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Problem Of Salinity In Delhi Region

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Abstract:

The hydrogeology of the southwest district of National Capital Territory (NCT) Delhi is challenging on the account of the fact that the quality of groundwater in the district shows horizontal and vertical variation with respect to salinity. The present paper tries to study the variation in the depth to fresh (electrical conductivity equal to or below 1500-2000 micro siemens per cm)/saline (electrical conductivity above 1500-2000 micro siemens per cm) water interface of the district and locate the factors controlling the variation in the depth to fresh/saline interface in the groundwater of the district. The map showing variation in the depth to fresh/saline interface in the groundwater of the district was studied vis-à-vis geology and cultural practices in the district, in order to identify the factors controlling the variation in the depth to fresh/saline water interface in the groundwater of the district.

In the irrigated areas of semi-arid regions, especially in northwest India, a considerable recharge to the groundwater leads to water logging and secondary salinization. In several sub-areas groundwater is mined, water tables fall, and salts are added to the root zone because a high proportion of irrigation water is derived from pumped groundwater of poor quality. Out of 1 million hectares of irrigation induced waterlogged saline area in northwest India, approximately half a million hectares are in the state of Haryana. Taking a homogenous physical environment as a starting point, the way and the extent to which farmers' activities will affect the salinity and sodicity situation depend on farming and irrigation practices. In the past, soil salinity was mainly associated with high groundwater tables, which bring salts into the root zone through capillary rise when water is pumped.

But nowadays, increasing exploitation of groundwater for irrigation purposes has led to declining groundwater tables and a threat of sodification and salinization due to use of poor quality groundwater. Farmers in northwest India are facing a situation in which they have to deal with salt volumes that are harmful for water uptake of crops. They are also facing the problem of sodicity, which has an adverse effect on the physical structure of the soil, causing problems of water intake, transfer and aeration. To mitigate the adverse effect of soil salinity on crop yield, the farmers irrigate frequently, either mixing canal water and groundwater, or alternately using canal water and groundwater. Due to differences in environmental parameters in the farming systems, such as groundwater quality, soil types and uneven distribution of irrigation water, income losses to the farming community are not uniform. This paper highlights the economic loss due to environmental degradation through the twin problems of water logging and soil salinity, which threaten the sustainability of agricultural production in Haryana state. Our analysis shows that the net present value of the damage due to water logging and salinity in Haryana is about Rs. 23,900/ha (in 1998–1999 constant prices). The estimated potential annual loss is about Rs. 1669 million (about US$ 37 million) from the waterlogged saline area. The major finding of the paper is that intensification per se is not the root cause of land degradation, but rather the policy environment that encouraged inappropriate land use and injudicious input use, especially excessive irrigation. Trade policies, output price policies and input subsidies all have contributed to the degradation of agricultural land.

Impacts of Urban Growth on Surface Water and Groundwater Quality (Proceedings of IUGG 99In recent years, water supply and groundwater resources in India have become threatened following uncontrolled disposal of urban waste into water bodies, open waste dumping and poorly designed landfills. Within the urban fringe zones of Delhi, the contamination of groundwater by industrial and domestic effluents now presents serious challenges. Subsoil waters in the area through which effluents from major industries infiltrate, are already polluted more or less permanently. Wells in many residential areas are contaminated with nitrate, detergents and high salinity levels with the high content of fluoride also posing severe health hazards in surrounding regions.

***Key words**: Hydrogeology, Groundwater, Salinity zone, Delhi area*

1.Introduction

Groundwater pollution has emerged as an important environmental issue all over the world with life support systems increasingly threatened by both anthropogenic activity and waste mismanagement. In India, contamination sources include industrial and domestic effluents, wastes sites, storage and transport of hazardous substances etc., as well as fertilizers, herbicides and pesticides from agricultural usage. Urban air pollution also contributes by acid precipitation. Groundwater systems are not only highly sensitive to land and water pollution in areas of groundwater recharge but also to changes in flow condition. In recent times, severe arsenic pollution of drinking water sources in India has attracted attention due to health effects in terms of skin disease. The management of such issues requires an integrated approach and public policies that support planning for the use and sustainable management of land and water resources. There is also a need to develop close linkages between economic forces, land use and landscape effects (Hilding-Rydevik & Johansson, 1997).

2.The Study Area: The Delhi Metropolitan Region

Geographically Delhi is situated along the western and eastern banks of the Yamuna River. Its altitude is 220 m above mean sea level with the difference between maximum and minimum levels being about 60 m. The territory is divided into five administrative blocks, viz. Alipur, Kanjhawala, Najafgarh, Shahdara and Mehrauli although recently another city block has been created. In the present study, two blocks (Alipur and Kanjhawala) have been selected for detailed empirical study.

3.Environmental Impact Of Urban And Industrial Development

Delhi, which is the Indian capital city, ranks third in population among Indian cities and thirteenth among cities of the world. The growth of Delhi had only been slow and gradual until India's independence in 1947 but considerably intensified after this date. From a small number of about 8000 industrial establishments in 1950-1951, the number had increased to over 90 000 by 1995. Government policies helped this rapid industrial growth by providing facilities and incentives. However, this has resulted in a mixed and even conflicting land use as well as causing a deterioration in the quality of land and water. The prime cause of critical unsanitary conditions in many cities in India is due to the lack of facilities for collection and disposal of wastewater. Data on wastewater generation and collection is poor in comparison to information on water supply and therefore it is difficult to access the total pollution potential. Municipalities dispose of their treated, partly treated or untreated wastewater into natural surface water drains, or it is applied directly to land for irrigation or in some cases recharged to groundwater.

The city of Delhi is only partially sewered but even in the sewered areas not all sources of wastewater (including households) are connected to the sewerage system. Out of the total pollution loads generated from domestic wastewater, only a part is discharged to the wastewater treatment plants with the remaining fractions finding their way, directly or indirectly (through seepage and overflow etc.) into the river. Yamuna via various open drains. However, having no better basis for the assessment of domestic wastewater and pollution loads reaching various drains, it has been conservatively assumed that roughly 50% of the wastewater and pollution load is carried by sewers with the remainder flowing to open drains. Such flows cause severe problems in terms of groundwater pollution.

4.Groundwater Quality

In the Alipur block, out of 21 monitoring stations only five stations viz. Wazirabad, Bakhtawarpur, Holambikan, Jindpur and Hiranki, show comparatively high salinity. A high value of residual sodium carbonate (RSC) in irrigation water causes increases in sodium adsorption with values greater than 5 meq l"1 having detrimental effects on crop growth. The levels of nitrate in all the groundwater samples are within the permissible limit set for drinking water purposes. The Kanjhawala block shows comparatively more salinity i.e. >4000 pmhos cm"1 at Chandpur, Nithari and Tikri Kalan. At all other stations, groundwaters have either low or marginal salinity. The RSC values in some places such as Mundka, Bawana and Qutabgarh are more than 5 meq l"1 indicating that these areas are affected by sodium hazard (Central Board for the Prevention and Control of Water Pollution, 1985). As in the case of the Alipur block, the predominant cation in Kanjhawala is also sodium whereas a considerable number of stations contain chloride as the dominant anion.

5.Status Of Heavy Metals In Groundwater

The trace elements surveyed at all monitoring stations are lead, zinc, copper, nickel and cadmium. Other metals, except lead in a few well waters, were within the Source: Based on Central Groundwater Board (1998) and Central Pollution Control Board (1998).

Permissible levels for drinking water,Data revealed that out of 30 locations in the Alipur and Kanjhawala blocks, three locations in Alipur and two locations in the Kanjhawala block were contaminated, with cadmium exceeding the drinking water standard by 17 and 11 pg l"1 respectively in the latter location. Out of 42 wells in both blocks, the survey revealed that the level of lead in six wells, (three in each block), exceeded the drinking water standard.

In terms of irrigation water quality the heavy metal concentration in all the ground water stations of Alipur and Kanjhawala block were within the permissible limit particularly with respect to locations having fine textured soils. Among anions, nitrate shows the highest measure of variability in both the blocks. The values of nitrate never exceeded the permissible limit (50 mg l"1 as NO_3) with concentrations of trace metals being well within the limit of the drinking water standard. On the basis of detailed analysis of groundwater quality, the Central Ground Water Board (1998) of New Delhi recently informed the public that groundwater from shallow water-bearing zones up to 30 m deep has high concentrations of fluoride and nitrate and was not fit for drinking purposes. It advised that groundwater within certain areas should not be used for drinking purposes without proper treatment.

6.Groundwater Management

Groundwater recharge projects should be initiated for augmenting available supplies with abstractions regulated to ensure they do not exceed recharge possibilities. Integrated development of surface water and groundwater and their rational usage must be encouraged right from the project planning stage and should form an essential part of a phased water resource development programme. There is a need for water zoning and constraints on water usage in the metropolitan region and the economic activities should be regulated in accordance with such zoning (Government of India, 1987).

Serious consideration needs to be given to storage and recharge of rainfall-runoff in low lying areas and to recharge of aquifers by treated wastewater. In addition, environmental improvement along roads and majors drains is needed (Asian Development Bank, 1993). There is also promising scope for the use of remote sensing techniques for pollution detection and detailed, continuous monitoring of both surface and ground waters.

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