

Role of Society and Government in the Sustainable Development of Water Resources of Hathras City: A Case Study

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ABSTRACT

A study of the water resources and its management for the sustainable development of Hathras City and adjoining villages has been carried out in this paper. Keeping in mind the rapid growth in population, industries, agriculture and change in the lifestyle of the society, certain strategies are proposed in present paper for future sustainable development of the Hathras City and adjoining villages. The strategies include education of society in water conservation, soil conservation, ground water recharging, and water preservation reservoirs, implementation of stringent laws by the government for maintaining the existing water resources afresh to provide adequate quantity of good quality water to the society.

Keyword- sustainable, development, society, government, NGOs

1. INTRODUCTION

Water and land are two components of vital resources of our country. Sustainable development of a country depends on better management of these two resources. India has a vast land and good water potential through rains. As far as Land management is concerned, more and more uncultivated lands can be transformed into cultivable land by employing soil conservation measures, however, optimal use of this land for food production is merely possible without water. Therefore, for sustainable development of a region, an all out effort should be made to make available an ample quantity of water for the irrigation of lands for sufficient flood production. In addition to this water is an important element for other essential purposes which are directly associated with sustainable development of a region like, navigation, hydroelectric power generation, industrial and domestic requirements.

The sustainable development of country depends on adequacy of water needed for irrigation, power generation, navigations, industries, domestic requirements and wild life, A good irrigation system makes country self reliant in food requirements of the people. Good irrigation can't survive without adequacy of water. A major part of irrigation water requirement is fulfilled by direct rainfall during monsoon. India has a good water potential. However, some parts of India are subjected to flood while the other parts face drought simultaneously. Floods bring enormous loss of property and life and has an adverse impact on Environment, Ecology and Sociology and hence on sustainable development of a country. Thus, on one hand, flood water goes west on the other hand it results in tremendous miseries to the people. If the flood water is saved from being lost, dual problems of flood protection of people and availability of water will be solved. This can be achieved by employing flood water management measures like aquifers recharging, water harvesting, channel networking and better watershed management.

Keeping this scenario in mind a case study of Hathras City and adjoining villages has been carried out for water management and their sustainable development.

2. LITERATURE REVIEW

The present and future status of water resources in many regions is closely monitored due to the pressures of climate; land cover and population change (Murray *et al.* 2012). Freshwater availability and consumption is of particular interest in India due to the country supporting an increasingly large population with decreasing per capita water supplies (Mall *et al.* 2006). Climate change offers the potential to significantly alter precipitation and surface water regimes in India (e.g., Chattopadhyay and Hulme 1997; Kumar *et al.* 2005), while the anticipated population increase and expanding economy is expected to exacerbate stress on groundwater reserves (e.g., Amarasinghe *et al.* 2007; Jain *et al.* 2007). As the region is among both the most intensively irrigated and densely populated in the world (Kumar *et al.* 2005), it is critical that water security is ensured in order to prevent the socio-economic adversities associated with water resource shortages. Of particular concern is north-west India, which is densely populated and identified by the Indian Ministry of Water Resources (2006) as a region where groundwater extractions exceed recharge. Recent hydrological research regarding northwest India has largely focused on optimizing agricultural yields against the backdrop of increasing water stress.

Groundwater resources in India have traditionally been assessed at the local scale through direct water table measurements (e.g., Naik and Awasthi 2003; Sharda *et al.* 2006) and electrical resistivity techniques (e.g., Israil *et al.* 2006). More recently, satellite-based gravity field retrievals of terrestrial hydrology have been employed for monitoring large-scale groundwater fluxes (e.g., Yeh *et al.* 2006; Strassberg *et al.* 2009; Syed *et al.* 2010).

3. WATER RESOURCES AND SUSTAINABLE DEVELOPMENT

3.1 Role of Water Resources in Sustainable Development

Without water, a harmonious and sustainable development of socioeconomic activities is not possible. For purpose of improving the quality of life as a condition of achieving sustainable development, it is essential to secure sufficient water of good quality throughout the community without upsetting the natural equilibrium of the environment. There is quantitative problem of water scarcity, particularly in developing countries. The aim of water management is to deliver the right amount of water at right time at the right place.

It is an unfortunate fact that amount of fresh water that is available to any country on a long-term basis is nearly constant for all practical purposes. Because of technical and economic considerations, only a certain percentage of total water available can be used at any specific time. However, total recycling or reuse is neither technically nor economically possible.

3.2 Role Awareness of Society in Sustainable Development

The people in a society are unaware about the dire consequences of pollution of water resources. In many localities, the public has connected their water closet pipes directly to the upper strata of earth. They do not realize that what they are feeding, they themselves will consume it, particularly poor people who rely on the upper strata for withdrawing water by hand pumps. Substantial amount of fresh water is lost due to public negligence or poor education of society. People do not bother about the continuous over flow of overhead tanks and leakage in the water supply system. Obviously, all this causes loss of precious water resource and affect adversely the sustainable development.

Therefore, sustainable development is possible only if concerned people are fully aware, educated in maintaining water resources afresh. This awareness will alarm the peoples with critical situations viz., loss of water through manmade leakages in the distribution system, wastages of water in the households, unhygienic practices in the catchment area as well as pollution from point and non-point sources. This will lead to appropriate, judicious and equitable use of limited water sources at our disposal. This is achieved by adopting technologies such as recycling, reuse, cleaner and economic process.

More than 90 million people add to the world's population every year Rouhollah Fatahi Nafchi, Hossien Banejad (2000). Human life relies on continuous access to fresh water and food resources. Food production, however is critically contingent upon the availability of water.

3.3 Adverse Impact of Contaminated Water Resources on Sustainable Development

Safe water in sufficient quantities is fundamental to human health. The most important water-associated health problem is diarrhea, accounting million of deaths per year, especially among children. Availability of safe drinking water, combined with sanitary facilities for disposal of feces and improved hygiene standards, could prevent diarrheal disease to a great extent in developing countries. Much emphasis has been placed on reducing biological contamination, but contamination from naturally occurring chemicals in groundwater and from industrial and agricultural waste is also becoming a serious problem in developing countries.

In India, about 66 million people drink groundwater with too high a fluoride content. While arsenic is toxic and carcinogenic, fluoride is an essential element for development and protection of teeth and bones. In excess, however, fluoride leads to serious dental and skeletal deformities and other health problems. Installing filters or other devices at millions of tube wells to remove arsenic and fluoride is an almost impossible task. Therefore, alternative sources of drinking water must be found in affected areas.

In some regions, the availability of shallow groundwater for drinking is an increasing problem because of over exploitation for agricultural and industrial purposes. In some of the major areas of Asia, Such as the Punjab in India, water table is falling 2 to 3 meters a year. Groundwater depletion also causes the shallow drinking-water wells of poor communities to run dry, a problem that has received less attention. Deepening these wells is costly and beyond the resources of the poor.

In the foreseeable future, many towns in developing countries like India will continue or expand the irrigation of high-value vegetable crops with untreated wastewater. Governments may wish to regulate reuse but are unable to offer practical solutions to the users. It is urgent, therefore, to develop a framework for evaluating different options and trade-offs so that governments and communities can make better-informed decisions.

In the light of aforementioned discussion it can be concluded that contaminated water resources cause many life taking diseases which ultimately affect adversely the sustainable development of a region. The government and NGOs are engaged in such environmental problem and the money which could be spent on developmental works, goes waste to solve polluted water problems. Sometimes the situation takes political colour which also has adverse impact on the development.

3.4 Effect of Urbanization

Humanity has crossed the line from being a rural to urban species. Urbanization has especially increased in Asia and South America as well as in Africa to a substantial extent in the second half of the last century. Urbanization will eventually lead to negative consequences for the environment as well as for the water resources. It is to be assumed that the water problem in the megacities of the developing countries will continue to intensify. In this context, one of the key tasks of sustainable and long-term land and natural resources management is to optimize water resource utilization referring to the spatial distribution of people and their activities. The environmental and social problems associated with water scarcity point to a crisis in urban water resources management, and one that threatens the security and livelihood of the population and the environment over the coming decades. This complex interaction between water resources and urban development is becoming increasingly recognized across the world, as the urban areas become home to an increasing number of people. The urban water household represents one of the most vulnerable sectors in the course of rapid urbanization: With rising population the adequate water supply risks to become an insolvable problem due to the serious decrease of ground and surface water quality together with a drastically decreasing infiltration rate by reason of rising structural densification.

4. DATA COLLECTION FROM HATHRAS CITY AND ADJOINING VILLAGE

Various data collected from Hathras city and adjoining villages are shown in Table 1. The data include Population, Educational facilities, Sources of water, Domestic water use, Public water use, Land use pattern etc. There is direct influence of these data on water resources balance and sustainable development. Based on these data, water required to fulfill various demands and water available from existing water resources are compared to see the current condition water balance.

Except a few villages, water availability is satisfactory, however, it is at critical limit in some villages. At places, where water shortage is found, certain strategies are proposed for augmenting the water resource.

5. STRATEGIES FOR SUSTAINABLE DEVELOPMENT

A better management system should be developed to preserve the available water resources. Water use for any purpose should be optimal. The irrigation system should be so designed that the quantity of water supplied to the field just fulfills the crop water requirement at lowest cost and no portion of supplied water is lost. For domestic purposes also, an effort should be made to use the water just sufficient to fulfill the need. Ground water should be used according to the exact requirement. Excessive pumping of ground water by the public should be checked. People should be educated for optimal utilization of ground water otherwise; a time may come soon when the people of the region may not get ground water any more.

The water quality in the streams and aquifers should be maintained to standard level. The industries should be checked strictly not to feed their effluents into the surface drains without proper treatment otherwise the surface and ground water resources may be polluted making the water unfit for use. Continuous infiltration of polluted surface water may pollute ground water resource which may hamper the human and aquatic life. Streams, rivers and reservoir sedimentation should be minimized so that the reservoirs capacity is not reduced and floods do not occur frequently. It is very helpful for sustainable development.

An appropriate flood water management may save a bulk quantity of flood water which flows haphazardly, causes damage to the property and life and then goes waste without being used. Proper management of flood water may augment the surface and ground water resources and reduce damages..

Several measures can be adopted for flood water management. Ponds can be built in villages to harvest the flood water. These ponds should only be used to store flood water and village people should be educated for not feeding their waste water in such ponds. The ponds may also be made pukka. The pond capacity should be fixed such that most of the water is consumed by the village people before the commencement of next monsoon and flood water can be accommodated in these ponds. N.G.Os. and local village people must be involved in the construction of those ponds. The soil excavated from ponds site may be used in flood proof roads and community centers construction at higher levels. In case of Kutcha ponds, some amount of stored water will infiltrate into the aquifers and thus the water will be used for aquifers recharging. Some flood water in thin layer can be fed to the paddy fields. Some amount of water will infiltrate into the aquifer.

Clear rain water from roof tops, can directly be fed through pipes to the aquifers for their recharging. In this way the flood water may be prevented from standing in the localities and thus the people can be safeguard against untold miseries. Thus flood damage is controlled one end and a substantial quantity of water fed to the aquifers will augment ground water resource and provide sustainability. .

People can be encouraged to build ponds for fish production. Some part of flood water is utilized for fish production which in turn gives job opportunities to the unemployed people.

An ill managed water resource may lead to social problems. People to people, region to region and country to country conflicts over the water resource make the relations strained and create political and social problems. Tamil Nadu-Karnataka and India - Bangladesh water conflicts are the two examples of strained social relations.

Inadequate water resources lead to environmental threats. Crops, Plants, Forests vegetal cover and pasture are all dependent on water resource.

Water availability is taken for granted by the public in most of the world today. Similarly, political leaders not made fully aware of present dimension of water crisis until disasters occur. Water Crisis is not temporary phenomenon that can be dealt with in a crisis management style. It requires long terms and lasting solution beyond the short term of decision makers in office. Political leaders and decision makers must be made fully aware of the magnitude of the problem at the local, national and global level. This is needed to devise appropriate policies, strategies and action plans and to create the enabling environment for their implementation.

Without full participation of the public at all levels, it is not possible to envisage or implement sustainable solution. Raising the awareness of the public is essential to ensure their involvement. Awareness - rising involves changes in the education system, enhancing research and development, support of civil society.

5. CONCLUSIONS

Following conclusions are drawn from present study for sustainable development of a region including Hathras City:

By force solution is not sustainable in all cases. Confidence building measures are essential for good results.

Public should be educated about benefits of optima use of water for different uses. This education can be implemented from school level and a course should be included in school curriculum for children.

Pollution of fresh water resources should be protected by enacting and judiciously implementing the stringent laws.

People should be educated about the benefits pollution free water. once they are convinced, they will not pollute water. They should be made realized that if they are connecting their water closets directly with the ground water aquifer, they themselves will consume this water and will fell pray to life taking water born diseases.

Heavy penalty should be charged from the people who discharge their effluent directly into fresh water carriers and polluting the fresh water resource.

Loss of water in any form should be checked. This task is also possible through education including motivation though media.

Public participation is important in maintaing the sustainable development. Society do the correct things themselves. For correct activities people should be acknowledged and appreciated.

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Table 3.0 Data collected from Hathras City and adjoining Villages

	Hathras City	Nagla Ummad	Avranpur	Ruheri	Tamnagarhi	Dayanapur	Jogia
Area (in hectares)	1150	82.766	529	261.927	195	83.985	201
Population	140000	640	1000	3909	3079	1167	2391
Education Facilities:							
(a) No. of Primary Schools	19	1	1	1	1	1	1
(b) No. of Jun. High Schools	12	-	-	-	-	-	-
(c) No. of inter Colleges	10	1	2	-	-	-	-
(d) No. of degree Colleges	6	-	-	-	-	-	-
Sources of Water:							
(a) No. of rivers	-	-	-	-	-	-	-
(b) No. of canals:	-	1	1	-	1	1	1
(c) No. of ponds	3	1	2	3	2	1	-
(d) No. of Tube-wells	11	9	16	16	13	10	5
(e) No. of Hand Pumps	550	32	35	39	49	20	35
(f) No. of Water tank (O.H.)	4	-	-	-	-	-	-
(g) No. Submerseble	930	16	10	15	25	16	18
(h) No. of Cattle	618	51	88	301	715	89	175
Quantity of Water required for domestic use							
Per annum (hectare-meters):							
(a) For drinking	22.945	0.105	0.1643	0.642	0.5057	0.192	0.393
(b) For bathing & washing	252.945	1.156	1.8067	7.062	5.562	2.108	4.319
(c) For cattle	0.3045	0.025	0.0433	0.148	0.3523	0.438	0.0863
(d) For Toilet	114.975	0.5256	0.5212	3.2102	2.5286	2.1420	1.9636
(e) For Sprinkling of road	114.975	0.5256	0.8212	3.2102	2.5286	2.1420	1.9636
(f) For Business and industrial	114.975	0.5256	0.8212	3.2102	2.5286	2.1420	1.9636
Quantity of Water required for public utilization							
(a) For irrigation	-	48.418	398.30	138.444	95.25	48.32	192.20
(b) For industrial use	19.163	5.256	-	-	-	-	-

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(c) For school and college	14.235	0.1095	0.1095	0.410	0.657	0.1095	0.1095
(d) For Fire Fighting	76.75	0.35	0.5475	2.140	1.685	0.1095	1.309
(e) For water losses	255-50	1.2848	2.007	7.8473	6.1810	2.3427	4.7999
Land Use Distribution (hectares):							
(a) Total land:	1150	82.766	529	231.927	195	83.985	201
(b) Open land	-	16.550	121.67	53.34	42.90	20.15	48.24
(c) Gardens	-	0.166	4	11	10	4	-
(d) Barren land	-	8	10	13	26	0.985	20
(e) Imigated land	-	66	468	185.927	86	62	157
(f) Non irrigated land	1150	0.8	47	22	3	9	30
Amount of rainfall (cm)	74	74	74	74	74	74	74
Total revenue collections (Rs.)	13860	2233	2283	3531.70	4436	2867	2202