

A GEOGRAPHICAL STUDY OF WATERSHED AREA IN JHUNJHUNU DISTRICT

Dr. Sawan Kumar Jangid¹, Ms. Astha²

¹Associate professor, ² Research Scholar

¹Department of Geography

¹S.C.M. Govt. P.G. College, Mandalgarh (Bhilwara) -Rajasthan (India)

Abstract: A watershed can be defined as geo-hydrological unit that drains to a common point by a system of drains. All lands on earth are a part of one watershed or another. Water is the source of the all living beings of the earth. Water is most important factor in development of living beings and human development is totally depending upon its availability. Water ratio is definite on the earth in the form of (sea area, vapor in the climate, snow in mountain region water in rocks) nature keeps balance through water cycle. But due to selfishness human being had created imbalance in the ratio of water. Day by day the world's population is increasing which is resulting in to high per capital consumption of water and on the other hand from years back, water source is as it is. Industrialization, civilization, agriculture development, constructions and daily use of water etc. Have resulted in huge consumption of water and also due to various reasons water is wasting continuously in huge quantity. Due to such picture in future there will be great water scarcity as a possibility of water disaster Meager surface water resources and over exploited ground water problems are stressful in the desert area. Rainfall is the ultimate source of water resources in Rajasthan state. Ground water is the main and only available source for serving drinking water needs to Jhunjhunu and Nawalgarh block. Due of it watershed development is a malty area, multidiscipline and multipurpose task, hence it's planning, execution and management is need of hour. Water has become a highly precious resources. There are some place where a barrel of water costs more than a barrel of oil.

Keywords: Ground water, Watershed, Rain water, Nawalgarh, Quartzite, Over-exploited, Treatment, Blocks. Sprinkler, Irrigation.

Introduction:

Water and land are the main components of the overall development of any region and the development of the region is dependent on the availability of these. Because most of the land in the Nawalgarh block is coming to the region of rainfall and the rainfall is very low, the division seems to have a very shortage of water. Water is vital for our life. Now-a-days surface and ground water resources are under stress due to growing population, their food requirements, changing land pattern, urbanization, and industrialization, various chemical and mechanics-based agricultural activities, and inability to conserve the water resources by available traditional and scientific techniques. Meager surface water resources and over exploited ground water problems are stressful in the desert area. Rainfall is the ultimate source of water resources in Rajasthan state. Ground water is the main and only available source for serving drinking water needs to Jhunjhunu and Nawalgarh block. In various kind of chemical pollutants and ions found in excess in ground water than it may cause innumerable diseases and could be fatal for human life. The annual replenish able ground water resource in the Rajasthan state is 11.86bcm and the net annual ground water availability is 10.79bcm. Availability of water and water quality is vital to the quality of life on earth. Due to over exploitation, ground water has deteriorated to such an extent that crucial quality parameters such as TDS, Total Hardness, chloride, Fluoride, Nitrate, etc. Exceed the desirable levels as the water standards and regarding that one certainty is water quality will continue to deteriorate over a period of time. Ground water contamination has created fresh water scarcity situation in the study area. There is need to find out possible alternate remedial measures and proper management.

Statement of the problem:

The district receives rain mostly in the Monsoon period by the south west monsoon. It also receives less or no rainfall in winters. It characterized by very hot summer and very cold winter with poor rainfall during south-west monsoon period. Normal rainfall of the district is 480.51 mm (1901-2015). It can be inferred that the rainfall in the district has significance increased in the recent year. The annual average rainfall is 657. mm based on the data of available Nawalgarh block. It is very important to conserve the natural resources of soil and water to overcome impact of increasing day to day, increasing temperature decreasing ground water level and frequent drought. Because soil without water is a desert and water without soil is useless. To make soil and water conservation, effective treatment methods are required in the area.

Study Area:

Jhunjhunu district lies between 27.38°N to 28.31°N latitudes and 75.02°E to 76.06°E longitudes. It covers 5928 Km² of geographical area towards eastern periphery and located in the north eastern part of Rajasthan state. Administratively, Jhunjhunu district is a part of Jaipur division and comprises of 8 sub divisions and 8 blocks namely: Surajgarh, Nawalgarh, Udaipurwati, Chirawa, Buhana,

Khetri, Jhunjhunu, Alsisar. The district is bounded on the East and North-East by Haryana state and on the South, South-East and South-West by Sikar district, on the North-West and North by Churu district. Nawalgarh block lies on 27.85°N and 75.27°E, covers the area of 696.80 Km². It is situated in South-West of the district and bounded on South and South-West by Sikar district, on the North and North-West by Jhunjhunu and on the East and South-East by Udaipurwati. There are only 40 Gram panchayat and 120 villages in Nawalgarh block. Total population and household are 3,26,663 and 43,034 respectively (as 2011 Census) in the area. Its average elevation is 379 m (1243ft).

The district has almost flat topography except south-eastern peripheral area where the hills of the Aravalli range covers parts of Nawalgarh, Udaipurwati, Khetri, Buhana block by running in North-East direction. The highest peak (1051m) is bordering Sikar district in the south of Lohagar village. The district is covered by sand dunes and inter-dual sandy plains leaving behind a narrow South-East peripheral strip and covered by Delhi super group hills. Older and younger alluvium of quaternary age, quartzite, phyllites and schists of Delhi super group are the main water bearing formations whereas In Nawalgarh block older alluvium and quartzite are main water bearing formation. The undulating area with small isolated hills covers the study area.

Objectives:

Main objectives of the study are as follows:

1. To Geographical Study of watershed area in Jhunjhunu district blocks.
2. To study the ground water scenario and to highlight problems relating to ground water of the area.
3. To assess the watershed area development treatment methods implement in study area.
4. To suggest effective solution to development and manage the water resources, thus contributing drinking water supply.

Database and Methodology:

The study is based on primarily secondary data, collected from Central Ground Water Board, State Ground Water Board, and PHED district water testing lab, district ground water department, soil department, and various govt. And non govt. offices. Village level random samples have been collected as primary data for evaluation of water management. The study is based on secondary data base for an initial base profile of present and future management and sources of water.

Methodology:

The data thus collected through primary and secondary sources were processed and represented by statistical and cartographic techniques. For studying the geographical area and climate drought prone area, ground water level, land use and irrigation data for used and represented by Mean, S.D., and percentage. For studying the population, characteristics census year for period 2001 and 2011 has used. The present study was carried out through various methods and techniques. Several cartographic methods are used to represent the result of the study.

Drainage system:

The district does not have systematic drainage system because except for a strip in the center of the district running north-west to south-east, which is the part of Shekhawati River Basin, the remaining part of the district both in the east and west the region forms part of a so called "Outside Basin".

Table: 1 Main River or streams of district drainage system.

Name of River or Streams	Area drained in district (Km ²)	Percentage of area drained in district (%)	Total length in district (in Km)	Altitude at Origin (MSL)	Place of Origin
Kantli	44.71	0.75	105.808	332	Khandela hills
Chandrawati	7.927	0.133	43.445	440	Biharpur hills
Lohargal	5.908	0.099	39.584	466	-

Mainly, the district is covered under Sekhawati basin and its north western part falls under the outside the basin i.e. having inland drainage. All the rivers are ephemeral in nature and flows in response to heavy precipitation during the monsoon. Whole Nawalgarh block falls outside the basin. The district area is drained mainly by Kantli river. Shekhawati, Kantli and the Chandrawati River drain the area with their tributaries like Udaipurki nadi, Lohargal ki nadi, Dongar and Sukh nadi, etc. There is no perennial river in the district

Rainfall:

The district receives rain mostly in the Monsoon period by the south west monsoon. It also receives less or no rainfall in winters. It is characterized by very hot summers and very cold winters with poor rainfall during south-west monsoon period. Normal rainfall of the district is 480.51mm (1901-2015). It can be inferred that the rainfall in the district has significantly increased in the recent years. The coefficient of variation is on higher side at 36.6% indicating that the rainfall is slightly unreliable. The district experienced very poor rainfall between the periods 1979 to 1991 with the exception of few years in between. Thereafter, the district was fortunate to have very good spell of rainfall continuously for a period of 7 years from 1992 to 1998. The district again experienced drought condition from 1999 to 2002. The year 2002 was the worst with rainfall being 62.3% less than mean annual rainfall.

Table: 2 Block wise annual rainfall statistics (derived from year 2010 meteorological station data)

Block Name	Minimum Annual Rainfall (mm)	Maximum Annual Rainfall(mm)	Mean Annual Rainfall(mm)
Khetri	680.9	1125.5	913.7
Alsisar	697.2	987.2	854.7
Buhana	569.4	816.9	650.5
Nawalgarh	657.5	838.1	740.7
Chirawa	567.2	894.4	734.0
Surajgarh	568.8	785.0	617.5
Jhunjhunu	699.1	848.8	778.9
Udaipurwati	746.2	1129.4	888.0

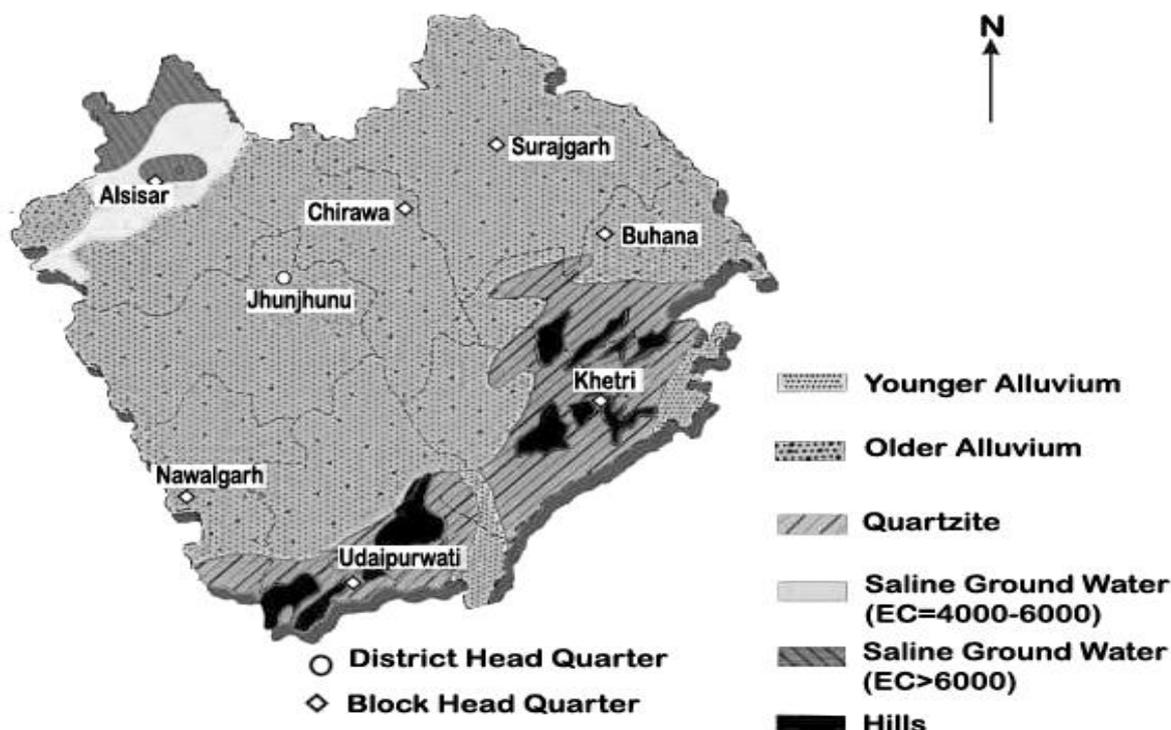
Rainfall received in the year 2010 has been very good as compared to other years. The general distribution of rainfall across can be visualized from isohyets. Rainfall is highest in the areas closer to hills in the southeastern part of the district as well as in the northwestern part where high rainfall of about 1000 mm are seen. The eastern and southwestern parts of the district show low rainfall and these areas correspond to outside basin. The annual average rainfall is 772.3 mm based on the data of available blocks.

Hydrogeology:

Hydro-geologically, the sub-district can be classified into two zones, viz. older alluvium zone and Quartzite (hard rock) zone. Older alluvium of Quaternary age is the principal water bearing formation in the study area whereas Quartzite hard rock of Delhi super group found in some part of south and south-west of the sub-district (Fig.1). Alluvial aquifers composed of sand, silt, clay, kankad, and gravel and form the principal and potential aquifer system in the area. Ground water occurs under unconfined to semiconfined condition in primary porosity.

In the context of whole district, thickness of alluvial sediments increases from south (having less than 60m) to north and north-eastern parts of district (more than 100m). Quaternary alluvium aquifer occupies 4639 km² (78.25%) and hard rock aquifers, quartzite and post Delhi intrusive covers 754km² (12.71%) of the district. Saturated thickness has been significantly reduced and no more alluvial aquifers exist as water level has been decline and reached down into underlying hard rocks. Quartzite, schist, phyllite, gneisses and limestone of Delhi super group, granite, amphibolite and pegmatites of post Delhi intrusive form the ancillary aquifer, occupy the south, south-eastern area of the district.

Fig.1. Block wise Ground Water Potential and Aquifer map of the Jhunjhunu district.



Source: Central Ground Water Board (WR).

Ground water occurs under un-confined condition in the weathered mantle and under unconfined to semiconfined conditions in deep seated secondary porosity (fractures, joints, contacts, etc.) of hard rock formation.

Ground water resources:

The dynamic ground water resources as per ground water estimation in 2013 is furnished below table. The entire area falls under non-exploited category due to excessive withdrawal of ground water being the only available source of irrigation. The condition in Alsisar block is better which is attributed by negligible ground water draft being area underlain by saline water.

Table: 3 Ground Water Resource

Block	Ground Water Availability (MCM)	Irrigation Draft (MCM)	Domestic/Industrial Draft (MCM)	Gross (MCM)	Draft Stage (MCM)
Alsisar	26.7296	17.7706	9.1498	26.9204	100.71
Buhana	26.6425	40.3020	9.9937	50.2957	188.78
Chirawa	5.6765	5.2762	3.1069	8.3831	147.68
Jhunjhunun	32.3191	45.5782	13.1006	58.6788	181.56
Khetri	5.0267	9.1164	1.0592	10.1756	202.43
Nawalgarh	17.8170	44.3556	10.4390	54.7946	307.54
Surajgarh	22.8437	53.4720	11.4982	64.9702	284.41
Udaipurwati	29.9514	56.5182	15.5900	72.1082	241.56
Total	250.7626	462.6845	104.0513	566.7358	226.00

Ground water is the only source for water requirements in the sub-district. Stage of ground water development in the area is 307.54% which indicates the scope of ground water development and the status of excessive withdrawal of ground water as it is already exhausted and categorized as "Over-exploited" by CGWB. Ground water availability in Nawalgarh block is 17.8170 mcm, irrigation draft of the sub-district is 44.3556mcm whereas the domestic and industrial draft is 10.4390mcm. So, the gross draft is 54.7946mcm and showing the stage of 307.54% highest among all 8 blocks of the district (estimated by CGWB). There is an urgent need of systematic ground water development and effective management of available ground water resources with an integrated approach consisting demand and supply side measures.

Irrigation:

Main source of water is the rainfall and ground water in whole Jhunjhunu district. There are some dam or tanks available in the district for irrigation purpose. Besides, wells and tube wells are mainly used in the district for irrigation purpose in farms and for floriculture also. Basically,

Table: 4 Tanks under the jurisdiction of water resources department district Jhunjhunu

S.N.	Dam	Tehsil	Construction year	Gross Storage Capacity (MCM)	Live Storage Capacity (MCM)	CCA (Ha)
1.	Ajeet Sagar	Khetri		4.63	4.63	662
2.	Modi Ilakhar	Khetri	1996-97	5.69	4.54	1070
3.	Ranva	Khetri	1985-86	1.55	1.21	426
4.	Mavta	Udaipurwati	1986-87	1.14	1.01	364
5.	Nirankaki Dhani	Udaipurwati	1987-88	1.26	1.15	302
6.	Ponkh	Udaipurwati	1962-63	1.33	1.32	819
7.	Sarju Sagar or Kot	Udaipurwati	1923-24	NA	NA	NA

Sprinklers and drip irrigation both are in use for the efficient utilization of available water for irrigation. More than 70000 number of sprinkler sets functioning in different blocks of Jhunjhunu tehsil.

Conclusion & recommendations:

The study of the changes in the water level of the open and bore wells of previous and after watershed area development in selected village shows that the average water level of the open well all has decreased by 1.81 meter while the average water level in Bore well has decreased by 6.19 meter. This study highlights the scenario of ground water resource, its management strategy, scope of development, hydrogeological conditions, and efforts of authorized functionaries, water quality, related emerging health issues and recent needs in the Nawalgarh block of Jhunjhunu district, categorized as over-exploited by CGWB. Although the scope of further ground water development is already exhausted in the condition of limited water resource and low rainfall but the implementation of water conservation, storage and management with coordinated efforts of individual, community and govt authorities can lead the positive change in this water deterioration and scarce condition. While researching on A Geographical Study of Watershed area in Jhunjhunu district a different section of the watershed area of Jhunjhunu was studied. While working through the development of

watershed area, it is important to inspire the villages and the farmers to use water very carefully and wisely. Use modern drip and sprinkler method for irrigation.

References:

1. Central Ground Water Board (2017) Aquifer Mapping and Ground Water Management Report, Ministry of Water Resources, Govt. of India.
2. Jha, B. M. and Sinha, S. K., towards better Management of Ground Water Resources in India, National Ground Water Congress.
3. Government of India (2005) Dynamic Ground Water Resources of India, Central Ground Water Board, Ministry of Water Resources, Government of India.
4. Kumar, M. Dinesh (2007) Ground Water Management in India: Physical, Chemical and Policy Alternatives, Sage Publications, New Delhi.
5. Kumar, M. Dinesh, Srinivasu, V. K., Bassi, Nitin, Triv Kumar, M. Dinesh, Patel, R. Ravindranath and Singh (2008) Chasing a Mirage Water Harvesting and Ground Water Recharging in Naturally Water Scarce Regions of India, Economic and Political Weekly, 43(35): 61-71.
6. Edi, Kairav and Sharma, M. K. Ground Water Management in Rajasthan: Identifying Local Management Actions, IRAP, Hyderabad.
7. Singh, Surjit, Reddy, V.R., Batchelor, C., Marothia, D.K., Jamea, A.J., Rathore M.S. (2013) Regulating Water Demand and Use in Rajasthan, EUSPP.
8. Sastry, Ramachandrula, Veeresh, A.M. (2007) Traditional Water Management Practices and Water Sector Reforms in South India- A Comparative Analysis of Three Systems and PIM Policy, National Seminar on Water and Culture, Karnataka.
9. Meena, S.K., Barthwal, V.V. (2016) Water Quality Level and Human Health: An Analytical Impact Study of Water Resources of Jhunjhunu District of Rajasthan, IJIRP, Vol.4.
10. Tiwari, Kuldeep, Goyal, Rohit and Sarkar, Archana (2017) GIS- Based Spatial Distribution of Ground Water Quality and Regional Suitability Evaluation for Drinking Water, Environmental Processes J. 4:645-662.
11. Sameena, Jayaraman V. and Rangana, G. (2007) Ground Water Assessment using Remote Sensing Data – A Case Study, National Seminar on Water and Culture, Hampi.