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A REVIEW ON GROUNDWATER EXPLOITATION IN THE HOLY CITY OF VARANASI (INDIA)

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ABSTRACT

Varanasi city is located on the banks of the river Ganga. It is also situated right over parts of Indo-Gangetic plain which has the largest aquifer system in the country. The climate of the area is such that it receives good amounts of rainfall in monsoon season which recharges the aquifer system in good amounts. The exploitation of an available water resource must always be closely linked to the ecology of the available pasture and to its actual or potential carrying capacity in terms of human and livestock units. Overdevelopment is not only wasteful of scarce resources, but it also carries the potential danger that, by attracting increased numbers of livestock without adequate control, the available forage is overutilised to its eventual destruction. Although studies have mentioned that the groundwater level in the Varanasi area is going down, there is still enough water for the needs of the people. Then why is clean drinking water is so inaccessible to the people of the city? Why there are so many water borne diseases? Why do the people of the city complain about foul smell from the water being supplied to them? Most important of all, why is there not enough water for the entire population? The answers to all these questions are not a secret. This paper emphasizes the important concerned points responsible for these issues and about some necessary steps to be taken to eradicate them.

KEYWORDS: Groundwater, Aquifer, Ecology, Rainfall, Livestock, Indo-Gangetic.

INTRODUCTION

At the present scenario, Varanasi actually has enough clean water for its entire population but the water supply and management system is in incredibly poor condition and is unable to supply the water to the people. Adding the old Sewage system into the equation makes a bad situation even worse for the population of the city. Varanasi desperately needs an overhaul of its entire water and sewage management system. Severe leakage from the sewage pipe lines into the water supply pipelines. Both these pipe systems in the city are very old, poorly planned and badly managed. In nearly the entire city, people complain about colored, smelly water every morning at the start of the supply. When the supply cleans out the pipes filled with sewage, the relatively clean water starts to come which is used by the people. The leakage also causes pollution to the shallow aquifers in the region where the pipes are located but the effect on the water being supplied is far more adverse. The people who have their private bore wells have access to cleaner direct source of groundwater. This proves that the water when taken out from the ground is much cleaner and of acceptable potable quality. However, during the process of storage of the water in big overhead tanks spread throughout the city and then the distribution via the pipe lines, the water gets severely polluted and becomes a health hazard. Another problem in the city is the quantity of water available. General public do not have 24 hour water supply. They get water twice a day for a few hours. In Summer, the water supply duration can become even less causing a lot of problems to the people. In the recent survey, data regarding the water needs of the total population of the city and the water supply capability was gathered and again, the cause of this water shortage was the poorly managed distribution system. Assuming the water need for the city's population is 172.5 LPCD (litres per capita per day), the total amount of water required for the whole city is 276 MLD (million litres per day). As on March 2012, the total amount of water being supplied by the Water Services (Jal Nigam) is 326 MLD (including both the river water and groundwater). The shortage of water is due to the leakage of 98 MLD of water, which reduces the supplied water quantity to 228 MLD i.e. a shortage of 48 MLD. All this data does not include the water which the users are forced to throw away at the start of the supply due to the high sewage content in the water. Also,

the leakage of 98 MLD of potable water is not just happening in the undergrous pipes invisible to the people above. In fact, in the survey, many taps were seen throughout the city, which were broken and so whenever supply was there, there was no way to stop the water coming out of those taps and flowing in the drains. Some of these taps were having water 24 hours and they were continuously releasing clean water to waste. Overhead tanks were seen near Kashi Railway Station which was leaking huge amounts of water because of holes on the sides of the tank. It was being continuously filled with new water by a Pipe line.

SOURCES OF WATER SUPPLY

The city obtains a total of 270 million liters water from the river Ganga and ground water source. The State government department, Varanasi Jal Sansthan is engaged in the supply of drinking water to the people residing in the city of Varanasi. This Jal Sansthan draws raw water from two sources: (a) the river Ganga and (b) ground water. Bhadaini Intake Works is pumping a total of 1.25×105 m3 d−1 raw water of the river through its six pumps, four each with a capacity of 40 m3 min−1 and 2 each with 30 m3 min−1. The pumped raw water is sent to the Bhelupur Water Works, situated at about 1.5 km away from the water drawing point, for its chlorination and purification. The treated water is supplied to the inhabitants of the city through a network of pipelines the total length of which is about 575 km. Sometimes, because of failure of electricity supply the Bhadaini intake works fail to pump up water from the river to its full capacity and because of which the problem becomes acute. At a few places, quite often, public of the city raise a hue and cry about mix up of water with sewage because of leakage in the pipes. The some gastro-enteric diseases and other health hazards. Along with the river water, a total of 1.45 m3 d−1 of ground water is extracted from 118 deep bore tube wells installed in different localities of the city to cater to the growing demand of potable water. Further, a total of 2,347 hand pumps were also set up at different parts of the city. With all types of water supply put together, Jal Sansthan provides a total of 2.70×105 m3 d−1 water. With such a capacity of supply, each person in the city gets 169 L d−1 water, which is far below the, WHO's norm of 270 L d−1. That means, about one fifth of the population of the city is not supplied with potable water. The river Ganga is an important source of drinking water in the city, but the level of water of goes down for various reasons, below the intake points. Jal Sansthan finds it very difficult to draw 1.25×105 m3 d−1 water not only during spring, winter but also during some period of rainy season. What, more there is problem of pollution concentration.

PRESENT STATUS OF WATER SUPPLY

The public water supply system in Varanasi was introduced in the year 1892 and is, therefore, more than 100 years of age. In the beginning it was designed for a population of 200,000 people, equipped with one water treatment plant in Bhelupur in the very central area of the city. The first major reorganization was done in 1954, when the supply system has been extended to satisfy the demand of 460,000 inhabitants. The water supply in the regions in the near vicinity has been improved with an expansion of raw water transport and treatment capacities, increase of raw water pumping capacity, and enlarged distribution network. However, more distant areas have been equipped with groundwater extracting wells (JNNURM 2006). A further population increase in the outskirts and the establishment of a master plan has led to a revision in the 1960s and 1970s. The city was subdivided into areas of municipal river water supply and groundwater supply including a subdivision into two areas of Cis-Varuna and Trans-Varuna a few years later. Today the population in Varanasi is about **3138671** out of which **1878100** is the rural population. Today 45 % of the city´s demand is met through water extraction from Ganga River, and another 50 % are covered by 118 deep tube wells. The remaining 5 % comprise more than 1500 publicly and privately owned hand pumps most of which are situated in the Trans-Varuna Area (JNNURM 2006). Because of the system´s age and the fact that only minor restoration and renovation works have been done in the past, the water supply system suffers from fragility which results in substantial losses of clean water. In some places the water pipes are passed by sewage channels, open drains and nallas from which sewage may contaminate the clean water because of seepage (JNNURM 2006).

CAUSES OF GROUNDWATER POLLUTION

- Pollution of the ground water in the city is mainly sourced from heaps of garbage. The solid and liquid wastes generated out of the household and industrial activities are dumped and released in uncontrolled sites. On an average, 661 million tons (approx.) of solid waste in a day is produced in the city, but only 87% of which is collected for ultimate disposal, and the rest is left uncollected. This is primarily due to lack of effective labor strength and fleet of vehicles for collection, transportation and disposal. These wastes are

disposed of in the low lying areas of the city where the tanks and ponds are located, which were once important sources of ground water recharge in the city.

- Before reaching Varanasi, the river receives municipal & industrial wastes brought by the River Yamuna at Allahabad. Prior to Ganga Action Plan about 150mld of sewage was being discharged through rivers Varuna and Assi, main trunk sewer at the downstream near Rajghat and from as many as drains located close to the bathing ghats all along its course at Varanasi. Apart from domestic sewage it also carries effluents from dyeing units of silk industry. In addition the river also receives industrial effluents of Diesel Locomotive Works (DLW) at Manduadih in Varanasi.
- The important reason of river pollution is by cremation of bodies in every year on its two ancients burning ghats- Manikarnika & Harish Chandra. Nearly many dead bodies of saints, diseased person due to certain infection and children below 8 years of age are thrown into the river as Hindu mythology restricts burning of such bodies. Thus every year tonnes of flesh and ash by burning of fire wood are poured into the river. In this way the decomposition or disposal of unburnt and half-charred bodies and animal carcasses contribute organic pollutants.
- Establishment of some industrial plants only for increase the productivity and income ratio of the city without taken into account the environmental gradation of the area causes over-exploitation of groundwater. In recent, eighteen village councils of Mehdiganj area of Varanasi district were demanding a local Coca-Cola bottling plant be prohibited from extracting water from the ground, claiming its over usage has led to water scarcity in the area which also exploits groundwater at the expense of the poor, the women, children, farmers and livestock who have to live with less water because Coca-Cola mines groundwater in a water scarce area for profit. Mehdiganj is largely agrarian and communities here rely on groundwater to meet most of their needs, including for personal drinking and washing, irrigation and for livestock.

PROPOSED REMEDIES

- Replacement of existing intake and supply system being very old lay out with smaller diameter pipes and not fulfilling the requirements of present population (16 lakhs according to 2001 Census); the pipes limit the intake of water.
- In Varanasi, many Ponds and tanks are used to serve as the holy places for holding Hindu rituals from ancient time. So, some attention should be taken to collect the rain water in them and thereby serve as sources for groundwater replenishment.
- Training programmes should be organized in entire corner of the city including villages by the authority such that each person will follow it and restricts not to dispose any types of wastes, garbages etc. anywhere of their own choice. Proper arrangement to disposal the wastes, garbages etc. should be made and installed in entire area so that each one of them should aware of the system.
- Some awareness campaign should be organized to aware the people for not to throw/dispose the ashes after cremation and not to throw/dispose the dead bodies for their some Hindu rituals in the holy water of river Ganga which ultimate leads to contaminate the ground water in greater extent.
- In many areas (including villages) of city a large number of dug wells, bore wells etc. were installed to draw the water for the needs but it is observed that much more wastage of water is taking place beyond the needs in casual way. So, these affect the drawdown in water level from the normal and ultimate it would create problem to the entire community.
- New plans and schemes like construction of more electronic crematorium, community toilets and treatment plants should be launched.
- Some new techniques like Rain water harvesting should be implemented for artificial recharge the ground water in the water drawdown zone.
- Beyond these some Groundwater treatment (Chemical & Biological) techniques should also be initiated to reduce the contamination in certain limits.
- Operation & maintenance of the entire hydraulic machines & structures should be done within their stipulated time period.

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CONCLUSIONS

The discussion so far reveals the pathetic condition and exploitation of water quality in the Varanasi region which is still continuously deteriorating in a rapid rate. The condition of Ganga river water quality should certainly send an alarm to policy makers and citizens alike. The lowering water table, increased hardness and presence of even toxic trace metals indicate degradation of ground water quality of the entire region. The recent Coco-Cola bottling plant in Mehdiganj, carpet cluster of Bhadohi, Varanasi Saree cluster, mushrooming electroplating and other hazardous industries are contributing to this woe. Preventive measures should certainly be taken by environmental agencies/authorities and even by alert citizens so that no untreated discharges should recklessly be made into our holy river Ganga.

The Government is committed to manage water resources by supporting a thriving economy, healthy environment and growing communities and is going on, and the teaching/research community should be committed to future by devising Strategy for 'Strengthening land and water management'. In order to manage our water resources there is a need to understand how effluent and other discharges to surface water impact our ground water resources. Comprehensive effort including policy makers, administrator, social activists, academicians and common masses should immediately be taken to save this precious commodity both in surface and underground reservoirs. Apart from these aspects the focus should also to develop the peoples view to think about the future results rather than adopt the rituals which came from ancient times.

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