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The Rajasthan Geographical Association

The Rajasthan Geographical Association

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Headquarter C/o Department of Geography,
M.L.V. Govt. College, Bhilwara-311 001 (Raj.)

The Rajasthan Geographical Association is the oldest state level geographical association in India. It was formed in 1965 at the time of first academic conference of Rajasthan geographers organised by the Department of Geography, M.L.V. Govt. College, Bhilwara which later on became the permanent headquarter of the Association. The Association was registered in 1971 under the Rajasthan Societies Act, 1958. Its monogram was designed and adopted with three key words- Maru, Meru and Mal i.e. desert, mountain and plateau which not only summarizes the Geography of Rajasthan but also reveals the cultural patterns associated with three major types of natural landscapes of the state.

Despite financial constraints, the Association holds its annual conference regularly in the various colleges and universities of the state of Rajasthan. Proceedings of these conferences are also published, though intermittently. The mouthpiece of the Association, **The Annals of the Association of Rajasthan Geographers**, (renamed as **Annals of the Rajasthan Geographical Association** since volume x) is published annually. The Annals (from vol. xxvii) has been registered (NSL/ISSN/INF/2009-10 dated 15.9.2009) and assigned International Standard Serial Number (ISSN 0975-4652) from International Centre for ISSN, Paris. Back volumes of the journal and proceedings of the conferences are available at the headquarter of the Association. All the life members are entitled to get a copy of the Journal and proceedings free of cost.

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The Rajasthan Geographical Association

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Annals of the Rajasthan Geographical Association
Volume XXXIV 2017

Contents

EDITORIAL

With mmense pleasure I am bringing forth this XXXIV (2017) Volume of the Annals of the Rajasthan Geographical Association (R.G.A.).The R.G.A. since it's inception in 1965, is holding its annual conferences regularity and publishes Annals annually with the objectives to provide an opportunity to learned scholars to present their research work in the annual geographical meet while the annals gives chance to publish qualitative research outcome.

This volume of the Annals contains a wide range of research papers covering various themes related to resources, environment and planning especially applications of geospatial technology in resources evaluation, water resources, livelihood, educational amenities, literacy, infrastructure development, water logging, mining, human health, perception of desert, neotectonic activities, development level in urban areas, growth centers and modernization of agriculture. I express my sincere thanks to all the scholars who have contributed their articles in this volume.

I am extremely thankful to Prof. H.S. Sharma, Prof. H.M. Saxena, Prof. Santosh Shukla, Prof. R.D. Gurjar and Prof. R.N. Mishra for reviewing the papers and providing comments and suggestions. I along with reviewers wanted to publish the articles in their original forms, but indispensable constraints forced us to make some modifications. Credit goes to Dr. S.S. Bhatt General Secretary of the Association for his constant efforts in bringing out this volume well in time.

On behalf of the RGA, I would like to acknowledge the fanatical support from ICSSR, New Delhi for publication of the Annals. I am thankful to M/s Shree Printing Center (Shri Ashok Kumawat and Rajender Kumawat) F-109, Opp. Morani Motor Fourwheel Work Shop, Karatpura Industrial, 22 Godown, Jaipur for designing and printing this volume well in time.

S C Kalwar

Prof. S.C. Kalwar

Editor

Mapping Potential Areas for Groundwater Exploration in a Semi-Arid Block of Haryana using Geo-spatial Technology

Tejpal and Anisha

Abstract

The main aim of this study is to investigate potential groundwater extraction areas in Nangal Choudhary block using remote sensing (RS) and geographical information system (GIS) approach. The thematic layers considered in this study are soil types, lithology, geomorphology, lineaments, drainage density, slope and land use/ land cover, which have been prepared using the satellite imagery and conventional data. Different thematic layers and related features have been assigned proper weights based on their relative contribution to groundwater occurrence. Thematic layers have been integrated in ArcGIS for delineation of groundwater potential zones. The obtained composite map has been divided into five zones (excellent, good, moderate, poor, and very poor) based on their effect on groundwater potentiality. It is found that about 42 percent of the area has been identified as excellent or good potential zones, whereas the remaining area falls under moderate and poor categories. The highest water potential area is located towards northern and middle parts of the block because of high infiltration rates caused by the distribution of flood plains, aeolian alluvium deposits and agricultural land. The low water potential areas are in the southern hilly tract due to the factors of high slope, runoff and low infiltration rate. The GIS based output results have been validated using ground water depth data which reflects the actual groundwater potential. It confirms the predicted results related to the general ecological perception and signifies the high quality map obtained which shows satisfactory agreement between the predicted potential areas and the depth of ground water table. The results of the study can be used to formulate an efficient groundwater management plan for sustainable utilization of limited groundwater resources.

***Keywords**: Semi-arid area, Groundwater, Remote Sensing, GIS and Potentiality.*

Introduction

Water is one of the most significant natural resources which supports human needs, economic development and ecological diversity (Preeja et al., 2011). With the increasing demands for water, groundwater resources are gaining much attention. Groundwater has become an immensely important and dependable source of water supplies in all climatic regions including both

urban and rural areas of developed and developing countries (Todd and Mays, 2005). Approximately, worldwide, 1.5 billion people rely on groundwater sources (Shen et al., 2008). Recently, many consequences of unsustainable groundwater use are increasingly evident in several parts of the world due to frequent failures in monsoon, ever-increasing population, rapid urbanization, industrialization and other intensified human activities (Sinha et al., 2012). In order to ensure a judicious use of groundwater, its proper evaluation is required for optimal utilization.

Groundwater, being a hidden natural resource, is not amenable to direct observations hence, its identification and location are based on indirect analysis of some direct observable terrain features like geology, geomorphology, lineaments, drainage pattern etc. (Sinha et al., 2012). Therefore, extensive hydro-geological investigations are often a prerequisite to systematically understand groundwater availability. Conventionally, geophysical methods are employed for groundwater prospecting, but it is very costly, time-consuming and requires skilled manpower thereby restricting its use in practice, especially in developing nations (Fetter, 1994). Hence, geo-spatial technology provides an opportunity for better observation and more systematic analysis of identification and demarcation of groundwater resources (Mukherjee et al., 2012). Geo-spatial technology with its advantages of voluminous data handling capacities, spatial, spectral and temporal availability of data has proved to be a handy tool for quick and useful baseline information about the factors controlling the occurrence and movement of groundwater resources (Solomon and Quiel, 2006). Therefore, it has been applied in several groundwater potential zonation studies both in India and abroad (Jaiswal et al., 2003; Solomon and Quiel, 2006; Shen et al., 2008; Chowdary et al., 2009; Preeja et al., 2011; Mukherjee et al., 2012; Sinha et al., 2012; Singh et al., 2013). However, most of these studies are restricted to consolidated rock formations; therefore, the present study focuses on the Nangal Choudhary block of Mahendergarh district in Haryana under unconsolidated rocks.

Objective of the study

The main objective of the present study is to investigate the areas with different responses to potential water extraction in the Nangal Choudhary block of Mahendergarh district in south-western Haryana using geo-spatial technology for the purpose of improving groundwater exploration.

Study Area

The study area (Fig. 1) is located in the south-western part of Haryana. It is triangular in shape, covering an area of 314.74 km^2 and geographically falls between 27°47' 30" N to 28° 2' 8" N latitudes and 75° 58' 23" E to 76°13' 14" E longitudes. The block area lies in Mahendergarh district and bounded by the great expanse of Rajasthan in south-west. It is a part of the Indo-Gangetic alluvial plain with extreme hot and extreme cold conditions. The area lies between an altitude of 294-648 m above the mean sea level and made up of fluvial and aeolian deposits and conglomerates. The slopes of the study area are from South to North varying with a gradient ranging from 1° to 68°. Lithological observations reveal that the block can be sub-divided into two hydro-geological units, namely porous and two fissured formations. The porous formation consists of aeolian deposits (quaternary alluvium sands and

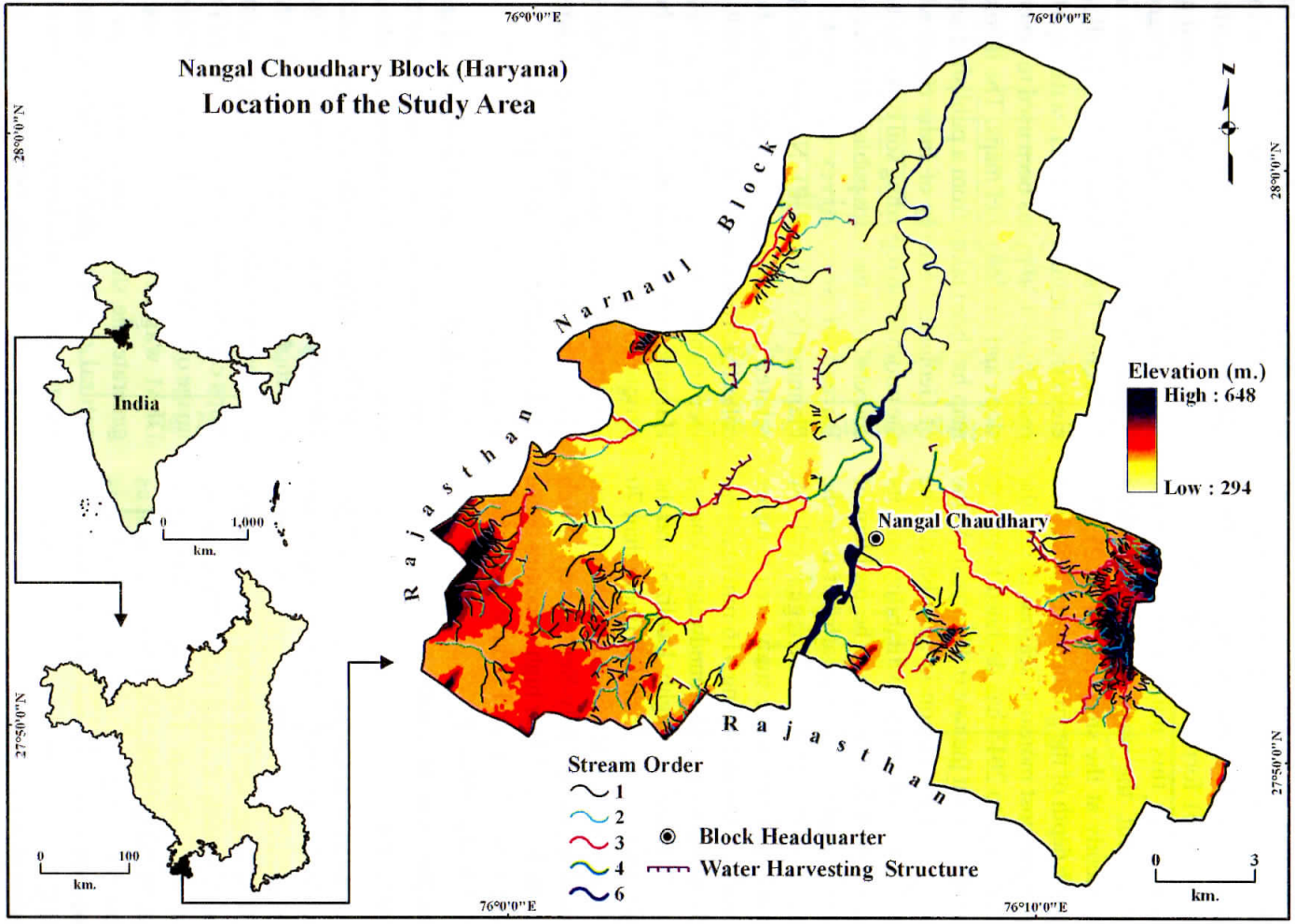

Fig. 1: Location map of the study area

gravels) that define phreatic aquifer, whereas the fissured formation made of sandstones and subdivided in two different units (Ajabgrah and Alwar group part of Delhi super group) forms the aquiferous water resources in this multi-layered aquifer system. But, the water table has declined consistently at the steep rate (Fig. 2). The average depth of the groundwater table both in pre and post monsoon seasons during the period 1975 to 2015 has declined from 6 m to about 43 m at the rate 0.90 m/year. As the economy of the region is agro-based, the significance of water availability and its management is immense. The problem of water availability is often attributed to the natural water scarcity in the region and low rainfall. Rainfall in the study area is rather erratic and low averaging 416 mm in a year is the major source of groundwater recharge (Fig. 3). Rainfall is highly localized and the major part of annual rainfall (more than 70 per cent) is experienced during south-west monsoon period (July-September). Such torrential rain and their high velocities cause heavy soil erosion and reduce the natural groundwater recharge.

Material and Methods

Data Used

The United State Geological Survey (USGS) satellite data of Landsat 7 ETM+ sensor data of March 07, 2015 with a spatial resolution of 30 m have been chosen as this is the peak time of growth of winter crops (Rabi season) and dry season vegetation helps to understand earth surface features as well as groundwater perspective. The data is downloaded from Global Land Cover Facility (GLCF) website (http://earthexplorer.usgs.gov). Moreover, about 220 high resolution Digital Globe Image tiles for the study area from Google Earth have also been downloaded using the Map Grabber 3.2 software. The Survey of India (SOI) topographic map with a scale of 1:50,000 has been procured and used as a source of ancillary information. Advanced Space borne Thermal Emission and Reflection Radiometer (ASTER) digital elevation model (DEM) with spatial resolution of 30 m has been used to generate slope and shaded relief maps. The lithology map has been taken from a published report of Geological Survey of India (GSI) while the information regarding soil types has been collected from the maps published by National Bureau of Soil Survey and Land Use Planning (NBSS&LUP), Nagpur. The data related to groundwater depth has been collected from Ground Water Cell (GWC), Department of Agriculture, Panchkula, Haryana whereas rainfall data has been procured from India Meteorological Department, Chandigarh. Ground data has also been obtained through the field visits in various locations of the study area.

Methods

The methodology adopted in the present study consists of five distinct stages. In the first stage, the various information/data and maps have been acquired from various sources and converted in digital format and geo-referenced. In the second stage, the study area has been delineated using topographical maps corroborated with information of FCC image of Landsat 7 ETM+ imagery. Further, DEM was developed and processed to generate the shaded relief map, slope and natural drainage pattern. Various digital image processing techniques, viz., principal component analyses, band radioing, band multiplication, enhancements and filtering have been used to analyze the satellite image.

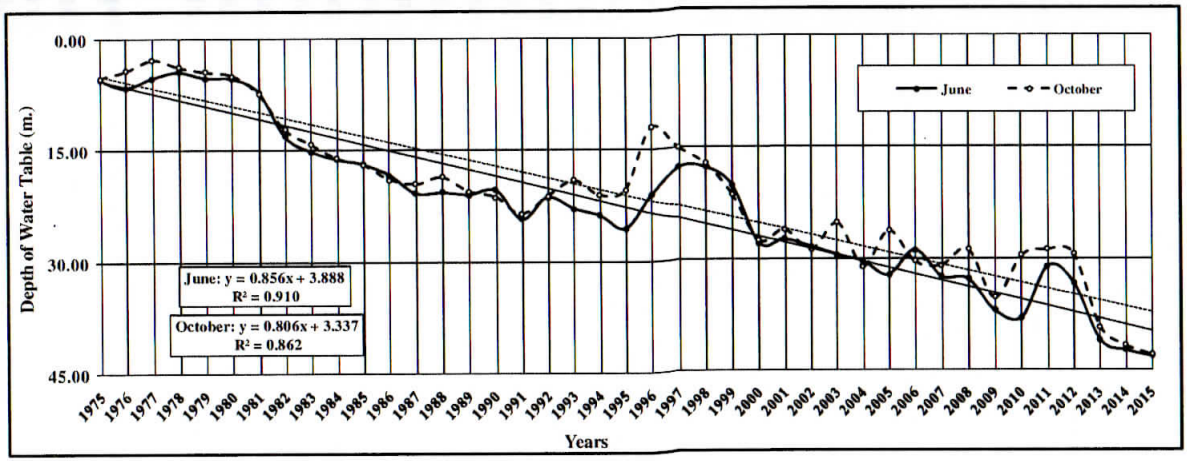

Fig. 2: Hydrograph showing pre and post monsoon depth to water table in Nangal Choudhary block.

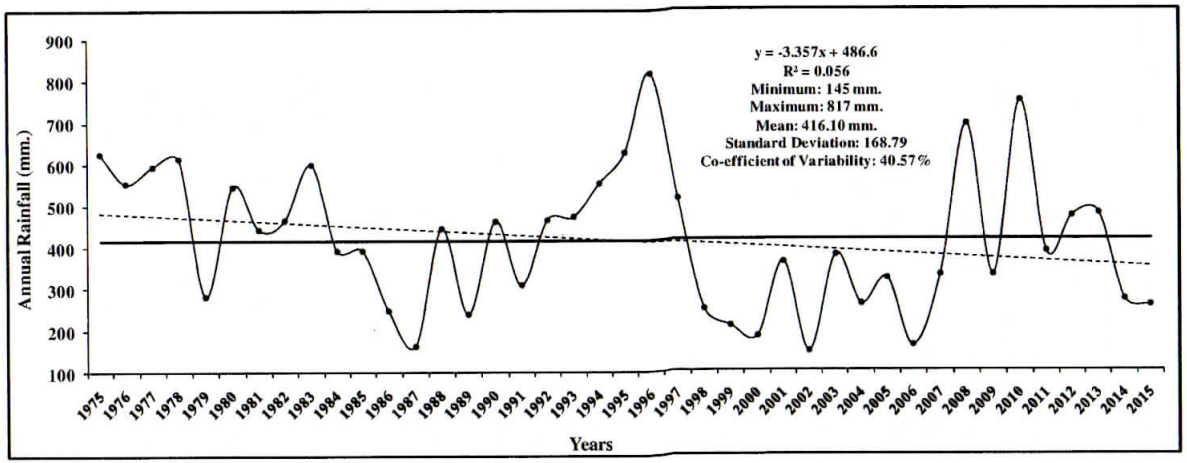

Fig. 3: Variation in annual rainfall and trend in Nangal Choudhary block in Haryana.

With the help of hybrid classification method (supervised, unsupervised image classification and mask of important features) land use/ land cover map has been prepared. Geomorphic features have been extracted both from a combination of satellite images and lithological characteristics such as soil, geology and topography using visual interpretation technique. The lineament map derived from shaded relief map and later updated with high resolution Digital Globe Image data from Google Earth and linearly stretched and edge-enhanced False Colour Composite (FCC) of Landsat 7 ETM+ image. Lineament density and drainage density maps have been prepared using line density function of ArcGIS 9.3. A field survey was conducted at various locations in the study area using GPS.

The third stage involves assigning weightage to different units/classes of various thematic layers according to their individual role in groundwater perspective. Seven thematic layers like soil type, lithology, geomorphology, lineament density, drainage density, slope and land use/ land cover map have been taken into consideration for weighted aggregation method (WAM). Weightage has been assigned to respective classes on the basis of hydrogeologic importance and knowledge-based hierarchy of ranking from 1 to 5 point scale (5 was the highest weightage order and 1 was the lowest weightage order) depending on their perspective role, characteristics and spatial distribution (Table 1). Different thematic layers have also been ranked considering their relative importance and capacity to hold groundwater. Higher ranks are assigned to the themes that have higher potentiality of groundwater occurrence and capacity to hold groundwater. Before the calculation of the final weights of the thematic layers and their corresponding categories, consistency ratio was calculated which was found within the acceptable limit. Table 1 summarizes the relative weights assigned for demarcation of groundwater potential zones. In the fourth stage, the 'Raster Calculator' tool of spatial analyst extension in Arc GIS 9.3 has been used for overlaying and integrates these layers by weighted aggregation method. The sequence adopted to create the final integrated layer in the present exercise is: (a) soil type, (b) lithology, (c) geomorphology, (d) lineament density, (e) drainage density, (f) slope, and (g) land use/ land cover map. Finally, the resultant groundwater potential map of the study area has been prepared showing the groundwater occurrence scenario of the study area. Based on the cumulative pixel values received after the integration of all layers, the final map is further classified into five categories namely 'Excellent', 'Good', 'Moderate', 'Poor', and 'Very Poor'. Each category represents its relative potential for the occurrence of groundwater in the study area. The details of groundwater potential zones are given in Table 2. The methodology described above has produced a multi-criteria scheme for the groundwater potential areas mapping within the study area located in semi-arid region as reported by a flow diagram in Fig. 4. In the last stage, the output map is validated with the field groundwater data.

Validation of Groundwater Potential Map

The reliability of groundwater potential map must be investigated in order to assure correct application of the applied method. For this purpose, a validation approach is needed. This can be achieved by comparing the actual depth of groundwater in wells with respect to the zones determined in the study.

The basis of this validation implies the existence of wells with low water depth and high inter-seasonal fluctuation in zones described as high or excellent potentiality in the resulting map. For the validation, the groundwater level depth data has been collected from the Groundwater Cell, Department of Agricultural, Government of Haryana, Panchkula and a field survey has been carried out in the study area. The co-ordinates have been collected using GPS in all the selected wells and incorporated in the final GIS-derived groundwater potential zone map as depicted in Fig. 4 which is a useful tool for result confirmation. Accordingly, two zone wise wells have been identified for the groundwater level depth in each zone and a comparative analysis has been applied between the classes describing different potential zones for groundwater storage and actual depth of groundwater in sampled wells.

Result and Discussion

Soil Types

The water-holding capacity of an area depends upon the soil type and its permeability. The initial infiltration and transmission of surface water into an aquifer system is a function of soil type and its texture (Anbazhagan et al., 2005). Seven types of soils are found in the study area, viz. sandy, sandy loam, coarse loamy, fine loamy, loamy sand, loamy skeletal, and rocky outcrops (Table 1 and Fig. 5). Sandy is the soil that is deep, excessively drained and forms highest potential aquifer cover 25.3 percent area. Sandy loam and coarse loamy are the soils that are deep, somewhat excessively to moderately drained and loamy texture with coarser particle size. They also provide good potential for groundwater occurrence and cover about 4.2 per cent and 11.1 per cent area, respectively. Fine loamy and loamy sand soils are deep, moderately drained and loamy in texture with fine particle size. They collectively cover about 40 percent of the study area. These two soil types have comparatively moderate potential for groundwater occurrence. Due to the lithic contents in loamy skeletal soil, it does not have the capacity to hold water that percolates down from surface. It covers about 7.4 percent of the study area. These soils form less potential aquifers and have low potential for groundwater occurrence. Weights are assigned subjectively to each soil unit after taking into account the type of soil, specific yield and its water-holding capacity given in Table 1.

Lithology

Lihology plays an important role in locating groundwater potential areas (Rashid et al., 2011). Hence, the knowledge of lithology of a region is essential to understand the nature and distribution of their water bearing properties. Lithologically, the area is mostly dominated by quaternary alluvium and Precambrian meta-sediments of Delhi super group rock formations system. Quaternary sediments include alluvium deposits consisting of a sequence of inter layered clay/ silt and sand with occasional kankar formations of older alluvium formations and coarse to fine aeolian sand deposits. Hence, this zone acts as a good source of groundwater potential. This is largely distributed over about 85 percent area of the block (Table 1 and Fig. 6). Delhi super group is represented by Alwar quartizites, mica schists and pegmatite intrusives of the Ajabgarh series and slates of phyllites and quartzites of the sub recent alluvium and sand dunes. These two collectively cover about

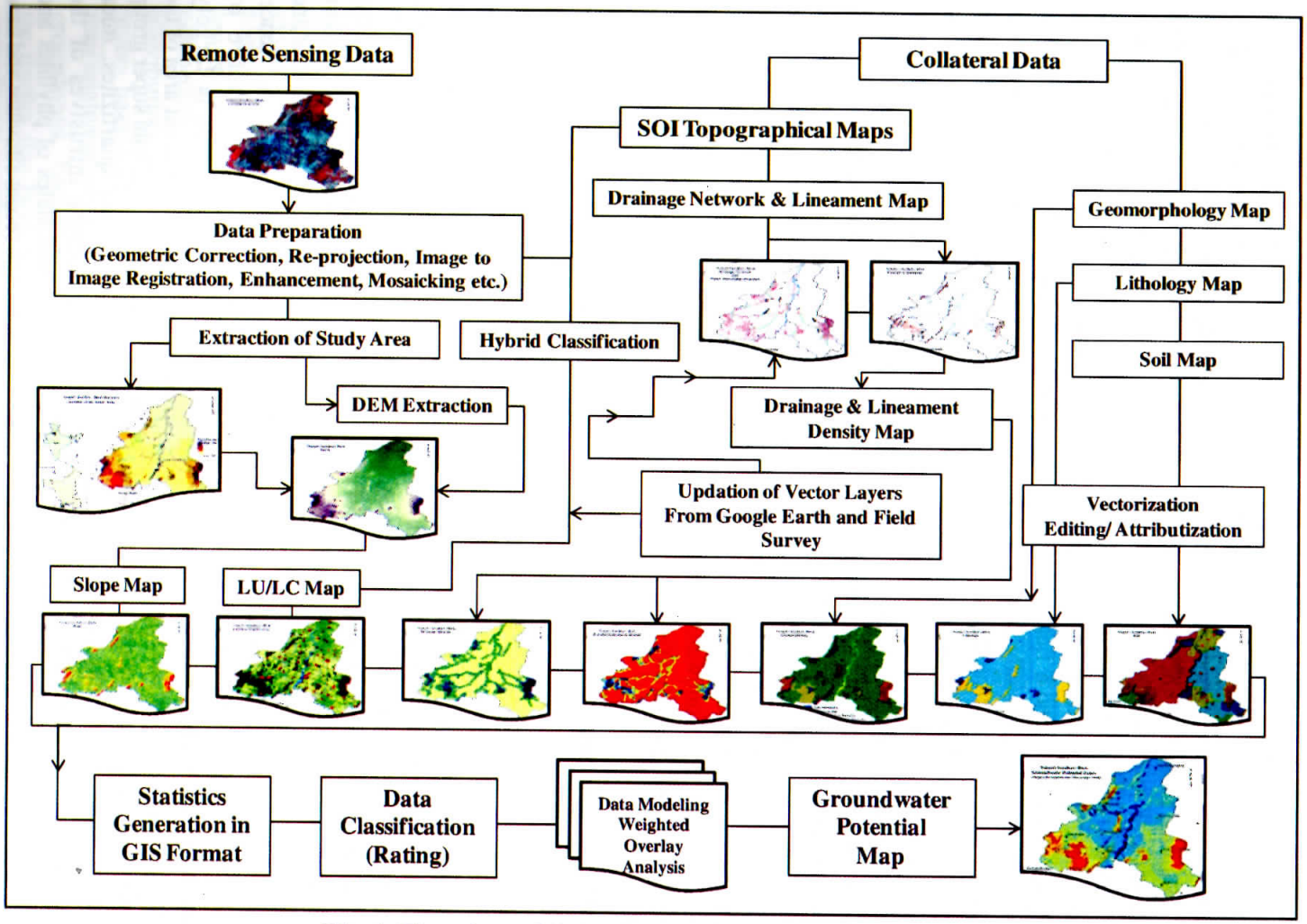

Fig. 4: Flow chart of data and methods employed for the study.

15 percent of the study area. These hydro-geological units have moderate potential groundwater repositories.

Geomorphology

Geomorphology of an area is one of the most important features in evaluating the groundwater potential and prospect (Kumar et al., 2008). The study area is characterized by a number of erosional and depositional features with consolidated and unconsolidated materials (Fig. 7). The unconsolidated material comprises of aeolian plain, pediments, river bed and valley fills. Deep weathered aeolian plain with the presence of scattered sand dunes/sand mounds with gentle slopes is a dominant geomorphological unit that covers 83 percent of the study area. Its lithological composition is relatively coarse weathered material to fine sand with little clay which is porous and permeable. Pediments are found in very low weathered zone. Pediments covering a total area of 5.5 percent are mainly found in the southern parts besides some scattered patches in the eastern and western parts of the study area (Table 1 and Fig. 7). The river bed area is mainly covered by coarse sediments with good vegetation cover (long grasses), and groundwater potential of this unit is described as very good. Valley fills are generally consisting of sand, silt, gravel, and pebbles deposited along the floor of a stream valley covering minuscule area (0.37 percent). The hard rock formation (consolidated material) of the study area comprises of residual, denudational and structural hills (highly dissected and moderately dissected) covering about 9.23 percent of the study area. The percolation of rainwater in these areas is directly related to the presence of lineaments, as in the absence of primary porosity due to the consolidation of rocks, presence of lineaments produce secondary porosity and make them permeable to some extent. Negligible to sparse vegetation is found around these units therefore, according to the probability of the occurrence of groundwater, the rocky outcrops are assigned low rank. Theme weight and class rank assigned to each geomorphic unit are given in Table 1.

Lineament Density

Lineaments are linear or curvilinear features which play an important role in groundwater recharge. The higher the lineament density in an area, the more the chance of groundwater occurrence will be and vice-versa (Kumar et al., 2007). On the basis of lineament density, the area was divided into five different zones (Table 1 and Fig. 8). It is observed from Fig. 8 that about 85 percent of the study area has low to very low lineament density because most of the study area is composed of unconsolidated formation with primary porosity. It is also observed from Table 1 that high to very high lineament density is limited only to 6 percent area of the block. The value of these lineament density categories is found to be present within structural hills. Since groundwater potential is directly proportional to lineament density, hence, high rank was assigned to high lineament density zones, and low rank to low lineament density zones as given in Table 1.

Drainage Density

Drainage density indirectly indicates its permeability and porosity due to its relationship with surface run-off (Krishnamurthy et al., 1996). Fig. 1 shows the distribution of drainage lines in the study area. The drainage of the area is typical of arid and semi-arid areas dominated by small depressions, deeply incised, sand filled and

Table No. 1: Class rank and theme weight assigned to different thematic layers in weighted aggregation method (WAM)

S.No.	Map Unit/Class	Area (ha)	Area (%)	Rank	Map Weightage
1	Soil Type				5
	Sandy	7972.03	25.33	5	
	Sandy Loam	1334.74	4.24	4	
	Coarse Loamy	3496.90	11.11	4	
	Fine Loamy	10026.60	31.86	2	
	Loamy Sand	2418.28	7.68	3	
	Loamy Skeletal	2328.32	7.40	2	
	Rocky Outcrop	2353.93	7.48	1	
	Habitation Mask	1207.28	3.84	1	
	Water-body Mask	336.23	1.07	5	
2	Lithology				4.5
	Ajabgarh Group (Delhi super group)	3997.73	12.70	3	
	Alwar Group (Delhi super group)	763.06	2.42	3	
	Eolian Deposit (Quaternary alluvium)	26713.52	84.87	5	
3	Geomorphology				4
	River Bed (Dry)	552.63	1.76	5	
	Eolian Plain (Deep)	26160.90	83.12	4	
	Pediment	1738.54	5.52	3	
	Residual Hill	3.53	0.01	1	
	Valley Fill (Shallow)	117.60	0.37	5	
	Denudational Hill	588.39	1.87	1	
	Structural Hill (Less Dissected)	1844.27	5.86	2	
	Structural Hill (Moderately Dissected)	468.46	1.49	2	
4	Lineament Density				3.5
	Very High (>3.51)	917.20	2.91	5	
	High (2.51-3.50)	991.70	3.15	4	
	Moderate (1.51-2.50)	2864.32	9.10	3	
	Low (0.51-1.50)	3252.18	10.33	2	
	Very Low (<0.50)	23448.91	74.50	1	
5	Drainage Density				3
	Very High (>6.0)	669.86	2.13	1	
	High (4.01-6.0)	1340.56	4.26	2	
	Moderate (2.01-4.0)	5128.91	16.30	3	
	Low (1.01-2.0)	3339.64	10.61	4	
	Very Low (<1.0)	20995.35	66.71	5	
6	Slope				2.5
	Very Low (< 1.0)	8010.08	25.45	5	
	Low (1.01-3.0)	17112.37	54.37	4	
	Moderate (3.0-6.0)	4413.66	14.02	3	
	High (6.01-15.0)	1331.00	4.23	2	
	Very High (>15.0)	607.20	1.93	1	
7	Land Use/ Land Cover				2
	Settlements	1257.28	3.99	1	
	Cultivated Area	10247.23	32.56	4	
	Hills with Shrubs	4772.51	15.16	3	
	Hills	1351.22	4.29	2	
	Open Area	13298.78	42.25	3	
	River & Canal	336.23	1.07	5	
	Roads	211.06	0.67	1	
	Total	31474.31		100	

seasonal streams flowing from south to north. These stream beds are a locally important source of water during the dry season when water can be found within a few meters of the surface. The drainage density values derived based on spatial density analysis of drainage network have been grouped into five categories and represented in Fig. 9. To visualize the area of sheet wash and channel flow, the zones of different drainage density i.e. very high (>6.0 km/km^2), high (4.01-6.0 km/km^2), moderate (2.01-4.0 km/km^2), low (1.01-2.0 km/km^2) and very low (<1.0 km/km^2) comprise 2.13 percent, 4.26 percent, 16.3 percent, 10.61 percent and 66.71 percent of the area, respectively (Table 1). The area of very high drainage density represents more closeness of drainage lines and vice-versa. The values obtained and the respective theme weight and class rank assigned to them are shown in Table 1. A higher ranking has been attributed to low drainage density category and a lower ranking to a high drainage density category.

Slope

Slope is considered as one of the important parameters for evaluating potential groundwater occurrence. A high slope will cause more runoff and less infiltration, and thus have poor groundwater prospect. On the other hand, in low slope regions, break in slope introduces the lesser surface runoff and rainwater gets sufficient time to infiltrate downward recharging the groundwater table. The slope in the study area varies from 0° to 68° and is categorized in five classed ranging from Very low (<1°), Low (1-3°), Moderate (3-6°), High (6-15°) and Very high (> 15°) covering an area of about 25.5 percent, 54.4 percent, 14.0 percent, 4.2 percent and 1.9 per cent, respectively (Table 1 and Fig. 10). A higher ranking was assigned to a gentle slope and a lower ranking to a higher slope. The groundwater potential of these classes is given in Table 1.

Land Use/ Land Cover

Land use/land cover plays a vital role in groundwater prospecting. Different land use/ land cover types affect the rate of recharge, runoff, and evapo-transpiration. In the study area, seven land use/ land cover classes have been identified (Table 1 and Fig. 11). The land use classes identified include mostly open surface, cultivated area, hills/ rocky outcrops with shrubs. The open space and cultivated area occupy the maximum proportion of land area (42.3 and 33 percent) followed by rocky outcrops with and without shrubs occupying (20 percent) and settlements with about 4 percent area. Among the other land use/ land cover classes, river bed and canals constitute about 1 percent, and paved land under roads 0.67 percent of the total study area. The groundwater potential ranks of these classes are given in Table 1. The river beds, canals and cultivated fields with good vegetation cover promote the infiltration rate and prevent excess runoff and, therefore, are assigned high rank for groundwater prospecting. Rocks and built-up and barren lands are assigned low weightage as the infiltration rate is very low.

Delineation of Groundwater Potential Zones

To demarcate the different groundwater potential zones, all the thematic layers are integrated with one another according to their importance through the WAM union concept in GIS environment. After the integration of all thematic maps, resulted map has been classified into five groundwater potential zones namely, very poor, poor,

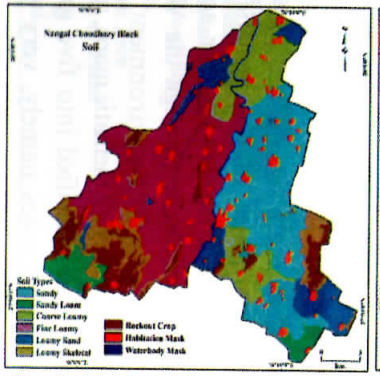

Fig. 5: Soil types

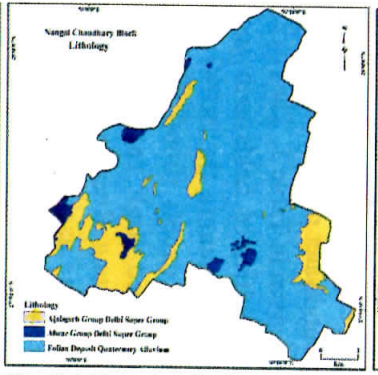

Fig. 6: Lithological details

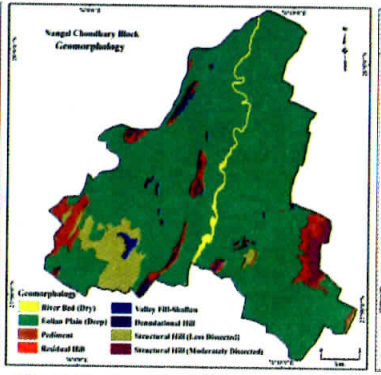

Fig. 7: Type of landforms

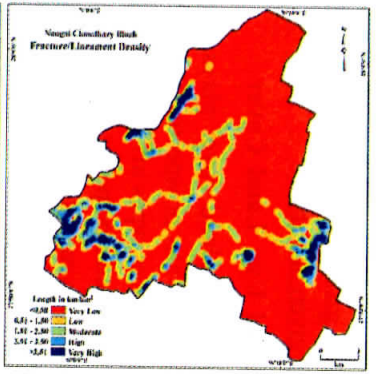

Fig. 8: Lineament density

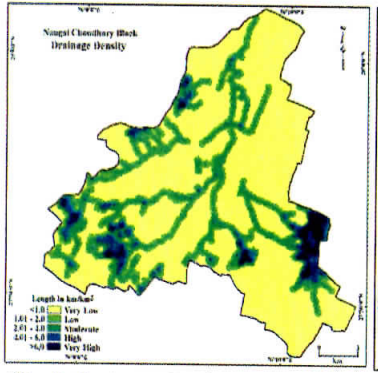

Fig. 9: Drainage density

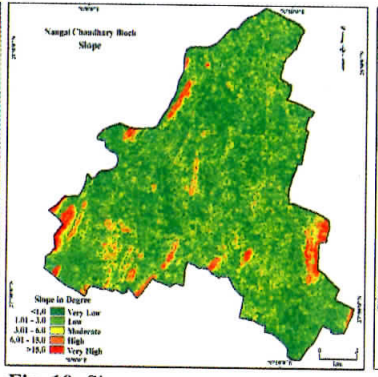

Fig. 10: Slope map

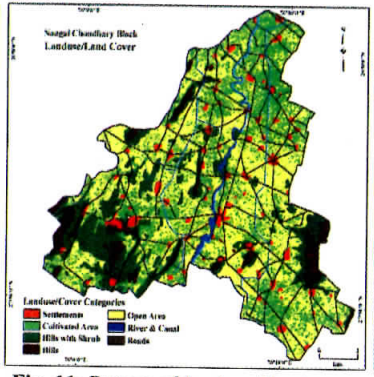

Fig. 11: Pattern of land use/ land cover

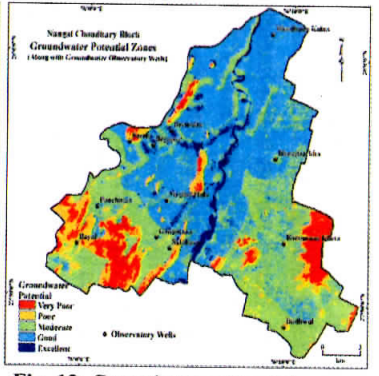

Fig. 12: Groundwater potential zones

moderate, good, and excellent The spatial distribution of all these categories is depicted in Fig. 12 and their respective figures summarized in Table 2. The very poor zone is indicative of the least favourable region for groundwater prospecting while the good to excellent zone is the most favourable region.

Excellent potential for groundwater occurs in the places where all the seven parameters are more favourable to groundwater. It is revealed by Table 2 that about 6 percent of the study area has an excellent potential of groundwater occurrence and is observed near the lower reaches of the study area where gentle slope and low drainage density provide more time for sub-surface infiltration of surface water, aeolian plain with coarse to fine sand deposits develops potential aquifers and concentration of unconsolidated material increases the infiltration rate. The second and third categories which show good and moderate potential of groundwater dominate the study area and cover about 65 percent area of the block. Moderate prospect zones are found in isolated pockets distributed all over the study area. It is also observed from the Fig. 12 that with the increase of distance from the piedmont area with gentle slope and low drainage density poses moderate potential while harder rock formation and concentration of consolidated material with very steep slope and very high drainage density decrease the percolation rate and lie in poor to very poor potential zones. Most of the south-eastern and south-western periphery of the study block has poor to very poor groundwater prospect. The areal extent of these two categories together has been estimated to be about 29 per cent of the study area.

Table No. 2: Proportion of area under different groundwater potential zones

Categories	Area (ha.)	Percent Area
Very Poor	4126.28	13.11
Poor	4979.24	15.82
Moderate	9328.99	29.64
Good	11075.81	35.19
Excellent	1964.00	6.24
Total	31474.31	100.00

Verification of Groundwater Potential Map based on the Hydrological Investigation

A comparison between the groundwater level depth data and groundwater potential zones prepared by the WAM model have been made to check the validity of the proposed model and represented through the Fig. 12 and Fig. 13. It is apparent from Fig. 13 that the higher fluctuation and low depth of groundwater in pre and post monsoon season fall within excellent groundwater potential zones whereas lower fluctuation and high depth of water table fall in poor groundwater potential zones. Moreover, not a single well is found in the very poor zone in the groundwater potential map (Fig. 12). Based on the above verification results and discussion, it can be inferred that the groundwater potential map based on WAM shows that both sets of data complemented each other.

Conclusion

This study represents a modeling approach to integrate the physical, geologic, and anthropogenic factors governing groundwater potentiality in the Nangal Choudhary block of Mahendergarh district in south-western Haryana. Thus, the groundwater potential map produced is an important component for the sustainable development of groundwater

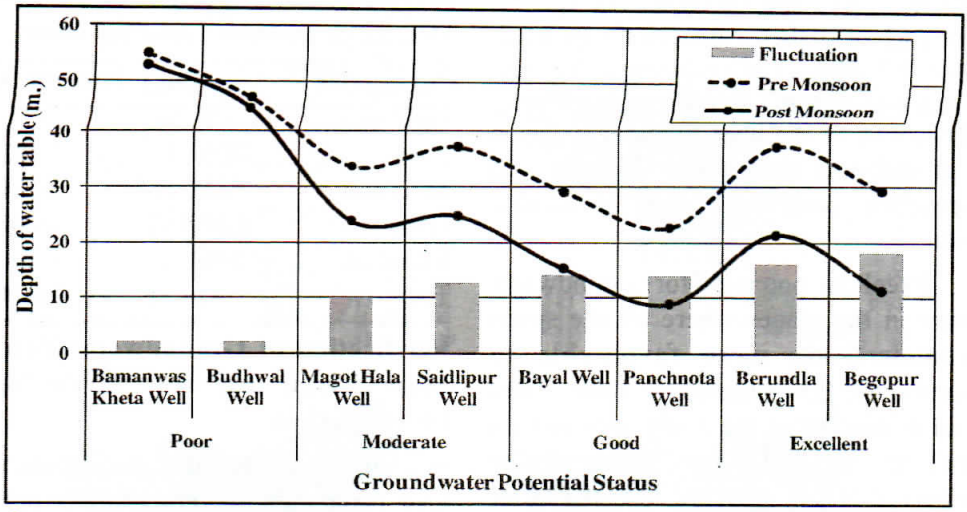

Fig. 13: Graph validates the achieved groundwater potentiality with pre and post monsoon depth of water table in sample village of the study area.

resources of the area. The resulting groundwater potentiality map of the study area indicates that the different geographic locations are suitable for groundwater exploration with different magnitudes, but the overall groundwater potential in the block is the moderate to low class. However, Krishnawati and its tributaries that have higher runoff were predicted to have high/ moderate groundwater potential through the performed WAM. These areas could be the main source of contribution to sustainable recharge of the aquifer systems of the block.

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Uncertainty of Livelihood and Survival Strategy in Tribal Community of Simalwara Tehsil, Dungarpur District

Savitri Patidar

Abstract

Dungarpur district is the southernmost tip of Rajasthan, surrounded by Arawali hillocks. Sometimes it introduced as a backward district or Janjatiya Bahul area of the state. The tribal community may have some small piece of undulating land and many Government policies have been launched for their livelihood sustainability, but the existence of livelihood uncertainty remains as it in the expanse. The tribal inhabitants of the District are the poorest and most disadvantageous group of the District. Out of all these facets (extreme poverty, uncertainty and resource constrained situations) the tribal community (Bhil) has evolved their own livelihood strategies to ensure survival. This study is an attempt to explore the livelihood strategies of the tribal people, which sustain their existence in unfavorable conditions. The study has been accomplished on primary data based survey of 116 households of the Simalwara tehsil of the District, using anthropological approach. The findings of the study accounted that there are abundant of formal and informal strategies with them (tribal community) to sustain their livelihood in spite of vulnerable conditions.

Key Words: Livelihood, Strategies, Sustainability, Uncertainty, Vulnerable

Introduction

The livelihood approach to understanding the survival strategies of poor people, as well as development processes, has become increasingly popular in the last decade. Recently, development agencies and government have been ustilising the concept of livelihood in the design of policies, projects and plans. For instance; Department for International Development (DFID), International Labour Organisation (ILO) and Institution of Development studies (IDS) have been gradually accomplished their research and policy initiatives on livelihood sustainability for poverty reduction particularly in developing countries of Asia and Africa.

The livelihoods are 'unsustainable' since they are poorly equipped to cope with sudden or even long-term changes. Consequently, many livelihood studies carried-out by development authorities to alleviate poverty and to have focused on examining sustainability as an indemnity against a total breakdown of livelihoods (Carney 1999; Brock 1999; Carswell et al. 2000; de Haan 2000; DFID 2002; Toufique 2001). The concept of sustainable livelihoods used in these studies relates to the conditions of poverty, well-being, capabilities, resilience and

the natural resource base of families and communities. A number of studies are also emphasized the significance of migration in the livelihood literature of poor rural households sustainability (de Haan 1999, 2000; de Haan et al. 2000; Mc Dowelland 1997 etc., Siddique 2003.

In that sense many Government policies and community welfare programmes have been established to diminish the livelihood uncertainty of tribal people in India. But the existence of livelihood uncertainty remains as it is in this group. Nevertheless, the lifestyle of each indigenous community is unique and related to the utilization of particular natural resources and particular type of work in their own environment with some strategies to sustain their life. Simultaneously, the tribal inhabitants of the District are the most disadvantageous group of the southern Rajasthan. They bear disproportionately high burden of poverty and multiple deprivation. Extreme poverty, uncertainty of resource constrained situations, ownerships of undulating and small piece of land, lack of education, followers of customary erroneous beliefs, unhealthiness and dreadful habits of drinking and smoking enhances the uncertainty of livelihood. Besides these facets the tribal community (Bhil) has been developed their own certain livelihood strategies to ensure survivals. Here the study attempts to highlights survival strategy that ensure their life.

Objectives

- To depict the survival strategies of the tribal people.
- To examine the ways that how these people utilized the scarce resources utmost for survival and to cope with the vulnerabilities.
- To recommend some submissions that sustains poor livelihoods.

Database and Methodology

The research study has been completed on the basis of the anthropological surveying approach and on qualitative databases. The anthropological study has distinguished itself from other social sciences because it addresses human nature and its many facets – holistically. (Keith Hart)

The database has been based on primary as well as on secondary source of information. The Secondary source of data has based on census, 2011 figures of the study area.

The primary data have been collected with the help of (a.) Well structured interview schedule questionnaire and on (b.) Anthropocentric based observation of households at village level.

To collect household level data stratified random sampling has been designed:

At the first stage Simalwara tehsil of the District has been selected.

At the second stage randomly 13 villages have been selected from the Tehsil.

At the third stage purposively 116 tribal households have been selected from sampled villages.

(Note: - For household selection any type of proportion has not been fixed in a particular village because, the settlement pattern of this group is so scattered so it is difficult to find out fixed proportion households in a particular village. But 4 households have mentioned minimum limitations.)

Study Area

Simalwara tehsil located at the southern west part of the District. It extends between 23°

26'-23°37' N. Latitude to 73°39'-73°52' E. Longitude. The terrain of the Tehsil is highly undulating, characterized by low-lying hills, but the western topographical features merged with Gujarat region. The western portion slopes down towards the southeast.

Population wise Tehsil constitute 23.46 per cent population of the District with 249 habited villages (Census, 2011). The Tehsil is well-known for tribal populous block of the District as well as of Rajasthan. Since 84.78 per cent population (Census, 2011) belongs to purely tribal community in it. The literacy rate has registered only 43.18 per cent in the Tehsil according to census 2011. Working population wise 47.58 percent population engaged in different types of works.

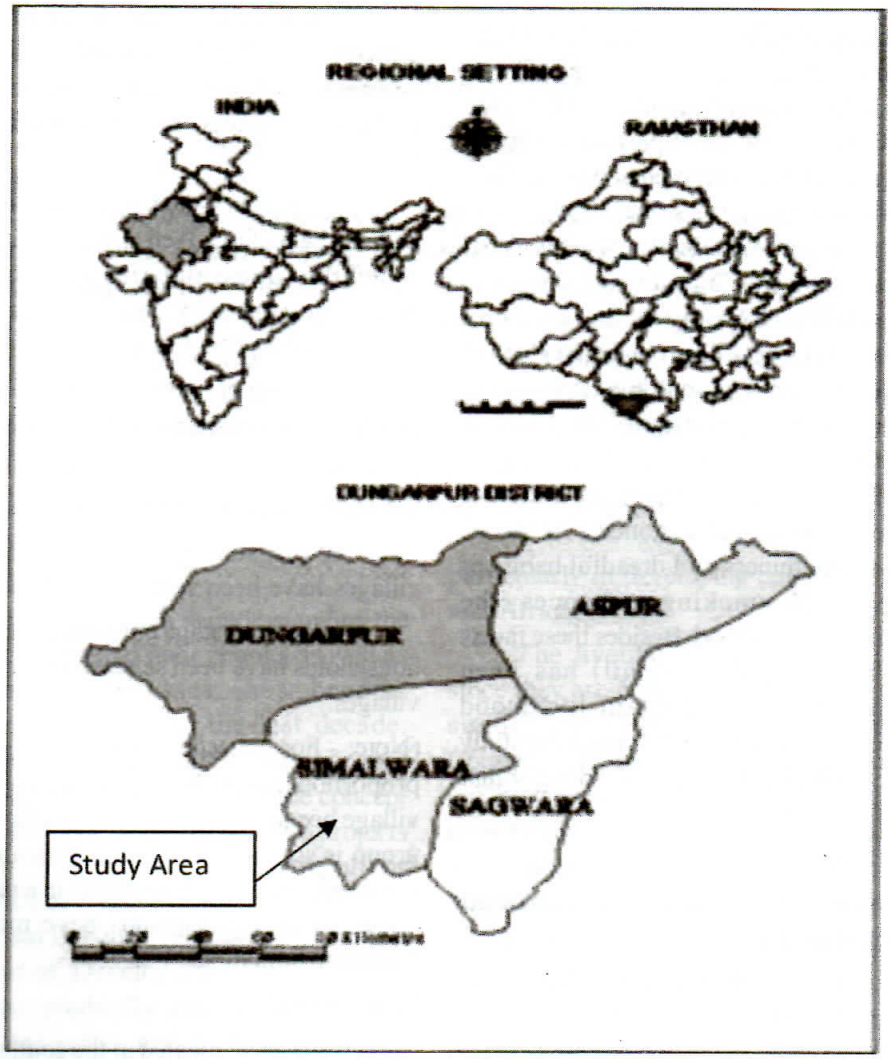


Fig. Key Map of Study Area

Overall, it has to be summarised that the Simalwara tehsil of the District is a most backward tehsil of the District. Tehsil holds lowest literacy rate, with highest tribal grouped population. The community surrounds with very low livelihood sources. Whatever, they having (least agriculture land with infertility and with low irrigation facilities) is the very slightest amount of survive for this group of people in study area. Apart from it the Tehsil covered with inadequate natural resources which are not sufficient to sustain these people life.

Results and Discussions

The results of household survey interpret that in Simalwara Tehsil, the tribal group of people are living in so vulnerable conditions. Besides this, they have been adopted some survival strategies to sustain their livelihood and environment. From the field survey, it has been observed that, mainly the tribal families are engaged in formal as well as in in-formal activities to sustain their livelihood. Household's annual income wise it found that these people earned their annual income from some significant sources of income which categorised into formal and informal sources.

Informal strategic Sources of Income

(a.) Agriculture (b) Agriculture labour (c.) Wage Labour work, (d.) Livestock rearing (e) Fishing and forest collection (f) Traditional crafts work and (g.) Informal ways of Borrowing (loan) Money. (See Plate No. 1-4)

Formal Strategic Sources of Income

(a) Seasonal labour migration (b) Petty trading (c) Work in MANREGA (d) Modern farming and trading of vegetables etc. (See Plate No. 5-8)

Analysis of Informal Sources of Income

After the analysis of the 116 household's scheduled data, it found that usually tribal families received Rupees 110,000 average annual incomes from aforementioned formal and informal sources of activities in the Tehsil. Out of standard total annual income about 28.55 per cent of income gained from informal activities in the study area households. Table 1 given below depicts that average annual income wise, most of family members engaged in agricultural activities in the area. Averagely, about 7 members of a family take on in agricultural activities. Whereas, the ratio of annual income and number of family members engaged in a particular activity is not so satisfactory.

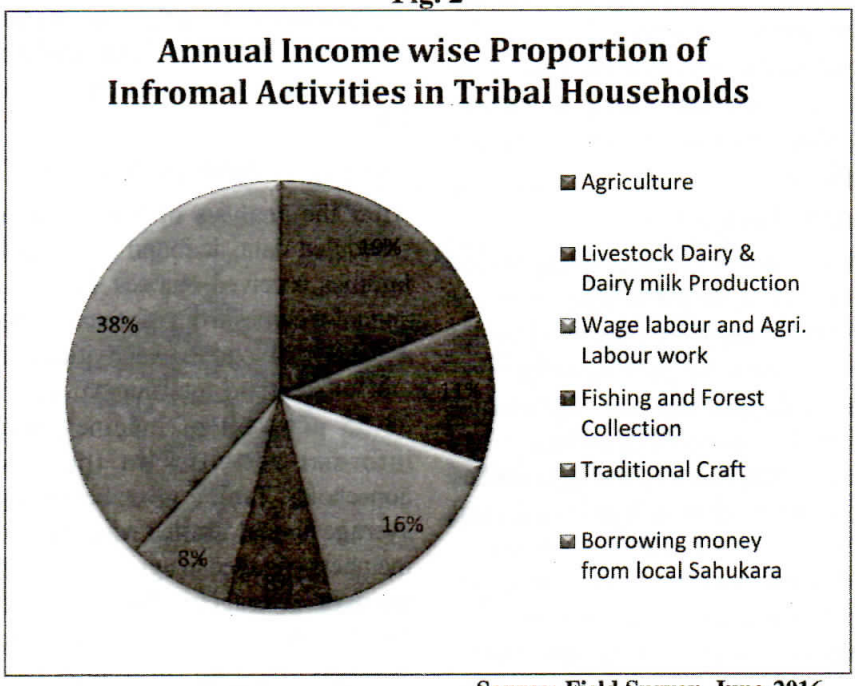
Table No. 1: Informal Activities Wise Annual Income Distribution of Households

Informal Livelihood Activities	No. of Family Member Engaged in Particular Activities (Averagely)	Average Annual Income of a Household (Rs.)
Agriculture	07	6000
Livestock Dairy & Dairy milk Production	03	3500
Wage labour and Agri. Labour work	05	5000
Fishing and Forest Collection	02	2500
Traditional Craft	03	2500
Borrowing money from local Sahukara	01	12,000
Total Average Annual Income from Informal Activities		31500

Source: Field Survey, June-2016

Fig. 2 depicts the livestock dairy and dairy milk production activity wise percentage of total informal activates annual income is about 11 per cent in the Tehsil. It has been observed that most of the families are uninterested to do this type of activity. Because they pointed out that this activity demand lots of passion and operating expenses. It also make-out from field survey that about 50 per cent households have not earned their income from this activity, because they rears animals only to fulfill their own family demand.

Fig. 2



Source: Field Survey, June-2016

Table 2: Formal Activities Wise Annual Income Distribution in Households

Formal Livelihood Activities	No. of Family Member Engaged in Particular Activities (Averagely)	Average Annual Income of a Household (Rs.)
Manrega	01	12,000
Seasonal Labour Migration	03	50,000
Petty Trading	01	8,000
Vegetable Plantation and Trading in Local market	02	5,500
Others	01	3,000
Average Total Annual Income from Formal Activities		78,500

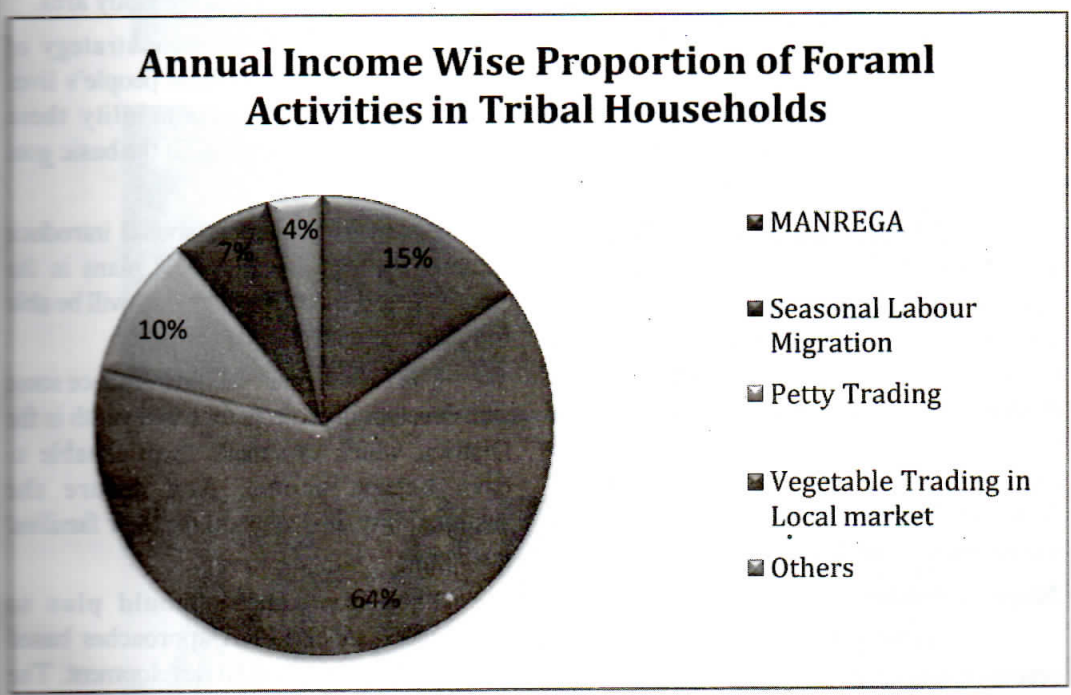
Source: Field Survey, June 2016

The profit received from labour migration is the main source of income in this community. Fig. 3 represent that about 64 per cent annual income of formal activities earned through labour migration in the study area. It concludes that labour migration is being a major source of sustainable survival strategy in the Tehsil. Earnings from MANREGA are also a significant survival strategy of this poor people.

Besides these, petty trading is another technique of survival. In petty trading this group of people purchases different small things from main traders and then trade them or vending them in local areas. Fig. 3 depicts that about 10 per cent annual income of formal activities received from petty trading by this group of people. Though, the members engaging proportion are less, but the income earned through this activity is much enough. It has been noted from field survey that most of people are adopting this strategy to survive now a day in the area.

Close to 7 per cent annual incomes of formal activities obtained from planting of vegetations and trade in the local market as an additional means of making it. It appears that lately some families use to planting of vegetables and trading in the local market. Though, the geographical and infrastructural services for vegetable plantations are not so respectable, despite of that some tribal farmer's family exert oneself to survive.

Fig. 3



Source: Field Survey, June-2016

In the end about 4 per cent of annual earnings of survive obtained from other sources of income. In other source of income mainly illegal activity like; push children to work in Biti-cotton fields, in hotels and dhabas, compel women to do illegal works etc. are the additional sources of income in this group of people.

Overall, it could be said that the importance of traditional activities is diminishing day by day in the study area. Because the earnings from these sources are not so valuable and the outputs are less effective. It has also observed that the interest towards agriculture has been reduced day to day and people are interested to sale-out their parental land property in greediness of some handsome amount. People perceptions towards agriculture are that "the agriculture activities make them vulnerable due to Monsoon uncertainty and expensiveness of seeds, wage, fertilizers and irrigation facilitation". As an outcome they haven't received any sum. It becomes less profitable for them.

On the other hand, income from formal sectors like; seasonal migration, petty trading and MANREGA are so significant and became valuable supplements of strategic sources of income for tribal people recently. Overall, the informal and formal strategies of livelihood sustain these people life primarily but it could not able to sustain their life regularly. In the absence of labour wage, MANREGA or Monsoon they become vulnerable and powerless to survive.

Major Findings

Extreme poverty, uncertainty of resource constrained situations, ownerships of undulating and small pieces of land, lack of education, followers of customary erroneous beliefs, unhealthiness and dreadful habits of drinking and smoking enhances the uncertainty of livelihood and poverty in tribal people of the District.

It found that tehsil's tribal people sustain their livelihood on the basis of land, livestock, crops, forests and on indigenous traditional knowledge.

Broadly tribal groups of people engaged in informal and formal activities to sustain their livelihoods in the study area. Most significant activities which create uncertainty regarding livelihoods are agriculture, local wage labouring and borrowing money from local Sahukars.

On the other hand, lately petty trading, vegetable marketing in local areas, MNREGA and migration becomes supplement sources or strategies of survival for this group of people in the study area.

No doubt, the alternate strategy of livelihood has sustained these people's lives temporally. But for sustainability these strategies are not able to fulfill the basic goal of survival.

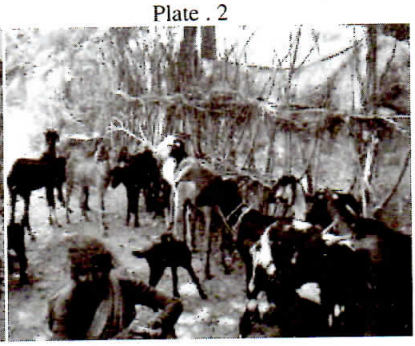
For that government should introduce some new policies and project plans in the survey region, through which they will be able to sustain their livelihood regularly.

The Government should introduce some skill developing projects for tribal youth in the District, which can make them capable to earn better income. And secure the sustainability of livelihood for their families' lastingly.

The Government should plan to introduce PLA and PRA approaches based projects in tribal areas to development. The main goal of these approaches is to involve local communities, and all other stakeholders

Plate . 1

Plate . 2



Informal Strategies of Livelihood in Study Area

Plate 3

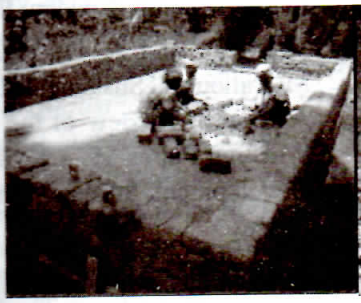


Plate 4

Plate .5

Plate .6

Formal Strategies of Livelihoods in the Study Area

Plate 7

Plate 8

voluntarily for community development, so that they can identify, plan, control and maintain and use of local resources for greater prosperity. (Exmp; Biodiversity conservation and Rural Livelihood improvement Project, Ministry of Environment and Forest conservation).

Despite it, the Government should focus on the development of basic amenities on health, education drinking water, proper road networks, electricity, banking facilities etc.

To increase employment opportunities locally, the NRIS, local administration and state government should bring together hands in inviting investment for setting up industries, and other small scale or cottage industries depending on the availability of resources in the district. This will help to generate employment locally for the people of the district.

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Dimensional Stone Industry in Rajasthan Challenges and Strategic Measures

Seema Jalan and Purnima Singh

Abstract

With the advancement of civilization, the uses of stone have also tremendously increased. Stones are not only the oldest building material but their availability and durability has led to their widespread use in construction activities for many purposes. Rajasthan is the hub of stone activity accounting for approximately 65% of India's stone production. Rajasthan is endowed with about 95%, 85%, 80%, 20% and 20% of marble, sandstone, limestone, granite and slate production respectively of the entire nation. Rajasthan possesses 91% of deposits and produces about 95% of the total marble production in India. But the industry is presently faced with some formidable constraints and challenges including obsolete technologies and poor performance in international marketing. The present paper is an attempt to evaluate the potential strength as well as weaknesses of this industry in Rajasthan, capitalize on the opportunities and overcome the threats so that this industry providing livelihood to a sizeable section of the society in the state can withstand in the market.

Keywords: *Dimensional Stones, Constraints, Environmental Degradation, Strategic measures.*

Introduction

Stone was the earliest inorganic material used for various purposes by mean. With the advancement of civilization, the uses of stone have also tremendously increased. Stones are not only the oldest building material but their availability and durability has led to their widespread use in construction activities for many purposes.

Any stone specially, cut or shaped to a size is called as 'dimensional stone'. Dimensional stones usually include marble, granite, flaggy limestone, sandstone and slate. Their use is not limited to a particular variety of buildings. In fact, one or many of the stones find their applications in all kinds of buildings. Marble and granite have extensively been used in palaces, forts, temples, churches, mosques, gurudwaras and castles, not only as structural members but also with their functional use and aesthetic sense.

Review of Literature

The stone industry has become a popular theme among the researchers. K. Vikram has done a lot of work on stone industry. Important works of Vikram, K. are 'Stone Industry in India' (1984), 'Directory of Dimensional Stones' (1986), 'Pashan' (1990), 'Export Potential of Dimensional Stone', 'Slate : The Wonder Stone' (1995). His most

important work is 'The Rajasthan Dimension Stone Industry : Opportunities Galore'(1996). Various other research works in this regards includes 'Need of Research & Development and Innovative Techniques for Proper Development of Dimensional and Decorative Stone Mining and Processing' by H.R. Banthia (1990), 'Marble and Granite Processing Industry in Rajasthan - A Locational Analysis' by Seema Chouhan (1996).'Stone Characterization: An Important Step for Ensuring Enhanced Export and Domestic Sales' by O.P. Jain (1997), "Problem faced by Indian Stone Industries" by B. D. Verma (2000, 2003). Gagan Goyal (2002, 2003) has very extensively dealt with the marble industry in Rajasthan. Ravindra Nagar et al (2016) have studied the potential resources of granite and marble dust and comparative assessment of sand and cement replacement in concrete by marble and granite dust.

Objectives of the Study

The objectives of this study are to identify major constraints relating to the development of dimensional stones in Rajasthan, analyse and propose strategy for its sustainable mining in Rajasthan. The main constraints being faced by this industry particularly in relation to the competition from the international market have been identified and further, an attempt has been made to find out the remedial measures

Study Area

Rajasthan extending from 23°3' N to 30°12' North latitudes and from 69°30' E to 78°17' East longitude is the largest State of India. It spreads over 3,42,239 square kilometres and occupies about 10.45% geographical area of the country. The neighboring states are Punjab in the north, Gujarat in the south, Uttar Pradesh in the east, Haryana and Delhi in the north-east and Madhya Pradesh in the south-east. International boundary separates the state from Pakistan in the west.

Physiographically, the State is bordered by the plains of the Sutlej-Beas rivers in the north-east, the Ganga-Yamuna rivers in the east, the Malwa Plateau in the south-east and the Gujarat plain in the south. Rajasthan is endowed with diverse physiographic features-the Great desert in the west, the Aravalli Mountains in the middle, the plains in the east and Hadauti plateau in the south-east.

Material and Methods

This paper is based both on primary and secondary data. Secondary data have been collected from the concerned Departments, Institutions and offices. Various publications of Department of Mines and Geology (DMG), Geological Survey of India (GSI), Rajasthan State Industrial Development and Investment Corporation (RIICO), Centre for Development of Stones (C-DOS), Indian Bureau of Mines (IBM) and souvenirs of exhibitions etc. have been studied carefully. Valuable information have also been collected from the various internet sites. Secondary data have been supplemented by field studies. Workers at the mine sites and the owners of processing units have been interviewed about working atmosphere. The interactions with the workers and owners have helped to understand present status and constraints of the industry.

Spatial Distribution and Development

The State of Rajasthan produces about 40% of the minor minerals in the country and a large proportion of it is covered under dimensional stones. Rajasthan is the hub of stone activity accounting for approximately

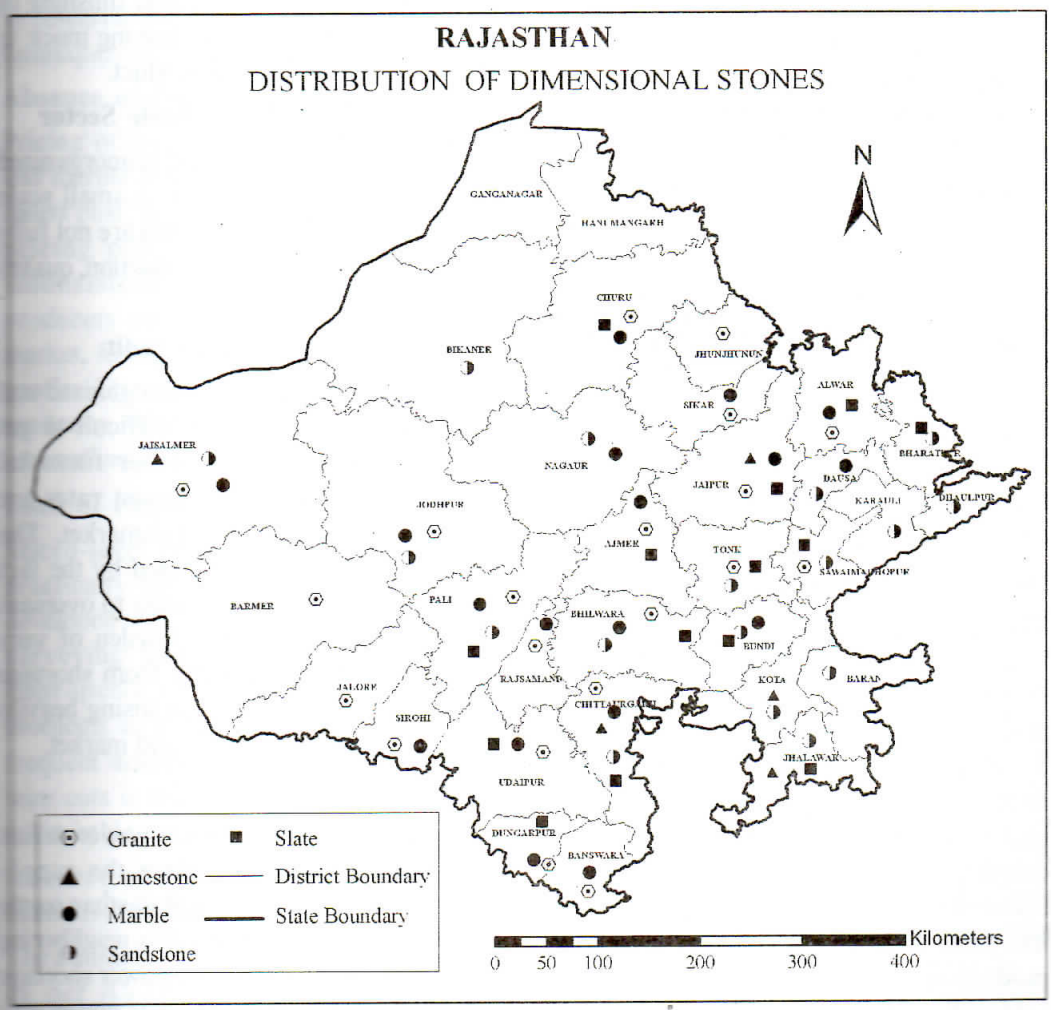
65% of India's stone production. Rajasthan is endowed with about 95%, 85%, 80%, 20% and 20% of marble, sandstone, limestone, granite and slate production respectively of the entire nation. Rajasthan possesses 91% of India's deposits and produces about 95% of the total marble production in India. The estimated reserves of marble, granite, flaggy limestone, sandstone and slate in the state are 1100,1128,1800,900 and 50 million metric tons respectively. The spatial distributions of various dimensional stones in the state have been depicted in Figure. 1.

Constraints in the Industry

Despite rich potentials for growth, the dimensional stone industry in Rajasthan is faced with the following constraints:

Manual mining

The mining of dimensional stones is mostly



(Fig. 1)

manual hence is very slow and time consuming. Open cast method of mining is adopted in all existing stone mines which is primitive, manual, slow, wasteful and highly uneconomical. The availability of labour is cheap and abundant but this labour is unskilled and mostly illiterate. Due to unskilled workforce, the products are not consistent in shape and sizes, besides being incapable of batch production.

Shortage of Modern Machinery and Absence of Latest Technology

While exporting the dimensional stones it is often viewed that the Rajasthan's material does not possess quality approved products. During the process of cutting the material to marketable sizes, the tiles or slabs are not cut at right angles. Similarly, the thickness varies from one corner of the slab to another corner. The edges are often chipped, jagged and often some percentage of the product is cracked or broken. These are mainly due to lack of modern machinery and obsolete installation techniques. The facing is done without proper water proofing and chemical treatment for protection from weather deterioration.

Inadequate Transportation Facilities

Mines are mostly located in remote areas which do not have sufficient transportation facilities. Many of the quarries are facing problem in movement of blocks from quarry to processing factories. This restriction is firstly due to the shortage of approach roads and secondly, due to the restriction on carrying overweight. Due to these transport restrictions, large blocks of stones are made into small sized blocks resulting in to lower production.

Lack of Regular Supply of Quality Approved Products

The entrepreneurs owning and operating the quarries and processing plants are not well versed with the technical aspects. Hence do not produce goods conforming to the international standards of polishing. Rejection of exports is often reported due to lack of quality control. This problem is further compounded by the lack of inspection and certification agencies. Sufficient attention is not being paid to polishing and finishing of the slabs and tiles, thereby leaving much to be desired in the finished product.

Unorganized and Small Scale Sector

The stone sector in Rajasthan is unorganized and has developed mainly as a small scale sector. The small entrepreneurs are not fully aware of the modalities of production, quality control, planning and export.

Shortage of Capital and Credit

The industry mostly being unorganized and in small scale sector finds difficult to get finance from banks and other financial institutions. Further the interest rates are higher than the international market. The problem is further compounded by the fact that the exporters extend credits to overseas buyers whereas they bear burden of very high interest rate and suffer from shortage of working capital. They are losing heavily in terms of working capital and market.

Shortage of Power

Rajasthan has always been a power deficit state with demand exceeding the supply specially in summer season. Rajasthan partly depends upon power supplied by neighboring states. During the periods of power shortage industrial estates are first to face power cuts and receive power on commercial rates.

Lack of Specialized Technical Education and Innovative Technology

There is shortage of trained workforce for the stone industry because of absence of education and training facilities for entrepreneurs as well as for the engineers and operators. The mine owners and processors are not well versed in technical aspects. Hence there is a general lack of quality consciousness in the quarrying as well as in the processing. Further, Rajasthan lacks in research and development of innovative techniques in the sector.

Absence of Proper Pricing Policy

Pricing of Indian stones especially granite and marble has become very flexible in the recent past, adversely affecting a reasonable pricing policy for our stones. Due to inconsistency in pricing, most of the producers are competing within the local market, losing the international market and profit. The Rajasthan exporters have a tendency to dump their product in the international market at bottom prices.

Lack of Planning Process

Micro-level planning of the quarries is practically non-existent. The quarries are developed without micro level sampling and surveying techniques. The benches are improperly developed thereby posing problems in material handling and causing frequent accidents. The orientation of the wire cuts is often unfavourable and causes undesirable cracks in the products.

Absence of High Quality Easting and Standardization Facilities

The available facilities are incapable of testing as per ASTM and other international standards. Exporters are not aware of the properties of their stones and their suitability for application. There is a complete lack of understanding about the need for testing of stones and standardization of applications. There is no export certification facility dedicated exclusively to the stone industry and there is absence of export inspection agency. Stringent standards adopted by European Commission Countries are too high to comply with.

Lack of suitable information and export promotional activities

An information network / data bank on potential importers of stone and exchange of information about export enquiries is not in place so as to assist the potential exporter except at C-DOS. Geological information regarding stone deposits has not been compiled and are not easily accessible

Due to lack of interaction between exporters and importers, and irregular promotional activities like international trade fairs, buyer seller meets, conferences the international market is not fully aware of the wide range and export potentials of stones from Rajasthan.

Small and Short Term Mining Leases

Mining leases have been given to too many small investors without checking their credentials on technical capabilities and ability to invest capital in mining machinery which are necessary to sustain massive production. Due to small size of plots, the mining industry has suffered. Banks are very hesitant to provide substantial financial help in developing the mines. Short term quarry leases make it impossible for quarry lease holder to invest sizeable amounts or entering into any long term contracts or projects.

Non-availability of Good Size Blocks

Countries like Italy, Germany China and few

far eastern countries are buying huge quantity of rough blocks to be reprocessed in their countries. Since, the block itself is of high quality, they are therefore, able to produce high quality stone with which our entrepreneurs have to compete from the left out blocks of low quality. Non-availability of good size blocks in the local market causes problem in producing high quality gang saw size slabs.

Improper Packaging

Segregation of various patterns and colours into various quality grades is very essential before being packed and dispatched. But our sorting system is improper- often good quality product is mixed with the poor ones. This results in inconsistency and non-uniformity in the packaged products. Improper packaging results in damages during transit and dissatisfaction of customer.

Slow Response to Changing Market Demands

Unlike other products, the dimensional stones have many specialties with high risks. Some unique stones like green marble have permanent market but other natural stones of all varieties, have seasonal preferences and drop outs depending upon the world trend in fashions, decorations and interior designs. Unfortunately, the delayed procedures and rigid policy framework have adversely affected stone operators to come out successful. The Indian stone industry has been observed to be strongly resistant to change and is very slow in responding to the challenges of international competition.

Absence of Rational Mining Policies

There is also absence of long term rational mining policy by the state government. The state government frequently formulates new policies altering its own earlier announced policy or of the previous government. Some policies of government have caused serious problems resulting into huge loss for the processing factories as the mines were not renewed due to change of mining policies which deprived them of their raw materials. All these uncertainties diverted the investors into countries with attractive investment opportunities like Brazil, China, Italy, Korea, Greece etc. and in to other states in India having more investor friendly environment.

Import Liberalizations

The liberalisation of imports threatens to challenge the monopoly of Indian stones in the domestic market especially in office complexes, prestigious complexes and hotels wherein high priced stone are generally installed.

Lack of Proper Implementation of Laws

The government agencies enforcing provisions of the Mineral Conservation Act and the Mining Safety Act are expected to act as a guide and friend, advise and assist the mine owners both in commerce and technology to exploit the natural stones in a safe, competitive and environmental friendly manner. Contrarily they are resorting to authoritative conduct which is detrimental for the smooth functioning and growth of mining plants

Threat from Ceramic Industry

The dimensional stone industry is facing insurmountable threats from the ceramic Industry. The ceramic tiles are becoming quite popular for the flooring purposes because of its accurate dimensions, easy availability, large variety, ease of installation and light weight.

Low Degree of Value Addition

A major proportion of the exports from India

consist of raw blocks to Italy and China which is then processed and re-exported to the rest of Europe and United States of America. Poor value-addition for exports is a major loss to the exporter as well as a loss of foreign exchange for the country.

Losses to the Marginal Players

During the last few years there has been an increase in supply due to overproduction. This is resulting in to severe losses to the marginal players in the sector.

Tough Competition from Other International Players

India's major competitors like China, Spain, South Africa, South Korea, Brazil, Turkey etc. are growing at a faster pace than India. China is far ahead of India in matters of price, quality as well as value-addition. Brazil, Turkey and South Africa are gaining over India through aggressive promotional efforts like group participation in International fairs etc. China and South Korea are presenting a strong threat to Indian stones in the Japanese market. Indian exports have shown a clear decreasing trend in the last few years while our competitors have retained their growth rates.

Environmental Degradation

The stone industry in India is causing widespread environmental degradation through indiscriminate disposal of waste and slurry. The problem of slurry has assumed mammoth proportions in the marble processing areas and has triggered backlashes from the communities living in nearby areas. The quarry waste and processing dust threatens the porosity of aquifer zones, reduces permeability, porosity and fertility of top soil, adversely affect vegetation and has become a potent cause of many respiratory ailments.

Proposed Strategic Measures

In order to improve the competitiveness of Rajasthan in the world stone market and to make this industry sustainable following strategic measures are to be adopted so as to take advantage of the strengths and minimize the weaknesses, to capitalize on the opportunities and overcome the threats.

Rationalization of Mining Policy and Mining Leases

Global level prospecting and mining policies with reliable long term periods for renewals with competitive royalties and dead rents are urgently needed. The mining leases which are of small size should be merged with the neighboring leases into one major mining operation and their owners should be asked to develop cooperative mining on a larger scale.. Government incentives on scientific development of the mines and low cost development funds need to be created. Proper mining and processing systems, machines and tools need to be developed to ensure low cost production and conservation of dimensional stones.

Flexibility in Government Policy

The local investors should have more flexible opportunity to reach the contemporary market material available locally to compete globally with other materials coming from other countries. The expedient procedures and flexible policy framework will help promote the industry. In order to provide a level playing field in all the states, there must be uniform policies for mineral leasing, taxation, incentives etc. at the national level. Formation of a study group for undertaking a comparative study of the existing policies in various states and to suggest rationalisation of the various policies all over the country is needed.

Rational Pricing Policy

All producers of green marble have to jointly consider the rational pricing policy and have to put an end to overproduction and dumping in international market at outrageously low price which is prevalent due to unhealthy competition and under priced selling.

Incentives and Levy on the Products

There should be more incentive on export of value added products such as polished gang saw slab, cut to size stones and finished tiles. At the same time there should be substantial levy on export of rough blocks to discourage people exporting them and to increase the cost of such block by the importers so that the entrepreneurs can compete with their competitors despite their infrastructural problems.

Improvement in Marketing System

For marketing in the world, one needs to carefully consider the end user's requirements, trends, price ranges, feasibility, economics of transportations, freights and other costs as well as competitive products, their prices, quality and performance. Time bound performance and required quality standards and specifications must be thoroughly studied to decide whether material being offered from India can sustain or even can enter the markets. A good exporter with adequate processing facilities should think of opening a warehouse abroad as a joint venture with a foreign company. Concepts of design centres and e-marketing must be practiced.

Adequate Finance Facilities

Long term funding with cheaper rates of interest at the global level for export-oriented mining should be promoted. Exporters should convince overseas buyers and educate them to pay for in cash and carry basis as there is huge difference between the interest rates in India and international interest rates. The industry needs assurance and insurance for capital investment on long term basis.

Reduction in Transportation Cost

Transportation cost of stone must be reduced in order to continue and widen the use of stone. Transportation of dimensional stones by railways to far places in the country and ports should be facilitated to meet the domestic and export demand. Movement of loaded trucks by railways will reduce the multiple loading and unloading of dimensional stone. There is a need to develop the roads, infrastructure at ports and power supply etc.

Promotion of Stone Testing Facilities

Research stations at various places should be established to determine the stone characters according to international practices and to evolve and standardise the tools and construction practices. There should be a careful analysis of the suitability of one's products based on the recommended specifications and architectural applications. The exporter must identify the countries with a potential for usage of stones as per the technical specifications of his stones. The whole emphasis of the Rajasthan stone industry needs to be shifted towards higher standards and stringent quality control in cutting, polishing, finishing and segregation according to pattern, colour and finish. Testing of stones is essential for identifying the right stone for the right application worldwide. The architects, if aware of the properties of stones, would be liable to use stones in structural applications in large complexes. The structural analysis of stones would also assist stones in competing with alternative materials like ceramics etc.

Import of Latest Technology and Machinery

Factories need consolidation and import of proper equipments. The system of international collaboration with highly experienced and established manufactures in Germany, Italy etc. may encourage and improve the stone processing plants. Machinery and its components should be allowed to import at low custom duty not exceeding 15% even for domestic sales. Diamond multi wire technology which has economic as well as other added advantages over the traditional gang saws for granite slab production must be developed. Wherever production flexibility is required, the complementary relationship between the two different technologies will ensure an effective and logical compromise.

Establishment of Stockyard

We should concentrate on producing finished tombstones of granite and have stock banks in various countries for prompt deliveries. The stockyards also could be established on cooperative basis. Organizations like C-DOS and CAPEXIL could help in establishing these stock yards.

Need for Improvement in Packing Technology

We need to improve our packing to avoid chipping of the stone and should not use second hand wood for making crates but stony wood and steel crates.

Development of Technology to Use Slurry and Stone Dust

Major thrust needs to be given for developing technologies aimed towards large scale applications of stone slurry such as bricks, roads and in other construction activities. There is great potential for use of marble stone dust in burnt and unburnt bricks. It is possible to utilize granite waste and marble dust as a partial replacement for cement and sand in the concrete manufacturing.

Formulation of environmental management plan for prevention, disposal and utilisation of stone waste

Quarry waste is normally not less than 40% and in some cases even more than 60%. Presently 6 million tones of marble dust per year is generated in Rajasthan which is dumped causing high environmental pollution. Processing waste is also enormous which is causing serious environmental hazards. Unless preventive measures are taken, public outcry and judicial intervention could lead a deathblow to the growth of this industry. In 2016 National Green Tribunal has made environment clearance mandatory for every mine.

Use of waste material is conservation of resources. Mining and processing waste can be used as cobbles, free size tiles, rough blocks, steps, production of binders, fertilizers in agriculture and production of binders in construction activities. Cement replaced by 1% to 10% of marble dust can be used as a filler and improve rate of hydration of cements and its strength can be increased.

In addition to the above, establishment of an information centre, a permanent museum and artisan village, awareness among buyers and research in the field are also required

Conclusion

Dimensional stone industry has tremendous potential and bright future prospects but unfortunately, all stone gifts of nature have been underutilized by inadequate mining techniques, shortage of approach roads, high processing cost, lack of capital, manual

mining, poor marketing techniques, lack of technical manpower, obsolete technology and numerous other problems. The proposed solutions to the constraints can be of great help for the sustainable development of the dimensional stone industry in Rajasthan. By selling finished products compared to the rough blocks, profit realization can be increased to 2.5 times.

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Development Level in Wards of Pushkar Town Based on Socio-Economic Variables

Milan Kumar Yadav and Himanshu Singh

Abstract

The present study assesses the level of development at ward level in Pushkar Town of Ajmer District. Pushkar is a holy town which has been a tourist spot from historical times and since then it is developing rapidly. Recently there has been massive population growth in the area approximately 46.3% decadal growth rate as compared to previous decade which directly impact the development of town. We would take into account number of demographic factors to analyze the development of the different areas in the town and would conclude if this development is converging or diverging. For this, a Composite Index has been constituted within the context of all wards which clearly shows that eastern and southern wards are more developed. Hence, there exist regional disparities among different wards of Pushkar town.

Keywords:*Sex Ratio, Female Literacy, Occupational Structure, Main Workers, Composite Index, Level of Development.*

Introduction

Pushkar is one of the major pilgrimage centers in India with over 500 temples in and around the town, the most sacred being the Brahma Temple. This holy town is situated around the sacred Pushkar Sarovar (Lake) and is set among the Aravalli mountains. Tourism is the main economic driver of the town, which promotes other key sectors such as trade and commerce, transportation and household industries.The cattle fair is the most important event which attracts large number of traders and craftsmen from across the state.

Development is a holistic process that involves reorganization and reorientation of socio-economic factors. Developmental programs has been implemented from time to time with the objective of enhancing the quality of life of people by providing the basic necessities as well as improving their social and economic well-being.In developing countries there is a wide range of regional disparities.

This paper analyzes socio-economic disparities amongst wards of Pushkar town to find out if they are on convergence or further divergence course. It compares eight selected demographic variables viz. Sex Ratio, General Population, Literacy Rate, Female Literacy Rate, Total Working Population, Female Working Population, Total Main Workers, Female Main Workers and frame out a composite index to find the underlying cause responsible for the difference in level of development amongst wards.

Review of Literature

- Fedorov (2002) highlights the growing regional inequalities in Russia in the 1990s. Referring to recent studies on regional disparities in Russia he states that "Virtually all authors agree that the transition period has been characterized by rapidly growing economic inequality among Russia's region."
- Dreze and Sen (1995) find the diversities in economic and social development amongst the Indian States remarkable.
- Datt and Ravillion (1993) observe "Disparities in living standards among regions and between urban and rural sectors have long raised concern in India."
- Datt and Ravillion (1998) referring to major states in India – after controlling for a number of socio-economic conditions, conclude that "Starting endowment of physical infrastructure & human resources appear to have played a major role in explaining the trend in poverty reduction."

Objectives

The present study aims at following objectives:

1. The study analyzes the variation of variables within the wards of Pushkar Town.
2. To study the spatial inequality in the level of socio-economic development and identify the regional disparity at ward level in Pushkar Municipality.

Methodology

The study is based on secondary data procured from demographic survey of Census India. The district census handbook, 2011 has also been helpful in providing us various statistical data. These data were then standardized using different statistical techniques and further a composite index has been prepared to analyze the level of development amongst the wards of Pushkar.For standardization technique SPSS software has been used. Maps were prepared using QGIS.

Study Area

Geographically, Pushkar Town lies in Central Arravali Region and occupies an important place on the cultural map of state of Rajasthan. The study area is stretched between the parallels of 26o23'N to 26o43'30"N and meridian of 74o22'E to 74o44'15"E. It covers an area of 444.65 sq.km and is inhabited by 21626 persons as in Census 2011.Geographical area lies between two parallel Arravali ranges stretched from North to South. The One of the range is known as Nag Hill (Snake Mountain) which is 28 km. long and another range is called as BandiGhati Hill or Nand Hill which is 38 km long.

Ward-wise Analysis of Socio-Economic Variables

Sex Ratio

The sex ratio of Pushkar Town is 911 which is less as compared to national average of 940. This is mainly due to less development in the area as compared to whole and also this is a tourist town hence working population dominate the area. Among the wards of Pushkar the variation is huge, as the minimum is observed in Ward no. 15 (788) and maximum has been observed in Ward No. 8 (1065).

The noticeable fact is that there was only 1 ward with above 1000 figure that is Ward no. 8 and that is because the area

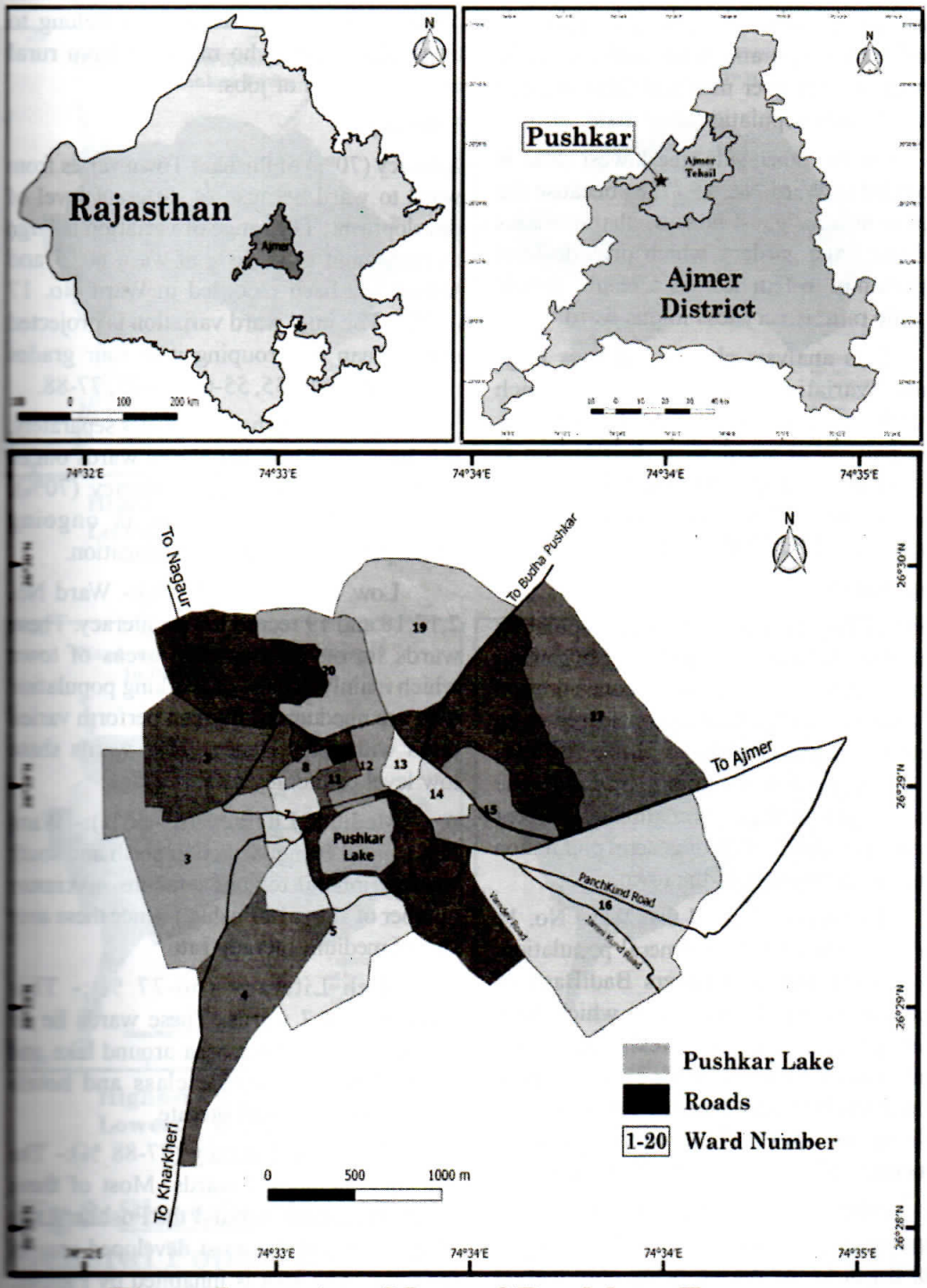


Fig 1: Location Map of Pushkar Town

consist of one of the oldest markets and main road of brahma temple. As a result handicraft shops and food markets prefer women worker over men and therefore rise in the female population over male.

On the other side, the lowest ratio is recorded in Ward No. 15 (788) because the area is hub for guest houses, dharamshalas and marriage gardens which provide least opportunity to females. As a result, female to male ratio is very less in this ward.

This analysis clearly indicates large spatial variation among the wards which directly influence the level of development. The pattern of ward wise distribution is displayed by categorizing the values of sex ratio in four categories and plotting it into a ward map of Pushkar town.

Population

General Population is the total population other than SC and ST population. In general trend if an area contains large concentration of general population, it is considered to be more developed. Hence, to check out level of development we must find out the percentage of general population in different wards. The distribution of general population is not even throughout the town.

The study revealed that Ward No. 11 has the highest (100%) general population. This is because area covers BadiBasti of Pushkar (Upper Class Area), which have been preoccupied by priests and other Brahmins of the town whose ancestors have been living here in prehistoric times. As they belong to upper class therefore it is concentrated only by general population.

Alternatively, the lowest general population percentage is recorded in Ward No. 8 (26.5) the reason being core market area which needs unskilled labour hence the area is occupied by other caste population. Most of the people living here belong to Scheduled Caste who migrated from rural areas in search of jobs.

Literacy

Literacy (70%) of Pushkar Town varies from ward to ward because of different level of development. The range of variation is huge as maximum is 85.46% in ward no. 5 and lowest has been recorded in Ward No. 17 (45%). The inter ward variation is projected onto a map by grouping it in four grades ranging from 44-55, 55-66, 66-77, 77-88.

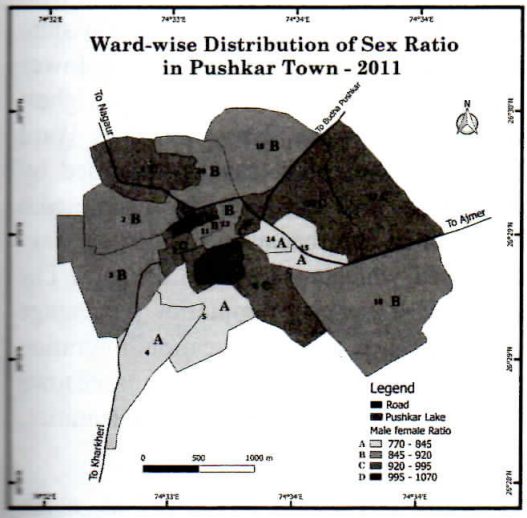
Considering the four grades separately, it is been observed that eleven wards out of 20 records above average literacy (70%). This clearly shows there is ongoing development in the area of education.

Low literacy (44-55 %):- Ward No. 2,17,18 and 19 record lowest literacy. These wards lie on the marginal areas of town which mainly consist of working population who are uneducated but can perform varied tasks with ease. Hence, these wards show low level of literacy rate.

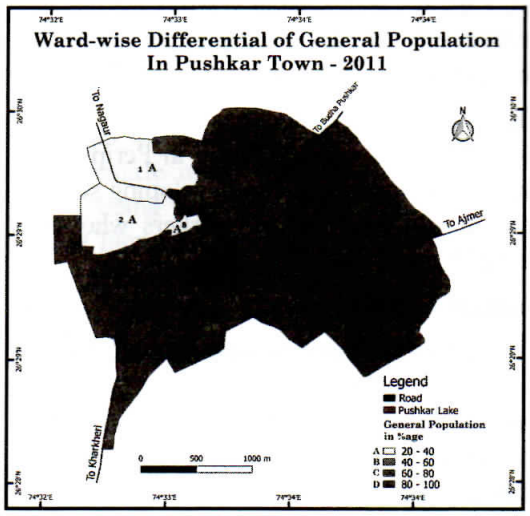
Medium Literacy (55-66%):- Ward No. 1 and 4 being located in north and south west peripheral regions contains maximum number of slums of Pushkar hence these area shows medium literacy rate.

High Literacy (66-77 %):- This category has 7 wards. These wards lie on the periphery of core area around lake and is inhabited by service class and hotels owners who are well literate.

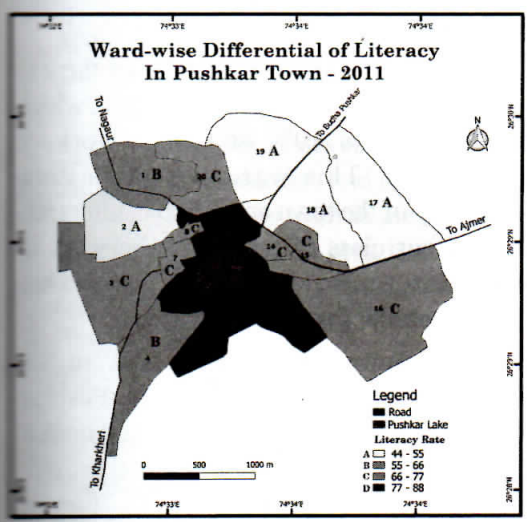
Very High Literacy (77-88 %):- The category includes 7 wards. Most of these wards are located around the Pushkar Lake which is one of the most developed area of the town. The area is inhabited by Pandits,



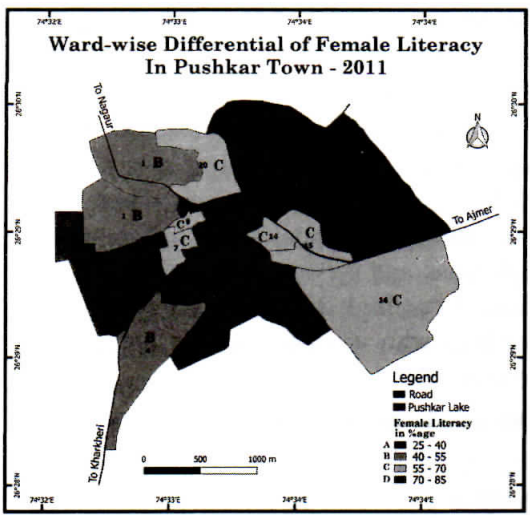
Highest - Ward No. 8
Lowest - Ward No. 15



Highest - Ward No. 6
Lowest - Ward No. 8



Highest - Ward No. 5
Lowest - Ward No. 17



Highest - Ward No. 5
Lowest - Ward No. 17

Fig 2: Showing Ward-wise Distribution of Sex ratio, General Population, Literacy and Female Literacy.

Hotel owners and highly skilled labours.

The Literacy is highest in Ward No. 5 due to presence of modern settlements, private school and families of big income groups.

The lowest literacy rate was found in Ward No. 17 as this ward is found in Peripheral area of the town and is in developing stage. It is mostly occupied by workers who are skilled but not enough literate.

Female Literacy

The regional disparity of female literacy ranges quite high from 27.6 to 83 with average being 61%. This is due to tourist influenced development and rural population immigration in the town.

The inter ward range is divided into four groups viz. 25-40, 40-55, 55-70, 70-85. The lowest category includes Ward No. 17, 18 and 19 which lies in the eastern peripheral region of the town. The cause behind is resorts, working unskilled labour population and rural settlers.

The highest literacy is recorded in Ward No. 5 and 6 which consist of area around the Pushkar Lake and to its west. These area have secondary school and is inhabited by high class and service class families. Also, these have high level of skilled women workers who work at various hotels and resorts.

Occupational Structure

The percentage of working population of Pushkar is 35% of the total population. The increase in percentage from previous decade clearly indicates more people are getting aware of jobs and lesser dependency on agriculture as a major occupation.

The variation among working population of different wards were grouped under four categories.

The study revealed that lowest working populationwas present in Ward No. 2 with 29%. The reason being it is inhabited by slum population and sand dunes hence lower income groups dwell in this area. The highest working population was recorded by Ward No. 17 because the area is occupied by immigrants and other working people who have settled here because it is distant from core area which makes land cheaper. The overall less working population percentage is because less female education, migration for higher studies and incapability of the town to create enough employment opportunities.

Female Workers

To study the female involvement in the development of area it is important to analyze the total female working in different wards of the town. For this female working population data is categorized in four categories.

In the study we found out that there is only one ward i.e. Ward No. 17(36%) which has more than 30% of female working population. This ward lies in Eastern periphery of the town and inhabits migrants, and labour class of the town who work in Pushkar town but due to lower income has to settle in the peripheral region.

The lowest in the group is Ward No. 12 which is situated North of the Pushkar Lake and consist of oldest hotels and market area. These businesses does not provide enough job opportunities to female population.

Main Workers

Main workers are those who work for more than 6 months in a year. Hence, those who have stable jobs are being considered in this category. This variable reveals a lot about the development of the area as whether it

could provide stable job opportunities or not.

The primary activity of people in Pushkar is agriculture and beside this the major activity is tourism. Pushkar remains a tourist attraction round the year for Indians but become major center in the month of Oct-Nov when there is a Pushkar fair held at occasion of KartikPurnima. Every year lakhs of people visit the town thus providing seasonal jobs to lots of people.

In this study we would analyze inter ward variation of main workers by grouping them in four categories.

The lowest number of workers is present in Ward no. 11 (38%) which is due to a large number of hotels and guest houses in the area which provide seasonal jobs to workers and hence most the population is engaged in more than one jobs and been considered as marginal workers.

The highest number is recorded by Ward No. 6 (98.5 %) which is the area of Pushkar Lake and around it. The reason being obvious that it provides round the year job opportunities to workers and they do not have to switch their jobs even in the months of less tourist activity. This area is covered maximum by oldest guest house, hotels and markets which are in business all the year.

Female Main Workers

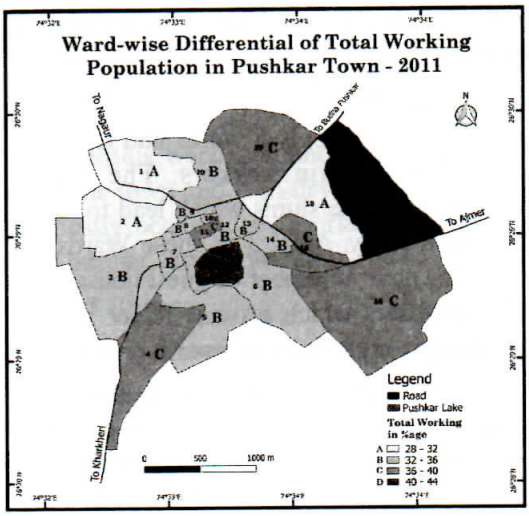
There is a wide variation among wards in the number of female main workers. The minimum being (3%) in Ward No. 19 because it is at North east corner of the town hence it is still in developing stage. Alternatively, the maximum has been (100%) in Ward No. 5 & 6 which covers area Of Pushkar Lake and south of it. It contains maximum number of resorts and hotels which provide permanent job opportunities to women. It is important to make a comparative study of wards to have a clear disparity of number of female main workers. The pattern of ward wise distribution is projected onto a map by grouping the data in four categories.

From the study it was observed that out of 20 wards only 5 wards had less than 50% female main workers. The reason clearly being the slums which lead to lower female literacy. Also, 3 of these Wards (7, 11 &15) have a number of guest houses and dharamshalas which provide lesser jobs to females as compared to resorts or hotels.

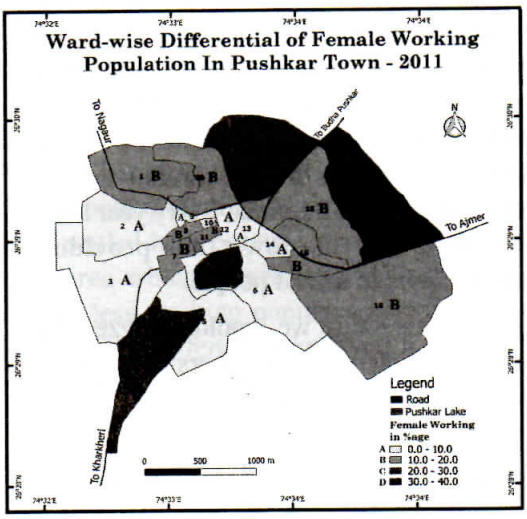
The highest numbers of female main workers were reported in Ward No. 5 & 6 (100 %). The reason lies in the location of the area. As this area covers Pushkar Lake and its surrounding area hence it provides ample job opportunities to females. Also these jobs are permanent in nature because their slack season is rare and they don't have to switch the jobs. Most of the workers are engaged in tourist related industry and handicraft shops.

Composite Index

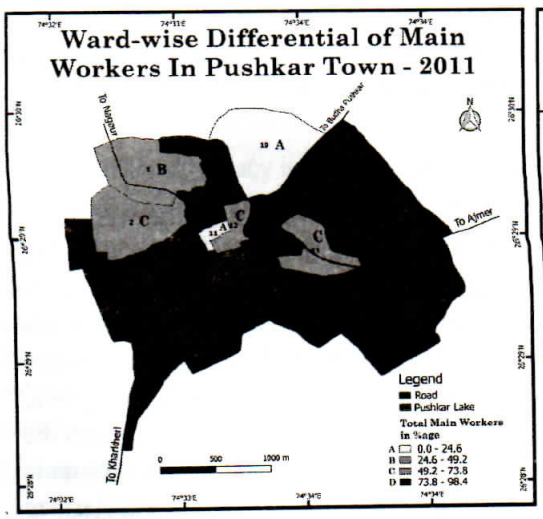
So far we have investigated the ward wise disparities for individual indicators. The interesting question is how these wards compare with each other, in terms of the selected indicators collectively? We answer this question by constructing a Composite Index. We start with the set of data from the 2011 Census on ward-wise socio economic indicators for towns. Then, we standardize the data in order to have each indicator spread around the same mean and variance and hence comparable. The standardized indicators would then constitute the variables in a multi-dimensional vector space. Conceptually, to make this confined in a particular path we must create a new index. Hence, a Composite socio-economic index



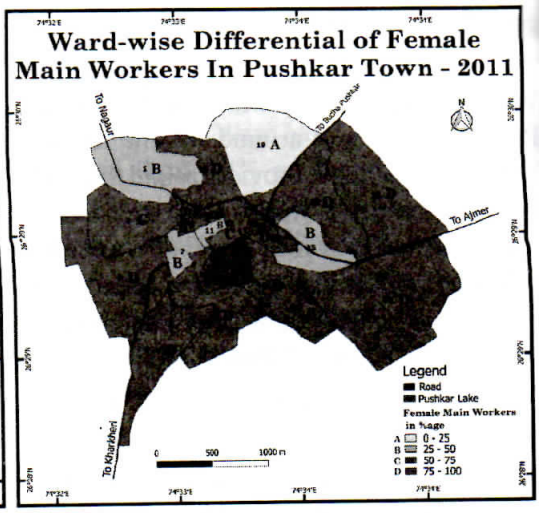
Highest - Ward No. 17
Lowest - Ward No. 2



Highest - Ward No. 17
Lowest - Ward No. 12



Highest - Ward No. 6
Lowest - Ward No. 11



Highest - Ward No. 6
Lowest - Ward No. 19

Fig 3: Ward-wise Distribution of Total Working Population, Female Working Population, Total Main Workers and Female Main Workers Of Pushkar Town, 2011

Table No 1: Ward-wise Data of Demographic Variables of Pushkar Town

Ward	Sex Ratio	General Pop	Literacy Rate	Female Literacy	Working Populaiton	Working Female	Main Workers Pop.	Main Workers Female
1	968.7	36.7	59.2	47.0	29.8	11.3	56.8	36.3
2	919.3	39.2	54.0	42.9	29.0	8.8	81.3	62.7
3	867.9	82.6	76.9	72.2	35.2	7.0	98.4	97.1
4	838.6	84.6	60.8	50.7	39.4	22.7	94.5	88.4
5	822.1	97.0	86.4	83.0	33.8	8.2	96.5	100.0
6	947.8	100.0	85.5	82.4	32.5	5.1	98.4	100.0
7	978.5	81.5	75.0	67.8	32.9	11.2	86.8	45.9
8	1065.9	26.5	75.6	68.0	33.3	15.9	94.2	93.1
9	969.2	96.2	78.3	74.0	33.6	8.3	93.6	85.7
10	931.6	98.1	82.5	80.8	34.5	10.0	89.5	77.4
11	892.8	100.0	78.2	73.1	37.6	12.8	38.7	26.5
12	900.7	95.4	82.9	76.3	33.8	4.6	78.1	64.7
13	978.0	98.6	78.6	71.3	34.5	9.9	84.7	68.6
14	821.1	80.2	67.3	60.6	32.4	5.7	97.1	84.2
15	788.3	95.5	71.5	62.6	37.4	19.8	80.3	47.1
16	853.9	88.9	66.2	59.2	38.2	19.8	93.3	82.8
17	950.4	97.1	45.2	27.6	42.4	35.6	86.1	81.3
18	964.4	96.4	50.5	35.3	30.5	10.8	89.3	93.6
19	919.3	80.7	52.2	34.2	39.5	25.0	47.3	3.6
20	849.4	62.6	67.8	63.1	33.3	10.8	96.7	96.6
ΣX	18227.9	1638	1394.3	1232.0	693.6	263.2	1681.2	1435.5
X bar	911.4	81.9	69.7	61.6	34.7	13.2	84.1	71.8
SD	69.5	22.7	12.5	16.8	3.5	7.8	17.1	27.2

ΣX = Sum of all values

X bar = Mean of values of particular variable

S.D. = Standard Deviation

Table No. 2: Standardization and Composite Index Value of Wards

Ward	Siz. 1	Siz. 2	Siz. 3	Siz. 4	Siz. 5	Siz. 6	Siz. 7	Siz. 8	Siz. 9	Composite Inex
1	0.8	-0.8	-0.8	-0.9	-1.4	-0.2	-1.6	-1.3	-6.3	-0.8
2	0.1	-1.2	-1.3	-1.1	-1.6	-0.6	-0.2	-0.3	-6.2	-0.8
3	-0.6	0.0	0.6	0.6	0.1	-0.8	0.8	0.9	1.7	0.2
4	-1.0	0.8	-0.7	-0.7	1.4	1.2	0.6	0.6	2.2	0.3
5	-1.3	-0.4	1.3	1.3	-0.3	-0.6	0.7	1.0	1.8	0.2
6	0.5	0.3	1.3	1.2	-0.6	-1.0	0.8	1.0	3.6	0.4
7	1.0	0.1	0.4	0.4	-0.5	-0.3	0.2	-1.0	0.3	0.0
8	2.2	-2.0	0.5	0.4	-0.4	0.3	0.6	0.8	2.4	0.3
9	0.8	0.4	0.7	0.7	-0.3	-0.6	0.6	0.5	2.7	0.3
10	0.3	0.7	1.0	1.1	0.0	-0.4	0.3	0.2	3.2	0.4
11	-0.3	-0.2	0.7	0.7	0.8	0.0	-2.7	-1.7	-2.6	-0.3
12	-0.2	-0.4	1.1	0.9	-0.3	-1.1	-0.3	-0.3	-0.6	-0.1
13	1.0	-0.5	0.7	0.6	0.0	-0.4	0.0	-0.1	1.2	0.1
14	-1.3	-0.9	-0.2	-0.1	-0.6	-1.0	0.8	0.5	-2.8	-0.3
15	-1.8	0.8	0.1	0.1	0.8	0.9	-0.2	-0.9	-0.3	0.0
16	-0.8	2.2	-0.3	-0.1	1.0	0.8	0.5	0.4	3.8	0.5
17	0.6	2.1	-2.0	-2.0	2.2	2.9	0.1	0.4	4.2	0.5
18	0.8	-0.1	-1.5	-1.6	-1.2	-0.3	0.3	0.8	-2.8	-0.3
19	0.1	-0.4	-1.4	-1.6	1.4	1.5	-2.1	-2.5	-5.1	-0.6
20	-0.9	-0.4	-0.2	0.1	-0.4	-0.3	0.7	0.9	-0.4	-0.1

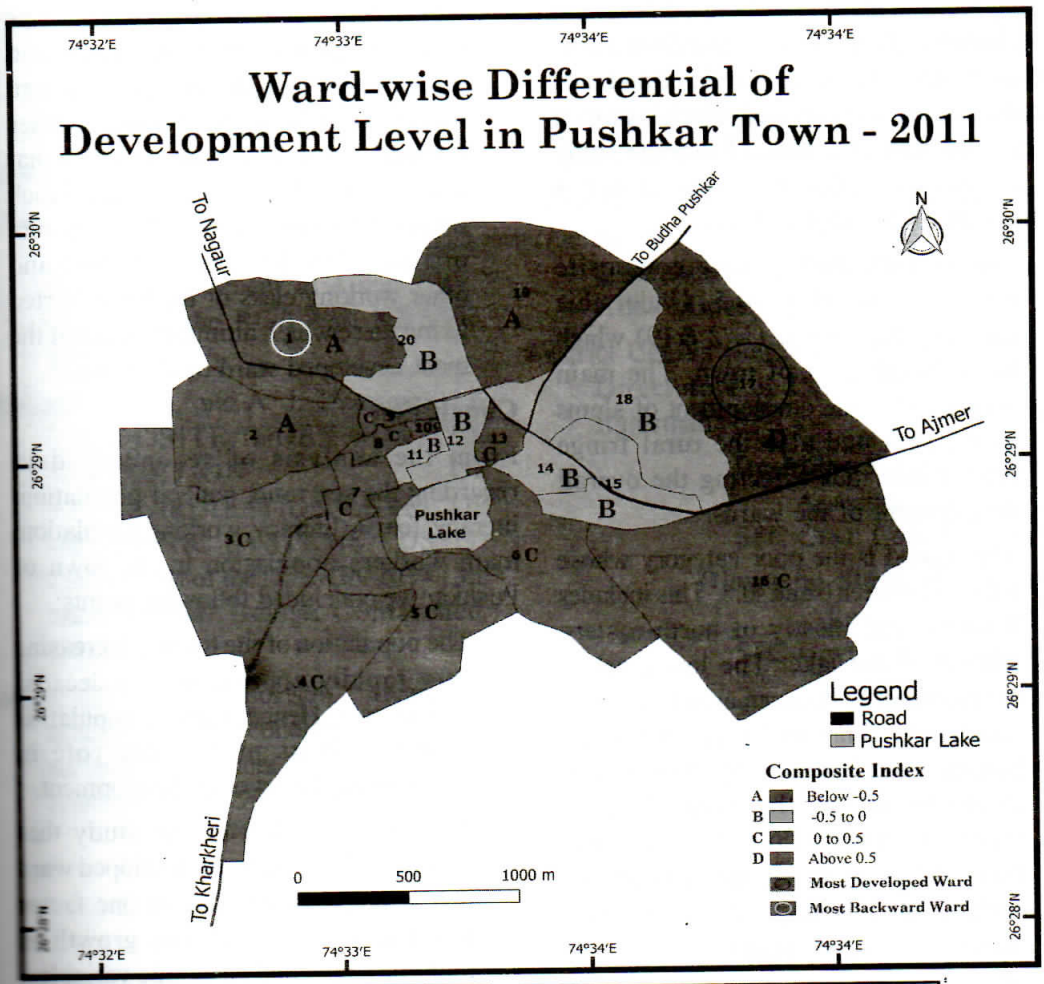
STZ = Standardized Value

for level of development in our case should be defined within the context of all wards. To find out the level of development within the wards we categorized the composite values in four categories viz.

S.N.	Class	Category
1	-0.5 and Below	Very Poor
2	-0.5 to 0	Poor
3	0 to 0.5	Medium
4	0.5 and Above	Very High

Analyzing Inter-Ward Level of Development

In our study we analyzed different variables both social and economic to measure levels of development amongst wards of Pushkar Town. The factors we studied here are ward wise sex ratio, general population, literacy rate, female literacy rate, total working population, female working population, main workers and female main workers. After



Ward	Composite Index
1	0.785
2	0.774
3	0.211
4	0.273
5	0.223
6	0.444
7	0.035
8	0.301
9	0.343
10	0.398

Ward	Composite Index
11	-0.326
12	-0.070
13	0.150
14	-0.349
15	-0.037
16	0.477
17	0.524
18	-0.350
19	-0.633
20	-0.054

Fig 4: Ward-wise Analysis of Composite Index in Pushkar Town, 2011

taking the data mean and standard deviation is calculated. From this standardized value firstly the gross value is formulated and then a composite index is created which is plotted on a ward map of Pushkar.From the study of composite index we figured out 4 categories of development level.

- One is very poor whose composite values is less than -0.5. Under this category lie 3 wards (1, 2 &19) which lie in North area of town. The main reason being the development of slums in the area and also the rural fringe nearby and thus affecting the overall development of the wards.
- The second is the poor category whose value is between 0 and -0.5. This includes 6 wards and mostly of north-eastern margin of the lake. The low level of development is because area is covered mostly by dharamshalas and guest houses which hold up any other type of development in the area. Due to increasing tourist flows there is more hotel industry development going on without any planning, hence the area is under lesser development zone.
- The third zone ranges from 0 to 0.5 which is moderate developing zone. This includes half of the wards of Pushkar and all lies in the south and south west area of Lake. The main reason is fertile land which was once used for plantation is now converted to resorts, colonies and other activities which gave a pace to the development of the area. The area is almost plain throughout and is most suitable for construction.
- The fourth zone includes the ward which have highest level of development i.e. Ward No. 17 (0.53). This is the ward which records maximum growth in terms of development of both social and economic factors. It lies on the Eastern margin and is located along Ajmer Pushkar Road. The main reason is that it is located 1.5 km from the lake which makes it less crowded and lowers rent of land. Therefore, service class and other working class of the town started living there which ultimately made it the most developed ward of the town.

Conclusion

From the analysis of secondary data regarding the sex ratio, general population, literacy, female literacy, working population, main workers population in the town of Pushkar we concluded following points:

1. The population of the town is increasing very rapidly approx. 46.3% decadal growth rate. Hence, various population related factors play a key role in determining the level of development.
2. As we observed from the study that Ward No. 17 is the most developed ward this is not only because of one factor but due to its continuous growth in multiple social and economic variables.
3. Due to desert area on the western and north western part, the development is maximum in eastern and southern margins of the town.
4. Due to heritage value of the town most of the development is seen in the area nearby the Lake.
5. As the main occupation of the area is tourism hence it provides jobs as well as global exposure to the people which directly effect on increasing awareness and literacy.
6. Due to its heritage and tourism

importance it is been part of National Heritage Places Development Projects which have given pace in the development of the town.

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Impact of Water Logging and Soil Salinity on the Agronomy in Chambal Command Area in Hadoti Region

L.C. Agrawal and Nishtha Sharma

Abstract

The present paper is an attempt to analysis the impact of water logging and soil salinity on the agronomy in Chambal Command Area (CCA) with pre and post installation of sub-surface drainage in Hadoti region including experiences of farmers. The Chambal Command Area comprises of 3, 85,000 hectares area of which 59.48 percent (2, 29,000 hectares) is under irrigation in Hadoti region. Water logging and soil salinity problems were detected following the introduction of irrigation in 1960's. The Sub-Surface Drainage (SSD) is mainly provide to control water table depth at a pre-determined level; to allow enhanced root development of crops; to leach excess salts and prevent salt accumulation within the root zone at levels higher than the tolerance level of crops; and to provide enhanced soil traffic ability during growing season. The paper discusses the reasons of water logging and soil salinity and redemption from water logging and soil salinity. The following paper evaluates the impacts of pre and post installation of Sub-Surface Drainage (SSD) on the agronomy in the area. This paper also focuses on the effects of water logging and soil salinity on farmer's economic and social life in the study region.

Keywords: *Chambal Command Area (CCA), Sub Surface Drainage (SSD), Right Main Canal (RMC), Left Main Canal (LMC), On Farm Development (OFD), Rajasthan Agricultural Drainage Research Project (RAJAD), Farm Yard Manure (FYM).*

Introduction

After the beginning of planning process in India, a large number of irrigation projects were constructed for increasing agricultural productivity. However, it was realized that the potential created was not utilized fully and a substantial gap existed between the potential created and potential utilized. A Command Area Development Programme was launched in 1974-75 with the main objective of improving utilization of irrigation potential and optimizing agricultural production and productivity from the irrigated areas by integrating all functions related with irrigated agriculture.

Prior to the introduction of irrigation, crops grown in the area were either rain fed or matured on residual soil moisture. The traditional crop, Sorghum, was not very remunerative and farmers have preferred to let their land lie fallow in the Kharif to replenish the soil moisture, thus allowing the staple crop, wheat, to be grown on residual moisture in the Rabi. Now-a-days, cropping

pattern in Chambal Command Area has changed and farmers exclusively growing Soyabean as a main crop in Kharif season. Mustard and Wheat are other dominating crops.

Since the introduction of irrigation in 1960s, the Chambal Project ran into serious problems of water logging and increasing soil salinity, aggravated by the undulating nature of the terrain, lack of proper water management and traditional rain fed farming practices. Neither the farmers nor the lands were ready to receive the water for irrigation. The rural population, accustomed to rain fed farming, did not know how to utilize the irrigation water. In addition, proper field distribution systems were not installed to receive and drain water.

In the present paper an attempt has been made to study the impact of water logging and soil salinity on the agronomy in Chambal Command Area with pre and post installation of sub-surface drainage.

Study Area

Chambal Command Area (CCA) is situated in the south-east of Rajasthan between 25 and 26 degrees north latitude and 75 to 76 degrees east longitude (Fig.1).The total Chambal Command Area is 3, 85,000 hectares of agriculture land out of which 59.48 percent (2,29,000 hectares) is irrigated by canals. Chambal River is a main river in the study area. Chambal acts as a trunk Channel, its tributaries i.e. Parbati, Kalisindh, Parwan and Mej are like branches.

Chambal Irrigation Project construction began in 1953 and was substantially completed by 1971, with irrigation beginning in 1960. Regulating structures on Chambal River include two storage reservoirs with power stations, a smaller pondage with third power station and the Kota Barrage which diverts water into the Canal system. The 372 kilometers long Right Main Canal (RMC) serves 1, 27,000 hectares in Rajasthan as well as the Madhya Pradesh Command Area. The 168 kilometers long Left Main Canal (LMC) serves 1, 02,000 hectares area.

Project area is an elongated basin in the former alluvial plain of the Chambal River. The average slope is slight (about 0.08 percent) but the basin is deeply incised by the main river and its four major tributaries. These channels and the network of meandering gullies (nallahs) tributary to them from the primary drainage system of the area.

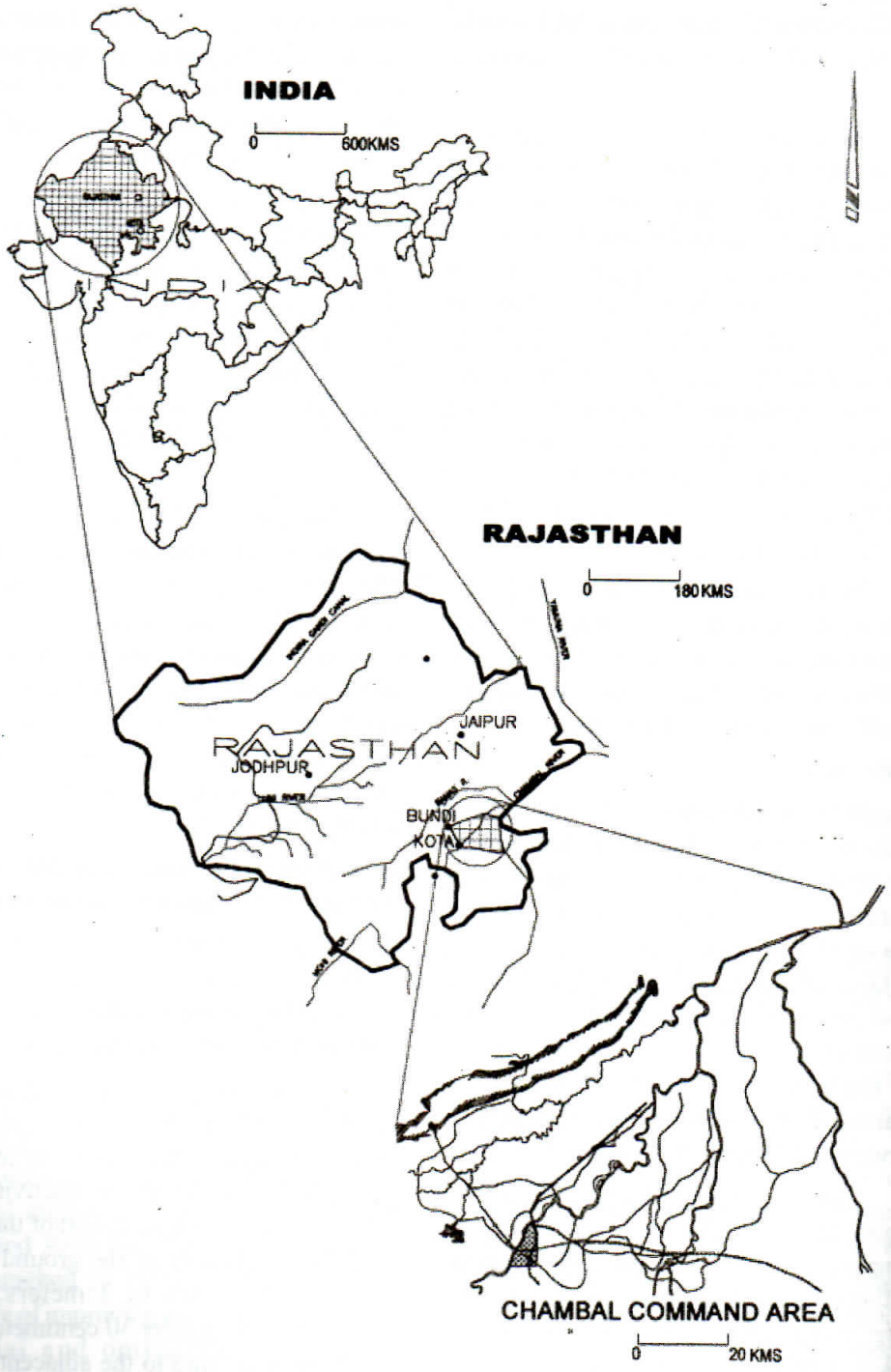
The surface of CCA is constructed by igneous rocks, having different properties i.e. when the surface is wet it puddles and in dry very hard crust, the spade does no penetrate in the ground earth for one inch or two inches, so vertical spade has to use for earth work. The tilling in wet and dry spell is very difficult task. Farmer has to wait for the favorable moisture for the ploughing which delays the sowing time of crops.

Past History of Water Logging and Soil Salinity in Chambal Command Area

Agriculture even in its most modernized and mechanized farms, is still earth-bound and controlled by natural factors such as soils, climate, topography and the rest.

At the inception of the irrigation canals in 1960 in CCA, there was a siltation of production in agriculture sector for few years, but started to decline the productivity nearly after ten years of the inception of the canals. And the water-table of the ground reached nearby 1.5 meters to 3 meters, but in monsoon it was nearby 30 centimeters at the low lying area. And to the adjacent to main

LOCATION MAP OF CHAMBAL COMMAND AREA



canals and distributaries the water is /was oozing during canal regulation.

The farmers felt that their fields have been waterlogged and affected with soil salinity. Due to this regardless water logging and soil salinity problems, thee agronomy of the farmers was castaway.

Reasons of Water Logging and Soil Salinity in CCA

The main reasons of water logging and soil salinity in CCA are:

(a) Rolling type topography

(b) Fractured sandy soil

(c) Heavy Rainfall in monsoon

(d) Underground surface has variant layer of depth of earth and stone

(e) Some patches have/had natural salinity

(f) Absence of rotational water supply in irrigation system among farmers

(g) Excess irrigation with dependability on fields

(h) Wild irrigation with ponding

(i) Seepage drains plugged with siltation and vegetation

(j) Unawareness of the farmers

Redemption from Water Logging and Soil Salinity

Pre-installation of sub-surface drainage various methods to reclaim the soil and lowering the water table were adopted by the government with the help of extension department among the farmers.

The government tried to solve this twin problem through OFD and excavating seepage drains adjacent to main canals, distributaries and minors, but these surface drains were plugged with vegetation and silt due to unawareness of the farmers because the drains were/are used to carry out irrigation water by the farmers. On the other hand, the farmers who had their own infrastructure, they scrapped the upper layer of the soil of their fields, raising high ridges, giving thresh of canal and puddling well, raised the crop of rice.

In spite of it the farmers added gypsum, FYM and several ploughing in dry period, alternative year sowing the crop of Berseem (green fodder) on their fields. So like this some farmers at some extent solved the problem of soil salinity, but the water logging problems remain uncontrolled. So, during from 1970 to 2016, the farmer of the area had suffered great loss economically and mentally due to water logging and soil salinity.

In this tight fiscal period by the mercy of God, the work of OFD was done in our area in the year 1994, with the help of Rajasthan Government. The farmer got relief and there after the work of SSD was done in Jan 1996, with the help of Canadian Government through Indian Government, Rajasthan Government and RAJAD by Agro drain a private contractor from Canada using trench less plow, when the wheat and mustard was standing in the fields. On the day when plow entered into the fields farmers felt good although it caused 15 percent damage to the crops, because farmers had the vision of getting higher yields thereby they could compensate the present loss by getting the additional income in future, because, over the two years farmers had observed the changes occurred on the SSD installed land in the area. It was surprising for us to see legumes crops and gram on the same land where it was difficult to grow these crops otherwise. To our utter surprise after the work of SSD the conditions of the fields

becomes very good, the salinity and water logging condition of the fields are removed.

Impacts and Benefits of Post Installation of SSD on the Agronomy in Chambal Command Area

The SSD work is like **"Surgery of Sick Land"** when the surgery of land was done by installing SSD. The farmers felt relief knowing that the wounds of their land will be cured by eroding salinity through SSD pipes over the time, because SSD work had ameliorated the water logging and soil salinity on the farm in very short period, through perforated pipes by effusion of water. Major benefits of Sub-Surface Drainage (SSD) are as follows:

Tilth

Tilth of the land takes place near about 8 to 10 days in winter and in rainy season. It depends upon temperature and sunshine.

Pre-SSD tilth in land, in winter season took place near about 20 to 25 days, and in rainy season it was uncertain some fields remained without growing any crops throughout the year. This problem occurred only in those areas where the surface was not level.

Hand tillage become very difficult work due to boggy ground. Then the farmers started to till the land with tractors, in spite of using tractor by the farmers for ploughing, they had to face many obstacles due to wet, boggy and stiff ground making poor griping power and bagging of tractor. The earth of tractors tires was rammed, rugged and resorted. The cultivator's tilling constructed clods, the earth did not loose well. So five to six times had to plough the land that the sun-shine might dry the earth, but the farmer and the tractor could not achieve any success in demolishing the wet clods. Same conditions were faced in winter. On some farms the fall ploughing was done. Post SSD tilling frequencies are three to four for preparing one crop-wet clods nil.

Crops

Pre-SSD, due to water logging and soil salinity, it became an implied condition for the farmers that they would have to raise the crop of rice, because it is a such crop which has much water resisting capacity. Due to uncertainty of tilth, the farmer's discretions became negative in summer season and so for winter. In winter season only the wheat crop could be raised, other crops like mustard, coriander, grams and root crops became totally dormant. Post SSD, the farmers have expressed discretions to raise the crops i.e. cereal crops, legumes crops and root crops.

Hoeing and Harvesting

Pre-SSD these activities had to do mostly by manual labour. On the farm the spade or hoe did not penetrate at the proper depth due to buggy ground and damp weather, the earth remained unloose and changed into wet clods. The shavings of weeds reburgeoned due to buggy ground. In rice aquatic grasses became great problem, some weedicides had become failed. Hoeing in rice is mostly done by manual without the help of any hand tool. The aquatic grasses shavings remaining in field and made the water enrich, helping to growth to remaining aquatic grass and philamenteous algae. Generally all the activities of earth work for example the excavation of water-course, ridge shaving etc. caused considerable difficulties.

Harvesting was mostly done by manually. Near about 40 percent of rice crop caused the problem of lodging because the surface remained wet, the root and steam of

the plant became poor or rotten. Rice post harvesting fields in some area, philamenteouc algae prevailed on the surface, always made delay in tilth and sowing for the next crop. Post-SSD hoeing work has become very easy, the earth looses very fast allow to penetrate the spade or hoe up to proper depth gently. Generally weeds are combated mostly by weedicides through spray machine mounted by tractors and harvesting is done by combine when the crop is fully matured. Crop logging in rice 90 percent solves.

Fertilizer

Pre-SSD commercial fertilizers were given in much quantity, due to infertility of the soil caused by water logging and soil salinity. Post SSD less commercial fertilizer near about 27 percent saving in kilograms per hectare near about 93.75 kilograms for one crop.

Pesticides

Water logging and soil salinity impeded orderly crop rotation and combating weeds was especially difficult because ridges and hedges between plots harboured insects plant diseases and weeds. So like this, poor crop and higher dose of commercial fertilizer gave the invitation to many pests, and the farmer started to spray in revolutionary manner, which made the most expensive operation in preparing for crop. Post SSD work, pesticides saving near about 67 percent.

Productivity

Pre SSD productivity decreased through many aspects. They were:

(a) Infertility of soil due to salinity.

(b) Long tilth and fall ploughing made delay for the next crop.

(c) Micro nutrients wastage through excess irrigation and rainy water.

(d) Population of plants became less, damaged by wet clods and irrigation and rainy water.

(e) Some seeds were damaged by wet surface.

(f) Some terrains changed into permanent pasture covered with moss, white salinity and boggy land.

Overall these whole reasons decreased the productivity of the area.

Post SSD productivity has increased near about 40 percent to 45 percent. The reasons are early sowing, proper tilth, wet clods nil and seed germination 90 percent. Plants population does not become less.

Quality

Due to water logging the crop was affected from stem rust, red rust and black leaf rust which caused the crop not fully matured and then be reap red with the sickle. Intense heat, excess winter and too much wet surface, so all these affected the quality of grains i.e. under size and spotted. In Basmati rice not superfine slander grains and unexquisite aroma, the color of paddy grains looked fade.

Post-SSD, quality of food grains has improved with size and colour. Especially in basmati rice important characters have been found. They are:

(a) Pleasant and exquisite aroma

(b) Extra long superfine slander grains

(c) Delicate curvature

(d) Soft texture

(e) Sweet taste

(f) Extra elongation with a least breadth wise swelling on cooking.

Seed Rate

Pre-SSD, seed rate in wheat per hectare was

187.5 kilograms. Post -SSD, seed rate in wheat per hectare is 125 kilograms means 33.33 percent less.

Irrigation

Pre-SSD less irrigation only two frequencies of irrigation in wheat crop were given. At the first frequency the crop of wheat showed mineral deficiency because the drainage system was not there. Post-SSD irrigation to crops has become just double.

Double Cropped Area

Pre-SSD near about 20 percent arable land became unusable, on the 30 percent land one crop was raised and the remaining 50 percent area was used to double crop. Field ways became muddy and baggy. Post-SSD hundred percent areas are under double crop rotation except field drains and ways.

Trees and Natural Vegetation

Pre-SSD in water logging and soil salinity area, the trees became withered dwarf and grew only in sheltered places. So water logging on the ground for many months, or so rainy that the soil was wet of the time, and the grass of moor land was affected from stem rust, red rust and infected with toxemia which was not appealed by the animals and dehydration in cattles. Post-SSD trees and natural vegetation are rehabilitating with spurt growth of trees.

Environmental

Pre-SSD:

(a) Due to damp weather and boggy ground for many months the trees and natural vegetation withered away or became dwarf.

(b) Much diesel consumption by machineries was used.

(c) Poor crops gave invitation to many diseases and pests.

(d) Revolutionary spray vats of pesticides, resulting to bill many farmer's friend i.e. birds (sparrow, crane etc.) frogs, tortoise, snakes and fishes and earth worms.

(e) Some dipping vats of water in low terrain gave invitation to mosquitoes.

(f) Even the drinking eater of wells and hand pumps was badly affected; the colour of water became rusty and creamish which caused the injury to teeth and bones.

(g) Even the vulture which eats the dead animals flesh used to migrate to somewhere else from August to November because in this period, heavy spray of pesticides was being done by the farmers to protect their crops. Casualties of cattles were also at high rate in this period due to dehydration and F.M.D etc. Due to muddy way and non existence of proper graveyard for dead cattles, cattles were thrown on beaten path or anywhere on open ground where their bodies remained rotten and polluted the environment.

Post-SSD work: all these problems have been overcome or rectified by SSD.

Social and Economic

Soil salinity and water logging had affected to the farmer's economic and social life as well as to the national economy.

(a) Slackness in the habit of work among some famers. Partial people became idle, due to shortage of work throughout the year.

(b) Some people became smuggler and litigant due to shortage of income sources.

(c) A poor peasant had to cover his deficit by borrowing and ultimately by selling his land. Within few years some farmers became landless and did not liberate from the clutches of local money lenders. If there was a crop failure in successive years, even the middle income farmers went bankrupt and lost their lands to the village moneylenders. So the majority of owner farmers turned into share cropper and land labour.

(d) The ploughing became the most expensive operation in preparing the land for crops.

(e) Residential houses changed into ranch houses due to boggy ground and poverty. Near the village where curtilage fields are situated remained absolutely full with water as the type of dipping vats throughout the year. The polluted water with animals dug, dust and other wastage etc. affected the human health as well as animals.

(f) Shortage of cooking fuel, only dung cakes were used, exhausting much smoke polluting the air.

(g) Children could not reach at school due to muddy way and poor economic condition.

(h) Non existence of dry way farmers was inaccessible to urban areas for selling their production. A large part of production was being purchased by the village money lenders in village at cheap rate.

(i) Economic condition of some farmers became too much poor that he could not attained medical aid.

In spite of all these, the activities of much diesel consumption, high seed rate, pesticides, more labour, poor productivity and poor quality of crops etc. and the crop failure in successive year at any time deficits to the poor peasant as well as to the national economy.

Conclusion

The foregoing analysis of water logging and soil salinity on the agronomy in Chambal Command Area in Hadoti region with pre and post installation of sub-surface drainage and including experience of farmers at different locations leads to the following conclusion.

1. SSD removed excess water from the soil and created a well-aerated root environment and thus good growth of the plant.
2. By removing excess water from the soil drainage provided a surface soil layer dry enough to handle farm machinery earlier which facilitates in timely sowing.
3. Increased number of days was available for field work.
4. Reduced the need of fertilizer and thus reduced the cost of production.
5. SSD benefited not only to farmers but also to regional or and even to national economy.
6. Post SSD, the farmer, who has near about 3.2 hectares of land, for producing the crops and tending the animals, employs one man as a labour, for the whole year.
7. Post SSD, the farmers are interested in tending the animals of high lactation i.e. buffaloes and cross bread cows, near about two or three head for domestic and dairy purpose are tended.
8. Due to siltation in productivity after SSD

work, the farmers have close proximity to the Agriculture Supervisor for the latest seed varieties, soil analysis, fertilizer dose and pesticides etc.

9. To maintain the fertility of the soil and pests control, fall plough is done in summer after harvesting the crops of wheat, barley, mustard and coriander etc. On farms green manure is prepared to increase the fertility of soil.
10. Cooking fuel is collected on fields, the stubble of mustard and its supplement manure is being spread on fields, and dung cakes are less consumed.
11. Less micro-nutrient has to aid for the growth of the crop and crop-rotation can be performed.

Over all it can be said that the farmers remain busy throughout the year in their farming activities, after SSD work, and has became judicious, proficient and economically well

development. The results of SSD work are very significant, exuberant, striking, aggressive production and beneficiary from all aspect.

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Growth Centres of Jaipur District: A Bridge of Rurban Advancement

Shweta Khandelwal

Abstract

Since after the independence, India has adopted the rapid industrialization and mechanization policy through five year plans for rapid economic growth for building strong economy and make a better quality of life for its people. This policy brings India into leading stage among developing countries and this happened in an unplanned way which results into an imbalance among rurban areas.

In urban areas, with the new concept of Smart cities and Amrit cities, rapid industrialization and technological advancement took place and job orientation and development of infrastructural facilities are the major focal point of growth and development. While in rural areas, with the introduction of mechanization in agricultural activities, job opportunities are reduced which force the rural people to migrate towards urban areas. Due to this process, the cities or the urban areas are becoming the major centre of attraction and concentration of job, amenities whereas the rural areas are lack behind undeveloped with their primary activities.

With the increase in mass rural-urban migration, big cities are under tremendous pressure of population alongwith rising tide of migrant workers and ever-mushrooming squatter settlements, developing slum areas, water supply problems, traffic congestion, air, water and noise pollution, increasing social/cyber-crimes, etc. resulting in a series of human and socio-economic complications.

All these increasing problems in big cities/ towns, attracts the planners and government to bring the development in rural areas, check the rural-urban migration and reduced the gap of imbalances. In recent years, the small and medium towns are growing with favorable potentialities and becoming into growth centres. These growth centres can play a role of bridge of Rurban advancement. So that they could not only stop the migration of rural poor's to big cities and towns but also provide certain services to their hinterland and thus lead to balanced development of the whole district, region and as far as whole nation.

In the present study, Jaipur city along with surrounding small and medium towns of the district shows the rapid growth in industrialization and

mechanization which results rurbanadvancement. The whole study shows the various growth centres and hierarchy of settlements which has been identified on the basis of functional index value. There are many socio-economic changes took place due to the clubbing and clustering of settlements which make a bridge of rurban development.

Secondary data has been used for the paper and functional index value method has been applied.

Therefore, it is clearly visible that the development of small and medium growth centres of rurban Jaipur reduces the burden on the land. It reduces the imbalances between rural and urban areas and lead to integrated development of the district.

Keywords: *Rurban, growth centres, integrated development, hierarchy, potentiality.*

Introduction

Since after the independence, India has adopted the rapid industrialization and mechanization policy through five year plans for rapid economic growth for building strong economy and make a better quality of life for its people. This policy brings India into leading stage among developing countries and this happened in an unplanned way which results into an imbalance among rurban areas.

Urban areas are come up with the new concept of Smart cities and Amrit cities, which leads to the rapid industrialization, technological advancement, job orientation and development of infrastructural facilities are the major focal point of growth and development, on the other handit lacks in rural areas which force people to migrate towards the developed towns. Due to this process, the cities or the urban areas are becoming the major centre of attraction and concentration of job, amenities whereas the rural areas are lack behind undeveloped with their primary activities.

With the increase in mass rural-urban migration, big cities are under tremendous pressure of population along with rising tide of migrant workers and ever-mushrooming squatter settlements, developing slum areas, water supply problems, traffic congestion, air, water and noise pollution, increasing social/cyber-crimes, etc. resulting in a series of human and socio-economic complications.

All these increasing problems in big cities/ towns, attracts the planners and government to bring the development in rural areas, check the rural-urban migration and reduced the gap of imbalances. In recent years, the small and medium towns are growing with favorable potentialities and becoming into growth centres. These growth centres can play a role of bridge of Rurban advancement. So that they could not only stop the migration of rural poor's to big cities and towns but also provide certain services to their hinterland and thus lead to balanced development of the whole district, region and as far as whole nation.

The concept of growth centres refers to the appropriate location of social and economic activities over a physical space for the balanced development of a region. The development of backward areas is also a

matter of concern to the integrated area development. It is based on the idea of selectively on the one hand and decentralization of functions between well served and poorly served areas. It suggest a framework for decentralizing of specific functions in appropriate places. Special planning implies focusing of investment on socio-economic infrastructure at certain places which are selected in terms of maximum access to the beneficiaries at the minimum cost.

Objectives

1. To examine the causes of the rapid growth of urbanization.
2. To examine the newly developed growth centres.
3. To find the hierarchy among various urban and rural growth centres.

Hypothesis

The development of small and medium growth centres of rurban Jaipur reduces the burden on the land. It reduces the imbalances between rural and urban areas and lead to integrated development of the district.

Study Area

The study area is Jaipur District which falls between 260 23' to 270 51' N latitude and 740 55'to 760 50' E longitudes and total geographical area is 11,143 km2, which 9.71 per cent of the state. The district has on its northern fringes, the state of Haryana and Sikar district of Rajasthan, in the south by Tonk district, on its eastern boundaries lies Alwar, SawaiMadhopur districts whereas on its western borders lies the districts of Ajmer and Nagaur. It is on Delhi-Ahmedabad western railway line and Delhi, Mumbai and Agra, Ajmer National Highways. This lies nearest to the national capital Delhi, Jaipur is conveniently connected by trunk road with the important cities of India. It has direct air link with Agra, Delhi, Kolkata and Mumbai and with abroad (Fig. 1).

Research Methodology

The present study intends to seek more knowledge about the emerging various growth centres in both urban and rural areas. Maps and figures dealing with the aspects such as urban expansions, land use, land cover changes, various statistical techniques and suitable cartographic techniques are used for the preparation of all these maps. For the present study, the relevant data/ information were obtained from Town Directory of Census of India which includes all primary census data and relevant information.

For finding out the emerging growth centres and hierarchy, the rank size rule has been adopted. The concept of hierarchy refers to the ranking of settlements according to their population and functional entities. The Rank Size rule is the method of analyzing total settlement network in a region. Hence, it is a tool for analyzing the national settlement system and help in the description and interpretation of the relationship between rank and population size of urban places.

The rule presents a generalized picture of the urban settlements of region. The belief that the cities are related to each other in some orderly way forming into a system, is the basis for the postulation of rank size rule.

1. The law of rank size rule —if all the settlements of a country are ranked according to population size, the sizes of the settlements will be inversely proportional to their rank." -Zipf
2. The law of primate city "the primate city is commonly atleast twice as large as

FIGURE NO.2.1

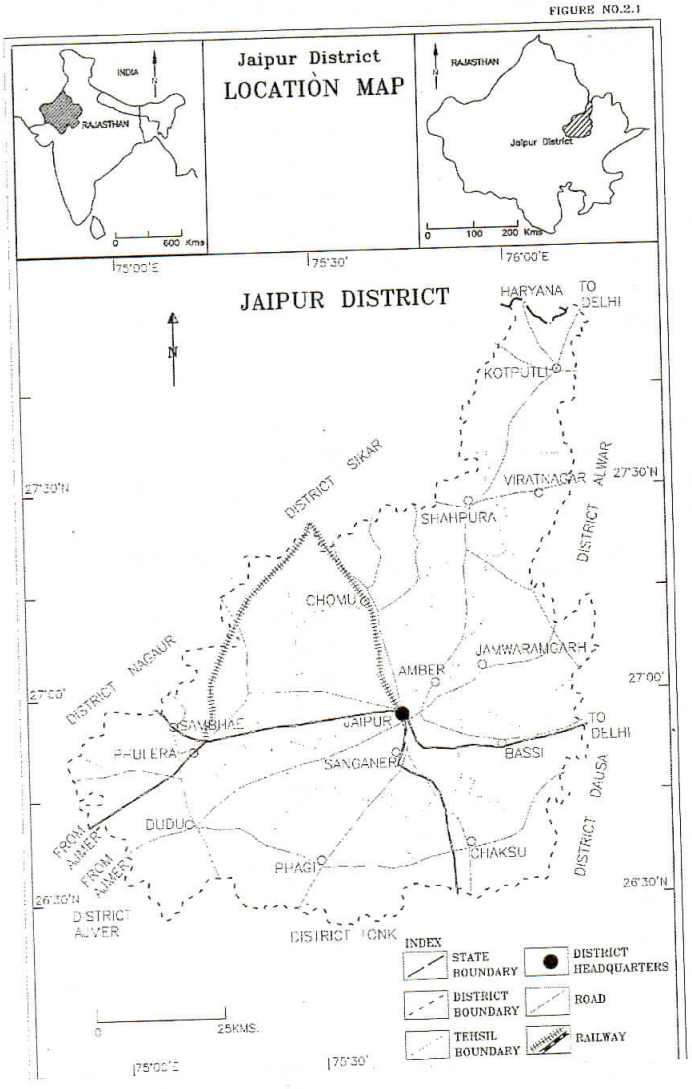

Fig. 1: Location Map

the next largest city and more than twice as significant. -Mark Jefferson

The rank size formula used is as follows:

$Pr = Pi/r$

Where Pr= population of r^{th} rank size.

Pi = population of the largest city

r = rank of the city

Discussions And Results

The second ranking city of a region has one half of the population of the largest city. The third largest city is one third of the largest and so on. For the calculation, total 40 centres has been considered and the results are given below in the table:

Table No. 1: Rank, Actual and Expected Population of GrowthCentres

S.No.	Name of Growth Centres	Actual Population	Rank	Expected Population
1.	Jaipur	3,046,163	1	3,046,163
2.	Sanganer	794,803	2	1,523,082
3.	Amber	132,375	3	1,015,388
4.	Chomu (M)	64,417	4	761,541
5.	Kotputli (M)	49,202	5	609,233
6.	Bassi	48,429	6	507,694
7.	Shahpura (M)	33,895	7	435,166
8.	Chaksu (M)	33,432	8	380,770
9.	Bagru (M)	31,229	9	338,463
10.	KishangarhRenwal (M)	29,201	10	304,616
11.	Phulera (M + OG)	26,091	11	276,924
12.	Sambhar (M)	22,327	12	253,847
13.	Viratnagar	20,568	13	234,320
14.	Manoharpur (CT)	20,287	14	217,583
15.	Khejroli	16,531	15	203,078
16.	Paota	15,473	16	190,385
17.	Achrol	15,077	17	179,186
18.	Dudu	14,961	18	169,231
19.	Narayana	13,275	19	160,324
20.	Kaladera	13,151	20	152,308
21.	Phagi	12,682	21	145,055
22.	Pragpura	12,114	22	138,462
23.	Niwaroo	11,745	23	132,442
24.	Jobner (M)	11,354	24	126,923
25.	Kanota (CT)	11,250	25	121,847
26.	Baskhoh (CT)	11,150	26	117,160
27.	ItawaBhopji	10,881	27	112,821
28.	Bagrana (CT)	10,790	28	108,792
29.	Vatika	10,590	29	105,040
30.	Med	10,379	30	101,539
31.	Badhal	9,482	31	98,263
32.	Samod	9,365	32	95,193
33.	KotKhawada	9,341	33	92,308
34.	ManpuraMancheri	9,167	34	89,593
35.	Akedadoongar (CT)	9,062	35	87,033
36.	Boraj	8,779	36	84,616
37.	Mauzamabad	8,635	37	82,329
38.	Kalwar	8,393	38	80,162
39.	Govindgarh (CT)	7,735	39	78,107
40.	JamwaRamgarh (CT)	7,665	40	76,154

Source: Calculated by the Researcher

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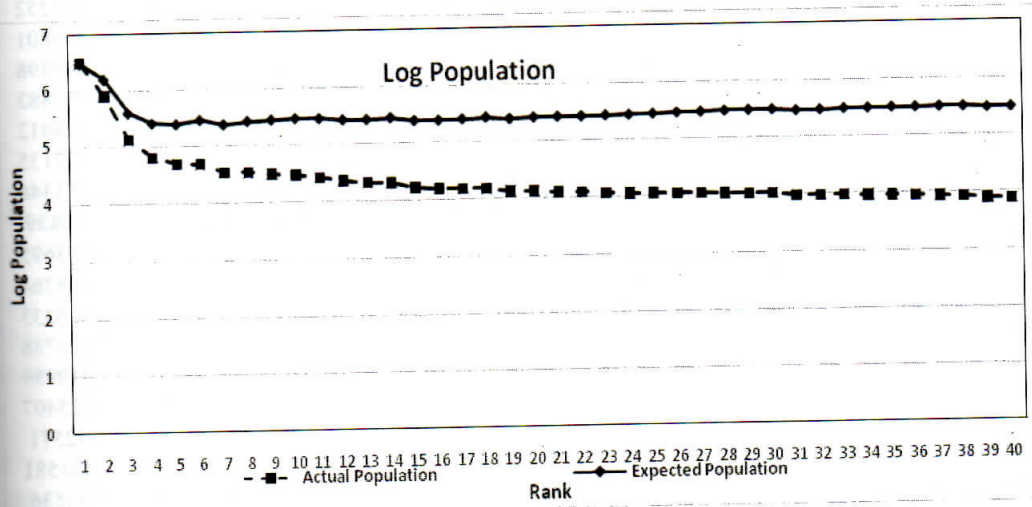
37.	Mauzamabad	8,635	37	82,329
38.	Kalwar	8,393	38	80,162
39.	Govindgarh (CT)	7,735	39	78,107
40.	JamwaRamgarh (CT)	7,665	40	76,154

Source: Calculated by the Researcher

After calculating the expected population with the help of the rank given, the reciprocal rank has also been calculated by using the following formula (I/R). Than P_1 is calculated by using the formula

$$P1 = Pi / \left(\frac{1}{R}\right)$$

It shows that the higher the population, higher the hierarchy of the centre as Jaipur, Sanganer, Amber and Chomu respectively, whereas lower the population, lower the hierarchy as seen in Govindgarh and JamwaRamgarh. After that the log of actual and expected population has been determined (Fig. 2 and Table 2). The log value of actual and expected population than shown with the help of the log graph.



Reasons For Changes In Rank Size of Growth Centres

Total number 111 large, medium and small towns were taken into consideration from the study area. On the basis of the above calculations, it shows that the Jaipur city work as a Primate City or Growth pole, 3 towns namely Sanganer, Amber and Chomu as an urban growth centres, 10 as urban growth points i.e. Kotputali, Bassi, Shahpura, Chaksu, Bagru, KishangarhRenwal, Phulera, Sambhar, Viratnagar and Manoharpur respectively, 17 as a rural growth centres as Khejroli, Paota, Narayana, ManpuraMacheri, etc. and rest all 80 towns as a rural growth points.

The picturesque capital of Rajasthan, Jaipur city displays a remarkable harmony and architectural splendor. The only planned city of the country of its times has fairy tale palaces, rugged fortresses perched on Aravalli's hills and broad plains. The city of Jaipur boasts of a harmonious blend of traditional and modern culture. The administration of the city promulgates a vibrant and balanced economy, a well-educated and working populace, a clean and healthy environment and a quality of life which is best among the world.

Table No. 2: The P_1 value and log value of actual and expected population

Name of Growth Centres	Acutal Population	Rank	Expected Population	I/R	Pi=Pi(I/R)	Log Actual Population	Log Expected Population
Jaipur	3,046,163	1	3,046,163	1.000	3,046,163	6.483753	6.483753
Sanganer	794,803	2	1,523,082	0.500	1,589,606	5.900259	6.201289
Amber	132,375	3	1,015,388	0.333	397,125	5.121806	5.598927
Chomu (M)	64,417	4	761,541	0.250	257,668	4.809	5.41106
Kotputli (M)	49,202	5	609,233	0.200	246,010	4.691983	5.390953
Bassi	48,429	6	507,694	0.167	290,574	4.685106	5.463257
Shahpura (M)	33,895	7	435,166	0.143	237,265	4.530136	5.375234
Chaksu (M)	33,432	8	380,770	0.125	267,456	4.524162	5.427252
Bagru (M)	31,229	9	338,463	0.111	281,061	4.494558	5.448801
KishangarhRenwal (M)	29,201	10	304,616	0.100	292,010	4.465398	5.465398
Phulera (M + OG)	26,091	11	276,924	0.091	287,001	4.416491	5.457883
Sambhar (M)	22,327	12	253,847	0.083	267,924	4.34883	5.428012
Viratnagar	20,568	13	234,320	0.077	267,384	4.313192	5.427135
Manoharpur (CT)	20,287	14	217,583	0.071	284,018	4.307218	5.453346
Khejroli	16,531	15	203,078	0.067	247,965	4.218299	5.39439
Paota	15,473	16	190,385	0.063	247,568	4.189575	5.393695
Achrol	15,077	17	179,186	0.059	256,309	4.178315	5.408764
Dudu	14,961	18	169,231	0.056	269,298	4.174961	5.430233
Narayana	13,275	19	160,324	0.053	252,225	4.123035	5.401788
Kaladera	13,151	20	152,308	0.050	263,020	4.118959	5.419989
Phagi	12,682	21	145,055	0.048	266,322	4.103188	5.425407
Pragpura	12,114	22	138,462	0.045	266,508	4.083288	5.42571
Niwaroo	11,745	23	132,442	0.043	270,135	4.069853	5.431581
Jobner (M)	11,354	24	126,923	0.042	272,496	4.055149	5.43536
Kanota (CT)	11,250	25	121,847	0.040	281,250	4.051153	5.449093
Baskhoh (CT)	11,150	26	117,160	0.038	289,900	4.047275	5.462248
ItawaBhopji	10,881	27	112,821	0.037	293,787	4.036669	5.468033
Bagrana (CT)	10,790	28	108,792	0.036	302,120	4.033021	5.480179
Vatika	10,590	29	105,040	0.034	307,110	4.024896	5.487294
Med	10,379	30	101,539	0.033	311,370	4.016156	5.493277
Badhal	9,482	31	98,263	0.032	293,942	3.9769	5.468262
Samod	9,365	32	95,193	0.031	299,680	3.971508	5.476658
KotKhawada	9,341	33	92,308	0.030	308,253	3.970393	5.488907
ManpuraMancheri	9,167	34	89,593	0.029	311,678	3.962227	5.493706
Akedadoongar (CT)	9,062	35	87,033	0.029	317,170	3.957224	5.501292
Boraj	8,779	36	84,616	0.028	316,044	3.943445	5.499748
Mauzamabad	8,635	37	82,329	0.027	319,495	3.936262	5.504464
Kalwar	8,393	38	80,162	0.026	318,934	3.923917	5.503701
Govindgarh (CT)	7,735	39	78,107	0.026	301,665	3.88846	5.479525
JamwaRamgarh (CT)	7,665	40	76,154	0.025	306,600	3.884512	5.486572
Total	4,641,446		13,033,139	4.279			

Source: Calculated by the Researcher

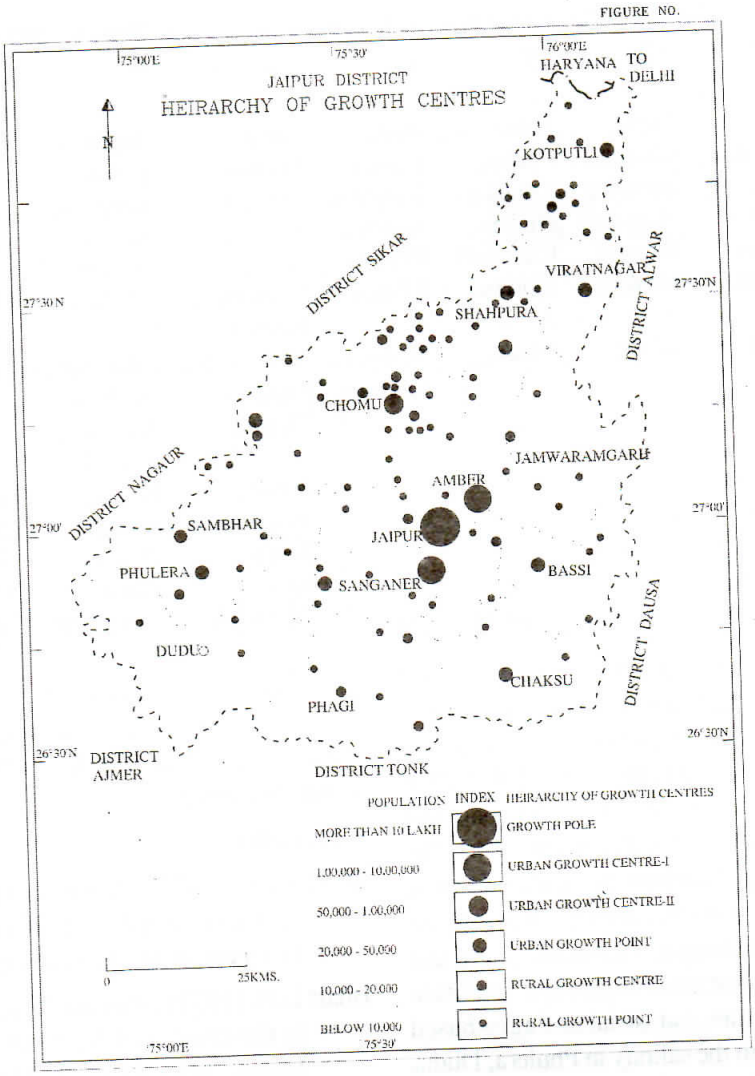


Fig. 1: Hierarchy of Growth Centres of Jaipur District

Recently record growth in terms of reality, infrastructure, tourism industries and multi-national corporate growth, Jaipur is scaling new heights of development projects and heavy transportation, BRTS and metro train facilities.

Changes of Rank Size of Central Places

From 1961 to 2011, rank size of urban growth centres of Jaipur, Chomu and Sanganer was quiet same in descending order whereas Kotputali from 1951 to 2011 except 1971 stands at 4th place. Sambhar stands 2nd place in 1951 and 4th during 1961 to 1971, later on it falls at 8th place from 1991 to 2011. Rank size of Manoharpur as a rural growth centre was seen at 7th place in 1991 and 2011 (Tab.3).

Table No. 3: Change in the Rank Size of Central Places from 1951 to 2011

Rank Size	1951	1961	1971	1981	1991	2001	2011
1.	Jaipur	Jaipur	Jaipur	Jaipur	Jaipur	Jaipur	Jaipur
2.	Sambhar	Chomu	Chomu	Chomu	Chomu	Chomu	Chomu
3.	Chomu	Sambhar	Sambhar	Kotputali	Sanganer	Sanganer	Sanganer
4.	Kotputali	Kotputali	Phulera	Sambhar	Kotputali	Kotputali	Kotputali
5.	Shahpura	Phulera	Kotputali	Phulera	Amber	Amber	Amber
6.	Chaksu	Chaksu	Chaksu	Chaksu	Kishangarh Renwal	Chaksu	Kishangarh Renwal
7.	Viratnagar	Jobner	Jobner	Shahpura	Manoharpur	Manoharpur	Manoharpur
8.	Jobner	-		Viratnagar	Sambhar	Shahpura	Sambhar
9.					Chaksu	Kishangarh Renwal	Chaksu
10.					Phulera	Sambhar	Phulera
11.					Shahpura	Bagru	Shahpura
12.					Bagru	Phulera	Bagru
13.					Bassi	Bassi	Bassi
14.					Viratnagar	Viratnagar	Viratnagar

Amber has remarkable palaces and traditional heritage cultural attracts the people whereas Sanganer is known for printing and dyeing of textile and both are the Sub-Urban Towns of capital city. Railways and national highway transport facilities boost up the surrounding population in search of jobs increase the growth centres. Remaining Kotputali, Manoharpur, Shahpura, Bagru and Bassi are on National highways facilitate with infrastructure, industrial and agro-based activities. Due to the salinity in Phulera, Dudu, Phagi and Chaksu, undulating hilly terrain of Viratnagar and JamwaRamgarh growth centres lacking in economic development.

Conclusion

On the basis of increase in industrial infrastructure, transport facilities, irrigated and agricultural innovations the production and productivity and mobility of people has increased which results in the change in functions of newly developed in clubbing and clustering of settlements that make a bridge of rurban advancement. It fulfill the gap between functional and non-functional centres and that can check on rural migration to urban centres.

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Effects of Asbestos Mining and Related Activities on Human Health A Case Study of Udaipur District

Purnima Singh

Abstract

Minerals are one of the most precious non renewable natural resources gifted by the nature to human beings. These minerals have been exploited and used for the industrial and economic development. Most of the asbestos mining and related manufacturing activities in the state of Rajasthan has been confined to Udaipur district. Asbestos fibers inhaled by human beings lead to asbestosis. Asbestosis is a chronic, scarring disease affecting the tissue of the lungs. The disease leads to long-term breathing complications including severe shortness of breath and increases risk of certain cancers including lung cancer. The present study is an attempt to identify the spatial distribution of asbestos mining, asbestosis among the workers and evaluate the remedial measures initiated by the Governments to the effect of banning the asbestos mining and extend the relief grants to the effected persons.

***Keywords**: Asbestos ore, Mining, Affected area, Environment, Legislation, Symptoms, Relief Meansures.*

Introduction

Interaction between man and his surrounding environment paves way to various geospatial environs. By engaging in different occupations man becomes an agent for environmental modifications such as physiographic, biotic and atmospheric. For his livelihood man chooses different occupations and mining is one of the oldest occupations. Diseases which are the result of working environment at the site of occupation are called occupational diseases. Asbestosis is an occupational disease caused by mining of asbestos and related manufacturing activities in Udaipur district in Rajasthan. Asbestos fibers especially chrysotile fibers when inhaled reach in the lungs and start to damage the lung cells and result in to asbestosis and /or lung cancer. The risk of lung cancer among people exposed to asbestos is 7 times higher compared to the normal population. Asbestosis is an interstitial pulmonary fibrosis which reduces the lung capacity to deliver the oxygen in proper way to the whole body. As a result the lung tissue loses its ability to function. It is characterized by the airway obstruction and air trapping, reducing vital capacity. This disease has relatively long latency period of about 7 to 40 years and therefore its growth and identification takes long time.

Review of Literature

A number of research studies undertaken so far lead to establish an association between exposure to various types of mineral fibres

and bronchogenic carcinoma.(Rajhans et al, 1981; Cohen, 1981; Miller,1993; Brown,1994; Hart et al,1994; Mansingh et al, 1996). Epidemiological surveys and experimental studies have established that asbestos is a carcinogen as well as co-carcinogen (Mossman et al, 1994; ILO 1980).

It is reported that human beings may be exposed to asbestos from a variety of sources- occupational settings, ambient environment and consumer products. Exposure to asbestos may cause various lesions ranging from simple non-malignant inflammatory reactions, pleural thickening and asbestosis to malignant mesothelioma and brochogenic carcinoma (Mossman and Gee, 1989; Mossman, 1994; Rahaman et al, 1993; Mossman et al, 1990a). Cigarette smoking and asbestos exposure have additive or synergistic interactions in inducing cancer of the lung (Mossman et al, 2000, 1989). Several epidemiological and experimental studies have proved that the presence of some other predisposing factors like exposure to cigarette smoke, kerosene soot and biofuels smoke at indoor levels accelerate the asbestos induced disease processes (Arif et al, 1996). Lung function tests (LFT) show higher impairments in population exposed to asbestos related activities as compared to control one while restriction was also more in exposed population as reported by others (Rastogi et al, 1990). Factors namely smoking, kerosene soot may accelerate the disease process in asbestos exposed workers (Arif et al, 1996; Lohani et al, 2000).

After indepth studies Kulkarni G.K. (2001) suggested to impose ban on Asbestos mining. Ramanathan, A.L. and Subramanian, M. (2001) conducted studies on the present status of asbestos mining and related health problems in India. Central Pollution Control Board, Ministry of Environment and Forests Government of India in its report (2008) 'Human Health Risk Assessment Studies in Asbestos Based Industries in India' found health hazards due to exposure to asbestos oriented industries and also suggested measures to minimize it.

Objectives

The present study is an attempt to (a) identify the spatial distribution of asbestos mining and related activities, (b) understand the steps being taken for conducting medical tests of the workers engaged therein, (c) identify asbestosis patients, (d) evaluate the remedial measures initiated by the Governments to the effect of banning the asbestos mining and extend the relief grants to the effected persons.

Study Area

Udaipur district is located in southern Rajasthan between 23°45'00" N and 25°05'30" N latitudes and from 73°00'00" E to 74°33'18"E longitudes spreading over and area of 13,419 square kilometer.

The historic city of Udaipur is the administrative headquarter of both the division and the district. Udaipur district is bounded by the districts of Sirohi and Pali in the north-west, Rajsamand in the north, Chittorgarh in the east, Banswara and Dungarpur in the south and by the state of Gujarat in the southwest. The terrain of the district is generally hilly. The western portion of the district is drained by the Sabarmati river, the northern portion of the district is drained by tributaries of the Banas river including the Ahar river which flows through the city of Udaipur. The southern and central portion of the district is drained by the tributaries of the Mahi river including Som and Gomati.

Geologically, Udaipur district is comprised of basement rocks of Mangalwar Complex of Bhilwara Supergroup followed by Aravalli Supergroup, post-Aravalli intrusives, Delhi Supergroup, post-Delhi intrusives and Recent alluvium.The mining activities in the district have been in place since 14th century when the mining and smelting of lead and zinc was started in Zawar area.The important metallic and non-metallic minerals found in the district are ores of copper, lead, zinc and silver. Besides these, other important minerals like industrial minerals- rock phosphate, asbestos, calcite, limestone, barites, emerald and marble etc. are also available in the district. According to the 2011 census Udaipur district has a population of 3,068,420. Most labourers engaged in mining works are either from tribal or scheduled caste population.

Material and Methods

This paper is basically based on the secondary data and information obtained from the Department of mines and medical, District Collectorate and other published sources as well as from internet sites. The data have been compiled, tabulated, analysed and suitably interpreted to draw meaningful results.

Distribution of Asbestos Ore

Asbestos- an insulation mineral, is used for making asbestos cement, roofing sheets, pipes and other products for heat insulation. Flexibility, length of fiber, toughness, fineness, fusibility and strength are main physical characteristics. Out of the six varieties of asbestos, amphibole and chrysolite are major commercial varieties. The amphibole found in Rajasthan is of inferior quality. Rajasthan at one time accounted for about 96% of the country's production of asbestos. Asbestos bearing areas in Udaipur belong to two groups - Rikhababdeo and Jhadol.

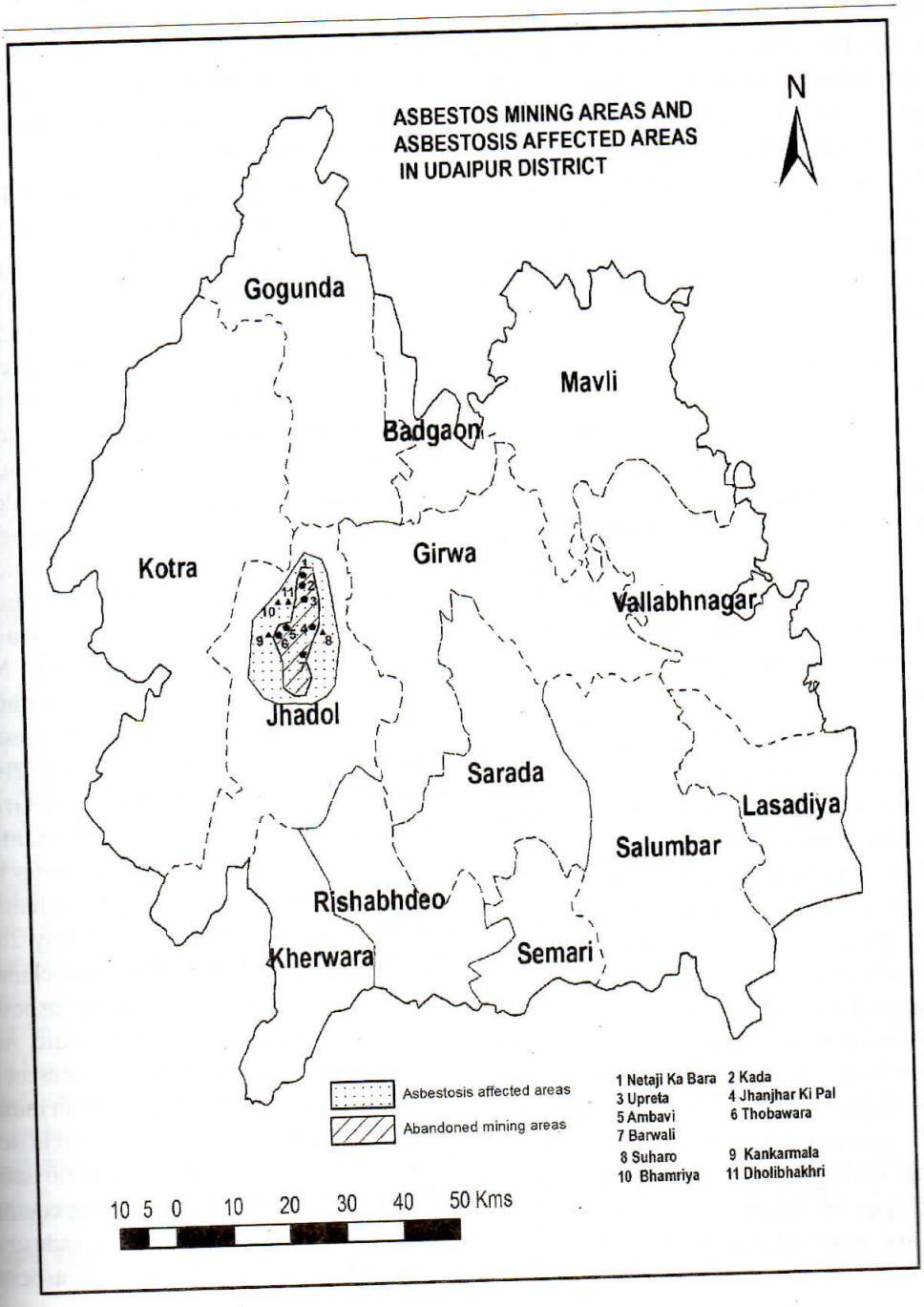
Rikhabdeo group: The Chrysotile variety of asbestos is known to occur around villages - Kagdar-Ki-Pal, Rikhabdeo, Serro-Ki-Pal and nearby areas in the form of cross fibre veins forming ribbons or irregular stock--works. The length of fibre varies from 1 mm. to 12 mm. Recovery percentage is quite low and commercial production is negligible. In south of Rikhabdeo, occurrences of tremolite asbestos have been reported near villages Dhelana, Odwas, Saru, Bhana, Khanmin, Kalighati etc. This asbestos is associated with talc and therefore its commercial exploitation is not viable.

Jhadol group: The deposits are located 16 km west of Jhadol. The area extends for about 20 km. in strike length and 3 km. in width from Barvali and Kirat villages in the south, spreads over Jhanjhar-Ki-Pal, Parri, Amari Bara, Solar Ambavi, Upreta villages and extends up to Malmukhi village in the north. The mineralisation of anthophyllite variety of asbestos is found in altered ultrabasic rocks as detached lenticular masses.

Spatial Distribution of Asbestosis Mining and Affected areas

There were 69 mining leases in 1990-91 in Udaipur district with a production of 31.6 thousand tones per annum which came down to 10 leases and production of 9.80 thousand tones in 1999-2000. The annual production in the year 1995-96, 2000-01 and 2003-04 was about 21,17.87 and 13.46 thousand tones respectively. The main areas of production were located at Jhadol, Kherwara, Rikhabdeo and Salumber in Udaipur district. The production has manifested decreasing trend before the

mining activities were finally and fully banned. The ten mining leases were spread in villages of Thobawara, Barawali, Jhanjhar Ki Pal, Netaji Ka Bara, Upreta, and Ambavi in Jhadol tehsil (Figure – 1). These leases granted between the years 1971 and 1999 have expired in the year 2011.



Effects of Asbestos on Environment and Legislation

Asbestos is used as a part of construction material. Due to flame retardant quality it poses major risk to human health. Asbestos is made of tiny fibers that when released into the air can settle inside lungs and irritate the tissues in the chest cavities. Asbestos dust can easily travel through the air into the water supply. It settles on the surface of the soil instead of getting absorbed into the ground and thereby it can still get picked up by the wind and inhaled into human respiratory system.

Asbestosis is a chronic, scarring disease affecting the tissue of the lungs. The disease leads to long-term breathing complications including severe shortness of breath and increases risk of certain cancers including lung cancer. People with long term occupational exposure of 7 to 20 years to the mining, manufacturing, handling, production of products of asbestos, are at a high risk of developing this occupational lung disease.

Many of the asbestos mine workers have slowly developed asbestosis. The National Institute of Occupational Health (NIOH), Ahmedabad conducted clinical tests on 164 workers of Jhadol tehsil of Udaipur district in 2007 and the report was made public in 2012 only after the intervention of National Human Rights Commission and State Human Rights Commission of Rajasthan. It suspected 93 persons to be suffering from asbestosis and out of them 20 have died since then. The NIOH again carried out a health camp for mining/ milling workers exposed to asbestos at Udaipur on 14-22 June 2011. In all 87 workers were examined but the NIOH experts did not come to any definite conclusion regarding the presence of asbestosis even in a single worker. Mine Labour Protection Campaign (MLPC) led by Dr. Rana Sen Gupta is an actively working NGO championing the cause of health of mine workers. This NGO is actively persuing the cases of various occupational diseases like asbestosis and silicosis in the state.

In 1986 the Government of India banned the renewals and grants of fresh asbestos mining leases in the country due to the adverse effects on the health of mine workers. In June 1993, the Government stopped the renewal of existing mining leases of asbestos. In 2007 the Government of Rajasthan requested the Central Government to revoke the ban on asbestos mining. Government of Rajasthan has also filed a report in an ongoing case regarding asbestos exposure related diseases before National Human Right Commission (NHRC). Due the increasing pressure of NHRC, State Human Right Commission, media and Non Governmental Organization the Government of Rajasthan has withdrawn its request to revoke the ban on asbestos mining in 2010. Since 2011 even as the National Green Tribunal has asked the Government of Rajasthan to file a report on all asbestos and associated mineral mines, their scientific closure and their overburden. In July 2015 the Government of Rajasthan has claimed that no case of cancer caused by asbestos has been reported till date in the state. As a result of above developments, at present no permission is being granted for fresh mining lease of asbestos mineral and no old lease is being renewed. At present there is no active asbestos mine in Udaipur and in the country. The present status is that all the industries registered for making products of asbestos

in Udaipur city - M/s Maan Trading Corporation, M/s Multi Mineral Processing Industry, Pipes Pvt. Limited, Ms Kumawat and Company have been closed.

But no restrictions have been imposed on imports of asbestos. However, the Ministry of Environment and Forest Government of India has prohibited the imports of waste asbestos (dust and fiber) considering it hazardous waste detrimental to human health and environment.

Signs and Symptoms of Asbestosis

The signs and symptoms of asbestosis become visible after several decades. Exposure of at least 7 to 20 years or even 40 years in some cases is required to develop the disease. The slow onset of shortness of breath specially with physical activity is primary symptom. Clinically advanced case of asbestosis may result in respiratory failure. Inspiratory crackles can be heard with a stethoscope.

Other symptoms include clubbing of the fingers, softening of the fingernail beds, bulging of the end of the finger and mishappen nails. Lung cancer can also cause clubbed fingers. Persistent dry coughing, chest pain, blood in the sputum, swelling in the neck or face, difficulty in swallowing, tightness in chest, loss of appetite and weight loss are other common symptoms. In severe cases, drastic reduction in lung function and total lung capacity (TLC) are the symptoms. Stiffening of the lungs may induce heart failure. In the later stages, pulmonary hypertension, heart disease and other lung complications including lung cancer may develop.

Causes and Diagnosis of Asbestosis

The cause of asbestosis is the breathing of the mineral asbestos. Greater exposure results in greater risk of developing the disease. When person inhale asbestos fibers, they can become embedded in person's lungs and lead to the formation of scar tissue. This scarring is known as asbestosis. Scarring prevents lung tissue from expanding and contracting normally leading to difficulty in breathing. Complete physical examination, chest x-ray and lung function tests may help diagnose the disease. A lung biopsy is the most reliable test since x-rays fail to detect the presence of microscopic asbestos fibers.

The American Thoracic Society (ATS) has recommended following general diagnostic criteria for asbestosis:-

(i) evidence of structure pathology consistent with asbestosis as documented by imaging or histology,

(ii) occupational and environmental history of exposure and

(iii) abnormal chest x-ray with a white or honey comb appearance on lungs or chest and its interpretation.

There is no cure for asbestosis but treatment includes oxygen therapy to relieve shortness of breath, respiratory physiotherapy to remove secretions from the lungs and medications to thin secretions and relieve pain. Prescription inhalers may help loosen congestion in patient's lungs.

State Government Intervention

In the year 2008 the Government of Rajasthan legislated to levy environment and health cess on mineral rights. The fund thus credited is being utilised for protection of environment, health and maintenance of ecological balance especially in mining areas of the State. Further the Government has notified Rajasthan Environment and Health

Cess Rules, 2008 and subsequntly Rajasthan Environment and Health Administration Board (REHAB) has been constituted under the chairmanship of Principal Secretary Finance.

The REHAB meets at least once in 6 months. Apart from many other functions, the function of board is to formulate general policies and procedures to facilitate management of the fund and long term plan to mitigate the environmental and health issues in mining areas by developing synergy with government/ public and private institutions preferably in public private partnership mode. The yearly revenue collected and expenditure incurred under the subheads are shown in the table -1.

Table No.1: Revenue and Expenditure Under REHAB Fund (in crore rupees)

Year	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
Revenue	53.77	47.08	61.85	66.84	47.30	58.60	65.92	98.98
Expenditure	-	-	-	20.86	20.45	13.64	7.12	14.89

Source: District Collectorate, Udaipur

The REHAB cess fund is being utilised on strengthening of various hospitals in mining areas, improvement of urban and rural infrastructure in mining areas including railways and assistance to silicosis / Asbestosis affected patients or to their dependents. In 2014 it has been decided that a sum of rupees one lac is paid to an asbestosis patient and in case of death rupees 3 lakh is paid to dependents of the deceased on production of certificate issued by Pneumoconiosis Board or the Principal, Medical College, Udaipur.

Screening of Asbestosis and Relief Measures

As per the complaint of MLPC to the State Human Right Commission, the asbestos pits lying open in Udaipur district have been posing threat to human beings and livestock. On the direction of State Human Rights commission, a technical committee was constituted by Collector, Udaipur to evaluate whether these asbestos mines are safe or if there is any need to get them filled up. The Committee has reported that the mining activities have been non operational since many years and the people who have worked in asbestos mines show symptomatic of long cough and bronchitis whereas people who have never worked in asbestos mines do not show any such symptoms. The Committee further reported that there is no danger posed by open mines of asbestos. The habitations are also at least 200 to 500 metres away from open mines which rules out any possibility of causing asbestosis. The experts of Rajasthan State Pollution Control Board are also of the view that the soils of open mines have settled and vegetation has grown on it. The Indian Bureau of mines, Directorate of Mines and Geology and the Rajasthan State Pollution Control Board have also examined the issue and concluded that there is no danger of asbestosis due to open abandoned mines.

It has been noted that 164 mine workers were medically examined by National Institute of Occupational Health (NIOH) Ahmadabad in 2007 out of which 93 cases were suspected of Asbestosis. By the year 2016 about 660 mine workers have

been screened both by Ravindra Nath Tagore Medical College Board, Udaipur and the District Pneumoconiosis Board, Udaipur. The Udaipur district administration has arranged to screen the asbestos mining worker in Jhadol tehsil in the years 2013 -16. After certification of the asbestosis the patients have been sanctioned and disbursed relief grants of rupees one lakh each as indicated in table - 2

Table No 2: Asbestosis Patients and Relief Measures in Udaipur district.

Year	No. of screened Workers	No. of Asbestosis certified cases	No. of Relief disbursed case	No. of Relief Due case
2013	98	16	16	-
2014	363	-	-	-
2015	77	30	23	7*
2016	122	27	27	-
Total	660	73	66	7

Source: District Collectorate, Udaipur

* 4 dead, 02 not traceable, 01 wrong name recorded in the certificate issued.

The data in the table-2 clearly indicate that the certified cases of asbestosis were 16, 30 and 27 in the years of 2013, 2015 and 2016 respectively. Each of the patients has been sanctioned Rs 1 lakh by district collector. So far 73 people have been certified as suffering from asbestosis and all of them are residents of villages lying in and around the asbestos mining belt in Jhadol tehsil. Out of them four people have died. One person is non traceable and entry of name in the certificate in one case has wrongly been made. The number of cases certified as suffering from the asbestosis falling in the age group of 30 - 44, 45-59, 60 and above are 6, 30 and 36 respectively. Their breakup as per age groups and sex have been given in table 3. Out of 73 asbestosis certified cases 62 are males and rest 11 are females. This clearly indicates that the workers engaged in asbestos related activity are mostly males. This is undisputed that there have been workers below the age of 30 engaged in asbestos related acitivities but as per data available nobody below the age of 30 years has been certified as suffering from asbestosis. The number of certified cases in the age group of 30-44 is only six so far. As noted above latency period of asbestosis is long. Accordingly there is a high probability that some more cases of asbestosis particularly in males who are presently in the age groups of 30-44 and below 30 will come out in due course of time.

Findings

With the intervention of human rights commissions and active involvement of NGOs and the media, the mining of asbestos mineral has been banned. The mine workers who worked in the then asbestos mines in the district of Udaipur have slowly developed asbestosis due to long latency period of disease. All the asbestosis affected people certified so far are residents of the area in and around the abandoned mining belt in Jhadol tehsil. Normally there is delay in providing the relief to the asbestosis patients.

Table No. 3: Distribution of Asbestosis Certified Cases by Residence, Sex and Age (2013-16)

S. No.	Name of Village	Tehsil	Sex		Age				Total
			Male	Females	Below 30	30-44	45-59	60 and above	
1.	Netaji Ka Bara	Jhadol	20	06	-	03	08	14	26
2.	Jhanjhar Ki Pal	Jhadol	11	02	-	01	09	03	13
3.	Ratwan Kada, Kada	Jhadol	09	00	-		01	08	09
4.	Barwali	Jhadol	09	00	-	00	03	06	09
5	Upreta	Jhadol	03	01	-	01	01	02	04
6.	Kankar Mala	Jhadol	02	00	-	-	02	-	02
7.	Ambavi	Jhadol	02	00	-	01	-	01	02
8.	Magwas	Jhadol	00	01	-	-	01	-	01
9.	Bhamriya	Jhadol	01	-	-	-	01	-	01
10.	Dholi Magri (Dhuli Bhakhari)	Jhadol	01	-	-	-	-	01	01
11.	Kirat	Jhadol	01	-	-	-	01	-	01
12.	Magwas	Jhadol	-	01	-	-	-	01	01
13.	Godawato Ka Para	Jhadol	01	-	-	-	01	-	01
14.	Sarawali	Jhadol	01	-	-	-	01	-	01
15.	Chokhala Bara	Jhadol	01	-	-	-	01	-	01
	Total		62	11	-	6	30	36	73

Source: District Collectorate, Udaipur

An all out and extensive medical campaign is required to identify the asbestosis patients and to provide them adequate and due compensation for their welfare. The procedure of issuing certificates needs to be simplified, specially for mine workers who have died.

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Percepetion of Drought-A Case Study of Rajasthan Desert

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Abstract

The Geographers and economists have also started working on perception of environment or drought for human behavior like psychologists. Several scholars have explained the elements shaping the perception of drought. In view of this the present paper deals with perception of drought in desert part of Rajasthan. It is generally believed that arid region of Rajasthan has high rainfall variability and is severely affected drought prone region compared to other parts of Rajasthan. In order to understand the perception and behavior of farmers on drought, 12 villages have been selected for the this study and 240 respondents were interviewed to find out the inner's view. The paper also examines the socio-economic impacts of drought in Rajasthan with challenges for further research in view of climate change.

Keywords: *Drought, Perception, Behavior, Socio-economic Impacts, Climate Change.*

Introduction

The studies on perception of environment or drought for human behavior fall in the domain of psychologists. As a multi disciplinary field with some common research problems, the geographers and economists have also started work in this field. The dominant perception of drought and drought prone areas in Rajasthan is quite different than what can be supported by the available fact and figures. It is generally belived that the arid part of Rajasthan has high rainfall variabilities and is severely affected drought prone region compared to rest of the state, as south eastern parts experience high rainfall and less variability. The study conducted by Banerji and Upadhyay (1975) and recent study by Rathore (2003) reveal that western Rajasthan is highly sensitive for drought is more than the eastern Rajasthan. Rathore, M.S. in his working Paper 93 has analysed state level drought policies and impacts in Rajasthan, which also provides the basis for the present analysis of drought of arid Rajasthan.

It has been realized that managing a disaster with over-all considerations results in serious lapses. Especially with reference to traditional societies there exists a serious gap between the expert's and the user's perception of any environmental problem of hazard (Joshi, Y.G.1998). Most of the traditional societies of drought –prone areas do not manage drought in isolation from their overall farming system and have evolved strategies to deal with drought that include loss-minimizing, land utilization and social arrangement in tune with the survival compulsions. Therefore, for any drought management intervention and policy framework, a better grasp and understanding of people's perception, response, priorities

and their own coping strategies is undoubtedly called for.

Conceptual Framework of Drought Perception

Theory of Drought Perception

In order to analyze the problem of drought perception in arid region of Rajasthan it would be better to discuss the theoretical aspects of drought perception. Taylor et al (1988) have specially depicted how four coherent element shape drought perception (Fig.1). According to Taylor at.al experiences shapes an individual's memory and is an important influence on how someone defines drought. The way drought is defined and the way past droughts are remembered influence an individual's expectation of future drought and one's behavior.

Behaviour can both re-active and pro

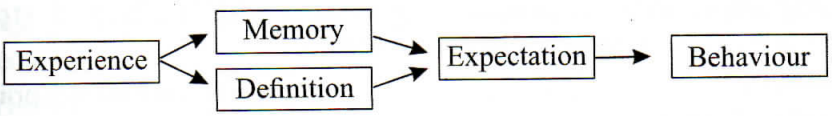

Fig.1. Elements shaping the perception of drought (Taylor et al. 1988)

active perception refers to a range of judgment, belief and attitude (Taylor, at el 1980) from which it can be inferred that perception is neither universal for statics but rather a value laden, dynamic concept. What an individual identifies as a drought on his environment and it characteristics (Heathcote. 1969)?

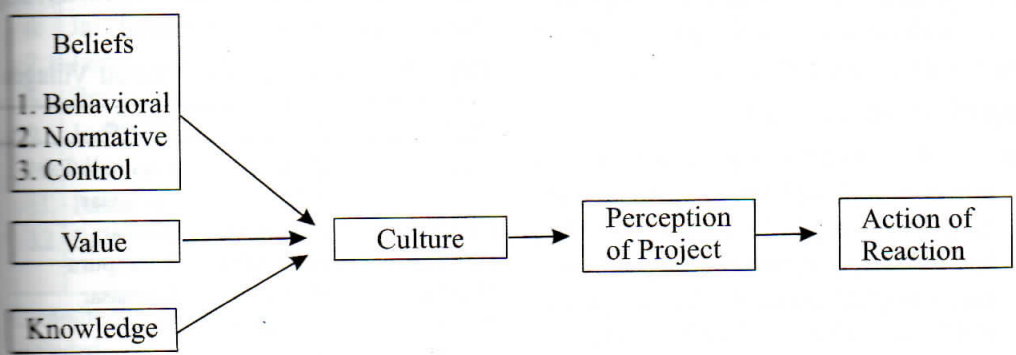

Fig.2 Factors influencing formation of perception and subsequent (re) action (ased on Ajzen and Madden 1986; Jones, 1990)

Based on the perceptional approach to man-environment relations, the present paper was designed to understand the problem of drought in desert area and to come out with valid suggestions with the insider's view, taking into account people's perception, priorities and traditional wisdom in managing the droughts. In the present paper extensive use of studies conducted by various scholars and reports prepared by experts has been made to comprehend the issue of drought and its perception.

Basic Questions Raised

There is serious gap of knowledge between the expert's and the user's perception of any environmental problem, or hazard.

Although present drought – management practices have made considerable headway in minimizing the impact of drought in dryland areas, they have tended to ignore , and therefore, undermine people's traditional coping strategies which include components such as people's participation, collective sustenance and other survival strategies.

Area and units of study

Western part of the Aravalli region has been covered by desert hence it forms the area of the present study. In arid region of Rajasthan which represents the core of the drought prone belt of India, droughts should not just be seen as a natural calamity to be managed under the strategy of disaster management; these are the major contributing factors for creating a condition of chronic scarcity.

Objectives of the study

(a) To understand the perceptions and practices followed by people to face the drought and its implication on their life and livelihood; to review, the policy and plans implemented by Governments (GOR & GOI) and NGOs to provide relief to human and cattle population in drought conditions during last 60 years;

(b) To explore a feasible management model for an easy access and effective distribution/delivery of drinking water, fodder, food, health and medical services to affected population with an emphasis on vulnerable groups like women, children, aged, disabled etc.

(c) To make an optimum utilization of locally available natural and human resources and their wisdom and knowledge;

Methodology

The methodology of the present paper has been designed with the basic aim of collecting the real problem of the villagers and therefore, the emphasis has been on closer association with the people. To study the local residents, the sarpanch and the authorities have been included with reference to the primary data, generated with the help of structured schedules.

The paper is based on both primary and secondary data. The secondary data for the 12 districts of arid region were obtained from Government Departments. For primary data 12 randomly selected villages have been chosen (Table 1). 20 families in each village were interviewed with the help of structured schedules. So the total 240 households were interviewed and interacted. Group discussions were also organized.

Table No. 1: Randomly Selected Villages

District	Tehsil	Village
Barmer	Ramser	Pandhi ki Par
Bikaner	Bikaner	Geegasar
Churu	Sujangarh	Abasar
Ganaganagar	Ridhmalser	Ratanpura
Hanumangarh	Rawatsar	Barmasar
Jaisalmer	Jaisalmer	Dabla
Jalore	Ahore	Sankarna
Jhunjhunu	Jhunjhunu	Dhani Purohito ki
Jodhpur	Bhopalgarh	Khedapa
Nagour	Degana	Kitalsar
Pali	Sojat	Karmawas Patta
Sikar	Sikar	Nani
Total	12	12

Status of Droughts: Past and Present

Droughts are a recurring feature in arid zone

Common saying in the Marwar tract is that in a hundred years period there are 3 years of disastrous droughts, 7 years of famine-, 63 years of moderate drought and 27 are good years.

Bharara (1978) based on memory recall method came to figures close to it. Analysis of the incidence for the past century showed that 47 years in some intensity or the others suffered from droughts of some intensity or the other. Data from rainfall analysis by Narain and Singh (2000) presents also a similar picture. Worst happens when the drought years tend to cluster. The decades of 1901-10, 1911-20, 1961-70, and 1981-90 have been marked for concentration of drought years. The year 2012 was witnessing a similar situation. The frequency of drought from 1901 to 2009 is presented in Table 2.

Table No. 2: Frequency & intensity of droughts in Districts of Rajasthan Desert during 1901-2009.

S. N.	District	Number of Years with droughts of different intensity				% of all drought Years in the %
		Very Severe	Severe	Moderate	Light	
1.	Barmer	6	15	18	11	46.0
2.	Bikaner	8	13	17	10	46.0
3.	Churu	8	11	10	17	43.1
4.	Ganaganagar	9	11	12	18	47.5
5.	Hanumangarh					
6.	Jaisalmer	7	12	13	17	48.0
7.	Jalore	8	13	13	20	48.1
8.	Jhunjhunu	10	15	12	12	47.0
9.	Jodhpur	6	16	17	19	53.9
10.	Nagour	3	17	15	16	48.5
11.	Pali	8	12	19	14	52.0
12.	Sikar	6	20	12	14	49.5
		6.58	12.91	13.16	14.00	44.13

Computed by the Author: Based on district wise rainfall data Hanumangarh and Ganaganagar are included.

The table 2 reveals that highest number of years with drought of different intensity has been reported from Jhunjhunu (10), Jalore (8), Bikaner (8), Churu (8) and Pali (8). The highest percentage of drought years has been reported in Jodhpur (53.9) followed by Pali (52.01) and Sikar (49.5%).Though common people tend to believe in an accentuation of desiccation, long term data do not support it. But one thing is certain that impact of droughts has certainly increased manifold, as there are a lot more people and livestock to be fed and served with drinking water. With the smaller population of the past and larger holding, most farming families used to have reserves of fodder to last for 2-3 years of droughts. But now there is hardly a family, which has stocks of last beyond a year and a half. Not able to afford fodder even with subsidy, the farmers

abandon their less productive or aged cattle or make a distress sale. Kalla et al., reported a loss of 30 per cent of cattle during the 1987-88 drought. The current and previous droughts have meant also large out migration of most of the able bodied men in search of work, leaving women, is accentuated through increased indebtedness, strain on traditional clan and community relations, poor attendance in schools, postponement of construction of house and other family activities and so on. It also means mounting of huge relief effort by the government at the cost of other development activities.

Farmers Perception of Drought

Farmers/villagers in arid Rajasthan prioritize drought as their major productivity – reducing problem as a major threat. The question that needs to be addressed is how farmers perceive drought.

During survey it has been studied that farmers saw drought in a broader perspective than that of deficient rainfall. Drought indicator was area specific. Farmers recognized differences in drought vulnerability between soil types location and state of land, land management practices and farmer types. Farmers' perception can be related to the scientific concept of agricultural drought. Since the amount of rainfall cannot be influenced, the efficiency of the rains can be a local point for addressing farmer's concern about drought. Any viable strategy to reduce farmers vulnerability to drought and to improve productivity should be integrated into farmers existing strategies to adapt to and cope with ecological insecurity.

Farmers talk about a "good year" or "bad year" when evaluating a crop season. Any problem that limits harvest causes a "bad year", but water deficiency constitutes the principle problem. Most commonly, farmers described this problem based on weather conditions, the amount or distribution of the rainfall and sunshine. When there is strong sunshine, the soil will dry fast and the crop will burn easily.

Drought indicators are related to weather conditions, but most commonly to the influences on the farmer's environment. Drought impacts on vegetation and crops were most important drought indicators for farmers. When drought resistant crop such as millets fail, it is a sign that rainfall and sunshine were really imbalanced. However, farmers related drought not only to loss of production, but also to low availability of water for livestock and humans. A few farmers feel that the annual unavailability of water during the dry season is part of the drought problem and stated that every year there is drought.

Farmers Perception of Drought Risk

About 60% of the sampled survey villagers perceived an increased frequency of drought years, while 65% perceived and increased severity of drought years. A third of the farmers perceived a decreased in drought frequency and severity. In a group discussion, farmers agreed that the number of drought years had increased roughly once every 5 years to once every 3 years.

A more equally shared feeling was that the weather pattern has become less predictable. This feeling may also feed farmers concern about drought frequency and severity. Now a days, the clouds pass by and bring rain to the areas, even when all good rain are present in the morning. The farmers in the discussion groups agreed that the destruction of the forest in the Aravallis and hills may be a major factor contributing

to this change of predictability. Farmers have lost confidence in other signs of nature as well.

Farmers related differences in drought vulnerability to weather conditions, land characteristics, land management techniques and farmers characteristics.

Discussion and Analysis

From the analysis of socio-economic and ecological base of the villages of arid region of Rajasthan, it is apparent that this region is drought prone area with an over exploited and fragile ecological base where disequilibrium has emerged between resources available and man power. Poverty in the area is a structural element compelling majority of population to acquire a negative homeostatic under the survival mechanism. In a society where general economic laws do not operate due to survival compulsions, any policy formulation cannot be successful unless the priorities and perception of the people are taking into consideration (Joshi, Y.G.1998).

General Characteristics of Sample Respondents

As has been mentioned that 12 villages have been selected to draw general conclusions and perceptions of local inhabitants of Rajasthan desert relating drought. In most of the villages the percentage of scheduled tribes and schedule caste are less in comparison to non tribal population. A majority of family members are engaged both as cultivators and agricultural labors. The literacy in the family is as high as 84% ranging from the lowest 30%.

Social Psychology

In desert districts of Rajasthan social psychology of people is generally uniform. The salient features depicting the fragile nature of ecology and poor socio-economic base may be stated as follows:

1. A sizable portion of arid land has now been converted to degraded land due to drought and man induced desertification processes.
2. The quality of agricultural land is poor due to land degradation 45% of the so called agricultural land has no top soil.
3. The land is sandy and the soils have low retentive capacity and therefore, even a small deficiency of rainfall results in crop failure.
4. Rainfall is low ranging from 100 mm to 400 mm. the variability of surface and ground water is also low due to low rainfall. Denuded vegetation cover, poor retentive soil, undulating sandy terrain and poor water management are main feature of most of surveyed villages.
5. The mineral resources expect gypsum and kankar pan are negligible.
6. The quantity of human resources is also poor with reference to modern standard literacy is between 30% to 84%.
7. The prevailing system essentially depicts disequilibrium between the man power and available resources, leading to perpetual scarcity.

Perception of Moderate and Severe Drought as Compared to Normal year

The survey reveals that keeping aside the technical definition of the meteorological aspect, villagers perceive drought in the totally of their milieu and with reference to the difficulties they have to face. Thanks to MNERGA that people are getting wages during drought conditions. Numbers of questions were asked to the respondents to

express about the moderate and severe droughts. The perception of villagers is given below:

(1) Availability of water in rivers, nalas tanks and wells.

(2) Distance from which drinking water had to be fetched.

(3) Losses in crop and milk production.

(4) Occurrence of rainfall as compared to what they considered it to be optimum.

(5) Availability of fodder and its enhanced cost during drought period.

(6) Losses in disposing off their cattle.

(7) Repayment of loan and higher interest rate to be paid.

(8) Schedule of migration.

It has been noted that the perception differ from person to person and from one area to another area in desert part. However, it was realized during field work that it is possible to generalize the overall perception of people.

The study reveals that less than half to be a moderate drought and nearly failure of rain is perceived to be a year of severe drought. During moderate droughts the rivers and wells are perceived to provide water only for short period of 2-3 months while during severe droughts people do not expect that water will be available beyond rainy season. People do not perceive that their pumps will operate at all in a year of severe drought. Now the people rely on three sources during droughts i.e hand pumps, PHED supply and canals. Due to Govt. efforts now drinking water is available to villagers by tanks.

Kharif is the main cropping season in desert districts. Even a moderate drought is expected to result in a crop loss of about more than 60%, while in severe drought the output is not expected to be even 10 percent. In the same way people expect a loss in milk production.

It has been noted that water and fodder for cattle is perceived to be the greater problem during drought as animals are forced to move out of desert area for search of fodder. However, this migration has been reduced drastically during last two three decades. People are compelled to migrate one to two months before their normal schedule and those who remain at home have to face difficulties. The following things emerged as a result of drought:

1. Wastage of large amount of time of family member to fetch water from distance sources.
2. Nearly total loss of crop and milk production.
3. Severe scaricity of fodder and higher prices.
4. Death of cattle due to starvation
5. High indebtedness and its long term effect on house hold economy.

Perception about Previous Drought

The drought of the year 1987 was perceived to be the worst in the living memory of even the eldest persons who were contacted during the field survey. Asked as to why they think that it was the worst drought, people gave their different versions. Out of the total 240 responses, the main factors which were in memory of the people may be stated as follows in the order of importance:

1. Total failure of crop
2. Mass migration of people from villages
3. Very low rainfall

4. High price of fodder
5. Very high incidence of looting and thieves.
6. People had to travel long distance to fetch drinking water.
7. Starvation of population
8. Wells, reservoirs and ponds dried up.
9. Large sum had to be spent on pleasing god and goddesses.
10. Unemployment increased
11. Diseases increased
12. People had to borrow large sum on high interest rate.

The study further reveals that none of the respondents perceived drought as an uncommon event. However, more than half perceived is to be uncertain, while some expected a drought in 4 to 5 years period. In a span of hundred years, Rajasthan desert had perceived more than 42 droughts. It is interesting to note that droughts are considered to be a part of life and psychologically people are prepared to face a drought situation normally once in 3 or 4 years.

Socio- economic Impacts of Droughts

The inhabitants of desert do not perceive drought as an unusual occurring, however, due to sub marginal level of living and near absence of any saving or surplus, it is a period of greatest hardship to them. The drought of desert area should not be seen just as natural calamities to be managed under a strategy of disaster management, there are major contributing factor for creating a condition of chronic scarcity in this harsh environment. The impact of drought of 1987 has been the worst in their life time.

Social Impacts

Drought results in economic hardship, liquidation of assets, physical and psychological tension due to lack of proper nutrition, illness and wastage of time and energy for collecting, fodder and fuel and bringing water. The women have to bear this stress higher than male counter parts.

Collective Activities

It has been noted that normally during any famine and calamities the villagers collectively participate in activities to extend co operation and help to each other. The collective activities are building houses, digging wells, digging canals, digging tankas, cutting tree and worshiping the deity.

Economic Impacts

Impact on Water Resources

One of the important manifestations of drought in the desert area is the reduction of water availability in different sources of irrigation and drinking water. In the desert areas where soils are generally sandy, the retention capacity of soils is very low the farmers have to leave a sizable portion of their fields as fallow during the deficient rainfall. In order to report the impacts of 1987 drought open discussion was organized in sample villages. The people reported that during the summer of 1987 drought the rivers, nallas and ponds were dried up. In winter season, the availability of water in these sources was very meager. Drying of sources of water had a profound impact on irrigation of cultivated land. Drinking water became a problem as house hold had to travel for a long distance of more than one kilometer to acquire water for them and domestic cattle's.

Effect on Crop Pattern, Fodder and Milk

Rajasthan desert is a low rainfall region.

Where, rainfall ranges from less than 100 mm in the west to 400 mm in the eastern side of the desert. During kharif season generally farmers grow Bajara, Moong, Moth, Maize etc, while in Rabi crops wheat and barley are grown. During 1987 drought no crops were sown in major agricultural lands of sampled villages.

Death and Sale of Animals

Land is the only capital assets of inhabitants of desert areas. During drought period, due to scarcity of fodder and water it becomes difficulty to maintain the cattle, and therefore a sizable number of cattles are sold at low prices. Generally inhabitants do not sell goats and sheep, but family members are forced to migrate to other areas for grazing.

Effect on Consumption and Expenditure

In the absence of any savings the inhabitants are compelled to cut down their food consumption during scarcity condition. The main diet of the people is bajra bread and "Rabari. sometimes near starvation condition triggers lawlessness specially in marginal workers. During 1987 drought people had to cut down social rituals and expenditures were drastically reduced. Now due to government relief measures under drought prone area Progamme, Desert Development Programme and Mahatama Gandhi National Rural Employment Guarantee Yojana (MNREGA) there are opportunities to people to fulfill their requirements.

Management of Drought

The problem Faced

In course of survey an open ended question was asked to the respondents to list out the problems faced by them, during drought periods specially during the 1987 drought. The following responses were found:

1. The scaricity of water and problem of cattle ranked highest.
2. Physical stress was classed as the next ranking problem after the problem of cattle.
3. Economic losses due to drought. The high interest rate and non availability of credit at a time when the prices were high and wage rates were low.
4. Insecurity was ranked as the next problem, which the inhabitants had to face, During drought period theflts and looting were common.

The present study reveals that despite tall claims of government regarding drought relief measures undertaken, the non availibiliy of relief at proper time was also indicated by inhabitants as one of the important problems faced by tham during the drought.

Strategy to Manage Future Droughts

A number of open ended questions, and group discussions, two major points clearly emerged:

1. The concept of saving and using in future drought period had emerged nowhere.
2. The strategies suggested by villagers were more or less the same throughout the desert region, meaning there by that there was no micro level differentiation as far as the management of drought was concerned.

During survey out of all the programmes initiated by the government, the hand pumps and construction of water tanks in villages have been perceived to be the most beneficial one. Nearly all the respondents had a confidence that drinking water would not be a major problem during future droughts on account of PHED supply of drinking water in the rural areas.

Management of cattle was perceived to be a major problem, for which they demanded fodder houses in each village by the government/NGO agencies.

Taking loan from the local trader or money lender and migrating out for a longer period was expressed as the inevitable compulsion.

Affectivity of Drought Relief Measures

Various schemes by central and state government have been initiated for long under DPAD, DDP, MNERGA, CDP and so on. It has been noted that a large share of working populated migrated out for work during drought of 1987. Majority of respondents reported that they did not get sufficient employment during relief work.

Despite a number of programmes initiated by the government it was observed that people in general have little faith in them. The most preferred programmes are tube wells, ponds, chec dams and tankas and road construction. The general opinion about relief programmes was that no help was received when it was required, it was thrust on people. The attitude of functionaries towards rural people was not found to be sympatric, besides large scale corruption. In fact drought relief has become a good business in which every body, expect the people of the officers during drought relief programmes was to do some haphazard patch work specially in road constructions here and there just to keep the law and order situation under control.

Conclusion and Challenges for further research

Farmers of the desert region recognized that human induced environmental changes influence drought vulnerability and that one has to be an active farmer to be productive and to withstand drought conditions. This implies that farmers can distinguish drought, conditions that are "an act of god" from those that are human induced. This inside creates possibilities for improved management to reduce drought vulnerability.

Since the amount of rainfall cannot be influenced, the efficiency of the rains can be a foul point for addressing farmers concern about drought. Studies conducted in arid areas indicate that only 10-30% of rainwater is actually productive, while the remaining rainwater evaporates or disappears through surface runoff or underground flow (Stroosrijder and Slegers, 2007)

A focus of rainwater use efficiency is a challenging one. In Rajasthan soils are generally poor; rainfall is erratic and when it falls, it often comes in highly erosive showers. Furthermore, the famers in this region have generally a limited availability of resources. Any viable strategy to reduce farmer's vulnerability to drought and to improve productivity should be integrated into farmers existing strategies to adapt to and cope with ecological insecurity.

Climate change is said to be occurring, however, studies on long term trends in rainfall pattern in different parts of Rajasthan have not confirmed ideas about general increase of drought frequencies. Deeper insight is needed how farmer's drought risk perceptions relate to the actual rainfall trend in the area. The environmental history of Rajasthan desert and farmers perception of environmental change deserve further exploration as these may partially explains farmers growing concern about drought.

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Quaternary Geology and Neotectonic Activities In and Around Sambhar lake - a Peep into the Planning of Sambhar Salt Source

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Abstract

Quaternary Geology have a basic influence on the Sambhar lake source. Quaternary geology refers as to the last phase of Geological history of earth surface. The sambhar lake have witnessed a number of upheavals and the climate of the area have seen a number of phases i.e. dry and wet phases in the last period which have a number of impressions on the surface of the earth in area. The lake is situated in an elongated graben in the Aravallis. Rocks comprising of micaceous schists and primary rocks. These primary rocks are full of salt and thus they are inland salt source.

The sambhar lake wet land source is feed by seven seasonal- streams. The area of the study is Jaipur Upland area which is carved by kantli basin mendha basin. Turtamati basin and khandel basin etc. The area is mostly influenced by various facets faults and fractures lying there. The orientation of drainage lines, control over structure dislocation denoting the area.

Above all the quaternary features of the basin are the primary features secondary and tertiary which are responsible for further environmental impression and management of environmental events in the wetland area.

Keywords: *Quaternary geology, Neotectonic, Activities, Sedimentaly, Lineaments, Salt Source.*

Introduction

The wetland forms a separate fish-shaped, elongated, diagonally stretched inland drainage network which is a nature's freak in itself. The Sambhar lake on which the basin owes it's name and fame is fed by seven seasonal streams like Mendha, Rupangarh, Khandel, Khari ka nala, Bandi ka nala, Turatmati and Jhaphok nala.The study will show the new ill star like survey and utility of the area for salt extraction and migratory birds and Animals.

Study Area

Geographically the basin is located between 26°30'5" N latitudes and 74°35'5'10" to 75°55'10" E longitudes. Politically, it encompasses the parts of Jaipur, Ajmer, Sikar, Nagaur districts of Rajasthan (Fig.0.1). The basin includes the tehsils of Phulera, Kishangarh, Chomu (Govindgarh), Nawa, Dantha Ramgarh, Parbatsar, Sri Madhopur and Ajmer. The Sambhar wet land and it's environs covers an area of 5702.62 Sq. Kilometers and located in the central Aravallis and extends to the west of Aravallis

in semi-arid climatic zone.

Methodology

Research methodology is changing a fast due to technological advancement. Therefore, a number of inter related techniques have come into consideration. In this study, field work and ground checks are corroborated with remote sensing technique, study and interpretation of survey of India toposheets scale- (1:50,000-45M/8, 45M/12, 45M/11, 45N/1, 45I/16, 45J/13, Scale 1:1, 25,000-45M/SE, 45M/SW, 45N/NE, 45N/SW, 45N/SE, and 45N/SW) Scale 1:250,000-45 I, 45J, 45M, 45N and 1:63360 of the basin area which have given the new dimensions to this work.

Climatic data were collected from meteorological department, western zone, Jaipur and Sambhar salts Ltd. Hydrological statistics were obtained from irrigation department, Jaipur. Geological Survey of India western zone H.Q. Jaipur have been consulted in preparing the geological map and other related map's Geological Quadrangle map sheet no. 45M, 45I, 45J, 45N on scale 1:253440 have been consulted for preparing the various maps of the basin. B.M. Birla remote sensing Institute, Jaipur and Institute of Development studies, Jaipur have also been consulted for preparing the maps and text of the research work. The area is situated in extraction as well as collection of salt as well as arrival of migratory beids and their rearonal arrival and departure is selat with study reluaence,

Quaternary Geology and Neotectonic Activities

Quaternary geology of the basin has been subjected to neo-tectonic activities during the last 1-2 million years B.P. The Sambhar inland drainage basin popularly known as part of "Jaipur upland" comprising Mendha, Kantli, Rupangarh, Bandhi, etc. river basins have witnessed neotectonic and sedimentation activity in quaternary era. The basement induced post neogene tectonic adjustment are evidenced by a number of morph tectonic and geological features described ahead. (Fig. 1:2)

Sedimentary cycle features operated in Jaipur upland be feature emerged out of rejuvenation in the area and the quaternary features and their in influence remitted in the out come of newly quaternary activities like lineament, their effect over river flow, structural control over rivers etc. All ultimately influence features as well as wide vistas of quaternary tectonics. These are features of quaternary tectonomy gave the newera to the activity of salt extraction.

The basement of the area consists of the pre-Cambrian rock types like micaceous schist, gneiss, feldspathic quartzite etc. Physiographically and geomorphologically the area under study has distinct facies in the catchment of Sambhar inland basin. The general geology and quaternary geology both are effected by the climatic changes experienced during the last phase of cainozoic era. The alternate humid and dry phases occurred during the quaternary period in the basin area have given rise to number of sedimentological evidences and different geomorphological features which are evidenced from field study, bore hole, data from augerholes and dug well sections, pits, river and nala cuttings and with the help of aireal photographs of 1:50,000 scale. Besides the sediment characteristics, pedological evidences, artefacts, pottery, vertebrate and invertebrate remains were also studied. by Raghav (1992).

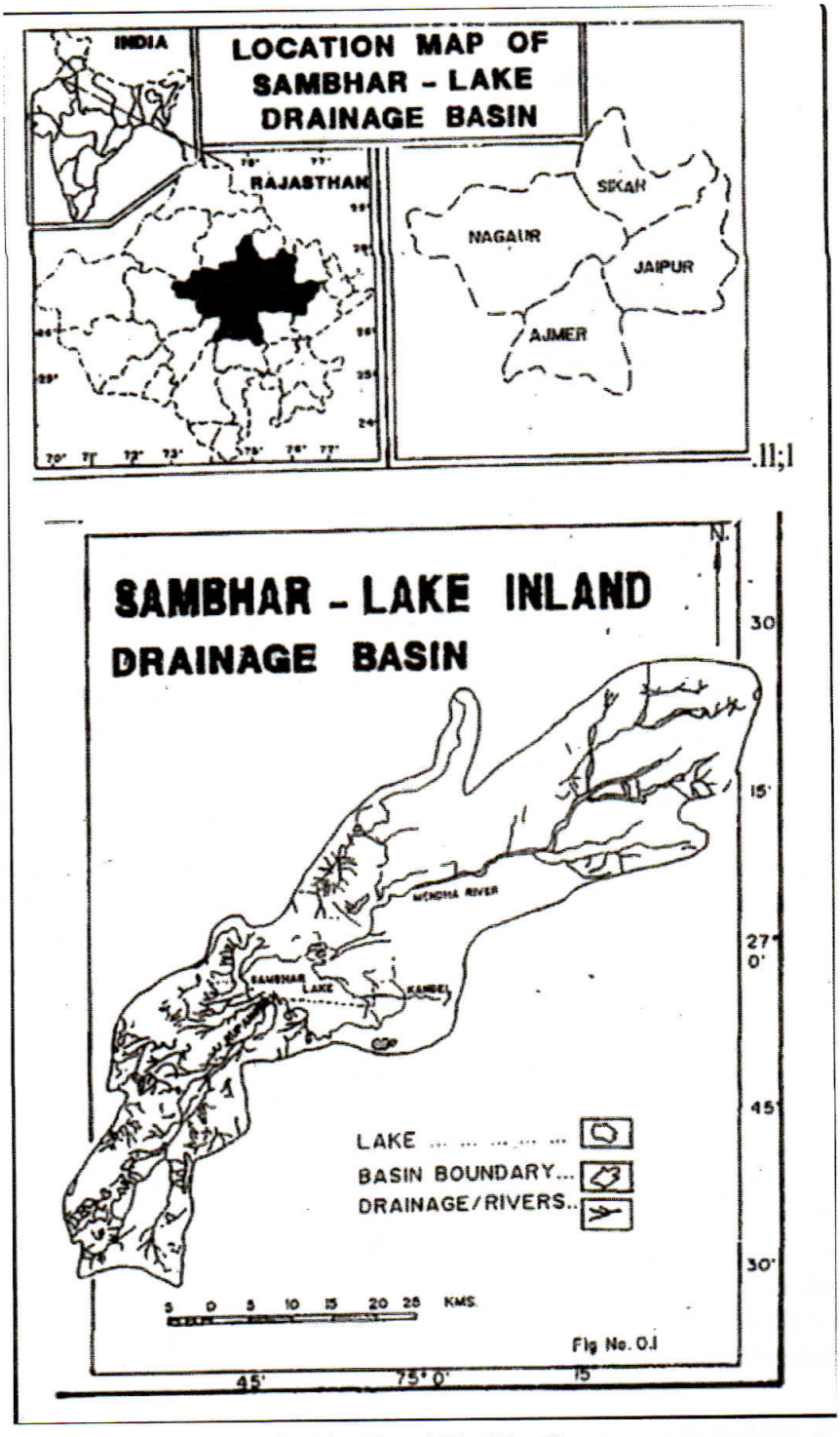


Fig-1(m-1) and Fig-2(m-1)

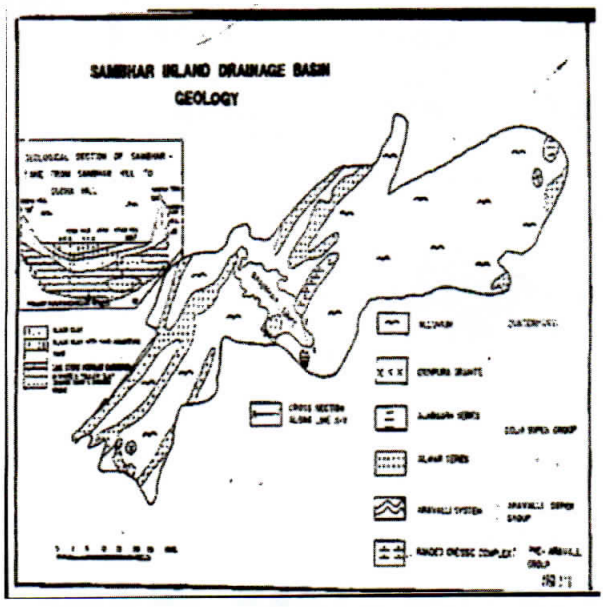


Fig-03

First Sedimentyary Cycle

It begins with a fluvial phase (Fig 1:3) during which a boulder, pebble, gravel bed was formed over the unconformity observed above the primary rock. This sedimentary layer was considered to be the result of hill wash, fan materials, colluvial accretion and the like and mostly occurred at the foot of the hills. This material is overlain by calcareous conglomerate with fine cement cast.

In the close southern proximity of the Sambhar salt lake between Sambhar and Naraina towns, a caicrete bed resting over the rocky pediplain (NALIYASAR) is overlain by 1m to 2m in thick calcareous silty sand and clay bed enclosing gastropod shells. This sequence of material represent a possible time equivalent of the aforesaid fluvial phase (Raghav 1991 and sundaram 1995).

It is evident from the study of the sediments of boreholes that the playa stage sediments overlie the fluvial deposits. These playa deposits are well exposed in dug wells to the south of Sambhar salt lake comprise alternation of compact calcareous grey brown to gypsum white silty, sandy layers and enclosing fresh water MOLLUSES and black silty sand and clay beds. The organic remains found in these sediments include viviparous sp, and eyprids etc.

The aeolian phase (Al) deposits largely modified by later geomorphic processes can be identified in the form of obstacle dunes, longitudinal and transverse sand ridges and flat sand sheet around the hills, depressions and open lands respectively. Some mesolithic stone implements are found over the top surface of these dunes. These (Al) aeolian deposits comprise reddish brown oxidised non- calcareous rounded sand having the thickness between 1.5 to 3.5 m. This layer is underlain by light yellowish to grey calcareous sand with 1 to 15 cm. Catcareous

concretions underneath.

Second Sedimentary Cycle

The palaeo drainage of this phase in the Mendha master stream basin largely aligned in east- west direction. The fluvial phase (F2) sediments rest over the pedogenised Fl, P1 and Al deposits. These fluvial deposits are discernible south of Sambhar- lake near Naliasar and consists of alternation of light grey, coarse fine grained sand, silty sand and clay. In second sedimentary cycle, the surface of the abandoned playas represents playa stage. These playas form broad flats or oval shaped centripetal depressions and regionally aligned along the palaeo- channels of the F2 system. The P2 sediments consists of fossiliferous calcareous silty sand and clay alternation with 1 to 1.5 m hard Kankar horizon in the Mendha river' basin.

The wind born deposits (A2) of this second sedimentary cycle are observed as stabilised longitudinal, transverse, parabolic and obstacle dunes and sand sheets. These A2 deposits consist of more oxidised to light-brown, non-calcareous rounded sand, underlain by yellow sand with calcareous concretions at depth.

Third Sedimentary Cycle

This third cycle pertains to the present day drainage network which have dendritic pattern and controlled by the structure. The fluvial sediments consist of light colored calcareous to non-calcareous, oarse to fine silty sand and clay interwoven with calcareous concretion and gastropod shells. These sediments are overlained by silty sand and clay with aeolian sand along the flood plains.

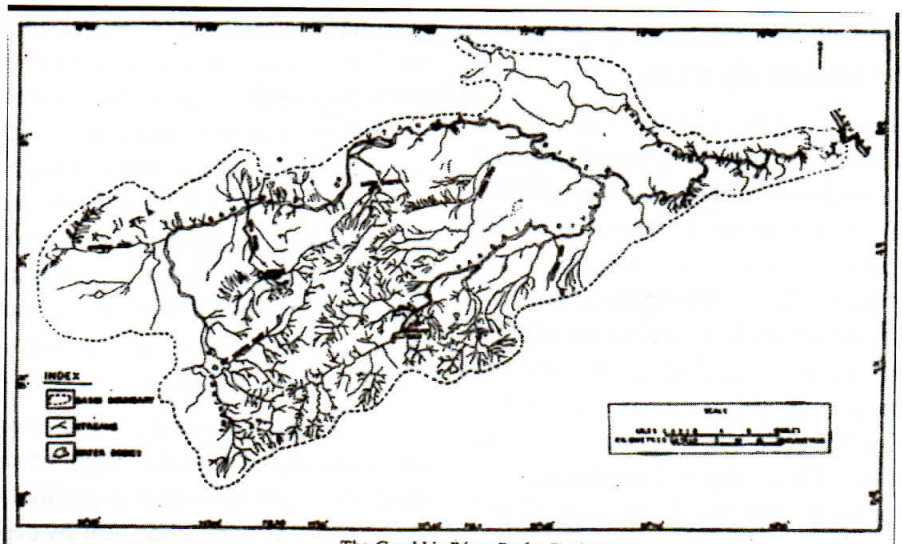
The playas of this cycle (P3) are located along the aggrading channels of recent period. Sambhar- lake shallow depression and a number of other depressions in and to semi-arid topography of great Indian desert are the examples of this stage. The surface of these playas and lakes is devoted to glistening carbonate salt which is gathered from the surrounding sand dunes and arid topography by rainy water. The P3 sediments are composed of thinly laminated silt, sand and black clay with mud and fine sand. These are coeval with F3 and A3 deposits.

All these sedimentary cycles are very much associated with the origin of salt, salt productivity, salt production and like span of Lake as well as population near by depending on the salt activities. It is the matter of great concern to all planners, administrators, constitutes and persons engaged in salt production and trading plan and strong then the salt productivity in view of the sedimentary cycles and climatic uphheavals in the area of the basin. The cycle in more related with the migratory birds and wet-land were of the sruree .

Lineaments

Lineaments are linear features on land surface corresponding to the straight segments of land forms and generally reflect sub surface planer structures. The study of lineaments is very useful for investigations in geomorphology tectonics including seismology (Powar et al 1978, 1979, 1980, 1982, 1983). Besides, economic geology, ground water geology, structural geology and geomorphology investigations are also carried out with the help of lineaments. In the present context of study of which reveal the hidden architecture of the rock basements. They are the character lines of the earth's physiognomy. (Hobbs 1904).

The intersection of NNE-SSW and



The Gambhir River Basin, Drainage
(Source: Quarter inch Toposheets. Sur. Ind. Dehradun No. 54 A, B, E.)

NNE-SSE and ENE-WSW trending lineaments where evidence of recent crustal movements can be discerned shouts developments of sag ponds. The Mendha river appears to be flowing in a younger graben which is bounded on both side by uplifted blocks occupied by Khandel hills in the north and Rupangarh river basin in the south. The upliftrnent has also created a divide along eastern margin of this graben which has diverted the flow of Bandi river toward south paralleling the divide which causes Bandi river to flow into Yamuna system as against the other rivers to the area which are internal in nature. The dominance of salinity, waterlogging, flooding and sand movements in the Mendha river basin and soil erosion in the Rupangarh basin also indicate tectonic control of these features.concluion to rupimp it can safly by coneheded that the area is in blnenea with arious ocathues is quaterneg solegy.

On the basis of disposition of palaeo drainage as well as present drainage, it appears that the NNW-SSE trending lineaments are the youngest which have caused off-set in the ENE-WSW and NNE-SSW trending lineaments. The ENE-WSW trending lineaments show parallelism with the palaeo-drainage and abandoned playas of second generation indicating a clockwise rotation of the palaeo drainage from first generation t second generation.

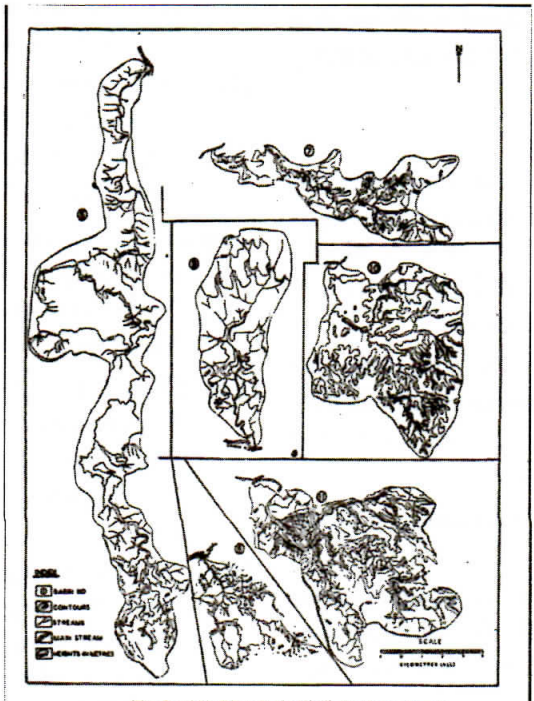
The influence of these directions is also noted in the development of hill gaps as well as Sambhar lake depression where longer axis exist parallel to these orientation.

Above all, the features of neotectonic evidences were also reported by a pioneer geologist Das Sarma (1986). The palaeo channels are linearly disposed segments in successive parallel stretches indicating sedimentation in stepped grabens (Das Sharma 1988). Various lineaments have also been marked which trend ENE-WSW NW-SE and NNE-SSW and define the boundaries of some of the land forms. Some of the lineaments have also been corroborated by

aeromagnetic signatures (Ramakrishna et. al. 1977) Das sarma and Basudav sural (1987) inlrred the presence ol' push up swells along NNl-SSW trending basement controlled enechelon strike slip faults as well as i'iedel and conjugate i'iedel shears in the study area.

The quaternary geology and landforms in the basin are primarily the products of geomorphic, depositional, structural and erosional processes. The depositional landforms related to three sedimentary cycles are made up of four fluvial and two each lacustrine and aeolian faces. The basement induced post - Neogene tectonic adjustments are evidenced by a variety of morphotectonic and geological as well as structural features in the basin. Drainage network study and field checks along the course of Mendha and Rupangarh rivers show the dissection of buried pediments , changing base level, terrace pattern, location of 100 m to 130 m thick quaternary alluvium in the north western part of Sambhar lake area and the shifting course of Mendha attributing towards subsidence and tectonism. Similarly, inversion of drainage and sedimentation, river entrenchment, fault and dislocation, association of lineaments with orientation and alignment of river courses, geomorphic features etc. are again the index of tectonism in the basin.

Lineaments reveals that the shape and orientation of drainage lines as well as the alignment of the relief features including scarps are strongly suggestive of their association with lineaments (Fig 1:4). Major stream courses and channels reveal the prominent relationship of their orientation and alignment with the lineaments while the tributaries and the small ephemeral streams



The Gambhir River Basin Vindhyan Super Group
(Based on 1 : 50,000 Toposheets; Sur. Ind.

show varying relationships with the less prominent lineaments (Arunachalam 1981). A spring controlled by a lineament near maroth is also noticed with higher temperature which could be attributed to neotectonic energy released in heat form (Saxena and Sinha 1991) in the basin.

These lineaments are important for the drainage lines, their courses, orientation and above all the salt, salitity and salt productivity.

Conclusion :

The study area in associated with Aravali mountains of primary rocks climatically it is of semi- arid area. Climate of the area is environmentally fully covered with different types of monsoonal trees but now it is under stress of population, pastrolism and diverse situations. The tectonic activities are being witnessed by these activities seen on the surface of the earth. Its concluded that the area should be visualized with modern activity in associated with quaternary activities.

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Spatial Variations in Educational Amenities of TSP Area of Rajasthan

Shivani Swarnkar and Khetpal Rawal

Abstract

Education amenities are key component of social development. Educated people can contribute significantly to the development and prosperity of a nation. The development of any region depends upon social and economic development, but such a development can't take place without simultaneous development of amenities. Education amenities development in Tribal Areas is the base of economic development of the any region. Generally an amenity defines as "a set of facilities through which goods and services are provided to the public, which shows the quality of life of people in a region." Regional disparity is worldwide problem today, especially in the developing countries.Educational development especially at amenities level is instrumental factor for eradication of illiteracy and regional development of any region. Educational development means overall status of education in terms of access, infrastructure and outcomes. The present study considered Eight (8) indicators for educational amenities and each indicator has two sub categories. Centres per 20,000 person and per 100 Square kilometres. Educational Development index (EDI) has been determined by using Standard Score. Levels of educational development at amenities have been calculated followed by determination of composite educational development index. The study concluded category in comparison to tehsil of TSP area of Rajasthan.So present study made is an attempt to examine the Spatial Variation in educational amenities development in twenty four tehsils of TSP area of Rajasthan.The idea of analysis of spatial variation in the educational development is relevant for integrated area development because we can't provide all services and development programmes for all settlements due to scarcity of resources.The study found that TSP area has also spatial variation in educational amenities development like other region, states and countries. It is found that tehsils like Gogunda had high educational amenities development where as Kotra and other tehsils.

Keywords: *- Amenities, Education, Disparity, Composite index, Development*

Introduction

Education is the mile stone of socio-economic development of a society. Education improves the productive capacity of societies and their political, economic and scientific institutions. Education is one of the

key inputs and plays a primary role in its socio-economicand human development. Education is an important component, determining the status of person. It is an integral part of a country's development process. Education is a sensitive indicator of cultural advancement of an area. It develops the personality and rationality of individuals and qualities to fulfil certain economic, political and cultural functions. The existence of spatial variation is one of the basic structural characteristics of tribal dominant areas, creating problems for the planners and policy makers in determing the development process. In India, tribes have their own unique socio-economic identity and the issue of tribal education stand out as discipline requiring special treatment.

The development of any region depends upon social and economic development, which cannot be achieved without amenities development. The problem of regional disparities has become a worldwide phenomenon. Today in developing and under developing countries and especially in India-Rajasthan being the area wise largest state of the nation is well knowfor widespread disparities in the amenities of educational development. So, present study is an attempt to examine the spatial variation in educational amenities development in TSP area of Rajasthan. Which is at extreme backwardness because of educational amenities. Some indicators of educational development have been considered for detailed study, like number of primary, upper primary, secondary, and senior secondary schools. For balanced spatial variation an essential component of the state development strategy to ensure the minimum amenities of the region.Against this backdrop, there is a need to identify the tehsil which are backward to find out the extent and nature of backwardness and to look into the dynamic of the region cover space and time. The present study is an attempt in this direction.

Study area

Tribal Sub-Plan Area of Rajasthan is located in Southern Part of the State. As its neighbour along with Madhya Pradesh and Gujarat state. The Tribal Sub-Plan Area is confined within 23°02'41.09"N and 24°54'59.73"N Latitude and 72°11'28.73"E to 75°00'14.57"E Longitude. The Tribal Sub Plan Area covers an area of 21563.1 Square Kilometres with 24 tehsils in the region. The population of Tribal Sub-Plan Area according to the Census (2011) is 5934792 persons (including 3001090 Males and 2933702 females) in Area. The sex ratio of the TSP region was registered as 977 and the density of population per sq. km. was 274,which are below the national average. The literacy rate in the tribal sub plan area is 56.18 percent.

Objectives:

The present study attempts to investigate the following objectives:

- To find out the status of educational amenities in each tehsils and identify the backward tehsil of the area.
- To describe Spatial variation in the educational amenities of TSP area of Rajasthan

Data base and Methodology

The present study is mainly based on Secondary data obtained from census of India (2011) and Department of Education, Government of Rajasthan. This research paper aims to measure the spatial variation in the status of education amenities in the region at tehsil level with the help of multi

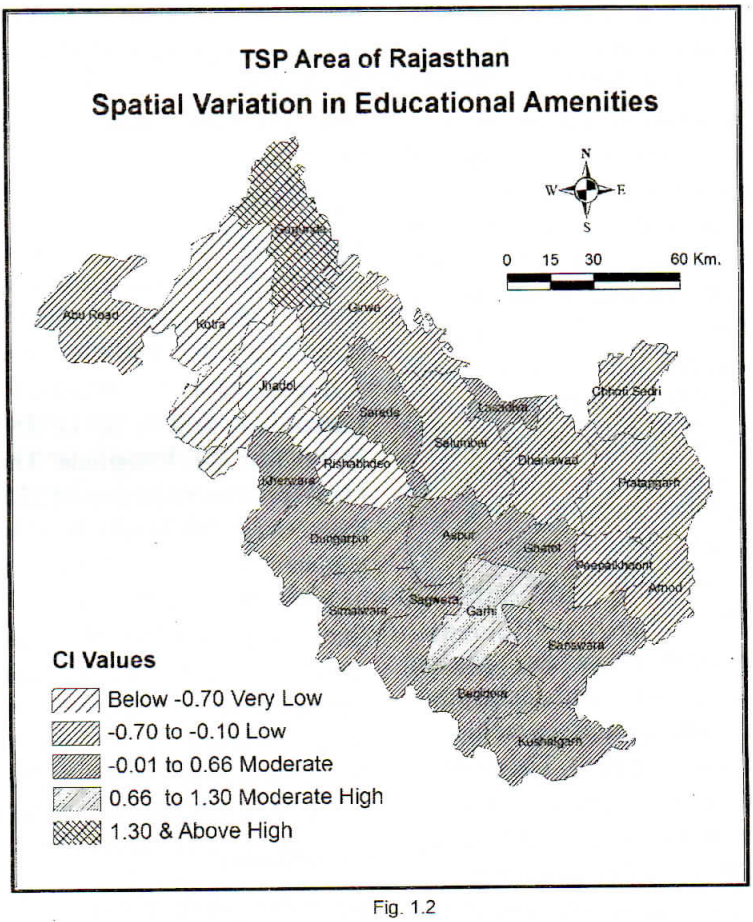

Fig. 1.2

variables data analysing method. The presented models and methodology based on it are suitable for making spatial variation measurablethrough this and with the help of statistical data, the spatial variations of any territorial unit of any level can be determined. It is also analysed and presented by GIS and Cartographic methods based on statistical techniques. A number of methods have been used to study. The following Eight indicators are taken to calculate to status of educational amenities.

- X_1 -Number of Primary Schools per 20000 persons
- X_2 -Number of Upper Primary Schools per 20000 persons
- X_3 -Number ofSecondary Schools per 20000 persons
- X_4 -Number of Senior Secondary Schools per 20000 persons
- X_5 - Number of Primary Schools per 100 Square Kilometres
- X_6 - Number of Upper Primary Schools per 100 Square Kilometres
- X_7 - Number of Secondary Schools per 100 Square Kilometres
- X_8 - Number of Senior Secondary Schools

per 100 Square Kilometres

The above indicators are taken to calculate the indices, on the basis of each Tehsils of the TSP Area. The level of amenities have been divided are the five categories like High, Moderate High, Moderate, Low and Very Low disparities in educational amenities development.

To determine the level of development composite index method has been used. Following steps are involved to calculate the composite index.

1. First of all mean of each indicator has been identified.

a) Arithmetic mean of indices-

$$\overline{X} =, \frac{x}{N}$$

Where= "x = sum of indices

N= number of indices

2. Standard deviation (S) of each indicator has been calculated.

b) Standard deviation of indices

$$\sigma = \sqrt{\sum d^2} / N$$

Where- d= $\overline{x}$ -x – deviation from actual mean

3. Standard values has been calculated by using the following formula

c) Standard Score Zij = (X-X) / Sj

Where X= Mean of the jth indicators

Sj= STDEV of jth indicator

4. Gross values of each tehsils has been calculated by adding the standardized value of all indicators found in that tehsils

d) G.V. = sum of total indicators

5. At the last composite index has been identified

e) Composite index= G.V/N

G.V. = Gross Value

N = Number of Indicators

Analysis and Discussion

The composite indices of development have been worked out separately for educational amenities given in Table3. The amenities have also been ranked on the basis of development. It may be seen from the table that in case of educational development the Gogunda tehsil ranked first and Kotraranked last ranked. The development in all tehsils of the region is never uniform, whether the countries are developing or developed. Regional disparities in the level of educational amenitiesin tribal area are varying in all tehsils of TSP area. The detailed explanation of level of disparities is given below.

Regional Disparities in the Educational Amenities

Educational disparities have many causes ranging from poor infrastructure to present status of number of schools in different categories and various other factors which are social, economical and political. Based on 8 indicators the levels of educational development have been calculated. The composite index of all selected indicators of educational amenities in the TSP area is calculated the number of primary centres, Upper Primary Centres, Secondary Centres and Senior Secondary Centres per 20000 persons and per 100 sq. Kms are the important educational indicators considered and computed by composite index formula show in table 3. It is observed that the educational indicators value from below -.7 to above +1.3. Fig. 2 show.

High Level: - The High level amenities consist of 1 tehsil namely Gogunda (C.I.V. +1.59 and rank 1) respectively with having a range from > +1.3. This tehsil have high level educational amenities in all indicators and better conditions of education amenities.

Moderate High Level: - The moderate high level educational amenities consist of 1 tehsil namely Garhi (+.83 and rank 2) respectively with having a range from +.66 to +1.3. These tehsil have moderate high level educational amenities in all indicators and good conditions for educational institutions.

Moderate level :- The moderate level educational amenities consist of 11 tehsil namely Sagwara(C.I.V. +.61 and rank 3), Lasadia(C.I.V. +.59 and rank 4), Bagidora(C.I.V. +.61 and rank 3), Banswara(C.I.V. +.41 and rank 6), Simalwara(C.I.V. +.37 and rank 7), Dungarpur(C.I.V. +.37 and rank 8), Ghatol(C.I.V. +.30 and rank 9), Kushalgarh(C.I.V. +.26 and rank 10), Aspur(C.I.V. +.11 and rank 11), Kherwara(C.I.V. -.01 and rank 12) and Sarada(C.I.V. -.09 and rank 13) respectively with having a range from +0.1 to +0.66. These tehsil have moderate level educational amenities in all indicators and average conditions of institutions in all categories.

Low Level :- The low level consist of 8 tehsils of the area in the educational scenario Salumber(C.I.V. -.18 and rank 14), Arnod(C.I.V. -.19 and rank 15), Pratapgarh(C.I.V. -.23 and rank 16), Peepalkhoont(C.I.V. -.25 and rank 17), Dhariawad(C.I.V. -.38 and rank 18), Chhoti Sadri(C.I.V. -.55 and rank 19), Abu-road(C.I.V. -.65 and rank 20) and Girwa(C.I.V. -.70 and rank 21) respectively having a range from -0.7 to +0.1. These tehsils have low level amenities in all indicators.

Very Low Level: -The very low level

Table No.1: The levels of development of Educational Amenities inTSP Area

S.N.	Category	CDI Value	Tehsils	Number of tehsils
1.	High Level	>+1.3	Gogunda	1
2.	Moderate High Level	+.66 to +1.3	Garhi	1
3.	Moderate Level	+.1 to +.66	Sagwara, Lasadia, Bagidora, Banswara,Simalwara, Dungarpur, Ghatol, Kushalgarh, Aspur, Kherwara and Sarada	11
4.	Low Level	-.7 to +.1	Salumber, Arnod, Pratapgarh, Peepalkhoont, Dhariawad, Chhoti Sadri, Abu-road and Girwa	8
5.	Very Low Level	<-.7	Rishabhdeo, Jhadol(PH) and Kotra	3

Source: Calculate By the Authors

Table No. 2: Development Indicators of educational amenities in TSP area

Tehsils Name	Number of Centres per 20000 Persons				Number of Centres per 100 Sq. KMs			
	P_Sch	UP_Sch	S_Sch	S.S_Sch	P_Sch	UP_Sch	S_Sch	S.S_Sch
Aburoad	14.97	6.42	1.52	3.48	19.12	8.19	1.93	4.44
Arnod	16.13	11.06	1.70	5.25	27.80	11.98	1.84	5.68
Chhoti Sadri	12.74	8.95	1.64	4.62	19.84	8.32	1.53	4.30
Dhariyawad	18.63	9.37	2.00	4.00	22.65	9.64	2.06	4.12
Peepalkhoont	21.57	13.50	1.69	4.28	28.94	12.44	1.55	3.95
Pratapgarh	24.15	9.24	2.25	4.82	20.56	8.72	2.12	4.55
Aspur	22.46	9.63	1.78	4.82	35.48	15.21	2.82	7.60
Dungarpur	52.41	10.09	1.61	3.31	44.59	18.96	3.03	6.22
Sagwara	36.81	10.26	2.10	4.37	47.05	20.05	4.10	8.54
Simalwara	38.77	11.42	1.47	3.81	50.38	21.54	2.78	7.18
Bagidora	36.10	9.31	1.87	4.28	46.93	20.16	4.06	9.27
Banswara	45.63	9.51	1.40	4.19	45.12	19.21	2.82	8.46
Garhi	27.63	8.77	2.81	5.02	42.56	17.98	5.77	10.30
Ghatol	34.76	11.56	1.25	4.11	50.58	21.53	2.33	7.65
Kushalgarh	42.69	10.71	1.37	3.59	46.75	19.81	2.54	6.64
Girwa	17.02	8.16	1.71	2.92	19.11	8.10	1.70	2.90
Gogunda	9.54	32.41	4.32	1.44	105.48	44.36	5.91	1.97
Jhadol(PH)	15.51	5.86	1.28	4.17	12.17	5.11	1.12	3.64
Kherwara	23.26	10.83	1.26	4.26	40.94	17.57	2.04	6.90
Kotra	20.50	8.42	0.26	2.86	13.24	5.58	0.17	1.90
Lasadiya	9.63	10.08	3.29	11.40	19.72	8.40	2.74	9.49
Rishabhdeo	13.90	7.63	1.04	3.12	23.27	9.84	1.34	4.03
Salumber	25.76	9.99	1.69	4.11	29.41	12.62	2.14	5.19
Sarada	23.89	9.95	2.16	4.07	28.93	12.41	2.70	5.07
Min	9.54	5.86	0.26	1.44	12.17	5.11	0.17	1.90
Max	52.41	32.41	4.32	11.40	105.48	44.36	5.91	10.30
Mean	25.19	10.55	1.81	4.26	35.02	14.91	2.55	5.83
STDEV	11.81	4.94	0.79	1.73	19.54	8.24	1.33	2.38

Table No. 3: Composite development index of educational amenities in TSP area

Tehsils Name	Number of Centres per 20000 Persons				Number of Centres per 100 Sq. KMs				Gross Value	C.I. Values	Rank
	P.Sch	UP.Sch	S.Sch	S.S.Sch	P.Sch	UP.Sch	S.Sch	S.S.Sch			
Aburoad	-0.86	-0.84	-0.37	-0.46	-0.81	-0.81	-0.46	-0.59	-5.21	-0.65	20
Arnod	-0.77	0.10	-0.14	0.57	-0.37	-0.36	-0.53	-0.06	-1.55	-0.19	15
Chhoti sadri	-1.05	-0.32	-0.22	0.21	-0.78	-0.80	-0.77	-0.64	-4.37	-0.55	19
Dhariyawad	-0.56	-0.24	0.24	-0.15	-0.63	-0.64	-0.37	-0.72	-3.07	-0.38	18
Peepalkhoont	-0.31	0.60	-0.16	0.01	-0.31	-0.30	-0.75	-0.79	-2.00	-0.25	17
Pratapgarh	-0.09	-0.26	0.55	0.32	-0.74	-0.75	-0.32	-0.54	-1.82	-0.23	16
Aspur	-0.23	-0.19	-0.04	0.32	0.02	0.04	0.20	0.74	0.87	0.11	11
Dungarpur	2.30	-0.09	-0.25	-0.55	0.49	0.49	0.37	0.16	2.92	0.37	8
Sagwara	0.98	-0.06	0.36	0.06	0.62	0.62	1.17	1.14	4.90	0.61	3
Simalwara	1.15	0.18	-0.43	-0.26	0.79	0.80	0.17	0.57	2.97	0.37	7
Bagidora	0.92	-0.25	0.08	0.01	0.61	0.64	1.14	1.44	4.59	0.57	5
Banswara	1.73	-0.21	-0.52	-0.04	0.52	0.52	0.20	1.10	3.30	0.41	6
Garhi	0.21	-0.36	1.26	0.44	0.39	0.37	2.42	1.88	6.60	0.83	2
Ghatol	0.81	0.21	-0.70	-0.09	0.80	0.80	-0.16	0.76	2.43	0.30	9
Kushalgarh	1.48	0.03	-0.56	-0.39	0.60	0.60	-0.01	0.34	2.09	0.26	10
Girwa	-0.69	-0.48	-0.12	-0.78	-0.81	-0.83	-0.64	-1.23	-5.58	-0.70	21
Gogunda	-1.32	4.43	3.16	-1.63	3.61	3.57	2.54	-1.62	12.72	1.59	1
Jhadol(PH)	-0.82	-0.95	-0.67	-0.05	-1.17	-1.19	-1.08	-0.92	-6.85	-0.86	23
Kherwara	-0.16	0.06	-0.70	0.00	0.30	0.32	-0.38	0.45	-0.12	-0.01	12
Kotra	-0.40	-0.43	-1.95	-0.81	-1.12	-1.13	-1.79	-1.65	-9.28	-1.16	24
Lasadiya	-1.32	-0.09	1.86	4.13	-0.78	-0.79	0.14	1.54	4.69	0.59	4
Rishabhdeo	-0.96	-0.59	-0.97	-0.66	-0.60	-0.61	-0.91	-0.76	-6.06	-0.76	22
Salumber	0.05	-0.11	-0.15	-0.09	-0.29	-0.28	-0.31	-0.27	-1.45	-0.18	14
Sarada	-0.11	-0.12	0.44	-0.11	-0.31	-0.30	0.11	-0.32	-0.73	-0.09	13

Source: Department of Education and Calculate By the Authors

P.Sch: Primary School, U.P.S.: Upper Primary School, S. Sch: Secondary School, S.S. Sch: Senior Secondary School, C.I. Value: Composite Index Value,

educational amenities are found in 3 tehsils namely Rishabhdeo (C.I.V. -.76 and rank 22), Jhadol (PH) (C.I.V. -.86 and rank 23) and Kotra (C.I.V. -1.16 and rank 24) respectively having a range <-0.7. This is due to the reason that all these tehsils have poor condition of institutions in all categories.

Conclusion and Suggestions

The broad conclusions emerging from the study are as follow: wide disparities in the level of development have been observed between different states of the southern region. Tribal Sub Plan area does not have good condition for educational amenities. In educational development the Gogunda tehsil is found to be better developing at very high level where as Rishabhdeo, Jhadol (PH) and Kotra tehsils have very low level development. It may be concluded that the TSP region has very high regional disparities and backwardness in the levels of educational amenities. Government should not only focus on very low and low level amenities but also focus on equivalent development of all these tehsils. Therefore all tehsils with High level and moderate high levelin the TSP area should be given first priority so that they may

come to the level of low disparities area and the concepts of planning with sustainable development may be fulfilled. Therefore the tehsil with low levels of development should be given top priority so that they may come to the level of developed area. The concept of planning with social justice sustainable development may be fulfilled.

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Infrastructure Development in Baragaon Block, Varanasi District, Uttar Pradesh

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Abstract

In the present paper an attempt has been made to study status of infrastructure development in Baragaon Block of Varanasi District in Uttar Pradesh. Infrastructure is generally defined as the physical framework of facilities through which goods and services are provided to the public. There is a close relationship between infrastructure and economic development. Infrastructure is a precondition for economic growth and development. It may not be the 'engine of growth', but certainly are its 'wheels'. The present study is based on both primary and secondary data. For the assessment of overall level of development of infrastructure in the study area Initially Z-score has been calculated for each Nyay-Panchayat by taking into consideration different variables of infrastructure. Thereafter individual indices have been prepared for five categories of infrastructure i.e. road infrastructure, health, banking and finance, education and other infrastructure and a composite index is derived by adding all these individual indices to assess the status of infrastructure resource development for each Nyay-panchayat. the composite index of overall development of infrastructure in the study area shows that Biraon Nyay-Panchayat has the highest level of development whereas Bachaura is least developed.

Keywords: *Development, Education, Infrastructure, Nyay-Panchayat.*

Introduction

Infrastructure is generally defined as the physical framework of facilities through which goods and services are provided to the public. It means something which lies below or comes before (infra) the 'structure'. It is opposite to superstructure which is built over and above the structure (Majumdar, 2003). Thus while superstructure is the end product, infrastructure is the base or foundation on which lies the superstructure. Thus, 'infrastructure' consists of all those activities and services whose contribution to the economy is not the income generated within the sector itself but the sustenance and support that they provide to the income generation in the rest of the economy.

There is a close relationship between infrastructure and economic development. Infrastructure is a precondition for economic growth and development. It may not be the 'engine of growth', but certainly are its 'wheels'. The present as well as future of a nation's economy depends upon both qualitative and quantitative availability of infrastructural facilities (Ghosh et.al. 1998). Failure in providing such facilities largely reduces productivity of economic activities

and lowers general living conditions. As a result, the process of Capital formation - both physical & human - suffers a setback, leading to shortages in the future. In fact, such discrepancies in providing necessary infrastructure hinders the building of the 'structure' itself and holds back the economy national or regional and prevents its take-off into self-sustained growth. It contributes to economic development by increasing productivity and by providing amenities that enhance the quality of life. Its linkages to the economy are multiple and complex. It affects each of the economic activities such as production, consumption, distribution, trade, etc directly or indirectly. The availability of adequate infrastructure facilities is imperative for the overall economic development of a country(Sahoo, P. 2009). Its adequacy helps determine success in diversifying production, expanding trade, coping with population growth, reducing poverty and improving environmental conditions.

Rural infrastructure is an essential ingredient of the overall infrastructure development in India. It is not only a key component of rural development but also an important ingredient in ensuring any sustainable poverty reduction programme. It helps in the improvement of the quality of life of rural population by promoting better productivity, increased agricultural incomes, adequate employment, etc. Consequently it has received high priority in developmental planning of the country. A number of programmes have been launched by both the Central and State Governments in different Five Year Plans and a substantial fund is allocated for the expansion and development of its various sub-components. One such programme is the Bharat Nirman, initiated in 2005 it is a time-bound business plan for action in rural infrastructure. Under Bharat Nirman, action is proposed in the areas of rural roads, irrigation, rural housing, rural water supply, rural electrification and rural telecommunication connectivity.

Despite substantial progress made in developing rural infrastructure in the country, the achievements are far from satisfactory. Even now 89 percent population has no access to telephone connectivity, 52 percent do not have access to power and 91 percent do not have proper toilet facilities. Against this background this paper assesses the level of infrastructure development in Baragaon Block. It analyses Nyay-Panchayat wise the status of transport and communication, educational institution, financial infrastructure, health and other infrastructural amenities in the study area.

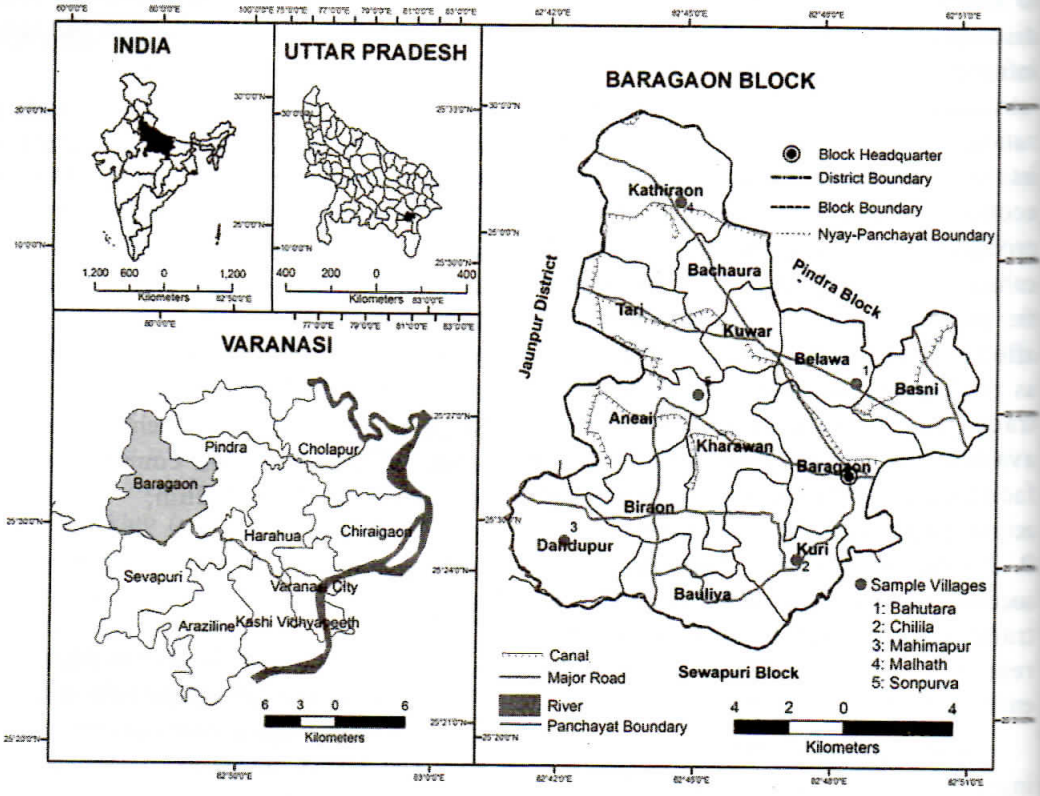
Objectives

The main objective of the present paper is to study the distribution of various infrastructural facilities in the study area at nyay-panchayat level and assess the status of various nyay panchayats in terms of level of development of these facilities.

Study Area

Baragaon Block is situated in western and north-western part of Varanasi district. The geographical limit of the study area is 25023' N to 25034'47" and 82039'50" E to 82050'15"E. The total geographical area of the Baragaon block is 174.33 km^2. It is bordered by river Basushi in the south-west and river Varuna in south. It touches the administrative boundary of Jaunpur district in west and north, S.R.N. Bhadohi in south-west, Sewapuri block in south, Harahua in east and Pindra block in north-east.(Fig-1). It being a part of Indo-Gangetic Plains is

topographically, characterized by flat surface with very little regional variation mostly ranging from 60 to 82 m and very little area below 60m above mean sea level.



Materials and Methods

The present study is based on both primary and secondary data. The secondary data has been obtained from District Census Hand Book 2011, District Statistical Abstract published by Economics and Statistical division, Government of Uttar Pradesh for various years and several government reports. Remotely sensed data obtained from google earth has been used for the calculation of the road length after digitization of the block map and roads for the 13 Nyaya Panchayats in Arc GIS 10.2 .Various statistical measures viz. road density and per capita availability in terms kms per thousand of population have been calculated to assess the availability of roads in the study area. For the assessment of overall level of development of infrastructure in the study area Initially Z-score has been calculated for each Nyay-Panchayat by taking into consideration different variables of infrastructure (Table-1) by using the formula

$$Z = \frac{X - \mu}{\sigma}$$

Thereafter individual indices have been prepared for five categories of infrastructure i.e. road infrastructure, health, banking and finance, education and other infrastructure and a composite index is derived by adding all these individual indices to assess the status of infrastructure resource development for each Nyay-panchayat. Based on the composite score derived the various nyay panchayats have been categorized as Very High, High, moderate low and very low level of development.

Table No.1: Variables for Assessing overall Infrastructure Development in Baragaon Block

Number of PHCs	Number of sub-centre	No. of maternal care Center	No. of veterinary Hospital
No. of Ayurvedic Hospital	No. of Junior Basic School	No. of Senior Baic School-male	No. of Senior Baic School-female
No. of higher Secondary School male	No. of higher Secondary School female	No. of nationalized Bank	No. of post offices
No. of Rural Cooperative Bank	No of Cold Storage	No. of Aggriculatural Repairing Centre	No. of Bus Stops
Density of Material Road		Density of un-metalled Road	

Results and Discussion

Overview of Infrastructure Roads

Several roads are found within the block. These can be broadly categorized into major roads and minor roads based on functional importance. The major roads include the National and State Highways whereas the minor roads include the subsidiary roads that connect the various habitations with the major roads. Table-2 shows panchayat wise distribution of roads in Baragaon block. The total road length of the block is 604.27kms. The total road length of all metalled roads is 126.3kms which is 20.90 percent of the total road length. Unmetalled roads including cart track and roads other than cart track extend for 351 kms which is 58 percent of the total road network. Within it 27 percent is accounted for by cart track and rest 31percent by unmetalled roads other than cart track. Nyay-Panchayat wise Kathiraon has maximum road length of 72kms which is 11.98 percent of the total road length whereas Bachaura Nyay-Panchayat has minimum road length accounting for only 4.09 percent of the total road length of the block. Within each Nyay-Panchayat significant variation is observed in the different category of roads. Baragaon Nyay-Panchayat accounts for maximum proportion of metalled road length accounting for 12 percent of the total metalled road length in the block. As a proportion to its own total road length it is 23.88 percent. On the other hand Bachaura Nyay-Panchayat has minimum proportion of the metalled roads as proportion of total metalled roads in the block accounting for only 4.61 percent. In case of unmetalled roads again Kathiraon Nyay-Panchayat

accounts for maximum proportion of road length having 13,56 percent of the total unmetalled road in the block. As a proportion of the total of individual road length of each Nyay-Panchayat Aneai Nyay-Panchayat with 80 percent of its total road length as unmetalled has the highest proportion of unmetalled road in the block.

An important measure to analyse the availability of roads is by measuring road density in terms of road length per 100 km^2. From table-2 it can be observed that the metalled road density in the study area is

Table No. 2: Nyay Panchayat wise Status of Road network in Baragaon Block, 2014

Nyay-Pachayat	Length in Kms.					Density (Kms/100 Km2)	
	Metalled Road		Unmatalled Road		Total	Metalled Road	Unmattaled Roads
Aneai	6.29	(18.20)	28.27	(81.80)	40.85	43.26	194.43
	#4.98		#8.04		#5.72		
Bachaura	5.82	(23.68)	12.94	(52.64)	24.58	68.23	151.70
	#4.61		#3.68		#4.07		
Baragaon	15.93	(23.88)	34.85	(52.24)	66.71	81.28	177.81
	#12.61		#9.91		#11.04		
Basani	13.82	(23.03)	32.36	(53.93)	60	95.51	2223.64
	#10.94		#9.20		#9.93		
Bauliya	8.77	(22.46)	21.5	(55.07)	39.04	69.33	169.96
	#6.94		#6.11		#6.46		
Belawa	6.29	(18.89)	20.72	(62.22)	33.3	65.79	216.74
	#4.98		#5.89		#5.51		
Biraon	13.28	(23.88)	29.04	(52.23)	55.6	118.47	259.05
	#10.51		#8.26		#9.20		
Dandupur	6.64	(17.08)	25.6	(65.84)	38.88	44.24	170.55
	#5.26		#7.28		#6.43		
Kathiraon	12.37	(17.08)	47.78	(65.84)	72.42	55.10	212.38
	#9.79		#13.56		#11.98		
Kharawan	7.91	(15.62)	34.83	(68.77)	50.65	56.30	247.90
	#6.26		#9.90		#8.38		
Kuri	11.77	(22.69)	28.33	(54.62)	51.87	87.57	210.79
	#9.32		#8.06		#8.58		
Kuwar	8.80	(29.74)	11.99	(40.52)	29.59	129.22	176.06
	#6.97		#3.41		#4.90		
Tari	8.60	(21.08)	23.59	(57.83)	40.79	63.24	173.46
	#6.81		#6.71		#6.75		
Block	**126.3**	**(20.90)**	**351.67**	**(58.20)**	**604.2**	**71.79**	**199.90**
	100		**100**		**100**		

Source: Derived from Google Earth Image, 2014.

Note: Values within bracket are percent of row total; # values as percent of individual column total

around 71 km/100km^2 and un-metalled road density is 199 km/100km^2. Highest metalled road density is found in Kuwar Nyay-Panchayat followed by Biraon, Basani, Baragaon,, Kuri, Bauliya and Biraon; while lowest in Aneai followed by Dandupur, Kathiraon, Kharawan etc. and Belawa, Bachaura, Bauliya and Tari are in moderate category of metalled road density (Table-2). In case of un-metalled roads, highest density is found in the western and central part of the block comprising Kharawan and Biraon Nyay-Panchayats. Belawa, Aneai, and Kuri have moderate density whereas Bachaura has lowest density followed by Bauliya, Dandupur, Tari etc.

Health Facilities

Enjoying good health, remaining free from disease and having access to health care are basic human rights. Good health is important for overcoming poverty and achieving the wider goal of socio-economic development and improving the quality of life of people. Table-3 & figure-2 shows the status of health infrastructure in the study area. From the table it can be observed that between 1995 and 2011 the number of PHCs has remained stagnant at 5. The number of beds in PHC's were 63 in 1995 and 2001 which decreased to 59 in 2011; the number of doctors increased from 14 to 16 between 1995 and 2001 but decreased to 11 in 2011. Similarly the number of paramedical staff decreased from 79 to 53 and 51 in 1995, 2001 and 2011 respectively; along with this other staff decreased from 20 in 1995 to 14 in 2011. If we compare the availability of PHC in the study area with the existing norms of the Government of India in terms of population covered by each PHC it is slightly higher. The total population of the block is 232759 and the number of PHC's are 5 thus the population covered by each PHC is 46551 as against the norm of 30000 in plain areas. Similarly the number of doctors available is one doctor for 21160 persons Further the spatial distribution of PHC is very uneven. Of the 5 PHC's three are located in the Western part of the block, one in the east and one in the south. The northern part and central part of the block do not have any PHC. Likewise the sub centres are also concentrated in the northern part of the block (Figure-2). Besides PHC there were 2 Ayurvedic hospitals with 4 beds and 1 doctor located in Kathiraon and Aneai Nyay-Panchayats, 36 family and maternal care sub-centres and two veterinary hospitals in Baragaon and Biraon Nyay-Panchayats in 2011. (Table -3).

Education

Education is the cornerstone of any developmental process. It holds key to growth and socio-economic development of any region. The basic educational infrastructure available in the study area is primary, secondary, and higher secondary schools and degree college (Table-4 & Figure-2). There were 76 junior basic schools in 1995 which subsequently increased to 91 in 2001 and 151 in 2011 which is almost double the number in 1995; the number of senior basic schools was 25 in 1995 which increased by three times to 71 in 2011, while higher secondary schools increased from 9 in 1995 to 30 in 2011. There is only one degree college located in Baragaon Nyay-Panchayat.

Other Infrastructure Facilities

Other infrastructure facilities include banking and finance, facility of cold storage, agricultural equipment repairing centres, bus stop etc. Table-4 & Figure-2 shows the status

Table No. 3: Health Infrastructure in Baragaon Block

S.No.	Type of Facility (in Nos.)	1995	2001	2011
1	Primary Health Center (PHC)	5	5	5
2	Beds in PHC	63	63	59
3	Doctors	14	16	11
4	Paramedical staff	79	53	51
5	Other staff in PHC	20	15	14
6	Ayurvedic Hospitals	2	2	2
7	Beds in Ayurvedic Hospitals	4	4	4
8	Doctors	2	2	1
9	Family and maternal care centre	2	2	2
10	Family and maternal care sub-centre	27	27	36
11	Veterinary hospitals	2	2	2

Source: Uttar Pradesh District Statistical Handbook (online), Economic and Statistical Division, Govt. of Uttar Pradesh, Lucknow

Table No. 4: Education Infrastructure in Baragaon Block

S.No.	Type of Facility (in Nos)	1995	2001	2011
1.	Degree Colleges	1	1	1
2.	Higher Secondary Schools	9	16	30
3.	Higher Secondary School for Girls	3	3	4
4.	Senior Basic Schools	25	30	71
5.	Senior Basic School for Girls	3	3	4
6.	Junior Basic Schools	76	91	151

Source: Uttar Pradesh District Statistical Handbook (online), Economic and Statistical Division, Govt. of Uttar Pradesh, Lucknow

Table No. 4: Other Infrastructure Facilities in Baragaon Block

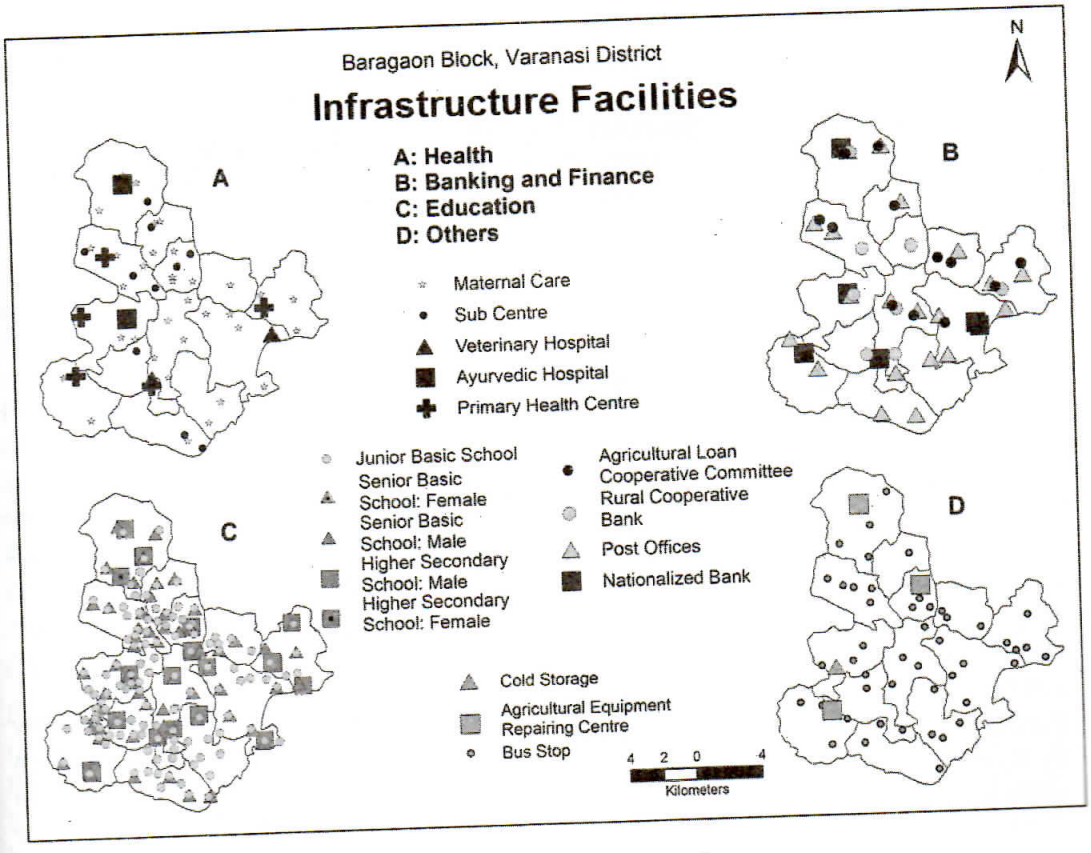
S.No.	Type of Facility (in Nos)	1995	2001	2011
1	Nationalized Banks	6	6	7
2	Rural Regional Banks	3	3	3
3	Other Banking Institutions	1	1	2
4	Post offices	20	20	20
5	PCOs	9	53	243
6	Bus Stop	50	50	50

Source: Uttar Pradesh District Statistical Handbook (online), Economic and Statistical Division, Govt. of Uttar Pradesh, Lucknow

of other infrastructure facilities in the study area. There were 6 nationalized banks in 1995 which increased to 7 in 2011. Thus in a period of 16 years only one more nationalized bank got added in the block which is abysmally low.

Moreover it has a very skewed spatial distribution with three out of seven located in Baragaon alone and one each in Dandupur, Aneai, Biraon and Kathiraon Nyay-Panchayats. Similarly there are only three Regional Rural Banks since 1995(Table-4) in the block. In terms of population served there is one commercial bank for a population of 11651 as per 2014-15 figures in the block. At micro level the financial requirements of the people are met by agricultural loan committees of the villages; it is available in 8 Nyay-Panchayat out of 13 Nyay-Panchayats

Among other infrastructural facilities available in the block are 20 Post offices, 243 PCO's, 50 bus stops, 3 agricultural repairing centres, and 1 cold storage. Out of 13 Nyay-Panchayats 12 Nyay-Panchayats have post office, only one Nyay-Panchayats viz. Kuwar do not have post office and people here depend upon near by post offices in other Nyay-Panchayats.(Table-4 & Figure-2). The three agricultural repairing centres are located in Kathiraon, Kuwar and Dandupur Nyay-Panchayats and the lone cold storage facility is available in Aneai Nyay-Panchayat.



Nyay Panchayat wise Status of Infrastructure Development

Table- 5 shows nyay panchayats wise overall status of development of infrastructure resource in the study area. Looking individually at different categories, in case of road infrastructure development, Biraon Nyay-Panchayat has the highest score followed by Basani and Kuwar; while Dandupur has the lowest score followed by Aneai, Bauliya, Bachaura, Baragaon and Belawa; rest other Nyay-Panchayat i.e. Kharawan and Kuri come under the moderately developed category (Figure-3E).

Table No. 5: Infrastructure Resource Development Index (Z score), Baragaon Block

	Infrastructure resource development (Z-score)					Composite Index
	Road Infrastructure	Health Infrastructure	Education	Banking and Finaace	Other	
Aneai	-2.24	0.20795	2.47606	-0.06430	-0.12670	0.25
Bachaura	-1.92	-0.28356	-0.97274	-1.10921	-1.77383	-6.06
Baragaon	-0.62	0.94521	0.66955	1.81653	0.69686	3.51
Basani	2.050	0.20795	-0.48005	0.56264	0.69686	3.04
Bauliya	-1.73	-0.52932	-0.31582	-0.90023	-0.95027	-4.43
Belawa	0.07	-1.51233	-1.30119	-0.69124	-0.95027	-4.38
Biraon	5.21	-0.40644	0.34109	-0.06430	-0.95027	4.13
Dandupur	-2.75	-1.14370	-0.64428	0.35366	1.52043	-2.66
Kathiraon	.16	0.699450	0.01263	1.39856	1.52043	3.79
Kharawan	0.54	-0.03781	0.50532	0.56264	-0.12670	1.44
Kuri	1.08	-1.14370	-0.97274	-0.90023	-0.12670	-2.06
Kuwar	2.19	0.94521	-0.15160	-1.52717	-0.12670	1.33
Tari	-2.03	2.05110	0.83377	0.56264	0.69686	2.11

Source: Computed by the Author

Similarly in case of health infrastructure development, Tari Nyay-Panchayat showed highest level of development followed by Baragaon, Kathiraon and Kuwar; while Belawa is least developed followed by Dandupur, Kuri, Biraon, Bauliya and Bachaura; rest other Nyay-Panchayats are moderately developed (Table-5 & Figure-3A). In case of banking and finance infrastructure, Baragaon Nyay-Panchayat has the highest score followed by Kathiraon, Basani, Kharawan and Tari while Kuwar has the lowest score followed by Bauliya, Kuri, Bachaura and Belawa(Table-5 & Figure-3B). In the same vane Aneai Nyay-Panchayat has scored highest in education infrastructure resource development while Belawa has the lowest score followed by Bachaura, Dandupur, Kuri, Kathiraon and Bauliya Nyay-Panchayats. While remaining four Nyay-Panchayats viz. Kharawan, Baragaon, Biraon and Tari are placed in the category of moderately developed education infrastructure (Table-5 & Figure-3C). In terms of other infrastructure resource

development which includes availability of facility i.e. cold storage, agricultural equipment repairing centres etc. Kathiraon and Dandupur Nyay-Panchayat have scored highest followed by Baragaon, Basani, and Tari; while Bachaura is least developed followed by Belawa, Biraon and Bauliya. Aneai, Kharawan, Kuri and Kuwar placed under the moderately development category of other infrastructure resource development (Table-5 &Figure-3D).

Table No. 6 Status of Nyay-Panchayats in Infrastructure Development in Baragaon Block

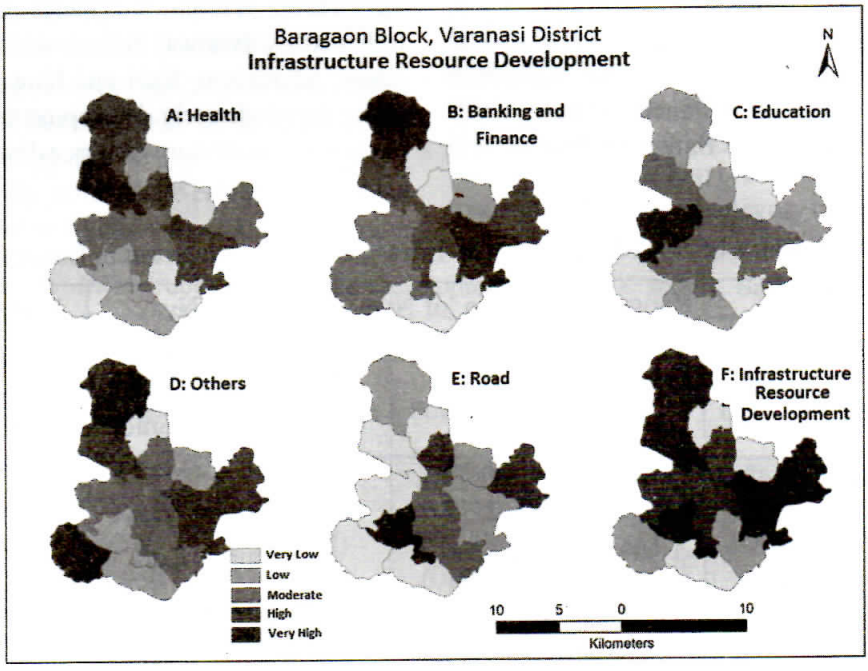
S.No.	Level of development	Range (z-score)	No. of Nyay-Panchayats	Name of Nyay-Panchayat	Remarks
1	Very High	>2.08	4	Baragaon, Basani, Biraon, Kathiraon,	Highest: Biraon
2	High	0.05 to 2.09	2	Aneai, Kuwar	
3	Moderate	2.09 to 0.05	2	Kharawan, Tari	
4	Low	-1.98 to 0.05	2	Dandupur, Kuri	
5	Very low	<-4.02	3	Belawa, Bauliya, Bachaura,	Lowest: Bachaura

Source: Computed by the author

Table-6 & Figure-3F show the status of nyay panchayats in overall development of infrastructure in the study area, Biraon Nyay-Panchayat has the highest level of development followed by Baragaon, Basani, and Kathiraon; while Bachaura has very low level of development followed by Belawa, and Bauliya. Aneai, and Kuwar Nyay-Panchayat fall in the category of high level of development; while Dandupur and Kuri comes under category of low level of infrastructure resource development. Remaining Nyay-Panchayats viz.. Tari and Kharawan come under the category of moderately developed infrastructure.

Conclusion:

Present paper aimed at assessing the basic infrastructure amenities available in Baragaon Block at Nyay-Panchayat level. It included transport and communication, health, education, financial and other infrastructural resources. Basic means of transport and communication is roads which include metalled roads, un-metalled roads and minor roads including cart track etc. Maximum road development is found in the eastern part of the study area in and around block headquarter where the overall road density is found to be highest while it is lowest in western region. Similarly in case of health infrastructure again eastern region i.e. around block headquarters has the maximum development. Whereas in southern region it is least developed particularly in Bauliya Nyay-Panchayat it is least developed. However in terms of educational infrastructure central region of study area including Aneai and Baragaon Nyay-Panchayats have the maximum development whereas it is relatively lower in northern and southern region. Overall the eastern region comprising Baragaon and Basani Nyay-



Panchayats has the highest level of infrastructural development while the central part is moderately developed and western and southern part have least developed infrastructure resource.

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Literacy Trends And Its Urban-Rural Differentials In Rajasthan

Rajender Kumar

Abstract

Literacy is an important indicator for gauging the socio-economic changes as well as the pace of development in both urban and rural areas. This study therefore, is focused on urban-rural differential in literacy in population of the state of Rajasthan. The study is based on the Census of India data for 2001 and 2011. Urban rural disparity ratio in literacy of the state decreased from 3.4 in 1961 to 1.3 in 2011. The study concludes that the number of high differential districts decreased from 19 in 2001 to 14 in 2011 but medium differential districts increased from 9 in 2001 to 13 in 2011. On the other side, the number of districts of low differential was marginally improved 5 to 6 in the same period. Urban-rural differential in literacy is originates from uneven development and prevailing socio-economic milieu in the state. Western and southern districts of Rajasthan show more differential than north-eastern interstate border districts. 'Historical-structural' perspective can be employed to understand the contemporary urban-rural differential in literacy of Rajasthan population. It is suggested that greater efforts should be made to improve rural literacy through institutional structures.

Keywords: Urban-rural differentials, Disparity Ratio, Differential Index, Literacy, Socio-economic milieu.

Introduction

Literacy is considered as an index of the pace at which the socio-economic transformation is taking place in a society. A wide diffusion and spread of literacy is indispensable to the process of development both in social and economic terms. Though literacy by itself does not generate socio-economic progress, but the lack of it can certainly be an impediment in the development process (Gosal, 2002). Literacy not only helps in eradicating poverty and mental isolation but also improves international relations in peaceful and friendly way (Chandna, 2014). It is a key input for social change and development (Joshi, 2000). It keeps people well informed of various issues of socio-economic importance and spread the range of human activities. Literacy creates awareness about one's rights and helps in achieving quality of life (Kaur, 2013). Therefore, literacy is requisite for overall development of a nation and society.

Literacy is an important factor in demographic and socio-economic transformation. Developing countries are passing the midst of the literacy transition. Since most of these countries are primarily agricultural economy, as result the progress of literacy in these nations has been slow

(Chandna 2014).

In India, a number of geographical studies of literacy have been made since independence. But most of the studies have been conducted on patterns and trends in literacy at national and regional level. The studies that aim at differential in literacy by residence, age and sex are not sufficient. At national Krishan and Shyam (1978), Sopher (1980), Sangwan and Sangwan (2008) have studied urban-rural differentials in literacy at district level for whole nation. On the other side, at regional level in Rajasthan Kaur (2011), Joshi (2000), Kumar and Sharma (2013) have studies literacy disparity, changing level of literacy, and spatial pattern in literacy respectively. Kothari, (1990) have studied female literacy in the state. Rajasthan is the largest state of India and there exist socio-cultural and natural diversity. The Aravalli range divides the state into the northwest Thar Desert and northeastern plain region. The western Thar Desert is devoid of socio-economic development and backward region of the state. The northeastern region has fertile basins of the Banas, the Mahi and the Chambal Rivers and it is developed, densely populated region of Rajasthan. This diversity of natural and cultural elements necessitates the study of urban-rural differential in literacy of Rajasthan.

Objectives of the study

Major objectives of the present study are:

- To describe the spatial patterns of urban-rural differentials in literacy
- To analyze the literacy differentials by urban-rural residence.

Data base and Methodology

The present study is based on secondary data. Literacy rate is taken from version census reports published by Office of the Registrar General and Census Commissioner of India.

The Literacy differentials either by sex or by residence have been calculated by simply subtracting the female literacy rate from the male literacy rate and the rural literacy rate from urban literacy rate respectively. This is called absolute differential. However, the relative differential, also known as disparity ratio, has been calculated by working out the ratio between the two literacy rates, i.e.,

Urban literacy: Rural literacy = 79.7:61.4 = 1.29 : 1

Though, these are two different views of disparity from different angles, but both suffer from a common vagary of grouping dissimilar areas into the same type. An area with an urban literacy rate of 75 per cent and a rural literacy rate of 65 per cent would have the same absolute differential as an area with 45 per cent of urban literacy and 35 percent of rural literacy rates.

Hence, a more sophisticated technique is required to measure the differential. Therefore, differentiate indices for literacy rate were computed on the basis of Sopher's disparity Index

$$D_I = \log (x_2/x_1) + \log (200-x_1) / (200-x_2)$$

Where $x_2 > x_1$ and x_1 and x_2 are the literacy rates of alphas (rural or female) and non-alphas (urban or male) respectively.

Study area

Rajasthan, the largest state in the country in terms of geographical area, is located in the north-western part of the country. The study area lies between $23^0 3¢$ to $30^0 12¢$ north latitudes and $69^0 30¢$ to $78^0 17¢$ east longitudes.

It has a geographical area of 342239 square kilometers, which constitute 10.41 per cent area of the country. It shares international border with Pakistan in the west. Physiographically, the state can be divided into four major regions, namely the western Thar Desert: with barren hills, rocky and sandy plains, the Aravalli hills: running south-west to north-east, the eastern plains: with rich alluvial fertile soils and the south-eastern Haroti plateau. Mahi, Chambal and Banas are the three major rivers of the state. The state has varied climatic conditions ranging from arid to semi humid. It is administratively divided into seven divisions and thirty three districts. From demographic, climatic and socio-economic development point of view the state has a wide range of variation and diversity, and therefore, it is an ideal field to investigate and analyses urban-rural differential in literacy at district level.

Results and Discussions

Urban – Rural Differentials in Literacy

Literacy of Rajasthan is characterized with wide variation among the literacy rate of males and females, of rural and urban areas, and of various population subgroups. Literacy, like other innovations, originates in urban places and subsequently diffuses into the country side (Krishan and Shyam 1978). An Urban-rural differential in literacy rates of Rajasthan population evolves from the disparities in the type economy, social life and physiographic difference in terrain and topography. The type of economy of urban areas is education friendly. On contrary, the society and economy of the rural areas is less favorable and demanding of education and literacy (Chandna, 2014).

In 2011, while 79.7 per cent of urban population in Rajasthan was literate, the corresponding figure for rural population was 61.4 per cent, implying wide disparity of 18.3 per cent points in urban and rural literacy rate. This urban-rural differential was wide among female literacy rates (24.9 per cent points) than that of males (11.7 per cent points). The female literacy in rural areas of Rajasthan was 45.8 per cent, while in urban areas 70.7 per cent of the females were literate, but still in twenty first century more than half female population of the state is not able to read and write. By comparison the male literacy rates in rural and urban areas were 76.2 per cent and 87.9 per cent respectively.

Table No. 1: Literacy Rate and Differential Index by Urban-Rural Residence, 2011

State/District	Literacy Rate (Percentage)			Urban-Rural Differential Index
	Total	Urban	Rural	
Persons	66.1	79.7	61.4	0.1748
Males	79.2	87.9	76.2	0.1051
Females	52.1	70.7	45.8	0.2651

Source: Computed from Census of India (2011) Primary Census Abstract, Data Highlights Rajasthan Series 9,p 46, 48, 50 Directorate of Census operations Rajasthan

Table No. 2 : Literacy Rate, Differential Index and Disparity Ratio by Urban-Rural Residence, 1961-2011

Ceusus Year	Literacy (Percenage)			Urban-Rural Differential Index	Urban-Rural Dispartiy Disparity Ratio
	Total	Urban	Rural		
1961	18.1	44.5	12.9	0.6178	3.4494 :1
1971	24.6	55.1	18.0	0.5848	3.0611 :1
1981	30.7	59.7	22.8	0.5194	2.6184 :1
1991	35.0	65.3	30.4	0.4321	2.1480 :1
2001	60.4	76.2	55.3	0.2059	1.3779 :1
2011	66.1	79.7	61.4	0.1748	1.2980 :1

Source: Computed from Census of India (2011) Primary Census Abstract, Data Highlights Rajasthan Series 9, p 46, 48, 50 Directorate of Census operations Rajasthan

Trends in Urban-Rural Differentials in literacy, 1961 to 2011

After independence, literacy rate of the state has increased more than eight folds during the last sixty years from 8.5 per cent in 1951 to 66.1 per cent in 2011. The literacy rate for urban areas which was 44.5 per cent in 1961 rose to 59.7 per cent in 1981 and then further increased to 79.7 per cent in 2011. In rural areas, the literacy rate was only 12.9 per cent in 1961 increased to 22.8 per cent in 1981 and it reached 61.4 per cent in 2011 (Table 2)

Since 1961, the urban-rural differential index has been showing a steady decreasing trend. In 1961, it was wider (0.6178), as there was only one rural literate for nearly every four urban literates (1:3.44). This urban-rural disparity ratio declined from 3.44 in 1951 to 1.29 in 2001. The rural literacy rate of Rajasthan has gradually increased from 12.9 per cent in 1961 to 61.4 per cent in 2011. As a result of this phenomenon, the urban-rural differential index has narrowed down significantly from 0.6178 in 1961 to 0.1748 in 2011 (Table 2). The degree of urban influence and intensity of rural-urban interaction are evidently the two major factors involved in the reduction of disparities between urban-rural differentials in literacy rates. (Krishan and Shyam, p-11,1978)

Urban-Rural Differentials in Literacy

With increasing level of literacy rates in both the urban and rural areas, the urban-rural differential in literacy is narrowing down, but at varying pace among the districts of Rajasthan. To explain the absolute decline and trend in urban-rural differential in literacy during 2001-2011 among the districts, the state has been divided in three categories. (Fig. 2)

(i) **Districts of high Differentials (More than 20 per cent points)**

Out of 33 districts, 19 district recorded high urban-rural differential in literacy in 2001 (Fig.2). The highest different of 42.2 per cent points was recorded in Banswara district followed by Pratapgarh (38.4), Udaipur (32.5), Dungarpur (32.1), Chittaurgarh (31.5) and Bhilwara (30.4) in 2001. All these districts had very high, more than 30 per cent points, urban rural differential in literacy. Remaining 13 districts observed high urban rural differential in literacy of 20-30 per cents points range.

Table No. 3: Trends in Urban-Rural differentials in Literacy Rates (Persons) 2001-2011

Stat/District	Literacy Rate (Percentage), 2011			Literacy Rate (Percentage), 2011			Urban-Rural Differentials		Trends in Urban-Rural Differentials 2001-2011
	Total	Urban	Rural	Total	Urban	Rural	2011	2001	
Rajasthan	66.1	79.7	61.4	60.4	76.2	55.3	18.3	20.9	2.6
Ganganagar	69.6	78.7	66.2	64.7	77.0	60.5	12.5	16.5	4.0
Hanumangarh	67.1	75.4	65.1	63.1	73.0	60.5	10.3	12.5	2.2
Bikaner	65.1	78.0	58.1	57.4	75.3	47.4	19.9	27.9	8.0
Churu	66.8	72.6	64.4	67.6	72.1	65.7	8.2	6.4	-1.8
Jhunjhunun	74.1	76.6	73.4	73.0	74.2	72.7	3.2	1.5	-1.7
Alwar	70.7	83.4	67.9	61.7	81.4	58.2	15.5	23.2	7.7
Bharatpur	70.1	79.0	67.9	63.6	74.5	60.8	11.1	13.7	2.6
Dhaulpur	69.1	72.7	68.1	60.1	66.8	58.6	4.6	8.2	3.6
Karauli	66.2	72.8	65.0	63.4	69.2	62.4	7.8	6.8	-1.0
Sawami Madhopur	65.4	79.0	61.9	56.7	73.3	52.6	17.1	20.7	3.6
Dausa	68.2	80.7	66.3	61.8	76.0	60.1	14.4	15.9	1.5
Jaipur	75.5	82.5	67.6	69.9	77.5	62.1	14.9	15.4	0.5
Sikar	71.9	75.4	70.8	70.5	72.7	69.9	4.6	2.8	-1.8
Nagaur	62.8	70.6	60.9	57.3	68.1	55.0	9.7	13.1	3.4
Jodhpur	65.9	79.4	58.5	56.7	75.5	46.2	20.9	29.3	8.4
Jaisalmer	57.2	78.0	53.8	51.0	73.0	46.8	24.2	26.2	2.0
Barmer	56.5	78.2	54.8	59.0	75.8	57.6	23.4	18.2	-5.2
Jalor	54.9	71.1	53.3	46.5	66.2	44.8	17.8	21.4	3.6
Sirohi	55.3	78.7	49.0	53.9	77.6	48.5	29.7	29.1	-0.6
Pali	62.4	75.8	58.4	54.4	70.2	49.9	17.4	20.3	2.9
Ajmer	69.3	83.9	59.1	64.7	81.3	52.7	24.8	28.6	3.8
Tonk	61.6	73.8	58.0	52.0	68.5	47.5	15.8	21.0	5.2
Bundi	61.5	77.9	57.3	55.6	73.1	51.4	20.6	21.7	1.1
Bhilwara	61.4	80.7	56.0	50.7	74.7	44.3	24.7	30.4	5.7
Rajsamand	63.1	81.9	59.5	55.7	79.7	52.0	22.4	27.7	5.3
Dungarpur	59.5	84.4	57.6	48.6	78.1	46.0	26.8	32.1	5.3
Banswara	56.3	85.2	54.0	45.5	84.3	42.1	31.2	42.2	11.0
Chittaurgarh	61.7	82.7	56.8	54.0	79.8	48.3	25.9	31.5	5.6
Kota	76.6	81.7	68.6	73.5	79.6	66.3	13.1	13.3	0.2
Baran	66.7	78.0	63.6	59.5	73.5	56.6	14.4	16.9	2.5
Jhalawar	61.5	81.1	57.6	57.3	79.3	53.5	23.5	25.8	2.3
Udaipur	61.8	87.5	54.9	59.8	85.5	53.0	32.6	32.5	-0.1
Pratapgarh	56.0	84.8	53.2	48.2	83.0	44.6	31.6	38.4	6.8

Source: Computed from Census of India (2011) Primary Census Abstract, Data Highlights Rajasthan Series 9, p 46, Directorate of Census operation Rajasthan

In 2011, urban-rural deferential in literacy has narrow downed in comparison of 2001 and 14 districts remained in high differential category. These districts situated in two areas of the state. One area lies in the western Thar Desert region, comprising of Jaisalmer, Jodhpur and Barmer districts. Both, economy and agriculture in the western Thar Desert is depending on monsoon rain of july, august and september of the year. Consequently the life style and standard of desert people remains at subsistence level. Prevalence of pastoral nomadism in arid and semi-arid parts has also negated the diffusion of literacy and education. Severe climatic condition and shifting sandy dunes of the Thar Desert hinders the development and infrastructural activities and amenities. Further, less developed transport network system adds to low literacy rates in rural areas because roads increase accessibility to schools. Subsequently creates high differential in urban-rural literacy in the western Thar Desert districts. Similarly, tribal population dominant southern districts of Udaipur (32.6), Pratapgarh (31.6), Banswara (31.2) Dungarpur (26.8), and Chittaurgarh (25.9) have high urban rural differential in literacy. These districts have very high proportion of scheduled population in general and specially in its rural areas, Banswara (81.3 per cent), Dungarpur (74.4 per cent), Pratapgarh, (68.5 per cent) Udaipur (60.3 Per cent) as its rural population belong to tribal community.--- As result the rural literacy rates in these district are low (Table 3)

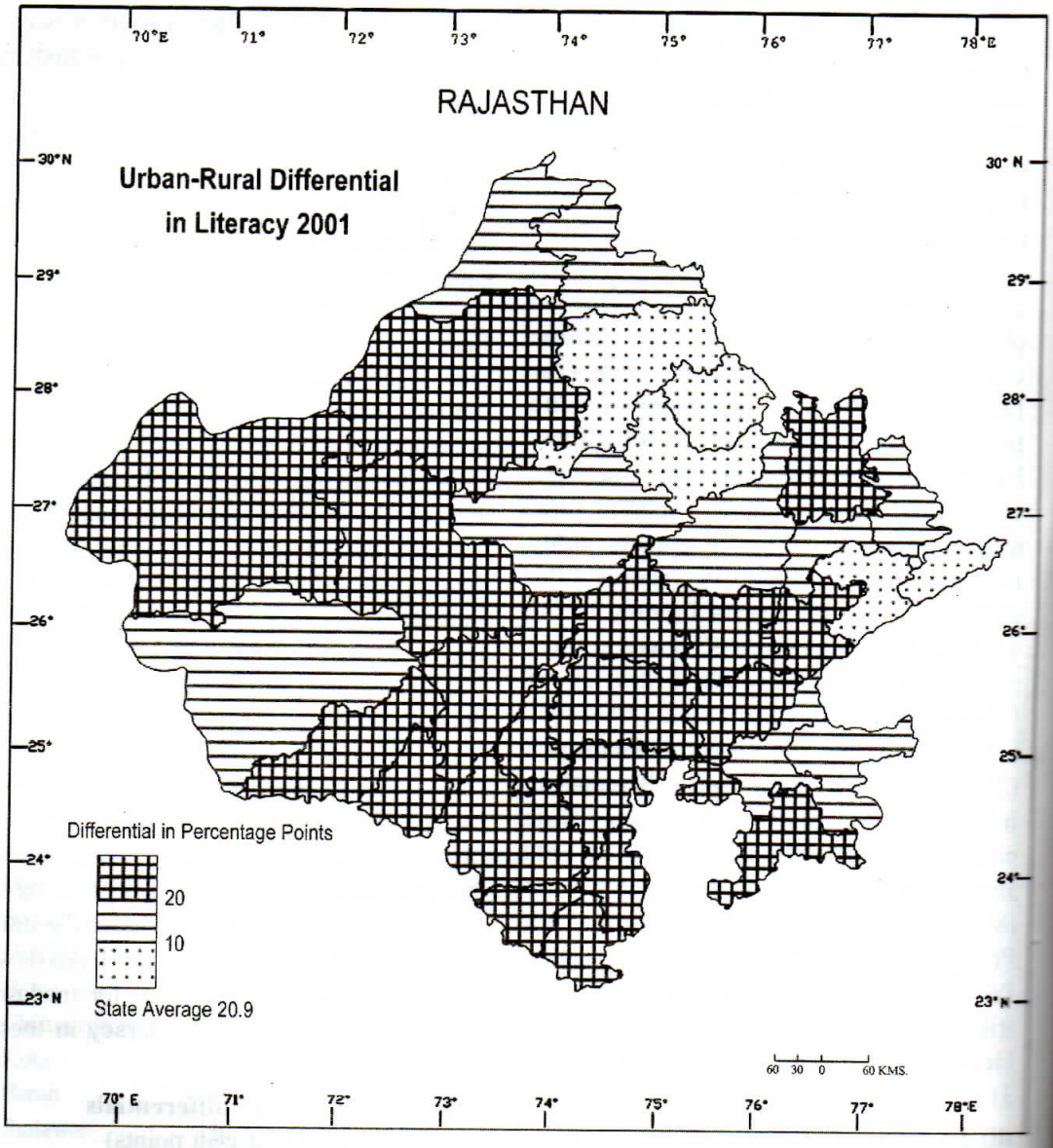
(ii) Districts of medium differentials
(Between 10-20 per cent points)

This category covered nine districts in 2001, but four districts namely Jalor, Pali, Bikaner and Tonk entered from high to medium urban rural differential category, therefore, the number further increased to 13 districts in 2011. Geographically, these districts lie in three regions of the state. Bikaner, Ganganagar, Hanumangarh in northern part, Sirohi, Pali in south western part and remaining eight districts in eastern plain region.

Eastern plain region is well developed area of the state. Accessibility and connectivity of eastern plain region is good. The districts of this region are near National Capital Region (NCR). Jaipur, Alwar, and Bharatpur districts are part of NCR region. Eastern plain region is industrially advanced area of the state. Proximity to NCR regions contributed to overall socio-economic upliftment of area, which gradually inspired to greater attention to rural education and literacy. On the other side, Hanumangarh and Ganganagar Districts shares border with developed state of Haryana and Punjab. Further irrigation facilities provided by Gang canal, Bhakhra canal and Indira Gandhi Nahar Priyojana in border area districts of the state mitigated the limits imposed by dry Thar Desert on reliable agriculture. Consequently the quality of life in these district are good in comparison to others districts of Rajasthan. Both Ganganagar (66.2%) and Hanumangarh (65.1%) have higher rural literacy rate than that of the state average of 61.4 per cent (Table 3). All these factors are mainly responsible for medium urban rural differential in literacy in these districts.

(iii) Districts of low differentials
(less than 10 per cent points)

Rajasthan is still in literacy transition state. It has very few districts where urban rural literacy has low differential. Only five


RAJASTHAN
Urban-Rural Differential
in Literacy 2001
70°E
71°
72°
73°
74°
75°
76°
77°
78°E
30°N
29°
28°
27°
26°
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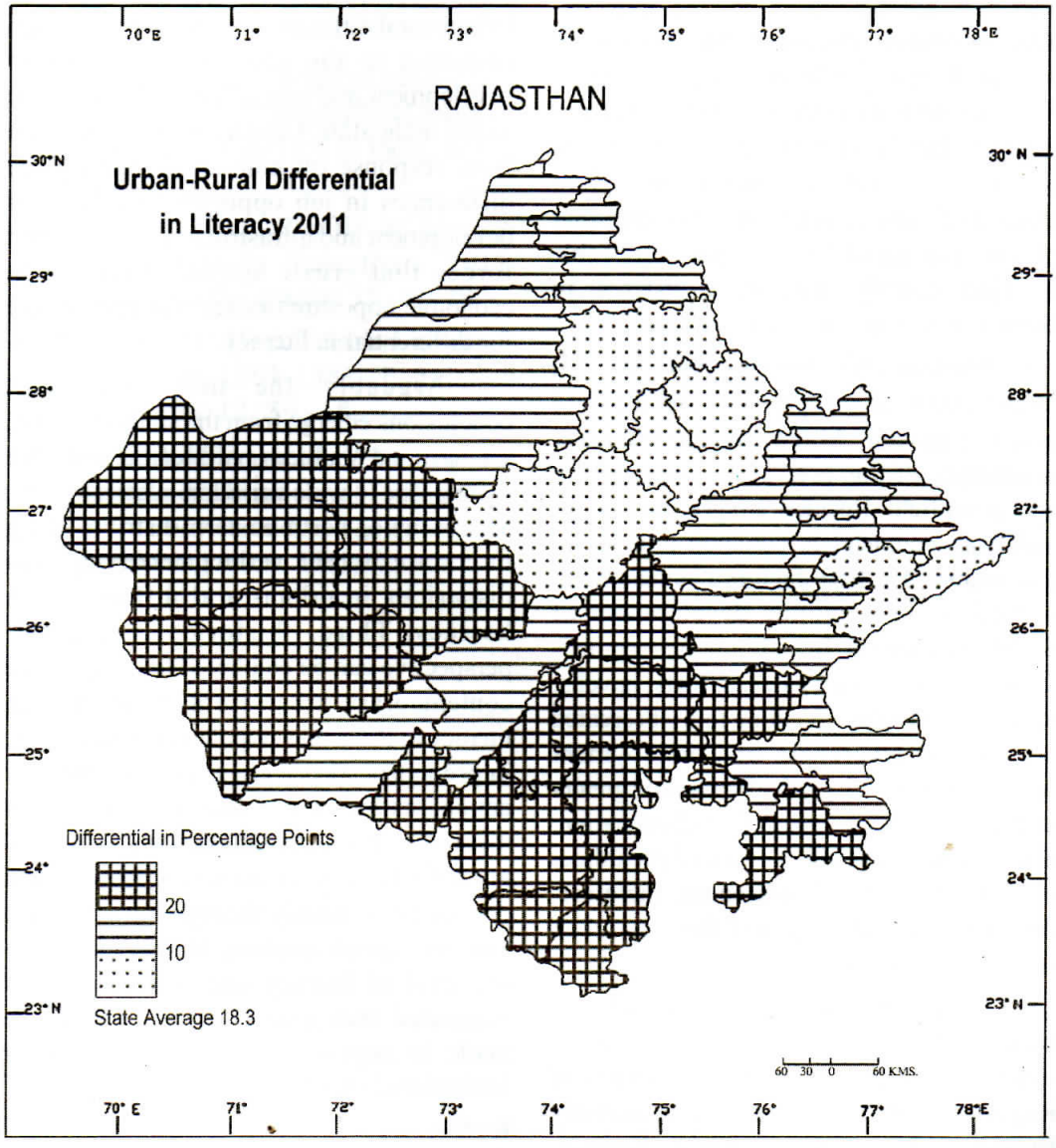
24°
23°N
Differential in Percentage Points
20
10
State Average 20.9
60 30 0 60 KMS.


RAJASTHAN
Urban-Rural Differential
in Literacy 2011
70°E
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25°
24°
23°N
Differential in Percentage Points
20
10
State Average 18.3
60 30 0 60 KMS.

districts were in this category in 2001 and with Nagaur district, the number reached to six in 2011. These districts are located in two region of the state. Shekhawati region comprising of Churu, Sikar, Jhunjhunun and Nagaur districts lie in central north eastern part and, second region of Dhaulpur and Karauli districts located in extreme eastern part of Rajasthan. In these districts rural literacy rate is more than 65 per cent and it is higher than 61.4 per cent rural literacy rate for the state. On the other hand, urban literacy of these districts is lower than that of state average of 79.7 per cent (Table 3). Consequently, urban-rural different in literacy is also of low level.

Shekhawati region has an old established tradition of military service since colonial period. Marwaris the business community of this area also contributed in education field. Besides, emigration to Gulf and Arab countries is common practice in this region. All these factors contributed to overall socio-economic development of Shekhawati region. In addition, this region is famous for its tourist palaces, forts, havelis, temples and frescos. Visiting tourists created both social awareness and employment opportunities which gradually inspired greater attention and importance of rural education. Subsequently, less effect of social prejudices provided more rural awareness, therefore, the more rural literacy, and the less urban rural differential in literacy.

During the last ten years (2001-11), trend of urban-rural differential in literacy has steadily been decreasing in the districts of Rajasthan. But seven districts namely Barmer, Udaipur, Sirohi, Sikar, Karauli, Jhunjhunun and Churu have shown sign of growing difference in its urban rural literacy rates. In these districts rural literacy was marginally lower in 2011, as against it were recorded in 2001 in respective districts (Table 3). It is alarming trend. It needs attention of our educationists, administration system and literacy mission.

Conclusion

Urban-rural differential in literacy is a human response to the geography of uneven development and prevailing socio economic milieu in the state. Consequently, it originates from response by individuals from place differences in job opportunities, level of development and infrastructure. Factors and forces that create spatial variation in economic opportunities are also responsible for differential in literacy.

Arguably the most important conclusions emerge from the study are, first, western and southern parts of the state are more prone to wide variation in literacy rate, and, second, north eastern districts along interstate border reflect relatively less disparities in urban-rural differential in literacy. Third, 'historical-structural' perspective can be employed to interpret the contemporary urban-rural differential in literacy of Rajasthan population. Historically, in pre independence era attitude of princely administrations and feudalisms were against mass education. After independence, national attempts to achieve economic growth and development, mainly through infrastructure and institutions creation, had an impact on the level of literacy and education. It is suggested that greater efforts should be made to improve rural literacy through institutional structures.

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Anthropogenic Influences on Water Bodies, Pullution and Their Management in Varanasi Urban Space, Uttar Pradesh

Muraree Lal Meena and Prem Sonwal

Abstract

India is one of the developing country having prosperous fresh water resources in the form of rivers streams, ponds and lakes etc. These water bodies have an aesthetic value and ecologically viable components. The water pollution has been defined as many kind of man-mad alteration of chemical, biological or physical quality of the water which results in unacceptable depreciation of the utility of the natural value of water. In this paper we emphasis the study on Varanasi urban space/area of Uttar Pradesh. Varanasi is a religious city and is popularly known for its mythological Mokhsydayani Ganga ghats. The urbanization, high growth rate and load of the various pollutant sources lead to deterioration of the holly river Ganga and water bodies which are used in various ways like as drinking, bathing, commercial purpose, religious purpose and many more ways for the society. The quality of these water bodies are gradually shrinking and some of them are worst affected due to unauthorized intervenes on these valuable resources. Activities of dumping domestic waste, biodegradable waste and other wastages regularly are being polluted and sediment the water bodies of area in many ways regularly. This situation is going worst due to lack of people awareness, inactive government apparatus and unplanned growth of city. The present study will try to analyze the environmental perspective of water pollution and its management in Varanasi urban area. The study based on primary and secondary source of data emphasis on identification of source of pollution and requirement of proper management in the urban areas. Among all water bodies the Durgakund, Lahartara, Surya Kund and Pushkar talab sites have accounted very low water quality level. These ponds reveal various ritual activities, municipal waste water, washing discharge of temple effluents and animals waste etc.

Keywords: *Water pollution, Urban Space, Environmental Perspective, Varanasi, Development and Society.*

Introduction

As the state concerns over water resource and the environment perspective, the importance of considering surface-water and ground-water as a single resource has become increasingly evident. Environmental pollution in urban areas is assuming dangerous proportion all through the world and India is not free from this problem. It's an outcome of industrialization, urbanization.

modern civilization, high population growth and low urban. Increasing water pollution has posed serious threat to human life and environment. Among other problems of urban life water (in term of quality and quantity) is considered as an important problem which affects the quality of urban life. In the face of water scarcity and lack of access to clean water, urban and peri-urban resident will have no alternative except to use diluted, untreated or pollutant water. Water bodies are shrinking by day at the faster rate due to high population and urbanization load. Traditionally the rain water is being harvested in water bodies like as Kund, Ponds, Johada and lakes in most of the urban areas of the country, and these water bodies are work as water reservoir for various purposes throughout the year. Varanasi is the oldest living city in the world and has been a great centre of learning through the ages. It is very difficult to ignore the mythological significance of these ponds particularly for protection of holy Ganga river (Dubey, 2015). Hindu and Budhist pilgrims come for their rituals here throughout the year in this cultural capital of India. So, here important sacred water bodies (such as Durgakund, Lahartara, Kinababa, Laxmikund and Suryakund) near the temples and Ganga Ghats are very often used for religious activities. Therefore, these Kunds and Ghats of Varanasi are in highly polluted situation due to various anthropogenic activities.

Objective

The objective of the present study is to assess the degree of water pollution in urban water space (bodies), their impact on society and its management. Study aims to valuing the contribution made by urban, sub-urban water bodies to support and improve the quality of life of the local people residing in (and around) adjoining areas. Further, study also dealt with sustainable management of water bodies through the community participation.

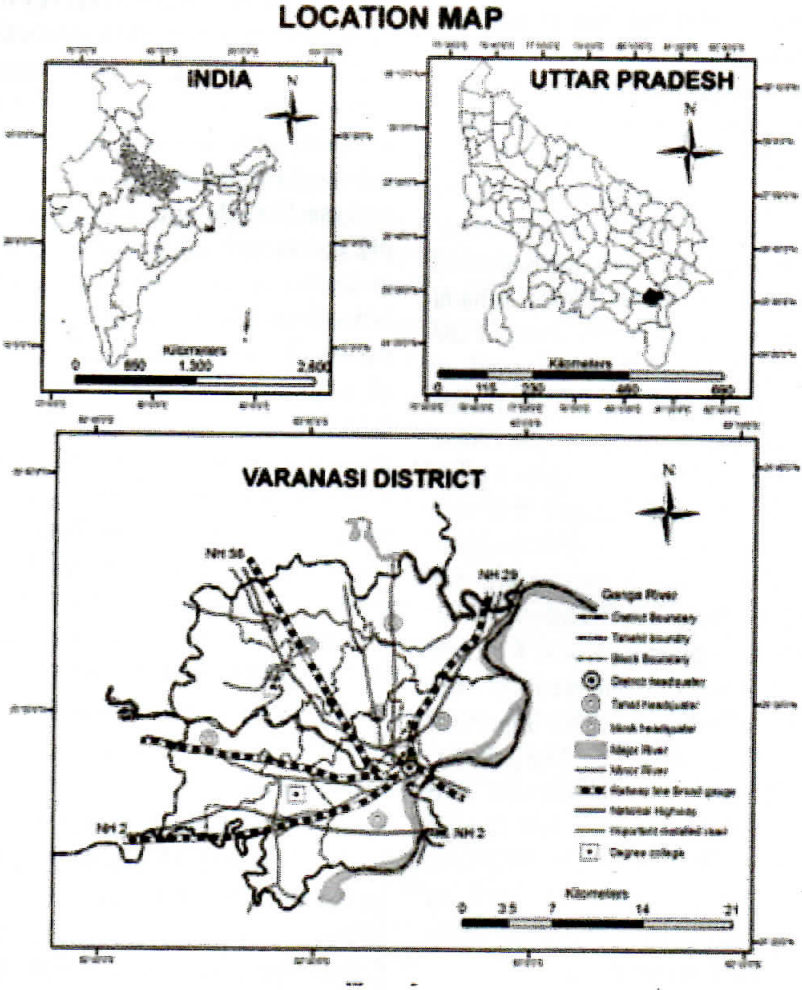
Methodology

Present study represents a field investigation (January to March 2015) survey of different occupational groups and to asses the existing statues of water pollution during session monitored of Varanasi urban area at sampling sites. Surface water samples were collected for physic-chemical and biological analysis from the sites selected for measuring pH, conductivity, dissolved oxygen, alkalinity and other analysis which were taken in the laboratory. The results were compared to the permissible limit of drinking and domestic use of water quality standard. Filed based questionnaire survey was also conducted among the local resident who resided in (and around) the water bodies such as river Ganga, Varuna, Assi and Ponds, lakes etc., through stratified sampling method. Thereafter, social perceptions of water uses through observed trend were analyses and interpret with the sampling results and and suggest suitable measures of water landscape.

Study Area

Varanasi lies between $25^0 15'$ N Latitude to $25^0 22'$ N and $82^0 57'$ E to $83^0 1'$ E Longitude, on the left bank of the holy river Ganga. The city occupies almost a central position in the Ganga valley (Location Map). Varanasi is well connected through railways, road routs and airways with other parts of the country. It is a unique in its religious expressions of traditional Indian culture. Varanasi is a unique example of civilization in world history too. It is also known as city of Kund (Ponds) because there are more than 62 kunds which are naturally or man-made. Purpose of these

ponds is to conserve water for survival of human being (Gupta et.al, 2011). Varanasi city is also known for its religious, educational, and tourist importance and thus invites large number of peoples from regionally, country wide and abroad for various purposes. It causes more presser on water resulting shrinking the water bodies and depleting quality of water.



Surface Water Bodies of Varanasi Urban Space

Water bodies may be defined as an area or stream holding water such as river flow, ponds, wetland and lakes. Therefore they can be classified in many ways by their size-shape, quality-quantity, natural-artificial, permanent-temporary etc. Here we will define the major types of urban water bodies which have urban and peri-urban presence are: River stream (Ganga), Kund, lake, Naala, Wetland etc. Ponds and Kund can be describes as water body with specific area and ecological characteristics. Kunds, ponds

and lakes can be natural or man-made. Out of total accounted 126 water bodies (62 Kunds and 64 Hauds) of the Varanasi city, only 37 existed or registered in local urban-government record. Other smaller than above mentioned categories, which are mostly created for water storage, recreation, open spaces and other major urban requirements. River stream or Ganga river is a life line for the study area. The local people of area or city have well aware about the importance of river Ganga in their social, cultural and religious life. Wetlands are defined (through Ramsar Convention, 1971) as areas of marshes, fens, peat land of water, whether natural or artificial, temporary or permanent, with water that is static or flowing. Among all water body sites have low water quality especially with respect to human health and entire ecosystem of the area. The deterioration in water quality and shrinking of kunds and ponds reveal various Hindu ritual activities or customs, urban waste water, washing discharge of temple effluents and animals waste of the city.

The water bodies of the urban area are very much part of the city's cultural basics. The kunds and ponds are an ecological entity for society. These water bodies have come under presser due to rapid urbanization and surrounding encroachment. Traditionally these water bodies are developed for rain water harvesting, water conserving and recharging for ground water. But in modern era this structure were wiped out from government record of local authority. On the basis of historical records of Varanasi (Erstwhile Banarans) town and its water bodies are accounted as follows (Tabale: 1):

Table No. 1 Major Surface Water Bodies in Varanasi Urban Area

S.N.	Locality/Wards	Water Bodies (Kunds/Ponds/Talab)
1.	Alaipur	Bakaria Kund
2.	Bhadeni	Lolark Kund, Krim Kund, Sonbhdra Talab, Pushkar Talab.
3.	Danialapur	Sona Talab
4.	Habibpura	Maldhaia Talab,
5.	Jaitpura	Ramkatora Talab, Jagatgunj Talab, Dhupchandi Talab, Bawalia Bagh, Ishwargangi Talab, Chhohara Talab
6.	Jolha	Snkuldhara Kund
7.	Karoundi	Aditya Nagar Talab
8.	Khajuri	Kanphodva Talab
9.	Kashipur	KaranGhanta Talab
10.	Lahartar	Laharatara Kund
11.	Lallapura	Sonia Talab, Shastri Nagar Talab
12.	Mavain	Mavain Kund
13.	Rampura	Surajkund
14.	Shivpurva	Sagar Talab, Shivpurava Talab
15.	Shivpur	Panchpanve Talab, Pilikot Kund

Source: Central Ground Water Board (2002), U.P. State Unit office, Allahabad

In Varanasi city majorly we accounted 26 water bodies and 12 other water encroached water structures through the governmental records. Above major water bodies (Kund/ponds/talab) are on the threshold of shrinking owing to exploitation by the local people or society and neglect from local body government. Encroachment and illegal claims on such dried water bodies in the city the nexuses land mafia and corrupt system of administration. They are failing to understand the significance of these water bodies for sustaining ecosystem and ground water recharging.

Water Quality Analysis Of Water Bodies

The users survey data also revealed that majority of the respondents (72.22%) using the Kund/Pond belongs to the low income group. This group includes 19.74% dependent ratio as they were child or housewives and other unemployed. The water samples from Durgakund, Bhadaini, Lahartara, Lolark and Adityanagar sites showed very low quality water as compared to other sites. The deterioration in water quality in these Kunds or ponds is due to use of domestic direct discharge uses detergents, soaps and of temple discharge, animals waste etc. The studies of the observed samples were shows that lead was found. All other metal Phosphate, Sulfate, Nitrate and BOD were found at different low standard as follows:

In analysis the water quality the pH value is a measurement of acidity and ranges from 0 to 14, below 7 is acidic, 7 is neutral and above 7 is alkaline. In the observed trends of water samples from kunds/ponds pH value will fluctuate due to the Carbon dioxide level in the water. The BOD of the samples is measured between 1.4 to 2.3. So, water is not suitable for ponds ecology and after construction of concrete embankments the natural ecosystem has also disrupted. It is also found that due to high eutrophication fish can't sustain in such water and Kunds is running to transformed into muddy or swamp land. Here, from the religious point of view, the Kunds/Ponds are related to spiritual sentiments but from the scientific point of view, the pond water is not good for human consumption.

S.N.	Kund/Pond	Phosphate (mg/L)	Sulfate (mg/L)	Nitrate (mg/L)	BOD
1.	Dugakund	7	7.3	51.0	1.7
2.	Lahartara	6	3.4	49.5	2.3
3.	Lolark	6	6.1	47.2	2.2
4.	Aditya Nagar	6	7.1	39.4	1.4
5.	Pushkar talab	7	4.2	48.6	1.7

During the field based socio-economic questionnaire survey among the local peoples the following features are found that about 57% peoples were aware of Kund or water body pollutions, 44% are indifferent to protect it. Among the local community some NGO and voluntary groups are working about the awareness but with low response of people. As per the observed statues is in very critical danger in respect of pollution and water bodies' management. Among the respondent, most of water user come from the poor section of society. Due to lake of awareness local-body government has a responsibility to ensure that the Kund/Ponds should

properly managed, if sufficient measures will not taken up immediately the existence and ecological balance of structures will disturbed.

Anthropogenic Influences on Water Bodies

Human interference to the water bodies in the study area an unsolicited effect. Un-consciousness of the local peoples and society makes the problem hard. The shrinking of water structures, BOD, eutrophic level of ponds are increasing regularly. The variation of occupational structure within the ward or area shows the different picture of water bodies. Anthropogenic activities on these water bodies (Kund/Pond/Ghats) ultimately, deteriorate the quality of water, accumulation of toxic unwanted matters, and shrinkage of catchment area leads to loss of aesthetic value. The water quality is mainly affected due to religious rituals, pilgrims and related activities by the people living in the nearby areas and tourist from the outside the area. In our traditionally society man-made ponds have been used as an alternative source of drinking water and various domestic purposes by the local people. In Varanasi city water bodies (Kund/Pond and Ghats) are typically situated near environs of temples.

Therefore, bathing for worship and disposal of waste from temples or domestic are the two major sources of pollution in the city. Rapid growth of urbanization directly or indirectly affected existence of the ponds such as over exploitation of resources and improper waste disposal practice (Mehta, 2013). Including social, cultural, physic-chemical parameters of water quality and quantity have accumulation of various kinds of pollutants and nutrients through the religious disposed, domestic sewage, municipal effluents, and agricultural runoff in to the river Ganga and ponds leads changes in the physic-chemical characteristics of fresh water in and around the urban area of Varanasi city.

Instruments For Watr Security and management of Water Landscape

Ponds are a major water asset which provides enormous opportunities in water security. The change in rainfall pattern will affect all important water sources, even high rainfall region encounter water scarcity problems during summers or low-rainy session. With this variability, ground water recharge, storage provides a suitable mechanism of water security, favors the agricultural production and economic growth of the state. They help to reduce poverty level in rural or urban areas. Water storage can make substantial contribution and livelihood sustainability. Ponds are one of the possible water storage options especially during dry session, small volumes of stored water are often vitally important it can safeguard domestic supplies and provide support to crops and livestock.

These small water storage options, with proper planning can contribute significant role for food and water security at the local level for the development of local communities. At the urban water space the urban water resources there sustainable management is absolutely necessary. Conservation of these water bodies cans significantly capturing rainfall water and they are essential receptors for harvesting rainwater and in maintaining groundwater levels. These water bodies or ponds can also be used as sedimentation structures to control water quality. They can remove diffuse pollutants including sediments, nitrogen, and

phosphorous in surface waters and reduce the nutrient load of the receiving water bodies. This technique called nutrient retention and these are strategically located in such a way to intercept water from the drainage systems before they join receiving water bodies (Kumar and Padhy, 2015).

Conclusion And Sugestions

The present study shows that the urban water landscapes in India are under threat due to increase in pollution rates and encroachment. There is a need to formulate policy development plan and then endeavor to deliver the plan on the actual ground instead of treating water-bodies as individual sites, they should rather be treated as part of network or water space. The study reveals that the water pollution badly affected the respondents in several ways. A substantial proportion of respondent of different occupational groups desire to make complaint to the local administration. Public education, social awareness, voluntary participation and non-governmental organization programmes appears to be the best suited method as suggested by the respondents beside empowering the land, water supply, revenue department and enactment of law. In this study we also concluded that with the increasing magnitude of the pollution severity the social awareness is also growing in the same proportion. Results of various physico-chemical parameters of various kunds, ponds and ghats at Varanasi as studied in the investigation. It clearly shows that the water quality is not suitable for human consumption and water bodies were also struggling for their existence. So there is an immediate need of restoration, improvement and proper management of these secret water bodies for the human and environment.

Further, study also suggested for a need of awareness among the local people and society to maintain these water landscapes (kund, ponds and ghats) at least their optimum quality and level of purity. The onset of monsoon helps in diluting the pollutants but awareness and proper management practices such as planting trees around ponds, regularly recharging during summer period, removal of sediments from the bottom of pond, removal of floating debris from the pond surface, diversion of sewage discharge to proper disposal site and proper enforcement of law and policy might be very successful.

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कोटा जिले में जल संसाधन गुणवत्ता

बी.एल. जाट, प्रियंका यादव, अंजना कुमारी

सारांश

जल का उपयोग सामान्यत: घरेलू उपयोग, सिंचाई हेतु एवं उद्योगों में किया जाता है। प्रत्येक के लिए अपने अलग-अलग गुणवत्ता मापक हैं। पैतृक चट्टान खनिजों के साथ ही मानवीय गतिविधियाँ भी भू-जल की प्राकृतिक गुणवत्ता में परिवर्तन कर उसे बिगाड़ देती हैं। कोटा जिले में सतही एवं भूमिगत जल की गुणवत्ता के सर्वेक्षण एवं परिक्षण के लिए विभिन्न जल स्त्रोतों से नमूने लेकर गुणवत्ता स्थिति ज्ञात की है। जिले में पी.एच. मान एवं घुलनशील ठोस स्वीकृत सीमा में हैं। सतही जल स्त्रोतों में मानवीय क्रियाओं के फलस्वरूप नकरारात्मक प्रभाव उत्पन्न हुये हैं। जल गुणवत्ता की स्थिति के सामान्य मापकों जैसे फ्लोराइड, नाइट्रेट, टीडीएस व क्लोराइड आदि की स्वीकृत सीमा से अधिक मात्रा वाले गाँवों की स्थिति का अध्ययन करना शोधकार्य का प्रमुख उद्देश्य है।

मूल बिन्दू: जल गुणवत्ता, घुलनशील संघटक, सतहीजल, भूमिगतजल, टी.डी.एस, न्यूनतम स्वीकृत सीमा, गुणवत्ता मानक, प्रबन्धन।

प्रस्तावना

जल की गुणवत्ता उतनी ही महत्वपूर्ण है, जितनी कि उसकी मात्रा। सामान्यत: जल की गुणवत्ता को उसकी जीवाणवीय विशेषताओं (गंधलापन, रंग, स्वाद एवं गंध) एवं रासायनिक विशेषताओं के रूप में व्यक्त किया जाता है। रासायनिक विश्लेषण में जिन घटकों की गणना की जाती है वे मुख्यत: आयन के रूप में पाए जाते हैं। जिनमें मुख्य धनात्मक आयन कैल्शियम, मैग्नीशियम, पोटेशियम एवं लोहा होते हैं, जबकि ऋणात्मक आयनों में सल्फेट, क्लोराईड, फ्लोराईड, कार्बोनेट एवं बाईकार्बोनेट होते हैं। जल में जो जीवाणु एवं सूक्ष्म जीव होते हैं वे सूक्ष्मदर्शी (1-4 माइकोन) होते हैं। हानिकारक जीवाणु विभिन्न प्रकार की बीमारियों के कारक हैं वे रोगकारी जीवाणु कहलाते हैं।

जल में घुलनशील संघटक विभिन्न उद्देश्यों के लिए उसकी उपयोगिता का निर्धारण करते हैं। जल में घुले हुए लवणों की गुणवत्ता एवं संगठन उसके सम्पर्क में रहने वाली मृदा एवं चट्टान की प्रकृति पर निर्भर करते हैं, इसलिए सामान्यतया भूमिगत जल में सतही जल की तुलना में अधिक लवण पाए जाते हैं। खनिजों की मात्रा सीमा से अधिक पाए जाने से जल की गुणवत्ता पीने, कृषि तथा औद्योगिक उपयोग के लिए अनुपयोगी हो जाती है।

अध्ययन क्षेत्र :-कोटा जिला राजस्थान में 24° 25′ से 24° 51′ उत्तरी अक्षांशो व 75° 26′ से 77° 37′ पूर्वी देशान्तरो के मध्य राज्य के दक्षिण पूर्वी भाग मे स्थित है। जिले का कुल भौगौलिक क्षेत्रफल 5203.94 वर्ग किलोमीटर है। जिले में पांच

तहसीले- पीपल्दा, दीगोद, लाडपुरा, सांगोद और रामगंज मण्डी है। क्षेत्र की जलवायु नम व औसत वार्षिक वर्षा 882 मि.मि है। यह हाडौती पठार पर स्थित क्षेत्र है। जिसमें विन्ध्यन पहाड़ियों की मुकन्दरा श्रैणी स्थित है। चम्बल, पार्वती, परवन और कालीसिन्ध जिले की प्रमुख नदियॉ है। कोटा शहर राजस्थान का प्रमुख औधोगिक नगर है। जिले की कुल जनसंख्या 1001694 (2011) है।

उद्देश्य

1. सतही जल व भूमिगत जल की गुणवत्ता का मानक बनाये रखने के सन्दर्भ में विभिन्न जल प्रदूषणकारी तत्वों को पहचान कर निवारण हेतु सुझाव प्रस्तुत करना।
2. राष्ट्रीय जल नीति के अनुसार अध्ययन क्षेत्रमें सभी कों स्वच्छ पेयजल उपलब्ध करानें की सुनिश्चिता में आनेवाली समस्याओं की जानकारी प्राप्त कर समाधान प्रस्तुत करना।

विधितंत्र

1. प्रस्तुत अध्ययन प्राथमिक एवं द्वितीय समंकों पर आधारित है। प्राथमिक संमक (सतही जल स्त्रोत नमूने) शोधार्थीयों द्वारा एकत्रित किऐ गये हैं तथा द्वितीय समंक (भूमिगत जल स्त्रोत) केन्द्रीय रासायनिक प्रयोगशाला कोटा से एकत्रित किये हैं।
2. एकत्रित समंकों एवं सूचनाओं को अध्ययन के उद्देश्य अनुसार उपयुक्त रूप से (गुणवत्ता मापक/ तहसील अनुसार) तालिका बद्ध किया है। जिससे अपेक्षित परिणाम प्राप्त हो सके। अध्ययन श्रेत्र में जल गुणवत्ता को मानचित्र द्वारा प्रदर्शित किया है।

सतही जल की गुणवत्ता

कोटा जिले में सतही जल की गुणवत्ता ज्ञात करने के लिऐ जिले के विभिन्न सतही जल स्त्रोतों यथा- तालाब, नदी, बाँध से जल के नमूनों का प्रयोगशाला में विश्लेषणकर सतही जल की गुणवत्ता को ज्ञात किया गया है।

अध्ययन क्षेत्रमें जल गुणवत्ता सर्वेक्षण के लिए 10 जल स्त्रोतों(जैसे चम्बल नदी,कालीसिंध नदी, आहु नदी,परवन नदी,अन्धेरी नदी,आलनिया डेम,सुरेड़ा खान,बुढ़ादीत बाँध,रंगबाड़ी तालाब, व बंधा धर्मपुरा) का चयन किया गया है। जल के नमूने संग्रहण के लिए इस तथ्य को ध्यान में रखा गया है कि चयनित नमूना अध्ययनक्षेत्रमें तहसील का प्रमुख पेय जल स्त्रोत हैं। जल के नमूने शोधार्थियों द्वारा एकत्रित किए गये है। एकत्रित जल नमूनों का विश्लेषण केन्द्रीय रसायनशाला अकेलगढ़, कोटा में करवाकर विश्लेषण प्रतिवेदन तैयार किया गया हैं।

उक्त नमूने कालीसिंध, चम्बल, परवन, आहु, अन्धेरी नदियों जैसे 10 विभिन्न जल स्त्रोतों (तालाब, बावड़ीयाँ आदि) से एकत्र किये गये है। जल गुणवत्ता के विभिन्न मानकों के मूल्य जो परीक्षण के उपरान्त प्राप्त हुए है,को तालिका-2मे दर्शाया गया है।

जिले मे सतही जल का पीएच मान सामान्यत: 7 से अधिक (7.2-8.9 के मध्य) है जो यह दर्शाता है कि सतही जल कुछ क्षारीय है। जल में कुल कठोरता 70 PPm से अधिक है लेकिन 330 PPm से कम है जो पेयजल के उद्देश्य से स्वीकृत सीमा में है।अन्य रासायनिक तत्व जैसे कैल्सियम, क्लोराईड एवं मैग्नेशियम की मात्रा भी स्वीकृत सीमा में है। परवन नदी में मैग्नेशियम 200 PPm है जो

तालिका संख्या 1: जिला कोटा –सतही जल स्त्रोतों की गुणवत्ता

क्र.सं.	मानक	कालीसिंध नदी	आहू नदी	परवन नदी	अंधेर नदी	आलनिया डेम	सुरेड़ा खान	बुढ़ादीत बांध	रंगबाड़ी तालाब
1.	पीएच	7.9	7.8	7.5	7.8	8	7	7.7	7.1
2.	गंधलापन	–	35	30	साफ़	–	–	4	12
3.	रंग	–	अल्प गंधला	गंधला	रंगहीन	रंगहीन	रंगहीन	रंगहीन	गंधला
4.	गंध	–	गंधहीन	गंधहीन	गंधहीन	–	–	गंधहीन	गंधहीन
5.	कुल क्षारता	160	290	300	220	–	–	170	130
6.	कुल कठोरता	170	–	260	200	120	90	110	130
7.	कैल्शियम कठोरता	170	–	260	200	120	90	110	130
8.	मैग्नेशियम कठोरता	80	110	200	100	50	35	40	50
9.	क्लोराईड	40	70	20	20	50	35	10	50
10.	सल्फेट	0	0	0	0	0	2	0	0
11.	नाइट्रईट्स	0	0	0	0	–	–	0	0
12.	नाइट्रेट	12.5	सूक्ष्म	12.5	12.5	–	–	0	7.5
13.	टीडीएस	356	534	570	347	520	200	205	231
14.	अवशिष्ट क्लोरिन	0.4	–	–	0.2	–	–	–	–
15.	लोराईड	0.4	0.25	0.5	0.6	1.6	0.6	0.42	0.50

स्रोत–क्रेन्द्रीय रासायनिक प्रयोगशाला अकेलगढ़, कोटा

स्वीकृत सीमा से अधिक है। अध्ययन क्षेत्र से लिये गये समस्त 10 सतही जल स्त्रोंतों का जल रंगहीन है एवं स्वाद की दृष्टि से संतोषजनक है।जिले में सतही जल सिंचाई के उद्देश्य से अनुकूल गुणवत्ता वाला है। समस्त नमूनों के परीक्षण परिणाम दर्शाते है कि जिले में कुल घुलनशील ठोस की मात्रा 125 PPm से 771 PPm के बीच है जो सिंचाई की दृष्टि से पूरी तरह से उपयुक्त है। लिये गये नमूनों के परीक्षण परिणाम दर्शाते हैं कि सतही जल का पीएच मान 7.2 से 8.9 के बीच है जो सिंचाई के लिए सुरक्षित है। औद्योगिक उपयोग की दृष्टि से भी जिले का सतही जल सुरक्षित है। यद्यपि जिले में स्थापित अधिकांश औद्योगिक इकाईयाँ निजी नलकूपों का उपयोग करते हैं।

भूमिगत जल गुणवत्ता

कोटा जिले में कुल गाँवों की संख्या 828(20110) है। अध्ययन क्षेत्रके विभिन्न गांवों से लिये गये जल नमूनों की जाँच के आधार पर यह पाया गया है कि 121 (14.80 प्रतिशत) गाँव ऐसे हैं जहाँ फ्लोराइड़ की मात्रा न्यूनतम स्वीकृत सीमा 1.5 PPm से अधिक है। नाइट्रेट की न्यूनतम स्वीकृत सीमा (विश्व स्वास्थय संगठन एवं भारतीय मानक अनुसार) 45-100 PPm है। अध्ययन क्षेत्रके 169 (20.41 प्रतिशत) गाँव ऐसे है जहाँ उक्त सीमा से अधिक नाइट्रेट पाया गया है। नाइट्रेट की अधिक मात्रायुक्त जल का उपयोग करने से शिशुओं में नीलवर्ण बीमारी (Blue Baby Syndrom) होती है। जिले के 119 (14.37 प्रतिशत) गाँव ऐसे हैं जहाँ टीडीएस की मात्रा स्वीकृत सीमा 2000 PPm से अधिक हैं। क्लोराइड की न्यूनतम स्वीकृत सीमा 1000 PPm है। जबकि अध्ययन क्षेत्रके 13 गाँवों में यह स्वीकृत सीमा से अधिक है। तालिका-2 में तहसीलानुसार विभिन्न जल गुणवत्ता समस्याओं को दर्शाया गया है।

तालिका संख्या 2: जिला कोटा:-तहसील अनुसार विभिन्न जल गुणवत्ता समस्याओं से प्रभावित गाँवों की संख्या

क्र. स.	तहसील	फ्लोराईड >1.5PPm	क्लोराईड >1000PPm	नाइट्रेट >100PPm	टीडीएस >200PPm	लोहा >1.0PPm	आर्सेनिक >0.05PPm
1.	लाड़पुरा	22	00	37	11	00	00
2.	दीगोद	60	3	17	41	00	00
3.	सांगोद	4	00	50	8	00	00
4.	पीपल्दा	22	7	20	45	00	00
5.	रामगंजमंडी	13	3	14	14	00	00
	योग	121	13	156	119	00	00

स्रोत-क्रेन्द्रीय रासायनिक प्रयोगशाला अकेलगढ़, कोटा

तहसील दीगोद कोटा जिले के उत्तरी भाग में स्थित है, इस तहसील में 168 गाँव हैं। अध्ययन क्षेत्रमें भूमिगत जल की गुणवत्ता को मापने के लिए गाँवों से जल के 181 नमूने लिये गये, जिनके परीक्षण पर पाया गया है कि इस तहसील के 60 गाँवों (35.71 प्रतिशत) में फ्लोराइड की मात्रा

न्यूनतम स्वीकृत सीमा 1.5 PPm से अधिक है जो कि स्वास्थ्य के लिए ठीक नहीं है।इसी तहसील में नाइट्रेट मापन द्वारा 17 गावों(10.12 प्रतिशत) के जल में इसकी मात्रा न्यूनतम स्वीकृत सीमा 45 PPm से अधिक पाई गयी है।

41 गाँवों (24.40 प्रतिशत) में टीडीएस की मात्रा न्यूनतम स्वीकृत सीमा 2000 PPm से अधिक एवं 3 गाँवों में क्लोराइड की मात्रा न्यूनतम स्वीकृत सीमा 1000 PPm से अधिक पाई गयी है।लोहा व आर्सेनिक अन्य दो महत्वपूर्ण मानक माने जाते है परन्तु दीगोद तहसील के किसी भी गाँव में इनकी मात्रा न्यूनतम स्वीकृत सीमा से (क्रमश: >1.0 0>0.05 PPm) से अधिक नहीं है।

तहसील साँगोद कोटा जिले के उत्तरी भाग में स्थित है। इस तहसील में 211 गाँव हैं, अध्ययन क्षेत्रमें भूमिगत जल की गुणवत्ता मापने के लिए 226 जल के नमूने लिये गये हैं जिनके परीक्षण पर पाया गया कि इस तहसील के 4 गाँवों (1.89 प्रतिशत) में फ्लोराइड की मात्रा न्यूनतम स्वीकृत सीमा >1.5 PPm से अधिक है एवं तहसील के 50 गाँवों (23.69 प्रतिशत) में नाइट्रेट की मात्रा न्यूनतम स्वीकृत सीमा >45 PPm से अधिक है इस तहसील के 8 गाँवों (3.79 प्रतिशत) में टीडीएस की मात्रा न्यूनतम स्वीकृत सीमा >2000 PPm से अधिक है। किसी भी गाँव में क्लोराइड की मात्रा स्वीकृत सीमा >1000 PPm से अधिक नहीं है।

तहसील पीपल्दा कोटा जिले के उत्तरी पूर्वी भाग में स्थित है। इस तहसील में 167 गाँव हैं। अध्ययन क्षेत्रमें भूमिगत जल की गुणवत्ता को मापने के लिए 225 जल के नमूने गाँवों से लिये गये, जल के नमूनों के परीक्षण पर पाया गया कि इस तहसील के 22 गाँवों (13.17 प्रतिशत) में फ्लोराइड की मात्रा न्यूनतम स्वीकृत सीमा >1.5 PPm से अधिक है जो स्वास्थ्य के लिए ठीक नहीं हैं तथा नाइट्रेट मापन द्वारा 20 गाँवों (11.09 प्रतिशत) के जल में इसकी मात्रा न्यूनतम स्वीकृत सीमा > 45 PPm से अधिक पाई गई है। तहसील के 45 गाँवों (26.94 प्रतिशत) में टीडीएस की मात्रा न्यूनतम स्वीकृत सीमा >2000 PPm से अधिक है। तहसील के 7 गाँवों (4.19 प्रतिशत) में क्लोराइड की मात्रा स्वीकृत सीमा से अधिक पाई जाती है।

लोहा व आर्सेनिक जो कि अन्य दो महत्वपूर्ण मानक माने जाते हैं, परन्तु पीपल्दा तहसील के किसी भी गाँव में इनकी मात्रा न्यूनतम स्वीद्धत सीमा से (क्रमश: >1.0 0>0.05 PPm) से अधिक नहीं है।

तहसील रामगंजमण्ड़ी कोटा जिले के दक्षिणी भाग में स्थित है, इस तहसील में 165 गाँव हैं। भूमिगत जल की गुणवत्ता को मापने के लिए 178 जल के नमूने गाँवों से लिये गये है, जिनके परीक्षण पर पाया कि इस तहसील के 13 गाँवों (7.87 प्रतिशत) में फ्लोराइड की मात्रा न्यूनतम स्वीकृत सीमा >1.5 PPm से अधिक पाई जाती है जो स्वास्थ्य के लिए ठीक नहीं हैं। नाइट्रेट की मात्रा 32 गाँवों (19.39 प्रतिशत) के जल में न्यूनतम स्वीकृत सीमा >45PPm से अधिक पाई गयी है। इस तहसील के 14 गाँवों (8.48 प्रतिशत) में टीडीएस की मात्रा न्यूनतम स्वीकृत सीमा >2000 PPm से अधिक है एवं 3 गाँवों में क्लोराइड की मात्रा स्वीकृत सीमा >1000 PPm से अधिक पाई गयी है। तहसील के किसी भी गांव में लोहा व आर्सेनिक न्यूनतम स्वीकृत सीमा से (क्रमश: >1.0o>0.05 PPm) से अधिक नहीं है।

निष्कर्ष

अध्ययन क्षेत्र में जल की विधुत चालकता आम-तौर पर 1500 us/cm (micro-mhos/cm) है जो

कुल घुलनशील ठोस के अनुरूप 1000 मिलीग्राम/लीटर है। भू-रासायनिक दृष्टि से भू-जल मुख्यत: बाइकार्बोनेट प्रकार का है। जिले में 70 प्रतिशत कुओं का पानी इसी प्रकार की रासायनिक विशेषताओं/लक्षणों से युक्त है। 18 प्रतिशत कुओं के पानी में धुलनशील आयनों की मात्रा अधिक है एवं शेष 12 प्रतिशत कुओं का जल क्लोराइड प्रकार का है। जिले में भू-जल लवणत्ता बाईकार्बोनेट प्रकार से क्लोराइड प्रकार की ओर निरन्तर बढ रही है।

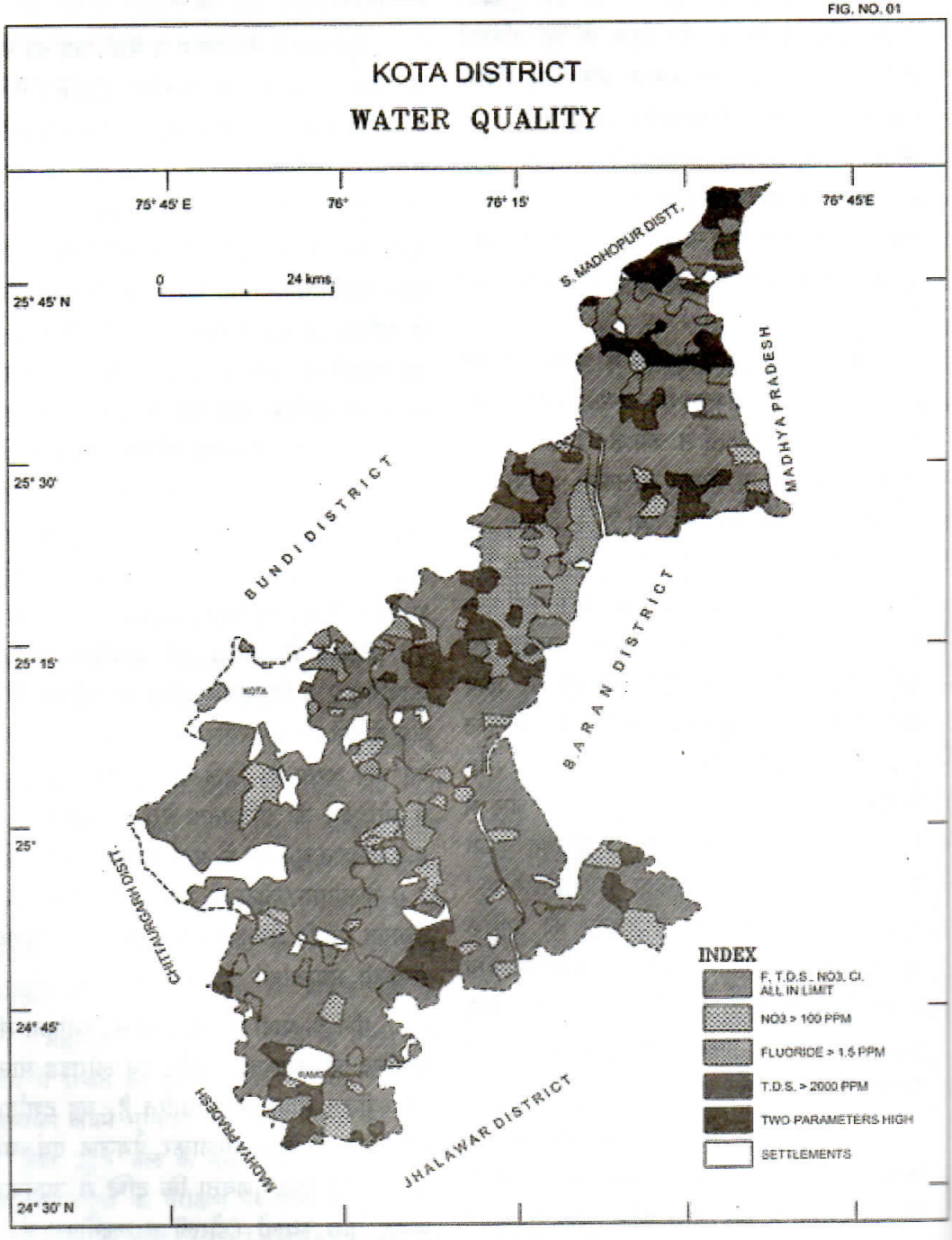
मानचित्र (Fig. No. 1) में कोटा पंचायत समिति के दक्षिणी-पश्चिम में लवणीय पट्टी है एवं लवणता 4000 us/cm से कम है। 145 पानी के नमूनों में से 132 में विद्युत चालकता 1500 us/cm से कम है, यह भी पाया गया है कि 4000 us/cm से ज्यादा विद्युत चालकता का जल स्थिर एवं छोटे गड्डों में विशेष कर जिले के उत्तरी-पूर्वी भाग में पाया गया है। जिले का भू-जल नाइट्रेट एवं फ्लोराइड जैसे जहरीले एवं स्वास्थ्य के लिए हानिकारक तत्वों से मुक्त है। जिले के 83 प्रतिशत कुओं के जल में नाइट्रेट की सांद्रता 0-50 मिलीग्राम/लीटर है। 9 प्रतिशत कुओं के जल में 51-100 मिलीग्राम/लीटर एवं 8 प्रतिशत कुओं के जल में नाइट्रेट की सान्द्रता 100 मिलीग्राम/लीटर से अधिक है। जल में नाइट्रेट की अधिक सान्द्रता (>100 मिलीग्राम/लीटर) मुख्यत: स्थानीय प्रदूषण के कारण होती है, जो कि जल की अधिक क्षारीयता के रूप में प्रकट होती हैं। इटावा पंचायत समिति में नाईट्रेट की सांद्रता अधिक है।

जिले में 90 प्रतिशत कुओं के जल में क्लोराइड तत्व 1.5 मिलीग्राम/लीटर से भी कम है जो यह दर्शाता है किं जिलों में भू-जल क्लोराइड की अधिकता से मुक्त है। सांगोद पंचायत समिति के 2 गॉवो में भूमिगत जल में सान्द्रता 3.00 मिलीग्राम/लीटर पाई गई है।

भू-जल में कैल्शियम व मैग्नेशियम का प्रमुख हो जाने पर भी जल की कठोरता Caco3 के रूप में 59 मिलीग्राम/लीटर के न्यून स्तर से Caco3 के रूप में 1420 मिलीग्राम/लीटर उच्च स्तर तक बदलता रहता है। जिले में 59.3, 33.5 एवं 8.5 प्रतिशत भू-जल में कुल कठोरता मूल्य का सान्द्रण क्रमश: 00-300, 300-600 एवं 600 मिलीग्राम/लीटर से अधिक (Caco3 के रूप में) है। जिले में मात्र 14 स्थानों के जल में कठोरता 600 मिलीग्राम/लीटर से अधिक पाई गई है इनमें से चन्दा व निमोला (इटावा पंचायत समिति -कुल कठोरता 2320 एवं 1840 मिलीग्राम/लीटर) एवं लाडपुरा पंचायत समिति के गलाना में (कुल कठोरता 1032 मिली/ली) है। निम्न लवणता के कारण जिलें में भू-जल सिंचाई के लिए उपयुक्त है। सोडियम का 70 प्रतिशत से ज्यादा एवं अवशिष्ट सोडियम कार्बोनेट 2.0 मिलीग्राम/लीटर से अधिक सिंचाई जल में होने पर यह फसल उत्पादनएवं मृदा पारगम्यता को कम करता है। जिले में 3.5 प्रतिशत भू-जल में सोडियम की प्रतिशतता 70 से अधिक है एवं 4.8 प्रतिशत भू-जल में अवशिष्ट सोडियम कार्बोनेट 2.0 मिलीग्राम/लीटर से अधिक है। केवल इटावा पंचायत समिति क्षेत्र इस प्रकार की भू-जल गुणवत्ता सम्बन्धी समस्याओं से ग्रस्त हैं।

पीने के पानी की गुणवत्ता का स्वीकृत सीमा मानचित्र जो लवणता, नाइट्रेट एवं लोराइड सान्द्रता की स्वीद्धत सीमा पर आधारित है, यह दर्शाता है कि जिले में कुल मिलाकर पेयजल एवं घरेलु उपयोग हेतु जल गुणवत्ता कि दृष्टि से उपयुक्त है केवल कुछ स्थानों (डोरली व लक्ष्मीपुरा पं. स. इटावा) पर फ्लोराइड एवं नाइट्रेट की सान्द्रता अधिक

FIG. NO. 01


KOTA DISTRICT
WATER QUALITY
75° 45' E
76°
76° 15'
76° 45'E
0
24 kms.
25° 45' N
25° 30'
25° 15'
25°
24° 45'
24° 30' N
S. MADHOPUR DISTT.
MADHYA PRADESH
BUNDI DISTRICT
BARAN DISTRICT
CHITTAURGARH DISTT.
MADHYA PRADESH
JHALAWAR DISTRICT
INDEX
F, T.D.S., NO3, Cl. ALL IN LIMIT
NO3 > 100 PPM
FLUORIDE > 1.5 PPM
T.D.S. > 2000 PPM
TWO PARAMETERS HIGH
SETTLEMENTS

है,जहाँजल को पीने हेतु उपयोग में लाने से पूर्व गुणवत्ता प्रबंधन आवश्यक है।

सुझाव:

1. जिले में जहाँ पेयजलकठोरता स्वीकृत सीमा से अधिक है, को सीमा में रखने हेतु प्रबन्ध आवश्यक है।
2. जिले के सतही जल स्त्रोतों की गुणवत्ता मानवीय क्रियाओं (जैसे उद्योग, सिंचाई व जल के दैनिक / घरेलू उपयोग) से खराब हो रही है। इस हेतु अविलम्ब उपचार व नियोजन आवश्यक है।

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Gupta Nitin and Kalpana S., (2009), Assessment of water quality index for monitoring pollution of River Chambal at Kota City, Rajasthan State, India, Env. Poll. Control J., 12(6), 45-54.

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श्रीगंगानगर जिले में कृषि का आधुनिकीकरण

श्योपत राम सहारण

सारांश

कृषि मानव का एक प्राचीनतम व्यवसाय है, परन्तु इसकी प्रविधियाँ एवं प्रणालियाँ समय समय पर बदलती रही है। आज मानव कृषि में नई नई प्रविधियों का प्रयोग करने लगा, जिसे आधुनिकीकरण कहा गया है। कृषि में आधुनिकीकरण के लिये उसमें नई प्रविधियों, मशीनीकरण, रासायनिक उर्वरक, उन्नत किस्म के बीज एवं विभिन्न कीटनाशकों का उपयोग किया जाने लगा है, जिससे कृषि उत्पादन में आशातीत वृद्धि हुई है। कृषि आधुनिकीकरण के लिए उपलब्ध आधारभूत सुविधाओं का क्षेत्रीय आंकलन किया गया है। कृषि आधुनिकीकरण के स्तर को ज्ञात करने के लिए आंकड़ों का संकलन, प्रमाणीकरण एवं संयुक्त सूचकांक की गणना करके कृषि आधुनिकीकरण स्तर ज्ञात किया गया है।

मूल बिन्दू: *आधुनिक कृषि यंत्र, उन्नत किस्म के बीज, रासायनिक उर्वरक, कृषि आधुनिकीकरण।*

प्रस्तावना

श्रीगंगानगर जिला कृषि प्रधान क्षेत्र है। इस क्षेत्र में उपलब्ध उपजाऊ मृदाएँ तथा सिचांई सुविधाओं के कारण विभिन्न प्रकार की फसलों का उत्पादन किया जाता है। यह क्षेत्र जहाँ कभी रतीले टीलें ही नजर आते थे, आज गंगनहर, राजस्थान नहरं और भाखड़ा नहर आने से पूरा इलाका सरसब्ज हो गया है। सिंचाई का प्रधान साधन नहरें ही है। कुल क्षेत्रफल के 59.40 प्रतिशत भूमि पर सिंचाई होती है। वर्तमान में सिंचाई के लिए चार नहरों का विस्तार है।

1. इन्दिरा गाँधी नहर (राजस्थान नहर) 2. गंगनहर 3. भाखड़ा नहर 4. घग्घर की नहरें

इन्दिरा गाँधी नहर द्वारा 26.92 लाख हैक्टेयर, गंगनहर द्वारा 3.08 लाख हैक्टेयर तथा भाखड़ा नहर द्वारा 3.68 लाख हैक्टेयर भूमि पर सिंचाई होती है। इस प्रकार नहरों द्वारा 97.82 प्रतिशत सिंचाई होती है एवं कुल सिंचित क्षेत्र 74.61 प्रतिशत है।

कृषि विकास में भूमि उपयोग स्वरूप का भी महत्वपूर्ण योगदान होता है। जिले को भूमि उपयोग की दृष्टि से निम्न वर्गो में बांटा गया है –

1. वन भूमि
2. अकृषित भूमि
3. कृषित भूमि

जिले में कुल भौगोलिक क्षेत्रफल का वन भूमि 5.54 प्रतिशत, कृषि अयोग्य भूमि 6.45 प्रतिशत, जोत रहित भूमि 2.38 प्रतिशत, पड़त भूमि 20.57 प्रतिशत, शुद्ध बोया गया क्षेत्र 65.07 प्रतिशत कुल बोया क्षेत्रफल 82.72 प्रतिशत है। यहाँ की अर्थव्यवस्था कृषि पर निर्भर करती है। जिले की प्राकृतिक दशाओं जैसे – शुष्कता के

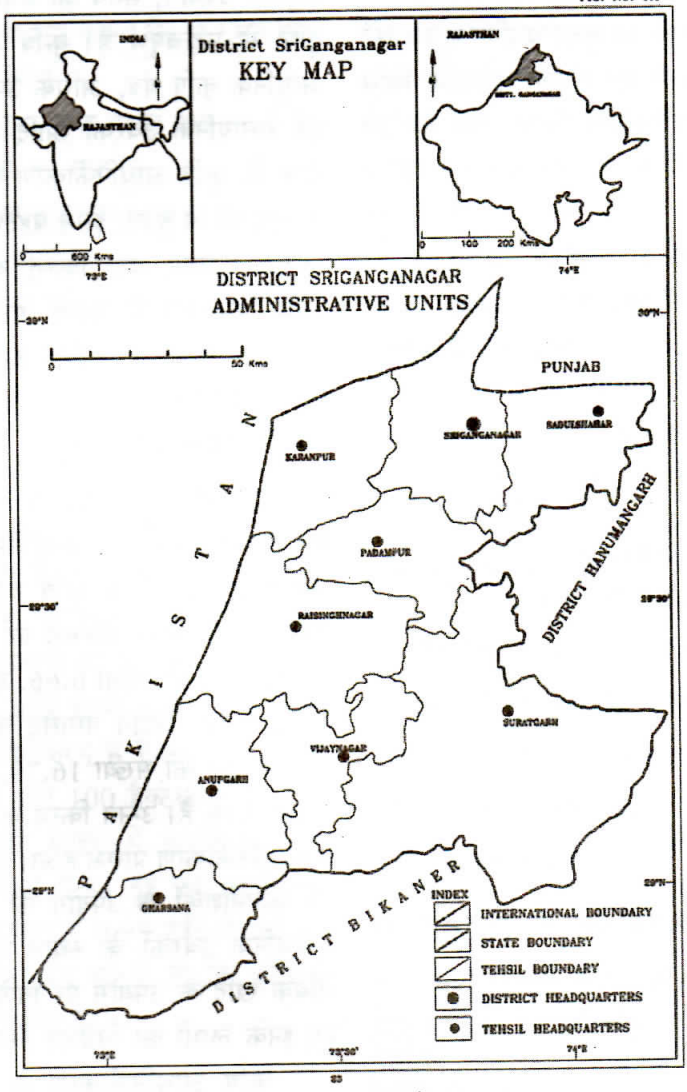
कारण सिंचाई की इतनी आवश्यकता कहीं नहीं होती, जितनी इस जिले में होती है।

राज्य का मुख्य कृषि उत्पादक जिला होने के कारण यहां के कृषक भी अधिक सम्पन्न है जो कृषि के उत्पादन में निरन्तर वृद्धि के लिए प्रयासरत रहते है। यही कारण है कि राज्य में सर्वाधिक कृषि यंत्र, उन्नत किस्म के बीजों, रासायनिक उर्वरकों, कीटनाशक औषधियों का उपयोग इसी जिले में किया जाता है। अध्ययन क्षेत्र में तीव्र गति से बढती हुई जनसंख्या एवं घटते हुए संसाधनों के कारण कृषि का विकास करना अत्यन्त आवश्यक है।

अध्ययन क्षेत्र

राजस्थान के उत्तरी भाग में स्थित श्री गंगानगर जिला कृषि उत्पादन में प्रदेश का एक महत्वपूर्ण जिला है। कृषि ही यहाँ के लोगों का मुख्य व्यवसाय

FIG. NO. 1.1



है। जनगणना 2011 के अनुसार श्रीगंगानगर जिले की जनसंख्या 17,88,487 है। जनसंख्या की दृष्टि से जिले का राज्य में 15वाँ स्थान है तथा क्षेत्रफल की दृष्टि से 10वें स्थान पर है एवं क्षेत्रफल 11,154 वर्ग किमी. है। इसका भौगोलिक विस्तार 73°-4' से 300-6' उत्तरी अक्षांश तथा 720-30' से 750-30' पूर्वी देशान्तर है।

विधि तंत्र

श्रीगंगानगर जिले में कृषि आधुनिकीकरण के स्तर को ज्ञात करने के लिए 10 मुख्य चयनित सूचकांकों को लेकर प्रमापीकरण एवं संयुक्त सूचकांक विधि की सहायता से परिकलित किया गया है। इन सूचकांकों के आधार पर जिले की विभिन्न तहसीलों के समान्तर माध्य, प्रमाप विचलन एवं संयुक्त सूचकांक एवं वास्तविक मूल्यों को दर्शाया गया है। तहसील क्षेत्र को क्षेत्रीय इकाई मानकर कृषि आधुनिकीकरण के विभिन्न परिवर्तनों को बताया गया है।

विधि -

$$\text{प्रमाणीकरण मान} = \frac{x - \bar{x}}{Sd \text{ or } \sigma}$$

x = चरों का वास्तविक मान

$\bar{x}$ = अलग-अलग चरों का समान्तर माध्य

sd(σ) अलग-अलग चरों का प्रमाप विचलन

संयुक्त सूचकांक

$$\text{(Composite Index)} = \frac{\text{प्रमापीकरण मान का योग}}{\text{चरों की संख्या}}$$

1. कृषि आधुनिकीकरण के लिए आधारभूत सुविधाएँ

कृषि आधुनिकीकरण प्रक्रिया के विकास हेतु सरकार ने किसानों को वांछित सुविधाएं एवं सहायता देना प्रारम्भ किया जिसमें प्रमुख है - 1. ऋण सुविधा 2. यातायात सुविधा 3. सिंचाई सुविधाओं का विकास 4. कृषि यंत्र एवं कृषि विस्तार कार्यक्रम क्रियान्वित करना 5. कृषि यंत्र एवं मशीनीकरण उपलब्ध करवाना।

1. कृषि आधुनिकीकरण - आधुनिक कृषि यंत्र, अधिक उपज देने वाले बीज, एवं रासायनिक उर्वरकों का उपयोग

कृषि में मशीनों का उपयोग - भूमि संसाधन के समुचित उपयोग, समय की बचत एवं उत्पादन की दृष्टि से महत्वपूर्ण है। कृषि आधुनिकीकरण में आधुनिक कृषि यंत्र, अधिक उपज देने वाले बीज एवं रासायनिक उर्वरकों आदि का उपयोग किया जाता है। कृषि आधुनिकीकरण का सूत्रपात 1960 के बाद प्रारम्भ हुआ, इससे पहले जिले में कृषि का स्वरूप पुरातन था। किन्तु वर्तमान में कृषि आधुनिकीकरण में बढ़ता मशीनों का प्रयोग, आधुनिक कृषि यंत्र, अधिक उपज देने वाले बीजों एवं रासायनिक खादों के उपयोग से कृषि में आधुनिकीकरण प्रारम्भ हुआ।

आधुनिक कृषि यंत्रों में - ट्रैक्टर, लोहे के हल, पावर टिलर्स एवं कल्टीवेटर्स मुख्य भूमिका निभाते है। आधुनिक कृषि यंत्रों में प्रति 100 हैक्टेयर शुद्ध काश्त क्षेत्रफल पर ट्रैक्टर की संख्या 4.25, थ्रेसर की संख्या 6.66, डीजल पम्पसेट की संख्या 1.69, विद्युत पम्पसेट की संख्या 0.48, लोहे के हल की संख्या 16.79, पावर टिलर्स की संख्या 0.16 है। उन्नत किस्म के बीजों द्वारा कृषि में आधुनिकीकरण प्रारम्भ हुआ। रासायनिक उर्वरकों एवं कीटनाशकों के उपयोग की विधि बताते हुए रासायनिक उर्वरकों के स्थान पर प्राकृतिक एवं जैविक खाद के उपयोग पर विशेष प्रकाश डालते हुए इनके लाभों का विवेचन किया गया है।

कृषि आधुनिकीकरण के स्तर मापन हेतु

है। जनगणना 2011 के अनुसार श्रीगंगानगर जिले की जनसंख्या 17,88,487 है। जनसंख्या की दृष्टि से जिले का राज्य में 15वाँ स्थान है तथा क्षेत्रफल की दृष्टि से 10वें स्थान पर है एवं क्षेत्रफल 11,154 वर्ग किमी. है। इसका भौगोलिक विस्तार 230-4' से 300-6' उत्तरी अक्षांश तथा 720-30' से 750-30' पूर्वी देशान्तर है।

विधि तंत्र

श्रीगंगानगर जिले में कृषि आधुनिकीकरण के स्तर को ज्ञात करने के लिए 10 मुख्य चयनित सूचकांकों को लेकर प्रमाणीकरण एवं संयुक्त सूचकांक विधि की सहायता से परिकलित किया गया है। इन सूचकांकों के आधार पर जिले की विभिन्न तहसीलों के समान्तर माध्य, प्रमाप विचलन एवं संयुक्त सूचकांक एवं वास्तविक मूल्यों को दर्शाया गया है। तहसील क्षेत्र को क्षेत्रीय इकाई मानकर कृषि आधुनिकीकरण के विभिन्न परिवर्तनों को बताया गया है।

विधि -

$$\text{प्रमाणीकरण मान} = \frac{x - \bar{x}}{Sd \text{ or } \sigma}$$

x = चरों का वास्तविक मान

$\bar{x}$ = अलग-अलग चरों का समान्तर माध्य

sd(σ) अलग-अलग चरों का प्रमाप विचलन

संयुक्त सूचकांक

$$(\text{Composite Index}) = \frac{\text{प्रमापीकरण मान का योग}}{\text{चरों की संख्या}}$$

1. कृषि आधुनिकीकरण के लिए आधारभूत सुविधाएँ

कृषि आधुनिकीकरण प्रक्रिया के विकास हेतु सरकार ने किसानों को वांछित सुविधाएं एवं सहायता देना प्रारम्भ किया जिसमें प्रमुख है - 1. ऋण सुविधा 2. यातायात सुविधा 3. सिंचाई सुविधाओं का विकास 4. कृषि यंत्र एवं कृषि विस्तार कार्यक्रम क्रियान्वित करना 5. कृषि यंत्र एवं मशीनीकरण उपलब्ध करवाना।

2. कृषि आधुनिकीकरण - आधुनिक कृषि यंत्र, अधिक उपज देने वाले बीज, एवं रासायनिक उर्वरकों का उपयोग

कृषि में मशीनों का उपयोग - भूमि संसाधन के समुचित उपयोग, समय की बचत एवं उत्पादन की दृष्टि से महत्वपूर्ण है। कृषि आधुनिकीकरण में आधुनिक कृषि यंत्र, अधिक उपज देने वाले बीज एवं रासायनिक उर्वरकों आदि का उपयोग किया जाता है। कृषि आधुनिकीकरण का सूत्रपात 1960 के बाद प्रारम्भ हुआ, इससे पहले जिले में कृषि का स्वरूप पुरातन था। किन्तु वर्तमान में कृषि आधुनिकीकरण में बढ़ता मशीनों का प्रयोग, आधुनिक कृषि यंत्र, अधिक उपज देने वाले बीजों एवं रासायनिक खादों के उपयोग से कृषि में आधुनिकीकरण प्रारम्भ हुआ।

आधुनिक कृषि यंत्रों में - ट्रैक्टर, लोहे के हल, पावर टिलर्स एवं कल्टीवेटर्स मुख्य भूमिका निभाते है। आधुनिक कृषि यंत्रों में प्रति 100 हैक्टेयर शुद्ध काश्त क्षेत्रफल पर ट्रैक्टर की संख्या 4.25, थ्रेसर की संख्या 6.66, डीजल पम्पसेट की संख्या 1.69, विद्युत पम्पसेट की संख्या 0.48, लोहे के हल की संख्या 16.79, पावर टिलर्स की संख्या 0.16 है। उन्नत किस्म के बीजों द्वारा कृषि में आधुनिकीकरण प्रारम्भ हुआ। रासायनिक उर्वरकों एवं कीटनाशकों के उपयोग की विधि बताते हुए रासायनिक उर्वरकों के स्थान पर प्राकृतिक एवं जैविक खाद के उपयोग पर विशेष प्रकाश डालते हुए इनके लाभों का विवेचन किया गया है।

कृषि आधुनिकीकरण के स्तर मापन हेतु

चयनित 10 सूचकांक निम्न है -

1. प्रति 100 हैक्टेयर शुद्ध काश्त क्षेत्र पर ट्रेक्टर
2. प्रति 100 हैक्टेयर शुद्ध काश्त क्षेत्र पर थ्रेसर
3. प्रति 100 हैक्टेयर शुद्ध काश्त क्षेत्र पर लोहे के हल
4. प्रति 100 हैक्टेयर शुद्ध काश्त क्षेत्र पर डीजल पम्पसेट
5. प्रति 100 हैक्टेयर शुद्ध काश्त क्षेत्र पर विद्युत पम्पसेट
6. प्रति 100 हैक्टेयर शुद्ध काश्त क्षेत्र पर रासायनिक उर्वरकों का उपयोग
7. प्रति 100 हैक्टेयर शुद्ध काश्त क्षेत्र पर उन्नत किस्म के बीजों का उपयोग
8. प्रति 100 हैक्टेयर शुद्ध काश्त क्षेत्र पर कीटनाशक औषधियों का उपयोग
9. प्रति 100 हैक्टेयर शुद्ध काश्त क्षेत्र पर हार्वेस्टर का उपयोग
10. प्रति 100 हैक्टेयर शुद्ध काश्त क्षेत्र पर स्प्रेयर का उपयोग

ट्रेक्टर

वर्तमान समय में बढता हुआ मशीनों का प्रयोग कृषि आधुनिकीकरण है। कृषि कार्य में ट्रेक्टर एक बहुकार्यिक मशीन है, जो खेतों की जुताई, बुवाई, अनाज निकालने, फसलों को घर तक पहुँचाने एवं मण्डी तक ले जाने आदि कार्यो के उपयोग में लिया जाता है। कृषि मशीनीकरण में ट्रेक्टर एक आधार मशीन है। जिले में प्रति 100 हैक्टेयर शुद्ध काश्त क्षेत्र पर ट्रेक्टरों की संख्या में सर्वाधिक वृद्धि सादुलशहर तहसील में 3.83 हुई एवं सबसे कम वृद्धि अनूपगढ़ तहसील में 0.99 हुई। ट्रेक्टरों की संख्या में अत्यधिक वृद्धि हुई है जो कि कृषि में मशीनीकरण को दर्शाता है।

थ्रेसर

कृषि आधुनिकीकरण की नई प्रविधि के माध्यम से थ्रेसर का उपयोग बढा है। जो काम पशुओं द्वारा महीनों में होता था, वो अब थ्रेसर के माध्यम से कुछ घण्टों में हो जाता है। थ्रेसर का उपयोग भूसे से दानों को अलग करने में किया जाता है। इससे समय व श्रम की बचत होती है। जिले में प्रति 100 हैक्टेयर शुद्ध काश्त क्षेत्र पर थ्रेसरों की सख्या में सर्वाधिक वृद्धि सूरतगढ तहसील में 2.17 की वृद्धि हुई एवं सबसे कम वृद्धि रायसिंहनगर तहसील में 0.44 की वृद्धि हुई है। कृषि आधुनिकीकरण में थ्रेसरों का उपयोग बढ़ता ही जा रहा है। इनके उपयोग से समय एवं श्रम की बचत होती है।

लोहे के हल

लोहे के हल लकड़ी के हलों की तुलना में उपयोगी एवं टिकाऊ होते है। इसलिए जुताई एवं बुवाई के कार्यो में लोहे के हलों की संख्या बढती जा रही है। जिले में प्रति 100 हैक्टेयर शुद्ध काश्त क्षेत्र पर लोहे के हलों की सर्वाधिक संख्या सूरतगढ तहसील में 22.73 एवं सबसे कम संख्या अनूपगढ तहसील में 12.24 है। लोहे के हलों की सर्वाधिक वृद्धि 9.04 सूरतगढ़ तहसील में तथा सबसे कम वृद्ध 0.64 अनूपगढ तहसील में हुई।

अत स्पष्ट है कि कृषि आधुनिकीकरण में यंत्रीकरण की मुख्य भूमिका रही है। जिन तहसीलों में कृषकों की कार्य शक्ति अधिक है वहाँ ट्रेक्टरों की संख्या भी अधिक है, उनमें लोहे के हलों की संख्या में वृद्धि हुई है। जिले की आधे से अधिक तहसीलों में लोहे के हलों की संख्या में वृद्धि हुई।

डीजल पम्पसेट

कृषि अधुनिकीकरण में सिंचाई का काम डीजल पम्पसेटों से होने लगा है। डीजल पम्पसेटों से कम से कम समय में अधिक क्षेत्र में सिंचाई हो जाती है.

जिससे कृषकों को अधिक लाभ होता है। जिले में प्रति 100 हैक्टेयर शुद्ध काश्त क्षेत्र पर डीजल पम्पसेटों की सर्वाधिक संख्या अनूपगढ तहसील में 2.39 है एवं सबसे कम संख्या घड़साना तहसील में 0.06 है।

शुरूआत में डीजल पम्पसेटों की संख्या में वृद्धि हुई किन्तु धीरे धीरे कमी होती जा रही है, इसका मुख्य कारण क्षेत्र में नहरों द्वारा सिंचाई का होना है।

विद्युत पम्पसेट

विद्युत पम्पसेट कुऐं एवं ट्यूबवेल द्वारा सिंचाई किये जाने वाले क्षेत्रों में ही उपयोग में लिये जाते है। विद्युत पम्पसेटों की अधिक संख्या इस वजह से है कि सरकार ने ग्रामीण क्षेत्रों में विद्युतीकारण का सिंचाई एवं कृषि सहायक कार्यो के विकास हेतु विशेष ध्यान दिया। जिले में प्रति 100 हैक्टेयर शुद्ध काश्त क्षेत्र पर विद्युत पम्पसेटों की सर्वाधिक संख्या श्रीगंगानगर तहसील में 1.25 है, एवं सबसे कम संख्या 0.02 सादुलशहर तहसील में है।

हार्वेस्टर

कृषि आधुनिकीकरण में हार्वेस्टर की संख्या में वृद्धि होती जा रही है। प्रति 100 हैक्टेयर शुद्ध काश्त क्षेत्र पर हार्वेस्टर की सर्वाधिक संख्या सादुलशहर व घड़साना तहसीलों में 0.24 है एवं सबसे कम संख्या विजयनगर तहसीलों में 0.06 है।

रासायनिक उर्वरक

कृषि आधुनिकीकरण में रासायनिक उर्वरकों की मुख्य भूमिका रही है। रासायनिक उर्वरकों का सही समय एवं सही मात्रा में उपयोग करना कृषि के आधुनिक आदानों को दर्शाता है, जिले में प्रति 100 हैक्टेयर शुद्ध काश्त क्षेत्र पर रासायनिक उर्वरकों का सर्वाधिक उपयोग श्रीगंगानगर तहसील में 58.70 है एवं सबसे कम उपयोग पदमपुर तहसील में 50.60 है।

उन्नत किस्म के बीज

उन्नत कृषि प्रविधियों के साथ साथ उन्नत किस्म के बीजों का उपयोग भी कृषि आधुनिकीकरण में महत्व रखते है। उन्नत कृषि की नींव उन्नत किस्म के बीजों पर आधारित है। जिले में प्रति 100 हैक्टेयर शुद्ध काश्त क्षेत्र पर उन्नत किस्म के बीजों का उपयोग सर्वाधिक मात्रा में श्रीगंगानगर तहसील में 96.84 है एवं सबसे कम मात्रा में सूरतगढ व सादुलशहर तहसीलों में 83.86 है। अत: कृषि आधुनिकीकरण में उन्नत किस्म के बीजों के उपयोग का विशेष महत्व है।

कीटनाशक औषधियाँ

कृषि में फसलों के रोग नियंत्रण हेतु अनेक प्रकार के कीटनाशक औषधियों का उपयोग किया जाता है, जिले में प्रति 100 हैक्टेयर शुद्ध काश्त क्षेत्र पर कीटनाशक औषधियों का सर्वाधिक उपयोग सूरतगढ व सादुलशहर तहसीलों में 138.93 है एवं सबसे कम उपयोग करणपुर तहसील में 118.02 है। कृषि में फसलों के रोग नियंत्रण हेतु कीटनाशक औषधियों का उपयोग नितान्त आवश्यक है।

स्प्रेयर

कीटनाशक औषधियों के प्रयोग हेतु स्प्रेयर तरल पदार्थो के छिड़काव में काम आते है। जिले में प्रति 100 हैक्टेयर शुद्ध काश्त क्षेत्र पर स्प्रेयर की सर्वाधिक संख्या सादुलशहर तहसील में 1.87 है एवं सबसे कम संख्या घड़साना तहसील में 0.30 पायी गयी है। स्प्रेयर सदैव काम में न आने वाला कृषि उपकरण है, बल्कि फसल विशेष में जब कभी बीमारी लगती है, तब कृषक इन्हे काम में लेते है।

तालिका के अन्तिम कॉलम में (+) और

(-) में सामूहिक सूचकांक दिये गये है।

उपरोक्त विधि द्वारा परिकलित परिमाण - स्तर मापन के मानचित्र में प्रदर्शित किया गया है। मानचित्र के अवलोकन से यह तथ्य उभर कर सामने आता है कि कृषि आधुनिकीकरण के परिमाण में विभिन्न सूचकांकों को तहसीलों की भौगोलिक दशाओं ने प्रभावित किया है। कृषि आधुनिकीकरण में सहायक आर्थिक एवं सामाजिक दशाऐं भौगोलिक दशाओं की तुलना में गौण रूप से मुखरित हो पा रही है। भौगोलिक दशाओं से प्रभावित होने के कारण जिले में कृषि का आधुनिकीकरण स्तर उत्तरी-पूर्वी भाग की तुलना में पश्चिम भाग में निम्न स्तर पर हो पाया है अर्थात् उत्तरी-पूर्वी भाग में उच्च है।

प्रमाणीकरण मान एवं संयुक्त सूचकांक विधि द्वारा परिकलित परिमाणों के आधार पर जिले को

श्रीगंगानगर जिले में कृषि आधुनिकीकरण स्तर मापन (2015-16) सूचकांकों से प्रमापीकरण व संयुक्त सूचकांक द्वारा परिकलित

क्र. तहसील स.	कुल कास्त क्षेत्रफल	हार्वेस्टर	कीटनाशक औधध्यिां	ट्रैक्टर	थ्रेसर	लोहे के हल	डीजल पम्पसेट	विद्युत पम्पसेट	रासायनिक उर्वरक	उन्नत बीज	सकल मूल्य	संयुक्त सूचकांक
1. श्रीगंगानगर	+1.32	+0.03	+1.00	+0.79	+1.16	-0.43	-0.37	+1.74	+1.54	+1.30	+8.08	+0.80
	116.28	104.03	135.64	5.67	6.99	14.49	0.97	1.25	58.70	96.84		
2. करणपुर	+0.24	+0.17	-1.50	+0.69	+0.16	-0.84	-0.08	-1.05	-1.69	+0.60	-3.55	-0.35
	89.95	100.65	118.02	5.42	5.60	13.36	1.34	0.52	47.50	94.05		
3. पदमपुर	+0.96	-1.22	+0.04	-0.02	+1.39	+0.21	+1.18	+1.56	-0.79	+0.63	+3.94	+0.39
	107.34	83.55	128.94	4.51	7.32	16.27	2.24	1.17	50.60	94.17		
4. रायसिंह नगर	+0.56	-1.44	-1.22	-0.20	-0.17	+0.13	-0.37	-0.04	-0.28	+0.83	-2.33	-0.23
	97.64	79.91	120.02	4.25	5.13	16.06	0.97	0.48	52.40	94.97		
5. अनूपगढ़	-0.03	+0.81	+0.63	-0.63	-0.50	0.28	+1.36	+0.44	-0.66	+0.59	+0.94	+0.09
	84.67	116.72	133.38	3.64	4.67	14.90	2.39	0.69	51.08	94.01		
6. सूरतगढ़	+0.03	+0.68	+1.47	+1.82	-1.64	-1.22	-1.15	-1.12	+0.08	-1.96	-3.01	-0.30
	84.67	114.62	138.93	7.17	3.08	12.29	0.33	0.02	53.39	83.86		
7. सादुलशहर	+0.03	+0.68	+1.47	+1.82	-1.64	-1.22	-1.55	-1.12	+0.08	-1.96	-3.01	-0.30
	82.62	114.62	138.93	7.17	3.08	12.29	0.33	0.02	53.39	83.86		
8. विजय नगर	+0.26	-0.07	+0.09	-0.18	-0.02	-0.25	-1.48	-1.09	-0.15	-1.03	-3.69	-0.36
	90.37	102.28	129.25	4.29	5.33	14.99	0.06	0.03	52.84	87.58		
9. घड़साना	-0.83	-0.07	+0.09	-0.18	-0.02	-0.25	-1.48	-1.09	-0.15	-1.03	-5.01	-0.50
10. समान्तर माध्य	83.86	103.49	128.59	4.54	5.37	15.69	1.27	0.50	53.36	91.66		
11. प्रमाप विचलन	24.57	16.30	7.03	1.42	1.40	2.78	0.82	0.43	3.47	3.97		

नोटः + और - के मान प्रमाणीकरण व संयुक्त सूचकांक विधि द्वारा प्रमाणित मान है।
स्रोत-शोधार्थी द्वारा परिकलित

पाँच कृषि आधुनिकीकरण स्तर वर्गो में विभाजित किया गया है। जिले के पाँच कृषि आधुनिकीकरण वर्गो का विवरण इस प्रकार है -

1. उच्चतम कृषि आधुनिकीकरण वर्ग :- + 0.20 से 0.80 तक
2. उच्च कृषि आधुनिकीकरण वर्ग :- +0.1 से + 0.20 तक
3. मध्यम कृषि आधुनिकीकरण वर्ग :- -0.1 से - 0.20 तक
4. निम्न कृषि आधुनिकीकरण वर्ग :- - 0.20 से - 0.40 तक
5. निम्नतम कृषि आधुनिकीकरण वर्ग:- - 0.40 से 0.80 तक

उच्चतम कृषि आधुनिकीकरण वर्ग

इस वर्ग में जिले की दो तहसीलें शामिल है। आधुनिकीकरण के संयुक्त सूचकांकों के आधार पर इसमें क्रमश: श्रीगंगानगर व सूरतगढ़ तहसीलें शामिल है। जिसमें संयुक्त सूचकांक का स्तर 0.20 से 0.80 तक आता है। उच्चतम वर्ग की दो तहसीलों के सूचकांकों में धनात्मक परिवर्तन दिखाई देता है अर्थात् इस वर्ग के सभी सूचकांकों में वृद्धि हुई है। विशेषकर इस वर्ग में उच्चतम कृषि आधुनिकीकरण के मुख्य कारण अनुकूल भौगोलिक दशायें, काश्त क्षेत्र में वृद्धि के साथ सिंचाई सुविधाओं का विकास, उन्नत किस्म के बीज, रासायनिक उर्वरकों एवं फसलों में लगने वाली बीमारी के नियंत्रण हेतु कीटनाशक औषधियों का बढता उपयोग, कृषि के आधुनिक यंत्रों का बढता उपयोग एवं आधारभूत सामाजिक व आर्थिक सुविधाओं के सहयोग से उच्च परिवर्तन आया है।

उच्च कृषि आधुनिकीकरण वर्ग

इस वर्ग में जिले की तीन तहसीलें शामिल है। आधुनिकीकरण के संयुक्त सूचकांको के आधार पर इसमें क्रमश: अनूपगढ, सूरतगढ व पदमपुर तहसीलों को शामिल किया गया हैं। इन तहसीलों में संयुक्त सूचकांक का स्तर 0.01 से 0.20 तक है। इस वर्ग में पदमपुर व सूरतगढ तहसीलों का सूचकांक उच्च है और अनूपगढ तहसील का सूचकांक 0.09 तक है।

उच्च आधुनिकीकरण होने का मुख्य कारण इन तहसीलों में उपजाऊ मृदा व सिंचाई सुविधाओं का विकास का होना है।

मध्यम कृषि आधुनिकीकरण वर्ग

इस वर्ग में जिले की रायसिंहनगर तहसील को शामिल किया गया है। आधुनिकीकरण के संयुक्त सूचकांको के आधार पर इस वर्ग में संयुक्त सूचकांक - 0.01 से -0.20 तक आता है। मध्यम कृषि आधुनिकीकरण वर्ग की इस तहसील के औसत सूचकांकों में कमी आयी है या मध्यम स्तर की वृद्धि हुई है।

मध्यम कृषि आधुनिकीकरण के मुख्य कारण - सिंचाई सुविधाओं का धीमा विकास, आधुनिक कृषि आदानों का उपयोग कम, प्रतिकूल भौगोलिक दशायें, रासायनिक उर्वरक, उन्नत किस्म के बीज एवं मशीनीकरण का कम उपयोग आदि के परिणामस्वरूप आधुनिकीकरण स्तर मध्यम है। लेकिन फिर भी पिछले 10 वर्षो भी तुलना में काफी परिवर्तन दिखाई दे रहा है।

निम्न कृषि आधुनिकीकरण वर्ग

इस वर्ग में जिले की सादुलशहर, करणपुर व विजयनगर तहसीलों को शामिल किया गया है। कृषि आधुनिकीकरण के संयुक्त सूंचकांकों के

आधार पर इस वर्ग में संयुक्त सूचकांक का स्तर - 0.20 से -0.40 तक आया है। निम्न कृषि आधुनिकीरण वर्ग में संयुक्त सूचकांको का मान धनात्मक की तुलना में ऋणात्मक अधिक है।

यहां निम्न कृषि आधुनिकीकरण का प्रमुख कारण सिंचाई सुविधाओं का विकास कम होना, लेकिन क्षेत्र में नहरों द्वारा सिंचाई सुविधा सुलभ होने पर धीरे धीरे परिवर्तन आ रहे है।

निम्नतम कृषि आधुनिकीकरण वर्ग

इस वर्ग में जिले की घड़साना तहसील को शामिल किया गया है। कृषि आधुनिकीकरण के संयुक्त सूचकांको के आधार पर इस वर्ग में संयुक्त सूचकांक - 0.40 से -0.80 तक आता है। इस वर्ग में घड़साना तहसील का संयुक्त सूचकांक - 0.50 है जो निम्नतम स्तर माना गया है।

कृषि आधुनिकीकरण के निम्नतम स्तर का प्रमुख कारण शुष्क जलवायु, सिंचाई सुविधाओं का अभाव, वर्षा की न्यूनतम मात्रा के साथ साथ काश्त क्षेत्र में कमी एवं आधुनिक कृषि आदानों का कम उपयोग होना है।

निष्कर्ष

जिले में कृषि आधुनिकीकरण के लिए आधारभूत सुविधाओं की विस्तृत रूप से विवेचना की गई है। कृषि आधुनिकीकरण प्रक्रिया से जिले के कृषि क्षेत्र में समयानुसार परिवर्तन आने लगा है तथा कृषि समयानुसार परिवर्तित होकर आधुनिकीकरण से जुड़ती जा रही है। कृषि विकास हेतु जिले में किसानों को आधारभूत सुविधाऐं उपलब्ध करवायी जा रही है। जैसे - पूँजी विस्तार सेवा सुविधाऐं, गहन पूँजी सुलभ सुविधाऐं, संस्थागत सेवा सुविधाऐं आदि। कृषि आधुनिकीकरण प्रक्रिया के अन्तर्गत जिले में नई कृषि तकनीकियों का उपयोग बढता जा रहा है। पिछले 10 वर्षो में कृषि मशीनों के उपयोग के कारण कृषि में क्रांति आई है। जिले में कृषि कार्यो में प्रयुक्त मुख्य कृषि यंत्र एवं औजारों में आशातीत वृद्धि हुई है। जिले में कृषि आधुनिकीकरण के लिए आधुनिक कृषि आदानों के उपयोग की दृष्टि सर्वाधिक विकसित क्षेत्र है।

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सिरोही जिले में आधारभूत संरचना का स्वरूप एवं मूल्यांकन

सुनील बैरवा

सारांश

आधारभूत सुविधाएँ किसी प्रदेश के विकास का सूचक होती है। आधारभूत सुविधाओं के विकास का सम्बन्ध प्रदेश की गुणात्मक जनसंख्या एवं भौगोलिक स्थिति से है। आधारभूत सुविधाएँ अर्थतंत्र में मेरूदण्ड के समान है जो नगरीयकरण की प्रक्रिया को भी गति प्रदान करती है। प्रस्तुत शोधपत्र के माध्यम से सिरोही जिले की आधारभूत सुविधाओं जैसे शिक्षा, चिकित्सा, परिवहन, बाजार, बैंकिग एवं पोस्टल आदि की संरचना-स्वरूप का अध्ययन करना तथा संयुक्त सूचकांक विधि का प्रयोग करते हुए विभिन्न तहसीलों मे उपलब्ध आधारभूत सुविधाओं के आधार पर विकास के स्तर को ज्ञात करना है एवं विकास मे पायी जाने वाली असमानताओं का गंभीरतापूर्वक अध्ययन करते हुये उपर्युक्त सुझाव देना है।

मूल बिन्दु : *आधारभूत सुविधाएँ, सेवा केन्द्र,विकास का स्तर, जनसंख्या का संकेन्द्रण*

प्रस्तावना

किसी भी प्रदेश का आर्थिक, सामाजिक एवं सांस्कृतिक विकास उस प्रदेश में उपलब्ध आधारभूत सुविधाओं पर निर्भर करता है। जिस प्रदेश में आधारभूत सुविधाएं अच्छी होती है उस प्रदेश का आर्थिक-सामाजिक स्तर भी ऊँचा होता है। आधारभूत सुविधाओं के धनात्मक स्तर को विकास का पैमाना भी कहा जा सकता है। जिस राष्ट्र या प्रदेश में आधारभूत सुविधाओं का स्तर न्यून होता है, वह प्रदेश पिछड़े विकास की श्रेणी में आ जाता है। ग्राम से नगरों की ओर बड़े पैमाने पर लोगों का पलायन करने का मुख्य कारण नगर में पायी जाने वाली उच्च स्तरीय आधारभूत सुविधाएं सरल एवं आसानी से मिलना होता है। जहां आधारभूत सुविधाएँ अधिक पायी जाती है वहां जनसंख्या का संकेन्द्रण भी अधिक पाया जाता है।

सिरोही जिला प्रारम्भ से ही आदिवासी जनजातीय क्षेत्र रहा है जहां भील, गरासिया, मीणा आदि जनजातियां निवास करती है, लेकिन धीरे-धीरे आधारभूत सुविधाओं के विस्तार होने से यह जिला अब आदिवासी क्षेत्र नहीं रहा है। शिक्षा, परिवहन, चिकित्सा सुविधाओं के बढ़ने से जिले का विकास होने लगा है, लेकिन वर्तमान समय तक सिरोही जिले में आधारभूत सुविधाओं का संतोषप्रद विकास नहीं हो पाया है जिसका कारण जिले का पवर्तीय-पहाड़ी क्षेत्र के रूप में पाया जाना, घने जंगल का विस्तार, जनजातीय बाहुल्य क्षेत्र का आज भी क्षेत्र विशेष में पाया जाना है।

अध्ययन क्षेत्र

अध्ययन क्षेत्र सिरोही जिला अनियमित त्रिकोण की आकृति का है जो राज्य के दक्षिण पश्चिम भाग मे 24°20' से 25°17' उतरी अक्षांश तथा 72°16'

से 73°10' पूर्वी देशान्तर के मध्य स्थित है इसके उत्तर पूर्व में पाली जिला, पूर्व में उदयपुर जिला, उत्तर पश्चिम में जालौर जिला और दक्षिण में गुजरात राज्य का बनासकांठा जिला है। अध्ययन क्षेत्र का क्षेत्रफल 5136 वर्ग किलोमीटर है जो राज्य के कुल क्षेत्रफल का 1.5 प्रतिशत है। जिले की कुल जनसंख्या 1037185 है जो यूरोप के साईप्रस एवं यू.एस.ए. के रोहड द्वीप के लगभग बराबर है। सम्पूर्ण जिला पहाड़ियों एवं पर्वत श्रेणियों से घिरा है। अरावली की मुख्य पर्वत श्रेणी आबू पर्वत जिले की दक्षिणी सीमा बनाती है, जिले की समुद्र तल से उँचाई 300-350 मीटर तक है। जिले की जलवायु सामान्यतया आर्द है, जिले की सामान्य वार्षिक वर्षा 591.2 मिलीमीटर है। जिले कें जल संसाधनो में मुख्यत: स्त्रोत नदियाँ, तालाबों एवं झीलो को सम्मिलित किया गया है। जिले की मुख्य नदियॉ पश्चिमी बनास, जवाई, सूकडी, खारी, कृष्णावती, बाडी, कपालगंगा तथा सूकली है।

विधि तंत्र:

सिरोही जिले में निम्नलिखित आधारभूत सुविधाऐं पायी जाती जिसके आधार पर जिले की आधारभूत संरचना के विकास स्तर को मालूम किया गया है।

परिवहन सुविधा

अच्छी परिवहन सुविधा आर्थिक विकास की रक्त धमनी के समान होती है। जिले में 2006-2007 में पेंटेड रोड़ 1731 किलोमीटर तथा ग्रेवल 38 किमी है। जिले में रेल परिवहन सुविधा आबूरोड में अधिक विकसित है। समीपी हवाई अड्डा जिले से 164 किलोमीटर उदयपुर में स्थित है।

शिक्षा

सिरोही जिले में शिक्षा का विकास राज्य के अन्य जिलों की तुलना में काफी कम हुआ है। जिले में 5 सरकारी कॉलेज, 4 व्यवसायिक कॉलेज, उच्च माध्यमिक विद्यालय 164, माध्यमिक विद्यालय 38 तथा उच्च प्राथमिक विद्यालय 191 तथा प्राथमिक विद्यालय 840 है। सम्पूर्ण जिले में 1239 शिक्षण-संस्थाएं कार्यरत है।

चिकित्सा एवं स्वास्थ्य

जिले में 3 चिकित्सालय, 6 सामुदियक स्वास्थ्य केन्द्र, 191 ब्लॉक प्राथमिक स्वास्थ्य केन्द्र, 40 मातृत्व निशुल्क केन्द्र, 22 प्राथमिक स्वास्थ्य केन्द्र हैं। जनसंख्या स्थायित्व तथा सभी को स्वस्थ्य रखने के उद्देश्य से चिकित्सा एवं स्वास्थ्य विभाग विभिन्न गतिविधियों एवं योजनाओं को क्रियान्वित कर रहा है।

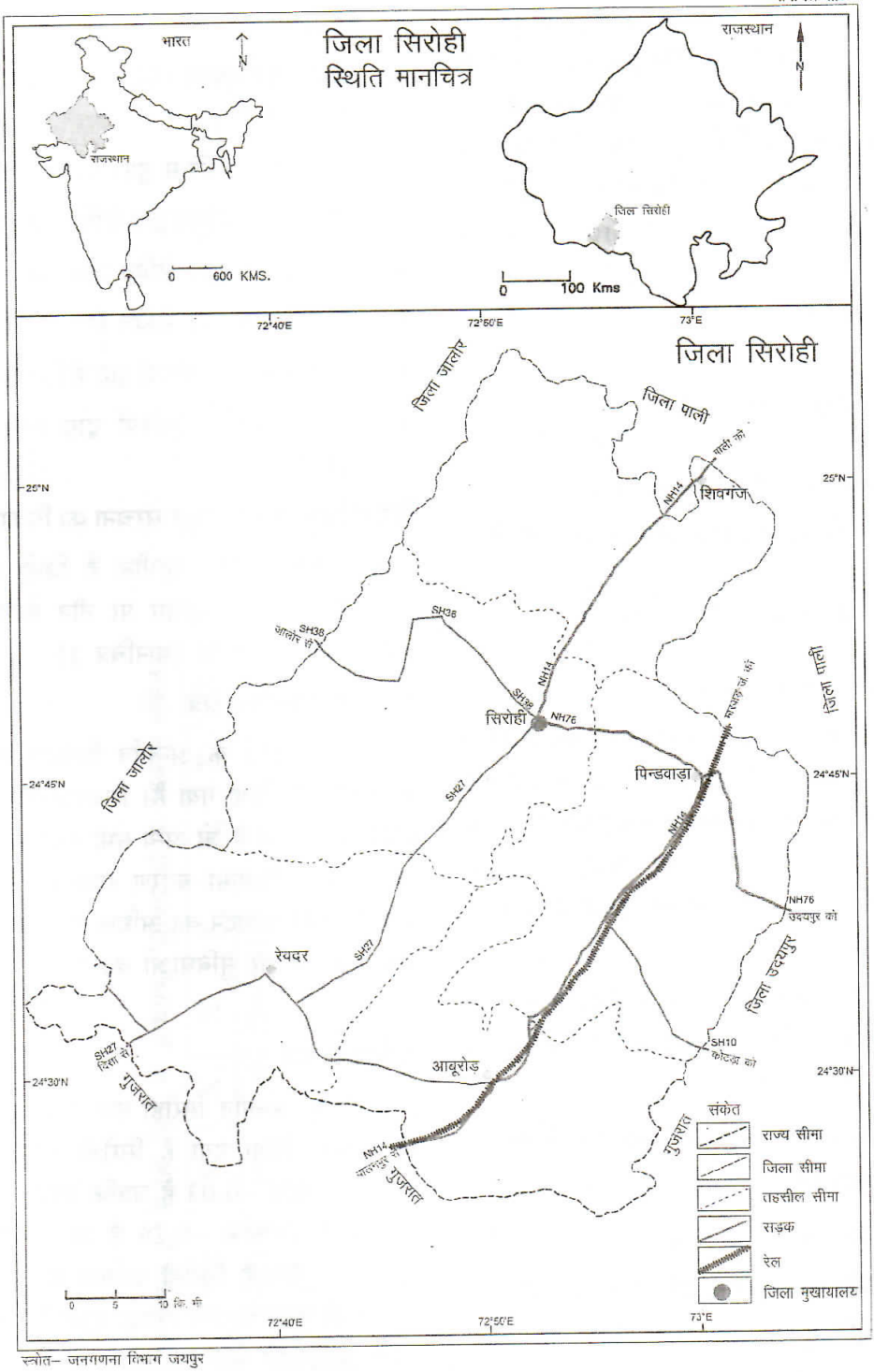
अन्य सुविधाएँ

जिले में बैंक, बाजार, सहकारी समितियाँ, डाक - तार, विद्युत आदि सुविधाएँ भी विद्यमान है लेकिन इन सुविधाओं का सर्वाधिक संकद्रेण तहसील एव जिला मुख्यालय तक ही है। ग्रामीण क्षेत्र आज भी इन सुविधाओं से वंचित है। जिले में विकास का स्तर आधारभूत सुविधाओं के वितरण पर ही निर्भर करता है।

आधारभूत सुविधाओं के आधार पर विकास स्तर

एम.एन.पाल (1962) ने अपने अध्ययन '' भारत में विकास के स्तर मे क्षेत्रीय असमानता'' में विभिन्न विकास संकेतों को लेकर सयुक्त सूचकांक विधि का प्रयोग किया है। **के.एल.शर्मा (1975)** ने अपने अध्ययन ''राजस्थान में स्थानिक असमानताओं'' में विभिन्न आर्थिक संकेतो का प्रयोग करते हुए सयुक्त सूचकांक विधि का प्रयोग किया। **आर.एन. मिश्रा (2002)** ने अपने अध्ययन ''ट्राइबल लाइफ एण्ड हेबीटेड'' में दक्षिण राजस्थान के आदिवासी क्षेत्र में क्षेत्रीय असमानताओं का मापने के लिए सयुक्त

मानचित्र सं.



स्त्रोत– जनगणना विभाग जयपुर

सूचकांक विधि का इस्तेमाल किया है। प्रस्तुत शोध पत्र में 12 सूचकांकों का आँकड़ा (Data), जनगणना 2011 को आधार मानकर लिया गया है तथा संयुक्त सूचकांक विधि द्वारा विकसित क्षेत्रों का सीमांकन किया गया है जिसमें मानकीकृत मान (Standardized Value) द्वारा Gross Value ज्ञात की गयी है।

मानकीकृत मान

$$(\text{Standardized Value}) = \frac{x - \bar{x}}{SD}$$

(Goss Value= Total of Sd. Value)

अंत में संयुक्त सूचकांक ज्ञात किया जाता है।

$$\text{संयुक्त सूचकांक } (CI) = \frac{\text{Gross Value}}{N}$$

N=कुल चरों की संख्या

विकास के निम्न स्तर को जबकि कम सूचकांक का मान विकास के उच्च स्तर को इंगित करता है। सिरोही जिले में तहसीलवार आधारभूत सुविधाओं की संरचना के आधार पर विकास स्तर को निम्नलिखित चरों एवं संयुक्त सूचकांक विधि के माध्यम से प्रस्तुत किया गया है।

आधारभूत सुविधाओं के विकास स्तर को ज्ञात करने के लिए तहसीलवार निम्नलिखित चरों का प्रयोग किया गया है:-

X_1 प्रति शिक्षा केन्द्र द्वारा सेवित जनसंख्या

X_2 प्रति शिक्षा केन्द्र द्वारा सेवित क्षेत्र (किमी.)

X_3 प्रति स्वास्थ्य केन्द्र द्वारा सेवित जनसंख्या

X_4 प्रति स्वास्थ्य केन्द्र द्वारा सेवित क्षेत्र (किमी.)

X_5 प्रति श्रुद्र दुकान (पेटी शॉप) द्वारा सेवित जनसंख्या

X_6 प्रति श्रुद्र दुकान (पेटी शॉप) द्वारा सेवित क्षेत्र (किमी.)

X_7 प्रति पोस्ट ऑफिस द्वारा सेवित जनसंख्या

X_8 प्रति पोस्ट ऑफिस द्वारा सेवित क्षेत्र (किमी.)

X_9 प्रति बैंकिंग द्वारा सेवित जनसंख्या

X_{10} प्रति बैंकिंग द्वारा सेवित क्षेत्र (किमी.)

X_{11} प्रति सहकारी समितियों द्वारा सेवित जनसंख्या

X_{12} प्रति सहकारी समितियों द्वारा सेवित क्षेत्र (किमी.)

सिरोही जिले में आधारभूत संरचना का विकास स्तर

सिरोही जिले में पांच तहसील हैं जिन्हें संयुक्त सूचकांक विधि के आधार पर तीन श्रेणियों में वर्गीकृत किया गया है। (मानचित्र 1)

1. औसत विकसित क्षेत्र

इस श्रेणी के अन्तर्गत शिवंगज तहसील को सम्मिलित किया गया है। शिवगंज का सयुक्त सूंचकाक -1.34 है जो अन्य सभी तहसीलों से भी सर्वाधिक है जिसका कारण समतल, उपजाऊ धरातल, कृषि उत्पादन का अधिक पाया जाना एवं शिक्षा तथा बाजार सुविधाओं का अधिक विस्तार होना है।

2. पिछड़ा क्षेत्र

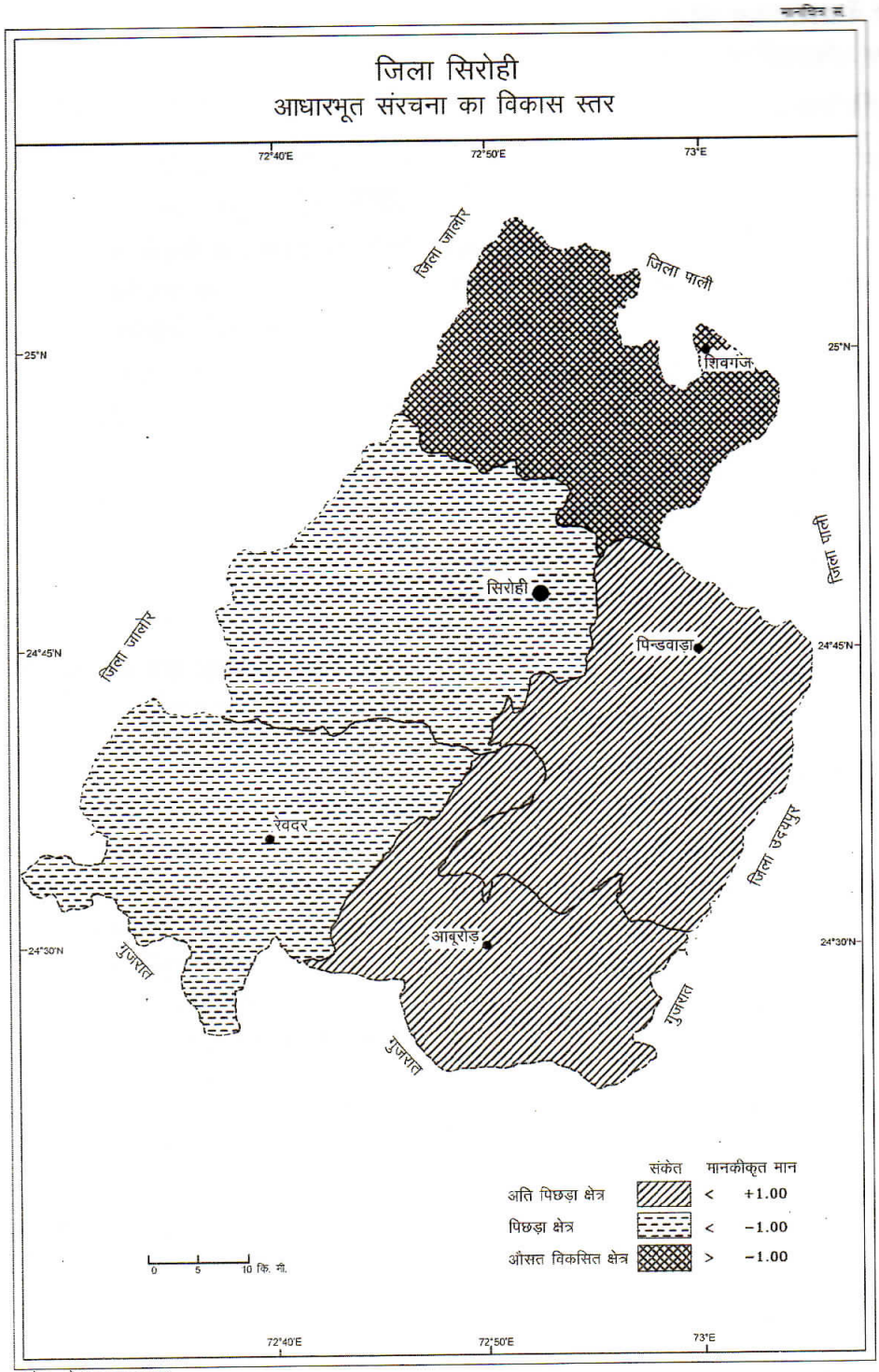
इस श्रेणी के अन्तर्गत सिरोही तथा रेवदर तहसील को शामिल किया गया है सिरोही तहसील का सयुक्त सूचकांक -0.03 है जबकि रेवदर तहसील का सयुक्त सूचकांक -0.23 है जो कि सिरोही तहसील से कम है सिरोही वर्तमान में आज भी विकास की मुख्य धारा से पिछडा हुआ है। जिसका कारण आदिवासी क्षेत्र का अधिक पाया जाना है।

सारणी संख्या 1: सिरोही जिले में आधारभूत सुविधाओं के विकास संकेतक

क्र.सं.	तहसील	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}
1	शिवगंज	808	5.08	2189	13.7	2372	14.52	4744	29.84	15814	99.47	5271.4	33.15	4186	26.33
2	सिरोही	827	5.22	2696	17.03	2549	16.09	4651	29.38	18607	117.52	5316.5	33.57	5638	35.12
3	पिण्डवाडा	927	4.28	2973	12.91	2754	11.95	7476	25.57	32710	142.01	9345.9	40.57	9345	40.57
4	आबूरोड	850	3.34	3869	15.24	2876	11.33	5342	21.04	18700	73.17	6800	26.78	14960	58.93
5	रेवदर	781	3.83	2738	13.44	2521	12.37	5838	28.65	27731	136.10	8532	41.87	3892	19.10
	माध्य Mean (X)	838.6	4.35	2893	14.46	2614.4	13.25	5610.2	26.89	22712.4	113.6	7053.16	35.18	7604.2	36.01
	मानकीकृत (S.D.)	49.9	0.56	546.56	1.49	178.7	3.10	1027.17	3.75	6006.88	25.15	1655.19	5.49	1229.91	13.61

सारणी संख्या :2 मानकीकृत मान (Standardised Value)

क्र. स.	तहसील	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}	Gross Value	संयुक्त सूचकाकं (Comp-site Index)
1	शिवगंज	−0.61	+1.30	−1.28	−0.63	−1.35	0.40	−0.84	0.78	−1.14	−0.56	−11.07	−0.36	−2.7	−0.71	−18.77	−1.34
2	सिरोही	−0.23	1.55	−0.36	1.72	−0.36	0.91	−0.93	0.66	−0.68	0.15	−1.04	−0.29	−1.5	−0.06	−0.44	−0.03
3	पिण्डवाडा	1.77	−0.12	0.14	−1.04	0.78	−0.41	1.81	−0.35	1.66	1.12	1.38	0.98	1.41	0.33	9.16	0.65
4	आबूरोड	0.23	−1.80	1.78	+0.52	1.46	−0.61	−0.26	−1.56	−0.66	−1.60	−0.15	−1.53	5.98	1.68	3.48	0.24
5	रेवदर	−1.15	−0.92	−0.02	−0.68	−0.52	−0.28	0.22	0.46	0.83	0.89	0.89	1.21	−3.01	−1.24	−3.32	−0.23



स्त्रोत– लेखक द्वारा गणना

रेवदर में ग्रामीण स्तर की प्रधानता एवं शिक्षा, तथा बाजार सुविधाओं की कमी है।

3. अति पिछड़ा क्षेत्र

इस श्रेणी के अन्तर्गत पिण्डवाडा एवं आबूरोड तहसील को शामिल किया गया है जिसका संयुक्त सूचकांक क्रमश: 0.65 तथा 0.24 है। यहाँ पर विकास का स्तर अधिक पिछड़ा होने का मुख्य कारण पर्वतीय क्षेत्र की प्रधानता, रूढीवादी परम्पराऐं तथा आधारभूत सुविधाओं में असमानता का पाया जाना है।

निष्कर्ष

सिरोही जिला आज भी राज्य के अन्य जिलों की तुलना में विकास की दृष्टि से पिछड़ा हुआ है जिसका मुख्य कारण अध्ययन क्षेत्र में पायी जाने वाली भौगोलिक धरातलीय विषमता, आदिवासी जनजाति क्षेत्र, सघन वनीय तथा पर्वतीय क्षेत्र भी है। परिवहन सुविधा किसी भी क्षेत्र के लिए सबसे महत्वपूर्ण एवं विकास का सूचकांक भी होती है, लेकिन जिले में सड़क व रेलमार्ग पूर्ण विकसित नहीं हो सका है। एक मात्र आबूरोड में रेलवे स्टेशन है। जिले में शिक्षा का निम्न स्तर, बडे उद्योग-धन्धों का अधिक विस्तार न होना, अधिकतर जनसंख्या जिला मुख्यालय एवं तहसील पर निर्भर है, जिसका मुख्य कारण विशिष्ट उच्च स्तरीय सेवा केन्द्रो का नहीं होना। सरकारी व अर्द्धसरकारी सुविधाओं के वितरण में असमानता पाये जाने के कारण भी अध्ययन क्षेत्र में आधारभूत सुविधाओं की कमी पायी जाती है।

समस्याएँ

शिक्षा का निम्न स्तर का पाया जाना कारण सरकारी एवं अर्द्धसरकारी शिक्षण संस्थाओं की कमी का होना। परिवहन सुविधा में धरातलीय विषमता एक बाधक है। चिकित्सा सुविधाएं जिला मुख्यालय पर ही केन्द्रित है। बडे उद्योग धन्धो के लिए पूंजी एवं सरकारी ऋण सुविधाओं की कमी का होना एवं विकास केन्द्रो का ग्रामीण क्षेत्रों में पूर्ण रूप से विकसित न होना।

सुझाव

शिक्षा एव स्वास्थ्य के क्षेत्र में अत्यधिक कार्य किये जाने की आवश्यकता है। जिले में औद्यौगिक परिदृश्य में स्टोन क्राट, टेराकोटा, हस्तशिल्प, खनिज एवं वन उत्पाद आधारित उघोग विकसित करने से रोजगार की समस्या कम होगी परिणामस्वरूप जिले कि आधारभूत सुविधाओं में भी वृद्वि होगी। स्थानीय सामुदायिक संगठन को जागरूक किया जावे। विकास केन्द्रो को ग्रामीण क्षेत्रों तक विकसित करने का प्रयास किया जाये। सरकारी एवं अर्द्धसरकारी सेवाओं के वितरण की असमानता को कम किया जावे अर्थात जिले के समग्र क्षेत्र को ध्यान में रखकर विकास योजनाऐं बनाई जाये।

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