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QUALITY & STATUS OF GROUNDWATER IN INDIA

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ABSTRACT

People on globe are under tremendous threat due to undesired changes in the physical, chemical & biological characteristics of air, water & soil. Due to increased population, urbanization , industrialization , use of fertilizers water is highly polluted with different harmful contaminants Natural water resources are being contaminated due to weathering of rocks & leaching of soil, mining processing etc. In the past five decades since independence, the development of water resources in country has increased rapidly in order to meet the demands for diverse users. Ground water has played a significant role in maintenance of India's economy, environment and standard of living. Besides being the primary source of water supply for domestic and many industrial uses, it is the single largest and most productive source of irrigation water. Uncontrolled development of the resource for meeting the increased demands has resulted in declining ground water levels. Further haphazard disposal of domestic and industrial wastes and excessive application of fertilizers, pesticides in agricultural fields have led to deterioration of ground water quality thereby further limiting the availability of fresh ground water resources.

KEYWORDS: Groundwater, Quality.

INTRODUCTION

Monitoring of ground water regime is an effort to obtain information on ground water levels and chemical quality through representative sampling. The important attributes of ground water regime monitoring are ground water level, ground water quality and temperature. The primary objective of establishing the ground water monitoring network stations is to record the response of ground regime to the natural and anthropogenic stresses of recharge and discharge parameters with reference to geology, climate, physiographic, land use pattern and hydrologic characteristics. The natural conditions affecting the regime involve climatic parameters like rainfall, evapotranspiration etc., whereas anthropogenic influences include pumpage from the aquifer, recharge due to irrigation systems and other practices like waste disposal etc. Ground water levels are being measured four times a year during January, April/ May, August and November. The regime monitoring started in the year 1969 by Central Ground Water Board. At present a network of 15640 observation wells located all over the country is being monitored. Ground water samples are collected from these observation wells once a year during the month of April/ May to obtain background information of ground water quality changes on regional scale. The database thus generated forms the basis for planning the ground water development and management programme. The ground water level and quality monitoring is of particular importance in coastal as well inland saline environment to assess the changes in salt water/fresh water interface as also the gradual quality changes in the fresh ground water regime. This data is used for assessment of ground water resources and changes in the regime consequent to various development and management activities.

REVIEW OF LITERATURE

Datta and Natrajan (1996) have analysed the drinking well and tap water quality in connection with the high incidence of gastrointestinal diseases and cholera epidemics in Pondicherry. Richariya and Mishra (1998) have reported that groundwater has become a great problem in Rewa area according to bacterial pollution due to sewage of polluted surface water from industries, mining domestic wastes, causing various water borne diseases.

Verma and Thakur (1998) have studied the water quality of different water sources viz., municipal water supply, wells, borewells and river water at Ghatsila (Jamsedpur, Bihar), also indicate that the industrial influents released by a giant metal processing unit contaminate the water sources and make them unsuitable for drinking purpose. Kumar and Siddiqui (1998) have studied the quality of drinking water in and around Ranchi.

Pande (2000) has studied of surface water, sediments and ground water of river Ramganga at Moradabad. Aswathanarayana (2002) has studied the utility of groundwater available is dependent on its physical, chemical and bacteriological properties. Spatial and temporal distribution of groundwater quality is a function of climate (precipitation and evaporation), topography (slope which affects the residence time of groundwater), geology of the area (mineralogical and chemical composition of rocks and soils with which groundwater is in contact) etc.

Suthar et al. (2005) have conducted study of ground water quality of Shri Ganga Nagar city, Rajasthan. Agarkar and Kulkarni (2005) have evaluated the status of drinking water quality in school in Buldana District of Maharashtra. Sandhya (2005) has studied the presence of iron in groundwater can be attributed to the dissolution of rock and minerals (pyroxenes, pyrite, magnetite and haematite), acid mine drainage, sewage and industrial effluents.

Kumari and Jha (2009) have studied the assessment of drinking water quality in and around Patna town and they found that the maximum concentration of hardness in summer season (pre monsoon). Kavitha and Elangovan (2010) have studied the ground water quality characteristics at Erode district, Tamil Nadu, India. Rajkumar et al. (2010) have studied the groundwater contamination due to municipal solid waste disposal– AGIS based study in Erode city. Rajamanickam and Nagan (2010) have studied the groundwater quality modelling of Amaravathi river basin of Karur district, Tamil Nadu

Prajapati and Rokde (2011) have studied the quality of drinking water of potable water of southern Indore city, M.P., India. Singh et al. (2011) have studied the assessment of groundwater resources of Panandhro lignite mining region, Gujarat state, India.

Prajapati and Bhagore (2012) have studied the microbiological study of drinking water of Dhar city and adjacent villages. Mishra et al. (2012) have studied the assessment of groundwater quality in Shivpuri town, Madhya Pradesh, India. They reported the WQI range from 30.80 to 70.58, 34.58 to 70.22 and 33.02 to 69.97 in rainy, winter and summer seasons respectively.

Shrivastava and Pandey (2013) have studied the Physico-chemical and microbiological quality evaluation of groundwater for human domestic consumption in adjoining area of Omti Nallah, Jabalpur (M. P.), India. Shende et al. (2013) studied the Laboratory studies on water quality assessment of groundwater of open dug wells and surface water of Lake Waddepally in Warangal city, India. Hassan et al. (2013) studied the Physico-chemical assessment of groundwater quality of Waluj industrial area, Aurangabad, Maharashtra.

Hazarika and Bhuyan (2013) have studied the fluoride, arsenic and iron content of groundwater around six selected tea gardens of Lakhimpur district, Assam, India. Nirmala et al. (2013) have studied the Physico-chemical analysis of selected groundwater samples of Tumkur district, Karnataka. Narsimha et al. (2013) have studied the Hydro chemical concept of groundwater in and around Atmakuru area, Anantapur district, Andhra Pradesh, India.

GROUND WATER SCENARIO IN PRE-MONSOON INDIA

A perusal of depth to water level of India for Pre- Monsoon period reveals that that in sub-Himalayan area, north of river Ganges, generally the depth to water level ranges from 2 to 10 meter below ground level (mbgl). In the eastern part of the country in the Brahmaputra valley water level generally ranges from 2-5 mbgl, except in isolated pockets where depth to water level is less than 2 mbgl. However, in upper Assam, isolated pocket of deeper water level, 5-10 mbgl has been observed. In major parts of Indus basin, depth to water level generally ranges from 5-20 mbgl. In the western part of the country covering states of Gujarat and Rajasthan deeper water level is recorded in the range of 10-20 m.bgl. Relatively deeper water level in the range of 20-40 mbgl and > 40 mbgl have been observed in Alwar, Barmer , Bikaner, Churu, Nagaur, Jhunjhunu, Sikar and Jaipur district of Rajasthan and also in central and north Gujarat. In Punjab and Haryana deeper water level in the range of 10-20 mbgl and 20-40 mbgl has been observed. In Maharashtra water level recorded is mostly in the range of 5-10 mbgl except western Maharashtra where water level is generally less than 5 mbgl. In the east coast i,e coastal Andhra Pradesh, Orissa and Tamil Nadu, generally the water level ranges between 2-5 mbgl. However, isolated pockets of water level more than 5 mbgl have also been recorded. Eastern most part of West Bengal recorded water level in the range of 5-10 mbgl. In central India water level generally varies between 5-20 mbgl, except in isolated pockets where water level is more than 20 mbgl. The peninsular part of country generally water level ranges between 5-20 mbgl except in pockets where water level is less than 5 mbgl. Isolated patches of deeper water level in the range of 20-40 mbgl and more than 40 mbgl have also been observed in various parts of the country. A comparison of depth to water level during Pre-Monsoon (May 2009) with decadal mean (1999-2008) reveals that in general, there is decline in the water level throughout the country except in the states of Andhra Pradesh, Gujarat, Karnataka and Tamil Nadu where more nos. of wells showing rise in water level than fall. Most of the wells have been showing rise / fall of water level in the range of 0-2 m and are common in all the states. Fall in water level more than 2 meters on long term basis has also been observed in various parts of the states such as Madhya Pradesh, Uttar Pradesh, Gujarat, Rajasthan, Haryana, Punjab and Maharashtra. In Gujarat fall of more than 4m is observed in isolated patches in Banaskantha, Sabarkantha, Kheda, Gandhinagar, Ahmedabad, central & eastern parts of Kachchh districts and Saurashtra region. In Maharashtra districts of Amravati, Aurangabad, Beed, Jalna, Nanded, Nagpur, Sindudurg and solapur fall in this category. In Haryana districts of Ambala, fatehabad, Kaithal, Karnal and Panchkula showing decline in this category. In Punjab more than 2 m decline is observed in isolated patches in Bathinda, Faridkot, Jalandhar, Rupnagar, Patiala and Sangrur districts.

GROUND WATER LEVEL IN DURING MONSOON

A perusal of depth to water level map of India for August 2009) (Plate V) reveals that that in sub-Himalayan area, north of river Ganges, generally the depth to water level ranges from 0 to 5 meter below ground level (mbgl). In the eastern part of the country in the Brahmaputra valley water level generally less than 2 mbgl, except in isolated pockets where depth to water level is in the range of 2 to 5 mbgl. However, in upper Assam, isolated pocket of deeper water level, 5-10 mbgl has been observed. In major parts of Indus basin, depth to water level generally ranges from 5-20 mbgl. In the western part of the country covering states of Gujarat and Rajasthan deeper water level is recorded in the range of 10-20 m.bgl. Relatively deeper water level in the range of 20-40 mbgl and > 40 mbgl have been observed in Rajasthan, Punjab, Haryana and also in central and north Gujarat. A comparison of depth to water level during August 2009 with decadal mean (1999-2008) reveals that in general, there is decline in the water level throughout the country except in states of Assam, Gujarat, Karnataka, Kerala, Orissa and Tamil Nadu.

Most of the wells have been showing rise / fall of water level in the range of 0-2 m and are common in all the states. Rise / fall in water level in the range of 0-2 meters may not be significant in view of dynamic nature of groundwater resources. Fall in water level more than 2 meters on long term basis has also been observed in various parts of the states such as Andhra Pradesh, Delhi, Madhya Pradesh, Uttar Pradesh, Gujarat, Eastern Rajasthan, Haryana, Punjab and Eastern Maharashtra.

GROUNDWATER QUALITY DETERIORATION AND POLLUTION

Groundwater quality is a major environmental concern. Factors affecting the quality of ground water include sea water intrusion, pollution due to human activities, aridity and water logging. Seepage from septic tanks; animals wastes and return flow irrigation where fertilizers and pesticides/insecticides are applied has resulted in high levels of nitrate, potassium and phosphate in parts of Bihar, Haryana, Gujarat, Uttar Pradesh and Delhi. Pollution of ground water with toxic chemicals in the vicinity of industrial areas and urban settlement has been observed in many parts of the country. Besides the pollution caused by human activities, instances of ground water pollution of grogenic origin have also been noticed. It has been estimated that over 1.93 lakh hectares sq.km. area in parts of Haryana, Punjab, Delhi, Rajasthan, Gujarat, Uttar Pradesh, Tamilnadu is affected by the inland salinity in ground water. Large areas particularly in the command areas of major and medium irrigation projects suffer from the water logging due to rejected recharge. Current water resource constrains, therefore, are expected to manifest themselves even more rapidly in the coming years. Further expansion in irrigation, industry and domestic water demands will have serious implications on competing non-consumptive uses, such as hydropower.

SUSTAINABLE MANAGEMENT NEED

Management of ground water resources in the Indian context is an extremely complex proposition as it deals with the interactions between the human society and the physical environment. The highly uneven distribution of ground water availability and its utilization indicates that no single management strategy can be adopted for the country as a whole. On the other hand, each situation demands a solution which takes into account the geomorphic set-up, climatic, hydrologic and hydrogeologic settings, ground water availability, water utilization pattern for various sectors and the socio- economic set-up of the region.

Supply Side Measures

As already mentioned, these measures are aimed at increasing the ground water availability, taking the environmental, social and economic factors into consideration. These are also known as 'structural measures', which involves scientific development and augmentation of ground water resource. Development of additional ground water resources through suitable means and augmentation of the ground water resources through artificial recharge and rainwater harvesting fall under this category. For an effective supply-side management, it is imperative to have full knowledge of the hydrologic and hydrogeologic controls that govern the yields of aquifers and behavior of ground water levels under abstraction stress.

Demand Side Measures

Apart from scientific development of available resources, proper ground water resources management requires to focus attention on the judicious utilization of the resources for ensuring their long-term sustainability. Ownership of ground water, need-based allocation pricing of resources, involvement of stake holders in various aspects of planning, execution and monitoring of projects and effective implementation of regulatory measures wherever necessary are the important considerations with regard to demand side ground water management.

GROUNDWATER DEVELOPMENT PROSPECTS IN INDIA:

The analysis of available data indicates that contribution made by ground water to the agricultural economy of India has grown steadily since early 1970's. In just last two decades, the ground water irrigated lands in India has increased by nearly 105%, this change was most striking in northern India, the heart of the Green Revolution. A close examination of the ground water resource availability in different geomorphological terrains of the country and its utilization indicates that out of the total of 433 BCM of annual replenishable ground water resources available in the country , the share of alluvial areas covering Eastern Plain states of Bihar, Orissa (part) , Eastern Uttar Pradesh and West Bengal; *and* North Western plain states of Delhi, Haryana, Punjab, Western Uttar Pradesh, Chandigarh; is about 192 BCM which is works out to be 44% of the total available resource. The enigma is in the eastern plain states the overall stage of ground water development is about 43%, whereas the overall stage of ground water development in North Western Plain states covering Punjab, Delhi and Haryana is 98%. Except Western part of Uttar Pradesh, a major part of the area is overexploited. In conclusion can be say that the available water would need to be used in an optimal manner so as to avoid wastage with exploring new options.

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