Some socio-economic aspects of groundwater development in India

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Abstract: At the end of the 20th century, the population of India crossed one billion mark. India has mainly an agricultural economy where land holdings are generally small. Due to steep rise in population, the demand of water has increased considerably over the last 50 years resulting in overdraft and water quality deterioration. The paper discusses major aspects of groundwater development and connected socio-economic issues.

Keywords: groundwater development, water rights, socio-economic issues.

Introduction

In India about 70 % people live in rural areas. However, in recent years there is a greater trend of migration of the rural population to urban areas. Due to steep increase in population along with associated activities, water is becoming a scarce resource coupled with quality deterioration.. It is estimated that the entire utilizable water resources of the country would be required for various uses by the year 2025 A.D.
The maximum use of water is for irrigation. Surface water is Government owned but groundwater is private i.e. it belongs to the landowner. There has been an indiscriminate use of water as there is no control on its use either by the Government or public organizations. Recently attempts are being made for an equitable distribution of this scarce resource for the economic development and well being of the society.

Water Resources Availability and Demand

The average annual rainfall in India is about 1170 mm depth with a total volume of 4000 km^3. However, its distribution is greatly uneven in space varying from about 100 mm in the western parts to more than 1100 mm in the northeastern parts of the country.
The total utilizable water potential is 1140 km^3, out of which 690 km^3 is from surface water and 450 km^3 from groundwater. Out of total water utilized in the country, 84 % is used for irrigation, about 4.4 % for drinking and municipal use, 4 % for industry, 3.6 % for energy development and the remaining 4 % for other purposes. Nearly the entire utilizable water resource of the country would be required to be put to use by the year 2025. This is mainly on account of increased demand of water for irrigation required to grow more food grains for the increasing population, which is estimated to reach about 1.25 billion by the year 2025 (Singhal and Gupta, 1999).

Scientific paper

GROUNDWATER DEVELOPMENT

Out of the total replenishable groundwater, which is estimated to be about 450 km^3 the present development is nearly 40 %. However, its development has not been uniform. Groundwater contributes to about 50 % of the total irrigated area of the country and 85 % of the rural water supply is met from groundwater.

There has been a significant increase in the demand of groundwater for agriculture, domestic and industrial uses, which has caused over- exploitation of groundwater in some areas causing excessive lowering of water levels, seawater intrusion in coastal aquifers, and upcoming of saline water in inland areas. In contrast to this, in canal irrigated areas, due to poor drainage and excessive irrigation, a rising trend of water level has taken place resulting in water logging and soil salinization. About 25,000 km^2 area under canal irrigation is affected by water logging.

The use of groundwater for irrigation has considerably increased from a meager 6.5 km^3 in 1951 to over 50 km^3 in 1997 .The number of wells has also considerably increased from merely 4 million in 1951 to nearly 17 million in 1997. The investment from all sources in the development of groundwater has also grown from less than Rs. 600 million (US$ 120 million) during the First Plan (1951-1956) to over Rs. 12 billion (US $ 2.4 billion) during the Eighth Plan period (1992-1997). The institutional finance for groundwater development is about 60 % of the total outlay for groundwater development while public outlay is 20 % and the balance is met from the private sources (KAPOOR, 2000). About 75 % landholders are small and marginal farmers having less than 2 hectares of land per family. The area owned by them is about 30 % of the total cultivated area in the country. At per the present norms, Government provides subsidies of 33 % to marginal and 25 % to small farmers for the construction of wells and purchase of pump sets.

The Central Ground Water Board (CGWB) has established a countrywide observation well network for monitoring water levels. A total decline of 4 m i.e. 20 cm/year has been noted during 1981-2000 in several states of the country. In the NCT (National Capital Territory) of Delhi, in some areas, a decline of as much as 5 to 10 m is noted. In several cases the water levels have fallen below the suction lift of existing pumping equipment.

The CGWB has categorized areas based on the present stage of groundwater development and past water level trends. Based on these criteria, about 300 blocks, all over the country, have been classified as 'over- exploited' where groundwater development is more than 100 percent and 160 blocks are 'dark' where the stage of groundwater development is between 85 and 100 percent. Such a categorization provides guidelines to financial institutions for providing loans to farmers for the construction of additional wells. 'Grey' and 'white' areas are those where groundwater development has been 65-85 % and < 65 % respectively and hence in these areas there is a scope of further groundwater development.

According to a study carried out by the International Water Management Institute (IWMI), India is among the 50 most water poor countries. This study is based on the Water Poverty Index (WPI). India is ranked 47th in WPI while Canada, Norway, Finland, Iceland, Guyana and Surinam are among the water rich countries. At the lower end of the scale lie Ethiopia, Rwanda and Malawi. Almost all the water rich nations are in the northern hemisphere and all those with less water are in Africa. The WPI is based on resource, access, use, capacity and environment. The WPI is not an indication of only water availability but it takes into account the effectiveness of its use also.

Ground Water Rights

Under the Indian Constitution, the landowner has an absolute right on the groundwater under his land. Therefore, a landowner can abstract any amount of water irrespective of its effects in the adjoining areas. It also means that 30 % of the landless rural population does not have the water rights. Such an approach violates the fundamental rights to life of a person in a socialistic society. Therefore, the above water rights have to be modified to ensure equitable availability of water to all the citizens irrespective of land holdings.
There are also inter-state problems in the sharing of not only surface water but also of groundwater as major aquifers run across the state administrative units. Therefore, water should be recognized as a national –rather than a regional –resource that needs cooperation amongst states on these issues.

Groundwater Legislation

Recognizing the importance of proper groundwater development, a model bill was framed by the Government of India in 1970 and was circulated to the states. On the basis of experiences in the last two decades, the Bill was revised first in 1972 and again in the year 1996. As a subsequence of this, the Govt. of India constituted the Central Ground Water Authority (CGWA) for the purpose of regulation and control of groundwater management and development including water quality. The CGWA has identified certain areas where for further groundwater development prior permission of the Authority is necessary. However, it is being realized that implementation of such restrictions is difficult. The bureaucratic setup of the Government is often unable to solve the local problems without involving local people. This also requires mass awareness about the adverse effects of overexploitation and degradation of groundwater quality. Local elected bodies, viz. village councils (***panchayats***) should be involved in decision making. Non-Government Organizations (NGOs) can also play an important role, as people will listen to them with greater care due to their involvement in other local developmental activities, such as health and education.

Groundwater Quality

In addition to salinity (both inland and coastal), high concentration of fluoride, arsenic, iron & nitrate are the main contaminants in groundwater. Unscientific disposal of industrial waste and sewage also causes widespread pollution of groundwater mainly in the urban and industrialized areas.
High concentration of fluoride (more than the permissible limit of 1.5 mg/l) is reported both from the hard rock (granites & gneisses) as well as alluvial aquifers. People living in such areas were drinking high fluoride waters without realizing its presence, which caused various bone diseases. The cause of high fluoride in groundwater is geogenic being a result of the dissolution of fluoride bearing minerals. Defluoridation plants have been installed in areas where such problems exist.

A very serious problem detected recently is the presence of As in groundwater of several districts in the Ganga river delta, covering parts of Bangladesh and eastern part of India (West Bengal). About half a million people in eight districts of West Bengal suffer from various arsenic related skin and other diseases. Shallow aquifers in the depth range of 15 to 75 m have higher concentration of As (0.3 to 1.1 mg /l) while the deeper aquifers (>150 m) contain negligible amount of As. The origin of As in groundwater of West Bengal (India) and Bangladesh is controversial. However, it is regarded to be geogenic derived from the As rich pyrite present in peat and clay formations in the deltaic alluvium (MUKHERJE ET AL., 2002). Mitigation is difficult given the scale of the problem as well as social and economic factors. Options include use of deep groundwater (>150 m), rainwater harvesting and treatment of contaminated groundwater (BGS, 2000)

Inland salinity is predominant in canal-irrigated areas due to water logging. People living in these areas are also exposed to malaria and other diseases.

Over- exploitation of groundwater in the coastal aquifers of Saurashtra in Gujarat state, Tamilnadu in south India and coastal parts of Orissa in the east has led to seawater intrusion and thereby water quality deterioration.

CONCLUSIONS

The growing population of the country needs more water for various uses. However water can be constraint, if not prudently developed and managed. The real life problems facing India in the water resources sector are about the water rights including sharing of surface and groundwater resources between the various states and individuals, general shortage of water in rural and urban areas, deterioration in water quality and degradation of the environment. These aspects need due attention by administrators, scientists, engineers and social workers to ensure equitable distribution of water for the sustenance of mankind without endangering the needs of future generation.

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