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Research Paper

Rajsamand and Potable Water

Dr. Sandhya Pathania
Lecturer,
Department of Geography,
Government Meera Girls College,
Udaipur (Rajasthan).

Dr. Neelam Bageshwari
Corresponding Author.
(Head),Lecturer, Department of Geography,
Kanoria PG Mahila Mahavidyalaya , Jaipur .

Abstract:
Despite good rains and several ongoing projects to protect the city's beauty infinite, Rajsamand , Rajasthan, with a population of about 50.000 in the Mewar region, suffers from a general scarcity of water and a lack of potable water in particular. However, the availability of portable water (water that can be taken from one site to another, such as river water) does not solve the problem of potable water (water that can be stored and utilised for drinking purposes), because potable water must meet particular standards with permitted limits. Because of the good rains, the portable water supply in Rajsamand is adequate, but the problem is a lack of drinkable water in comparison to the population.
This is raising alarm among planners. Based on primary and secondary data, this article illustrates the disparity between the demand and availability of potable water in Rajsamand city in connection to increasing population, urbanisation, and industrialization. Data is displayed by graphs and maps made with Arc GIS 09, Coral, T.N.T. Lite, and Adobe Arcade.

Key Words

mld - Million Litres Per Day
lpcd - Litres Per Capital Per Day
llpd - Lakh Litre Per Day
bcum - Billion Cubic Metre
mbgl - Metres Below Ground Level

I. INTRODUCTION

Water abounds, but there isn't a drop to drink. The name "Blue Planet" is due to the fact that water covers three-fourths of the world. Fresh water accounts for only 2% of total available water. There is 68.7% in the form of glaciers and snow, 30.1% as underground water, and 0.9% as surface water.

Many countries, including India, have encountered a "water crisis" in recent years. In India, the two most major sources of fresh water are rain and snow. The average annual rainfall in India is 4,000 billion cubic metres, which is irregularly distributed both physically and temporally. The majority of the rain falls between June to September, during the monsoon season.In recent years, there has been a "water crisis," with precipitation ranging from 100 millimetres per year in Western Rajasthan to over 9,000 millimetres per year in North Eastern Meghalaya.

Rajasthan has a distinct geographical location, topographic structure, climatic conditions of continual high temperatures, low humidity, drier desertic conditions, environmental, ecological structure, and water-related problems. Unfortunately, Rajasthan lacks a single perennial river. Water is a limited resource, but it is necessary. Rajasthan is India's largest state by area and tenth by population. Rajasthan, on the other hand, barely has 1% of India's accessible water resources.

WATER:

Nearly 97.25% of all water is in oceans and about 2.05% is covered under ice, while only 0.70% is available for our direct use of which 0.60% as ground water and 0.10% in lakes, rivers and as vapour in the

atmosphere above the available water nearly 70% is polluted, due to over population. The extensive use of the available water resource along with ground water has led to decrease in the availability of water. Many parts of the globe suffered from water scarcity at the time of need.

At global level even the highly industrialized countries of Temperate latitudes, which can be categorized as 'water surplus regions, tend to suffer from scarcities caused due to higher level of drinking water consumption rates and the very high rate of its use in three main industrial purpose of cooling, processing and steam generation. The majority of third world countries, located mainly in the Tropics and Sub Tropics tend to suffer from water scarcity usually and more fundamentally by natural factors whereas their ever-growing human number and its influences have also contributed towards this problem only recently.

As a consequence of the activities of over fertilization, excessive application of berbicides and pesticides, under the intense pressure of green revolution, changing ideas of hygienic living, increasing rate of industrialization and urbanization, changing cropping pattern from food grains to commercial items for economic gains, greater water demand has accounted not only to the ever increasing scarcity of water for drinking and problems of salinity, alkalinity and drainage in canal irrigated areas but the more serious concern is the steepened rate of underground water table of which Rajsamand is no exception.

In India the major source of water is rain and snow. India receives an average annual rainfall equivalent of about 4.000 billion cubic metres (bcm). This sence of water is unevenly distributed both spatially as well as temporally. Most of the raintail if con of the rainfall if confined to the monsoon season from June to September and levels of precipitation vary from 100 mm a year in Western Rajasthan to over 9,000 mm a year in North Eastern Meghalaya.

With 3,000 bcm of rainfall concentrated over the four monsoon months and the other one thousand bcm spread over the remaining eight months. India's rivers carry 90% of water during June to November and only 10% of the river flow is available during the other 6 months. It is estimated that around 700 billion cubic metre of water soaks into the ground, 1150 billion cubic metre flows as surface run off

Spatially, the utilizable resource availability in the country varies from 18.417 cubic metres in the Brahmaputra valley to as low as 180 cubic metres in the Sabarmati basin, Rajasthan, with 8.5% of the country's population has only 1% of the country's water resources.

The fresh water demand for agriculture. Industry and fast growing urban centes is expected to double by 2025 .In the rural areas, where the majority of India's population lives ground water resources account for 80% of domestic water supply 50% of the urban & industrial water demand is met by ground water and 50% of all irrigated area is fed by this source. Moreover, in drought ground water is the prime one of water for irrigation Rain water by itself has been found to be inadequate to meet the domestic needs. Even areas with heavy rainfall Cherrapunji, for example face water scarcity. Owing to deforestation, soil erosion -, the rain water does not percolate in the ground to feed the spring

India will be a "Water stressed nation by 2017. This signifies that it will face acute water shortages for prolonged periods. There is also the risk of water pollution in cities as they generate approximately 2,000 crore litres of sewage per day and treat only 10% of it, the rest flows out to merge with ground water or even surface water which results in drastic increase in water borne diseases and deaths. The Central Ground Water Authority says that in various districts of the differ states of India the water level has fallen more than 4 m since 1982. The situation is serious regarding the quality and quantity of fresh water in states

All the reviewed literature tells us about the available water resources their methods of purification conservation and management techniques. They do not highlight the problems and solution of potable water of Rajsamand, Rajsamandcitiy in particular for which this study has been undertaken.

II. METHODOLOGY & DATA SOURCES

The collection of data was done at primary and secondary level for theresearch work

Collection of Primary Data

Primary data was collected wardwise through schedule and water sample were also collected. Water samples were collected and tested by SwachSansthan and schedules were filled. The picture of primary data collection is clear from the figure given below:

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 Rajsamand. Data related to future strategy of water supply was collected from PHED and RUIDP. Data related

to was collected from Indian Meteorological Department, Jaipur. Besides all these data related to underground water was collected from Under Ground Water Department, Udaipur.

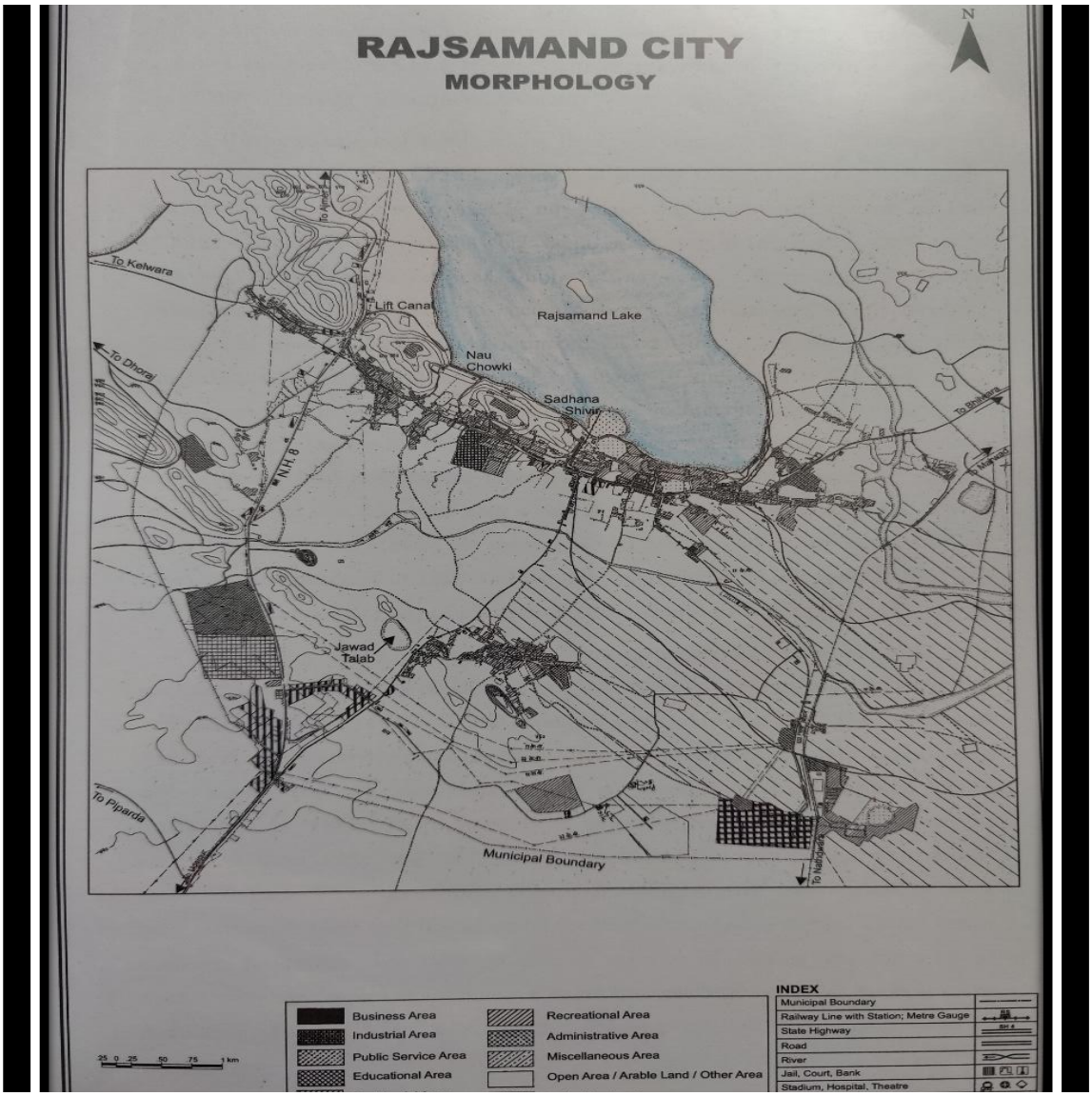
Analysis of data was done by different techniques like departure from the average of annual rainfall, for number of rainy days, correlation between water demand and supply and per person water demand & supply, wardwise, Scarcity of water was also calculated by finding out the difference between demand & supply. The fluctuation between pre monsoon 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.

In respect of rainfall in Mewar it is important to mention here that a part of the Arabian Sea current moves northwards over Kachchh-Saurastra, Western Rajasthan & Western Mewar region which are the centres of low pressure. But curiously enough, these areas get least amount of rainfall. This phenomenon is, in part, the result of the absence of a mountain barrier in Kachchh and because of the Aravali system positional attitude, which is parallel to the direction of the wind that offers no resistance to force air to ascend up its slope. This phenomenon affects the rainfall in Mewar region.

III. MORPHOLOGY

It is the degree of urbanization which is an indication of level of economic and social development of a region. A lower level of economic development is indicated by a lower degree of urban development from the very beginning and at least chronologically till 1951; the region functioned under the shadow of a feudal system, plagued by political unstability arising out of dangers of frequent external invasion and warfare.

Rajsamand is middle class town in Rajsamand district. Rajsamand town is divided into four planning zones. The first three zones encompass the proposed urbanized area, while the fourth zone represents the area proposed around the urbanisable limits for regulatory and controlled development. In 2001 the town had a population of 55,671. Rajsamand has become a major commercial and trade distribution centre for its hinterland. Specially, it has developed as a Marble Mandi. About 105 acres of land of the total developed area has been reserved for government and semi-government use as shown in figure 2.10 which shows the municipal limit of Rajsamand city taken from Town Planning Department, Udaipur.



Changing Pattern of Rainfall (1950-2007)

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 rainfall. The annual variability of rainfall in the region is over 30 per

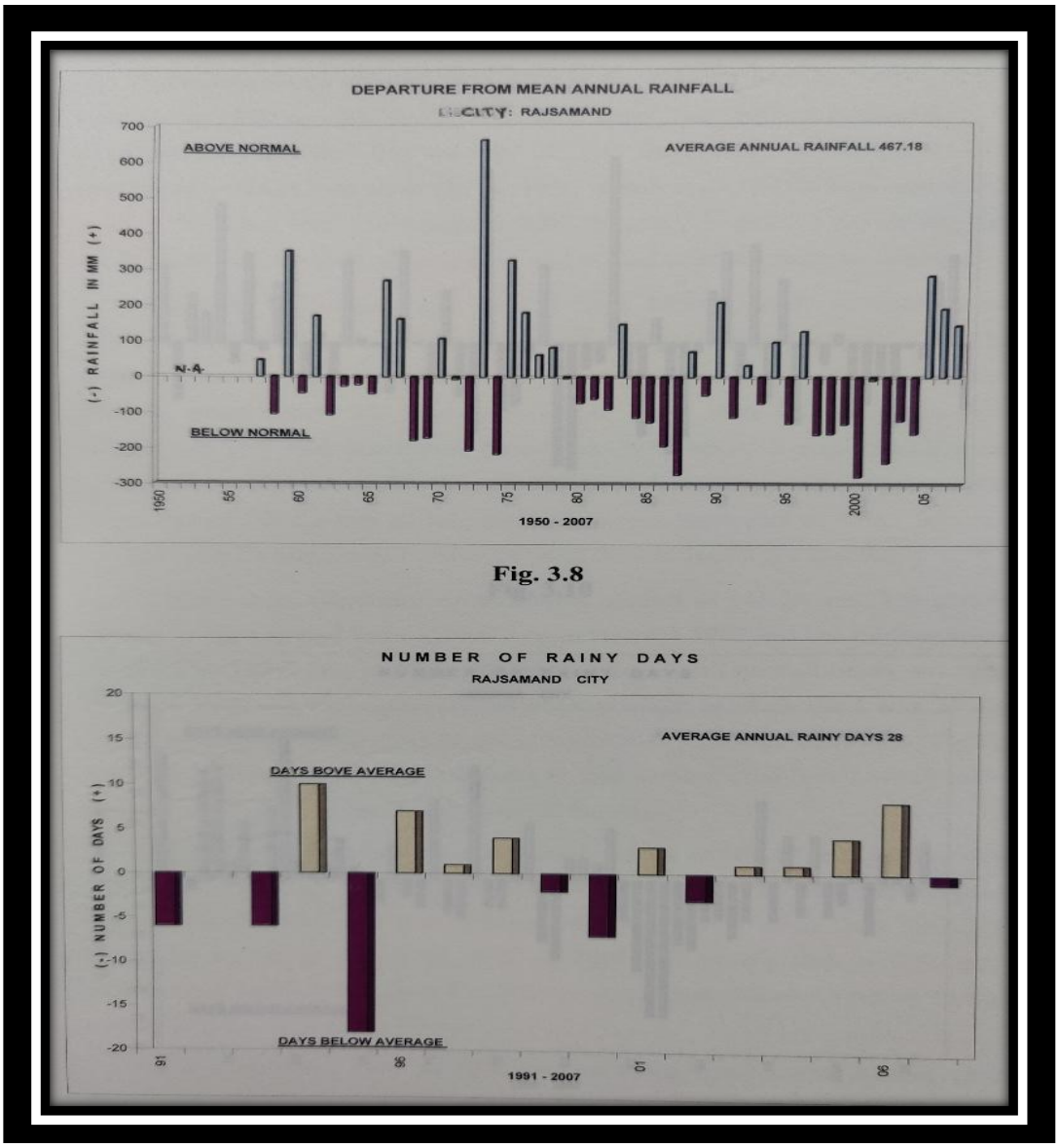
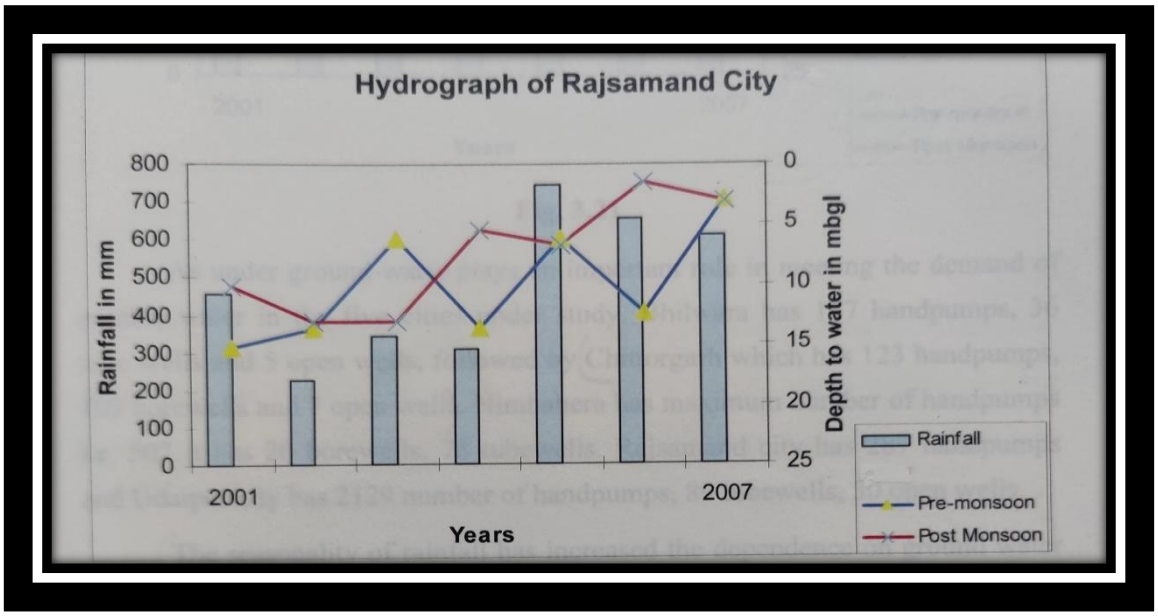


Fig. 3.8

All the reviewed literature tells us about the available water resources their methods of purification conservation and management techniques. They do not highlight the problems and solution of potable water of Rajsamand city in particular for which this study has been undertaken.

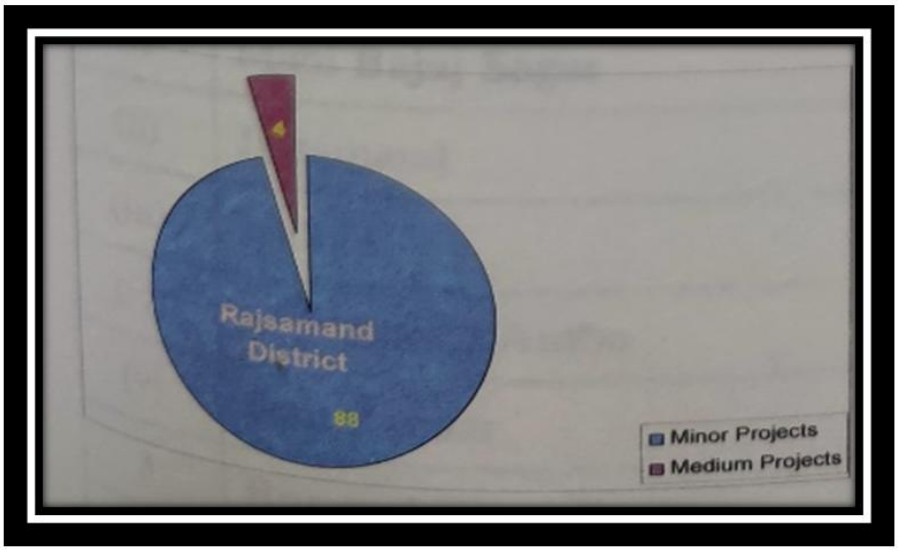


Rajsamand city had average annual rainfall of 467.18 mm. In last 58 years the rainfall had been maximum in 1973 when it was 1128.0 mm and minimum in 2000 when it was 187.0 mm. The average number of rainy days for 17 years came out to be 28 i.e. from 1991 to 2007 and during this period 10 years experienced rainfall less than the average annual rainfall as shown in the figure.

Rainfall from 1991 to 2007 had been mostly in the months of July, August and September. The maximum number of rainy days in a month had been 18 days in August in 2003 in Bhilwara, 19 days in July in 1994 at Chittorgarh. 19 days in July in 1994 at Chittorgarh. 17 days in 2006 in Rajsamand in the month of August, 14 days in Rajsamand

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.



The presence of fresh water in any area depends upon the amount of transpiration, evaporation, run off in the streams, and porosity of the soil. Precipitation that occurs in these urban areas of Mewar region flows of in the form of rivers. Most of the water is either lost in evaporation or by seepage in the soil. Due to wide fluctuation in precipitation, the pronounced low water periods tends to promote water storage and irrigation through reservoir construction. The streams, lakes, ponds, or Tals form the main sources of surface water in the

region in range of 25 to 50%. Broadly they may be categorized into- (1) Rivers or streams and (2) Lakes or tanks. The major sources of surface water in urban areas of Mewar having population above 50,000 namely, Rajsamand are various like lakes ,handpumps etc.

Rivers

A large body of flowing water constrained in a channel is termed as river. This term is also used for the main trunk of a drainage system. The major rivers of the region are ephemeral, and carry out only during or immediately after rains, thus they obtain their supply only during rainy season as shown in figure 3.13. The river basin map has been made by SRTM show in the Banas basin, Som basin, West Banas basin, Chambal basin, Jakham basin and Mahi basin.

RAJSAMAND LAKE (Rajsamand)

Rajsamand was formed by Maharana Rajsingh first in 1662 A.D. This region is famous for historical background, geographically specific, natural beauty, mineral resource deposit and for various economic activities. It is not only famous in state but also in the country. It is adjoining with the boundaries of Udaipur, Chittorgarh, Bhilwara, and Ajmer. It is about 67 km away from Udaipur and is in its North East direction. It is about 210 km far from National Highway 8.

It is situated at Rajsamand. It was made in the year 1676 by the than Maharana Rajsingh on river Gomti which is a tributary of Banas river. About 151.70 lakh rupees were spent on its making. Its construction started in January 1662 and got completed by 1676. The main objective of this lake was conservation of wild life, entertainment and providing employment to the people. One side of the lake has a cemented wall andmud has been dumped at the side of the paal. The complete dam has been constructed by calcium carbonate. The water catchment area of this lake has been 522.98 sq km. Out of this 83.24 sq km is intercepted under minor irrigational project. After being completely full with water the total submerged area of the lake is 18.14 sq km. The gross capacity of the lake is 3786 mcft. The inflow of water is very less in comparison to its storage capacity because of which water from river Banas is diverted and put into the lake through Nandsamand dam through feeder, which as made in the year 1966.

4	Rajasamand	Storage capacity Gauge /RL	Storage capacity Mcft
(i)	Rajsamand	30.00	3786
(ii)	Nandsamand	32.00	750
(iii)	Kundali	16.00	210
(iv)	Chandrabhaga	18.50	352
(v)	Bharai	17.00	200

At the time of its construction there was no sluice and its right canal was constructed before independence of which 800 hectare of land was irrigated. After independence sluice was constructed on left and then left canal was constructed of which 7311 hectare of land was supposed to be irrigated. At present, single water lifting irrigation project is in working condition for Bhana village.

Rajsamand Lake is a major source of potable water for Rajnagar and Kankaroli blocks of Rajsamand city. Water is being provided to J.K. Industries from this lake. The inflow of water in Rajsamand lake is less because of two reasons: (1) Construction of approximately 100 anicuts after 1970 in its catchment area. (2) Due to excessive mining from mines and various industries related to it.

Among these water bodies the tanks of Titardi and Purohiton ka Talab are located in the South and South East direction of the basin. It is about 67 km away from Udaipur and is in its North East direction. It is about 210 km far from National Highway 8.

Underground Water

The underground water development work started in 1950 with the establishment of "Underground Water Board". In 1971 it was renamed as "Ground Water Department". A systematic and scientific based study started in 1965. It was from 1984 that a continuous watch was kept on the water level of the wells. It's head office is in Jodhpur. Its subdivisional offices are at Jaipur, Jodhpur, Udaipur and Bikaner.

Data is collected after monitoring the water level at pre monsoon and post monsoon which helps in comparative analysis and annual recharge is found. On the basis of underground water level all the blocks, districts are divided into 3 zones-safe, semi critical and critical.

Safe zones are those areas where water exploitation is less than 70% than water recharge. The Semi critical zones have 70% to 90% and 90% to 100% are critical zones. 100% exploited zones are called over exploited. In East of Rajasthan deth of water is in between 10 m to 25 m, Western Rajasthan has water level in between 20 m to 80 m. The fluctuation is in between 2 m to 5 m. Eastern Rajasthan has fluctuation in hard rocks, it is in between 1 m to 10 m.Rajsamand district has a total area of 4635 sq km. Area of potential zone is 3540. Water table area is 3398 sq km. It comes under semi critical zone.

City of Rajsamand from 2001 to 2007 had an average pre-monsoon underground water level as 10.2 mbgl and post monsoon average water level was 7.64 mbgl in 2007 the underground got recharged only upto 0.59 mbgl. Whereas in 2006 the underground water was tremendously recharged due to good rainfall where the pre-monsoon underground water level was 12.47 mbgl and post monsoon underground water level was 1.52 mbgl. The recharge was tremendous in this year of the underground water level. In the year 2001 and 2002 the recharge was very less and in 2003 the post monsoon condition of underground water level was 13.09 due to very less rainfall as shown in figure.Asunderground water plays an important role in meeting the demand of potable water Rajsamand has maximum number of handpumps i.e. 507 it has 20 borewells, 78 tubewells. Rajsamand city has 287 handpumps.

The seasonality of rainfall has increased the dependence on ground water resources. In the absence of wide network of surface storage system, ground water is the only source of supply of water especially during summers. Though long-term use of water is not favourable but due to exigency the dependency on ground water has increased since independence and has seriously increased since last decade. City of Rajsamand gets water supply from Rajsamand Lake on a whole along with 287 hand pumps which are located at various locations of the city and fulfill the local demand of its population.

Thus it becomes very clear that at places like Rajsamand surface sources play a vital role Rajsamand has less than 50% of potable sources.Rajsamand Lake is in better position . Surrounded by ghat on one side, a bridge on other side and other side left open but despite of that due to intervention of human activities like bathing, washing and making picnic, leaving the waste behind leads to pollution of lake deteriorating the quality of its water.

The old pipelines for water supply to the old part of the cities are not in good condition. Frequent leakages lead to the contamination of water as the sewage lines and they run parallel to each other. Ultimately the houses receive polluted water. Industrial effluents from the industrial areas of Rajsamand inflicting irreparable damages to surface as well as ground water sources.

AVAILABILITY OF WATER

So far the availability of water is concerned, rainfall is not sufficient in relation to the existing population. Availability means the amount of water present either as surface water sources or as under ground water sources in relation to the existing population of the units. All the rivers of the units, lakes. baovries, tanks, panghats, open wells, tube wells, bore wells have water present in them. This is the availabe water to the mankind but to be more precise we find out the availability of water by taking the demand into consideration in relation to the extend the available water resources can be exploited.

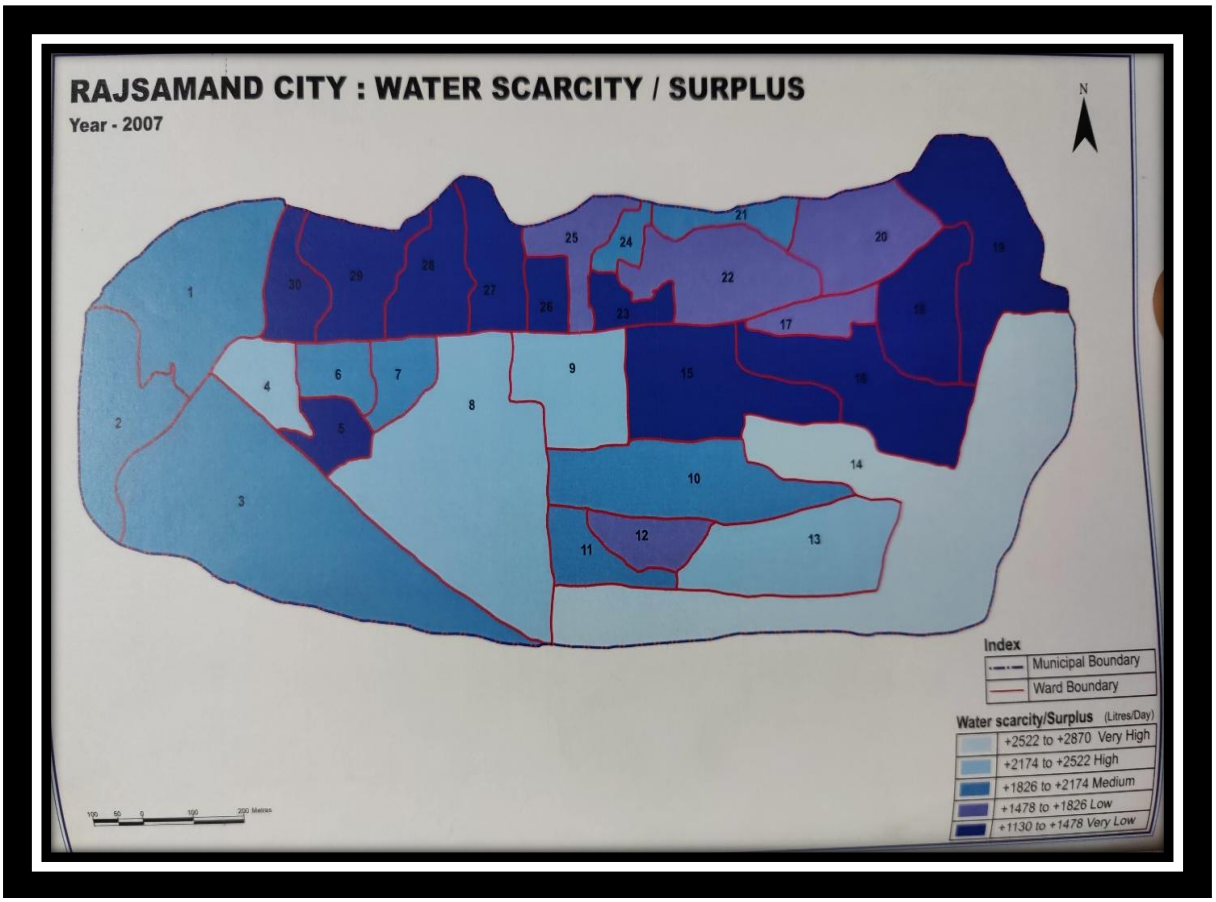
So far the requirement of water is concerned, it is quiet different from region to region and place to place. The demand normally depends on the number of people dwelling in any unit. The per capita consumption thus depends on thetwo factors-

(1) Number of persons using

(2)The habits of the people of water consumption. This result in the demand of water which is invariably different in all the five cities of the study area but the habits of people of using water is almost the same as they are living in a similar domain of social ways.

City of Rajsamand had maximum demand in ward no. 23 and ward no. 14 than 5 lakh litres per day and their supply was first 2 llpd. Ward no. 1, 4, 8, 9, 10,11, 12 had more than 4 lipd of demand but supply had been less than 2 llpd. In 2007 the scene changed the wards were supplied with more water than the demand as Rajsamand lake got filled by good rainfall in 2006 therefore in 2007 the supply was more than the demand. The map 4.9 shows the wards getting more water than the demand.

In 2001 ward no. 4, 7, 8, 11, 26, 27, 28 had demand of more than 40 Ilpd. Supply was 20 lpd only in ward no. 7 rest all other wards had supply of less than 20 Ilpd showing high scarcity in all these wards. Whereas in 2007 wards no. 7 had very high scarcity and ward no. 4, 8, 11, 26, 28 had scarcity of water as shown in figure given below.



Thus the condition related to availability of water per person in this remains more or less from 2001 toareas where the sewerage line is very less there the demand is considered to be between 30 Iped to 40 lpcd as in Rajsamand and Rajsamand.The scarcity index is reported in Rajsamand to be positive that is the supply more than the demand

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. Thus the present trend of demand and supply and man water ratio showing the general water in all the units.

Minor projects are those which cover small area with a comparatively little storage capacity. Thus in size the project is comparatively small covering the area falling near by the project itself. The financial income bend is lesser than those of medium projects. So far the need and requirement of the local areas is concerned they serve better to the people because their maintenance is easier. But these minor projects are normally constructed on those rivers and river streams which are seasonal. But these rivers have been checked and check dams and anicuts have been constructed.
Rajsamand has 119 anicuts.

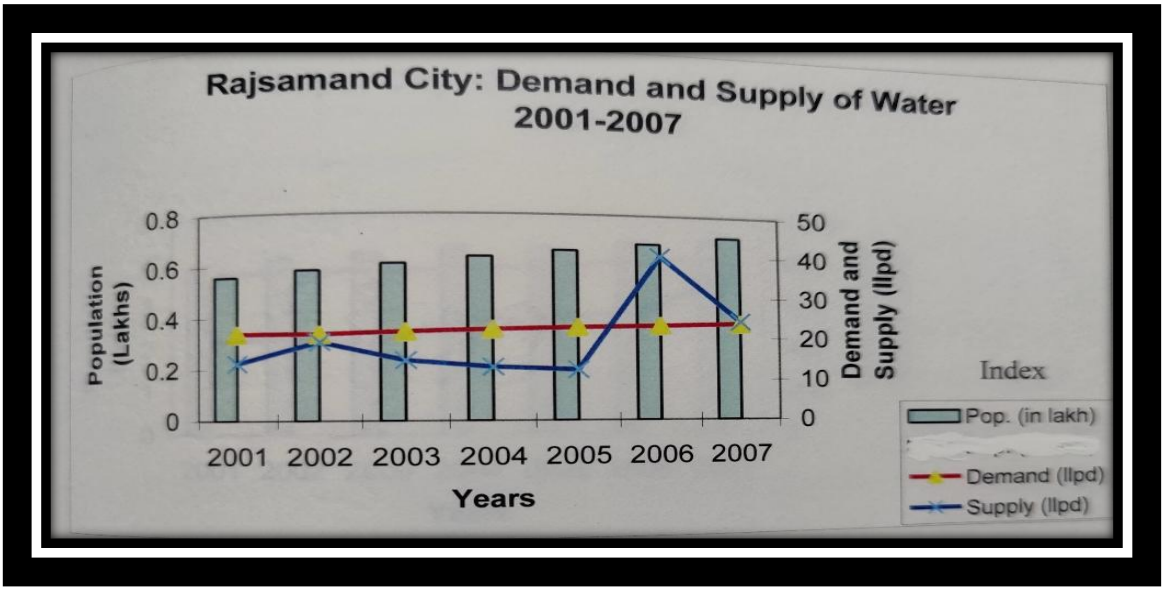
Low and erratic rainfall force the mankind to make the maximum use of water available either on the surface or below it. Now a days in urban areas most of the potable water demand is met by ground water sources in the form of borings, hand pumps, open wells, tubewells etc.

Water Demand & Supply in City

Water demand is the amount of water required for drinking purpose and the supply is the amount of water given to meet the requirement. The water demand is established on the basis of design criteria as per the guidelines given by PMC, which states that 85% domestic and 15% slum figure has been considered as per the field situation which out to be 135 lpcd for domestic and 70 Ipcd for slums.

For communities with population up to 20,000, water supply through stand post should be 40 lpcd (min) and 70 lpcd for house connection. Communities with population 20,000 to 1,00,000 it should be 100-150 lpcd. And for communities above 1,00,000, it should be 150-200 lpcd (as per manual) central Public Health and Environmental Engineering Organisation, New Delhi.

Rajsamand city demand and supply situation is shown in figure given nbelow in relation to the population. The supply is more than the demand in 2006 and the demand is at par with the supply in 2007. City of Rajsamand comes under the average, that means the demand and supply is almost fifty-fifty (as correlation is 0.56) that we can say because supply is just half of the demand.



The city of Rajsamand gets water after 24 hours most of it wards get water supply for 2 hours whereas ward no. 8's Jawad Ghoinda and ward no. 28's MurkhiChoraha gets water only one hour in winter. Rest 27 wards gets water for 2 hours throughout the year. Water supply is mostly in the morning in summer and raining season whereas in winters for hour it is in the morning and for another 1 hour in the evening (source schedule). Ward no. 23 receives water for 2:30 hour. The supply of water is during morning. There are 29 wards in Rajsamand. All the houses had connections except for one who fulfilled their water demand from universal hand pump. This was in ward no. I's Nai Abadi Kank ward no. 26's Sanwar Raj. had tube well connection along with

tap connection. Most of the tap connections have been after 1992 and the cost per month for the water consumed is in between 40 to 60 Rs. per house per month.

Thus looking at the demand and population of Rajsamand we can conclude that there has been increasing trend in demand along with population form 2001 to 2008. The overall demand in 2008 of the city was 936330 Ipd and the overall estimated population was 69358.

In Rajsamand city the pipeline year of construction is distribution zone 1, 2, 3A was in between 1964 to 1966 and distribution zone 4C in between 1996 and 2006. Information regarding other pipelines is not known and their diameter vary from 35 mm to 300 mm. the length of the pipeline very form 15 m to 38.70 m in the cities under study. In Udaipur city the pipeline diameter vary from 32 mm to 80 mm. The work of laying of pipelines is executed in co-ordination with the Water Supply Maintenance Department of PHED. The concerned department of any zone or subdivision of the cities is provided with information prior to commencement of work.

Future Strategy

Water is a prime natural resource, a basic human need and a precious asset of the State. Integrated planning, development, operation and maintenance of all water resources to support the growth of the state economy and the well-being of the population, in response to the growing need for drinking water. agricultural products, industrial production and electricity, a general improvement of living conditions and employment is of utmost importance. Planning and Development of Water Resources need to be governed by the state's perspectives. The requirement of utilising all available water resources, surface and ground, in a judicious and equitable, as well as sound economic manner needs a well-defined State Water Policy.

The ground water also plays an important role especially in agriculture and drinking water supply. The following water resources development and management objectives are as follows:

- All development projects in the state shall be prepared keeping in viewthe availability of water and priority of utilisation.

- Development of all utilisable water resources to the maximum possible extent, including surface water, both internal and external, ground water and waste water, for optimal economic development and social well- being.

- Optimisation of water resources exploitation and raising the level of reliability of supplies through conjunctive use of surface and ground water.

- Judicious, equitable and economically sound allocation of water resources to different sectors, with drinking water supply as a first priority. However, the norms of drinking water should be revised bearing in mind the water availability in the state. Priority should be reflected at every stage of availability, utilisation, development and management of water resources of the state.

- Maintenance of water quality at acceptable standards and reduction of

- Water resources pollution by urban and industrial sewage.

- Ensuring proper functioning of existing structures, conveyance systemsand other assets through adequate maintenance and operation.

- Minimising adverse impacts of water resources development on the natural environment and on pollution affected by project implementation works.

- Facilitating private initiative in development, operation and management of water projects.

- Emphasis to be given for recharge of Ground water aquifers to mitigate the crisis of drinking water supply and for industrial and other purposes. Incentives and disincentives for efficient utilisation of water.

- Priority and pricing should be based on purpose of water use and availability of water in the region.

- Water resource development projects shall as far as possible be planned and developed as comprehensive and multi-purpose projects. Integrated and coordinated development of surface and ground water and their conjunctive use should be envisaged right from the project planning stage and should form an integral part of the project implementation. All present and predictable future demands, including domestic, livestock, irrigation, industrial, thermal and hydroelectric power stations, pisciculture and recreation, and all sources of

- Water as well as reclaimed waste water must be considered. Provision for drinking water shall be a primary consideration. The study of the impact of a project, during its construction period as well as during its operational life, on human lives, rehabilitation and resettlement of affected people, occupation, economic and other social aspects, shall be an essential component of project planning.

- Dam Safety Legislation may be enacted to ensure proper inspection, maintenance and surveillance of existing dams and also to ensure proper planning, investigation, design and construction for safety of new dams.

Exploitation of ground water should be so regulated as not to exceed recharging possibilities, and also to ensure social equity. There should be a periodical reassessment on a scientific basis of ground water potentials, taking into consideration the quality of the water available and economic viability. Ground water recharge projects should be developed and implemented for improving quality and augmenting availability. Underground storage of water should be given priority where ever feasible, to minimize evaporation losses. Saline water in areas suffering from acute water scarcity may be desalinated using reverse osmosis or electro dialysis or flash distillation techniques to make it potable. Drinking water supply schemes based on ground water shall be shifted to surface water in a phased manner, where ever feasible.

Adequate drinking water facilities should be provided to the entire population of Rajsamand District with community participation. Future irrigation and multi-purpose projects should invariably include a drinking water component where ever there is no dependable alternative source of drinking water. State Government shall make sincere endeavour to provide potable drinking water to every citizen. Drinking water needs of human beings and livestock should be the first charge on any available water. Following actions shall be taken to fulfil this need:

- Norms for drinking water supply should be prescribed taking into account the water availability in the state.

- Increased budget shall be allocated for upgrading urban and rural domestic and livestock water supply.

- Water demand for livestock should be considered along with demand for human beings for drinking purposes for all rural areas.

- Water quality standards shall be ensured.

- Strict control over activities, which endanger sources such as hazardous wastes and sewage, shall be exercised.

- Private and public community participation for O&M in urban and rural water supply would be encouraged.

- Rainwater harvesting structures would be constructed to augment water supply especially in urban areas where ground water sources are not sustainable.

- While deciding water rates, it is important to distinguish between pricing of water for drinking, irrigation, industrial and commercial purposes and the cross subsidies.

Both surface water and ground water quality shall be regularly monitored for quality and a phased program shall be undertaken for improvement in water quality. Government shall issue orders to routinely enter future water quality figures in the water resources database and publish ground water statistics and maps for river basins. Proposals for contracting the work of water sampling and analysis to private operators will be studied. Effluents should be treated to acceptable levels and standards before discharging them in natural streams or underground.

IV. CONCLUSION

The city of Rajsamand has been facing potable water scarcity due to the following reasons:
• Unplanned residential expansion in cities
•Uneven and erratic nature of rainfall .
• Surface and underground water sources are tangible
• Population explosion.
• Increasing water demand.
• More Demand ,less supply.
• Lack of coordination among departments (e.g., Cigation, PHED, Nape Palika, UIT, RUIDP, and so on.)
• Absence of a water supply management system
- Overexploitation of underground water.

V. SUGGESTIONS

Due to the erratic nature of the rainfall it is suggested that the wastage of water should be checked through rain water harvesting techniques which will check

- The lowering down of ground water levels.
- Rooftop harvesting, as well as rainwater harvesting, should be legally mandated for new construction.
- Day to day activities of people need a change like bathing.
- Such methods in daily chores should be practised which reduce the consumption of water.
- The water bodies should be conserved to make the supply of water adequate.
- There should be a standard procedure for boring wells.
- The use of lake water should be done with caution.
- Water from other surface sources should not be overexploited (talab, baovries etc.)
- Water bodies should be protected from pollutants such as garbage, solid waste, hotel sewage, and excessive boating, among other things.
- A treatment plant for polluted (dirty) water should be built.
- Old pipelines should be replaced, and leaks in pipes should be checked immediately to prevent water waste.

If the various measures suggested in this work are practised generously, the doomsday forecasters for mankind will be proven incorrect, and man will continue to enjoy the use of good quality potable water for a long time to come, and the doomsday fears will have to eat their words as they will be proven incorrect. The final remarks made are not the end in themselves, but rather guidelines for future development.

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