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Management and conservation of water resources in Chittaurgarh District

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ABSTRACT

Water is essentially required to sustain life. It is an important attribute of environment and is naturally available on our planet in abundance of water resource management has been in practice since time immemorial but is now becoming critical because of increasing population. Water is scarce commodity and is not spread over according to requirement. The entire world has been thinking seriously on water resource management. A systematic planning of the conservative use of water resource is important for development of the region. The best way of water management would be in the form of conservation of water resource of the study region. Though various techniques, water resource of the region can be managed and imbalance between need and supply of water could be minimized.

***Key words** : Water resource, Water management, Conservation, Surface and ground water.*

Introduction

Water is the most important resource of biosphere. It is an essential ingredient of life.It is essential for human as well as other living beings. Water is a basic need for sustaining life and it has no substitute. No animal and plant can survive and grow without adequate amount of water (Anderson, 1967). The demand of water is increasing obviously because all living beings are multiplying at a fast rate. The increase in demand is exerting tremendous pressure on resource development. Usable water on the earth however is limited but its demand for agriculture, as also for other purposes, is increasing rapidly due to growing pressure of population increase in demand for food, quick industrialization and rise in the standard of living of the people (Abbassi 2001).

Chittaurgarh is situated in the south-eastern part of Rajasthan State. The Aravali series play an important role in the rock formation of the district. Some part of the district are covered by Vindhyan and Delhi systems, Banded gneisses complex, Bundelkhand gneiss and by Raialo series. The topography of the district is generally undulating but the hills belonging to the famous Aravali range are scattered all over the area. The slope of the hills gentle and steep and are wooded. The climate of district is generally dry except during the Southwest monsoon season. The average annual rainfall in the district was 652. 62 mm. The maximum amount of rainfall constitutes during the month June to September. The drainage of district is oriented towards the bay of Bengal drainage system through rivers, namely Gambhiri-Berach-Banas-Chambal-Yamuna and finally the Ganges. The total forest area in the district is recorded 2800. 90 square kms.The entire forest area divided into two zones, Viz., The Dhokda zone and the Teak zone. Common trees in the district are Dhokra, Babul, Aam, Bargad, Gular, Jamun, Khejri and Bans. Water is undoubtedly the

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key factor for sustainable development. As a resource it is under relentless pressure due to the population growth, rapid urbanization and environmental concerns. it is utmost important to conserve and judiciously use the water resources of Chittaurgarh district (Grafton and Hussey, 2011).

Methodology

The research design and methodology adopted in the present research includes the following step - theoretical study, collection of data, preparation of maps and diagrams of the related aspects and analysis of the data. A detailed questionnaire of relevant questions was prepared. This research is based on secondary and primary type of data. The primary data were collected through questionnaires. Chittaurgarh district has been selected as an area of investigation. Data on water resource collected from various government offices. The collected data were processed with the help of various quantitative techniques. For analyzing the data Z-score or standard score method was adopted (Table 1). The z score have been calculated through the following formula:

Zi score = Xi - X /s.d..of x

Zi = standard score, xi = original score, X = mean of x

The above formula may be illustrated by the following data-

Table 1. Z Score or Standard Score Method

S.No	Tehsil	No.of Wells(X)	X-X	Z-score
1	A	50	-10	-0.5
2	B	70	20	1
3	C	60	10	0.5
4	D	30	-30	-1.5
5	E	90	30	1.5

The main objective of the research is to point out highest various possible alternatives for the proper management of water resources of the district. The aim of the present work is to highlight the improved practices for water resource management in the district.

Results and Discussion

The concept of water resource management has been in practice since time immemorial but is now becoming critical because of increasing population (Central Water Commission, 1988). Our needs are increasing everyday and ground water level has declined by more than 4 metres in last few years at many places (Anderson, 1967). Only 25% of rainfall is recovered as surface waters (Table 2).

Water conservation practices can reduce pollution of surface and ground water and can help to sustain environment (B.I.S. 2012). Water is a scarce commodity and is not spread over according to the requirement of the place or the person (Table 3).

Thus a systematic planning of the conservation and judicious use of the water resources is very important for the management of the water resources of the region (Irrigation Status Report, 2010).

Overall Pattern of Water Management : A spatial scenario of overall pattern of water manage t picture. At tehsil level only 4 units and at village level 19 units were found at high level (Table 4). These units have been in the top level category due to suitable topographical condition generally plains good water level, sufficient sources of water and better quality of water. Pratapgarh, badi Sadri, Chittaurgarh and Kapasan tehsils fall under this category and extending in the south , west end north direction of the district. Nimbahera, Bhadesar, Dungla, Chotti Sadri and Arnod tehsils have recorded the medium level category. Conditions of water resources in these areas has not been found as good as in the high level category (Jain Alok, 2018).

These units are situated at higher places topographicali which is main hurdle in the ground water availablity. Units coming under low level category have 4 Tehsils. The factors, Viz., Small sized area, undulating topography, few sources of water, deep level and interior location have caused these units at low level category. This part generally located towards north and north-central areas.

Relationship Among Indicators

The causal relationship was established among 23 indicator through correlation matrix the depicting 529 possible coefficient thus a number of indicators viz., Distributions of water resources, water utilisation for agriculture, domestic, industries, livestock, etc., Quality and quantity of water, precipitation and relief have showed varying degree of correlation in the district (Philippe Cullet, 2007). Water need and supply for domestic use are found strongly correlated but it's relationship with the

Table 2. Spatial Variation In Different Aspects Of Water Resource Management

S. No.	Aspect	Composite/Aggregate score of units (z score)		Spatial variation Index
		Highest value	Lowest value	
1	Water resources	0.62	-0.89	-0.27
2	Water resource utilization	1.47	-1.12	+0.35
3	Water problem	1.59	-1.46	+0.13
4	Overall pattern	0.79	-0.92	-0.13

Table 3. Spatial Pattern Of Distribution Of Water Resources

S.No.	Category	Composite score	Villages
1	Higher standard score	(More than+0.35)	Ghati, Bhimgarh, Mandawali, Sawa, Jeetawal, Sompura, Arnod, Kunwaliya, Laxmipura, Sagwadiya, Karmadiya, Bohera, Mayra, Achnera
2	Medium standard score	(0.35 to 0.15)	Palod, Bilot, Damdama, Talau, chorbadi, sangariya, Nikoom, Alakheri, Gurjaniya, salamgarh, Lader, Rajpuriya, Achalpura, Akola, Rajyas, Chupna
3	Lower standard score	(Less than-0.15)	Nilod, Ahirpura, Akodiya, Chowkri, Hadmatiya, Lohariya, Beelri, Hours, Nougama, Napaniya, Singri, Saran, Kolpura, Dalot, Jeetiya, Parsoli, Surkhand, Garawala, Dhobikhera, Charliya, Bichhor, Maheshra.

Table 4. Overall Pattern of water Resources

S.No.	Category	Villages
1	Higher score (more than 0.15)	Sawa, Bohera, Akola, Laxmipura, karmadiya, Bhimgarh, Ghati, Ninor, Palod, Nikoom, Mandawali, Jeetawal, Shahbad, Damdama, Sompura, Mayra, Bichhor, Kunwaliya, Dhamotar
2	Medium score (+0.15 to -0.20)	Sagwadiya, Dhobikhera, Nilod, Peepalda, Mota, Jeetiya, Talau, Salamgarh, Hadmatiya, Chorbadi, Achnera, Rajpuriya, Chupna, Napaniya, Singri, Joyra,charliya
3	Lower score (Less than -0.20)	Rajyas, Achalpura, Nougama, Chowkri, Lader, Athinera, Lohariya, Kolpura, Maheshra, Garawala, Akodiya, Surajpura, Dalot, Saran

hand pump and population has been found very weak. This shows that there are a number of hand pump but they are not fulfilling the requirements, the reason may be that either most of the hand pumps are defunct or their water quality is not fit for use (Rodier, 2009) (Table 5).

Management and Conservation of Water Resources

A systematic planning of the conservative and judicious use of the water resources is very important for the development of any region. Multi-faceted problems related and availability fluctuation and variations of water resources exist in the region which needs proper water management but some specific issues regarding hurdles in water management of the region may listed as -

The inadequacy of the availability of water resources compared to the minimum basic needs of population and this gap is sure to widen further under the pressure of higher rate of population growth.

The traditional methods of water conservation in practice were systematically deserted and destroyed.

The spatio-seasonal variations of rains and water resources are most pronounced in the region and fluctuations are further increasing (Dinesh Mohan, 1986). The urban population has high per capita consumption of water. Widening demands of multiple urban activities flourish and expend, despite their wasteful and polluting behaviour patterns, at places at the cost of agriculture and drinking water. It becomes necessary to ponder over the ways of

Table 5. Correlation matrix table

	Area	Population	Drainage Density	Wells	Wells/00 Sq kms of area	Wells/00 of population	Tube wells	Tube wells/00 sq.kms of population	Tube wells/000 of population	Hend-pumps	H.P/00 sq.kms. of area	H.p/000 of population	Domestic need of water	Domestic supply of water	Domestic shotase of water	Cropwise need of water	Cropwise supply water	Cropwise shoriage of weter	Animal wise need	PH	Total Alkalinity	Total Hardness	T.D.S
Area	1.0000																						
Population	0.2920	1.0000																					
Drainage Density	0.6056	0.6746	1.0000																				
Wells	0.4125	0.7312	0.4238	1.0000																			
Wells/00 sq. kms of area	0.9184	0.0665	0.5936	0.2036	1.0000																		
wells/000 of population	0.2682	0.3565	0.7036	0.0149	0.2839	1.0000																	
Tube Well/00	0.3839	0.7109	0.6384	0.8944	0.3034	0.3062	1.0000																
Tube Well/00 sq. kms of area	0.1705	0.1678	0.0777	0.0373	0.2112	0.3627	0.1039	1.0000															
Tube Well/000 of population	0.2693	0.1605	0.0762	0.3632	0.2736	0.1927	0.3093	0.6907	1.0000														
Handpumps	0.3296	0.8431	0.5085	0.6589	0.1222	0.3508	0.6319	0.0401	0.3301	1.0000													
H.P/00 sq. kms of area	0.7138	0.0642	0.3823	0.2945	0.7582	0.0518	0.2612	0.1859	0.2828	0.2657	1.0000												
H.p /000 of Population	0.1718	0.3722	0.5597	0.3843	0.1230	0.5682	0.5175	0.3678	0.1774	0.0662	0.4475	1.0000											
Domestic need of water	0.3243	0.8514	0.6731	0.7586	0.1443	0.5727	0.8158	0.2529	0.1691	0.8351	0.0109	0.5882	1.0000										
Domestic supply of water	0.3392	0.8419	0.6875	0.7615	0.1657	0.5802	0.8271	0.2385	0.1740	0.8222	0.0396	0.6057	0.9992	1.0000									
Domestic Shortcase of water	0.0039	0.7734	0.2594	0.5052	0.2461	0.3035	0.4072	0.4526	0.0077	0.8077	0.4453	0.1691	0.7458	0.7179	1.0000								
Cropwise need of water	0.3373	0.6492	0.7260	0.8010	0.3331	0.4022	0.9132	0.1405	0.2405	0.5626	0.2780	0.5526	0.7686	0.7791	0.3833	1.0000							
Cropwise supply of water	0.1099	0.2168	0.5773	0.2737	0.3309	0.2392	0.5103	0.0361	0.1693	0.1225	0.2481	0.2715	0.2521	0.2708	0.1338	0.6167	1.0000						
Cropwise shortage of water	0.2638	0.6438	0.3631	0.8349	0.0258	0.2149	0.8052	0.0872	0.3120	0.6147	0.0745	0.4162	0.7457	0.7451	0.5611	0.7239	0.0289	1.0000					
Animal wise need	0.4745	0.4875	0.4695	0.7281	0.2582	0.4713	0.6091	0.0707	0.2947	0.5848	0.2712	0.5131	0.6985	0.7083	0.3684	0.5347	0.0172	0.7249	1.0000				
pH	0.0701	0.1446	0.0715	0.1060	0.1524	0.3420	0.0611	0.2414	0.0413	0.4457	0.5791	0.2599	0.2278	0.2011	0.5970	0.0315	0.2905	-0.2312	0.1368	1.0000			
Total Alkanity	0.0742	0.2067	0.1170	0.2138	0.2511	0.0277	0.0880	0.1378	0.1745	0.3967	0.4318	0.2942	0.1503	0.1282	0.4788	0.1501	0.2940	0.5037	0.3310	0.6577	1.0000		
Total Hardness	0.2381	0.4015	0.1160	0.2950	0.3558	0.3205	0.3793	0.3759	0.2454	0.4775	0.5199	0.1177	0.4326	0.4224	0.4847	0.2877	0.0423	0.4533	0.3740	0.3966	0.5594	1.0000	
T.D.S.	0.0468	0.5050	0.4715	0.3173	0.0921	0.4783	0.4119	0.4566	0.0332	0.3940	0.1585	0.3860	0.4814	0.4815	0.3723	0.4231	0.1034	0.4312	0.4995	0.0927	0.4285	0.8071	1.0000

water management in the region. The best way of water management would be in the form of conservation of water resources of the region. Conservation may be defined as preservation against lose of waste (Kumar, Dharmpuri, 2019).

Main Techniques Of Conservation Are

(1) Rain water harvesting.
(2) Control of evaporation.
(3) Reducing demand of water.
(4) Efficient use of water.
(5) Reuse of water.
(6) Efficient supply system and
(7) Setting priorities.

Thus through various techniques of water conservation water resources of the study reason can be managed and the imbalance between need and supply of water for different purposes could be minimized (Gupta and Gurjar, 1993)

Suggestions for the Management of Water Resources

* Rainwater should be stored in the tanks.

* Check dams or anicuts along the flow of river water should be constructed.

* Number of tube wells should be curtailed so as to retain the level of ground water.

* In the urban areas the supply pipe lines should be changed at least after each five years and should be cleaned regularly (Saleth, 1991).

* A time bound monitoring of the quality of water of the major water sources of the region is must.

* The surrounding area of various water sources should be kept clean.

* Water resources management could be done by saving water resources from industrial effluents, treating and recycling water.

* public should be made aware for the conservation of even a single drop of water.

* For the solution of water problems in the urban areas, the potential sources of water should be utilised (Kumud Tanwar, 2016).

Thus multi-pronged management programmes, need to be designed and implemented properly. There is need to educate masses to conserve our depleting water resources.

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