



Original Research Article

Restoration and Management study of Water Bodies in the West District of NCT- Delhi

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A B S T R A C T

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Since 1912, when declared as the capital of India, Delhi has been witnessing a phase of developmental changes in the form of rapid urbanization and industrialization. At present, water demand in Delhi is about 1000 MGD (million gallons per day) while what it gets stand closer to 829 MGD. This demand-supply gap is increasing day by day & has put immense pressure on the urban public water supply & groundwater resource. Community resources such as traditional ponds, lakes etc can play a great deal in mitigating the above problem of water crisis at least to some positive extent, provided they are being appropriately managed to reap optimal benefits. The present study is a small endeavor to address the much bigger issue of restoration of water bodies in the NCT-Delhi region. Five natural water bodies have been selected as a case study from the West District of NCT-Delhi. The present water quality status of all the water bodies are currently facing severe water quality deterioration in terms of color, odour, BOD, COD, TSS, TDS, Turbidity, MPN etc. The main reason for the deterioration of the water quality is due to surrounding encroachment, sewage discharge, construction debris & garbage dumping, open defecation, cattle intrusion, local's inactiveness & influence of anti-social elements. Adoption & implementation of stringent laws pertaining to regional planning, encroachment, slum development, industrial establishment, solid waste dumping, sewage & effluent disposal will facilitate restoration of water bodies to a great extent.

Introduction

Over the centuries, surface water bodies like lakes, ponds, reservoirs, tanks etc have enjoyed the status of being called & treated as a community resource or asset. They were being nurtured, protected, conserved & managed by the active participation of the local community without any code of

conduct or rule. In turn, these water bodies have been catering the local human & livestock populations. In the modern times, after the introduction of public water supply & ground water development through tube wells & hand pumps, a tectonic shift in the attitude of the people towards these water

bodies has been witnessed. Both locals as well as the government have started neglecting this asset in the fad & fantasy of the introduced public water supply. They have stopped caring, nurturing & conserving these community resources & have developed careless attitude these resources. Land use change, including land conversion from one type to another and land cover modification through land use management, has greatly altered a large proportion of the earth's land surface to satisfy mankind's immediate demands for natural resources (Meyer and Turner, 1992; Vitousek et al., 1997;Foley et al., 2005). Human population growth represents the primary driving force in land use change (Vitousek et al. 1997). Other than this, mushrooming urban, industrial & infrastructure development has changed the status of these water bodies from community resources to a mere dumping ground or sink for construction debris, garbage, domestic sewage, religious offering etc.

These water bodies have fallen a prey to administrative & social atrocities. All this has put the existence of these water bodies on stake & has lead to severe deterioration of their water quality. The rapid urbanization and consequent haphazard growth of cities is resulting loss of agricultural lands, open spaces, loss of water bodies, air pollution, water contamination, health hazards and many microclimatic changes (Goyal, 2003). Joshi and Suthar (2002) explained temporal change of urban land use and its impact on ecology and environment of Jaipur city by using remote sensing technique as well as conventional method. Urbanization is an inevitable process due to economic development and rapid population growth (Shalaby and Tateishi, 2007). Urban growth, particularly the movement of residential and commercial land use to rural areas at the periphery of metropolitan areas, has long been considered

a sign of regional economic vitality. But its benefits are increasingly balanced against ecosystem impacts, including degradation of air and water quality and loss of farmland and forests, and socioeconomic effects of economic disparities, social fragmentation and infrastructure costs (Squires, 2002; Rimal, 2011). Community resources such as traditional ponds, lakes etc can play a great deal in mitigating the above problem of water crisis at least to some positive extent, provided they are being appropriately managed to reap optimal benefits. Some of their community benefits include rainwater harvesting (storage), ground water replenishment, drinking water source, fishing support to local biodiversity, cultural, aesthetic & Mythological significance. Ironically, despite being a splendid alternative to mitigate existing water crisis scenario, these ponds & lakes are presently facing severe social as well as administrative atrocities. Some of the social atrocities being committed on these water bodies include solid water dumping, local sewage discharge, defecation near the water body, encroachment etc.

In the recent years, urgent need to restore these community resources has been realized by the Government. This is because mushrooming population & development activities have put immense strain on the public water supply & ground water extraction. This has widened demand-supply gap & has lead to excessive depletion of ground water. Consequently, this has given birth to a bigger issue of water scarcity which is worsening day by day. In this regards, the traditional water bodies like community ponds & lakes can hold good prospects for ground water recharge thereby reducing the severity of the existing water crisis scenario at least to some positive extent. The status of water bodies in NCT-Delhi is presented in table-1.

The present study has been undertaken to seek attention of the general public as well as the concerned authorities towards the present water quality status of water bodies in the West District of NCT-Delhi, India. The significance of “Restoration & Management Approach” in upgrading their water quality status, & hence, in overcoming the persistent “Water Crisis” situation, has also been highlighted.

Materials and Methods

The west district spreads over an area of 130.6 sq. km., which is fourth largest in Delhi. This means that the West district covers 8.81% area of the total Delhi. The District has common boundaries with the Northwest, North, Central and the Southwest district. It shares its West Boundary with the state of Haryana Railway Line marks the Northern Boundary; Najafgarh Drain being the South Western edge of the district, then divides the district in two parts.

The basic methodology adopted for carrying out the present study is primarily by generating, analyzing & interpreting the primary data along with the review on the available literature & media reference on the concerned issue. Primary data for the present study has been generated by carrying out the water quality analysis & field survey (site visit & interaction with locals). Primary data is interpreted in the form of tables, graphs, checklists, questionnaires etc. The various components of the methodology for the present study are as follows:

Prashad Nagar Jheel: It is spread over an approximate area of about 3.5 acres, situated in the posh locality of Rajendra Prasad Nagar, New Delhi. Geographically, it is located at $28^{\circ}38'46.5''$ North & $77^{\circ}10'40.2''$ East. This jheel is a deep natural water body

with approximate depth of about 6.0-7.5 feet. Its scenic beauty in the form of surrounding green cover, water birds, ducks etc is simply heart pleasing. It is surrounded by a well maintained park which is spread over an approximate area of about 4 acre. The source of water for the jheel is rainwater, tube wells, surface runoff & storm off water from surrounding area. Water remains in this water body all round the year. Presently, it is under the Delhi Development Authority (DDA) and is comparatively well managed.

Mayapuri Jheel: It is spread over an approximate area of about 7.73 acres, is situated underneath the Naraina Flyover near Mayapuri intersection, adjacent to the Food Corporation of India (FCI) godown. Mayapuri industrial area is located just adjacent to the lake. Geographically, it is located at $28^{\circ}37'46.5''$ North and $77^{\circ}7'54.7''$ East.

This jheel is a deep natural water body with approximate depth of about 20.0-25.0 feet. Being a natural water body with ample spatial (area & depth) extent, this jheel holds very good prospects for ground water recharge & rain water storage. This jheel also provides a natural feeding area for many migratory & native avian species. But despite holding such a great ecological importance, this water body has been reduced to a mere dumping sink for construction debris, domestic waste, garbage & sewage discharge from the nearby settlement. This is under the Irrigation & Flood Control Department for the development.

Tihar Jheel: It is also known as Hari Nagar Jheel, spread over an approximate area of about 8.2 acres, is situated in the Tihar Village adjacent to Manak Vihar Industrial area in the West Delhi. Geographically, it is

located at 28°37'53.5" North and 77°6'14.3" East. This jheel is a shallow, seasonal natural water body with approximate depth of about 3.0 feet. The source of water for the jheel is rainwater, tube wells, surface runoff & to some extent sewage discharge from the surrounding area. Water do not remains in this water body all round the year.

Nasirpur Jheel: The Nasirpur jheel, spread over an approximate area of about 2.5-3.0 acres, is situated in the Nasirpur village adjacent to Mahaveer Enclave (Near Dwarka), New Delhi. It is located at 28°35'49.8" East. This jheel is a deep natural water body with approximate depth of about 7.0-7.5 feet. Water remains in the jheel all round the year. But despite holding such a great ecological importance, this water body has been reduced to a mere dumping sink for construction debris, domestic waste, garbage & sewage discharge from the nearby settlement. Due to inadequate management of this lake, it has transformed into a mere stinking water logged area & a roaming field for stray cattle.

Hastsal Jheel: It is spread over an approximate area of about 3.0-3.5 acres, is situated in the Hastsal village (near Uttam Nagar), New Delhi. It is located at 28°37'49.7" North and 77°3'17.8" East. This jheel is a deep natural water body with approximate depth of about 10-15 feet. At present this water body has been reduced to a mere dumping sink for construction debris, domestic waste, garbage & sewage discharge from the nearby settlement. Due to inadequate management of this lake, it has transformed into a mere stinking water logged area & a roaming field for stray cattle. Over the years, it has undergone siltation & fragmentation too. All this has made the overall landscape view of this jheel to be highly filthy & unpleasant.

Water Sampling

To determine the water quality status of the 5 selected water bodies; the water sampling has been done for their physic-chemical characterization (including heavy metals & biological parameters) as per Central Pollution Control Board guidelines.

Results and Discussion

The water quality analysis results of Physico-chemical parameters, heavy metals and biological parameters are presented in figure-1, figure-2 and figure-3 respectively. Out of the 5 water bodies, Prashad Nagar jheel is the only jheel which is, so far, enjoying regular & active management. It is because of this management by the concerned authority & awareness of the locals, the water quality status of this jheel is still comparatively much better than other water bodies. Dissolved Oxygen content of 8.6 mg/l is appreciable for the growth of fishes. But, even then, there are certain important factors which are posing adverse effect on its water quality, may be not evident now, but certainly in the near future. Contaminated runoff from the surrounding garbage dumping site, disposal of religious offerings, carelessly thrown polythene bags & plastic bottle on the water body by the tourists, easy access of tourists near the bunds resulting in degradation of bunds, vegetation on bunds, falling litter on the water body surface etc are some of the critical concern which is adversely affecting color, odor, BOD, COD, TS, TSS, TDS, MPN, Nitrate, Phosphate content of the water body.

The status of the remaining 4 water bodies i.e. Mayapuri jheel, Tihar jheel, Nasirpur jheel and Hastsal jheel is found to be critically alarming. They are currently facing severe water quality deterioration in terms of

color, odor, BOD, COD, TSS, TDS, Turbidity, MPN etc. They have fallen a serious prey to social & administrative negligence.

Mayapuri jheel is facing problems due to open defecation, cattle intrusion, locals inactiveness & influence of anti-social elements. Tihar jheel is facing problem due to dumping of garbage, religious offerings, cattle intrusion, inactiveness of locals and influence of anti-social elements. Nasirpur jheel is facing problems due to dumping of construction wastes, religious offerings, garbage, sewage discharge, open defecation, encroachment, and cattle intrusion. Hastal jheel is facing problems due to dumping of construction wastes, religious offerings, garbage & sewage discharge, open defecation, encroachment, and cattle intrusion. The nutrient level of these 4 water bodies in the form of BOD, COD, Nitrate, Phosphate etc. have been found quite elevated. It is because of the high organic loading in the form of sewage discharge, garbage dumping, disposal of religious offerings, and surface runoff from the surrounding area. Growth of wild bushes &

weeds on the surface of Mayapuri jheel, Tihar jheel & Hastal jheel signifies high organic loading in the form of BOD, COD, Nitrate, Phosphate etc.

The high values of conductivity in water of these water bodies indicate high level of dissolved solids, causing ionic imbalance in a water body to an extent, which may disrupts aquatic life. Almost all the lakes have been affected by fecal contamination. Increased number of Total Coliforms indicates fecal & soil-originated contamination. Sewage disposal, cattle bathing, open defecation in & around the lakes are responsible for very high coliform numbers in these lakes.

The traces of metals in these water bodies are through surface runoff sources of diffused pollution. The high values of turbidity in the water of Mayapuri jheel, Tihar jheel, Nasirpur jheel and Hastal jheel indicate high level of suspended solids. So there is an urgent need to manage & restore these community resources so that their potential does not remain underutilized.

Figure.1 Results of Physico-chemical parameters at different locations

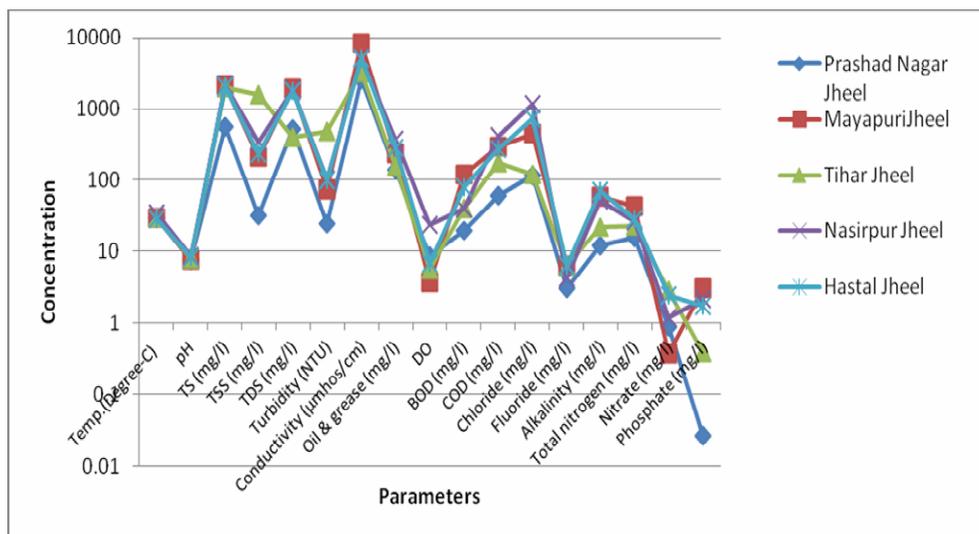


Figure.2 Results of heavy metals at different locations

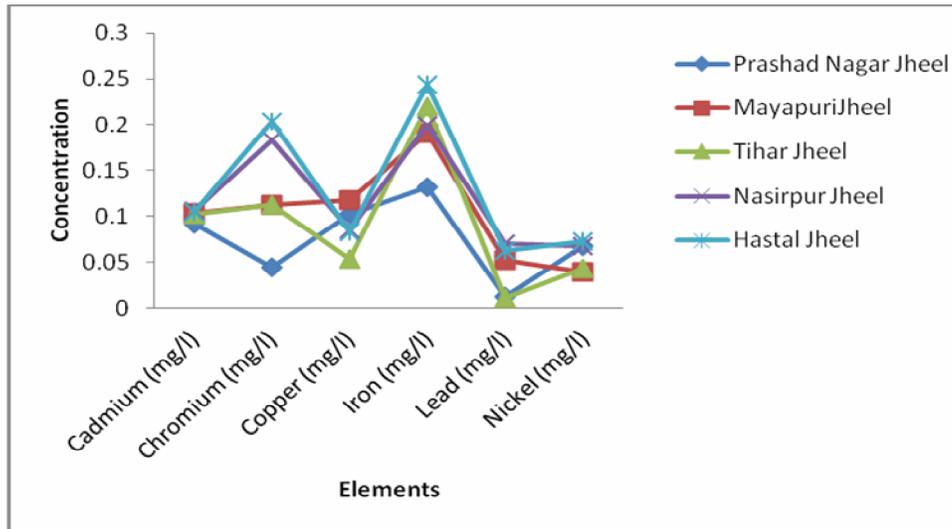
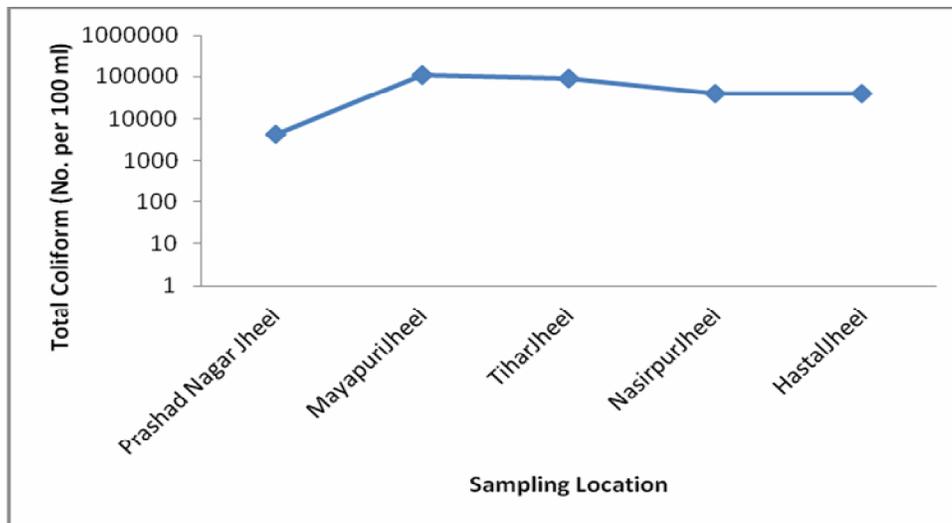


Figure.3 Total coliform at different locations



The present study highlights critically alarming water quality status of water bodies & their probable causes. Hence to deal with this scenario, appropriate site specific restoration & management strategies are required to be developed by taking into account the issues & concerns of the local community. The study has concluded following aspect of recommendations:

- Proper enlistment & record keeping practices should be adopted for the local water bodies regarding their actual number, location, area, depth & uses in order to prevent their vulnerability to exploitation.
- Adoption & implementation of stringent laws pertaining to regional planning, encroachment, slum development, industrial establishment,

solid waste dumping, sewage & effluent disposal will facilitate restoration of water bodies to a great extent. Zoning regulations for the establishment of industries in the surrounding area & effluent discharge regulations are very critical for the health of water body.

- Since nearby encroachments have serious impact on the water quality of water bodies. So, all encroachments coming in catchment area should be removed & if this is not possible then at least appropriate drainage & STP facilities should be provided so that sewerage does not enter into water bodies.
- Research & Development work should be encouraged by the state & central agencies to find out ecofriendly & economic treatment approaches for pollution reduction. For example use of bioremediation- phytoremediation, mycoremediation for heavy metal detoxification.
- Convincing the local about the proposed benefits of restoration approach will help in changing the mindset or notion of people about the surface water body like ponds/jheel. This will also change the general perception of regarding ponds/jheels as a mere breeding place for mosquitoes.
- Shallowness of a water body restricts in prospects for ground water recharge & rain water storage. So in such cases, deepening the water bodies upto its protecting/impervious layer will lead to its optimal utilization.

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