

WATER RESOURCE MANAGEMENT IN CHHATTISGARH STATE OF INDIA: STRATEGIES FOR SUSTAINABLE DEVELOPMENT

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Abstract: *Water is one of the most valuable natural resources gifted by nature to mankind. Out of the 3 percent fresh water available globally, 77.2 percent is stored in glaciers, 22.4 percent is ground water and just 0.4 percent is distributed among lakes, swamps, rivers and streams. World water demand doubles every 21 years, but the volume available is the same as it was in Roman times. Something has to be done urgently. According to UN and Stockholm Environment institute, statistics (1995) by the year 2025, two third of the world population will be affected by water scarcity. In such a situation our most valuable water resources are deteriorating, polluting and depleting day by day. Hence, each and every drop of rain water has to be conserved through various methods. In order to manage and conserve our precious water resources applying various scientific approaches, traditional method, technology and effective and relevant water policies of state government we may achieve the sustainable development of water resources in the state. In Chhattisgarh state about 80 percent population is rural and mainly dependent on agriculture. The biggest effect of PWC influence on state policy has been the three principles – location Specificity, decentralization and multipurpose water resources development. Instead it is replaced by state sponsored groundwater exploitation, which is underutilized is also most fragile in Chhattisgarh hydrological setting. A sustainable strategy for management of water resources is must to make aware masses for conservation of water and make the best use of our water by water saving programs, by capturing rain water from roof top. An attempt has been made in the present research paper to suggest the relevant strategies for the management of water resources. The aim of the research paper is to highlight various programs & policies of state government to manage and conserve the water resources of the state.*

Key words: Natural Resource, Depleting, Water Storage, Ground Water Exploitation

Introduction

Management of water resources has assumed great significance worldwide due to climatic factors associated with changes in life style of people. In last couple of decades, it has become the pertinent issue before the human society that should be addressed very wisely and scientifically by all the nations and their respective governments due to its great significance for the survival of their masses. Water is the precious gift of the nature given to the mankind is probably available only on mother earth. It is the base of human civilizations that have flourished in almost all part of the globe. About three fourth of earth's surface is covered by ocean. According to the UN estimates, the total amount of water on earth is about 1385.5 million cubic kilometres. About 71 per cent of earth surface is covered with water, out of which 97 per cent is ocean water (unsuitable for human consumption due to high concentration of salt) and rest merely 3 per cent, is available as fresh water. Out of the 3 per cent fresh water available, 77.2 per cent is stored in glaciers, 22.4 per cent is ground water and only 0.4 per cent is distributed among lakes, swamps, rivers and streams. World water demand doubles every 21 years, but the volume available is the same as it was in Roman times. Something has to be done. Nearly 45 crore people in 29 countries live in

water-short locations. More than 100 crore people lack safe drinking water. If the current trends continue, half the world could face water shortages by 2032.

India has plenty of natural resources and god has gifted plenty of water resources. In terms of quantum of water resources our country is very rich. In other words, the total amount of available water in the country irregular and its distribution is highly uneven. However, the situation is such that the floods and the droughts co-exist. Consequently, there is a severe problem of water surplus and water deficit in several parts of the country including in the study region that is Chhattisgarh state. The existing water resources of prime significance are critically depleting day by day, mainly because of over-exploitation. With regard to our country, the rate of depletion of ground water resources is very severe and beyond carrying capacity. If the continuing fall in the water table remains unchecked, the hydrological as well as environmental conditions of the concerned areas would worsen. So, keeping in view, the relevance of the issue, especially the extent, magnitude and the critical status of water resources in India particularly the management of water resources in Chhattisgarh State of India has been selected for research investigation.

Objectives

The main Aims and objectives of the research study are as under:

- To estimate and assess the present status of Water Resources in study region
- To analyze the spatial and temporal extent of research problem and major causal factors of water scarcity
- To examine the major problems and issues related to water resources
- To highlight the role of state govt. and its water policy for conservation and management of water resources
- To suggest a model for management and conservation of water resources and their sustainable development for future needs of the society

Research Methodology

The research study is entirely based on secondary data sources. The major data and information pertaining to the present research study have been collected from the secondary sources. The main sources of secondary data are Ministry of Water Resources, Govt. of India including the other Departments of Govt. of India and Department of Water Resources of Chhattisgarh Govt. and other central govt. organizations such as Central Water Commission, Central Ground Water Authority, Central Ground Water Board, as well as data has been also collected from the surface and ground Water Resources of Chhattisgarh Govt., Department of Public Health and engineering, Irrigation and their related departments. Apart from that intensive literature related to the Water Resources of State have also been collected and consulted including booklets, journals, various project reports, periodicals, statistical abstracts, newspapers and websites etc. to understand the various pertinent issues and problems related to the Water Resources from different perspectives. Lastly, all the data has been analysed by applying various statistical methods and techniques including some maps and tables to depict the major sources of water resources.

Major Causal Factors of Water Scarcity and Water Depletion in the Study Region

- Climate change and global warming
- Rapid growth in demand for drinking water to the accelerating human population both in urban and rural areas.
- Intensive and uncontrolled scale developmental activities i.e. mining, quarrying, road, building and bridges construction, agricultural operations and rising number of Industrial units etc.
- Undue exploitation of ground water resources through wells, tube wells and power pumps.
- Unbalanced demand and supply of water resources.

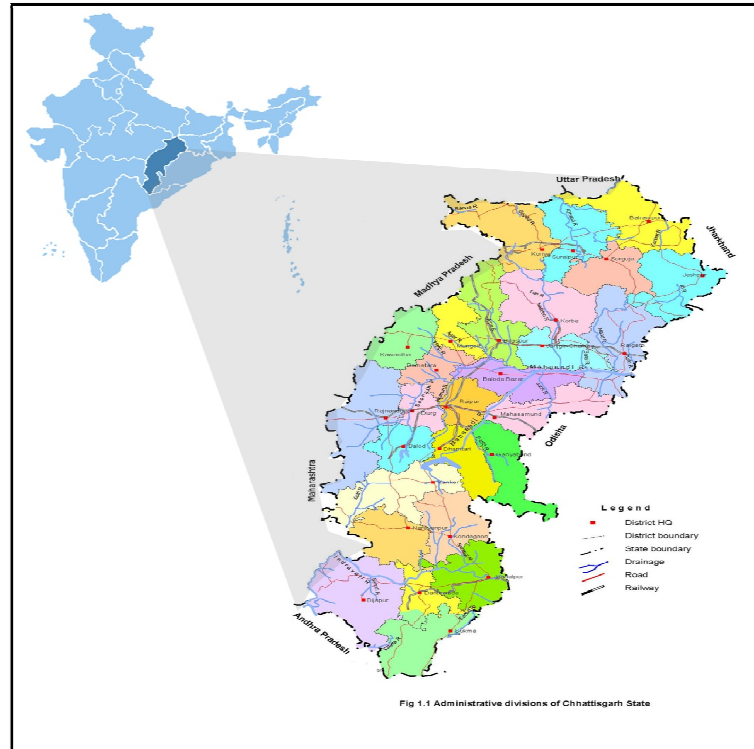
- Large scale encroachment in and around major, medium and small size water bodies.
- Lack of public awareness towards conservation and management of water resources especially in rural areas water bodies like lakes, tanks, wells, canals, rivers.
- Low public consciousness to arrest the rain water (Rain water harvesting) in agriculture farm, ponds, wells and tanks at local level.
- Changing lifestyle of modern society mainly in urban areas posing serious challenges to water scarcity.
- Supply of electricity and rising number of tube wells, power pumps and hand pumps in agricultural operations dominated areas resultantly, decaling ground water level in rural areas.
- Large scale deforestation in study area and further no afforestation consequently no seepage of rain water into the soil and no ground water recharge.
- No scientific planning of water resources including increasing the storage capacity of water resources.
- Issue of water quality and problem of fluoride content in water
- Issue of water logging and soil salinity
- Sever Problem of Drinking Water in Rural and Urban areas.
- Maximum use of Ground water resources in agricultural crops production predominantly paddy crop.
- Inadequate and inefficient drainage system.
- Deteriorating surface and ground water quality due to contamination from municipal and industrial waste as well as due to use of chemical fertiliser and pesticides in agriculture.

It is also felt that many of the problems and issues are inter-related or in some cases one is the reason for the other. Therefore, an integrated and comprehensive approach has to be adopted not only in dealing with these problems but also even in their identification. The water experts have initially classified the problems in two basic categories, one requiring physical or structural measures and other category requiring the non-structural measures these all issues and problems should be addressed scientifically by involving the latest technology (GIS) and traditional methods by the scientific community working in the field of water resource management at global, regional and local level in order to sort out the burning problem of scarcity of water resources, their management and to provide safe drinking to each and every human being of the society.

Geographical Profile of Study Region

The study region is located in the central part of India consisting of 18 districts surrounded by Madhya Pradesh in the north-west, Uttar Pradesh in the north, Jharkhand in the north east, Orissa in the east, Andhra Pradesh in the south, and Maharashtra in west (fig. 1). Geographically, it extends from 17^o 46^l North to 24^o 5^l North latitude and from 80^o 15^l East to 84^o 20^l East longitude. It consists of an area of 1,35,097 sq. km. and it is inhabited by 2,55,45,198 according to 2011 census. Previously, Chhattisgarh state was a part of the Madhya Pradesh state and it come into existence as a state in November 2000 and Raipur is the capital of Chhattisgarh state. Topographically the study region can be broadly divided into four geographic divisions viz, (i) Satpura range, (ii) Vindhyaachal Mountain range, (iii) Maikal range and (iv) Chhota Nagpur Plateau. The main rivers of the study region are Mahanadi, Indravati, Shivnath, Godavari, Arpa, Kelo, Rehar, Kanhar and Hasdeo which drains most of the geographical area of state along with their numerous tributaries. Apart from them there are many important lakes and water bodies in the state. The state experiences a tropical type of climate and about 44 per cent area of the state is covered by the forest predominantly by mixed deciduous variety of natural vegetation mainly the tree species of Sal, Bamboo and Teak. By and large the Study region experiences good amount of rainfall mainly from the South-West monsoon.

Fig: 1 Geographical Location of Study Region



Present Water Resources Status of Study Region

Nature has gifted abundant of water resources to the state of Chhattisgarh in terms of quantity. The average rainfall in the study region is about 1400 mm. and near about 90 percent of the total rainfall is experienced during the monsoon season (June to September) during which around 80 percent of the annual runoff flows. The pattern of rainfall occurrence is not uniform and it is erratic both temporal and spatial distribution. Due to the variation in rainfall the agricultural phenomenon of the entire state is badly affected mainly the paddy crop production i.e. one of the major crops of the Study Region. The recurring floods and the droughts are the main characteristics of annual flow of rivers in the state requiring storage reservoirs for efficient use of available surface water resources.

The statistical figures pertaining to water resources department of Chhattisgarh govt. reveals that the state has rich water resources. The geographical area of the state can be divided into five river basins. From the stage of ground water point of view, the study region is very dynamic state and about 146 total blocks in the State 138 blocks are identified as safe blocks and only 8 blocks are semi critical as per indicated in table 4. The study region has the distinction not to have any critical and over exploited blocks. The Mahanadi river basins cover the maximum geographical area of the state i.e. 56.15 percent followed by Godavari basin about 28.64 percent whereas the Ganga basin covered 13.62 percent and Brahmini basin only 1.03 percent. The estimated surface water flowing through the major rivers including perennial and seasonal is 48,296 Million Cum. and due to various physiographical and interstate constraints the usable surface water in the study region is 41,720 Million Cum. Surface water being used at present is only about 18,249 Million Cum whereas the estimated ground-water in Chhattisgarh is 14,548 Million Cubic meters and present exploration is about 18.31 percent.

Role of State Govt. for Management and Conservation of Water Recourses

Water Resource Management is a very important issue for socio-economic growth and for the betterment and to improve the standard of living of the specific region. It has multi-facet resource that is the basics of diverse activities of human survival and to balance the eco-system globally. In case of study region, it is a valuable resource because major lion share

of state population (about 80 per cent) is dependent on agriculture and its allied activities. Keeping in view, its significant for various development activities, the govt. of Chhattisgarh has taken a very important decision to adopt water resources development policy 2012. The main objective of this water policy was to provide drinking water to state population, agriculture and industrial sectors. The main objective of the policy are to rehabilitate the forest villagers of the submergence areas of proposed construction of dams for the development of water resources, completion of major and medium irrigation projects including to improve the quality of drinking water and to maintain ecological balance etc.

The Govt. of Chhattisgarh is very keen to implement this policy and also created new department for the management and monitoring of water resources. Several research extension counters related to monitor the water quality and to analyze the water pollution has also been made operational in the remote rural areas with a sole purpose to provide safe drinking water to every person of the state. Apart from all these decisions, recently various programs have been launched by the state govt. for the management and conservation of the water resources like “Jal Kranti”, “Jal Mahotsav” and several other awareness programs by the department of the water resources time to time.

Table 1: Districtwise Area of River Basins in Chhattisgarh (Area in Sq. Km.)

#	District	Ganga Basin	Brahmani Basin	Mahanadi Basin	Narmada Basin	Godavari Basin	Total
1	Baster	0.00	0.00	366.16	0.00	5019.84	5386.00
2	Kondagaon	0.00	0.00	0.00	0.00	5063.26	5063.26
3	Narayanpur	0.00	0.00	0.00	0.00	3748.77	3748.77
4	Bilaspur	858.85	0.00	4671.73	0.00	0.00	5530.58
5	Mungeli	0.00	0.00	2774.67	0.00	0.00	2774.67
6	Bijapur	0.00	0.00	0.00	0.00	9378.71	9378.71
7	Dantewada	0.00	0.00	0.00	0.00	2885.05	2885.05
8	Sukma	0.00	0.00	0.00	0.00	5443.83	5443.83
9	Dhamatari	0.00	0.00	4068.72	0.00	9.20	4077.92
10	Durg	0.00	0.00	2260.14	0.00	0.00	2260.14
11	Balod	0.00	0.00	3395.07	0.00	9.32	3404.39
12	Bemetara	0.00	0.00	2862.25	0.00	0.00	2862.25
13	Janjgir Champa	0.00	0.00	3859.56	0.00	0.00	3859.56
14	Jashpur	504.59	1243.45	4106.52	0.00	0.00	5854.56
15	Kanker	0.00	0.00	2354.55	0.00	4845.89	7200.44
16	Kawardha	0.00	0.00	3525.13	663.27	0.00	4188.40
17	Korba	0.33	0.00	6604.16	0.00	0.00	6604.49
18	Koriya	4042.36	0.00	2562.87	0.00	0.00	6605.23
19	Mahasamund	0.00	0.00	4745.36	0.00	0.00	4745.36
20	Raigarh	0.73	0.00	7030.06	0.00	0.00	7030.79
21	Raipur	0.00	0.00	2903.92	0.00	0.00	2903.92
22	Balodabazar	0.00	0.00	4661.19	0.00	0.00	4661.19
23	Gariyaband	0.00	0.00	4837.21	0.00	0.00	4837.21
24	Rajnandgaon	0.00	0.00	5683.81	80.39	2290.49	8054.69
25	Sarguja	1296.45	151.00	2585.03	0.00	0.00	4032.48
26	Surajpur	5451.48	0.00	0.00	0.00	0.00	5451.48
27	Balrampur	6251.86	0.00	0.00	0.00	0.00	6251.86
Total		18406.65	1394.45	75858.11	743.66	38694.36	135097.23
Percentage		13.62	1.03	56.15	0.55	28.64	100.00

Source: Water Resource Department, Govt. of Chhattisgarh 2016-17

Table 2: Stage of Ground Water Development

Categorization of Blocks in Chhattisgarh										
Total No. of blocks	Safe		Semi-Critical		Critical		Over-exploited		Others	
	Nos.	%	Nos.	%	Nos.	%	Nos.	%	Nos.	%
146	138	94	8	6	0	0	0	0	0	0

Name of Semi critical Blocks- Gurur, Balod, Saja Dhamdha, Patan, Durg, Dhamtari, Bilha

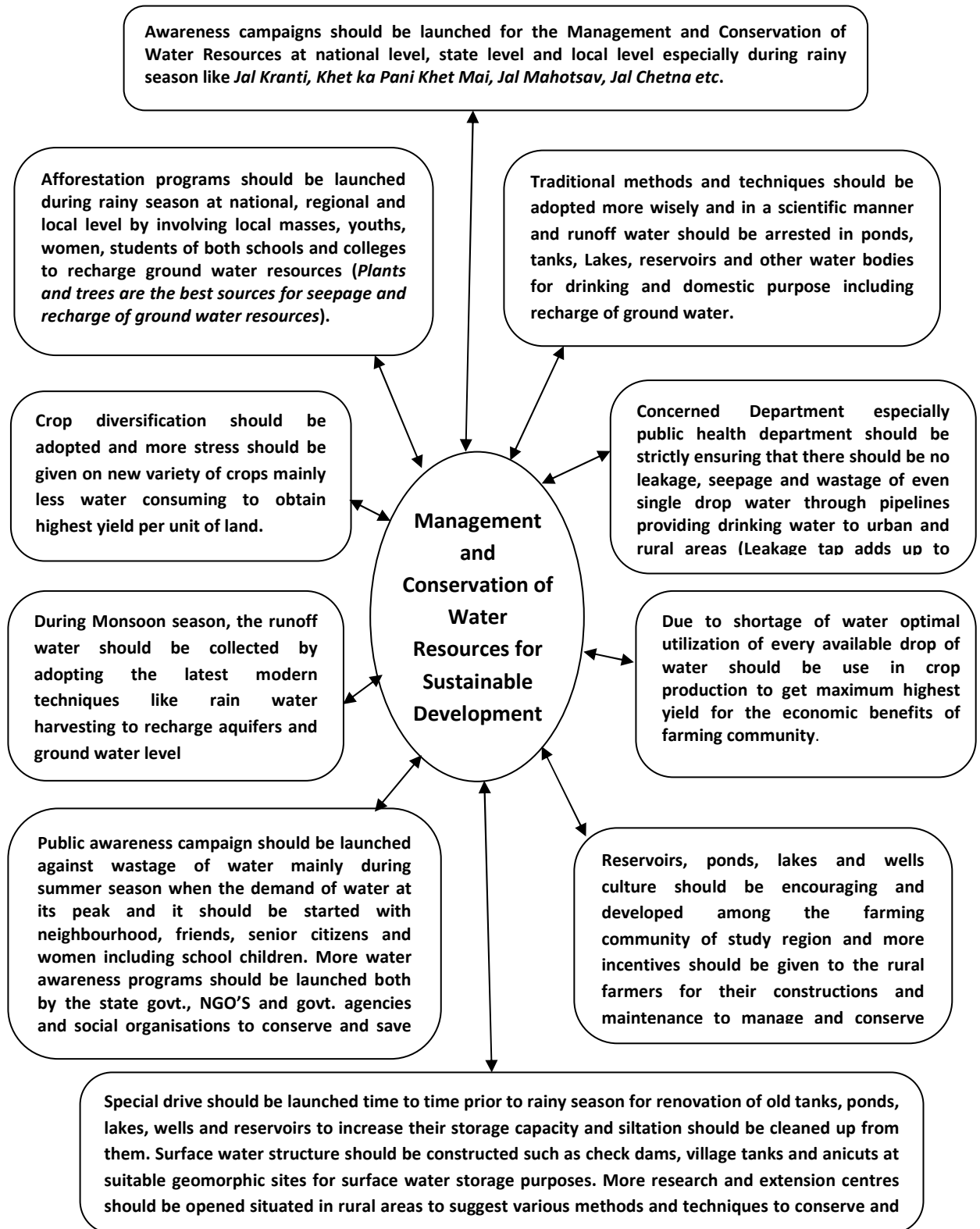
Source: Water Resource Department, Govt. of Chhattisgarh 2016-17

Table 3: Present Status of Ground Water Resources of Study Region

#.	Assessment Unit/ District	Net Annual Ground Water Availability	Existing Gross Ground Water Draft for irrigation	Existing Gross Ground Water Draft for domestic and industrial water supply	Existing Gross Ground Water Draft for All uses	Allocation for domestic, and industrial requirement supply upto next 25 years	Net Ground Water Availability for future irrigation development	Stage of Ground Water Development
1	Bastar	181706	8665	3007	11673	4223	168818	6
2	Bilaspur	66505	18128	4610	22738	7661	40716	34
3	Dantewara	175503	2490	1650	4139	2265	170748	2
4	Dhamtari	37182	13540	1641	15181	2424	21218	41
5	Durg	77658	44319	6473	50792	9126	24213	65
6	Janjgir Champa	46925	12061	3047	15108	4393	30470	32
7	Jashpur	87401	14592	1692	16284	2230	70579	19
8	Kanker	90987	6871	1521	8392	2317	81799	9
9	Kawardha	26310	7741	1333	9075	1776	16793	34
10	Korba	46554	3992	2363	6355	3588	38974	14
11	Koriya	31220	3909	1350	5259	1898	25412	17
12	Mahasamund	78070	16415	1933	18348	2344	59311	24
13	Raigarh	63919	13165	2927	16092	4225	46529	25
14	Raipur	138949	22329	6989	29318	10175	106443	21
15	Rajnandgaon	65138	16851	2961	19811	4213	44074	30
16	Surguja	154455	26326	4639	30965	7302	120827	20
	State Total (ha m)	1368482	231394	48136	279530	70160	1066924	20
	State Total (BCM)	13.68	2.31	0.48	2.80	0.70	10.67	20

Source: Water Resource Department, Govt. of Chhattisgarh 2016-17

Model 1: Model for Management and Conservation the Water Resources of Study Region for Sustainable Development



Conclusion

Water is the key to human development and poverty alleviation. Population growth and rising living standards of people are putting heavy pressure on water resources. Many regions of India including the study region are already suffering from water crisis that affects their people and the exiting ecosystem. Global Warming and climate change has further exaggerated the problem. Therefore, water management and its conservation have become a very important issue and major challenges before the global community. So keeping in view, the signification of water resources, the exiting water resources both surface and ground water resourcing should be harnessed very scientifically and carefully by invoking the water experts, policy makers, planners, community leaders including women, youths, rural farmers for their sustainable development. Otherwise, the entire human society will fall in danger of its survival. A part from the concerned State Govt. departments, the associated field experts, institutions and organizations should make sincere and joint efforts to control the depletion of water levels at regional and local levels for the management of water resources. More attention should be focussed on those areas of the study region where water shortages are acute and the rate of depletion of ground water is very alarming and acute. In such areas rural masses and farming community should be encouraged to arrest and conserve more and more rain water by preventing it from flowing away and divert it to ponds, lakes, wells and other water bodies. Such a simple action further helps recharging of ground water supply. The water experts, farmers, students, community leaders and women can play a pivotal role in the management and conservation of water resources of water resources. Apart from all these efforts and by applying the suggested model (1) followed by the latest technology (GIS) may also play a key and decisive role to manage and conserve the water recourse of the study region.

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