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DRINKING WATER AND IMPACT ON URBANIZATION RESOURCES ON SOUTH RAJASTHAN REGION

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ABSTRACT

Rajasthan has one of the most critical water statuses. Rajasthan with more than 10.4 % of the country geographical area. More than 60% of the state is a part of the great Thar desert , and of the total 142 blocks in the country ,85 blocks are in the state of rajasthan . increasing population coupled with erratic rainfall further aggravates the water crisis . it is possible to implementation of local water governance. This hase resulted in the rise in water levels in the shallow aquifer , increase in the area under sungle and double crops , increase in forest cover and drinking water supply security. The other advantage if this structure is that it checks soil erosion , miligates,floods and ensures water availability in wells or boreholes used for drinking water supply, even for several successive drought years. Ground water is increasingly being sought as a source of drinking water due to the scarcity, non-availibility and bacteriological pollution of surface water. The interesting fact is that the hardness alone is making ground water unfit for drinking

KEYWORDS: *INCREASING, RAINFALL, DRINKING, ERISION, FLOODS, AVAILIBILITY, HARDNESS, AQUOFER.*

INTRODUCTION

In the Mewar region the trend of rainfall has been decreasing since lG90 when it was 89.49, 11 1.60, 85.50 cm and in 2000 it was 46.64, 47.76, 30.73, 39.99 cm in Bhilwara, Chittorgarh, Rajsamand & Udaipur respectively.

In the years 2015-16 although the amount of rainfall has been satisfactory in Bhilwara, Chittorgarh and Rajsamand regions of Mewar with Udaipur as an exception but good rainfall is not enough until and unless proper planning is done for the conservation and management of the available resource i.e. water along with potable water. Due to developing infrastructure, industrialization, population explosion has let to urbanization of the four districts of Mewar. The cities of these districts are facing acute water crisis specially that of potable water. The selection criteria (50,000 population as per 2011 census) has been the size of the towns. If we go for the less population than the number of towns under study increases many times which hinderances the accurate study of all the units. Similarly if we go for the higher population than the present one than number of towns reduces, one or two. Hence the number of towns & cities under study justifies the appropriate number of units by taking 50,000 population as the base. In recent years it has been witnessed that these five units have grown up with an alarming rate of urbanization where water has become a main issue. The towns taken for the proposed research work have population above 50,000 and they are given in table no. 1.1

Table No. 1 : Administrative Set Up - 2011

S.No.	Districts	No. of Subdivision	No. of Tehsils	City	Class	No. 0 wards
1	Bhilwara	8	12	Bhilwara	M2	45
2	Chittorgarh	8	13	Chittorgarh	II	35
				Nimbahera	II	30
3	Rajsamand	4	7	Rajsamand	II	25
4	Udaipur	8	10	Udaipur	M3	50
	Stady Region	**28**	**42**			**185**

Source: Census of Rajasthan, 2011

OBJECTIVES OF THE PROPOSED RESEARCH PAPER

- The study of the Mewar Region in terms of the geographical conditions.
- To study the Hydrology and the Hydrograph and the status of potable water in the Mewar Region.
- To study quality of the water and its distribution pattern in various cities of the Mewar Region.
- To study the impact assessment of urbanization on the water resources.

METHODOLOGY & DATA SOURCES

The collection of data was done at primary and secondary level for the research work.

Collection of Primary Data

Primary data was collected wardwise through schedule and water sample were also collected. 185 water samples were collected and tested by Swach Sansthan and 185 schedules were filled.

Collection of Secondary Data

Secondary data was collected from various government and non government organizations. Data related to water demand, supply, duration, interval, pressure, distribution zone was collected from PHED deptt. of Bhilwara, Chittorgarh, Nimbahera, Rajsamand and Udaipur. Data related to future strategy of water supply was collected from PHED and RUIDP. Data related to temperature was collected from Indian Meteorological Department, Jaipur. Besides all these data related 'to underground water was collected from Under Ground Water Department, Udaipur, Bhilwara, Chittorgarh.

Analysis of data was done by different techniques like departyp from the average of annual rainfall, for number of rainy days, correlation between water demand and supply and per person water demand & supply, wardwise. Scarcity water was also calculated by finding out the difference between demand & supply. The fluctuation between pre monspon water level and post monsoon water level was also calculated by finding out the difference between the pre monsoon water level and the post monsoon water level. The representation of data was done by using cartographic techniques like charts, graphs, maps and tables also helped in data representation. Maps were prepared using Arc GIS 09, Coral and TNT lite, Adobe Arcade. The maps have been prepared on Vector and Raster which have there limitations along with Google Earth. Some maps have been taken from Town Planning Department of the various cities.

MEWAR REGION : LOCATION MAP

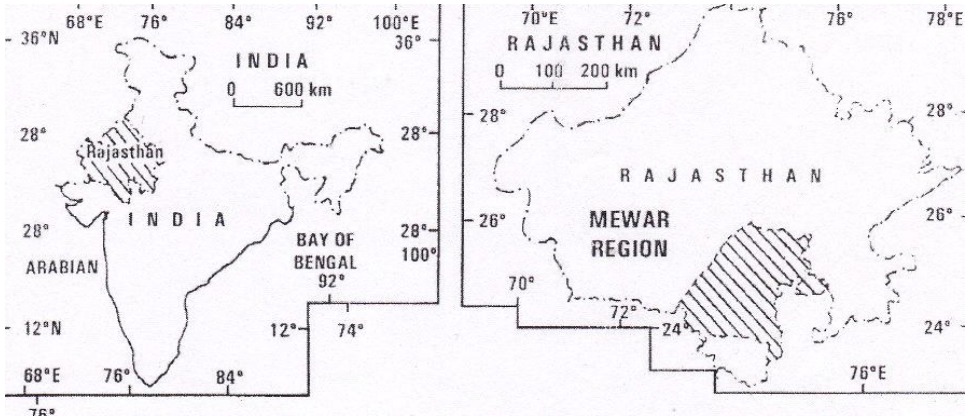


Fig : 1

The area under research has the five cities of Mewar which had population above 50,000 as per 2011 cencus. Among them the cities are Bhilwara with its latitudinal extension of 25 ^{0}00'N to 25 ^{0}24'N and longitudinal extension of 74 ^{0}30'E to 75 ^{0}00'E and area of 118.49 sq km. Chittorgarh city has its latitudinal extension of 24^{0}50' to 24^{0}57" and longitudinal extension of 74 ^{0}35' to 74 ^{0}39" covering an area of 41.76 sq km.

Nimbahera city has latitudinal extension of 24^{0}35' N to 24^{0}38' N and longitudinal extension of 74^{0}41 ^{1}2 ^{0} " E to 74^{0}45' E and it covers an area of 5 sq km followed by Rajsamand city with its latitudinal extension of 24^{0}46' to 25 ^{0}09' and longitudinal extension of 73 ^{0} 18' E to 73 ^{0}50'41 " E. The city of Rajsamand has an area of 55 sq km. Lastly city of Udaipur has its latitudinal extension from 24^{0}33' to 24^{0}28' and longitudinal extension from 73 ^{0}40' to 73 ^{0}45' and covers an area of 56.92 sq km.

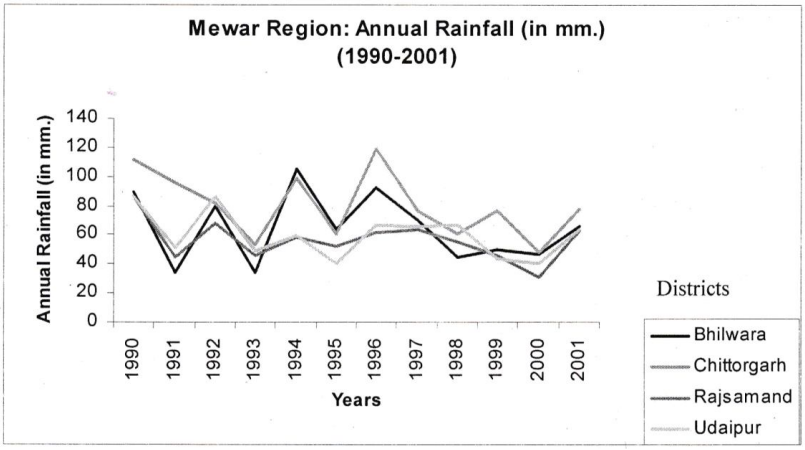


Chart 1

Changing Pattern of Rainfall (1950-2015)

Mewar region experiences the period of monsoon every year from the month of July to September. Both the quantity and quality of rainfall are of prime importance because it is the only replenishable source of the surface and ground water. The nature and amount of rainfall directly affect the water level in the water reservoirs of the region. Moreover the pattern of rainfall in the catchments area is also a factor of considerable importance, which supplements water in these reservoirs through various local "nalas" and

"streams'. Even a short delay in monsoon commencement results not only in scarcity of water for irrigation or industrial uses but for drinking and domestic purposes as well.

Most of the rainfall in the region is received from the Arabian Sea branch of the South West monsoon, though at times, the Bay of Bengal branch also causes precipitation. The South West monsoon season, June to September, is. the principal rainy season when over 95 % of the annual rainfall is received through 32 rainy days in a year. July is the wettest month of the year sharing 80% of the total annual rain a . The annual variability of rainfall in the region is over 30 per cent. The average annual amount of rainfall of Mewar declines from East to West or more particularly from South East to North West i.e. from Kushalgarh tehsil to Banswara district . The winter rainfall , locally known as 'Mavath' originating in the Western disturbances, is very beneficial for crops like wheat , barley and gram which otherwise have to be more intensely irrigated.

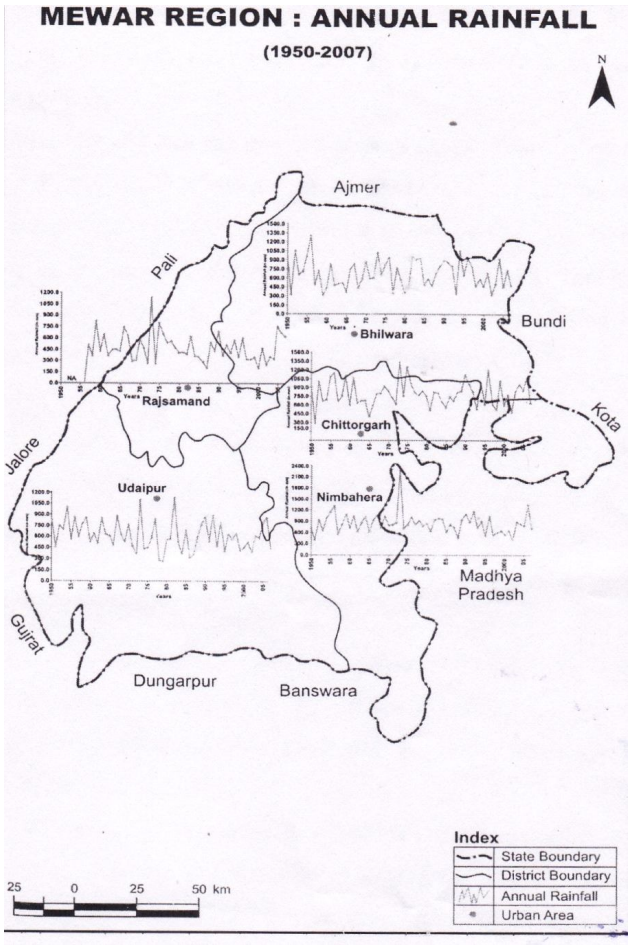


Fig. 2

Though traditionally, the rainy season is known as Chaturmas i.e. four months of rain from mid June to mid September. Like the distribution of mean annual amount of rainfall and the number of rainy days, spatial pattern of distribution of intensity of rainfall declines generally in the East West direction. Areas of high intensity, between 2.5 cms to 2.7 cms, are also found in the northern part of Chittorgarh district and the adjoining South Eastern part of district of Bhilwara.

Illustrates a wide fluctuation in the amount of annual rainfall of the five urban cities of Mewar region during a span of 58 years ranging from a maximum of 1330.20 mm in 1973 at Chittorgarh to the minimum of 137 mm in 2015 Bhilwara. Noticeably, every fifth or sixth year has been a rainy year which indicates a cycle of rainfall in the region. Month wise and the diurnal distribution of rainfall over the region also vary greatly.

It is needless to add that the amount as well as the intensity of rainfall greatly determines not only the variable rate of run off into the water courses through stream flow but also accounts for similar fluctuations in the percolation rates providing a source of supply in the sub soil during the periods of rainless intervals. Insufficient amount of rainfall over a couple of consecutive years reduce the water level in the local lakes, rivers, wells, tube wells and other water bodies adversely affecting the supply of municipal water directly. Thus insufficient inflow in them causes despair and alarm. Data of Rajsamand were available for 1957. Therefore annual rainfall departure calculation has been done from 1957. The annual rainfall of the five units under study is shown in figure 3.1 which show erratic nature of rainfall in the five units.

WATER RESERVOIRS

Water remained reserved in nature in various forms called water reservoirs. Rivers, lakes, tanks, anicuts, open wells, tube wells, baovries etc. are various types of water reservoirs of the Mewar region. They can be broadly classified into surface sources and underground sources.

Rivers of the four districts are Banas, Kothari, Berach, Menali, Manasi, Khari of Bhilwara district, Banas, Berach, Bamini, Bagali, Bagan, Orrai, Gambhiri, Seebana, and Jakham & Mahi of Chittorgarh district, Banas, Chandrqbhaga, Khari and Gomti of Rajsamand district and Banas, Berach, Wakal, Som, Jhakham and Sabarmati of Udaipur district.

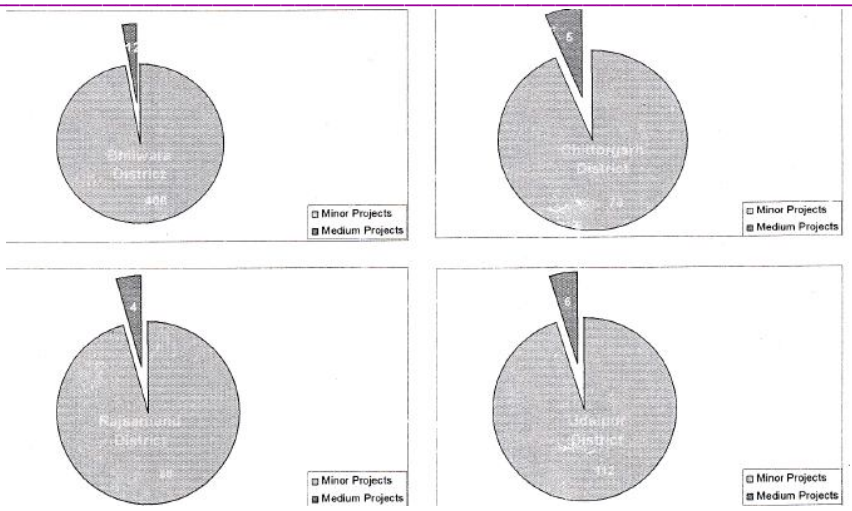
Lakes of Bhilwara district are Mandaltal and dams are Meja dam, Sareri dam, Ummed dam, Aphad dam, Khari dam and Jaitpur dam. of Chittorgarh district are Bhopalsagar and Ranapratapsagar, of Rqjsamand district is Rajsamand lake andUdaipur district are Jaisamand, Udaisagar, Fatehsagar, Swaroopsagar, Pichhola, Big Madar, Choti Madar, Wakal, Mansi Rivers etc.

From the above study we may conclude that the potable water which is the prime need of the people has been a major problem. It has been observed that, as it is a general principal, that availability of water is not uniformly available and distributed in all the five cities. Though geographically the Mewar Region almost falling under the similar physical conditions and the population also increasing with the similar trend but the rapid expansion of Urbanised areas has in general aggrevated the problem and hence the demand and supply of water is badly affected by this fact. This fact has resulted a different graph of man water ratio which also depends on the demand and supply of water in the entire region.

Table 2 : Mewar Region: Number of Dams

S No.	Name of District	Major Project	Medium Project	Minor Project	Total
1	Bhilwara	-	12	406	418
2	Chittorgarh	-	05	73	78
3	Raj samand	-	4	88	92
4	Udaipur	-	6	112	118
	Total	-	27	679	706

Source: Rajasthan Sujas (Införmation and Public Relation Department, Rajasthan, 2015).



Low and erratic rainfall force the mankind to make the maximum use of water available either on the surface or below it. Now a days in urban areas most of the potable water demand is met by ground water sources in the form of borings, hand pumps, open wells, tubewells etc. Table 5.5 shows the number of handpumps, tubewells, wells in the five urban areas of research which contribute in fulfilling the demand of potable water in the urban areas of Bhilwara, Chittorgarh, Nimbahera,Raj samand and Udaipur.

Table 3 : Mewar Region: Underground Water Sources

S. No.	Name of Cities	No.of Hand um s	No.of Tubewells/Borewells	No. of O enwells
1	Bhilwara	177	36	5
2	Chittorgarh	123	103 (bw)	7
3	Nimbahera	507	78 (Tw)/20 (Bw)	5
4	Rajsamand	287	-	-
5.	Udaipur	2129	89	30

Source: Rajasthan Sujas, 2015

Besides this more trees should be planted in and around the houses, around buildings, lakes in order to recharge the ground water level and preventing surface runoff which would further add to recharging of groundwater. Last but not the least

IMPACT OF URBANIZATION

Rainwater harvesting if practiced seriously can prove a boom in solving potable water problem in the urban areas of Mewar above 50,000 population.

Therefore it has been dealt in detail.

Table No. 4 : Correlation between Water Demands & Supply

S. No.	City Name	Corre. Value	Ca fegory	Rank
1	Bhilwara	0.88	Very high	2
2	Chittorgarh	0.85	Very high	3
3	Nimbahera	0.93	Very high	1
4	Rajsamand	0.56	Average	5
5	Udaipur	0.68	High	4

Source: Computed

The coefficient of correlation was computed table no. 5.12 shows that when we compute the correlation of demand and supply of water in different unit of study, reveals the different pictures. It is interesting the Nimbahera comes under the very high category of demand and supply that means there is very narrow margin of scarcity, in other works water is abundantly available or supplier of the demand. This is clearly indicated by the 0.93 correlation value of demand and supply.

On the contrary of the above Raj samand comes under the average, that means the demand and supply gave is almost fifty-fifty (as correlation is 0.56) that we can say because supply is just half of the demand.

The other units Bhilwara, Chittorgarh and Udaipur ranging from 0.88, 0.85 and 0.68 correlation respectively, that shows the supply of water is just to the near to the demand. These results clearly support our hypothesis that with the increase in population demand of water automatically increases but supply of water is not adequately meeting out the demand.

CONCLUSIONS

- Unplanned expansion of residential area in cities.
- Erratic nature of rainfall.
- Limited water sources: both surface and underground.
- Rapid increase in population.
- Drastic rise in demand of water.
- Inadequate water supply.
- Lack of co-ordination between departments (Irrigation, PHED, Nagar Palika, (UIT, RUIDP, etc.).
- Lack of management system of water supply.
- Over exploitation of underground water.
- Unplanned development (new colonies extension, tourist centres, hotels & restaurants, new constructions).
- The depth of lakes particularly in Udaipur city (Piccchola & Fatehsagar) is decreasing due to heavy silting enhance the capacity is decreasing.

SUGGESTIONS

- Looking to the erratic nature of the rainfall most of the water received during season is wasted. Therefore it is suggested that the wastage of water should be checked through rain water harvesting techniques.
- This technique will help in raising ground water level.
- Peoples habit of using water need to be changed (eg. Taking bath in a tub, washing cars with pipe etc.
- Lakes and other water reservoirs should be protected from the pollutants like garbage, solid waste, hotel sewage and unwarranted boating etc.
- The tourists visiting the tourist centres should be guided and directed by the guides or handling tour conductors to check the unwarranted activities or otherwise the guide or the tour conductors should be penalized for that act.
- Roof top harvesting along with rain water harvesting should be legally enforced for the new construction.

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