate and gain kinetic energy due to the heat absorbed from solar panels outside chimney and chimney effect. Thus the total kinetic energy of air moving through chimney will be due to combined effects of natural wind velocity, thermal energy received from Sun and chimney effect. Velocity of air inside chimney can be controlled by placing deflectors in tunnels.

The coaxial turbine can be mounted near about 50% of the height of the chimney with one shaft towards ground end connected with the generator. Speed of the generator can be changed by controlling air velocity through tunnels thus enabling stable operation.

IV ANALYSIS

(a) Effect of tunnel area reduction:

Let Cross-sectional area at input of tunnel = A_i
Cross-sectional area at output of tunnel = A_o
Ratio of Input to output cross-sectional area AR = A_i/A_o
Incoming air velocity at the tunnel = V_i
Outgoing air velocity from the tunnel = V_o
Neglecting friction losses and local currents, energy continuity and mass flow equations have been used to calculate the velocity and other parameters at the end of the tunnel.
Energy continuity equation

$$\frac{V_i^2}{2gJ} + C_p T_i = C_p T_o + \frac{V_o^2}{2gJ} \quad \text{..... (1)}$$

Mass flow equation

$$A_i V_i d_i = A_o V_o d_o \quad \text{..... (2)}$$

Assuming adiabatic process

$$\frac{T_i}{T_o} = \left(\frac{d_i}{d_o}\right)^{\gamma-1} \quad \text{..... (3)}$$

$$\frac{P_i}{P_o} = \left(\frac{T_i}{T_o}\right)^{\frac{\gamma}{\gamma-1}} \quad \text{..... (4)}$$

P_i, T_i, d_i are the pressure, temperature and density of incoming air at the tunnel and P_o,T_o, d_o are quantities at the outgoing air at the tunnel.
Let the values of the variables at the entry of the tunnel are
P_i = 1.033 kg/m^2, T_i = 300 ^{o}K and d_i = 1.17 kg/m^2
and
γ =1.4, C_p = 0.238, J = 427 and g =9.81 m/s.
Assuming area reduction ratio AR = 5 and input velocity V_i = 5 m/s
Substituting above values in equations 1 to 4

$$d_o = \frac{(A_i V_i d_i)}{(A_o V_0)} = \frac{29.25}{V_o}$$

Hence

$$T_o = 300\left(\frac{29.25}{V_o}\right)^{0.4}$$

Substituting the value of T_o and other constants in the equation 1, the polynomial in V_o comes out to be

$$V_o^{2.4} - 5.982 \times 10^5 V_o^{0.4} + 2.168 \times 10^6 = 0 \quad \text{..... (5)}$$

On resolving equation (5) we get
V_o = 25.06 ~ 25.00
Other parameters calculated from above equations at the outlet of tunnel are as follows:
T_o=300^{o}K, d_o = 1.17 kg/m^2, and P_o =1.033 kg/m^2

This indicates no change in the conditions when ratio of cross-sectional area reduction and velocity is low. However these parameters changes significantly at larger air velocity and high ratio of cross sectional area reduction. The values calculated at various conditions are shown in the table below.

Table- 1
Values of various parameters for different ratio of cross-sectional areas of the tunnel

Area ratio (AR)	3			5			8		
V_i m/s	5	10	20	5	10	20	5	10	20
V_o m/s	15	30	60	25	50	104	40	82	185
d_o	1.17	1.17	1.15	1.17	1.17	1.125	1.17	1.14	1.01
T_o	300	300	300	300	300	295	300	297	283
P_o	1.033	1.033	1.033	1.033	1.033	0.970	1.033	0.997	0.842

As Given in Table-1 the lower wind velocity can be increased by suitably choosing the area reduction ratio. If the natural wind velocity is higher, the area reduction ratio can be small or even reversed to suit the system. Thus stable turbine operation is possible in the power plant. These are approximate calculations neglecting friction and local currents hence may not be valid at higher wind velocities, but it signifies the underlying principle. Since wind velocity can be controlled, so this design is suitable for lower wind velocities. Because of heat storage and wider wind velocity operation the system can generate energy for longer time with stable operation.

(b) Chimney effect:

The velocity of air at the bottom of the chimney is given by

$$V = [2gHa']^{1/2}$$

Where Ha' is the actual height of the column of the hot gas in meter which would produce the pressure P kg/cm2

If H is the height of the chimney and T2 and T1 are the temperatures at bottom and top of it,

$$Ha' = 0.8H \left[\frac{T2}{T1} - 1\right]$$

Velocity will be somewhat less if friction is also considered.

Therefore velocity of the air at the bottom of the chimney will depend on the physical height of the chimney and ability of the chimney to absorb the heat from outside hot air trapped between solar panels and chimney. Total area of solar panels and ability of chimney to absorb heat are major factors for efficient operation.

V DISCUSSION

Energy of air at the top of the chimney is due to initial energy of air at the entrance of tunnels plus solar thermal energy acquired during transit through tunnels and chimney, fig. 1. As the air passes through tunnels the velocity increases in proportion to input/output area ratio, as shown in table-1. Thus the air velocity at the top of chimney is added effect of initial wind velocity, solar heat, tunnel area ratio and chimney effect, as shown in table-1. Air velocity increases with increase in tunnel area ratio. Very little effect is observed in density and temperature, only at higher velocity. Drop in these parameters will reduce or even may reverse due to solar heat as it is not taken into consideration during calculation. Therefore velocity will increase without drop in density. A coaxial turbine is installed inside the chimney at a height of 80% giving good energy recovery. This power plant will harness both wind and solar heat simultaneously in one power plant as disered.

The integrated approach of utilizing solar thermal energy (stored on the ground and around chimney), kinetic energy of wind and chimney effect in one single power plant has the potential of producing power 24x7 even during cloudy and rainy season. Its design is simple, easy to operate and maintain. The only moving parts are turbine and generator rotors. The complete power plant may be designed to work in semi or full automatic mode. If made to run commercially it will incur very little running cost. Its other benefits are:

(a) Unlike the solar chimney power plant (using solar chimney and storing heat only at ground, without wind kinetic energy) heat is stored around both the chimney and ground thus reducing the requirement for large land area.
(b) SHWPP generates more energy as it also simultaneously utilizes wind energy as compared to solar chimney power plant of same size.
(c) Stable operating conditions are possible to achieve as quantity of incoming air and its velocity can be monitored and controlled in the proposed design.
(d) 24x7 generation of electricity due to the area under the tunnels and around chimney is effectively used for heat storage. This is unlike other standalone windmills, where generation is totally dependent on the available wind velocity.

VI CONCLUSION

This paper describes the simultaneous usage of solar and winds kinetic energy to produce electricity. The outer surface of the chimney used for heat storage enables the user to reduce the land area requirement. It is possible to control the velocity of wind in the chimney by changing the area reduction ratio of the tunnels. Approximate analysis presented in the paper describes operational feasibility of the proposed SHWPP.

Detailed analysis of the system should be done including friction and heat flow. It will also need to find better position of turbine.

REFERENCES

[1] W. Haaf, K. Frendrick, G. Mayr, J. Schlaich, "Solar Chimneys Part -1, principle and construction of the power plant in Manzanares", International Journal of Solar Energy, vol. 2, Iss 1, pp 3-20, 1983. DOI: 10.1080/01425918308909911

[2] J. P. Pretorious and D. G. Kroger, "Critical evaluation of solar chimney power plant performance", Solar Energy, vol. 80, pp 535-544, 2006.

[3] M. Tingzhen, L. Wei., X. Guoling, X Yanbin, G. Xuhu and P. Yuan, "Numerical simulation of the solar chimney power plant system coupled with turbine", Renewable Energy, vol. 33, Iss 5, pp 897-905, 2008.

[4] Amel Dhahri and Ahmed Omri, "A review of solar chimney power generation technology", International Journal of Engineering and Advanced Technology (IJEAT), vol. 2, Issue 3, ISSN: 2249 – 8958, Feb. 2013.

[5] S. R. Nigam, Seema Saxena and Sameer Nigam, "Integration of solar thermal and wind energy-a new concept in power generation", Proc. International Conference on Advances in Mechanical and Industrial Engineering, University of Roorkee (India), 6-8 Feb,1997.

[6] M. O. Hamdan, "Analysis of a solar chimney power plant in the Arabian Gulf region", Renewable Energy, vol 36 pp 2593-2598, 2011. DOI: 10.1016/j.renene.2010.05.002

[7] N. Pasumarthi and S. A. Sherif, "Experimental and theoretical performance of a solar chimney model-part 1 and 2. Experimental and theoretical results and economic analysis". International Journal of Energy Research vol. 22, pp 277-288, and pp 443-461, 1998.

Economic Development in India with Special Reference to Non-Banking Financial Companies- A Review

Madan Singh Panwar[1], Dr. Kavita Aggarwal[2]
[1] Research Scholar, University School of Management Studies, Rayat Bahra University, Mohali (Punjab) India
[2] Associate Professor, University School of Management Studies, Rayat Bahra University, Mohali (Punjab) India

ABSTRACT
Financial sector of our country needed to be strong to cater the needs of all the sections of the economy so that the overall development of the economy can be made especially in developing country like India. In this paper mainly the significance and recent growth of NBFC's is explained. As the NBFC are the intermediary who plays very important role in the development of any economy like in India. As the financial needs of corporate as well as the unorganized sectors are increasingly day by day and in this respect NBFC provides the best services to all these sectors. NBFC are especially not covered under the banking scenario but these are regulated by central Government and reserve bank of India, so that their functioning can be properly managed and regulated. Their structure is so flexible so the amendments regarding up gradation can be introduced. The paper titled "Economic development in India with special reference to NBFC" presents the recent growth of Indian economy due to flow of credit with latest technology by NBFC and how their growth affect the long term growth of Indian economy.

Keywords: NBFCs, Economic Development, Financial Credit, Financial Intermediary.

I INTRODUCTION

NBFC is playing a very significant role by offering various direct/indirect financial supports to meet the various credit needs of all the sectors of the economy. Their numbers are increasing day by day as every investor in their field want to expand its operations and for it they need credit facility. NBFC provides many credit assistances by introducing flexible credit schemes and policies according to the needs of the entrepreneurs which help the investors in fulfilling their dreams of growth which came into existence and convert into reality. They contribute to the Indian economy's growth by supplementary to banks and other financial institutions.

In present study the development of Indian economy through the role and performance of NBFC is studied. NBFC helps in development of developing country especially like in India by providing facilities for development in the areas of capital formation, employment generation, rural credit, and infrastructure sector.

Over the last 3 years NBFC provides the double the housing loans in India. Market share of NBFC in MSME rose to 18% in 2017 from 8% five year ago. NBFC mainly contributing 60 percent of credit facility to the small, medium and large entrepreneurs which helpful in increasing the output of the nation and GDP.

NBFCs are regulated by the RBI under the RBI Act, 1934. The principle business is receiving of deposits under any scheme of arrangement or in any other manner or lending in any other manner. The regulation of NBFC falls under the preview of RBI. The first regulation framework was introduced by the Shah Committee in 1992 & the by the Khanna Group in 1997.

The RBI (Amendment) Act, 1997 provides for compulsory registration with the Reserve Bank of all NBFCs, irrespective of their holding of public deposits, for commencing and carrying on business, minimum entry point norms, maintenance of a portion of deposits in liquid assets, creation of Reserve Fund and transfer of 20 Percent of profit after tax annually to the fund. RBI Issued directions to companies on acceptance of public deposits, prudential norms like capital adequacy, income recognition, asset classification, provision for bad and doubtful debts, exposure norms and other measures to monitor the financial solvency and reporting by NBFCs.

As per section 45I (a) of the RBI Act, 1934 the NBFC Should be comply the following provisions to act as a NBFC in India:-

(i) It must be registered under section 3 of the Companies Act , 1956
(ii) Net worth of the NBFC should be 200 lacs minimum.

Different Categories of NBFCs are:-

- Loan companies
- Insurance companies
- Investment companies
- Hire purchase finance companies
- Equipment leasing companies
- Housing finance companies
- Residuary NBC

RBI- regulates the NBFC through-

- Mandatory registration

- Minimum owned funds
- Only RBI authorized NBFC can accept deposits
- RBI prescribes the interest rate and Investment policies for the NBFCs
- RBI prescribes the period of deposits
- RBI prescribes the prudential norms regarding the better utilization of the funds.

II REVIEW OF LITERATURE

Brij Mohan, Non-Banking Financial Companies In India: types, needs, challenges and importance in Financial Inclusion, (2014) have observed in his study that the financial institutes and NBFCs are playing a vital role and now more dominated than banks in Indian financial sector. As they are intermediary between the savers and the investors, they meet the credit needs of all the sectors whether it is small, medium or large enterprises. Their profitability has been studied with the help of tables showing increase in loans, advance, assets etc they provide to economy.

H.R. Kaushal, Impact of Non –Banking Financial Companies In India Economy Growth, (2016) explained in their study the role and growth of the NBFC, players in the Indian Financial economy and presented various information for the growth of NBFCs in India. They study that NBFCs are playing as an intermediary by facilitating the flow of credit to end customers.

Shewta Singh, the Role & Regulations of NBFCs in India: The Structure and status profile (2016), said that more flexible rate in credit policy helps the invertors to get different types of the loans. NBFC meets different capital requirement of all types of invertors. There is always some more scope to improve the performance of NBFC in India.

P. Sravan Kumar, Growth & Development of NBFC in India, (2016) studied and stated in his paper that NBFC are emerging as an alternative to mainstream banking. They are emerged as the internal part of the Indian Financial System & contribute development of Indian Economy by development of major sectors of the economy like road transport and infrastructure.

S. K. Das, Performance and Growth of Non-Banking Financial Companies as compared to Banks in India, (2016) has studied and concluded that the scope of NBFC in India much more as compared to the other financial institutions in India in future. In his study he observed that the risk arising from regulatory gaps should be minimized. NBFC provided better services towards the infrastructure sector than banks in present as well as in future. Overall the NBFC contribute capital formation as well as overall economy growth at the higher rate than other financial institutions in India

K. Ranjan Singh, Growth & Development of NBFC in India, (2016) concluded that NBFCs enjoy more flexible structure than banks in organized sector. NBFCs growth cannot be neglected as their role in economy development is very significant. RBI must make more relevant polices for the development of the NBFC as well as for the investors protection.

III OBJECTIVES OF THE STUDY

(a) Role of NBFC towards the growth of Indian Economy.
(b) To determine the present scenario & future prospects of NBFCs
(c) Presence of NBFCs is a boom for the development of the national.

IV RESEARCH METHODOLOGY

Present study is based on secondary data, hence it is descriptive. Data has been collected from the published records/ periodicals /publications. In addition to this the data collected from various statistics based reports issued by economy survey of India, newspapers, magazines, books, websites, and journals etc.

V GROWTH AND DEVELOPMENT OF NBFC

Well developed & efficient financial system is important for economic growth. In India at present NBFCs are more popular as they provides wide range of activities to their clients like risk absorber, quicker decision maker and works according to the needs of their client. NBFCs help in reduction the degree of risk involved and there is also a more efficient utilization of the resources in the economy. They provide benefits of higher returns, lower risk and liquidity. On an average it grows 22 percent every year.

Between 2014 & 2017, the share of NBFCs in total loans is estimated to have increased from 21 % to 44 %. NBFC had the maximum market share of 49% in the total loan financial.

For safety and security purpose in 2017, RBI has issued a notification master direction-Information Technology Framework for the NBFC sector .through these directions on IT Framework for the NBFC sector are expected to enhance safety, security, efficiency in processes leading to benefits to their customers.

At present in India, most developed and best services provided NBFC are:-

- HDFC
- Mahindra and Mahindra Financial Services Limited
- L&T Finance
- Reliance Capital
- Bajaj Finserv

Some others Information about NBFC in India as on November 30, 2017 (as per the RBI Bulletin)

- NBFC-MFI registered with RBI as on November 30, 2017- **84**
- Asset Finance Companies registered with RBI as on November 30, 2017- **399**
- Core Investment Companies registered with RBI as on November 30, 2017- **50**
- Non Deposit Accepting NBFCs as on November 30, 2017- **11284**

NBFC helps in the growth of Indian Economy in the followings ways:-

- Capital formation
- Provides employment
- Provides long term loans to different sectors.
- Development of financial markets
- Helps the invertors to convert their saving into investments.
- Stability to financial sector

Table 1
Numbers of different types of NBFCs in India (as on end March position)

Year	NBFC-D	NBFC-ND-SI	NBFC-ND	Total
2012	273	375	12010	12385
2013	254	418	11553	12225
2014	241	465	11323	12029
2015	220	420	11202	11842
2016	202	209	11271	11682
2017 P	178	218	11126	11522

P: Provisional
Sources: 1. Report of trend and progress of Banking in India
2. Supervisory returns, RBI

Table 1 show that numbers of different types of NBFCs in India. There is tremendous progress in numbers of NBFC recorded. In the last 5 years there number is varies between 220-260 under NBFC-D and 11100-11500 under NBFC-ND, but there is steady growth in both the NBFC-D as well as in NBFC-ND.

Table 2
Credit Growth of NBFCs and banks

(per cent)

Year	NBFCs-ND-SI	Banks	Private Sector Banks	Public Sector Banks
2011-12	30.5	16.08	21.08	16.4
2012-13	23.7	14.0	18.5	12.0
2013-14	8.8	14.2	16.1	13.09
2014-15	15.0	9.3	18.6	7.8
2015-16	12.4	10.9	25.7	1.4
2016-17 P	13.0	5.4	17.1	0.6

P: Provisional
Sources: 1. Report of trend and progress of Banking in India
2. Supervisory returns, RBI

Table 2 shows the credit growth of NBFCs and banks during the last five years from 2011 to 2017. A figure in percentage indicates that there is tremendous growth of credit by NBFCs than banks in financial sector. It indicates that NBFCs are more favorable credit & finance option opted by different sectors of the economy as they provides attractive rates of return on deposits and flexibility and timeliness in meeting the credit needs of specified sectors.

Many initiatives have been taken by Government of India and RBI to fascinate the development of

NBFCs services. In India after 1996 there is a rapid growth of NBFCs as its contribution towards the economic development shows positive response. Central bank of India i.e RBI is continuously monitoring their services and functions towards the each and every area so that they cannot be prove threat to ant part of the economy especially financial stability.

In the recent scenario to cope with the increase of competition, the RBI and Government of India take a step to introduce the IT Governance in the area of financial sector. The main motive is behind this is to provide transparent services to the customers and others.

VI RESULTS AND DISCUSSION

It is clearly found out that NBFCs is playing a vital role in the development of Indian economy. As the services and schemes provides by NBFC and the number of NBFC is increasing day by day, and at the same time the users of the NBFC is also increasing, so it has to be known about why the customers using their services, what are the mains future prospects and challenges for NBFC etc. Measures should be adopted in such a way that the frauds and risk associated with the use latest technology should be minimize if any. The study concludes that the NBFCs are the very convenient mode of provides finances/ credit to the society and the nation which helps in the really development of Indian economy with the faster way. NBFCs are the starters to develop strong financial sector in the India, as the time passes their existence will be shown the great results in the development and growth of the economy.

REFERENCES

[1] V.K. Puri and R.K. Saini, law relating to Non-Banking Financial Companies, Nabhi Publications, New Delhi , 4th Edition, 1996

[2] Verma J.C.” Non –Banking Financial Companies”. Bharath Law House Pvt Ltd, New Delhi, First Edition, 1997.

[3] K. Ranjan Singh” Growth and development of Non –Banking Financial Companies In India”, 2014

[4] H.R. Kaushal.”Impact of Non-Banking Financial Companies In Indian Economy Growth”, 2016

[5] Brij Mohan, Non-Banking Financial Companies In India: types, needs, challenges and importance in Financial Inclusion, 2014

[6] P. Sravan Kumar, Growth & Development of NBFC in India, 2016

[7] Santanu Kumar Das, Performance and Growth of Non-Banking Financial Companies as compared to Banks in India, 2016

[8] www.rbi.org, RBI Bulletin, 2016,2017

[9] http://en.wikipedia.org/NBFCs

Role of Micro Finance in Promoting Women Empowerment through Self Help Groups: An Empirical Study of Selected Districts of Odisha

S. K. Chaudhury[1], Dr. D. P. Misra[2]
[1] Faculty Member, Dept. of Business Administration, Berhampur University, Berhampur (Odisha) India
[2] Professor, Dept. of Business Management, F.M. University, Balasore (Odisha) India

ABSTARCT
The object of the present study is to examine the role of micro finance in enhancing women empowerment through SHGs. This study covered the areas of five selected districts of Odisha. A structured questionnaire was administered to obtain information on selected variables on the socio-economic and cultural variables that affect the members after joining the SHGs. Finally, the information from 612 member respondents representing cross section of population was collected from the SHGs of the area under the study. The data so collected has been analyzed by the application of appropriate statistical tools. The result reveals that the provision of micro finance through SHGs has a significant effect on the members of the SHGs. On the basis of the findings, few important suggestions were offered for the benefit of the Self Help Groups.

Key words: Micro Finance, Respondents, Self Help Groups, Women empowerment.

I INTRODUCTION

Development of a nation is very much dependent on the development of its rural masses. Micro finance is playing a significant role in alleviating poverty in rural areas and there by accelerating rural development. Since women are the sole family caretaker, emphasis should be given to the rural women and also to empowering them. Provision of micro finance to the rural SHGs is a way to raise income level and improve the living standard of its members. Various studies suggest that the Self Help Groups have paved the way for economic independence of rural women. Thus, the Self Help Groups can contribute substantially in pushing the living conditions of the female population up and assist in poverty eradication as well. The level of poverty is high in India as compared to its counterparts in developing economies and therefore, the Self Help Groups movement can be a potential tool for poverty eradication in rural areas and empowerment of women among the poor. Micro finance programs are important institutional devices for providing small credit to the rural people in order to alleviate poverty. Further, the SHG-bank linkage is the effective one to minimize the problems of inadequate access of banking services to the poor. Many studies also highlighted that SHGs have inculcated saving habits to its members. These studies also reveal that increased availability of micro credit to the poor through SHG-bank linkage program has helped in rural development and its people. Against this backdrop, an attempt has been made in this paper to analyze the impact of micro finance on the SHGs members and find out to what extent they have been benefited with regard to poverty alleviation and empowerment of women.

II STATEMENT OF THE PROBLEM

Micro finance has proved to be a potential tool for alleviating poverty in many parts of the world. India has the largest population of poor people in the world, and over the past decade, micro finance has begun to attract increasing attention from many mainstream players in India contributing to the growth of this industry. In the present research, an attempt has been made to examine the role of micro finance towards SHGs for socio economic development of its members. In this context, a number of questions related to the impact of micro finance on the beneficiaries, have been raised that need to be addressed empirically. The pertinent questions in this regard are as follows.

(i) What is the impact of micro finance on standard of living of the poor people joined in SHGs?
(ii) What is the impact of micro finance on social and cultural development of the poor people participated in SHGs?
(iii) Do SHGs empower the members particularly the women in such programs?

On the basis of the above questions, the objectives for the study have been set and accordingly, data have been collected and analyzed.

III REVIEW OF LITERATURE

The review of literature is an important step in any research work. Review of earlier studies discloses the works done by individual researchers and institutions and facilitates to start with the unexplored areas of the concerned research work. Various studies related to functioning of Micro Finance Institutions and Self

Help Groups, particularly in rural areas have been conducted by different social scientists at micro and macro level in India and abroad. While there has been much literature available in the area of micro finance and SHGs, it is found that the application of SHG-bank linkage is of recent development. The research work conducted by the eminent scholars in this area include Raghavendra (2001), Manimekalai and Rajeswari (2001), Kumaran (2002), Shylenra (2004), Moll (2005), Hietalahti and Linden (2006), Karlan and Jonathan (2009), Karmakar (2009), Goyal and Goel (2012), Eswar and Raghvendra (2014) and others. These studies mainly focused on the role of micro finance and its impact on the functioning of SHGs. Similarly, the well-known scholars namely Goetz and Sengupta (1996), Dahiya, et al. (2001), Kabeer (2001), Singh and Usha Kumari (2007), Ramchandran and Balakrishan (2008), Hoque and Itohara (2009), Jain and Jain (2012), Alikhan and Noreen (2012), Devi (2014) and others carried out the studies relating to women empowerment through SHGs. Most of the studies revealed that micro finance is a potential tool for poverty alleviation in rural areas and SHGs-bank linkage not only empower the women but also help in the rural development. Keeping in view the above stated issues, the present research paper made an attempt to study the impact of micro finance on the members of SHGs of selected districts of Odisha with regard to their socio-economic and cultural aspects.

IV OBJECTIVES OF THE STUDY

The main objective of the present research work is to examine the impact of micro finance on the economic and social development of poor people in the rural areas and the role played by micro finance in helping to SHGs in this regard. Apart from this, the other important objectives are:

(i) To examine the role of SHGs in improving the socio-economic and cultural conditions of the fellow members.
(ii) To examine the role of SHGs in empowering the women members.
(iii) To provide some concrete suggestions for the overall improvement of the functioning of SHGs.

(a) Scope of the Study- The present study is both descriptive and evaluative in nature and examines the impact of micro finance on the eradication of poverty in rural areas, particularly the members of the SHGs of said locality. The study also measures the impact of micro credit in alleviating the poverty of the SHG members under the study area covering five districts namely Nayagarh, Khordha, Puri, Ganjam and Kandhamal of Odisha. The scope of the study is thus limited to the SHGs who are operating in these districts.

(b) Hypotheses for the Study-Keeping in view the objectives set for the study, the following null hypotheses are framed to be tested during the due course of analysis.

(i) **H_o:** There is no significant increase in income after becoming the members of the SHGs.
(ii) **H_o:** There is no significant change in social and cultural conditions of SHG Members.
(iii) **H_o:** There is no significant improvement in empowerment of women after becoming the members of SHGs.

V RESEARCH DESIGN

The research design adopted for the present research work is outlined below.

The present study has used a structured questionnaire for the purpose of collecting primary data from the SHG member respondents. The secondary data were collected from books, journals, periodicals etc. For collection of primary data, purposive random sampling method was followed. Further, the data were collected during 2016-2017 in six months interval from the same respondents to know the improvements with regard to their socio-economic and cultural aspects. The reliability of the data set was tested by using Cronbach's Alpha whose test value was found to be 0.670 and considered reliable. Finally, the researchers have collected information from 612 SHG member respondents of 306 SHGs. The collected data was analyzed and interpreted by using the statistical tools such as percentage, scaling technique (measurement of attributes), Pearson's chi-square test etc.

VI DESCRIPTIVE ANALYSIS

Descriptive analysis can highlight the demographic profile of the respondents who have participated in the survey work. By analyzing this information by age, sex, or educational qualification etc., Micro Finance Institutions/SHGs can develop various schemes and programs to cater the needs of the target group. Based on the number of active SHGs in the five selected districts i.e. Nayagarh, Khordha, Puri, Ganjam, and Kandhamala districts of Odisha, a total of 1060 questionnaires were distributed among the SHG members. A total of 967 filled in questionnaires were received. Out of which 612 questionnaires were found to be valid and complete from all aspects. The

researcher has collected the information on each individual regarding the key variables such as gender, age, educational qualification, family size etc. The information on above selected demographic variables is presented for analysis in the following section.

Table-1
Gender-wise classification of the respondents

Gender	Frequency	Percentage
Male	78	12.75
Female	534	87.25
Total	612	100.00

Source: Questionnaire

(i) Gender

The gender profile of the respondents is presented in the table-1. Out of the 612 respondents participated in the survey, 78 respondents were male and 534 respondents were female. The percentage of female respondents was 87.25% and the remaining 12.75% were male respondents. This shows the participation of women in SHGs is more than that of their counterpart.

(ii) Age

Table-2
Age-wise classification of the respondents

Age	Frequency	Percentage
Below 25 years	24	3.9
25 to 40 years	488	79.7
41 to 55 years	84	13.7
Above 55 years	16	2.6
Total	612	100.0

Source: Questionnaire

The age group of the members of the SHGs plays an important role in doing various economic activities. The above table-2 shows that 488 members i.e. 79.7% belong to the age group of 25-40 years followed by 84 members belonging to the age group of 41-55 years. A negligible percentage was marked in the age group of below 25 and above 55 years. It can be concluded that young persons are motivated to join the SHGs.

Table-3
Education-wise classification of the respondents

Educational qualification	Number	Percentage
Illiterate	66	10.78
Primary education	87	14.22
High school	161	26.31
Intermediate & above	298	48.69
Total	612	100

(i) Educational qualification

It is clearly shown in the table-3 that out of the 612 respondents 66 respondents are illiterate i.e.10.78% and they constitute the lowest percentage of sample population. The respondents who have completed their primary education are 87 and it constitutes 14.22% of the total respondents. The above table also reveals that the highest percentages of the respondents are from intermediate & above qualification which constitute 48.69%. On the other hand, 161 respondents have high school level of education and its percentage is 26.3. It can be concluded that members having intermediate and above qualification are more interested in joining SHGs to do some kind of economic activities.

(ii) Social caste

Table-4
Social caste-wise classification of the respondents

Social caste	Number	Percentage
ST	135	22.06
SC	124	20.26
OBC	147	24.02
GEN	206	33.66
Total	612	100

It is noticed from the table-4 that out of the 612 respondents, 206 respondents are from general caste that accounts for 33.66% of the total respondents. The number of respondents belonging to Schedule Tribe is 135 and accounts for 22.06% of the total respondents. Similarly, the number of respondents belonging to Schedule Caste is 124 and that constitutes 20.26% of the total respondents. When it comes to OBC, its number is 147 i.e. 24.02%. From the analysis, it can be inferred that the representation of different castes in the total sample is more or less evenly distributed with minor variation.

Table-5
Family member-wise classification of the respondents

Family member	Frequency	Percent
1-2 members	24	3.9
3-5 members	370	60.5
6-8 members	64	10.5
More than 8 members	154	25.1
Total	612	100

Source: Questionnaire Survey.

(iii) Family members

The family member-wise distribution of SHG members is shown in table-5. It is revealed from the table that 60.5% of the respondents are having 3-5 members in their family which is distantly followed by 25.1% of the respondents having more than 8 members in their family. On the other hand, only 3.9% respondents have the family size of 1-2 members. Hence, it can be concluded that members with large family size is marked in the Self Help Groups, the reason may be attributed to generate extra income to feed the family members.

VII INFERENTIAL ANALYSIS

The following section deals with the detail analysis of the critical variables which affect the SHG members in their sphere of activities.

Table-6
Reason(s) for joining SHGs

Educational qualification	Reason(s) for joining SHGs			
	To generate extra income for the family	To develop social status	For availing low rate of interest from MFIs	For survival and poverty eradication
Illiterate	62	48	52	74
Primary education	21	45	35	56
High school	68	53	67	63
Intermediate & above	75	65	134	94
Total	226	211	288	287

(i) Reasons for joining SHG

The Table-6 presents the information on the reason(s) for which the respondents have joined as member of SHGs. Here, educational qualification is taken as base and on that basis the respondents were asked for reason(s) for Joining SHGs. It can be seen from the table-6 that a total of 74 illiterate respondents have cited survival and poverty eradication as the main reason for joining the SHG. Similarly, 56 respondents having primary education have given the same reason for joining the SHGs. On the other hand, 68 respondents having high school education said that they joined SHGs to generate extra income for the family. Likewise, 134 respondents having intermediate and above qualification joined SHGs to avail low rate of interest from MFIs for doing the business. On the whole, maximum respondents cited two important reasons namely, availing low rate of interest from MFIs and survival and poverty eradication for joining the SHGs.

(ii) Impact on income of members after joining SHGs

The respondents have joined the SHGs in order to generate more income and lead a better life. To know the position, data have been collected on income of the members in respect to before joining and after joining the SHGs. The frequency table is prepared and presented below.

Table-7
Impact on income of members after joining SHGs

Income			
Category	Observed frequency		Total frequency
	Yes	No	
After membership	287	180	467
Before membership	47	98	145
Total	334	278	612
Category	Expected frequency		Total frequency
	Yes	No	
After membership	254.87	212.13	467
Before membership	79.13	65.87	145
Total	334	278	612

Table-8
Chi-square test

Test	Calculated value	Df	Tabulated value	Decision
Chi-Square (χ^2)	37.65	1	3.84	Rejected

- H_o: There is no significant increase in income after becoming the members of the SHGs.

In order to test the above hypothesis, the chi-square test has been applied. The test result is presented in the table-8. It is observed from the table that the chi-square test value is 37.65 and it is higher than the tabulated value at 5% level of significance. Since the calculated value is higher than the tabulated value, the above hypothesis stands rejected. Therefore, it is concluded that there is a significant change in income of the members after joining the SHGs.

(iii) Impact on social and cultural conditions of SHG Members

In order to measure the effect on social and cultural conditions of the members of SHGs, the information on important variables were collected from them on pre and post membership period and they are tabulated and presented in table-9 for analysis.

Table-9
Impact on social and cultural conditions of SHGs Members

Observed frequency			
	Yes	No	Total
After membership	169	134	303
Before membership	192	119	311
Total	361	253	614
Expected frequency			
	Yes	No	
After membership	178.15	124.85	303
Before membership	182.85	128.15	311
Total	361	253	614

Table-10
Chi-square test

Test	Calculated value	Df	Tabulated value	Decision
Chi-Square (χ^2)	2.25	1	3.84	Accepted

- H_o: There is no significant change in social and cultural conditions of SHG members

In order to test the above hypothesis, the chi-square test has been applied and the test result is presented in the table-10. It is observed from the table that the chi-square test value is 2.25 and it is lower than the tabulated value at 5% level of significance. Since, the calculated value is lower than the tabulated value, the above hypothesis stands accepted. Hence, it is concluded that there is no significant change in the social and cultural conditions of members after joining SHGs.

(iv) Impact of Empowerment on women members of SHGs

In order to measure the impact of empowerment on the women members of SHGs, the information relating such variables were collected from them on pre and post membership period and they are tabulated and presented in table-11 for analysis.

Table-11
Impact of empowerment on women members of SHGs

Observed Frequency			
	Yes	No	Total
After membership	176	81	257
Before membership	80	107	187
Total	256	188	444
Expected Frequency			
	Yes	No	
After membership	148.18	108.82	257
Before membership	107.82	79.18	187
Total	256	188	444

Table-12
Chi-square Test

Test	Calculated Value	Df	Tabulated Value	Decision
Chi-Square (χ^2)	29.29	1	3.84	Rejected

- H_o: There is no significant impact of empowerment on women after becoming the members of SHGs.

In order to test the above hypothesis, the chi-square test has been applied. The test result is presented in the table12. It is observed from the table that the chi-square test value is 29.29 and it is higher than the tabulated value at 5% level of significance. Since, the calculated value is higher than the tabulated value, the above hypothesis stands rejected. Therefore, it is concluded that there is significant impact of empowerment on women after becoming the members of SHGs.

Table-13
Satisfaction level of member respondents of SHGs

Response	No. of respondents	Percentage
Highly satisfied	73	11.93
Satisfied	432	70.59
Neutral	37	6.04
Dissatisfied	52	8.50
Highly dissatisfied	18	2.94
Total	612	100

Source: Data compiled from survey.

(v) Level of satisfaction of SHG members

The table-13 reveals the level of satisfaction of member respondents with regard to performance of SHGs in which they are associated. It is seen from the table that 70.59 percent respondents are satisfied with their respective SHGs performance. It is followed by 11.93 percent highly satisfied members. On the other hand, 11.44 percent member respondents are either dissatisfied or highly dissatisfied on their SHGs performance. Apart from this, 6.04 percent member respondents remain neutral on SHGs performance. On the whole, It can be concluded that a maximum of 82. 52% members are satisfied with the performance of their respective SHGs.

VIII MAJOR FINDINGS OF THE STUDY

The major findings of the study are presented under two sub-headings namely, descriptive and inferential. They are presented below.

IX FINDINGS OF DESCRIPTIVE ANALYSIS

(a) It is observed that 87.25% of the respondents are female and the rest 12.75% belong to the male category.

(b) It is noticed that a majority of the respondents i.e. 79.7% belong to the age group of 25-40 years which is distantly followed by 13.7% respondents with the age group of 41-55 years.

(c) It is found that intermediate and above qualified respondents are 48.69%. It is followed by high school level qualification with 26.31% respondents. On the other hand, 10.78% respondents are illiterates.

(d) It is observed that one third of the respondents belong to the general category (33.66%) which is followed by 24.02% OBC respondents and 22.06% ST respondents.

(e) It is noticed from analysis that 60.5% of the respondents are having 3-5 members in their family while 25.1% of the respondents are having more than 8 members in their family.

X FINDINGS OF INFERENTIAL ANALYSIS

(a) The study reveals that 288 members i.e.47% have joined the SHGs to get cheaper loan from MFIs to do business and reduce poverty.

(b) The study observes that there is a significant change in the monthly income of the members after joining the SHGs.

(c) The study also reveals that there is no significant change in the social and cultural conditions of members after joining SHGs.

(d) It study brings out the fact that there is a significant change on empowerment of women after becoming the members of SHGs.

(e) The study also observes that 82.52% respondents are either satisfied or highly satisfied with their respective SHGs performance.

XI SUGGESTIONS

Finally, some important suggestions are given to SHGs for betterment of their functioning leading to the poverty alleviation and rural development. They are briefly presented below.

The successful implementation of programs for SHGs is not the responsibility of MFIs and the government alone. It also requires the co-operation and involvement of the beneficiaries in such programs. On the basis of the findings of the study, few suggestions are given for the benefit of the members of SHGs.

(a) It is suggested that the beneficiaries should organize themselves into groups because group linkage model can be very effective as it creates an environment of mutual trust among the group members.
(b) It is suggested that group linkage will enable the members to get cheaper finance from MFIs. This will help the members to carry out their economic activities on a cost effective basis.
(c) The beneficiaries should make only productive use of the micro credit instead of indulging in unnecessary expenditures which adversely affect their socio-economic condition.
(d) Guidance and counseling should be given to the members with regard to their choice of business activities which they would like to undertake. Funds provided to them should also be flexible to meet their requirements.
(e) Monitoring and follow-up on the functioning of micro enterprises run by the SHG members is crucial till the business is stabilized. The same is, of course, very important in case of non-farm activities such as basket making, incense stick making, preparation of dry food items etc. For this MFIs/ NGOs can take a lead role.
(f) Women empowerment through economic activities is a prerequisite for economic independence and that will ultimately contribute to the family income. Hence, various schemes available for them should be offered on the basis of their choice and interest.
(g) It is reported that MFIs organize awareness campaigns at village level but people hardly take interest on such campaigns. The beneficiaries should actively participate in such programs to enhance their knowledge regarding the availability and use of micro finance services.

XII LIMITATIONS OF THE STUDY

Descriptive research study, particularly using the survey method of collecting data is subject to certain limitations. So this piece of work is not an exception. The present research work has been carried out on the basis of the data collected from 612 SHG members from five districts. The limited number of samples, of course, will not give 100 percent accurate result. Further, the views expressed by the respondents may be biased one. Hence, the conclusion drawn on such information is one of the limitations of the study. The selection of five districts where the present study has been concentrated is another limitation from the area coverage (scope) point of view. The statistical tools and techniques used in the study too have their own limitations. In spite of all these limitations, an honest and sincere attempt has been made to make the study a systematic and reliable one.

REFERENCES

[1] Alikhan, E.R. and Noreen, S. (2012), "Micro Finance and Women Empowerment: A Case Study of District Bahawalpur (Pakistan)", African Journal of Business Management, Vol.6, Issue.12, pp. 4514-4521

[2] Dahiya, P. S., Pandey, N.K. and Karol, A. (2001), "Socio- economic Evaluation of Self Help Groups in Solan District of Himachal Pradesh: Impact, Issues and Policy Implications", Indian Journal of Agricultural Economics, Vol. 56, Issue.3, pp. 486-87.

[3] Devi, S. K. (2014), "Micro Finance and Women Empowerment", Global Journal of Multidisciplinary Studies, Vol.3, issue.5, pp.56-63.

[4] Ernest, O. U. (2014), "A Survey of the Perception of the Services of Micro Finance Institutions by the Female Service Users in Benin City, South-South, Nigeria", International Journal of Finance & Banking Studies, Vol.3, issue.2, pp.28-47.

[5] Eswar Kumar & Raghvendra (2014), "Role of Shri Kshetra Dharmasthala Rural Development Project (SKDRDP) in Micro Finance through SHGs: A Study in Shimoga District of Karnataka", IOSR Journal of Economics and Finance, Volume 3, Issue 2., pp 53-59.

[6] Goetz, A. and Sen Gupta, R. (1996), "Who Takes the Credit? Gender, Power and Control Over Loan Use in Rural Credit Programs in Bangladesh", World Development, Vol.24, Issue.1, pp. 45-63.

[7] Goyal, V.P. and Goel, M.M. (2012), "Micro Finance: A Review of Impact Studies" Arthshodh, Journal of Department of Economics, University of Rajasthan, Jaipur, India, Vol. IV, Issue.2, pp. 85-109.

[8] Hietalahti, J. & Linden, M. (2006), "Socio-economic Impacts of Micro Finance and Repayment Performance: A Case Study of the Small Enterprise Foundation", South Africa. Progress in Development Studies, Vol.6, Issue.3, pp. 201–210.

[9] Hoque, M. and Itohara, Y. (2009), "Women Empowerment through Participation in Micro Credit Programs: A case study from Bangladesh", Journal of Social Sciences, Vol.No.5, Issue 3, pp.244-250.

[10] Jain, D. and Jain, B. (2012), "Does Micro Finance Empower the Rural Women? An Empirical Study of Udaipur District in Rajasthan", Journal of Arts, Science and Commerce, Vol.3, Issue 2(1), pp. 76-81.

[11] Kabeer, N. (2001), "Re-Evaluating Conflicts over Credit the Empowerment Potential of Loans to Women in Rural Bangladesh", World Development, Vol.29, issue.1, pp.63-84.

[12] Karlan D. and Jonathan, Z. (2009), "Expanding Micro Enterprise Credit Access: Using Randomized Supply Decisions to Estimate the Impacts in Manila", Journal of Political Economy, Vol.106, Issue.5, pp. 45-67.

[13] Karmakar, K.G. (2009), "Emerging Trends in Micro Finance", Economic and Political Weekly", March 28, Vol. XXIV, Issue.13, pp.21-24.

[14] Kumaran, K.P. (2002), "Role of Self Help Groups in Promoting Micro Enterprises through Micro Credit", Journal of Rural Development, Vol.21, Issue.2, pp. 34-42.

[15] Manimekalai, M. and Rajeswari, G. (2001), "Nature and Performance of Informal Self Help Groups: A Case from Tamil Nadu", Indian Journal of Agricultural Economics, Vol. 56, Issue. 3, pp. 453-54.

[16] Moll, H.A.J. (2005), "Micro Finance and Rural Development: A Long Term Perspective", Journal of Micro Finance, Vol. 7, Issue.2, pp. 13-31.

[17] Raghavendra, T.S. (2001), "Performance Evaluation of Self Help Groups: A Case Study of Three Groups in Shimoga District", Indian Journal of Agricultural Economics, Vol. 56, Issue. 3, pp. 466-67.

[18] Ramachandran, T. and Balakrishnan, S (2008), "Impact of Self Help Groups on Women‟s Empowerment: A Study in Kanya Kumari District" , Kurukshetra, Vol.57, Issue.2, pp. 31-34.

[19] Shylendra H.S. (2004), "The SHG – Bank Linkage Programme: An Assessment and Future Strategies", Journal of Rural Development, Vol.23, Issue.4, pp.411-429.

[20] Singh, I. and Usha Kumari (2007), "Rural Development and Women Empowerment", Kurukshetra, Vol. 55, issue.5, pp. 3-8.

Toxicity of Lead (PB) and Mercury (HG) in Vermilion (Sindoor) in India and Comparison of old and New Process of Formation of Vermilion

Deepak Parmar[1], Dr. Sheetal Gulati[2], Dr. Archana Kushwaha[3]
[1,2] Dept of Chemistry, Rabindranath Tagore University, Bhopal (M.P.) India
[3] Professor& Head of Chemistry Dept, Govt. College Nagda Jn.,Vikram University, Ujjain (M.P.) India

ABSTRACT
India is a very great country because there are so many religions and so many festivals of them. All the religions have same respects in here. One of the beautiful and very old religions is 'Hindudharma' in here. It is a biggest religion in here. Maximum populations follow this religion in India. 'Sindoor' is animportant part of this religion. Actually Sindoor is a red colour which is used in festival, worship of god, and married woman uses as a sing of marriage. This colour is used in here because red colour is a symbol of energy and log life in this religion .Modern sindoor mainly uses vermilion, which is an orange-red pigment. Vermilion is the purified and powdered form of cinnabar, which is the chief form in which mercury sulfide naturally occurs. As with other compounds of mercury, sindoor is toxic and must be handled carefully. Sometimes, red lead (lead tetroxide, also known as minimum) is added to sindoor. Red lead is toxic and a known carcinogen for laboratory animals, though its carcinogenicity to humans has not been established. Traditional sindoor was made with turmeric and alum or lime, or from other herbal ingredients. Unlike red lead and vermilion, these are not poisonous. In early 2008, allegations of high lead content led the U.S. Food and Drug Administration to recall batches of sindoor from several manufacturers.

Key words:-Sindoor (vermilion), Gravimetric analysis;

I INTRODUCTION

As you know that day by day pollution is becoming a biggest problem for us. We should control it. For this we will have to watch our all useful products.One of the most respected pigment is sindoor which is a part of life. And it is chemical name is vermilion.There are so many cases of vermilion inwhich deferenttype of skin diseases. Like leucoderma disease has been a biggest problem for woman who uses sindoor regularly. India have deferent type of people who are in deferent financial condition.Maximum lower level people uses very cheap sindoor. This sindoor has large amount of lead and other toxic chemical. Sometime Rhodamine dye is also used for making more attractive product which can gives very harmful effect. At a time it is become a general trend to avoid using of sindoor at any occasion. And so many Hindu married women don't use sindoor. Because all they know about toxicity of sindoor. Following chemical compounds have been using in sindoor

Pb_3O_4(Red oxide of lead),HgS(Mercury sulfide)

(a) Old method:-For the formation of sindoor in previous time Turmeric and calcium hydroxide used to be use. Both are available in market mixed together. Both theamount should be equal. Alittle water is added just enough to make a paste of it turned a bright ketchup red colour. Then made small ball of this paste. Left to dry out completely crushed the balls and you can use to find a perfect red powder that is much safer than commercial sindoor. Sandal wood, lemon saffron are also used in previous time for making sindoor. It was an oldest method of sindoor and there is no Lead and cinnabarin this process.

(b) New method: -In new method of sindoorcinnabar and red lead are theMain Chemicals used to make Sindoor are: Vermilion–HgS (Mercury (II)Sulfide)and Some Times Red Lead (Pb3O4) is Also to add Rhodamine dye is used for making more attractive product .it is a very toxic for skin but in our India nobody is aware about toxicity of them.There is no Expire date ofsindoor.it is a general trend only medicine expire date is seen.

(i) **Side Effect of Lead Oxide** Lead rank 36th element in order of abundance in the Earth's crust and its concentration in the Earth's crust has been estimated at 12.5 ppmIn the recent year lead toxicity has emerged as an important global problem for public health consequences, particularly in children, due to its serious impact on brain function. There is in fact an urgent need for developing countries to generate data on the nature and extent of the problem so thatappropriate steps can be taken to prevent lead toxicity. In this communication, we highlight certain important facets of lead toxicity Lead levels up to 150 ppm have been reported in soil forming rocks. The usual rang of lead concentration in soils has been estimated at 2 to 200 ppm the problem of lead poisoning is quite serious in India about 53.5% of children below the age of 12 years have their blood lead levels about 10 µg/dl which is the WHO's permissible limit for blood lead level high blood lead level means that such children can lower IQ{4}

The important sources of lead exposure include gasoline additives, food can solder, lead based paints, ceramic glazes, drinking water system, cosmetics and folk remedies, and battery/plastic recycling industry. In India, the main source of lead pollution is through automobile exhaust because of the use of unleaded gasoline. In developed countries like UK, the Royal Commission on environmental pollutants has banned the use of leaded gasoline. In India, first National Emission standards for lead and other pollutants were issued in February 1990 through an Extraordinary Gazette of India. These standards were revised and promulgated in April 1996 and will be applicable till 2000-2001. However, these recommended permissible limits of lead (0.56 g/1) are still very high than the levels (0.013 g/1) in developed countries such as USA, UK and Germany{6}.

Lead toxicity is termed as "plumbism" or "saturism". It is known to cause acute, chronic and sub-clinical toxicity.

(ii) **Side Effect of Cinnabar**: -Cinnabar, mercury sulfide, is the most toxic mineral to handle on Earth. The name itself means dragons blood. Cinnabar is the main ore of mercury. Forming near volcanos and sulfur deposits, the bright red crystals signal danger. Cinnabar may release pure mercury if disturbed or heated, causing tremors, loss of sensation and death

Cinnabar (mercurysulfide) the chief mineral of mercury .which is used in sindoor Mercury in excess of 25 mg may be caused various diseases the symptoms due to mercury poisoning are tingling of fingers and lips. Restlessness, intolerance irritability, nervousness, constipation, loss of memory, weakness tremors, loss of teeth, and brain damage etc. mercury dose of about 200mg may even cause death. Mercury is the most toxic metal among all the commonly occurring metal pollutants. The world's first major of metal pollution well known as MINAMATA EPISODE**,** also involved Mercury is widely distributed in the environment, although in concentrations lower than other common heavy metals. The earth's crust contains 0.08 ppm of mercury, which is several times lower than the concentrations of vanadium, chromium, nickel, zinc copper, cobalt, lead and cadmium in sandstone and soil, hales and limestone mercury occurs at leaves averaging 0.03ppm 0.5ppm and 0.056 ppm respectively,

Mercury is widely used in industries which produce electrical equipment, paints, pesticides pulp and paper domestic thermometers, medicines, batteries, dental amalgams, cosmetic product, sindoor etc. these are contributed significant amount of mercury to the environment.

(iii) **Experiment: -S**ome samples of sindoor were collected from market. One was very cheap second was normal and third was costly and forth one was preparedby me by old method in lab. I found that lead contain of that sampleswere different Gravimetric analysis was used for finding lead contain of that samples.2gm of sindoor sample dissolve in 20 ml DM water added Con. H_2SO_4 till thatwhite precipitation is formed 1 to 2 ml of HCl is added warmed it and then cooled it and filtered with the help of glass crucible washed with DM water afterthat dryitand then weightit repeatfour times its weight after dry till than a constant weight. After that calculated weight of lead contain.

II CALCULATION

	Homemade sindoor	Purchased sindoor {very cheap }	Purchased sindoor {normal rate }	Purchased sindoor {costly }
Volume of sindoor solution	50.0ml	50.0ml	50.0ml	50.0ml
Mass of glass crucible	24.0730gm	24.0730gm	24.0730gm	24.0730gm
Mass of glass crucible and precipitate after first heating	24.2930gm	24.4836gm	24.4820gm	24.4715gm
Mass of glass crucible and precipitate after second heating	24.2735gm	24.4052gm	24.4019gm	24.3815gm
Mass of glass crucible and precipitate after third heating	24.2730gm	24.4048gm	24.4015gm	24.3810gm

Mass of glass crucible and precipitate after fourth heating	24.2730gm	24.4048gm	24.4015gm	24.3810gm
Net Wight	24.2730gm	24.4048gm	24.4015gm	24.3810gm
Mass of precipitate	0.2000	0.3318gm	0.3285gm	0.3080gm

Mass of precipitate= mass of (glass crucible+PbSO4)-mas of glass crucible
Weight of SO_4^{2-} = Weight of $PbSO_4$×gravimetric factor
=Weight of $PbSO_4$×a (gram formula weight of SO_4^{2-})/b (gram formula weight of $PbSO_4$)

$PbSO_4 \rightleftharpoons Pb^{2+}(aq) + SO_4^{2-}(aq)$
Thus a=1 and b=2
Hence weight of SO_4^{2-} =Mass of precipitate × [32.066+4(16)]/[207.2+32.066+4 (16)]
Weight of SO_4^{2-}=Mass of precipitate ×96.066/303.266
=Mass of precipitate ×0.3167
Mg/L SO_4^{2-} = Mass of precipitate ×316.7/ml sample
=Mass of precipitate ×10^{-3}×316.7/50×10^{-3}
= mg/l

III RESULT

Calcium contain in homemade sindoor = 2.8000mg/l

Lead contain in Chief rate sindoor =2.1016mg/l
Lead contain in normal rate sindoor =2.0807mg/l
Lead contain in costly sindoor =1.9508mg/l

After gravimetric analysis in homemade sindoor calcium sulfate (m.p. 1460 ċ) is formed which has lowdensity2.96g/$cm^3$and in other samples lead sulfate(m.p. 1087ċ) is formed which has high density 6.29g/cm^3 .It can be observed in aqueous solution.These data is like mirror for us to indicates lead contain of sindoor.

IV CONCLUSION

This is identified Sindoor has a high potentialof lead exposure in India. Among Indians whouse sindoor regularly are in high-risk population. With the help of this data it isvery clear that in sindoor lead contain is very high and so many people have been affected afterusing of it. It is a big drawback of our India there is no any strict rulesfor selling of this type of toxic material and we are not aware to selection of this.One more point which is economical gape of our India is very high. Maximum people of our India are very poor. they are use all things in worst quality. I thinks it is all people'sduty to maintain the quality of all products and don't use any toxic chemical in it.

REFERENCES

[1] Shah MP, Shendell DG, Strickland PO, Bogden JD, Kemp FW, Halperin W.(2015) Lead Content of Sindoor, a Hindu Religious Powder and Cosmetic,: New Jersey and India.

[2] Nath Singh N., Brave V. R., Shally K. (2018)Natural dyes versus lysochrome dyes in cheiloscopy: A comparative evaluation IP: 47.247.234.30

[3] Vivek B. Kute, Jigar D. shrimali, Manish R.,(2013)Lead nephropathy due to Sindoor in India. Balwani ISSN: 0886-022X

[4] Sharma P.,(2005)Environmental Chemistry,KrishnaPrakashanNinth Edition I.S.B.N. 81-8283-012-5

[5] Dhingra R., Dhingra A., and Munjal D.,(2013)Repair for Congenital Macrostomia: Vermilion Square Flap Method

[6] Material Safety Data Sheet of Lead and Mercury at science lab.com Inc. 14025 Smith Rd. Houston, Texas 77396 and Texas 77396

[7] Dwivedi V.,Anandan E.M., Rajesh S. Mony, T. S. Muraleedharan, M. S. (2012) In Vivo Effects Of Traditional Ayurvedic Formulations in Drosophilamelanogaster Model Relate with TherapeuticApplications,University of Massachusetts Medical School, United States of America

[8] T. Davis, J. Marcus Drymon, Sean P. (2010)Spatial and Dietary Overlap Creates Potential for Competition between Red Snapper and Vermilion snapper William

[9] L. Oder, David L. Stalling, and StevenM.(2016) Barlow3Short-Term Effects of Pacifier Texture on NNS in Neurotypical Infants Austin

[10] PriyabrataMukhiSwapnaSaritaMohapatra(2014)Mercury based drug in ancient India: The red sulfide of mercury in nanoscale

[11] Dwivedi V., AnandanE. M., Rajesh S. Mony, T. S. Muraleedharan, M. S. Valiathan (2005)In Vivo Effects Of Traditional Ayurvedic Formulations in Drosophila melanogaster Model Relate with Therapeutic Applications,Mousumi Mutsuddi4, Subhash C. Lakhotia1*

[12] Dhingra R., Dhingra A, and Munjal D.,(2006) Repair for Congenital Macrostomia: Vermilion Square Flap Method

[13] Material Safety Data Sheet of Lead and Mercury at science lab.com Inc. 14025 Smith Rd. Houston, Texas 77396 and Texas 77396

[14] Royal Commission in Environmental PollutionIX Report (1983) Lead in the Environment. London Stationary House ; 8852:184.

[15] Caldas IM, Magalhaes T, Afonso A.(2007) Establishing identity using cheiloscopyandpalatoscopy. Forensic SciInt; 165:1-9.

[16] Rajendran R, Sivapathasundharam B. Shafer (2006) Textbook of Oral Pathology .5th Ed. New Delhi: Elsevier Publication; p. 1223-4.

[17] Yasushi E, Yoshiteru M. Identification of lipstick smears by fluorescence observation and purge and trap gas chromatography. Forensic SciInt 1998; 96:1-10.

[18] Castello A, Alvarez M, Miquel M, Verdu F. Long - lasting lipsticksand latent prints. Forensic SciCommun 2002; 4.

[19] Landrigan PJ. (1990) Current issues in the epidemiology and toxicology of occupational exposure to lead. Environ Health Perspect. ; 89:61–66.

[20] Loghman-Adham M. Renal (1997) Effects of environmental and occupational lead exposure: a review. Environ Health Perspect. ; 105:928–938.

[21] Bennett WM.(1985) Lead nephropathy: nephrology forum. Kidney Int.; 28:212–220.

[22] Ekong EB, Jaar BG, Weaver VM.(2006) Lead-related nephrotoxicity: a review of the epidemiologic evidence. Kidney Int. ; 70:2074–2084.

[23] Perazella MA.(1996) Lead and the Kidney: nephropathy, hypertension and gout. Conn Med. ; 60:521–526.

[24] Craswell PW, Price J, Boyle PD, et al.(1984) Chronic renal failure with gout: a marker of chronic lead poisoning. Kidney Int. ; 26:319–323.

[25] Colleoni N, D'Amico G.(1986) Chronic lead accumulation as a possible cause of renal failure in gouty patients. Nephron. ; 44:32–35.

[26] Hu H, Aro A, Payton M, et al.(1996) The relationship of bone and blood lead to hypertension. The Normative Aging Study. JAMA. ; 275:1171–1176.

[27] Lead: Guidelines for drinking-water quality, 2nd ed. Vol 2.(1996) Health criteria and other supporting information. Geneva: World Health Organization (WHO); 254–275.

[28] Hu H, Payton M, Korrick S, et al. (1996)Determinants of bone and blood lead levels among community-exposed middle-aged to elderly men. The normative aging study. Am J Epidemiol. 144(8):749–759.

Development and Psychometric Testing of a Total Quality Management Scale

Dr. Sanjay Kumar
Dean-Academics, (Associate Professor), New Era College of Science and Technology
Ghaziabad (U.P.) India

ABSTRACT
The purpose of this paper is to describe the procedures followed in an instrument development and validation to measure the TQM practices in higher education institutions. The paper explores the process by which a reliable and valid questionnaire can be developed. The paper adopted the mixed methodology, qualitative and quantitative. The qualitative approach was used at the initial stage of item generation and development for the instrument while the quantitative method was predominantly used to empirically establish the psychometric properties of the instrument. The paper finds that the TQM Scale is psychometrically sound. The reliability index for all the dimensions are well above 0.75 and the various empirical analyses, providing evidence of convergent, concurrent, and discriminant validity as well as dimensionality. The paper provides detailed information on developing and validating a new measuring instrument. The method and procedure can be a good reference for researchers interested in developing measuring instruments on educational practices. The soft system methodology, intervention enhances holistic discussion in relation to the focal at the item generation phase. This allows a greater amount of creative debate resulting in a comprehensive list of indicators to be used the instrument. The final questionnaire consists of 30 items and the psychometry indicated that it is valid and reliable.

Keywords: Construct Identification, Item Generation, Psychometric Testing. Validity, Reliability and Construct Validity.

I INTRODUCTION

Fast economic growth, increasing global competition, privatization, globalization and the liberalization of world education has caused an immediate need of TQM implementation in Indian higher education. One of the researchers (Thiagarajan, 1996) suggested total quality management as most prestigious quality indicator for measuring the overall quality of an educational institution. As quality is a fundamental issue in education, the Indian government has also emphasized in improving the overall education quality. Moreover, the Indian government also encourages both private and public universities to acquire quality certification and TQM adoption with the purpose of meeting international standards. However, the current practices of TQM among the various higher learning institutions in India are not much satisfactory. Therefore, it is an urgent need to evaluate and upgrade the TQM practices in India. The purpose of this paper is to describe the procedures followed in an instrument development and validation to measure the TQM practices in higher education institutions. The paper explains the procedure by which a reliable and valid measuring instrument can be developed. The paper adopted the mixed methodology, qualitative and quantitative. The qualitative approach was used at the initial stage of item generation and development for the instrument while the quantitative method was predominantly used to empirically establish the psychometric properties of the measuring instrument.

II CONSTRUCT IDENTIFICATION

The writings of Crosby (1979), Deming (1986), Feigenbaum (1991) and others have developed certain propositions in the area of quality management. Their insights into quality management provide a good understanding of quality management principles. There are several Quality Awards, such as the Deming Prize in Japan, the European Quality Award and the Malcolm Baldrige National Quality Award, which are based on a perceived model of TQM. The constructs of these TQM models must be operational for empirical work. Based on the comprehensive review of the TQM literature, only 7 constructs are believed to be related to the education system. In this paper, The Malcolm Baldrige Award was chosen as the theoretical basis for the identification of TQM constructs because it incorporates a number of different perspectives on quality, rather than focusing on one specific view. The key dimensions of the total quality management identified are categorized as Management Support, Strategic Planning, Student Teachers Satisfaction, Teaching Staff Participation, Training & Development, Continuous Improvement and Information & Analysis. These seven principles can be best applied to higher education Institutions. In this study, the initial draft of TQM scale consisted of 7 constructs of the above TQM principles with modification to suit the higher education institutions setting. These seven constructs of TQM were collectively labeled as Total Quality Management Practices.

III MEASUREMENT APPROACH

Researchers use measuring instruments to measure factual knowledge, judgments, opinions, perceptions, attitudes, feeling, emotions, human behavior and interests. This approach captures the self-reported observations of the individual and is commonly used in educational research. Factual information under a research study is collected using a questionnaire. The rating scale is used for obtaining judgments or opinions or perception of the degree to which an individual possesses certain behavioral traits and attributes not readily detectable by objective tests. Attitude scales are used for finding the attitudes of persons on issues like co-education and religious education, etc. A list of statements is provided to respondents and asks them to respond to each statement in accordance with their true feelings. Tests are designed to measure and describe an aspect of human behavior. Inventory is the most appropriate tool to assess one's interest in a particular phenomenon. In the present paper, researcher is developing a measuring instrument to measure total quality management practices of higher education institutions on the basis of opinion or perception of the teachers and students. For the purpose of the present study, rating scales are best suited. Therefore, measurement of total quality management practices in higher education institutions can be done using rating scales only. There are various types of rating scales used in educational research. Now next question arises, which response style is best suited for the developing TQM scale.

IV RESPONSE STYLES

A number of response styles may be used when a researcher develops a new measuring instrument. These produce different types or levels of data and this will influence the analysis part of the study. Therefore, when developing a new measuring instrument, it is important to be clear which scale and response style to use. Frequency scales may be used when it is important to establish how often a target behavior or event has occurred (Rattray et al. 2004). Thurstone scales are less commonly used in educational research. Thurstone scaling approximates an interval level of measurement (Miller, 1991). Developing a true Thurstone scale is considerably more difficult than describing one (Nunnally, 1994).Guttman scaling is a hierarchical scaling technique that ranks items such that individuals who agree with an item will also agree with items of a lower rank (Katz et al. 1963). Knowledge questionnaires may be helpful when evaluating the outcome of an educational programme (Furze, 2001). They generally offer multiple choice or dichotomous yes/no response options. Likert's scale is widely and very commonly used response style in questionnaires because of its easy construction, high reliability, and successful adaptation to measure many types of affective characteristics. (Nunnally, 1994).

In the present study, TQM scale is being developed to measure the total quality management practices of higher education institutions. Likert scale suited the purpose of the researcher's study; therefore it was kept as a response style for the questions on TQM scale. These scales use fixed choice response formats and are designed to measure attitudes or opinions (Bowling 1997, Burns & Grove 1997). On the Likert rating scale, a respondent indicates agreement or disagreement with a variety of statements on an intensity scale. The five-point "strongly agree" to "strongly disagree" format is used. Responses are then summed across the items to generate a score on the effective instrument. The simplicity and ease of use of the Likert scale are its real strength. The Likert scale can provide an ordinal-level measure of a person's attitude (Babbie, 2001). Gathering and processing the Likert responses are efficient. When several items are combined, more comprehensive multiple-indicator measurement is possible. The rating scales have the advantage of providing data that use values rather than merely categories (Edwards, Thomas, Rosenfeld, and Booth-Kewley, 1997). This feature can provide greater flexibility for data analysis.

V ITEM GENERATION

Questions can be generated from a number of sources, including consultation with experts in the field, proposed respondents and review of associated literature (Priest et al. 1995, Bowling 1997). A key strategy in item generation is to review the research items repeatedly to ensure that items reflect the relevant construct. The draft of TQM scale was derived from the relevant literature and four existing 'quality management' tools: TQM implementation constructs (Ahire, Golhar & Waller,1996), The School Quality Management Scale (Lee 2009), Measure of Quality Management Practices in Education (Jose & Angel, 2014) and Quality Process Management instrument for higher education (David, Nurahimah & Arsaythamby,2016). The initial draft of the TQM scale contained 42 items in seven dimensions: Management Support, Strategic Planning, Student Teachers Satisfaction, Teaching Staff Participation, Training & Development, Continuous Improvement and Information & Analysis.

The most clear and understandable the item; the better the results (Covert, 1984).Poorly framed item produces meaningless responses. Writing items are more of an art than a science (Neuman, 1997).Many

authors (Dillman, 2000; Dornyei, 2003) suggested in their studies to keep the grammatical complexities to a minimum. All items in the measuring instrument are grammatically checked. Professional terms, technical terms and abbreviation may have different meanings to different background respondents ((Edwards, Thomas, Rosenfeld, and Booth-Kewley, 1997).The technical terms and professional terms were used to keep in mind the respondents. A short question avoids the ambiguity, confusion, and the vagueness (Neuman, 1997) in the mind of a respondent. The maximum length of a item in the TQM scale is 15 words.

Certain questions should be avoided, e.g. those that leads or includes double negatives or double-barreled questions (Bowling 1997). Fischer and Lewis (1983) find in their survey research that leading questions can influence the answer of respondents to another question on a survey. The total quality management practices scale has no leading statements. The general advice is against the inclusion of negatively worded questions (Foddy, 1993) as they takes longer time to process (Weems, 2002) and have greater chance of mistakes by respondent (Dudycha & Carpenter, 1973). Negatively worded questions are avoided in the TQMP scale. The more general the question, the wider will be the range of interpretations (Converse and Presser, 1986).Specific statement were asked Answers to a hypothetical circumstance are not very reliable, but being explicit will reduce respondents' frustration (Kent, 1993) and able to provide useful information (Babbie, 2001). People tend to under report unhealthy life style practices and over report healthy ones (Brace, 2004) because of social prestige. No sensitive questions were kept in the TQMP scale. Question order effects arise when answering behavior changes depending on the position of a question during the interview (Baker 2003). Consideration is given to the order in which items are presented. All possible considerations were taken into consideration in creating effective items.

VI PILOT WORK

It is important to ensure that sufficient pilot work is carried out during the development of a new measuring instrument. The piloting of a newly developed measuring instrument is done to more clarify its items. A measuring instrument is piloted on a small size sample of potential respondents. Item analysis is one way to pilot a questionnaire. It provides a range of simple heuristics on item retention or deletion. High endorsement of an option within a particular item suggests poor discriminatory power or the redundancy of an item that requires the deletion (Priest et al. 1995). Alternatively, a Cronbach's a < 0.70 may suggest that items in a questionnaire or subscale are poorly grouped. To identify specific items that do not add to the explanatory power of the questionnaire or subscale an item-total correlation cut-off of<0.3 can be used (Ferketich 1991, Kline 1993). However, retain items that are thought to reflect the concerned theoretical domains of the questionnaire despite poor psychometric analysis. Problem items should be identified if higher levels of non-response exist.

A comprehensive item analysis evaluates the items to the scales in the development of a measuring instrument. The item-score to scale score correlation are used to determine if an item belongs to the scale as assigned, is part of another scale, or should be discarded (Nunnally, 1978).The scale-score of each of the seven constructs in the TQM Scale was obtained by computing the mean of the scores of the items that comprise that scale. If an item did not correlate highly with any of the scales, it had to be discarded. Saraph (1989) used this method to evaluate the assignment of items to scales for developing their instrument. Generally, a correlation of item values greater than 0.5 indicates the items has been assigned appropriately to the relative scale. Whereas, item values lower than 0.5 do not share enough variance with the rest of the items in that scale. It is therefore assumed that the items are not measuring the same construct, and that it should be deleted from the scale (Creswell, 2002). The TQM scale was piloted keeping in mind the above discussed points.

(a) Psychometric Testing-In the present study, the Total Quality Management Scale was developed to measure quality practice in higher education institutions. This scale consisted of 7 sub-scales of TQM practices which had to be empirically tested and validated. Many methods are available for empirically assessing the reliability and validity of a measurement scale. This section addresses how the reliability and validity of this scale is evaluated to determine the efficacy of TQM Scale in measuring the total quality management practices in higher education institutions.

(b) Validity Testing-Validity is the most important consideration in developing and psychometric testing of a measuring instrument. Validity refers to whether a questionnaire is measuring what it purports to (Bryman & Cramer 1997). There are several different types of validity (Polgar & Thomas 1995, Bowling 1997).

(c) Content validity was undertaken to ascertain whether the content of the scale was appropriate and relevant to the study purpose. Content validity indicates the content reflects a complete range of the attributes under study and is usually undertaken by seven or more experts (Pilot & Hunger 1999; DeVon et al. 2007). To estimate

the content validity of the TQM Scale, the researchers clearly defined the conceptual framework of total quality management by undertaking a thorough literature review and seeking expert opinion. Once the conceptual framework was established, eight purposely chosen experts in the areas of quality, questionnaire design, and academic administration were asked to review the draft of 42-items to ensure that it was consistent with the conceptual framework. Each reviewer independently rated the relevance of each item on the TQM Scale to the conceptual framework using a 4-point Likert scale (1=not relevant, 2=somewhat relevant, 3=relevant, 4=very relevant). The Content Validity Index (CVI) was used to estimate the validity of the items (Lynn 1996). According to the CVI index, a rating of three or four indicates the content is valid and consistent with the conceptual framework (Lynn 1996). For example, if five of eight content experts rate an item as relevant (3 or 4) the CVI would be 5/8=0.62, which does not meet the 0.87 (7/8) level required, and indicates the item should be dropped (Devon et al. 2007). Therefore, three items on the draft TQM Scale were deemed to be invalid because they yielded CVIs of 5/8=0.62 to 6/8=0.75 and were removed from the scale.

(d) Face validity indicates the scale appears to be appropriate to the study purpose and content area. It is the easiest validation process to undertake, but it is the weakest form of validity. It evaluates the appearance of the questionnaire in terms of feasibility, readability, consistency of style and formatting, and the clarity of the language used (Haladyna 1999; Trochim 2001; DeVon et al. 2007). Thus, face validity is a form of usability rather than reliability. To determine the face validity of the TQM scale, an evaluation form was developed to help respondents assess each question in terms of the clarity of the wording; the likelihood the target audience would be able to answer the questions, the layout and style. Fifty respondents were randomly selected from twenty educational institutions and they completed the face validity form on a Likert scale of 1-4, strongly disagree= 1, disagree= 2, agree= 3, and strongly agree= 4. All respondents rated each parameter at three or four on a Likert scale of 1-4. Ninety five percent indicated that they understood the questions and found them easy to answer, and 90% indicated the appearance and layout would be acceptable to the intended target respondents.

(e) Construct validity refers to the degree to which the items on an instrument relate to the relevant theoretical construct (Kane 2001; DeVon 2007). Construct validity is a quantitative value rather than a qualitative distinction between 'valid' and 'invalid'. It refers to the degree to which the intended independent variable (construct) relates to the proxy independent variable (indicator) (Hunter & Schmidt 1990). When an indicator consists of multiple items, factor analysis is one statistical technique that can be used to determine the constructs validity within the developing measure. Factor Analysis is a statistical method commonly used during measuring instrument development to cluster items into common factors, interpret each factor according to the items having a high loading on it, and summarize the items into a small number of factors (Bryman & Cramer 1999). Loading refers to the measure of association between an item and a factor (Bryman & Cramer 2005). A factor is a list of items that belong together. Related items define the part of the construct that can be grouped together. Unrelated items, those that do not belong together, do not define the construct and should be deleted (Munro 2005). Following the initial pilot work and item deletion, the TQM Scale should be administered to a sample of sufficient size to allow exploratory factor analytic techniques to be performed. Ferguson and Cox (1993) suggest that 100 respondents are the absolute minimum number to be able to undertake this analysis. However, others would suggest that this is insufficient and a rule of thumb would be five respondents per item (Bryman & Cramer 1999). The sampling population for factor analysis was 350 respondents from the higher education institutions in the NCR. The sample was selected using a stratified sampling technique.

(f) Fairly Well Correlated Items: In the process of factor analysis, first we get correlation matrix for preliminary analysis. The top half of this matrix contains the Pearson correlation coefficient between all pairs of questions where as the bottom half contains the one-tailed significance of these coefficients. This correlation matrixes check whether all the question items in a developing measuring instrument correlate fairly well. First, the significance values were scanned and found that majority of values was less than 0.05 except one significance value. Then correlation coefficient were scanned and found that majority of correlation coefficient were less than 0.9 except one correlation coefficient value. One significance value greater than 0.05 and one correlation coefficient value greater than 0.9 could arise a problem because of singularity in data. After checking the determinant of the correlation matrix, if necessary, one of the two question items causing the problem can be eliminated. The value of the determinant of the correlation matrix is 0.0005271 which is greater

than the necessary value of 0.00001.Therefore; multicollinearity is not a problem in case of TQM scale data. It concludes that all questions in the TQM scale correlate fairly well and there is no need to eliminate any question item at this stage.

(g) Sampling Adequacy: It is essential to have a sufficiently large sample to enable factoring analysis to be undertaken reliably (Bryman & Cramer 2005). Ferguson and Cox (1993) suggest that 100 respondents are the absolute minimum number to be able to undertake this analysis. Although, the number of participants required undertaking factor analysis remains under debate, a minimum of five participants per variable is generally recommended (Bryman & Cramer 1999, Munro 2005). However, to ensure an appropriate sample size was obtained in the current study to enable factoring analysis, Kaiser-Meyer-Olkin (KMO) sampling adequacy was used. The KMO statistic varies between 0 and 1. A value of 0 indicates that the sum of partial correlations is large in comparison to the sum of correlations, which indicates diffusion in the pattern of correlation, and that factor analysis is inappropriate. A value close to one indicates that factor analysis will yield distinct and reliable factors (Field 2005). Kaiser (1974) recommended accepting values ≥ 0.5 and values below this should lead you to either collect more data or rethink which question items to include. Furthermore, described values between 0.5 and 0.7 as mediocre; 0.7 and 0.8 as good, 0.8 and 0.9 as great, and > 0.9 as superb. Therefore, using Kaiser's scale, the sampling adequacy value of 0.91(table-1) for the total quality management scale was superb. So it is clear that the sample size of 200 is appropriate to enable factor analysis to be undertaken. According to George & Mallery (2003), the Bartlett's test also examines whether the correlation matrix is an identity matrix. A significance value < 0.05 indicates that the data do not produce an identity matrix and are thus approximately multivariate normal and acceptable for factor analysis. The significance value of < 0.01 in this study was ideal for factor analysis as depicted in table 1.

Table-1
KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measures of Sampling Adequecy		0.91
Bartlett's Test of Sphericity	Approx. Chi-Square	19046.86
	Degree of Freedom (df)	349
	Significance	0.000

(h) Factor Extraction: Several types of extraction methods are used to undertake factor analysis. The most common method: Principal Component Analysis (PCA) was performed on the TQM Scale.PCA explores the inter-relationship of variables. It provides a basis for the removal of unnecessary items in a developing measure (Anthony, 1999) and can identify the associated underlying concepts, domains or subscales of a questionnaire (Oppenheim 1992, Ferguson & Cox, 1993). Therefore, PCA is assumed to be perfectly reliable and without error (Bryman & Cramer 2005). In this study, the principal component analysis was selected and conducted on the measurement instrument. The following five criteria were used in this study to determine the number of factors to be retained.

(i) Factors with eigenvalues greater than 1.0
(ii) Examination of the Scree plot
(iii) The magnitude of factor loading score greater than 0.40
(iv) The presence of the correlation with the other resulting factors
(v) The conceptual meaningfulness of the factors (Tabachink & Fidell,1996)

On the first run PCA, the eigenvalues associated with each linear component (factors) before extraction, after extraction and after rotation are explained. The eigenvalues associated with each factor represent the variance explained by that particular linear component. SPSS also displays the eigenvalue in terms of the percentage of variance explained. First Factor of TQM Scale explains 41.33% of total variance which means the first factor explains relatively large amounts of variance, whereas subsequent factors explain only a small amount of variance. SPSS then extracts all factors with eigenvalues greater than 1. An eigenvalue is an estimate of variance explained by a factor in a data set (Ferguson & Cox 1993), and a value >1 indicates greater than an average variance. In the present study, SPSS extracts 6 factors for TQM Scale. Rotation technique equalizes the relative importance of these extracted factors. Before rotation first factor accounted for considerably more variance than the remaining five (41.33% compared to 6.65%, 5.07%, 3.88%, 3.12% and 2.57%), however, after rotation it accounts for only 21.37% as compared to 13.47%, 10.92%, 6.76%, 5.48% and 4.62% respectively.

SPSS shows the table of the communities before and after extraction. PCA works on the initial assumption that all variance is common; therefore before the extraction value of all the commonalities is 1. After extracting some of the factors are discarded and so some information is lost. The amount of variation in each variable that can be explained by the retained factors is represented by the communities after extraction. Further SPSS also shows the component matrix before rotation. This matrix contains the loadings of each variable onto each factor. Factor loadings greater than 0.30 are considered significant; loadings of 0.40 are considered most important; if the loadings are 0.50 or greater, they are considered very significant (Hair et al., 1992). In this study, a factor loading of 0.40 was used as the cutoff point. It is suggested that each factor should have at least three items with significant structure coefficients (Tabachinck & Fidell,1996).

At this stage SPSS has extracted 6 factors. It becomes necessary to know whether the decision on the number factors to extract is correct. According to Steven (2002) and Field (2005), Eigen values and the Scree plot are accurate to determine how many factors should be retained. By the Kaiser's criterion we should extract six factors and this is what SPSS has done. However, this criterion is accurate if there are less than 30 variables and communalities after extraction are greater than 0.7 or if the sample size exceeds 250 and the average communality is greater than 0.6 then retain all factors with Eigenvalues above 1 **(Kaiser's criterion)**.The commonalities obtained in the present study are not greater than 0.7 and the average of the communalities (0.53) at not greater than 0.6.So, on both grounds Kaisher's rule may not be accurate. If Kaisher's rule does not apply, a Scree plot can be used when the sample size is large (around 300 or more cases). A scree test is the graphic representation of eigenvalues. An inspection of the scree plot indicated a sudden drop in the scree beginning with the seventh factor as depicted in figure 1, hence only 6 factors were kept for further analysis.

In interpretation of the factors, factor structure coefficients (faster loading) were used to describe correlations between each variable in the original variable set and each of the factors that was retained. Only factor structure coefficients of 0.40 or greater were considered to be significant and used to interpret the factors. It is suggested that each factor should have at least three items with significant structure coefficients (Tabachinck & Fidell, 1996). The relationship between the relevant subscales was examined by conducting Pearson correlations among these subscales and significant correlations were observed among these subscales as depicted in Table 4.2. Item content was examined for each factor to see if an underlying theme was identifiable. It was decided that the first 6 factors were conceptually meaningful and had greatest conceptual clarity in describing quality improvement strategies in school management. Therefore, they were retained in the final instrument. These 6 factors accounted for 62.62% of the total variance.

Table-2
Coefficient of Correlation among sub-scales

	MS	SP	TSP	TAD	CI	IAN
Management Support (MS)	1					
Strategic Planning (SP)	0.77**	1				
Teaching Staff Participation (TSP)	0.57**	0.59**	1			
Training and Development (TAD)	0.71**	0.68**	0.66**	1		
Continuous Improvement (CI)	0.59**	0.52**	0.58**	0.72**	1	
Information and Analysis (IAN)	0.75**	0.73**	0.63**	0.63**	0.73**	1

****Significant at the 0.01 level**

(i) Factor Rotation: The two methods of factor rotation are used under factor analysis. The orthogonal rotation is used when it is assumed that factors should theoretically independent and oblique rotation is used when it is assumed that the factors should be related to each other. The orthogonal rotation was used in the present study. It provides the rotated component matrix or rotated factor matrix which is a matrix of the factor loadings for each variable onto each factor. This matrix contains the same information as component matrix except that it is calculated after rotation. Before rotation, most variables loaded highly onto the first factor and the remaining factors did not really get a look into. But this problem is solved after the rotation of the factors.

The Results of the Final Six Factors solution of the Total Quality Management Practices according to Principal Component Analysis with Varimax Rotation and the internal consistency of each factor.

Table-3 (a)
Factor Loadings of TQM Practices and Cronbach's Coefficient Alpha for Factor-1*

Items (Alpha value= 0.87, Eigenvalue=18.07, Variance=41.33% and CV=41.33%)	Loadings
Management is committed to promote quality within the Institution.	0.93
Management clearly communicates vision, mission, objectives and policy statements.	0.83
Quality awareness programs are conducted by the Institution regularly.	0.85
Management provides internet facility to explore new areas of knowledge.	0.82
The institution has strong linkages with Industry for training and placement.	0.74
The institution has well- established system to handle inquiries and complaints.	0.73
Management ensures availability of qualified and competent teaching staff.	0.68
Management provides good quality of Infrastructural facilities.	0.63
Extraction Method: Principal Component Analysis **Rotation Method:**Varimax with Kaiser Normalization	

***Factor 1: Management Support**

Table-3 (b)
Factor Loadings of TQM Practices and Cronbach's Coefficient Alphas for Factor-2*

Items (Alpha value= 0.83, Eigenvalue=2.23,Variance=6.65% and CV=47.98%)	Loadings
The Planning of the Institution involves both teachers and Students.	0.91
Regular meetings are conducted to improve the quality of education.	0.85
The Institute develops an annual plan which is implemented and updated regularly.	0.82
Information collected from students is used for Institutional Planning.	0.81
The institution has quality cell for planning & maintaining quality of education.	0.67
Relevant information is communicated to the students well in Advance.	0.61
Extraction Method: Principal Component Analysis **Rotation Method:**Varimax with Kaiser Normalization	

***Factor 2: Strategic Planning**

Table-3 (c)
Factor Loadings of TQM Practices and Cronbach's Coefficient Alphas for Factor-3*

Items (Alpha value= 0.84, Eigenvalue=1.92,Variance=5.07% and CV=53.05%)	Loadings
Teachers are ready to help students inside and outside the class.	0.91
Students are encouraged to participate in extra-curricular Activities.	0.82
Teachers encourage student teachers to raise doubts and ask questions.	0.74
The creativity of the students is always encouraged and supported by teachers.	0.48
Teachers take an interest in the character building of Student teachers.	0.59
Extraction Method: Principal Component Analysis **Rotation Method:**Varimax with Kaiser Normalization	

***Factor 3: Teaching Staff Participation**

Table-3 (d)
Factor Loadings of TQM Practices and Cronbach's Coefficient Alphas for Factor-4*

Items (Alpha value= 0.87, Eigenvalue=1.53, Variance=3.88% and CV=56.93%)	Loadings
Special classes are conducted to improve the communication skills of the Students.	0.87

Special arrangements are made for the professional training of the students.	0.72
Teachers get a regular review of the training and development of students.	0.61
Teachers conduct seminars / workshops / conferences regularly.	0.48
Extraction Method: Principal Component Analysis **Rotation Method:**Varimax with Kaiser Normalization	

***Factor 4: Training and Development**

Table-3 (e)
Factor Loadings of TQM Practices and Cronbach's Coefficient Alphas for Factor-5*

Items (Alpha value= 0.80, Eigenvalue=1.37, Variance=3.12% and CV=60.05%)	Loadings
The regular assessment system is adopted to improve the performance of the students.	0.79
The complaints from students and stakeholders are immediately looked into.	0.67
Repair and maintenance of the instructional infrastructure are done regularly.	0.53
The college has developed quality standards that every teacher and students must meet.	0.47
Extraction Method: Principal Component Analysis **Rotation Method:**Varimax with Kaiser Normalization	

***Factor 5: Continuous Improvement**

Table-3 (f)
Factor Loadings of TQM Practices and Cronbach's Coefficient Alphas for Factor-6*

Items (Alpha value= 0.78, Eigenvalue=1.07, Variance=2.57% and CV=62.62%)	Loadings
Institution collects feedback to determine the quality of its services.	0.77
Teachers use feedback data in their decision making.	0.72
Institution regularly updates and maintains its website.	0.62
Extraction Method: Principal Component Analysis **Rotation Method:** Varimax with Kaiser Normalization	

***Factor 6: Information and Analysis**

Table-3 (a) to 3 (f) shows the factor loading of all the 30 items from the six components in the TQM scale obtained from factor analysis. Eigenvalues, cumulative variance explained by each individual factor and Cronbach's Coefficient Alphas were also presented. Eight items (1,2,3,4,5,6,34,35) loaded solely on the first factor (management support), Six items (8,10,11,12,13,25) on the second factor (strategic planning), five items (16,17,18,20,21) on the third factor (teaching staff participation), four items (22,23,26,28) loaded solely on the fourth factor (training and development), four items (29,30,32,33) on the fifth factor (continuous improvement) and tree items (37, 40,42) loaded on sixth factor (information & analysis).

The factor loading criterion of 0.40 or higher was used in this study for factors extraction. These resulted only 30 items were retained in the original 42- item TQM scale after performing a thorough examination on the item-factor loading and the reliability coefficient. This remaining 30 viable items categorized into six components or constructs of the Total Quality Management Practices. Table-4 presents the item list each of the six sub-scales of the total quality management practices in this study based on the results of principal component analysis (after rotation).

Table-4
Six Sub-scales of Total Quality Management Practices

Sub-scales	Item List	Number of Items
Management Support	1,2,3,4,5,6,34,35	8
Strategic Planning	8,10,11,12,13,25	6
Teaching Staff Participation	16,17,18,20,21	5
Training and Development	22,23,26,28	4
Continuous Improvement	29,30,32,33	4
Information and Analysis	37,40,42	3

(j) Reliability Testing-Once the validity procedures were completed, the final version of the TQM scale was examined to assess its reliability. Reliability refers to the ability of a questionnaire to consistently measure an attribute and how well the items fit together, conceptually (Haladyna 1999; Devon et al. 2007). Although reliability is necessary, is not sufficient to validate an instrument, because an instrument may be reliable but not valid (Beanland et al. 1999; Pilot & Hunger 1999, DeVon et al. 2007). Cronbach & Shavelson (2004) suggested researchers should consider the following issues when determining reliability:

(i) The standard error of the instrument, which is the most important reliability information to report.
(ii) Independence of sampling.
(iii) Heterogeneity of content.
(iv) How the instrument is used.

Two estimates of reliability are commonly used: internal consistency reliability and test-retest reliability: both were used to examine the reliability of the TQM Scale.

(k) Internal consistency reliability examines the inter-item correlations within an instrument and indicates how well the items fit together conceptually (Nunnally & Bernstein 1994; DeVon et al. 2007). In addition, a total score of all the items is computed to estimate the consistency of the whole questionnaire. Internal consistency is measured in two ways: Split-Half reliability and Cronbach's alpha correlation coefficient (Trochim 2001). In **Split-Half reliability**, all items that measure the same construct are divided into two sets and the correlation between the two sets is computed i.e 0.87.

(l) Cronbach's alpha is equivalent to the average of the all possible split-half estimates and is the most frequently used reliability statistic to establish internal consistency reliability (Trochim 2001; DeVon et al. 2007). Cronbach's alpha was computed to examine the internal consistency of the TQM Scale. If an instrument contains two or more subscales, Cronbach's alpha should be computed for each subscale as well as the entire scale (Nunnally & Bernstein 1994; DeVon et al. 2007). Therefore, Cronbach's alpha was computed for each subscale. Cronbach's alpha was computed for the revised TQM Scale after construct validation was computed and was 0.91, which indicates a high correlation between the items and the questionnaire is consistently reliable. Opinions differ about the ideal alpha value. Some experts recommend the alpha should be at least 0.90 for instruments used in clinical settings (Nunnally & Bernstein 1994). Others suggest an alpha of 0.70 is acceptable for a new instrument (DeVellis 1991; DeVon et al. 2007). The alpha computed for each of the four subscales also exceeded the minimum value for a new tool: all subscales were ≥ 0.70, see Table 4.1 to 4.7.

(m) Test–retest reliability can assess stability of a measure over time and this should be included in the process of any questionnaire development. This is of particular importance if the intended use of the measure is to assess change over time or responsiveness. Test-retest reliability is estimated by administering the same tool to the same sample on two different occasions on the assumption there will be no substantial change in the construct under study between the two sampling time points (Trochim 2001; DeVon et al. 2007). A high correlation between the scores at the two time points indicates the instrument is stable over time (Haladyna 1999; DeVon et al. 2007). The duration of time between the two tests is critical. The shorter the interval, the higher the correlation between the two tests, the longer the interval, the lower the correlation (Trochim 2001). However, very long test intervals can affect the results because of changes in participants or their environment (Linn & Gronlund 2000; DeVon et al. 2007). Currently, there is no definite evidence about the best time interval to allow between the test and the retest. Researchers need to consider factors such as the effects of time on health status such as deterioration or improvement in health and

what the results will be used for, to make an appropriate decision about the time interval between tests (Concidine, Botti & Thomas 2005). Test-Retest reliability of the TQM Scale was undertaken by administrating the questionnaire to 25 teachers randomly selected from four higher education institutions in an inner city area. They completed the TQM Scale on two different occasions; at baseline and eight weeks later. The coefficient of correlation of test-retest method was 0.77. Because ordinal data were obtained from the questionnaire using a five point Likert scale rated from strongly disagree to strongly agree; and the scale was not continuous, non-parametric statistical tests were deemed to be more appropriate than Pearson Correlation Coefficient. Therefore, the analysis of responses between the test and the retest was conducted using Wilcoxon Non-parametric Statistical Test to determine whether there were any significant differences between the responses at each time point.

VII CONCLUSION

This paper emphasizes the need to adopt a logical, systematic and structured approach to scale development. The researcher has presented a framework that supports this type of approach and has illustrated the rating scale development process using item analysis, factor analysis and related methods and has demonstrated strategies to demonstrate the reliability and validity of the new and developing measures. If a measure is poorly designed and has had insufficient psychometric evaluation, it may be difficult to judge between such competing explanations. In addition, it may not be possible to use the findings from an established measure, if that measure cannot be shown to be reliable in a particular sample. If educational practice is to be enhanced or changed using findings derived from scale-based methods, it is vital that the scale has been sufficiently developed. This paper presents a critical evaluation of the scale design and development process and demonstrates best practice at each stage of this process. This paper will enable the informed researcher to plan the design and development of their own research tools, to evaluate the quality of existing educational measures, and to inspire confidence in applying findings into practice.

REFERENCES

[1] Ahire, S., Golhar, D., & Waller, M. (1996). Development and validation of TQM implementation constructs. Decision Sciences, 27 (1), 23-56.

[2] Anthony, D. (1999). Understanding Advanced Statistics: A Guide for Nurses and Health Care Researchers. Churchill Livingstone,Edinburgh.

[3] Babbie, E. R. (2001). The practice of social research. Belmont, CA: Wadsworth.

[4] Baker M.J. (2003). Data collection – questionnaire design. Marketing Review, 3, 3, pp. 343–370.

[5] Beanland C., Schneider Z., LoBiondo-Wood G. and Haber, J. (1999). Nursing Research: methods, critical appraisal and utilization. Sydney: Mosby.

[6] Bowling, A. (1997). Research Methods in Health. Open University Press, Buckingham.

[7] Brace, I. (2004). Questionnaire Design. How to Plan, Structure and Write Survey Material for Effective Market Research. London: Kogan Page.

[8] Bryman, A., Cramer, D. (1999). Quantitative Data Analysis with SPSS Release 8 for Windows. A Guide for Social Scientists. London: Routledge.

[9] Bryman, A., Cramer, D. (2005). Quantitative Data Analysis with SPSS12 and 13. A Guide for Social Scientists. East Sussex Routledge.

[10] Burns, N. & Grove, SK. (1997). The Practice of Nursing Research Conduct, Critique, & Utilization. W.B. Saunders and Co., Philadelphia.

[11] Concidine, J., Botti, M., Thomas, S. (2005). Design, format, validity and reliability of multiple choice questions for use in nursing research and education. Collegian, 12 (1), 19-24.

[12] Converse, J. M., and Presser, S. (1986). Survey questions: Handcrafting the standardized questionnaire. Newbury Park, CA: Sage.

[13] Covert, R. W. (1984). A checklist for developing questionnaires. Evaluation News, 5(3), 74–78.

[14] Creswell, J. W. (2002). Educational research: planning, conducting and

evaluating qualitative & quantitative research. New Jersey: Merill Prentice Hall.

[15] Cronbach, L.J., Shavelson, R.J. (2004). My Current Thoughts on Coefficient Alpha and Successor Procedures Educational and Psychological Measurement, 64 (3), 391-418.

[16] Crosby, P. B. (1979). Quality is free. New York: McGraw-Hill.

[17] David, J. K., Nurahimah, M.Y. & Arsaythamby,V. (2016).Validating Quality Process Management instrument for higher education using structural equation modeling,International Journal for Quality Research, 10(2), 341-354.

[18] Deming, W. E. (1986). Out of the crisis. Cambridge, MA: MIT Center for Advanced Engineering Study.

[19] DeVon, H. A., Block, M. E., Moyle-Wright, P., Ernst, D. M., Hayden, S. J., Lazzara, D. J. et al. (2007). A psychometric Toolbox for testing Validity and Reliability. Journal of Nursing scholarship, 39 (2), 155-164.

[20] Dillman, D. (2000). Mail and Internet Surveys. The Tailored Design Method. New York: JohnWiley & Sons, Inc.

[21] Dörnyei, Z. (2003). Questionnaires in Second Language Research. Mahwah, NJ: Lawrence Erlbaum.

[22] Dudycha, A.L. & Carpenter, J.B. (1973). Effects of item format on item discrimination and difficulty. Journal of Applied Psychology, 58, pp. 116–121.

[23] Edwards, J. E., Thomas, M. D., Rosenfeld, P., and Booth-Kewley, S. (1997). How to conduct organizational surveys: A step-by-step guide. Thousand Oaks, CA: Sage.

[24] Feigenbaum, A. V. (1991). Total quality control. New York: McGraw-Hill.

[25] Ferguson E & Cox T (1993). Exploratory factor analysis: a user's guide. International Journal of Selection and Assessment 1,84–94.

[26] Ferketich, S. (1991). Focus on psychometric: aspects of item analysis. Research in Nursing and Health 14, 165–168.

[27] Field, A. P. (2005). Discovering Statistics using SPSS. London: Sage.

[28] Field, J. C. (1994). Total quality for schools: A guide for implementation. Milwaukee, WI: ASQC.

[29] Fischer, A.J., and Lewis, R.D (2008). "Deliberately Biasing Survey Questions." Australian and New Zealand Journal of Statistics. Volume 27, issue 1.

[30] Foddy, W. (1993). Constructing Questions for Interviews and Questionnaires. Theory and Practice in Social Research. Cambridge, UK: Cambridge University Press.

[31] Furze G, Lewin RJP, Roebuck A, Thompson DR & Bull P (2001). Attributions and misconceptions in angina: an exploratory study. Journal of Health Psychology, 6, 501–510.

[32] George, D., & Mallery, P. (2003). SPSS for Windows step by step: A simple guide and reference 11.0 update. Boston: Allyn & Bacon

[33] Hair, J.F.; Anderson, R.E.; Tatham, R. L.; Black, W.C. (1998). Multivariate Data Analysis, Fifth Edition, Prentice-Hall: Upper Saddle River.

[34] Haladyna, T. (1999). Developing and Validating multiple-choice test items. New Jersey: Lawrence Erlbaum.

[35] Hunter, J.E., Schmidt, F. L. (1990). Methods of meta-analysis: Correcting errors and bias in research findings. Newsbury Park: Sage Publications.

[36] Jose, S.G. & Angel,R.M. (2014).Development and Validation of a measure of the quality management practices in education, Total Quality Management and Business Excellence, 25 (1-2)

[37] Kaiser, H. (1974). An index of factorial simplicity Psychometrika, 39 (1), 31-36.

[38] Kane, M. (2001). Current concerns in validity theory. Journal of Educational Measurement, 38, 319-342.

[39] Katz S, Ford A & Moskowitz R (1963) Studies of illness in the aged: the index of ADL. A standardised measure of biological

and psychosocial function. Journal of American Medical Association 185, 914–919.

[40] Kent, R. A. (1993). Marketing research in action. London, England: Routledge.

[41] Kline, P. (1993). The Handbook of Psychological Testing. Routledge, London.

[42] Lee, S.S. (2009). The construction and validation of a school quality management scale for quality improvement in school management, Thesis, University of Malaya, Malaysia.

[43] Lynn, M.R. (1996). Determination and quantification of content validity. Nursing Research, 35, 382-385.

[44] Miller, D. C. (1991). Handbook for research design and social measurement. Newbury Park, CA: Sage.

[45] Munro, B.H. (2005). Statistical methods for health care research. Philadelphia: Lippincott, Williams & Wilkins.

[46] Neuman, W. L. (1997). Social research methods: Qualitative and quantitative approaches. Boston: Allyn & Bacon.

[47] Nunnally, J.C., Bernstein, I.H. (1994). Psychometric theory. New York: McGraw-Hill.

[48] Oppenheim AN (1992). Questionnaire Design, Interviewing and Attitude Measurement. Pinter, London.

[49] Pilot, D., & Hunger, B. (1999). Nursing research: principals and methods. Philadelphia: Lippincott Williams & Wilkins.

[50] Priest J, McColl BA, Thomas L & Bond S (1995). Developing and refining a new measurement tool. Nurse Researcher 2, 69–81.

[51] Rattray JE, Johnston M & Wildsmith JAW (2004). The intensive care experience: development of the intensive care experience (ICE) questionnaire. Journal of Advanced Nursing 47, 64–73.

[52] Saraph,.J., Benson, G., & Schroeder, R. (1989). An Instrument for measuring the critical factors of quality management. Decision Sciences, 20 (4),810-829.

[53] Stevens, J. (2002). Applied Multivariate Statistics for the Social Sciences (4th Edition). Mahwah, NJ: Lawrence Erlbaum Associates.

[54] Tabachnick, B. G., & Fidell, L. S. (1996). Using Multivariate Statistics (3rd ed.). New York: Harper Collins.

[55] Thiagarajan, T. (1996). An empirical study of total quality management (TQM) in Malaysia: a proposed framework of generic application , unpublished PhD thesis, University of Bradford, Bradford.

[56] Trochim, W.M.K. (2001). The Research Methods Knowledge Base. Cincinnati: Atomic Dog.

[57] Weems, G.H., Onwugbuzie, A.J. & Lustig, D. (2002). Profiles of respondents who respond inconsistently to positively and negatively worded items on rating scales. Paper presented at the Annual Meeting of the Mid-South Educational Research Association, Chattanooga, TN.

Impact of Engineers Self Help Group in Jammu & Kashmir – A Study

Dr. Rais Ahmad Khan[1], Altaf Hussain Haji[2]
[1] Dept. of Commerce, RNTU, Bhopal (M.P.) India
[2] ISS, Director NSSO, Ministry of Statistics and Programme Implementation, GOI (New Delhi) India

ABSTRACT
The impact of (SHG) Self Help Group is considerable in the provisions of Self-Worthy viz, Confidence Building, Capacity Building, Self-Employment Opportunities and meet their Financial Crises, betterment in Decision-Making Capacity of SHG members in terms of social matters in family like Education, Marriage of their Children and Strong protest against the husband beating the wife which is common among poor (due to unfortunate Economic and Social Status). It has helped lowered the social issues, increased the communication skills and self-confidence and brought behavioural change in Engineers folk. The formation of SHG is not finally a Micro-Credit Project but an Empowerment Procedure. It has been evident that people belonging to Low Economic Standards (LES) were suffering at different fronts due to shortage of money and get compelled to take loans from the professional money lenders, who in turn exploit them in several ways. It has been observed that Engineers face number of problems related to Poverty, Illiteracy, and lack of Communication Skills. They have limited access to services provided by the Government Agencies, confines to home and deprived of basic opportunities which cannot be solved individually but by group efforts. Therefore, the Empowerment of Engineers through formalization of Self Help Group is the most effective way of Self-Reliance.

Key Words: Self Help Group Self-Worth, Decision-Making, Communication Skills and Formulization

I INTRODUCTION

SHG is a Non-Professional Organization formed by people with a common situation for the purpose of mere resources, gathering information and offering mutual support and services. Self Help Group is a method of organising the poor people and the marginalized to come together to solve their individual problem. The SHG method is used by the Government, NGO's and others World-Wide. The deprived people collect their savings and save it in their respective accounts in banks. In return, they receive easy access to get loans with a small rate of interest to start their Micro-Unit Enterprise. In India, thousands of poor and marginalized population are structuring their lives, their families and their society through Self Help Groups. The Government of India's 9th Five Year Plan had given due recognition on the importance and the relevance of the Self Help Group method to implement developmental schemes at the Grass-Root Level. The main aim of this paper is to examine the impact and empowerment of Engineers Self Help Group in Jammu and Kashmir. SHG Programme clearly plays a central role in the lives of the poor. The impact on their lives is not just an economic one but gaining more Self-Confidence is often an additional lasting achievement that forms the basis for Social and Economic Improvements.

II IMPLEMENTATION OF ENGINEERS SELF HELP GROUP SCHEME

The Engineers Self Help Group Scheme was launched in 2003 for Self Employment of Unemployed Engineers as a substitute to Government Jobs for organizing them into groups and allotting them construction work by various agencies of the State Government.

Under the guidelines, the scheme shall be applicable to unemployed engineers of the J&K State possessing valid Bachelor's Degree in Engineering/Technology/Architecture in any branch of Engineering or 3 Years Diploma in any branch of Engineering. The unemployed engineers who are interested to organize the Self Help Group need to form a group of 4 to 10 members. The members shall approach to the concerned District Employment and Counselling Centre for issuance of the registration card or revalidation for Self Help Group.

The District Employment and Counselling Centres shall forward the name with registration number of Self Help Group to the Government Departments, Agencies and Autonomous Bodies in the concerned district for allotment of work. Also SHG on its own approach can get the work in any Government Department in their respective District. The total work earmarked for the Self Help Group at Government Departments, Corporations and Autonomous Bodies is 30 per cent out of total works.

A SHG shall be entitled to execute only construction work and supply contracts of civil, mechanical, electric and electronic in nature. The banks particularly J&K Bank lends loan upto 50 per cent of the cost of the work allotted to a Self Help Group against the work allotment letter.

III OBJECTIVES OF TEH SCHEME

(a) To organize the unemployed engineers of the state into groups to self employ them by providing gainful source of livelihood in the shape of work contracts in the Development Departments as an alternative against government jobs and also to create a group culture among the engineers and promote it for their Socio-Economic Empowerment to generate employment opportunities for others as well.

(b) To create an atmosphere of Hand-holding, Accommodation, and Encouragement constitute the sprit behind the scheme.

(c) To achieve the perfect goal, the officers of various departments should help these Self Help Groups to provide Self-Employment opportunities to the Unemployed Engineers.

IV WORKING OF SHG

The instalments and repayment periods are fixed by the group members. Each SHG acts as a Financial Institution owned and managed by the deprived people for their betterment and upliftment. The sources of funds of SHG are internal as well as external. The internal sources are the member's savings inclusive of Common-Fund, Interest on their Loans and Loan Repayment. The external sources are loans from grants or subsidies from government and NGO's. For lending to the needy members, each group collects the savings from all members and in addition it collects the administrative fee and membership fee from the members.

Table 1
The Works Allotted, Cost of Works & Engineers Involved in Kashmir Division

S.No.	District	No. of Registered SHG	No. of Engineers Involved	No. of Works Allotted	Cost of Work (Rs. In Lacs)
1	Srinagar	55	275	0	0.00
2	Ganderbal	13	65	5	15.00
3	Budgam	14	70	21	321.00
4	Anantnag	20	100	23	42.00
5	Kulgam	13	65	180	1390.00
6	Pulwama	20	100	106	601.42
7	Shopian	9	48	19	188.50
8	Baramulla	29	145	2	12.00
9	Bandipora	2	10	0	0.00
10	Kupwara	8	42	5	12.40
11	Leh	0	0	0	0.00
12	Kargil	3	15	0	0.00
TOTAL		**186**	**935**	**361**	**2492.32**

Source: **Department of Employment, J&K Government**

Table 2
The Works Allotted, Cost of Works & Engineers Involved in Jammu Division

S.No.	District	No. of Registered SHG	No. of Engineers Involved	No. of Works Allotted	Cost of Work (Rs. In Lacs)
1	Jammu	32	155	2	22.32
2	Samba	2	10	3	11.81
3	Kathua	7	35	4	70.19
4	Udhampur	11	55	33	165.64
5	Reasi	1	5	2	10.83
6	Doda	6	30	0	0
7	Kishtwar	3	15	0	0
8	Ramban	0	0	0	0
9	Rajouri	8	40	14	355.00
10	Poonch	2	10	0	0
TOTAL		**72**	**335**	**58**	**635.79**

Source: **Department of Employment, J&K Government**

V RECOMMENDATIONS

(a) Programs should be widely exposed to avail the benefit and should be related to locals in a transparent way. Awareness camps should be held in different areas with clear guidelines.

(b) There should be rational selection of the beneficiaries. Potential activity and capable member should be selected.

(c) Bankers should be motivated to pay active interest towards these schemes, trained by the professionals so that they would cooperate and reduce the time to process the application for disbursing the loans.

(d) A counsellor should be appointed to resolve the interpersonal issues in the SHG's that arise during their formalization and survival.

(e) NABARD should identify the deserving beneficiaries along with the selection of efficient rational income generation activities that could possibly help in the Economic Empowerment of the unfortunate.

(f) Formation of SHG's should be encouraged in marginalized and socially backward areas having weak networking with the banks.

(g) Corruption should be checked on priority basis at the time of sanctioning and upgrading the loans.

VI STUDY

The main function of Self Help Groups is to economically empower the members involved. The members join the group on Voluntary Basis and required to contribute out of their own pocket to start an Economic Activity. However, they are guided by some Organizations, Government and Non-Government Organizations. They have been able to speed up towards the target they have fixed. They got proper external as well as internal support. The groups can involve themselves with different crafts or arts which are found in the society and can seek the support of government agencies. The SHG Method is used by the Government, NGOs and others as well World-Wide. The thousands of deprived and marginalized population in India are building their Lives, their Families and their Society through Self Help Groups. Self Help Groups play a considerable role in Training and Infrastructure Development, Marketing and Technology, Communication Level of Members, Self Confidence among members, change in Family Violence, Frequency of Interaction with Out-Seders and Change in Saving Pattern of SHG members. The change in cumulative saving pattern of SHG members per month, Involvement in Politics, Achieving Social Harmony, Achieving Social Justice, Involvement in Community Action, Sustainable Quality and Accountability, Equity with SHGs, Defaults, Recoveries and Sustainability-financial Value.

VII CONCLUSION

The Self Help group anywhere in the world can be Strong-Technique of Economic-Empowerment of Economically Weaker-Sections of the Society. The members having passion to work honestly and dedicatedly are able to reach the gaol even if gradually. The Family-Heads of members involved, Locality and the External Agencies support is needed for the effective performance of the SHG. In the present universal unemployment scenario, the concept of SHG has greater scope throughout the world. Government and NGOs must involve all the needy people both from rural as well as urban ones and those who belong to economically vulnerable group to participate in the Self Help Groups. However, there is a need that the members involved in the group must be well educated about the methodology and Hard-Ships they face in making these groups successful.

REFERENCES

[1] Ministry of Health and Family Welfare 1998. Annual Report of Ministry of Health and Family Welfare, New Delhi: Ministry of Health and Family Welfare.

[2] Socio-economic Development of Jammu and Kashmir. Jammu and Kashmir: Jay Kay Book House.

[3] 001-Felicitation by NABARD and Chief Minister of Jammu and Kashmir for SHG Promotion in Jammu and Kashmir.

[4] Evaluation Report on SGSY, J & K (2017).

Cyber Physical Systems and Resilience in Micro Grid

Anurag S. D. Rai[1], Dr. Anil Kurchania[1], Dr. C. S. Rajeshwari[2], Reeta Pawar[1]
[1] Dept. of EEE, Rabindranath Tagore University, Raisen (M.P.) India
[2] Dept. of EEE, NITTTR, Bhopal (M.P.) India

ABSTRACT
In present era power systems architecture is now reconfigured and deregulated. Resilience of power systems is property to keep it within security limits and stable condition, which in present interconnected and complex system is major concern. Due to this advancement in automation in each stage Bi-directional power flow between utility and end-users' are now common aspect. As the Distributed Renewable Energy (DRE) Sources in present scenario is mostly affordable technology by end-users world-wide and promoted by governments too. Role of DRE for the creation of Microgrid and Nanogrid systems were must, along with integration of Utility grid and communication using cyber-physical elements. As cyber-physical systems (CPS) are ancillary requirements in past decade but now it is a technology without which system reliability, security and stability all were in stack. In this research, resilience of microgrid and cyber-physical arena is taken in to consideration.

I INTRODUCTION

With the advent of technology generation of power and distribution is restructured almost in every decade or two due to major breakthrough. As the world is now having faster communication and the storage of data is now that much tedious task, now most of the devices are having inter device connectivity. So as the case with this advancement lead to change in communication and controlling of Power Systems. Now a days power system are mostly differentiated to smaller units called Nanogrid or Microgrids whose integral part or super set lead to formation of Power Systems operations. Microgrids are now days having the smarter capability of controlling, forecasting, data logging and decision making between the load end and utility for bidirectional flow of power. Microgrids are mostly termed as self-sustained in power generation which is of integration of Distributed Renewable Energy Sources, Utility grid and Diesel generations' too. There is smart controlling required utilizing the power of the most convenient and cost effective source among the integration scheme. With the introduction of modern power electronics controller having embossed characteristics' of cyber-physical connection between different directly connected or indirectly connected devices via internet, empowered users to control the load according to economics values. With the introduction of Cyber-Physical Systems (CPS) security issues and power systems operations were to be modified with their integration to work within the limits of stability and security. Power system is having inherent capability to bring itself in stability while working in security limits are known as Resilience of the system, despite of sudden disturbances and turbulences to work under the limits. With the integration of modern smart controlling techniques along with cyber-physical system, threat of the system security is always concern, so the resilience behavior of the system is also to be taken in considerations.

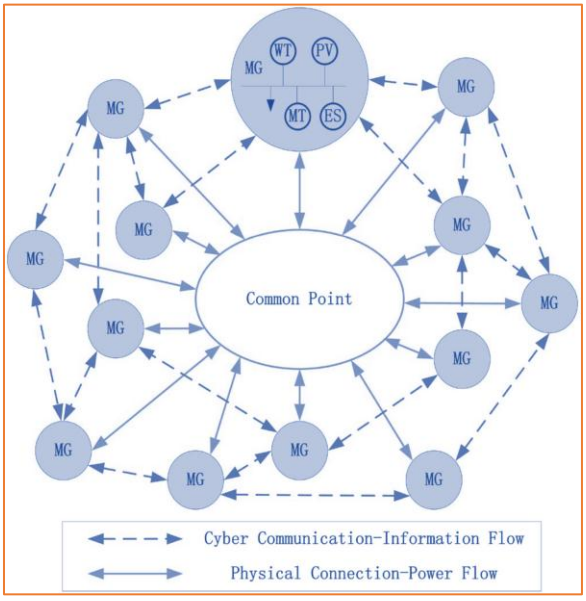


Fig. 1 Micro grid and Cyber-physical System Interaction.

Modern systems are influenced by the IOT (Internet of Things) along with incorporation of Cloud data communication and its utilization for data logging. This technology enables system to have peer to peer communications and level of IOT communication was also increased. Classifications of different CPS in Figure 2 are presented and interaction of CPS with elements of Microgrids and super-set of power systems are presented in Figure 1. Different states of Cybermatics will penetrate different stages of the systems and security limits. Evolution of CPS is from computer networking followed by Internet of Computers (IOC) then IOTs' which is further strengthen by concept of Hyper IOTs' this is the process by which interconnection of Computer and its processing were shared. With the advent of this technology Hyper IOTs' were involved in microgrid integral features for communication of different parameters and their controlling by data-logging and continuous monitoring.

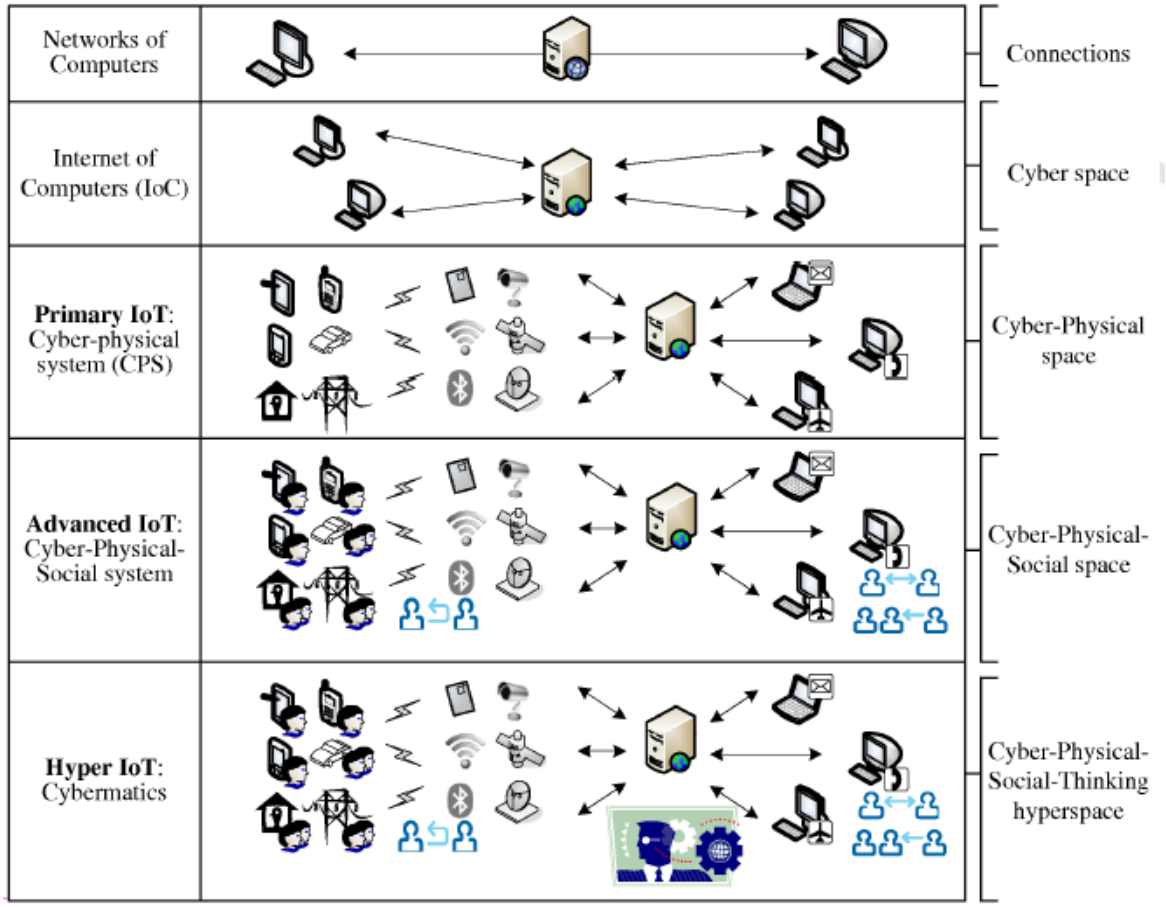


Fig. 2: Cyber-Physical System Classifications

II NEW PARADIGM IN MICRO GRID

As the power systems from its evolutions is being restructured in every Decade or half. Due to introduction of new break through technological revolutions which are dominating and efficiently utilizable for future perspective.

Traditional way of power generation is having unidirectional flow of power which creates the fixed topology of the systems as represented in Figure 3.

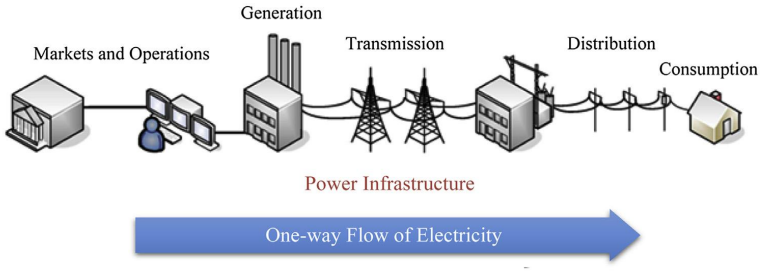


Fig. 3 Traditional Power Grid

In the traditional power systems interconnection between the different stages were only for the purpose of seeking operation parameter and security analysis. Where in the modern power systems data logging of the parameters were done by storing this data in cloud servers and continuous comparative analysis. With the modernization of system decentralized generation is promoted instead of centralized generation approach which promotes Distributed Generation using renewable Technology. In the Distributed Renewable Energy Sources solar, wind, fuel cells, etc were used for generation of electricity along with their integration to utility and localized backup generation units, this system popularly known as Microgrid in present era.

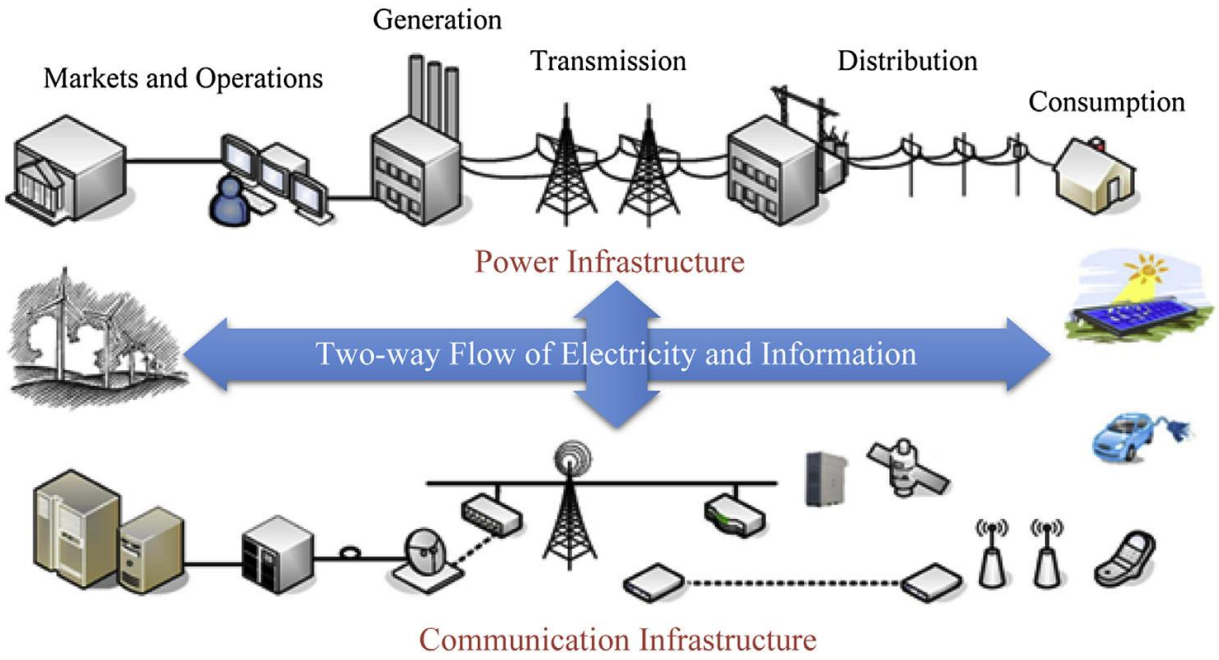


Fig. 4 Future Smart Grid

Microgrid is now getting advance day by day with embossment of Internet connectivity between generation system and load appliances to maintain the demand side managements, which change the economic scenarios. Microgrids enable the bidirectional flow of power in the system which is beneficial for the users and utility to utilize the diversity in power systems. This type of systems required well-tuned converters with proper connectivity and synchronization.However, due to the trends listed above, newer systems with greater capabilities are already being put to use; power flow can be bidirectional and variations can occur in minutes or even seconds. Figure 1.5 illustrates the impact of these new trends on the power flow.

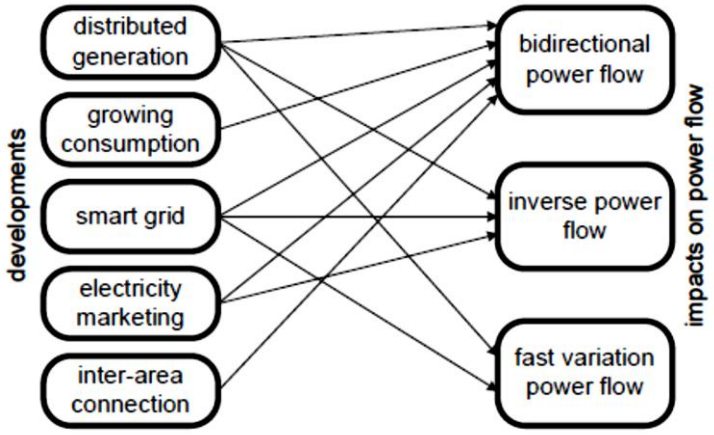


Fig. 5: Relation chart of the trends and their impact on the power flow

As the systems are getting smarter day by day with the increase in microgrids node in power systems as shown in Figure 1.1, CPS are introduced which are crucial in now a days in terms of security limits and operation of system without vulnerability. As interdependent power system and CPS will create

Hyper IOT systems which is itself a complex and rigid affair in case of security and operational impingements'. As power pool and its controlling is totally dependent on the continuous feedback of operation in power plants and followed by distribution and transmission systems; any miscommunication and error will cramp the whole systems for temporary or permanent failures which is undesirable. Thus with inculcation of CPS will increase the security issues although the ease of operation and controlling are facilitating concepts, but with advancement it is desired aspect.

III VOLTAGE REGULATION

Voltage regulation of a transmission line is defined as the rise in voltage at the receiving-end, expressed as percentage of full load at a specified power factor is thrown off, i.e.,

$$Per\ cent\ regulation = \frac{|V_{RO}| - |V_{RL}|}{|V_{RL}|} X100$$

Where,

$|V_{RO}| = Magnitude\ of\ no\ load\ receiving - end\ voltage$

$|V_{RL}| = Magnitude\ of\ full\ load\ receiving - end\ voltage (at\ a\ specified\ power\ factor)$[Kundur, 1993]

IV MICRO GRID CONTROLS

Control of every system is desired, with the advancement new controlling and operational techniques are also evolving which are communicably supportive to other devices. Microgrid is also having few control arenas on the basis of which new topology for control and operations were developed. The control techniques were shown in figure 1.6.

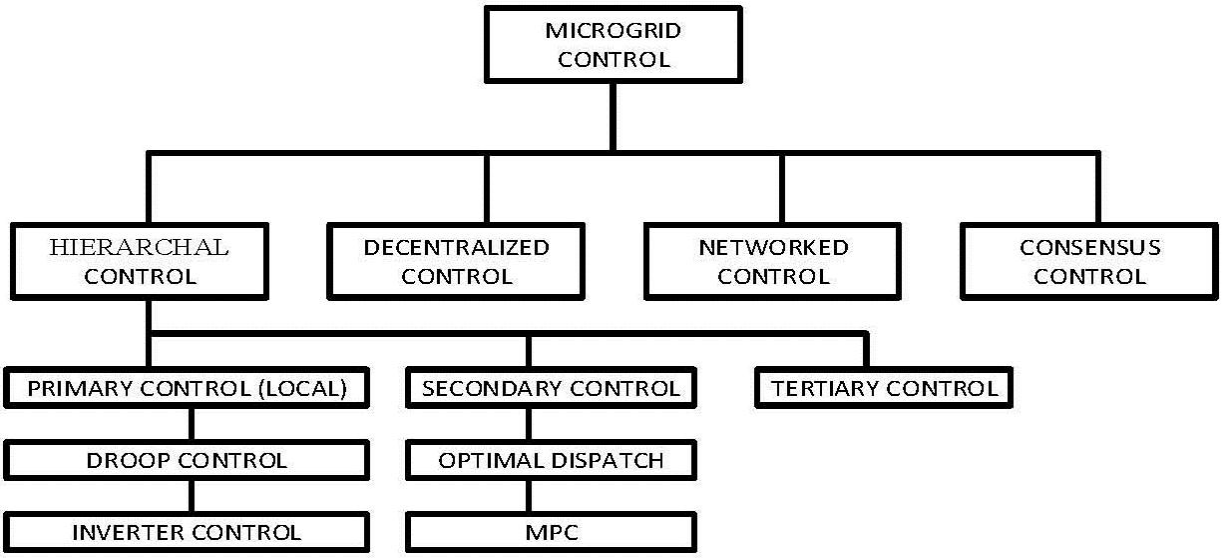


Fig. 6 Microgrid Control

In ours research Hierarchal Control system is used in coordination with networked control, as the era of correlations were now sustaining. The CPS will enable the resilience characteristic of smart-grid by empowering the power pool with the flow of information and parameters comparison to the reference sets. As the power grids are now a day are having Distributed Renewable Energy (DRE) sources forming subsets as Microgrid and Nanogrid interconnected and isolated from utility grid on the basis of topologies. Microgrids are equipped with features of bidirectional flow of power and self-generation of power on the demand of load. This type of feasibility of Demand Side Managements' in microgrids popularized the use of Cyber-Physical-Systems.

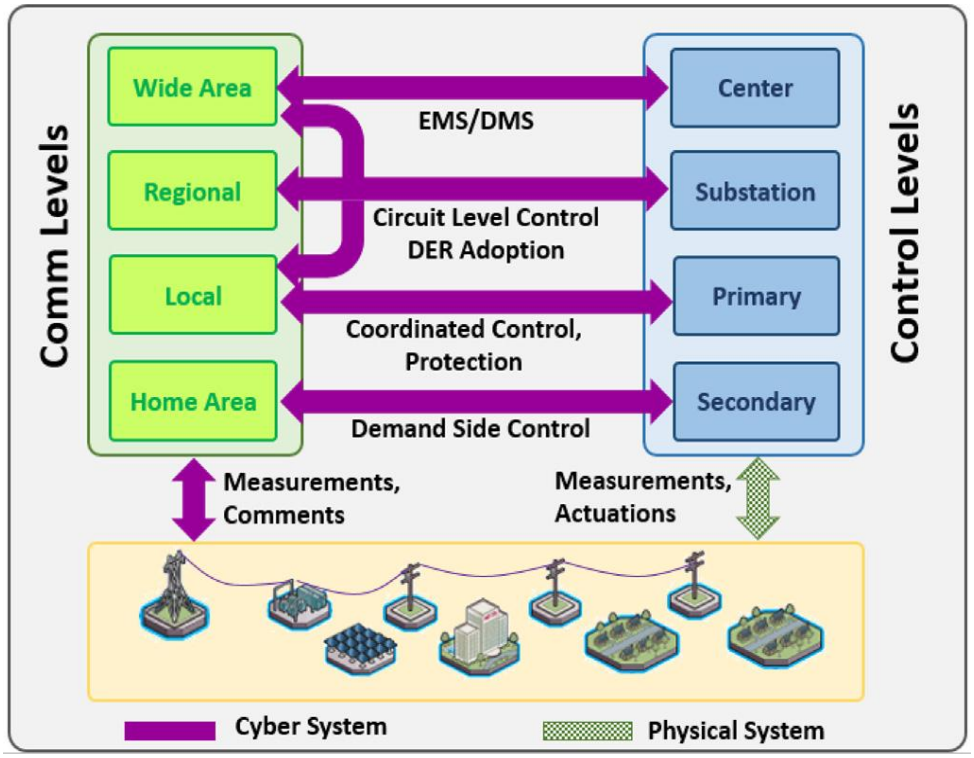


Fig. 7 Correlations between CPS

V CYBER AND PHYSICAL LAYER CORRELATION WITH MICROGRID

As the power a system is getting automated with the introduction of Bidirectional flow of power at end user is also now considered. In the power systems Cyber Fusion Points (CFP) nodes are created which are responsible for the up-streaming and down-stream communication and will help in economical decision making for microgrid operations. In smart microgrid bidirectional flow of power and communication are key inherent characteristics. As smart metering helps in understanding the power use pattern of each specific customer and by the microgrid and smart metering data power flow to be decided for each customer based on consumption pattern. This will encourage dynamic and real time pricing of power used in addition with smart metering.

Table 1
Comparison for Nano-grid, Micro-grid and VPP

Capabilities	Nanogrid	Microgrid	Virtual Power Plants
Grid-Tied	Yes	Yes	Yes
Islanding	Yes	Yes	No
Storage	Required	Required	Sometimes
Geographic Range	Confined to Load	Confined to Networks	Wide & Variable
Resource Mix	Static	Static	Mix-Match
Grid Connection	Mostly behind the meters	Mostly behind the meters	Mostly transmission Mode
Market Impact	Retail	Retail first then wholesale	Wholesale first then Retail

Cyber-controlled Micro grid consists of many distributed generators' which incorporates smart load appliances and effective communication among device and source. Smart microgrid based on CPS will have three essential integrated elements: Sensing and Measurement technology; Smart Transducers'; Communication tools, this will form the base to operate the system within resilience and security limits. As microgrid is part of wide-area systems its operation and congestion will impact the dynamics of the systems. In Figure 1.7 different communication and control levels are defined, this describes the penetration of cyber-physical systems in operation of smart microgrid.

Cyber-Physical Systems are mainly frame in which different devices of power generation, controlling, transmitting were interconnected together in Hyper-IOTstate of logical Cybermatics. In the operation of power systems its generation, transmission and distribution along with protection of system is in same hierarchy only by correct implementation of CPS at CFP nodes will transform the operation. Microgrids are essential in islanded condition in remote areas where arrangements for the transmission connectivity is challenging, in such area microgrid with renewable energy source are utilized. This specific and essential utility support this system along with stand-alone self-roof-top and distributed generation system with smart home appliances.

VI CONCLUSION

With the advancement of technology transformation are essential, same is with the power systems. Microgrid with smart metering and CPS are now effectively used. As the power systems operation stability and security limits should not be violated. In this review paper the present scenario of power systems paradigm shift and operation with IOT, IOC and CFP nodes are established. This research is useful for the Microgrid and Nanogrid operation and control systems planning.

REFERENCES

[1] Singh Sandeep Kumar , Khanna Kush, Bose Ranjan, Panigrahi Bijaya Ketan, Joshi Anupam, "Joint Transformation based Detection of False Data Injection Attacks in Smart Grid", *IEEE Transactions on Industrial Informatics, Volume: 14, Issue: 1, Jan. 2018, Page(s): 89 – 97, Year: 2018*

[2] Utkarsh Kumar, Srinivasan Dipti, Reindl Thomas, Trivedi Anupam, "Grid Ancillary Service using Distributed Computational Intelligence based control of Renewables and Storage Systems in a Distribution Network", *IEEE Congress on Evolutionary Computation (CEC), pages: 1412 – 1419 , Year : 2017*

[3] Kanellos Fotis D., "Real-Time Control based on Multi-Agent Systems for the Operation of Large Ports as Prosumer Microgrids", *IEEE Access, pages: 9439 – 9452, Year: 2017*

[4] Taplamacioglu M. Cengiz, Gözde Haluk, Ari Murat, "Simulation Study For Global Neighborhood Algorithm Based Optimal Automatic Voltage Regulator (AVR) System", *IEEE, 5th International Istanbul Smart Grids and Cities Congress and Fair, ICSG Istanbul, pages: 46 – 50, Year: 2017*

[5] Zhao Long, Yang Zhiyong , Lee Wei-Jen, "The Impact of Time of Use (TOU) Rate Structure on Consumption Patterns of The Residential Customers", *IEEE Transactions on Industry Applications, Volume: 53, Issue: 6, Pages: 5130 - 5138,Year: 2017*

[6] Liu Zhaoxi; Wu Qiuwei; Huang Shaojun; Zhao Haoran ,"Transactive energy: A review of state of the art and implementation", *IEEE Manchester PowerTech, , Pages: 1 - 6 Year: 2017*

[7] Wu Libing; Zhang Yubo; Choo Kim-Kwang Raymond; He Debiao; "Efficient Identity-based Encryption Scheme with Equality Test for Smart City", *IEEE Transactions on Sustainable Computing, Volume: PP, Issue: 99, Pages: 1 - 1, Year: 2017*

[8] Rana Rubi, Singh Mukesh, Mishra S., "Design of Modified Droop Controller for Frequency Support in Microgrid using Fleet of Electric Vehicles", *IEEE Transactions on Power Systems, Volume: 32, Issue: 5, Sept., Page(s): 3627 – 3636, Year: 2017*

[9] Vaahedi Ebrahim, Nodehi Kash, Heim David, Rahimi Farrokh, Ipakchi Ali , "The Emerging Transactive Microgrid Controller", *IEEE Power & Energy Magazine, Issue: July/August 2017*

[10] Tavares Suzanne Emanuelle; Luiz Alex-Sander A.; Stopa Marcelo M.; Pereira Heverton A. "Bidirectional power converter with adaptive controller applied in direct-current microgrid voltage regulation", *2017 IEEE 8th International Symposium on Power Electronics for Distributed Generation Systems (PEDG), Pages: 1 - 6, Year: 2017*

[11] Mudaliyar Shiv Raman, Mishra Sukumar, Sharma Rishi Kant, "Coordinated controller design and stability analysis of DC microgrid with constant power load", *2017 IEEE Second International Conference on DC Microgrids (ICDCM), Pages: 322 – 329, Year: 2017*

[12] Du Yan, Zhang Beilei, Yang Xiangzhen, Mao Meiqin, Li Hua, Chang Liuchen, "A decentralized multi-framed droop-controller for improving harmonic power sharing in an islanded microgrid", *2017 IEEE 3rd*

International Future Energy Electronics Conference and ECCE Asia (IFEEC 2017 - ECCE Asia), Pages: 1725 – 1730 , Year: 2017

[13] Anurag S D Rai, C S Rajeshwari, Anjali Potnis, "Voltage fluctuation and regulation improvement through the genetic algorithm based DPFC in a power transmission system", Eduved International Journal ofInterdisciplinary Research, ISSN 2348-6775 (online), Vol. 01 Issue 05 Aug 2014.

Occupational Health Status of Female Nurses in India: A Situational Analysis

Gargee Pradhan
Doctoral Scholar (UGC-JRF), School Of Women's Studies
Utkal University, Bhubaneswar (Odisha) India

ABSTRACT
Professional health of nurses directly affects the physical as well as emotional well-being by curbing their efficiency. It's having a direct bearing on overall quality of life. Aim of the paper is to discuss the physical, mental and emotional health of women nurses working in health care industry with special reference to India. The findings extracted from review were analysed thematically. It is basically divided into two segments one is occupational health hazards faced by nurses in general and other one is occupational health status of nurses in India. Nurses are exposed to various health problems and working conditions adversely affect the health of women nurses which also affect their profession and quality of life.

Key Words:-Professional Health, Workplace Injuries, Quality Life, Social Adjustment, Occupational Health of Indian Nurses.

I INTRODUCTION

Occupational health of nurses implies to workforce induced injuries and illness normally caused due to exposure towards patients. Nurses get affected with various diseases and injuries purely from their work environment. Lack of work safety environment physical and psychological stress adversely affect health of women nurses. Excessive work pressure and major time spending for patient cares which are determined at organizational level also affect health of nurses. Health status of nurses also greatly affected due to external factors such as increase use of complex technologies, innovations, and increase in numbers of very sick elderly patients (aging population) make them more vulnerable. So organization related risk arising from external factors produce threat to nurses and affect their health status.

II OBJECTIVE

In this paper attempt has been made to analyse some occupational health problems of nurses in general and health status of Indian nurses in particular.

III METHODOLOGY

This paper is basically descriptive and analytical in nature. A narrative literature review is made. A systematic approach was applied in the search for studies through electronic data base. Along with electronic data base information's are collected from journals, books, newspapers and websites.

IV HEALTH HAZARDS FACED BY NURSING PROFESSIONAL

The very nature of work creates additional risk for nursing professional. Various health problems that the nursing community is exposed to be musculoskeletal injuries, needle stick injury, latex allergy, chemical exposure, and work related stress that leads to poor emotional, psychological condition.

(a) Shift Work and Long Working Hours

Shift work effect the health of women nurses as long hours may reduce the time available for sleep, leads to sleep deprivation or disturbed sleep and incomplete recovery from work. (Spark K, Fried,Y et.al, 1997). Long hours of work in hospital expose them to work place hazards such as chemicals, infectious agents and physical, mental and emotional distress. Long hours of work most often compel them for smoking, alcohol consumption and other type of intoxication.

Due to night shift and rotating duty nurses experience long term insomnia and excessive sleeplessness make them unable to perform their normal shift duty (Drake &Richardson, 2005. Poor day time sleep and sleepless night shift are contributing factors for underperformance of many nurses. Injury risk increased by 18% during the afternoon /evening shift and 34% during night shift compared to morning /day shift. (Folkard, Tucker, 2005).

Nurses work in night shift in rotation. Because of the night shift they take rest at day time which is also interrupted due to various family and household activities. Due to night shift duty they get a little time for family friend. Night shift work posses' severe challenge for women nurses particularly with school going children and creates problem in family social adjustment. (Presser, 2003)

(b) Musculoskeletal Disorder

A number of studies examining the health consequences of long hour's studies have shown that long hours of duty produce silent killer effect damaging women's health with significant increase in adverse physical and psychological outcome. One study has highlighted that if the working hours of

shift duty exceeds more than 50 hours in a week it creates fatal consequences with multiple health problems among women nurses. Hectic work schedule along with increased work pace, physical and psychological demands, have been reported musculoskeletal injuries and disorders (MSD) (Liscomb & Geiger-Brown 2004). MSD also varies from region to region but mostly include pain in the affected body parts for a specific duration and frequency (Bernard, 1997) along with other related symptoms such as numbness and tingling. Findings of a mega study in United States in the year 2001 revealed that nearly 108,000health workers lost their work time due to musculoskeletal injuries and disorders (Bureau of labour statistics, 2002). Studies have focused that majority nurses reported postural problem due to heavy lifting, bending, twisting and other manual handlings (Smedley, 1995). One study revealed, nurses were found to be at particular risk of back injuries during patient transfer, which require sudden movements in non-neutral posture. Patient transfer also require flexion and rotation, increasing the injury risk due to combination of compensation ,rotation and shear forces(Forde,wegman,2002). Due to highly demanding physical work, almost all nurses developed neck shoulder and back MSD; one study observed that due to extreme flexion and frequent heavy lifting has direct impacted health of nurses with low back pain.

(c) Needle Stick Injury

Incidence of needle stick injury in nurses is highly risky, exposing them to the serious and sometimes life threatening risk of blood borne infection. According to study about 600,000 to 800,000 needle stick injuries, occur annually;(Henery,combell ,2005) half of which go unreported. Nearly 1000 nurses are contracted with serious infection, such as hepatitis B or C virus or HIV from a needle stick injury. One such study also found that each year nearly 50 to 247 nurses are infected with hepatitis C virus HCV from work related needle stick accidents. (Speko-witz, Eisenbury, 2005)

(d) Exposure to Rubber Latex

Various studies researching on hazardous health effect of rubber latex exposure found that such exposure creates serious health problems for all health workers. One such study has estimated the annual incident rate among all workers is 0.5 to 1.9 cases for 1000 full time worker per year. (Diepgen, 1999). Latex allergy start with contact dermatitis located in glove area and symptoms can be more severe such as asthma, anaphylaxis. Continuous exposure to latex creates inability to work because of severe asthma.

(e) Chemical Occupational Exposure

Health of nurses also greatly affected due to exposure to chemical and other toxic substance. Nurses are prone to hazardous chemical exposure in a number of ways which includes aerosols, gases, and skin contaminants- from medication used in practice. They are also prone to exposure on an acute basis. Various studies have found that substances commonly used in the health care setting can cause asthma and trigger asthma attack. Volatile organic compounds (VOCs) are chemicals that readily evaporate at room temperature, thus allowing the chemicals to be easily inhaled. The artificial spray fragrance used in the hospitals and inside the rooms create critical exposure to health workers in general and nurses in particular.(Buckley white et.al 2002) Studies have focused that most of the liquid used in spray form to keep the patient and other hospital rooms fresh but this have potential toxic that effects human health.(Daughton, 1999). Studies also have unfolded the truth about high toxic effect of strong odours, fumes and perfumes which are potent triggers of asthma.

V OCCUPATIONAL HEALTH STATUS OF FEMALE NURSES IN INDIA

History of nursing in India dates to about 1500 B.C. In the scriptures of Hindu teaching "Susruta" the leading authorities of Ayurveda cover the entire field of medical science, defined the ideal relation of doctor, nurses, patient and medicine as the four pillars upon which a cure must rest.

Nurses form the backbone of any medical services in the health sector. But in our country this section of skilled workers are highly exploited. They lack respect and dignity at workplace and more importantly are paid extremely low wages, less secure job and health vulnerability.

World Health Organization (WHO) in 2007 world health assembly declared a global agenda for health workers health. This recognized the need for member countries to improve occupational health. (Kalpana et.al, 2015). Irrespective of this Occupational health is a neglected health issue among health care worker in general and nurses in particular

Health care workers specifically nurse and other paramedical staffs in India are unaware of the fatal consequences of needle stick injury. Injuries created due to needle stick or other pointed weapon creates measure health problems like HIV, Hepatitis C and Hepatitis B but nurses lack awareness regarding this. (Jayachandran et.al, 2015). Another study revealed, 50% of health care workers who are mostly female had latent tuberculosis infection (LTBI). (Pai M, 2012).

Apart from physical and biological hazards, occupational stress is another major factor that negatively affects mental health of nurses. A study conducted in two tertiary hospitals of Delhi found time pressure as a major contributor to stress. (Bhatia,et.al 2010). Other various stress full sources are handling various issues of life such as work life balance, child/elderly care and personal responsibilities.

Department of humanities and social science, IIT, Mumbai carried out a study in 2004 with an objective to know about individual contribution of stressor on nurse's mental health. From the study it was revealed shift work is significant source of stress. Female health workers suffer with psychosomatic disorders like acidity, back pain, stiffness of shoulder and neck, high blood pressure, ulcers. They feel stressed because of time pressure, over burden of work, shortage of staff, conflicts with patients relatives and overtime.(Kane P. 2009). Many other studies also found result in the same line. Most of female health care workers feel work place stress.

Lack of professional respect and recognition by the management, senior colleagues and doctors is another measure cause of emotional imbalance with nurses. Lack of recognition, dealing with patients suffering from critical illness too creates fatigue among them. (Roy, 2011). Some nurses working in super speciality hospitals of Kerala and fresher to the profession suffer from anxiety and hypertension because they do not get support from their seniors to carry out the assigned responsibility effectively. (Purvi et. al 2012)
It is evident from above discussion that nurses in health care sector are prone to occupational hazard. In addition to this lack of awareness to observe simple safety measures, absence of protective device, inadequacy of basic amenities such as ventilation, lighting, seating arrangements, restroom, drinking water facility etc worsens the health concern of nurses. (Potdar; et. al 2016).

VI CONCLUSION

In the above analysis we have presented the threat perception and health hazard of nurses related to their profession. Although the health hazards and risks associated to occupation and workplace are many but effective measures initiated by the organization and govt could prevent and minimize work place related injuries of nurses irrespective of government, private and corporate hospitals. Authority should initiate all possible measures to prevent work places related injuries. However the benefit of improvements to nurses' health is of great importance as it helps retaining working nurses and new entries to the profession. All hospital management should redefine their working hours that excessively affect health of nurses which in turn also adversely impacts patients care. Hospitals whether government or private are making important financial investment and system level improvements to promote patients safety. However it is equally important for the administration to pay attention towards ensuring a good professional health for working nurses. This will definitely benefit patients, enrich the hospital management and promote a holistic development of health care industry.

REFRENCES

[1] Bhatia N, Kishore J, and Anand T, "Occupational Stress Amongst Nurses from Two Tertiary Care Hospitals in Delhi", Australasian Medical Journal , 2010, 731-738

[2] Bernard BP, editor,(1997) , "Musculoskeletal disorders (MSDs) and workplace factors- a review of epidemiologic evidence for work – related musculoskeletal disorders of the neck, upper extremity and low back." Washington, DC: National Institute for Occupational Safety and Health; U.S. Government Printing Office; . Publication No 97-141,

[3] Daughton,CG; Ternes TA,(1999) "Pharmaceuticals and personal care products in the environment: agents of subtle change "Environmental Health Perspective ;107:907-38 [PMC free article] [PubMed]

[4] Daughton,CG; Ternes TA,(1999) "Pharmaceuticals and personal care products in the environment: agents of subtle change "Environmental Health Perspective ;107:907-38 [PMC free article] [PubMed]

[5] Diepgen TI;Coenraads,PJ;(1999) "The epidemiology of occupational contact dermatitis." Int Arch Occup Environ-Health. 72:496-506 [PubMed.

[6] Drake CL; Roehrs T, Richardson G, (2005)"Shift work: sleep disorder: prevalence and consequences beyond that of symptomatic day workers." Sleep.; 27:1453-62[PubMed]

[7] Folkard S, Lombardi DA, Tucker PT.(2005) Shift work: safety, sleepiness and sleep.Ind Health.; 43L20-3.[PubMed]

[8] Kane P, "Stress causing psychosomatic illness among nurses", Indian Journal of Occupational and Environmental Medicine, vol 13, 2009, 28-32.

[9] Muralidhar,S; Singh P.K, Jain R.K, Malhotra, M, Bala M(2010) " Needle stick injury among health care workers in a tertiary hospital of india" Indian Journal of Medical Research 13(1) 405-410

[10] Nicolau,L, Daphne, L, Pai, M et.al (2012) " research questions and priorities for tuberculosis: A survey of published systematic reviews and meta-Analysis. Plos one 7(7):e42479

[11] Presser,H,B. Working in a 24/7 economy challenges for American families. New York:Russell Sage Foundation;2003

[12] Roy T; Chatterjee, C; Iskanius,P "Measuring stress among Nurses", International Journal of Logistic Economic and Globalization, 2011, vol 3, 142-154.

Contribution of Tourism Sector to Make in India

Shweta Bhatnagar[1], Dr. Deepti Maheshwari[2], Dr. Sangeeta Jauhari[3]
[1] Sr. Asst. Professor, BSSS & Research Scholar, RNTU, Bhopal (M.P.) India
[2] Dean, Faculty of Commerce, RNTU, Bhopal (M.P.) India
[3] Head, Dept. of Management, RNTU, Bhopal (M.P.) India

ABSTRACT
'Make in India' is an ambitious initiative of the central government which aims at increasing the pace of growth of national economy. But consistency in the growth to bring about sustainable development in the Indian economy is the biggest challenge of the program. India stands at a gross domestic product of 7.3 percent in the third quarter of 2016and are expected to continue at the similar rate for 2016-2017. This rate of growth is an outcome of improvement in the economic fundamentals and major initiatives by the government. Due to various policy reforms introduced by the government there has been a huge influx of funds under FDI enabling the economy to move along the growth trajectory. By enhancing the purchasing power and increasing demand, Make in India aims to spur the development. Tourism and Hospitality is one of the 25 targeted sectors of the economy under the program. Labour intensive nature of this sector makes it a key focus area that best suits the requirement of Indian economy. This study aims at looking at the phenomenon of Make in India from the perspective of tourism sector. How tourism integrates with this program and meets the challenges of contributing to maintaining the consistency and further enhancement of present economic growth? Also the study focuses upon how far Tourism sector would match to its global objective of Sustainable Development under this scheme?

***Key words**:* Make in India, Tourism and Hospitality sector, FDI, GDP and Sustainable Development.

I INTRODUCTION

India possesses tremendous potential to prove its global supremacy. Its 200 years of colonial history is a proof of the fact that the then advanced economies identified the country as a valuable destination for raw material to feed their industries. However, capital and technology the two key aspects which it lacks deters its growth objective. Realising the potential that India can be converted into a manufacturing hub the present union government has announced ambitious 'Make in India' program in September 2014. It is an action oriented comprehensive program aims at; (i)inspiring confidence of potential investors and partners in India's capabilities, (ii) empowering through providing required technical information on identified 25 industry sectors, and (iii) enabling to reach out to vast local and global audience to update them about the opportunities. (make in india). Led by the department of Industrial Policy and Promotion (DIPP), Ministry of Commerce, Government of India, programe also aims at improving Ease of Ding Business index by eliminating the unnecessary laws and regulations, making bureaucratic processes easier, making the government more transparent, responsive and accountable. Automobiles, aviation, chemicals, IT & BPM, pharmaceuticals, construction, defense manufacturing, electrical machinery, food processing, textiles and garments, ports, leather, media and entertainment, wellness, mining, **tourism and hospitality**, railways, automobile components, renewable energy, biotechnology, space, thermal power, roads and highways and electronics systems are the 25 focus sectors. 'Brand India' is promoted at almost all major international platforms. (ibef/economy/make-in-india)

II TOURISM SECTOR IN INDIA

Tourism in India has emerged through phases, with a single comprehensive National Tourism Policy in 1982 to state wise declaration of tourism as an industry between 1990-2000. Government policies gave a fillip to the hotel industry. With revised National Tourism policy in 2002 focus came onto robust infrastructure, online travel portals and low cost air travels to boost domestic tourism as well until 2005. Post 2005 till recently government have been really aggressive in marketing tourism to attract both inbound as well as outbound tourists with over 14 overseas offices (WWTC). Tourism contribution to Indian economy has two folds, first is contribution to GDP (6.88% for 2012-13) and second is towards Foreign Exchange Earnings (FEE) which stands USD 21.07 billion for the year 2015 a 4.1% growth over 2014.

Its economic significance increases more with the multiplier effect of tourism sector due to its forward and backward linkages with other sectors of the economy especially its major handholding with the hospitality sector. Growth statistics in terms of number of travelers have been impressive for both domestic with 1290.12 million tourists as well as international tourism with 8.03 million Foreign Tourist Arrivals (FTAs) during 2015. It has been well recognized by the government that tourism contributes to holistic development by generating employment and brings an inclusive growth through PPP i.e. public and private partnership. (UNWTO Report on India's Tourism Performance).

(a) Tourism: a Focus Sector under Make in India-Tourism is largely perceived as service sector, therefore, it is important to identify that what makes tourism fall in the purview of Make in India. The program mainly aims to create jobs, enhance skills and boost high quality manufacturing with zero defect at the same time minimizing its negative effects environmental and ecological impacts i.e. zero effect to bring about sustainable development. Tourism and hospitality sector has been identified under the 25 sectors under the program bears the following characteristics which makes it worth considering;

(i) Twin impact of tourism on employment and economic growth. The sector has huge potential to employ people ranging from skilled professional jobs to unskilled supportive workforce. The contribution of tourism to total GDP (direct and indirect) of the country and the total employment through tourism (direct and indirect) during 2012-13 were 6.88% and 67.0 million, respectively. (Press Information Bureau)

(ii) An incremental growth of 2.2% in Foreign Exchange earnings from USD 17.74 billion in 2012 to USD 18.13 billion in 2013, tourism has become the third largest contributor after gems and jewellery and readymade garments. During 2013, foreign exchange earnings from tourism registered a growth of 12% rising from INR 944.87 billion to INR 1058.36 billion.

(iii) India has moved up 13 positions to 52nd rank from 65th in Tourism & Travel competitive index. (IBEF)With 8.03 million foreign tourist arrivals in 2015, it registers an annual growth of 4.5% over the previous year

(iv) Its forward-backward linkages with other sectors of the economy tourism passes back the economic benefits to the local communities and businesses.

(v) Particularly, strengthening economic linkages between tourism and agriculture will enable the local agriculture industry to be competitive by meeting demand with high-quality products. The potential exists for such linkages to be created between local food producers and purchasing authorities for the tourism industry so that the needs of each party can be expressed and mitigated and the food producers and purchasers can build lasting and sustainable relationships.(Tourism & Agriculture - American University)

These economic benefits of tourism and hospitality make it a key driver of growth amongst the service sector in the country.

(b) Tourism Sector Initiatives-Ever since the Make in India program is introduced, various initiatives have been taken by the government by way of policy interventions and infrastructure development to transform and uplift 'Incredible India' to 'must revisit, must experience' destination. The outcome of the initiatives will translate into growth indicators such as FTAs, FEEs, employment opportunities, GDP contribution, etc. Some major initiatives and facilitations provided to the sector include;

(i) Policy Initiatives & Investments

- **FDI Policy**: 100% FDI is permitted in tourism and hospitality through automatic route for all construction development projects for improving infrastructure and facilities. Although, FDI is subject to a minimum three year lock in but the conditions of minimum capitalization and area restrictions have been removed.
- **E- Tourist Visas (e-TV):** Earlier known as Visa on Arrival enabled with Electronic Travel Authorisation was initially launched with 43 countries. The e-TV scheme now includes 155 countries, available at16 airports and 5 major ports. The fee for e-TV has been revised to four slabs of 0, USD 25, USD 48 and USD 60 which was uniformly USD 60 for all countries earlier. Also Bank charges have been reduced from 2.5% to 2% of the fee. There is no bank charge for zero visa fees and the validity of visa is for 60 days.
- **Service Exports from India Scheme (SEIS):** Served from India Scheme (SFIS) under Foreign Trade Policy 2015-20 has been replaced by Service Exports from India Scheme (SEIS). It applies to 'service providers located in India' instead of Indian service providers and provides them rewards for providing services from India irrespective of their constitution and profile. The rewards are based on net FEE which is 3% and 5% for tourism and travel related services, in the form of 'duty credit scrip'.

(ii) Integrated Development of Tourist Circuits on Specific Themes

- **Swadesh Darshan:** This scheme was launched by Ministry of tourism in March 2015 where theme based circuits will be developed for mass as well as niche tourism. Thirteen theme tourist circuits have been identified under the scheme for development. Five Pan India

Mega circuits have also been identified for Spiritual and Adventure Tourism.

- **PRASAD:** Pilgrimage Rejuvenation and Spiritual Augmentation Drive Scheme was launched by the Ministry of Tourism in March 2015 for beautification and development of pilgrimage sites for targeting domestic tourists and also foreign tourists driven by spiritual and religious sentiments. Initially thirteen cities with religious and pilgrimage importance are identified for development under PRASAD scheme.
- **HRIDAY:** The Heritage City Development and Augmentation Yojana (HRIDAY) action plans for eight missions cities including Varanasi, Mathura, Ajmer, Dwaraka, Badami, Vellankini, Warangal and Amaravati have been approved by HRIDAY National Empowered Committee for a total cost of Rs 431 crore (US$ 64.27 million).
- **Project Mausam:** The Government of India has proposed to establish cross cultural linkages and to revive historic maritime cultural and economic ties with 39 Indian Ocean countries.(Tourism & Hospitality, Sectoral report, 2017)

(iii) Development of Niche Tourism

- **Medical and Wellness Tourism:** 96,856 Medical Visas were issued between Jan- Jun 2016 to promote growth in this segment. This will be further facilitated by expanding the list of permissible activities under e-Tourist Visa for attending Yoga Program and Medical Treatment of short term nature.
- **Golf Tourism:** IGTC has approved eight golf events for FY 2015-2016 with a financial aid of INR281.71 lakh
- **Adventure Tourism:** Financial assistance of INR64.59 lakh has been given to Indian Institute of Skiing and Mountaineering (IISM) and INR47.06 lakh to Indian Mountaineering Foundation for adventure activities.
- **Cruise Tourism:** For development of vast coastline and promotion of Cruise tourism a Task Force is constituted with Secretary Tourism as Chairman and Secretary Shipping as Co- Chairman.

(iv) Other Initiatives

- **Promoting North Eastern Region:** To highlight tourism potential of the region National Tourism Mart is organized every year at different prominent places.
- **Adarsh Smarak:** 100 monuments are identified for development as Model Monuments by providing by necessary tourist facilities such as Wifi, encroachment free areas, interpretation centres and signboards of Swachh Bharat Abhiyan.
- **The Biennial Buddhist International Conclave:** To showcase rich Buddhist heritage and to promote inbound tourism to Buddhist sites the conclave is organized. (Tourism & Hospitality Sector- Achievement Report, 2016)

(v) Achievements of Tourism Sector under Make in India Program

- Tourism footfall registered an impressive growth both in terms of Foreign Tourist Arrivals (FTA) and Domestic Tourist Visits (DTV). During FY 2016-2017 (Jan- Oct 2016) FTAs were69.62 lakh as compared to 62.98 lakh during the same time in FY 2015-2016. Also DTVs to various states and UTs was 1432 million in 2015 as compared to 1282.8 million in 2014 registering a growth of 11.63%.
- The e- Tourist visa scheme has attracted large number of tourists US, Germany and UK.86.4% growth is registered in FTAon e- Tourist Visa from 56,477 in Oct 2015 to 1,05,268 in Oct 2016. The figures are more impressive in terms annual data for FY 2016-17 (Jan- Oct 2016) with FTA 7.8 lakh as compared to 2.58 lakh during FY 2015-2016 (Jan-Oct 2015) registering a 202.3% growth.
- Foreign Exchange Earnings (FEEs) from tourism in rupee terms during FY 2016-17 (Jan-Oct 2016) were INR 1,24,371 crore with a growth of 14.7% as compared to FEE of INR 1,08,392 crore during FY 2015-16 (Jan – Oct, 2015).
- Hotel and Tourism is amongst the top ten sectors attracting highest FDI equity inflow registering an increase of 72% in FY 2015-2016 over the previous FY 2014-2015 from USD 777 million to USD 1.33 billion.
- There has been a large scale skill enhancement during last two financial years with 180,376 persons being trained under ‘Hunar se Rozgartak’ and ‘Skill testing and certification schemes

by the government. Setting up of 3 State Institutes of Hotel Management (SIHMs), 12 Institutes of Hospitality Management in North Eastern states has been approved in-principle. Out of these Central Institute of Ho-tel Management (CIHM) Guwahati, Shilong, Gangtok and Food Craft Institute (FCI) Nawgaon are operational. Approval is also accorded to 3 FCIs in one in MP and two in Rajasthan. Also Indian Culinary Institute has been set up at Tirupati with a 3 years B.Sc course in Culinary Arts offering 30 seats for its first academic batch 2016-2019.(Tourism & Hospitality Sector- Achievement Report, 2016)

III CHALLENGES OF SUSTAINABLE DEVELOPMENT

Tourism has been identified as one of the most progressive sectors of the economy under the highly ambitious plan of Make in India. But tourism sector has a major challenge of matching with its global objective of sustainable development. Sustainability refers to development and maintenance of the area or community, environment or resources in such a manner and at such a scale that it remains viable over an indefinite period and does not degrade the physical environment in which it exists to a degree that it prohibits the successful development and wellbeing of others.(Butler, 1993). Therefore, sustainable tourism should ensure that; (a) tourist visits will be maintained and tourism resource will be retained indefinitely, and (b) no adverse impacts should be caused to society, culture and environment. Keeping in line the principles of sustainable development tourism sector has the following key missions'

(a) Promoting sustainable tourism on priority.
(b) Enhancing the tourism infrastructure and competitiveness to global standards.
(c) Ensuring greater visibility of tourism facilities.
(d) A concrete Central policy on Tourism and all the state tourism policies should be redraft in adherence to that so the uniform policy framework can be ensured throughout the country.
(e) Regulatory authority is required to be kept in place and conferred with sufficient powers to govern the sector as cut different domains of economic and social activities.

Out of all key ingredient to sustainability tourism sector in India lacks strong uniform policy to lead the dynamic industry in one direction. Regulatory front requires strengthening up keeping in mind the complexities of tourism industry which is a combination of other industries as well. This can be done to significant extent by identifying key industries in tourism sector, such as, hospitality, tour operators, travel agents and other service providers.

IV CONCLUSION

The patterns of travel and tourism are changing in the world, thereby, creating numerous opportunities for tourism sector to increase its contribution to the economy. Make in India initiative with adequate policy support provides large influx of capital through FDI and funding by the government to the tourism sector to enable it to reciprocate well to the requirements of growth and development under the program. Restoring to the objective of bringing about sustainable development Tourism sector has to follow an integrated approach with all its allied sectors to transform in accordance with the requirements of future. Initiatives and innovations are keys to take Make in India to another level. Apart from the efforts of Ministry of Tourism it is essential to seek PPP (public private partnership) for effective branding and marketing of tourism products, services and facilities. Government should equip all channels and medium through which world class tourism experience can be offered.

REFERENCES

[1] Butler, R. (1993). Tourism and Sustainable Debelopment: Monitoring, Planning & Managing.

[2] Economy/ Make in India. (2016, May). Retrieved February 9, 2017, from Indian Brand Equity Foundation: www.ibef.org

[3] ibef/economy/make-in-india.(n.d.). Retrieved from www.ibef.org

[4] make in india. (n.d.). Retrieved Feb 1, 2017, from www.makeinindia.com

[5] Tourism & Agriculture - American University. (n.d.). Retrieved February 2017, from american.edu: http://www1.american.edu/ted/niagra.htm

[6] Tourism & Hospitality Sector- Achievement Report. (2016, December 29). Retrieved February 2017, from DIPP, Ministry of Commerce & Industry, Government of India: http://www.makeinindia.com

[7] Tourism & Hospitality, Sectoral report. (2017, January). Retrieved February 2017, from IBEF: http://www.ibef.org/industry/tourism-hospitality-india.aspx

[8] UNWTO Report on India's Tourism Performance. (n.d.). Retrieved from http://asiapacific.unwto.org: http://asiapacific.unwto.org

A Study of Impulsive Buyers and Its Relationship with Coupon Proneness - A Special Case of the Chandigarh Tricity

Harsh Tuli
UIAMS, Punjab University, Chandigarh (Punjab) India

ABSTRACT
Impulsive buying is on increase in the nation with the populations' major portion being young. The new India is shopping differently. They make on the spot decisions which are influenced by many factors including sales promotions like coupons. Coupons today are using many mediums to reach their target audiences. The mediums include mobile messages to online websites and even the highly preferable mobile applications. These mediums are also one of the reasons that help in instigating an impulsive buy by its users. The new breeds of diners are hungry for bargains and are unlikely to go where they can't get them. This study deals with the study of these impulsive buyers and how they are influenced by these coupons.

Keywords: Impulsive buying, Sales promotion, Coupons.

I INTRODUCTION

In today's times when customers are becoming more and more aware, they are also on the lookout for bargains. Sales promotions are carried out by companies to attract and ultimately push the customers towards increased consumption. There are various common forms of Sales promotions amongst which Coupons are ones which are used very frequently. Coupons are instruments that save money for the customer when he/she purchases a product. This could be a 25% discount of the value of the product or a fixed amount like $5 on every piece (Harmon and Hill 2003: 167).

Coupons have a lot of advantages like increasing sales in the very short period and encourage the customers to switch their buying preference. Also, Coupons stimulates the trial of a new product. Coupons give consumers opportunities to obtain promoted products at reduced prices, because these reduced prices are in the form of a coupon, individuals who respond to coupon offers have been referred to as "coupon prone" consumer.

Coupons today are influencing how consumers spend their money. These coupons like other sales promotion methods are expected to provide the final push to the customer's dining decision.

Impulsive buying is on increase in the nation with the populations' major portion being young. The new India is shopping differently. They make on the spot decisions which are influenced by many factors including sales promotions like coupons.

Coupons today are using many mediums to reach their target audiences. The mediums include mobile messages to online websites and even the highly preferable mobile applications. These mediums are also one of the reasons that help in instigating a impulsive buy by its users.
This study deals with the study of these impulsive buyers and how they are influenced by these coupons.

The new breeds of diners are hungry for bargains and are unlikely to go where they can't get them. They are helping feed a growing industry of companies that offer access to cheap eats.

II REVIEW OF LITERATURE

The concept of impulsive buying has been an area of interest for a long time now. Since the initial discussions by (Weinberg, Gottwald 1982) who tried to identify the emotions that lead to impulsive buying behavior, different studies have tried to examine traits and influencers that lead to impulsive buying behavior amongst consumers. (Jalees 2009) in his study has tried to test the interface of traits such as individualism, moods etc. with impulsive buying behavior. (Kacen& Lee2002) conducted a cross country comparison to understand how cultural factors such as self-identity, normative influences etc. influence the impulsive buying behavior amongst the country. There are multiple studies that highlight how different factors such as store environment (Mattila and Wirtz 2008), signs, displays, and packaging (Peck & Childers 2006) affect the impulsive buying behavior of the consumer.

Coupons today are part of our everyday lives with their presence being everywhere. It's a huge industry today and thus a part of a lot of research too. Many studies over time have tried to understand the concept of Coupon proneness in a more comprehensive way. It was only in (Lichtenstein, Netemeyer& Burton 1990) when the study defined coupon proneness as a concept rather than one dependent on behavior.

Coupon prone across households and product classes has been studied by (Bawa& Shoemaker 1987). The study highlights how there is a difference in the demographics and behaviors of prone and non-prone customers.

Studies have been conducted across cultures and countries to highlight how cultural differences impact coupon proneness (Lalwani, Wang &Janiszewski 2018). A similar study is conducted by (Kitchen et al 2014) which conducts the research around coupon redemption behavior in Malaysia.

The literature is very limited in connecting the two concepts and this where lays the genesis of our research. A recent study by (Immanuel &Mustikarini 2018) has connected the dots on the same. It highlights that coupon proneness has a significant effect on impulsive buying behavior.

III VARIABLES UNDER STUDY

Coupon Proneness is defined as an increased propensity to respond to a purchase offer because the coupon form of the purchase offer positively affects purchase evaluations (Lichtenstein, Netemeyer, and Burton 1990).

(Rook and Fisher 1995, Rook 1987) define **buying impulsiveness** as consumer's tendency to buy spontaneously, unreflectively, immediately and kinetically.

IV RESEARCH OBJECTIVE

In exploring the research, the following objective shall be met:

(a) To explore demographics across impulsive buyers
(b) To gain an understanding about the impact that discount coupons have on the Consumer Impulsive Buying behavior with reference to fast food restaurants.

(i) Hypotheses of Study

The following hypotheses have been proposed for the scope of this particular study-

- H1: There is no significant difference between age, gender across impulsive buyers
- H2: There is no Impact of discount coupons on Consumer Impulsive Buying Behavior.

V ANALYSIS AND INTERPRETATION

Sample	Sample Size
Users of Coupons	154

(a) Sample description

Users as high as 73% of the sample have been using the coupons in the last 3 months. The frequency is also quiet high amongst nearly 50% of the sample with these many using coupons more than a couple of times in the past 3 months.

Sections of Questionnaire	Shapiro Wilk test		
	Statistic	df	Sig
Section B (Attitude Towards Coupons)	0.838	104	.000
Section C (Impulsive Buying)	0.840	104	.000

64% people reported to be impulsive as against the remaining 36% who could not be categorized as impulsive buyers based on the mean of their responses.

(b) Testing the reliability of Sections B, C of questionnaires

Cronbach Alpha was calculated for each section of the questionnaire:

Sections of Questionnaire	Cronbach Alpha
Section B (Attitude Towards Coupons)	0.864
Section C (Impulsive Buying)	0.733

(c) Checking the normality of collected data

Normality test was applied.

Average values of collected responses for each section was calculated and used for applying normality test.

Since the sample size < 2000, Shapiro-Wilk test has been used for ascertaining the normality of the data at hand

Thus the p-values are well below 0.05; therefore the data under consideration is not normal. Thus, non-parametric tests shall be used for analysis.

(d) Testing the hypotheses – H1

We conducted the Chi square test since data is non-normal. We have conducted the test for difference in categories amongst the Age and Gender demographics.

After conducting the test the value of significance in the output is the Pearson Chi- square and the p value corresponding the same. So the results are as follows –

Variable	P - Value
Gender – Pearson Chi Square	**0.485**
Age – Pearson Chi Square	**0.002***

The value for Age is less than 0.05 thus highlighting that there is a difference in impulsive buyers across the age groups. The difference is then checked and found out to be between the age group of 18-35 and 35 and above. This highlights an important aspect of demographics.

Thus the hypothesis of no significant relationship between the two variables is rejected.

Model		Standardized Coefficients	
	B	**Beta**	**Sig.**
Constant	**2.200214**		**.010**
Coupon Proneness	**0.288**	**0.306**	**.000**

VI REGRESSION ANALYSIS

Thus regression equation based on the table above is-

Impulsive Buying = 2.200214 + 0.306 (Coupon Proneness)

This implies that for 0.306 changes in Coupon Proneness there is one unit change in impulsive buying.

VII CONCLUSIONS AND IMPLICATIONS OF THE STUDY

Thus, the above tables give some keen insights into the usage and attitude of consumers towards coupons and their relationship to the impulsive buying behavior-

			Impulsive Buying	Coupon attitude
Spearman's rho	**Impulsive Buying**	**Correlation Coefficient**	**1**	**0.248****
		Sig. (2-tailed)		**0.011**
		N	**104**	**104**
	Coupon attitude	**Correlation Coefficient**	**0.248****	
		Sig. (2-tailed)	**0.011**	
		N	**104**	**104**

(e) Testing the hypotheses – H2

We made use of Spearman's Correlation test to analyze the hypotheses H2, due to the following relevant factors:

(i) The hypotheses try to study the relationship between attitude towards and coupons and Impulsive Buying Behavior.

(ii) The data is non-normal in nature.

- **Applying Spearman's Correlation test**

**Correlation is significant at the 0.05 level (2-tailed).

(a) Most people in the age group of 18-35 years are coupon users with online coupons being the largest source of the coupons but still the frequency is minimal thus providing a window of opportunity.

(b) Also people from this age group are more prone to impulsive buying and thus need to paid special attention as their decisions are made quickly rather than the ones who make much thought off decisions.

(c) The need of coupons is not being felt in the higher age groups. This is a potential segment that has not been targeted. The

challenge is to create a need for the same. Value creation is the way forward.

(d) Today's Shoppers are impulsive and show favorable attitude towards coupons. Thus greater attention needs to be paid on platforms such as mobile apps, message services etc. so as to provide them exciting offers on the go.

REFERENCES

[1] Bawa, K., & Shoemaker, R. W. (1987). The coupon-prone consumer: some findings based on purchase behavior across product classes. The journal of marketing, pp. 99-110.

[2] Jalees, T. (2009).An empirical analysis of impulsive buying behavior in Pakistan. Market Forces, 5(3)

[3] Kacen, J. J., & Lee, J. A. (2002).The influence of culture on consumer impulsive buying behavior. Journal of consumer psychology, 12(2), pp. 163-176.

[4] J. Kitchen, P., Faridah Syed Alwi, S., Che-Ha, N., & Yee Lim, P. (2014). Coupon redemption behaviour: a Malaysian cross-segment investigation. Marketing Intelligence & Planning, 32(1), pp. 66-88.

[5] Lalwani, A. K., Wang, J. J., &Janiszewski, C. (2018). How Do Consumers' Cultural Backgrounds and Values Influence Their Coupon Proneness?: A Multi-Method Investigation. Journal of Consumer Research.

[6] Lichtenstein, D. R., Netemeyer, R. G., & Burton, S. (1990). Distinguishing coupon proneness from value consciousness: An acquisition-transaction utility theory perspective. The Journal of Marketing, pp. 54-67.

[7] Immanuel, D. M., &Mustikarini, C. N. (2018).Price perception: effect of coupon proneness and sale proneness on consumer impulse buying. JurnalAplikasiManajemen, 16(1), pp. 51-60.

[8] Mattila, A. S., &Wirtz, J. (2008).The role of store environmental stimulation and social factors on impulse purchasing. Journal of Services Marketing, 22(7), pp. 562-567.

[9] Peck, J., & Childers, T. L. (2006). If I touch it I have to have it: Individual and environmental influences on impulse purchasing. Journal of business research, 59(6), pp. 765-769.

[10] Rook, D. W. (1987).The buying impulse. Journal of consumer research, 14(2), pp. 189-199.

[11] Rook, D. W., & Fisher, R. J. (1995). Normative influences on impulsive buying behavior. Journal of consumer research, 22(3), pp. 305-313.

[12] Weinberg, P., &Gottwald, W. (1982).Impulsive consumer buying as a result of emotions. Journal of Business research, 10(1), pp. 43-57.

An Enquiry into the Impact of Financial Crisis on Investment Pattern of Life Insurance Corporation of India

Dr. Abhijit Sinha[1], Soumen Kumar Das[2]

[1,2] Dept. of Commerce, Vidyasagar University, Medinipur (West Bengal) India

ABSTRACT

The present empirical study makes an in-depth analysis of the investment of Life Insurance Corporation of India (LICI), the insurance behemoth in India. The analysis is made on the basis of fourteen years' data from 2003 to 2016. The study includes an analysis of the investment across sectors namely public, private, joint and cooperative and into different instruments (stock exchange securities and others) by not only looking into the year-on-year growth but also growth during the period. Furthermore, the exploratory study looks into structural break, if any with regard to investment between the pre-financial crisis and post-crisis period. The investigation also aims to find out the relationship between investment in stock exchange securities and capital market movement.

Keyword: LICI investment, growth, Sectoral investment, Instrument investment, Correlation, Structural break

I INTRODUCTION

In financial system, financial intermediaries form very important component that play a major role in the economic development of a country. The studies of Greenwood and Jovanovic (1990) and Pagano (1993) have theoretically emphasised the impact of intermediaries that convert the savings into investment thereby leading to better allocation of capital. Similar such comments have been made in the research works of Outreville (1990) and Beck and Hebb (2003).

If we consider 'financial intermediaries', the first few names that come to our mind include banking, insurance, mutual funds, microfinance institutions etc. Hence, the importance of insurance has been duly acknowledged across the globe by policy-makers and researchers. The International Labour Organisation (2008) in a briefing note mention that insurance is considered to bring in funds that will stay in the long-term and will be stable for both financial markets and economy. Haiss and Kjell (2007) in their study show the positive effect of life insurance on the gross domestic product in fifteen countries of the European Union.

Insurance in India is not a new one. The industry has been in existence since the middle of nineteenth century and over time reforms have taken place to give a better shape to the industry and better regularise the sector. The nationalisation of life insurance industry that led to the formation of LIC in 1956 was done since the performance of provident societies was very poor with high operating expenses and huge policy lapses. Moreover, the industry business showed business concentration among certain business groups of the society because of their high-income profile. Since then, the insurer till 2000 operated as a monopoly player in the life insurance space in India. The story of deregulation in 2000 was in tune with the financial sector reforms that started in the early half of the 1990s after the New Economic Policy was implemented by the then Congress government. The insurance sector reforms that were brought about by the Malhotra Committee were aimed at "creating a more efficient and competitive financial system suitable for the requirements of the economy keeping in mind the structural changes currently underway and recognizing that insurance is an important part of the overall financial system where it was necessary to address the need for similar reforms…..". Since then, the industry has become vibrant with the entry of a large number of insurers. Hence, the monopoly status of LICI ended and it started losing some share of the market. No matter how much share it holds in the market, the role of LIC as an institutional investor has been phenomenal and unquestionable. The public sector insurer has been playing a very important role over the years since its establishment in 1956 in respect of making investments in different sectors of the economy, offering loans for different activities to different institutions and making investments in the share market and bond market. The total investment of LICI stood at Rs. 112.90 billion in 1986 which increased to Rs. 1390.32 billion in 2000 and currently stands at Rs. 19259.49 billion at the end of March 2016. Hence, in three decades, there has been a phenomenal increase in the contribution of LIC in different sectors and securities. The present study

aims to gain insight into the pattern of investment of LICI in the pre- and post-crisis period.

II LITERATURE REVIEW

It is known to all that review of earlier studies is a must before one decides the line of thinking as without such understanding it is difficult to identify the research gap. It is necessary to ensure that there is no repetition of studies as the concept of research is about doing something new. A snapshot of the earlier studies is given here. Husain (2010) in the article "Growth of LIC of India during post privatisation period" makes a comparison of offices and discusses about the wide expansion that LIC has shown over the years. The performance parameters includes issue of new policies, premium underwritten, market share of LIC and different financial ratios. Kadam (2012) in the study "Life Insurance Corporation of India: A Giant in India's Insurance sector" looks at the progress and performance of its business in India with details about its revenue and its functioning in the global market. Nena (2013) in the research paper titled "Performance evaluation of Life Insurance Corporation of India" looks at the expense side of the business. Natarajan (2013) in the article "Determinants for evaluating Life Insurance Corporation of India" makes a comparative analysis of insurance density and penetration with growth rate of gross domestic product and gross domestic savings in India. Bawa and Chattha (2013) in their article "Financial performance of life insurers in Indian Insurance Industry" look at the growth of life insurance industry and business performance with respect to various ratios like current ratio, solvency ratio, return on asset and leverage ratio. Jena (2014) in the article "Financial performance of selected Indian life insurance companies" looks at five life insurers which include LICI, ICICI Prudential Life, SBI Life Insurance, HDFC Standard Life and Birla Sun Life. For performance analysis, the areas studied include liquidity ratios like current ratio, acid-test ratio, profitability ratios and growth in assets over the years. Bhagavathi and Revathy (2015) in their article "Performance of Life Insurance Corporation of India" look at various parameters at the international arena to understand the growth in insurance premium and position of various economies in terms of insurance penetration and density. For the assessment of LIC's performance, a discussion is made about performance areas that include number of policies issued, new business, increase in sum assured, number of active agents, settlement of claims and commission paid to agents. Singh (2015) in the article "A study on financial performance of Life Insurance Corporation of India" looks at the expense side of the business. Dolai (2015) in the paper "Managing performance for business development in case of LICI" look at the growth in business, the life fund and sum assured on new policies. Manivannan and Karunanithi (2015) in their article "A study on micro life insurance products of LIC of India in Vellore division, Tamil Nadu" look at the micro-insurance portfolio of LIC of India and analyse its performance in terms of growth in first premium income. Siddiq (2015) in the article "Impact of work stress on LIC employee's performance: A study with reference to Mangalore Taluk" looks at the work stress level for employees and identifies the determining factors that influence such work stress satisfaction. Paramasivan and Anand (2016) in their article "Marketing problems of LIC agents" focus on the problems faced by the agents of LIC in selling their products to different categories of customers. Raghavendra and Gopanapalli (2016) in their article "A study on HRM practices in Life Insurance Corporation of India" look at the employee response on HRM practices. Mallick et al. (2017) in their article "Financial performance of life insurance companies and its impact in Indian economy" look at the growth in number of offices and development in the country with respect to life and non-life insurance business. Agarwal and Mishra (2017) in their article "Life insurance industry of India – Past, present & future" look at the post-nationalization trend and growth of LIC in the post-LPG (liberalisation, privatisation and globalisation) era apart from highlighting the future trend of its business in the country.

(a) Research gap-The above summarisation about various studies on LIC shows that there have been several researches already made on this public sector giant that cover various important aspects. A snapshot of the literature shows that the different areas which are already explored include the aspect of marketing, human resources related aspect, financial aspect in which the focus is on growth in business/market share/premium, ratio analyses, analysis of the expense side of business, impact of insurance companies on the Indian economy, growth and prospects of LIC and progress of the insurance industry and micro-insurance portfolio of the insurer.

The present study plugs one such area that has not been researched upon intensively. Hence, an endeavour is made to add further to the existing depth of knowledge by studying the issue of investment made by LIC across different sectors and instruments.

III OBJECTIVES OF THE STUDY

The main objectives are:

(a) To study the investment pattern and growth across different sectors and investment instruments.
(b) To identify the relationship between share market movement and investment in stock market related instruments.
(c) To check for structural break in the investment as a result of 2008 financial crisis.

IV RESEARCH DESIGN

In any research, there has to be a design that will lay the foundation and determine the strength of the research. For the purpose of this investigation, the following design is made:

(a) The study covers a period of fourteen years from 2003-2016.
(b) The study breaks the study period into two sub-periods namely pre-crisis period from 2003 to 2009 and post-crisis period from 2010 to 2016.
(c) The entire study is based on secondary data that is collected from the RBI.
(d) For meeting the objectives of this study, the research methods that are employed include growth analysis, mean difference test, bivariate correlation, trend analysis using semi-log linear method and Chow test for testing any change in the growth during the two sub-periods.

The semi-log method for determining growth is represented as:

ln (Yt) = a+bt, where Y is the variable whose growth is calculated, t is the time represented by 1, 2, 3,....etc and b is the growth rate.

In Chow test, the null hypothesis is that there is no structural break during the study period.
The procedure for application of this test is given below.

Let RSSp be the sum of squared residuals from the pooled data, RSS1 be the sum of squared residuals for the first sub-period, and RSS2 be the sum of squared residuals for the second sub-period. Also suppose that n1 and n2 are the number of observations in each sub-period and k is the total number of parameters.

The Chow test statistic which follows the F-distribution is calculated as:
$F = [RSSp – (RSS1+RSS2)]/k \div (RSS1+RSS2)/(n1+n2-2k)$.

If the calculated value of F-statistic exceeds the table F-value, null hypothesis is rejected at the set α level. The α level for this study is set at 5%. For this study, n1 is seven, n2 is six and k is two.

V ANALYSIS AND FINDINGS

(a) Distribution of LIC investment across sectors

The table below shows the distribution of investment across different sectors in the country.

Table 1
Distribution of LIC investment across sectors
(all figures are in Rs. bn)

Year	Inv. in Pub. sector	Inv. in Pvt. sector	Public + Pvt. Sector	Inv. in Jt. sector	Inv. in Co-op. sector	Total
(1)	(2)	(3)	(4) = (2) + (3)	(5)	(6)	(7)
2003	2195.97 (87.22)	294.07 (11.68)	98.90	6.85 (0.27)	20.82 (0.83)	2517.70
2004	2717.79 (83.18)	519.24 (15.89)	99.07	9.60 (0.29)	20.80 (0.64)	3267.41
2005	3220.22 (81.90)	684.85 (17.42)	99.32	12.70 (0.32)	14.08 (0.36)	3931.85
2006	3788.07	1051.48	99.33	19.15 (0.39)	13.56 (0.28)	4872.27

	(77.75)	(21.58)				
2007	4338.10 (83.15)	842.94 (16.16)	99.30	0.75 (0.02)	35.55 (0.68)	5217.35
2008	5033.88 (79.18)	1284.68 (20.21)	99.39	0.74 (0.01)	38.18 (0.60)	6357.48
2009	5720.50 (74.98)	1871.41 (24.53)	99.51	0.72 (0.01)	36.29 (0.48)	7628.92
2010	6783.74 (73.88)	2361.35 (25.72)	99.59	0.71 (0.01)	36.67 (0.40)	9182.47
2011	7990.09 (74.65)	2675.18 (25.00)	99.65	0.82 (0.01)	36.67 (0.34)	10702.76
2012	8996.55 (74.73)	3005.10 (24.96)	99.69	0.85 (0.01)	35.67 (0.30)	12038.18
2013	10187.81 (75.52)	3293.08 (24.41)	99.93	0.86 (0.01)	8.22 (0.06)	13489.96
2014	11942.61 (79.03)	3160.24 (20.91)	99.94	0.94 (0.01)	7.54 (0.05)	15111.33
2015	13697.13 (80.17)	3379.97 (19.78)	99.95	0.94 (0.01)	6.85 (0.04)	17084.89
2016	15788.42 (81.98)	3458.52 (17.96)	99.93	0.96 (0.00)	11.59 (0.06)	19259.49
SD	4286.98	1184.67	-	5.85	12.79	-
Mean	7314.35	1991.58	-	4.04	23.04	-
CoV	0.59	0.59	-	1.45	0.56	-

Source: Computed by the researchers

Figures in the parentheses represent percentage share.

The computation in the above table shows that the values of coefficient of variation are very low thereby throwing light on the fact that things have not changed much over the years in terms of share of the total investment made. The overall pattern has remained the same during the study period.

The following observations can be made from the above table.

(i) Investment in public sector:- From 2003 to 2016, it is obvious that the year-on-year investment is increasing. But if we look at percentage of investment by LIC in the public sector, then it can be commented that from 2003 to 2006, there is a downward move in the trend of investment. In 2007, though the percentage of investment increases to 5.4%, between 2007 and 2010, there is a down-pulling effect as before. After the financial crisis of 2008, the percentage of investment in the public sector shows an uptrend from 2010 to 2016. The mean share of investment in the public sector stands at 79% which shows the kind of support that LICI provides by making investments in these sectoral units.

(ii) Investment in private sector:- On the basic of the above computation, it can be mentioned that the investment in private sector shows an year-on-year rise in all but two years, viz. 2007 and 2014. If we look at the percentage of investment, it is evident that during the initial years from 2003 to 2010, the trend shows an increase with a break in 2011 after which there is a continuous rise, though it is marginal. If we only look at private sector investment, an average of 20.44% is invested by LIC in this sector. Hence, the share of investment in the public and private sector combined stands close to 99 percent.

(iii) Investment in joint and cooperative sectors: It is clear that since more than 99% goes to the public and private sectors, a meagre one percent goes to these two sectors. The average share of LIC's investment in the joint sector is a paltry 0.1% which is slightly lower than the 0.36% share towards the cooperative sector.

Thus, the above analysis shows that LIC's investment is concentrated mainly in the public sector, more so it being an insurance company set up under an Act of Parliament. The private sector investments have also been substantially high. The remaining two sectors

attract negligible amounts of investment from the insurance giant. The value of coefficient of variation in all the cases shows that it is quite low which points to a low dispersion and thus points to a similar trend throughout the period.

(b) Pattern in LIC investment across different instruments

This sub-section looks into the investment by LIC across different instruments.

Table 2
Share of LIC investment across instruments

Year	Inv. in stock exchange securities	Loans
2003	88.65	11.35
2004	91.07	8.93
2005	90.45	9.55
2006	92.47	7.53
2007	92.08	7.92
2008	92.88	7.12
2009	93.82	6.18
2010	94.97	5.03
2011	95.91	4.09
2012	96.56	3.44
2013	96.91	3.09
2014	97.20	2.80
2015	97.63	2.37
2016	98.19	1.81
SD	3.05	3.02
Mean	94.18	5.83
Coefficient of variation	0.03	0.52

Source: Computed by the researchers

The observations from table 2 are given below.

(i) Investment in stock exchange securities:- On the basis of the above table, it can be said that percentage of investment in stock exchange securities shows a rise in 2003 and 2004 after which there is a decline, though short lasting. From 2006 to 2016, there is a continuous upward trend with a share of 98.19 percent in 2016. The average investment in stock exchange securities stands at 94.18 percent.

(ii) Investment in loans:- In comparison to the investment in stock exchange securities, the investment in loans is quite low. An overall observation shows that there is a slow downtrend during the period of study which is in contrast to the slow but steady increase in the case of stock exchange securities.

(c) Relationship between 'market' and LIC's investment

In this sub-section, the researchers draw a relationship between movement in capital market and investment of LIC in stock exchange securities. For the purpose, the investigators use the Nifty and Sensex as proxies for the capital market.

Table 3
Correlation between capital market movement and SEIS

Variable of interest	SEIS
Nifty	0.886*
SENSEX	0.878*

Source: Calculated by researchers

SEIS stands for stock exchange investment in securities

The result shows that in both the cases the relationship is highly positive and also significant at 1% level. The strength of relationship with Nifty and Sensex shows a value of 0.886 and 0.878 respectively. Thus, this can be interpreted as an increase in the investments in the stock market securities with upward movement in the capital market. Similarly, there has been a severe cutting in the investment in case of a falling market.

(d) Growth of LIC investment

In this section of the research, the year-on-year growth and trend equations are arrived at for different cases of investment.

Table 4
Year-on-year growth of LIC investment
(figures are in %)

Year	Investment in public sector	Investment in pvt. sector	Investment in jt. sector	Investment in coop. sector	Total
2003	NA	NA	NA	NA	NA
2004	23.76	76.57	40.19	-0.13	29.78
2005	18.49	31.89	32.37	-32.28	20.34
2006	17.63	53.54	50.76	-3.71	23.92
2007	14.52	-19.83	-96.08	162.17	7.08
2008	16.04	52.40	-1.33	7.40	21.85
2009	13.64	45.67	-2.70	-4.95	20.00
2010	18.59	26.18	-1.39	1.05	20.36
2011	17.78	13.29	15.49	0.00	16.56
2012	12.60	12.33	3.66	-2.73	12.48
2013	13.24	9.58	1.18	-76.96	12.06
2014	17.22	-4.03	9.30	-8.27	12.02
2015	14.69	6.95	0.00	-9.15	13.06
2016	15.27	2.32	2.13	69.20	12.73

Source: Computed by the researchers

(i) (**Sector-wise analysis)**

- **Investment in Public sector:-** On the basis of the above table, it can be said that from 2004 to 2007, there is a rise. In 2008, the year-on-year (yoy) growth increases to 16.04% from 14.52% but it dips again in the following year following the financial crisis. Though there are years of rise and fall, the overall trend shows a rise during the period.
- **Investment in Private sector:-** With respect to LIC's investment in the private sector, during the study period, it is observed that during the initial years of the study period, the y-o-y growth is quite high which however declines substantially during the latter half of the period. Till 2009, the y-o-y growth rates were very high with maximum and minimum being 76.57% and 31.89% (not considering the negative growth in 2007). From 2010, following the financial crisis, the year-on-year growth declines considerably and that too following a similar trend throughout.
- **Investment in joint sector:-** In the joint sector, during 2007 to 2010, there is a negative growth. The computation shows that in the early

years there has been a substantial rise year-on-year. But, in the recent years, either there has been a decline or the growth rate is low.

- **Investment in co-operative sector: -** On the basis of the above table, it can be remarked that in most of the years there has been a decline from the previous year. Thus, there is a downward overall trend.

(ii) Test for difference in the growth rates in the different sectors

From the nominal figures, it is evident that there is a significant difference among the sectors. Hence, for a better understanding, the researchers look at the year-on-year growth rate on which the hypothesis is tested. The null hypothesis (H0) is: There is no significant difference in investment flow across the sectors.

The alternate hypothesis (H1): There is significant difference in investment flow across the sectors.

Table 5
ANOVA result based on year-on-year growth of investment

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	2987.850	3	995.950	.782	.510
Within Groups	61129.514	48	1273.532		
Total	64117.364	51			

Source: Computed by the researchers

The result for anova shows that there is no significant difference among the sectors in respect of their growth during the period as evident from the p-value of 0.510 for the F-statistic having a value of 0.782.

(iii) Instrument wise analysis

The analysis looks into the flow of LIC's investment into different securities which are divided into stock exchange securities and loans.

Table 6
Year-on-year growth of LIC investment (instrument-wise)

Year	Investment in Stock exchange securities	Loans	Total
2003	NA	NA	NA
2004	33.77	15.47	29.78
2005	19.51	18.02	20.34
2006	26.69	-1.05	23.92
2007	6.63	11.24	7.08
2008	22.91	9.62	21.85
2009	21.21	4.20	20.00
2010	21.85	-2.81	20.36
2011	17.71	-4.52	16.56
2012	13.24	-5.38	12.48
2013	12.47	0.57	12.06
2014	12.36	1.40	12.02
2015	13.56	-4.27	13.06
2016	13.38	-13.98	12.73

Source: Computed by the researchers

- **Investment in stock exchange securities:-** On the basis of the above table, a look at the y-o-y growth of LIC's investment in stock exchange securities reveals that during 2004 to 2016, in some of the years, there is a decline and increase otherwise. A noticeable point is the low rise in 2007 which however improves substantially after that. Overall, we observe that the rate of increase over the previous year shows a slow decline in nominal figures.
- **Investment in loans:-** The figures show that in 2006 and from 2010 to 2012 and 2015 to 2016, there is a negative growth on a year-on-year basis. An observation is that though there has been a rise in the earlier years, in recent years there are declines in most of the years.

Table 7
Test for difference using Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	T	Df	Sig.	Mean Diff.	Std. Error Diff.	Lower	Upper
Var. 1	Equal variances assumed	.748	.396	4.901	24	.000	15.906	3.245	9.207	22.605
	Equal variances not assumed			4.901	22.77	.000	15.906	3.245	9.188	22.624

Source: Computed by the researchers

- **Variable used:** year-on-year growth of investment across the two categories of securities

The result of the t-test shows a statistically significant difference in the growth for the two categories of securities at 1% level as evident from the p-value of 0.000.

(e) Tracing the growth in LIC investment

In this section, the researchers derive the trend equation for the different variables considered important for the study. Since financial crisis was a major economic event that shook the world, the growth rates are calculated for the pre-crisis, post-crisis and the entire period.

Table 8
Growth rates of LIC investment

Sl. no.	Variable	Pre-crisis period	Post-crisis period	Pooled period
Sector-wise investment				
1.	Investment in Public sector	15.7%* (27.721)	13.8%* (46.504)	14.8%* (78.155)
2.	Investment in Private sector	27.0%* (7.365)	4.6%* (4.207)	18.3%* (10.343)
3.	Investment in joint sector	-52.5% (-2.632)	3.4% (6.713)	-21.0%* (-3.424)
4.	Investment in co-operative sector	13.6% (1.963)	-30.8%*** (-2.224)	-6.4% (-1.540)
Security-wise investment				
5.	Investment in stock exchange	18.5%* (17.487)	12.2%* (131.941)	16.1%* (32.275)
6.	Investment in loans	8.6%* (9.616)	-3.5%*** (-2.708)	1.6% (1.765)

Source: Computed by the researchers

* significant at 1% level, and *** significant at 10% level

Figures in the parenthesis are values of t-statistic.

(i) Growth of investment in public sector: As per the trend equation, it is observed that the growth in investment of 15.7% during the pre-crisis period is the highest. There has

been a substantial decline in growth to 13.8% during the post-crisis years. The computation on pooled data reveals a growth of 14.8% which is comparatively good.

(ii) Growth of investment in private sector: There is a remarkable change in trend with respect to LIC's investment in the private sector. In the pre-crisis years, the growth was at a phenomenal rate of 27% which dipped drastically to a mere 4.6% during the post-crisis years. This might be due to extra caution by LIC strategists to limit investment in the private sector following the crisis and falling share market. However, the overall growth is 18.3% which is due to the contribution in the pre-crisis period.

(iii) Growth of investment in joint sector: The investment pattern in the joint sector is in sharp contrast to that in the public and private sectors. During the pre-crisis period, there is a severe dip in the investment with a negative growth of 52.5%. Following the crisis, there was a slow growth of 3.4% till 2016. The overall scenario shows investment into this sector to be poor with an overall decline of 21%.

(iv) Growth of investment in co-operative sector: The trend in investment flow of LIC to this sector does not match the pattern as seen in the other cases. The dis-similarity is due to the fact that during the pre-crisis period, there is an increase in the flow which however came down sharply during the post-crisis period. The overall growth is negative at 6.4%.

(v) Growth of investment in stock exchange: The computation shows that there is a sharp decline in flow of investment to stock exchange-based securities. During the pre-crisis period, there is a growth rate of 18.5% which declines to 12.2% after the crisis. The overall growth rate is seen at 16.1%. The pattern is a reflection of avoiding investment in the stock-exchange based securities following the sharp beating of the market due to the financial crisis. It was the period when the stock markets across were in a shattered state and there was a natural tendency among individual and institutional investors to avoid share market and debt market.

(vi) Growth of investment in loans: A look at the growth rates during the pre- and post-crisis period shows that there is a drastic fall in terms of investment as loans by LIC. One of the probable reasons could be the falling interest rate across markets which automatically led LIC to make investments in avenues that can generate higher returns.

(f) Test for structural break

In this part of the analysis, effort is made to identify whether the growth equation for different variables shows a structural break after the occurrence of the financial crisis of 2008, a major event that had a severe down-pulling effect on the global economic growth and different economies.

The hypothesis tested is:
The null hypothesis (H0): There is no structural break during the study period.

Alternative hypothesis (H1): There is a structural break during the study period.

For the purpose, the year for break is considered as 2010 intentionally to allow for the effect of 2008 to slowly trickle down before the event holds a grasp on the operational performance. The test for structural break is done using the Chow test which is based on F-statistic. The basic fundamental of this test is that it considers the growth during the two sub-periods individually and entire period as a whole and compares them to find whether there is any structural break.

The results of the test are given below.

Table 9
Results of Chow Test for Structural break for different investments of LICI

Investment Variable	F-statistic calculated	Inference
In public sector	3.181	The null hypothesis is not rejected. There is no structural break
In private sector	14.981	The null hypothesis is rejected at 1% level of significance
In joint sector	3.743	There is no structural break

In cooperative sector	5.965	There is structural break at 5% significance level
In stock exchange securities	14.639	The null hypothesis is rejected at 1% level of significance, thereby pointing to a structural break
In Loans	43.361	The null hypothesis is rejected at 1% level of significance

Source: Calculated by the authors

$F_{2,9,0.01} = 8.02$, $F_{2,9,0.05} = 4.25$

VI CONCLUSION

The focus of the study is the investment trend followed by LIC during the period 2003 to 2016. This period is a span of fourteen years which covers both pre-financial crisis period and the post-financial crisis period. It is interesting to note the trend in investment by LIC across different sectors and investment securities. The analysis of data shows that with regard to sectoral investment, the public sector units take the major chunk of its total investment portfolio with a mean of close to 80%. The share of the private sector stands at around 19% and the remaining 1% goes to the joint and cooperative sectors. A look at the year-on-year growth aspect shows that though there have been ups and downs, the overall curve is an upward going line for the investment in public sector. With regard to private sector investment, it is evident from data that though the growth was reasonably at a good rate till the year of financial crisis, after that there has been a considerable decline which followed the same trend till 2016. For a statistical inference on the growth pattern, the mean test shows that there is no statistical difference in respect of 'growth' variable during the study period. Hence, it can therefore be remarked that though there is a difference in terms of nominal values, the growth aspect does not differ considerably in statistical parlance.

The second focus on investment in the study is the investment in securities and disbursement of loans. The growth of investment clearly points to the fact that after the financial crisis there has been a dip in the investment in stock-market based securities which shows the tendency to show lesser interest in capital market investments following the blood bath in financial markets across the globe. The final part of the study about structural break gives interesting results. The results show that in the cases of investment flow to the private sector, cooperative sector and in stock-exchange base securities and loans, there are a significant change / shift in the pattern of growth between the pre- and post-crisis period. Thus, the overall study shows that there has been an impact on the flow of investment of LICI during the study period. Hence, the financial crisis can be considered to be a major event that changed the pattern of flow of money to different sectors and instruments.

REFERENCES

[1] Agarwal, S. & Mishra, A K. (2017). Life Insurance Industry of India – Past, Present & Future (A Study of LIC of India). SSRG International Journal of Economics and Management Studies, 4(4), 43-47.

[2] Bawa, S K. & Chattha, S. (2013). Financial Performance of Life Insurers in Indian Insurance Industry. Pacific Business Review International, 6(5), 44-52.

[3] Beck, Thorsten and Webb, Ian (2002). Economic, Demographic and Institutional Determinants of Life Insurance Consumption across Countries. World Bank and International Insurance Foundation. Available at https://www.gtap.agecon.purdue.edu/resources/download/8576.pdf, accessed on May 10, 2018.

[4] Bhagavathi, S. & Revathy, B. (2015). Performance of Life Insurance Corporation of India. International Journal of Management and Social Sciences Research, 4(3), 28-35.

[5] Dolai, D. (2015). Managing Performance for Business Development: The Case of LIC of India. International Journal of Emerging Research in Management &Technology, 4(7), 60-64.

[6] Greenwood, J., & Jovanovic, B. (1990). Financial Development, Growth, and the

Distribution of Income. The Journal of Political Economy. 98(5), 1076-1107.

[7] Haiss, Peter R. and Sümegi, Kjell (2007). The Relationship of Insurance and Economic Growth - A Theoretical and Empirical Analysis. Empirical Journal of Applied Economics and Economic Policy, 35(4), 405-431, Available at https://ssrn.com/abstract=968243.

[8] H M, R & R, S.(2015). A Study On Financial Performance Of Life Insurance Corporation Of India. International Journal of Research in Engineering and Technology, 4(14), 90-93.

[9] Husain, S. (2010). Growth of LIC of India during Post Privatisation Period. Management Insight, 6(2), 59-64.

[10] International Labour Organisation (2008). Insurance and economic development: Growth, stabilization and distribution. Impact Insurance.

[11] Jena, A B. (2014). Financial Performance of Selected Indian Life Insurance Companies Insurance Companies Insurance Companies Insurance Companies. International Journal of Computer Science & Management Studies, 14(7), 9-21.

[12] Kadam, R N. (2012). Life Insurance Corporation Of India: A Giant in India's Insurance Sector. International Journal of Physical and Social Sciences, 2(6), 316-325.

[13] Mallick, S. & Das, K K. & Nayak, N. (2017).Financial Performance of Life Insurance Companies and its impact in Indian Economy. International Journal of Innovative Research and Advanced Studies, 4(3), 38-42.

[14] Manivannan, C. & Karunanithi, G. (2015). A Study on Micro Life Insurance Products of LIC of India in Vellore Division, Tamil Nadu. International Journal of Emerging Research in Management &Technology, 4(8), 87-90.

[15] Natarajan, S. (2013). Determinants for Evaluating Life Insurance Corporation of India. Journal of Business Management & Social Sciences Research, 2(9).47-53.

[16] Nena, S. (2013). Performance Evaluation of Life Insurance Corporation (LIC) of India. International Journal of Advance Research in Computer Science and Management Studies, 1(7), 113-118.

[17] Outreville, J. Francois. (1990). The Economic Significance of Insurance Markets in Developing Countries. The Journal of Risk and Insurance, 7 (3), 487-498.

A Review on Different Types of Wind Generation

Reeta Pawar[1], Dr. Anil Kurchania[1], Dr. Alpana Pandey[2], Anurag S. D. Rai[1]
[1] Dept. of EEE, Rabindranath Tagore University, Raisen (M.P.) India
[2] Dept. of ECE, MANIT, Bhopal (M.P.) India

ABSTRACT
This research paper is review of different type of wind power generation techniques. Power generation and utilization via wind energy is done by human since 3200 BC. A small introduction about the wind energy followed by Characteristics was taken in this review. Comparison of different type of wind generation system is presented which help in adopting the system as per need. Modelings of wind power plant were also taken into considerations accomplishing different simulation software to model.

***Keywords*-**PWM, Gear Ratio, IG, PSCAD

I INTRODUCTION

Renewable Energy is now buzz again in this decade due to price hike of fossils and nuclear disasters of present few years. As renewable technology and its impacts are not very new, but recent advancements are driving with political wills and policy support boosted this endeavors. In present era researchers were focusing on cultivating energy more from sustainable non-polluting sources, of which major concentration were on, Wind, Hydro, Solar and Biomass. From the advent of human evolution it is dependent on Sun energy, and it is real driving force of life on our planet. Sun whose energy is source of life, but also driving winds, flow of Oceans' currents. The impact of solar energy radiations along with rotation of earth creates the wind systems round the globe which decides the wind flow patterns. Patterns of wind flow are important to tap this energy, for utility analysis, which is provided by every Nations weather forecast centers. In recent years direction of wind flow is changed due to climatic change this causes real worry for Wind Systems installed in past, as they are now becoming absolute. History of Wind power harnessing, from the evidences of 3200 BC, which is used to sail ships; Persians use Wind Mills for pumping water and grain grindings, for the first time in history at 1891 Denmark generated electricity by the use of wind generators.

Since the invention of Wind Electric Generators, there is amendments' in its design as per the continuous process of design thinking and advances in electrical technology and machining facility capability enhancements. Now a day's 2 MW and higher rating single Wind Generators are available and in working, also Tidal waves and Wind Generations were common in coastal areas in North and South Americas, also in European Nations, but not prominently utilized in South East Asia.

II CHARACTERISTICS OF WIND TURBINE GENERATORS (WTGS').

As wind is available in abundant around the globe but it doesn't mean that it is utilizable from everywhere, from the height of ground level to the 10 meter height above on one square meter area minimum wind speed is calculated as per KWh generation capability. In India maximum wind speed is 20-25 Kmph in potential areas utilized for generation whereas yearly average is 9-17 Kmph. For establishment of grid interactive wind power generation, wind farms required 12 hectare/MW, with area having wind power density greater than 200 W/m^2. With the advancement in manufacturing cost of generation were reduced and changes in used materials due to availability of advance lightweight materials. WTGs' were designed and developed based on few characteristics which are as follows:

(i) Power Flow Analysis of an Induction Machine.
(ii) Gear Ratio
(iii) Torque versus Speed of Induction Machine.

(a) Classification of Wind Turbines- Wind Turbines are main constituents of Wind Energy Generation system, which is classified as Horizontal Axis Turbine and Vertical Axis Turbine. Design of wind turbines are dependent on the Drag and Lift phenomenon. Utility of wind turbine depends on the wind penetration and density at the place where wind farms are planned to be installed. Different type of rotors which are in operations are as follows:
(i) Multiblade Rotor
(ii) Propeller Type
(iii) Savonious Type
(iv) Darrieus Type

(b) Squirrel Cage Induction Generator (SCIG)- Harnessing energy from wind is not as simpler as other renewable energy as, the complexity lies in the speed of wind which is not constant all the time. Due to this non-uniform availability of wind energy on the basis of annual average wind speed wind farms are installed and height of

installation is dependent. Due to this Asynchronous generators are used to generate electricity in wind farms popularly known as SCIG. In this construction Wind Turbines are having gear box arrangements, by the gear ratio arrangements asynchronous speed is transmitted to the generator which generate electricity in grid tied farms. Figure 1. Represents the topology of SCIG based wind generation system.

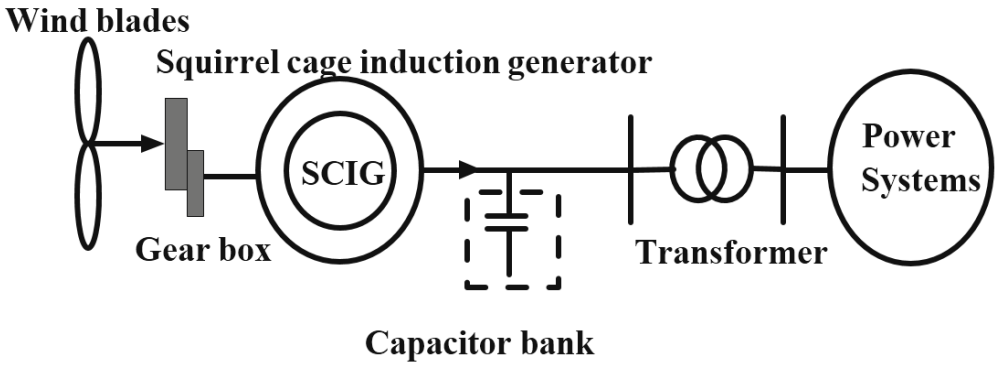


Fig. 1 SCIG Topology

(c) Doubly-Fed Induction Generators (DFIG)- As the SCIG is having its simplicity but the generation of reactive power externally is invincible in its adoption for large system, so a modification which then termed as DFIG. In figure 2, DFIG is shown, both active and reactive powers are decoupled and generation of power can be adjusted by PWM converters. Due to this stability of system is improved along with other parameters which can be controlled as and when required.

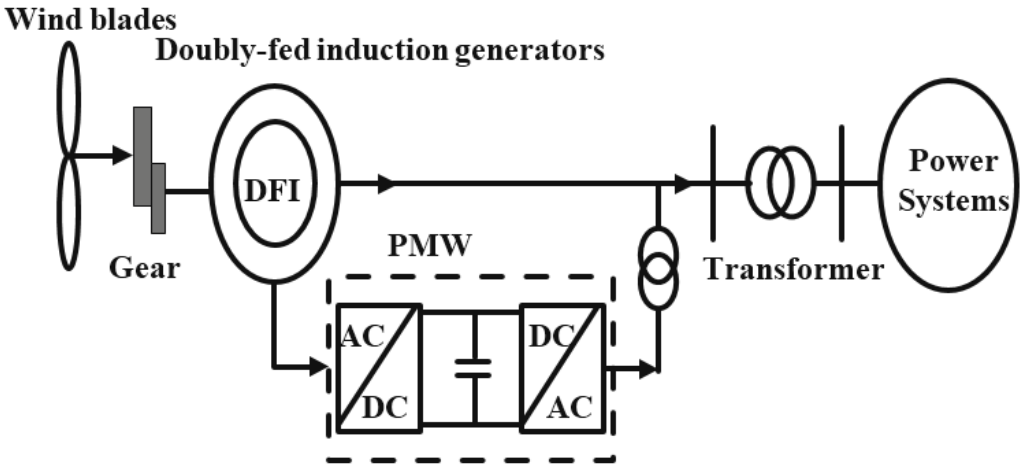


Fig.2 DFIG system topology

(d) Direct Driven Permanent Magnet Wind Power Generators (DDPMG)- This type of generators are adopted for large scale energy generation in MW scale as they are light in weight and free from wear and tear due to robust construction. This is new topology to be used in new age wind energy generation farms. In figure 3. DDPMG is shown in which cascaded connection of converter with grid interface is observed.

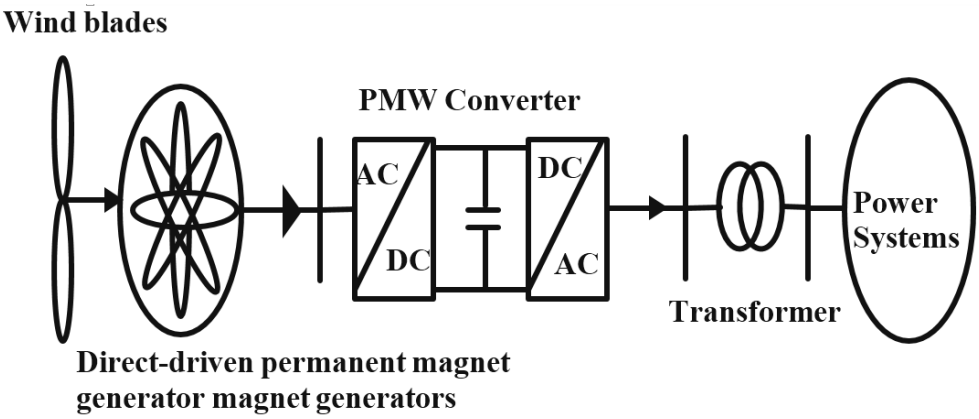


Fig. 3 DDPMG system topology

(e) Performance comparisons- Wind Energy Generation is done by its different topology which used worldwide were discussed in this section. Every technology having its Pros and Qons which lead to adaptation of some other technological advancement or rearrangements in existing facilities, comparison of above discussed wind energy generation schemes are presented in Table-1.

Table 1
Comparison of different WTGs

S.No.	Advantages	Disadvantages
SCIG	Simple in construction, Robust and electrically efficient system having less maintenance, Converters are not required.	Generation in Asynchronous speed is complex; gear ratio is complex, aerodynamically inefficient system with noises.
DFIG	Aerodynamically efficient systems, Noises are reduced.	This system requires complex gear ratio and box for the speed feed adjustment. Due to introduction of converters and feedback it is costly.
DDPMG	Mechanical Stress were reduced, Gear box is eliminated	Size of generator is increased, very costly, large rating converters are needed

III POWER SYSTEM SMALL SIGNAL STABILITY

As power systems is interconnection of different generation source also containing different sink nodes from where power is used by end user. The ability of electric utility to remain in synchronism is termed as stability, where due to variation of rotor angle any disturbances which introduce in systems are small signal. Due to continuous operation of power system, transient of small levels are common, but dynamics stability is prone to major failures, and this is due to contiguous degradation of generator system. In wind energy generation system, small signal stability plays a great role as the speed of rotor for power generation is not constant thus variable throughout the generation period. Due this dynamic stability and permanent wears will create errors in operation and control on mechanical adjustment and electrical adjustment both contexts.

Small Signal stability can be analyze using this two popular mathematical analysis in power systems context:

(i) Eigen Value
(ii) Frequency Domain

IV MODELING AND SIMULATION

With the advancement of technology now before final installation and commission of systems its all possible outcomes and challenges were outlook by the use of specific tools. Simulation software's and specific tools help in modeling of the wind energy generation systems and grid tied designing and its impact analysis. By the use of software like MATLAB-SIMULINK, PSCAD-EMTDC and tools like PSAT helps in Mini grid and micro grid modeling. Homer and PVsyst is software which calculates the yearly wind density predictions on the basis of past data.

As wind power generation is having following integrated steps, conversion of kinetic energy of wind into rotational motion of wind turbine, which consists of gear inside and adjust the shaft power which will be connected to electric generator. As the electricity is generated it has to be fed to the grid but with proper synchronism to the utility system, so designing of systems and its testing before final commissioning helps in resolving many issues.

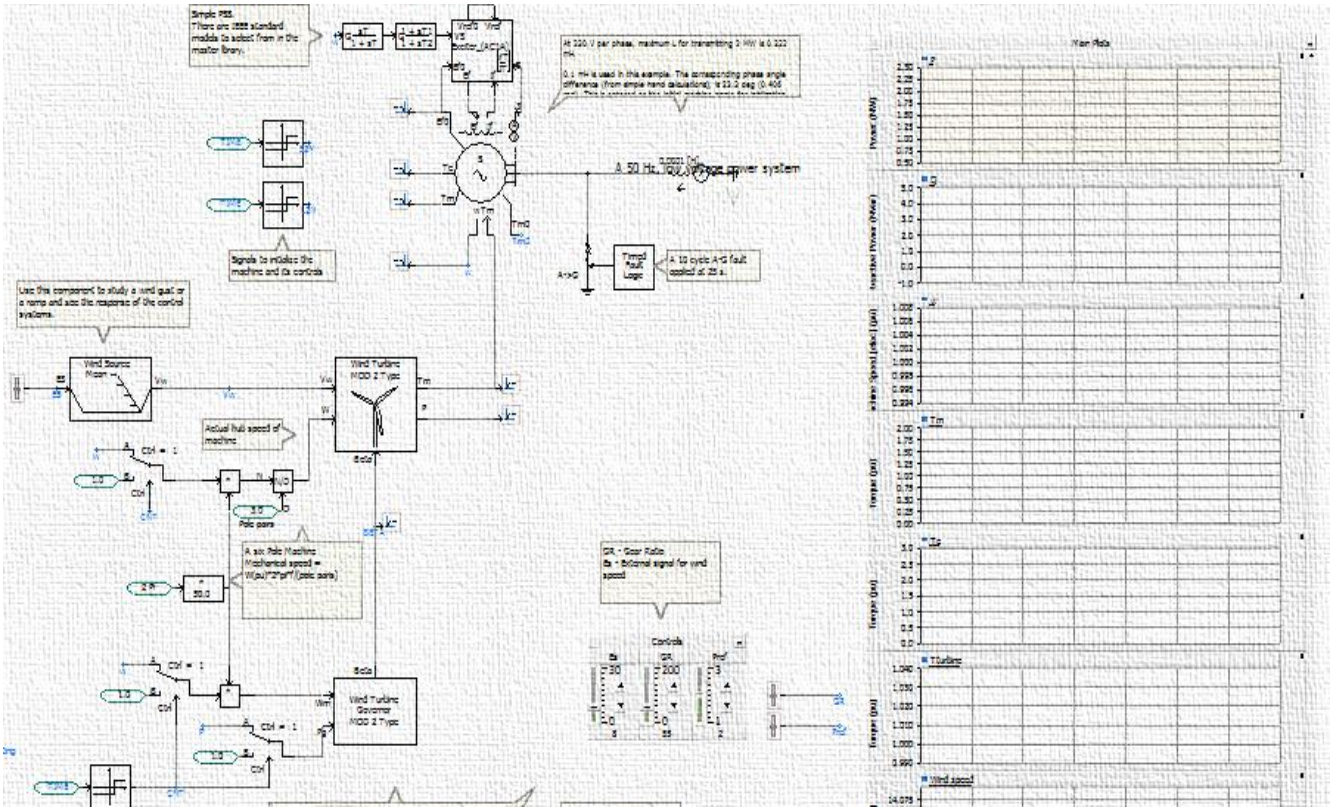


Fig. 4: Wind Farm Model in PSCAD-EMTDC

Now a day mathematical modeling of system, site layout and electrical stimulation of system is done using the above described software and some other specific tools. Stability analysis of system are also study and long term impact are also studied of both type of systems which are under existence and which are in row of existence. As electrical grids are complex real modeling is not possible so software modeling is utilized and popular throughout the globe.

V CONCLUSION

This review paper presents the need of wind energy generation system. Details of different type of wind generators and their evolution. Small Signal stability is the major concern of interconnected wind farms, which is to be taken in consideration while designing the system. Now a day's microgrid and mini grid systems operations and encouragements were round the globe, thus modeling of system before installation is focused by acknowledging software.

REFERENCES

[1] Joselin Herbert GM, Iniyan S, Sreevalsan E et al (2007) A review of wind energy technologies. Renew Syst Energy Rev 11(6):1117–1145

[2] Ackermann T (2005) Wind power in power systems. Wiley,Chichester

[3] Sorensen P, Cutululis NA, Vigueras-Rodriguez A (2007) Power fluctuations from large wind farms. IEEE Trans Power Syst 22(3):958–965

[4] Holdsworth L, Wu XG, Ekanayake JB et al (2003) Comparison of fixed speed and doubly-fed induction wind turbines during power system disturbances. IEE P-Gener Transm Distrib 150(3):343–352 Kundur P (1994) Power system stability and control. McGrawHill, New York

[5] Chedid R, LaWhite N, Ilic M (1993) A comparative analysis of dynamic models for

performance calculation of grid-connected wind turbine generators. Wind Energy 17(4):168–182

[6] Yang LH, Xu Z, Ostergaard J et al (2012) Advanced control strategy of DFIG wind turbines for power system fault ride through. IEEE Trans Power Syst 27(2):713–722

[7] Sun YZ, Wang LX, Li GJ et al (2010) A review on analysis and control of small signal stability of power systems with large scale integration of wind power. In: Proceedings of the 2010 international conference on power system technology (POWERCON'10), Hangzhou, 24–28 Oct 2010, p 6

[8] Yateendra M (2008) Advances in power system small signal stability analysis considering load modeling and emerging generation resources. Dissertation, The University of Queensland, Brisbane

[9] Ekanayake JB, Holdsworth L, Wu XG et al (2003) Dynamic modeling of doubly fed induction generator wind turbines. IEEE Trans Power Syst 18(2):803–809

[10] Tapia A, Tapia G, Ostolaza JX et al (2003) Modeling and control of a wind turbine design doubly fed induction generator. IEEE Trans Energy Convers 18(2):194–204

[11] Cadirci I, Ermis M (1992) Double-output induction generator operating at subsynchronous and supersynchronous speeds: steady-state performance optimisation and wind-energy recovery. IEE P-Electr Power Appl 139(5):429–442

[12] Hagstrøm E, Norheim I, Uhle K (2005) Large scale wind power integration in Norway and effect on damping in the Nordic grid. Wind Energy 8(3):375–384

[13] Rueda JL, Erlich I (2011) Impacts of large scale integration of wind power on power system small-signal stability. In: Proceedings of the 4th international conference on electric utility deregulation and restructuring and power technologies (DRPT'11), Weihai, 6–9 Jul 2011, pp 673–681

[14] Tsourakisa G, Nomikosb BM, Vournas CD (2009) Effect of wind parks with doubly fed asynchronous generators on smallsignal stability. Electr Power Syst Res 79(1):190–200

[15] QuinonezVarelaG,CrudenA(2008)Modellingand validationof a squirrel cage induction generator wind turbine during connection to the local grid. IET Gener Transm Distrib 2(2):301–309

[16] Tse CT, Tso SK (1988) Design optimization of power system stabilizers based on modal and eigen sensitivity analyses. IEE P-Gener Transm Distrib 135(5):406–415

[17] Wang KW, Chung CY, Tse CT et al (2000) Multimachine eigenvalue sensitivities of power system parameters. IEEE Trans Power Syst 15(2):741–747

[18] He P, Wang KW, Tse CT et al (2007) Studies of the improvement of probabilistic PSSs by using the single neuron model. Int J Electr Power Energy Syst 29(3):217–221

[19] Osauskas CM, Hume DJ, Wood AR (2001) Small signal frequency domain model of an HVDC converter. IEE P-Gener Transm Distrib 148(6):573–578

[20] Tabesh A, Iravani R (2008) Small-signal model and dynamic analysis of variable speed induction machine wind farms. IET Renew Power Gener 2(4):215–227

[21] Tsourakis G, Nomikos BM, Vournas CD (2009) Contribution of doubly fed wind generators to oscillation damping. IEEE Trans Energy Convers 24(3):783–791

[22] Fan LL, Miao ZX, Osborn D (2008) Impact of doubly fed wind turbine generation on inter-area oscillation damping. In: Proceedings of the 2008 IEEE power and energy society general meeting—Conversion and delivery of electrical energy in the 21st century, Pittsburgh, 20–24 Jul 2008

[23] Gautam D, Vittal V, Harbour T (2009) Impact of increased penetration of DFIG-based wind turbine generators on transient and small signal stability of power systems. IEEE Trans Power Syst 24(3):1426–1434

[24] Wu F, Zhang XP (2009) Small signal stability analysis and control of the wind turbine with the direct-drive permanent magnet generator integrated to the grid. Electr Power Syst Res 79(12):1661–1667

Controlling Factors in Aluminum Matrix Composites Fabrication

Manoj Kumar Gupta
Asst. Prof., Dept of ME, School of Engineering & Technology
H.N.B Garhwal University (A Central University) Chauras Campus,
Tehri Garhwal (Uttarakhand) India.

ABSTRACT
The aluminum matrix composite (AMCs) is one the promising material for automobile and aircraft industry. It has numerous applications due to their excellent prosperities and light in weight. The properties of the aluminum matrix composite depends on the factor like fabrication methods, process parameters, properties of reinforcement and their wet ability with aluminum, interfacial bonding between matrix material and reinforcement; and microstructure exist in composite. This paper discusses all responsible factors which affect the properties of aluminum metal matrix composite.

***Keywords*:** AMCs, Wet ability, Reinforcements microstructure, mach inability, Wearbility.

I INTRODUCTION

In the field of material science this is the era of composite and smart materials. Every industry required high performance material, so that the component can perform better service at desired condition. In the category of light weight high performance material, the Aluminum matrix composites (AMCs) are widely used by several industries. The composites formed out of aluminum alloys are of wide interest owing to their high strength, fracture toughness, wear temperature application when reinforced with ceramic particle. The reinforcement materials may be oxides, carbides, borides and nitrides of ceramics. The important reinforcement materials used in the aluminum metal matrix composites are carbon/ graphite, silicon carbide, alumina, zirconia and zircon in particulate, whisker or in fibre form. The foremost fabrication methods used for aluminum metal matrix composites are stir casting, squeeze casting, compo-casting, infiltration, spray deposition; direct melt oxidation process and powder metallurgy. The liquid phase processing which involves molten metals such as melt stirring or melt infiltration is mostly used for composite fabrications. But interfacial problematic is much more of a concern in this due to inherent process peculiarities. A weak interface will lead crack propagation at the interface, while a strong matrix associated with a strong interface will reveal cracks across both the matrix and the reinforcements. If however the matrix is weak in comparison with both the interface and the particle strength, the failure will propagate through the matrix itself. The surface roughness of the reinforcing material improves the mechanical interlocking at the interface, though the contribution of the resulting interfacial shear strength is secondary compared to chemical bonding. The large differences in thermal expansion coefficient between the matrix and the reinforcement should be avoided as they can induce internal matrix stresses and ultimately give rise to interfacial failures. In the case of continuous fiber reinforced metals (CFRM), high strength is achieved by preventing chemical reactions between the matrix and the inorganic fibers. While a weak interface is desirable to enhance longitudinal strength and toughness, a strong interface is desirable to achieve good transverse properties in CFRM. Considering physical and chemical properties of both the matrix and the reinforcement material, the actual strength and toughness desired for the final AMC, can be achieved by balancing between them according to conflicting requirements. The physical, mechanical, tribological and others desired properties of composite depends upon factors like processes root and temperature, shape, size, chemical affinity, wet ability and interfacial bonding and reactions of reinforcements materials with matrix material in composite.

II WETTABILITY AND REACTION PHASE

The wet ability of the reinforcement material by the liquid metallic matrix plays a major role in the formation of strong chemical bonds at the interface. It mainly depends on temperature of formation, electronic structure of the reinforcement and the molten metal, temperature, time, atmosphere, roughness and crystallography of the reinforcement. The presence of oxide films on the surface of molten metal and contaminant adsorbed on the reinforcement surface generally leads to non-wetting of the reinforcement with molten metal. The lower wet ability adversely affects the properties of composite. Some of the techniques which improve metal-reinforcement wet ability include metallic coatings on the reinforcement materials, addition of reactive elements, such as magnesium, calcium or titanium, to the melt and heat treatment of reinforcement particles before addition. In the case of fabrication AMCs of Al alloys/ Al_2O_3, the Al_2O_3 reacts with alloying elements of matrix material such as magnesium. In order to enhance its wet ability, metallic coatings such as nickel**,** cobalt and palladium are applied to alumina. It was found that MgO-coated

alumina particles improve the properties of composites. The cobalt coating increases its wet ability during processing. The tensile properties and fracture behavior of cobalt-coated Al_2O_3 fiber-reinforced Al alloy composites shown improved properties compared to that with uncoated fibres. The major problems encountered during the fabrication of SiC-reinforced aluminum matrix composites are the reactivity of SiC with molten aluminum at higher processing temperatures and the poor wet ability of SiC at lower processing temperature (900-1000 K).The wet ability of SiC in aluminum also depend upon the factors like free silicon in silicon carbide, wetting angle, kinetics of SiC and incorporation time [1].It was found that silicon carbide does not incorporate into the liquid aluminum immediately and it is gradually wetted by liquid aluminum. Therefore incorporation time is necessary for full particulates wetting. The incorporation time can be shortened by alloying magnesium and titanium [2,3]. The reaction between SiC and liquid aluminum during processing causes significant degradation in the properties of the composites**.** In order to prevent the degradation of SiC (particles, whiskers or fibres) and improve wet ability, various treatments and coatings are used. The metallic coatings given to SiC are copper, nickel, antimony and silver**.** The wet ability of copper, nickel and silver-coated SiC fiber with aluminum is better than as received fiber**.** The driving force for wetting can be increased by the interfacial reaction. In silicon carbide-reinforced AMCs, SiC is thermodynamically unstable in molten aluminum at around temperatures exceeding 1000 K**.** The SiC reacts with molten aluminum form Al_4C_3 and rejecting metallic silicon [36-39]. These reaction products cover SiCp and reduce wet ability. This reaction can be suppressed by having matrix alloy containing higher silicon content and maintaining the proper melt temperature**.** The figure 1(a) and1 (b) shows the formation of Al_4C_3 and silicon level required in the matrix to prevent the formation of Al_4C_3as a function of the melt temperature in Al or Al/SiC composite [40]. In case of Al/SiC composite where matrix is as pure aluminum, it was found that no Al_3C_4 forms at the interface [31].

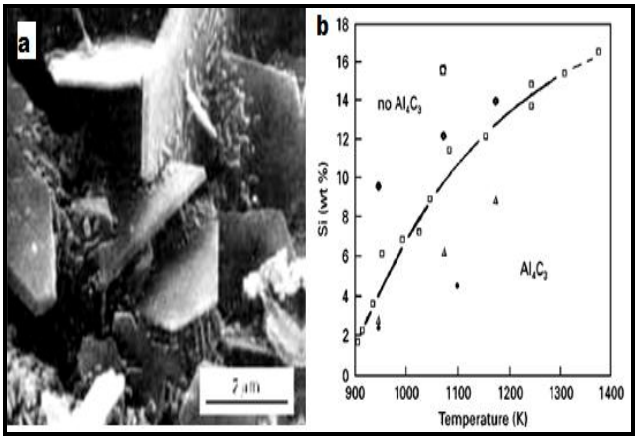


Fig. 1: SiC covered with Al_4C_3 crystals having hexagonal platelet shape [15] and 1(b) Silicon levels required in the matrix to prevent the formation of aluminum carbide as a function of melt temperature [16].

In Al-TiO_2-B_2O_3 system, when the B_2O_3/TiO_2 mole ratio is below 1, the reaction products are composed of particle-like α-Al_2O_3, TiB_2 and rod-like Al_3Ti. The α-Al_2O_3 forms at the grain boundaries due to a lower wet ability with the matrix. When the B_2O_3/TiO_2 mole ratio is around 1, the Al_3Ti phase almost disappears in the composites and the distribution of α-Al_2O_3 particulates is improved evidently[4]. In the system AlMg-Al_2O_3 the formation of magnesium oxide and mixed oxides $MgAl_2O_4$ (spinel) is governed by the magnesium content. At higher contents, MgO is formed while spinal formation decreases as Mg is reduced below 4wt% and non-existent under 1wt% Mg content. However at 1wt% Mg, the wetting of particulate alumina is not extensive. Despite its positive effect on interfacial reactions a high content of Mg is however not desirable from the matrix properties point of view. A strategy to avoid brittle spinal formation while maximizing matrix properties is to mix the alumina first with an aluminum matrix having a content of Mg beyond 8wt%, so that a thin passivation layer of MgO is formed at the surface of the alumina. In a second step, the Mg-content can be decreased at will by adding more Al to the melt, while the MgO layer prevents any spinal formation. The figure 2(a) and 2(b) shows the formation of spinal ($MgAl_2O_4$) on Al_2O_3 and at fiber matrix surface. The figure 3(a) shows that formation of magnesium oxide and magnesium silicate at the fiber surface and figure 3(b) depicted the formation of Al_3C_4 at the interface in Al/C composite system.

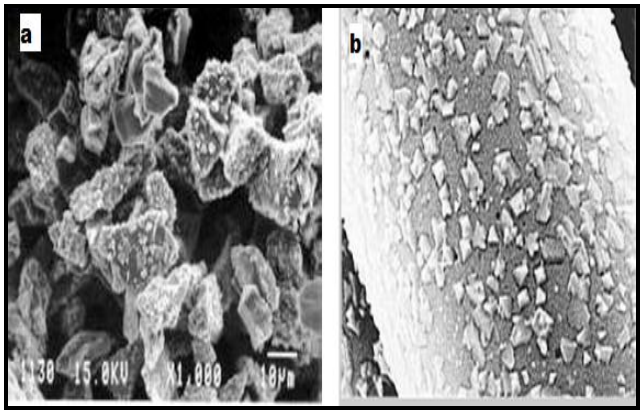


Fig.:2 Aluminum oxide particles covered with spinal ($MgAl_2O_4$) and 2(b) Spinal crystals on the surface of Al 6061 matrix fiber [32,29].

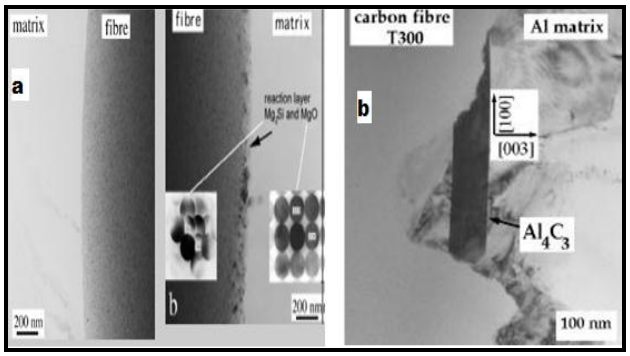


Fig. 3: One side of the fiber is unaffected while the other side shows Mg_2Si and MgO[28] and (b) Formation of Al_4C_3 at the interface [30].

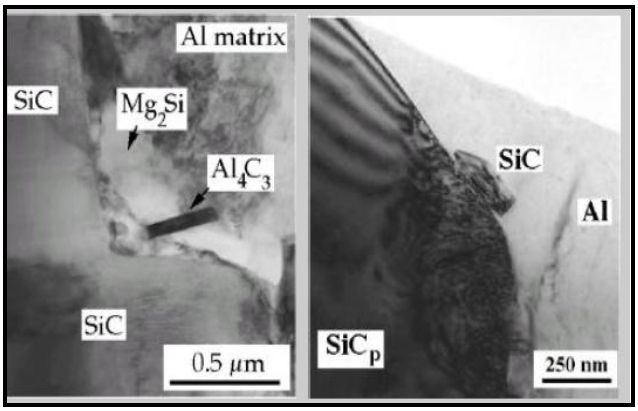


Fig. 4:Al-4Cu-1Mg-0.5Ag/SiC/60p (left) ; Al/SiC/60p (right) : the presence of Mg produces Mg2Si and enhances the formation of Al4C3 While no interfacial reaction if found when pure aluminum is used [31].

Table 1
Interfacial reactions and precipitates.

Element	Al	Mg+Al	Mg	Cu	Ti
C	$4Al+3C \rightarrow Al_4C_3$	$2Al+Mg+2C \rightarrow Al_2MgC_2$ (< 2% Al) $4Al+3C \rightarrow Al_4C_3$ (>2% Al)	no reaction	no reaction	$Ti+C \rightarrow TiC$
Si	AlSi alloy formed	$Si+2Mg \rightarrow Mg2Si$	$Si+2Mg \rightarrow Mg_2Si$	no data	no data
B_4C	$6B_4C+27Al \rightarrow 6AlBBC+9AlB2$. AlB10, Al3B48C2, AlB24C4 also formed	$6B_4C+27Al \rightarrow 6Al_3BC+9AlB_2$ Al B10, Al3B48C2, AlB24C4 also formed	no data	no data	no data
SiC	$4Al+3SiC \rightarrow Al_4C_3+3Si$	$4Al+3SiC \rightarrow Al_4C_3+3Si$	no data	no reaction	$SiC+Ti \rightarrow TiC+Si$
TiC	$4Al+3TiC \rightarrow Al_4C_3+3Ti$ $13Al+3TiC \rightarrow Al_4C_3+3AlBTi$	no data	no data	no data	no data
Al_2O_3	no reaction	$3Mg+4Al_2O_3 \rightarrow 3MgAl2O4+2Al$ $3Mg+Al_2O_3 \rightarrow 3MgO+2Al$	$3Mg+4Al_2O_3 \rightarrow 3MgAl2O4+2Al$	no data	no data
SiO_2	no reaction	$Mg+2SiO_2+2Al \rightarrow MgAl_2O_4+2Si$ $2MgAl_2O_4+3Si \rightarrow 2MgO+3SiO_2+4Al$	$2Mg+SiO_2 \rightarrow 2MgO+2Si$	no data	no data

The figure 4 shows the different interfacial precipitates in Al alloys/SiC and Al/SiC composite system. The Al-B_4C system is reactive at any temperature under 1000°C and reaction products are Al_3BC and AlB_2 [33,34, 35]. The continuous layer of Al_3BC can constitute a efficient diffusion barrier protection of B_4C as shown in figure 5[33, 36].

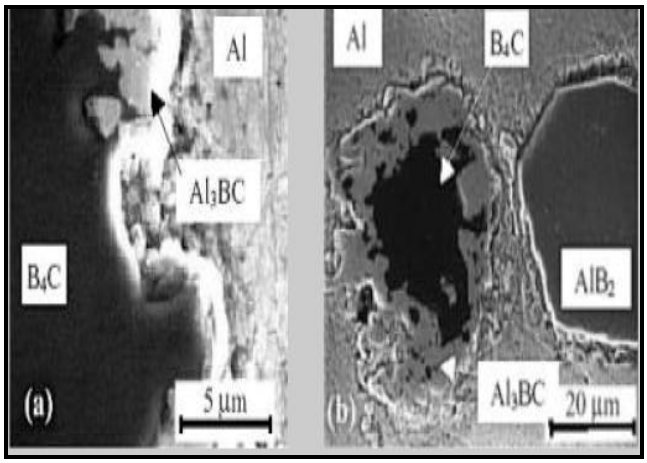


Fig. 5:Al/B4C interface at 727 °C: (a) after 15 h reaction (beginning of the interaction); (b) after 160 h (Passivation stage attained)[33,34,35,36]

The different reaction and reaction products form during the composite formation is depicted in table1.The various materials used for coating the reinforcement and their effects is depicted in table 2.

Table 2
Reinforcement coating and their effects.

Metallic coatings on carbon fiber and their effects on interfaces in AMCs with aluminum.		
Coating Material	Matrix Material	Effects
Copper	Al	Improved wetting and uniform distribution of the fibers.
Nickel	Al	Improved wetting and $NiAl_3$ formation around fibers.
Titanium	Al	1. Promoted wetting. 2. Interfacial reaction between Al and C 3.Difficult to coat due to reaction.
SiC	Al	Effective protection of fibers during processing and improved mechanical properties.
SiO_2	Al	1.Higher modulus of elasticity. 2.Lower strength due to fiber degradation.
Al_2O_3	Al	1.Good reaction barrier but poor wet ability.
TiO_2	Al	1. No reaction at TiO_2/C. 2.Improved wetting with formation of (Al, Ti)O_2 mixed oxide
SiO_2	Al and Al-Mg	1. Significant reduction of Al4C3 process formation at 973K and no protection above 1073K. 2.Once Al reacts with SiO2, the reaction between Al and SiC proceeds. 3.Interfacial reaction is dependent on alloy composition and thickness of SiO2 layer.
Al_2O_3	Al and Al-Mg	1.Good protection in whiskers but no protection in Particulates. 2.Interfacial reaction is
TiO_2	Al and Al-Mg	1.MgO/Ti reaction layer formed [119] in the interface is responsible for the protection of particles. 2.Remarkable reduction in Al4C3 formation.

III REINFORCEMENT MATERIALS AND ITS EFFFECTS ON PROPERTIES

The selection of reinforcements materials depend upon the properties desired for the particular application of composite and chemical suitability with matrix material. In Aluminum matrix composites (AMCs) the ceramic reinforcements are mainly oxides or carbides or borides (Al_2O_3 or SiC or TiB_2). The properties and chemical affinity of these reinforcement materials are discussed as below.

(a) Titanium Diboride (TiB_2): It has superior hardness and corrosion resistance with a high melting point (>2900°C) and good oxidation resistance to 1000°C. Titanium diboride is an extremely hard ceramic compound composed of titanium and boron which has excellent resistance to mechanical erosion. TiB_2 is also a reasonable electrical conductor.

(i) Properties:

- Extreme Hardness nearly as hard as diamond when its sintered.
- TiB_2 is tough enough to be used as military armor and improves the fracture toughness of ceramic cutting tools and other components.
- As an excellent conductor of both electricity and heat, TiB2 is valuable in electronic and specialty applications.
- TiB_2 enhances thermal conductivity when used as filler in polymeric matrices.
- Chemical resistance.
- Titanium diboride will not react with molten, nonferrous metals including Cu, Zn and Al.
- TiB_2 is used as crucibles, vacuum metallization components and electrodes for processing these materials.

(ii) Applications:

- Electrically conductive composites such as aluminum evaporation boats.
- Additives for producing specialty ceramic composite materials.
- Refractory material and antioxidant additive that is nonreactive to most molten nonferrous metals and alloys.
- Thermal management materials.

(b) Silicon Carbide (SiC): The aluminium-SiC composite system finds potential applications as structural elements in the automotive and aerospace industries. These composites possess unique properties such as improved strength, modulus and wear resistance and good resistance to corrosion. But several drawbacks of these materials such as low temperature, ductility and poor toughness hinder their wide range of application.

(c) Alumina (Al_2O_3): The alumina-reinforced aluminum metal matrix composites find wide application next to carbon and silicon carbide-reinforced composites in the areas of automotive and aerospace industries. Al-Al_2O_3 metal matrix composites possess high elevated-temperature strength, wear resistance, damping properties, electrical conductivity, thermal conductivity and coefficient of thermal expansion. The alumina can be in the form of particulates, whiskers and fibres. The alumina in a pure aluminum matrix is considered to be the ideal dispersoid with no chemical reactions. But, when aluminum alloys are used as the matrix, the Al_2O_3 reacts with alloying elements such as magnesium. The other major problem is its lower wet ability below 900K**.**

(d) Effects of reinforcement materials on mechanical and topological Properties: G. B. Veeresh et. al.[5], they prepared two composite Al6061-SiC and Al7075-Al_2O_3 with varying wt % of particles from 2 to 6 by using vortex stir casting and investigated mechanical properties. It was found that hardness increased to 60-97VHN & 80-109VHN respectively. The tensile strength of composite increased 68% & 24% increased respectively. It was found that Al6061-SiC exhibit superior mechanical and tribological properties due to Sic reinforcement. The processing temperature also play important role in composite fabrication. The effect of temperature on properties is depicted in table 1.

Table 3
Effect of temperature on tensile strength of Al/SiC composite.

Materials	Temperature (°C)	Tensile strength (MPa)
6061 Al/SiC	700	0.241
6061 Al/SiC	750	0.352
6061 Al/SiC	800	0.41

Christyet.al.[6], prepared Al6061-TiB_2 (12%wt)composite using the in-situ salt-metal reaction process and compare the mechanical properties and the microstructure of Al 6061 alloy & composite. The hardness, tensile strength and young's modulus of composite increased but ductility of the composite was

found to be slightly lower than that of the aluminum 6061 alloy as depicted in table 2. **D. Danels[7],** examined mechanical properties and stress-strain behavior for several fabricated aluminum matrix composites containing up to 40 vol. % discontinuous silicon carbide whisker, nodule or particulate reinforcement. The four types of aluminum matrices are used: 6061, 2024/2124, 7075 and 5083. Silicon carbide reinforced into the matrix material in a form of discontinuous, whisker, nodule and particulate. They found that the modulus of elasticity increased with increasing reinforcement content. When the factors influencing strength are considered, the effect of the matrix type is found to be the most important. The SiC/Al composites with as 2024/2124 or 7075 Al, has higher strengths but lower ductility. Composites with a 6061 Al matrix showed good strength and higher ductility. The results are shown in figure 6.

Table 4
Effects of Reinforcement on Mechanical Properties

Material	Hardness (BHN)	Tensile Strength(Gpa)	Young's Modulus	% Elongation
Al-6061	62.8	134.8	79.8	8.0
Al-TiB_2	88.6	173.6	94.2	7.0

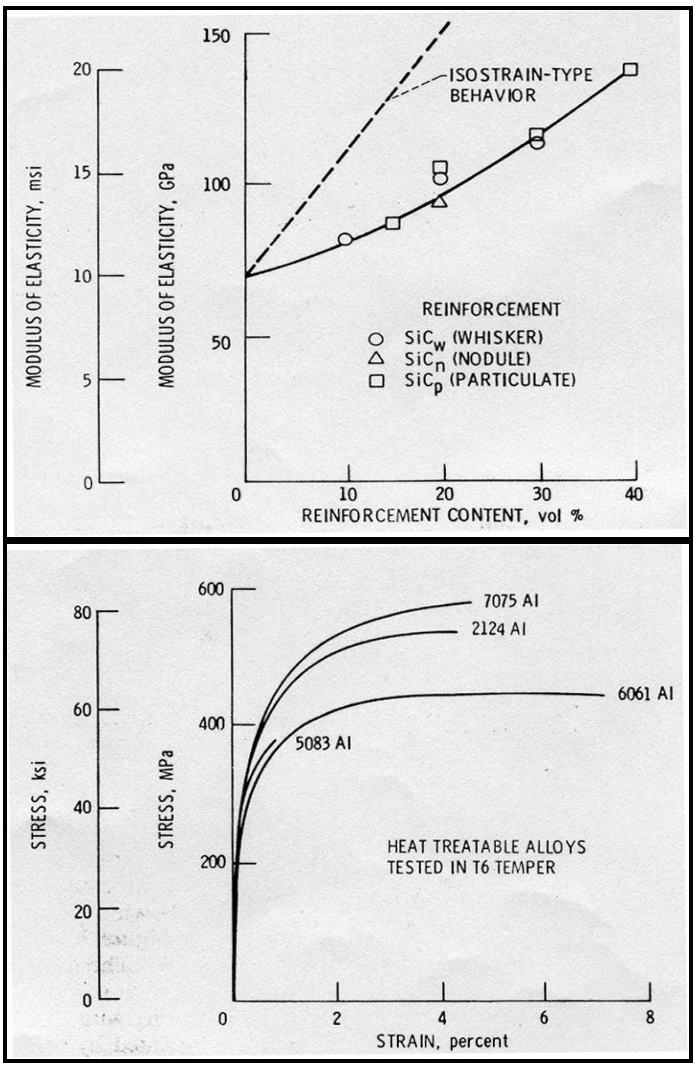


Fig. 6: Effects on shape, size, % wt. of reinforcement and matrix materials [7].

A. Sreenivasan, et.al[8], they prepared Al6061-TiB_2 (5,10,15%wt) composite using combo stir casting technique and microstructure and wear characteristics of TiB_2 reinforced aluminium metal matrix composites (MMCs) was examined. The result showed that the wear rate was decreased with increase in TiB_2 content in

the Al/TiB_2MMC specimens as depicted in figure 7. **L. Lu et.al [9],** the composite of Al/TiB_2/B_2O_3 prepared by in situ process, the yield and ultimate stress increased with increase of TiB_2 in composite. When the percentage of TiB_2 in composite is 15% the yield and ultimate stress increased 53% and 44% respectively as compare to its unreinforced. **M.D. Kulkarni, et. l [10],** examined the role of percentage volume of SiCp on the tensile properties and fracture behavior of Al 7075 Al alloys at various test temperatures. They found that as the percentage of SiC increases the yield strength, ultimate strength and young's modulus of composite increases. The effect on wear (trobological properties) is depicted in figure7.

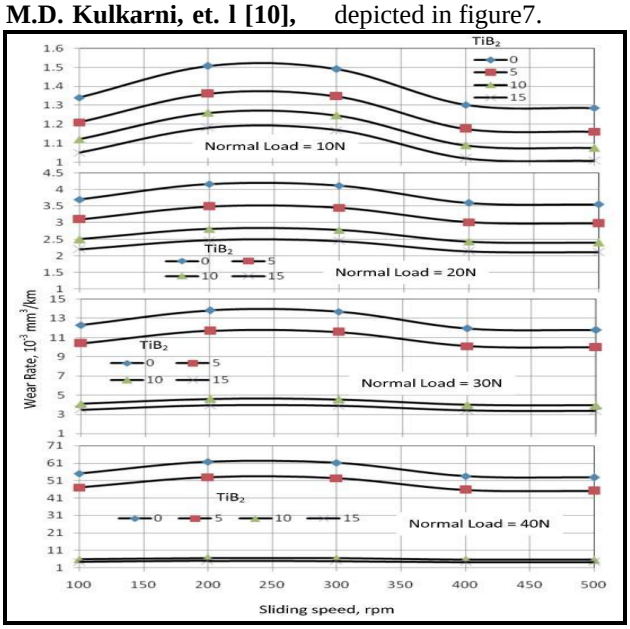


Fig. 7 (a): Wear rate of Al matrix and Al/TiB_2 for different load [8].

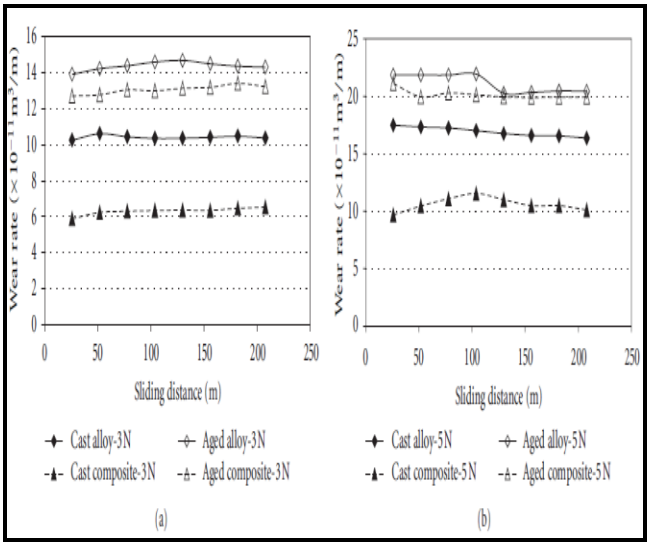


Fig. 7 (b): Wear rate behavior for 7075(a) alloy and (b) composite [10].

(e) Effects Reinforcement on Mach inability: Mach inability of AMCs is one of the important properties of the composite and has vital role during the machining. So that it has to be consider during fabrication and development of new composite. As AMCs contain softer matrix reinforced with very hard particulate, machining of such material becomes difficult. The major challenges in the machining of AMCs are to obtain desired the dimensional accuracy and surface finish. The traditional tool materials such as high speed steel are not suitable for machining MMCs due to rapid growth of tool wear. Generally Poly Crystalline Diamond (PDC), tungsten coated carbide tool, Chemical Vapor Deposition (CVD) diamond coated carbide insert, poly crystalline boron nitride (PCBN) tool, Al_2O_3, TiN and Ti (C,N) based CVD coatings on tool and non-conventional machining process are preferred for machining these materials. The costly tool material

and processes, increases the machining cost and make component expensive. In this regard many approaches such as optimization technique for optimizing the cutting parameters, new tooling system, improved cutting tool materials, coating the particulate before mixing in the matrix material, addition graphite particles were suggested by researchers **[11, 12, 13, 16, 19, 20, 21, 22, 23, 24, 25, 26, 27].** The effects of percentage weight of reinforcement in composite on surface finish and cutting parameters are depicted in figures 8 and 9.

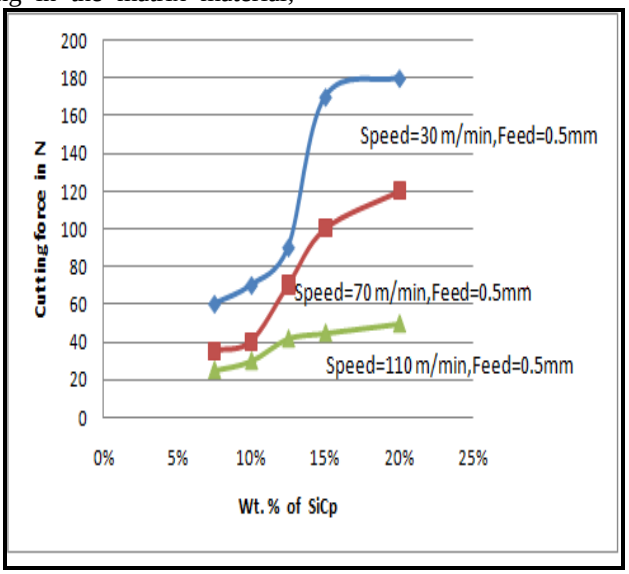


Fig. 8:Effects of weight % SiCp on cutting force.

Metin Kök[14], investigated the effects of cutting speed, size and volume fraction of particle on the surface roughness in turning of 2024Al alloy composites reinforced with Al_2O_3 particles. It was found that surface roughness decreased with increasing the size and volume fraction of particles for all cutting conditions. The dependency of the surface roughness on the cutting speed was smaller when the particle size was smaller.

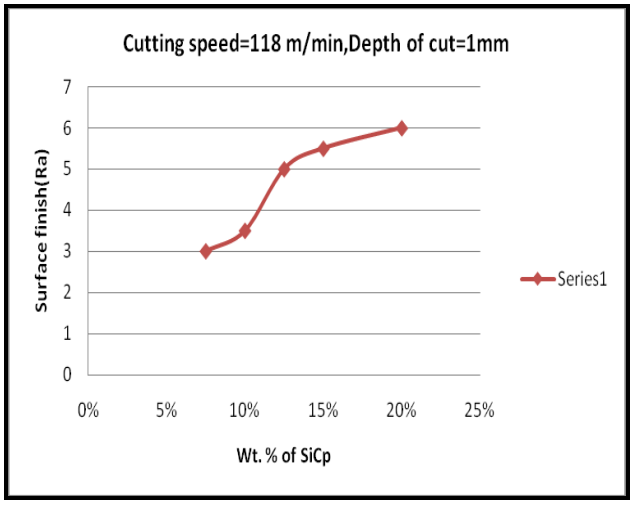


Fig. 9: Effects of SiCp weight % on surface finish.

Y. Altunpak et. al.[15], in their work, the influence of cutting parameters on cutting force and surface roughness in drilling of Al/20%SiC/5%Gr and l/20%SiC/10%Gr was investigated. The composite was fabricated by vortex method. The results indicate that inclusion of graphite as an additional reinforcement in Al/SiCp reinforced composite reduces the cutting force. For all cutting conditions, Al/20%SiC/10%Gr composite has lower surface roughness values than Al/20%SiC/5%Gr composite. **V. Anandakrishnan & A. Mahamani [17],** they investigated flank wear, cutting force, and surface roughness in the machining of Al-6061–TiB_2 in situ metal matrix composites produced by flux-assisted synthesis. Their finding was higher

TiB_2 reinforcement ratio produces higher tool wear, surface roughness and minimizes the cutting forces. The mach inability of in situ MMC is better from traditional MMC, because of the presence of fine and uniformly distributed reinforcement, which reduces flank wear. The hardness of the composite also increased with increase of the ratio of TiB2 in composite. **C. Tijun, et. al.[18],** The Al_3Ti intermetallic reinforced with pure Al, Al/Si and Al/Cu matrix composites were prepared by casting method. Their microstructures and dry sliding wear behaviors at room temperature and 100℃ were particularly investigated. It was found that Al-Cu matrix composite has the best wear resistance, while the pure Al matrix composite showed the worst for the same Ti content. The wear resistance of pure Al matrix composite increases with increase Ti or Al_3Ti content

IV CONCLUSION

The controlling factors of AMCs are process rout, temperature, alloys elements of matrix materials, types of reinforcement materials with their shape, size, wettibility, weight and volume percentage and reaction during composite preparation. These factors determine the properties of composites. The stir casting process for making the composite is most popular amongst the researcher but the composite made by in-situ and other process exhibits superior properties than this process. The selection of matrix and reinforcement material for the development and fabrication of composite required lot of attention otherwise their chemical incompatibility may adversely affect on their properties. It is also found that the properties of reinforced metal and alloys have always superior properties than the unreinforced materials.

REFERENCES

[1] Do-Suck Han, H.Jones, H.V. Atkinson ,"The Wettability of Silicon Carbide by Liquid Aluminium: The Effect of Free Silicon in the Carbide and of Magnesium, Silicon and Copper Alloy Additions to the Aluminum", Journal of Materials Science, 1993, pp.2654-2658.

[2] M.Kobashi, T.Choh ,"The Wettability and the Reaction for Sic Particle/Al Alloy System", Journal of Materials Science, 1993, pp. 684-690.

[3] V.Laurent,C.Rado, N. Eustathopoulos "Wetting Kinetics and Bonding of Al and Al Alloys on A - Sic", Materials Science and Engineering, A205, 1996,pp.1-8

[4] Zhu He-Guo, Wang Heng-Zhi, Ge Liang-Qi,Chen Shi, Wu Shen-Qing, " Formation of Composites Fabricated by Exothermic Dispersion Reaction in Al-Tio2-B2o3 System." Trans. Nonferrous Met. Soc. China Vol.17, 2007, pp.590-594.

[5] G. B. Veeresh Kumar, C. S. P. Rao, N. Selvaraj,, M. S. Bhagyashekar3, " Studies on Al6061-Sic and Al7075-Al2o3 Metal Matrix Composites", Journal of Minerals & Materials Characterization & Engineering, Vol. 9, No.1, 2010, pp.43-55.

[6] T.V. Christy, N. Murugan and S. Kumar, "A Comparative Study on the Microstructures and Mechanical Properties of Al 6061 Alloy and the MMC Al 6061/Tib2/12p", Journal of Minerals & Materials Characterization & Engineering, Vol. 9, No.1, 2010, pp.57-65.

[7] David L. Mc Danels, "Analysis of stress-strain, fracture and ductility behavior of Aluminum matrix composites containing discontinuous silicon carbide reinforcement" A Metallurgical and Materials Transactions, vol. 16A, 1985, pp1105-1115.

[8] A. Sreenivasan, S. Paul Vizhian, N.D. Shivakumar,M. Muniraju,M. Raguraman, " A Study of Microstructure and Wear Behaviour of Tib_2/Al Metal Matrix Composites", Latin American Journal of Solids and Structures, Vol.8, No.1, 2011, pp.48-56.

[9] Lu L, Lai M.O, Su Y, Teo H.L & Feng C.F "In Situ Tib_2 Reinforced Al Alloy Composites.", Ssripta Materialia,Vol.45,2001, pp.1017-1023.

[10] M.D. Kulkarni", P.S. Robi,R.C. Prasad, Ramakrishnan "Deformation and Fracture Behavior of Cast and Extruded 7075al-Sicp Composites at Room and Elevated Temperatures",Materials Transactions, Jim, Vol37, No.3, 1996, pp.223-229.

[11] T.Choh, T.Oki,"Wettability of Sic To Aluminum and Aluminum Alloys", Materials Science and Technology, 1987, Vol.3, pp. 378-385.

[12] Alakesh Manna,B. Bhattacharayya, "Influence of Machining Parameters on The Machinability of Particulate Reinforced Al/Sic–Mmc", Int J Adv Manuf Technol, Vol.25,2005, pp. 850–856.

[13] N. Muthukrishnan & M. Murugan & K. Prahlada Rao," Machinability Issues in Turning of Al-Sic (10p) Metal Matrix Composites", Int J Adv Manuf Technol ,Vol.39, 2008, pp211–218.

[14] Metin Kök, "Modelling The Effect of Surface Roughness Factors", Int J Adv Manuf Technol,Vol.55, 2011, pp.911–920.

[15] Yahya Altunpak & Mustafa Ay & Serdar Aslan, "Drilling of a Hybrid Al/Sic/Gr Metal", Int J Adv Manuf Technol, Sept.2011,Vol.10, pp.1-5.

[16] Ay Mustafa1, and Karagol Tanju, "Investigation of The Machinability of The Al 7075 Alloy"Using Dlc Coated Cutting Tools", Scientific Research and Essays Vol. 6(1), Jan. 2011, pp. 44-51.

[17] V. Anandakrishnan & A. Mahamani, "Investigations of Flank Wear, Cutting Force, And Surface Roughness in the Machining of Al-6061–Tib2 In Situ Metal Matrix Composites Produced by Flux-Assisted Synthesis", Int J Adv Manuf Technol,Vol.55, 2011, pp.65–73.

[18] Chen Tijun, Li Jian And Hao Yuan, "Casting Fabrication of in Situ Al3ti-Al Composites and Their Wear Behaviors", Research & Development, Vol.6,Nov.2009, pp.319-327.

[19] Rajesh Kumar Bhushan & Sudhir Kumar & S. Das, "Effect of Machining Parameters on Surface Roughness and Tool Wear for 7075 Al Alloy Sic Composite", Int J Adv Manuf Technol,Vol.50,2010,pp459–469.

[20] E. Uhlmann , W. Reimers , F. Byrne ,M. Klaus, "Analysis of Tool Wear and Residual Stress of Cvd Diamond Coated Cemented Carbide Tools in the Machining of Aluminium Silicon Alloys", Prod. Eng. Res. Devel. 2010,Vol 4,pp203–209.

[21] Gül Tosun,, "Statistical Analysis of Process Parameters in Drilling of Al/Sicp Metal Matrix Composite", Int J Adv Manuf Technol ,Vol.55, 2011,pp477–485.

[22] N. Muthukrishnan & M. Murugan & K. Prahlada Rao, "An Investigation on The Machinability of Al-Sic Metal Matrix Composites Using Pcd Inserts", Int J Adv Manuf Technol ,Vol.38,2008,pp447–454.

[23] S.-Y. Oh,J.A.Cornie, K.C. Russell, "Wetting of Ceramic Particulates With Liquid Aluminum Alloys",Metallurgical Transactions A, Vol 20a, March 1989,pp. 527-541.

[24] J. Singh, S. K. Goel, U. N. S. Mathur and M. L.Kapoor, In Proceedings of The Conference on Advances in Composite Materials, Edited By P. Ramakrishnan (Oxford & Ibh, New Delhi, India, 1991) p. 281.

[25] I. N. Fridlyander, V. G. Sister,1 O. E. Grushko, V. V. Berstenev, L. M. Sheveleva, and L. A. Ivanova1, "Aluminum Alloys: Promising Materials in the Automotive Industry", Metal Science and Heat Treatment Vol. 44, 2002,pp9-10.

[26] R. Deaquino-Laraa,B, I. Estrada-Guela, G. Hinojosa-Ruizc, R. Flores-Camposa,D, J.M. Herrera-Ramíreza, R. Martínez-Sáncheza, "Synthesis of Aluminum Alloy 7075-Graphite Composites by Milling Processes Andhot Extrusion", Journal of Alloys and Compounds, 509s(2011),pp284-289.

[27] M. K. Surappa, "Aluminium Matrix Composites: Challenges and Opportunities", Sadhana Vol. 28, Parts 1 & 2, February/April 2003, pp. 319–334.28.

[28] Moser, B., Et Al. Effect Of The Addition Of 1 Wt-% Mg On The Mechanical Properties And Failure Behaviour Of Aluminium Unidirectionally Reinforced With Atex Fibres. In 9th CIMTEC-World Forum On New Materials. 1998. Florence, Italy: Techna Srl.

[29] Mccullough, C., P. Galuska, And S.R. Pittman. Criteria For Matrix Selection In Continuous Fiber Aluminum Matrix Composites. In Design Fundamentals Of High Temperature Composites, Intermetallics and Metal-Ceramics Systems. 1996. Anaheim, California, USA:The Minerals, Metals And Materials Society.

[30] Hausmann C., Cayron C., Beffort O., The Influence of Aluminium Additions On The Properties Andmicrostructure Of Magnesium Unidirectionally Reinforced With T300 Carbon Fibres In 9th CIMTEC-World forum On New Materials Vicenzini P., P. 87-94, Techna Srl, Firenza, Italy (1998).

[31] Cayron C., EMPA Report Nr 250, Thun, Switzerland (2001).

[32] D. J. Lloyd, Particle Reinforced Aluminium And Magnesium Matrix Composites, Volume 39, Issue 1 (01 January 1994), Pp. 1-23.

[33] Kouzeli, M., Weber, L. San Marchi, C., Mortensen, A., Proceeding Of The 12th Internat. Conf. On Composite Materials, ICCM12,Paris (1999).

[34] Viala JC, Bouix J, Gonzalez G, Et Al. Chemical Reactivity Of Aluminium With Boron Carbide, J Mater Sci 1997 32 (17): 4559-4573 Lee, K. B.; Sim, H.S.; Cho, S. Y.; Kwon, H., Mater. Sci. Eng. A302, 2001, 227-34.