

“Gulshan Lake- an area of concern, probable threats and extreme consequences”- A case study

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Abstract

Water bodies are a vital and prolific resource to our environment. They provide a variety of amenities and services to communities across the world such as drinking water, food, travel, recreation, wildlife, aesthetic appeal, economic development, etc. This case study deals with the importance of the Gulshan lake, areas of problem in the lake water resulting in pollution and shrinkage of lake-water in the rapidly urbanizing city of Dhaka, and how the impact of this problems can be minimized by initiating some controlling measures. Bulk of the problems has been identified throughout the study are owing to accelerated demographic pressure, urbanization, land encroachment and land fill, disposition of increased volume of domestic and industrial waste. The lakes having suffered accelerated eutrophication, eco-system of the lake is tremendously stressed and now it is gradually turning in to a hazardous sewer- the contaminated waters of which are still being consumed. To amend this critical situation, some approaches have been mentioned in the study. Water exchange method, water hyacinth based hydroponics method and proper implementation of DPSIR (drivers, pressure, state, impacts and responses) monitoring model are those pillar which may prove advantageous in the longer run.

Keywords: 3-5 Water bodies, Industrial waste, contaminated water, water exchange method, DPSIR model

1. Introduction [6], [7], [8]

Water bodies and pollution probably go together in Bangladesh. Almost all the major water bodies (lake/khal) particularly in the urban or semi-urban area have been suffering severe pollutions. Wastes from households, sewerage systems and factories find an easy solution for dumping them in the nearby water bodies. Despite strict laws, it remains a challenge for everybody to find a solution. ". According to a study conducted by the Department of Environment (DoE), the water of the Gulshan, Baridhara and Banani Lake is the most polluted among the city's five lakes. It may be noted that the Gulshan, Baridhara and Banani Lake was declared as an ecologically critical area (ECA) in 2001^[8]. Hence Gulshan Lake is the primary point of concern for this study. The study of the lake's water revealed that presence of bacteria was 1,200 counts, which researchers say is not even fit to be touched by humans. The tolerable bacteria count in water bodies is 200 or less. The amount of Dissolved Oxygen (DO) in the same water was 0.5. According to a former scientist of the Bangladesh Atomic Energy Commission (BAEC), marine life could not survive in water that had a dissolved oxygen level of less than 5.0. The Biological Oxygen Demand (BOD) in Gulshan Lake was found at 35, indicating serious contamination of the water. The acceptable level is 3 or less. The level of pH in Gulshan Lake showed acidity and alkali of 7.1^[7]. Various studies have identified that Gulshan, Baridhara and Banani Lake and other water bodies in and around Dhaka city is playing an extremely critical role for sustenance of the city in many different ways. The water bodies acts as the kidney for the city to cleanse its daily waste. According to environmental scientists, a city should have 10% water bodies of its land mass to effectively function as a city and helps reduce sound and air pollutions. The water bodies also help recharge the ground water. As such effective conservation and improvement of water quality of water bodies is an extremely important issue today for the survival of Dhaka.

2. Problem Analysis

Gulshan Lake has a lot of prevailing pollution problems because of rapid urbanization and loss of sociological balance. The lake water is not properly maintained and it has lost its clarity and nutrient balance. Flood water

runoff flows into these water bodies practically turning these into buffer flood control reservoirs, except some pockets of transient water-logging. Drains and sewerage pipes dumping wastes in the Gulshan Lake has been identified as major pollution problem by DWASA. The malodorous wastes tend to spill over when the roads are flooded. People do not come close to the water edge for their refreshment and recreation because of the ill-maintenance and poor treatment by the people themselves. It's a vicious cycle of human intervention in the nature's own state and the extreme consequences of nature bouncing back on the human being.



Fig-1: Present scenario of Gulshan Lake

Major problems observed may be listed as:

- Unplanned commercial growth
- Loss of green space
- Absence of community hub
- Buildings along lake creating wall effect

Accelerated demographic pressure, urbanization, land encroachment and land fill, disposition of increased volume of domestic and industrial waste are major contributing factors behind water pollution of Gulshan Lake. Besides, Continuation of all sorts of banned activities in the ECA has almost turned Gulshan Lake into an ecologically dead lake.^[2] This has been manifested recurrently through the death of fishes and for vigorous media coverage each year. The water of the lake is being polluted day by day and during the summer season the level goes down and the pollution becomes worst.

Apart from these existing problems, due to neglegency of taking proper initiative as soon as possible, few more problems might creep in. This problems can be listed as:

- Inefficient use of economic factor
- Lost of ecological banalnce
- Lost of physical and psychological connectivity with the lake

3. Impacts of the problems found ^{[4], [11]}

The lakes having suffered accelerated eutrophication, tremendously stress on the lake eco-system and is now gradually turning in to a hazardous sewer- the contaminated waters of which are still being consumed and used by slum dwellers living near the lake. Experts in a recent seminar on "Updating the Existing Groundwater and Land Subsidence Model" organized by Dhaka WASA, expressed concerns of land subsidence ground water in many areas of city contaminated by toxic waste. Ground water in many areas of the city has become contaminated with a number of toxic chemicals discharged by different industries. Statistics presented by the BUET experts showed that ratios of toxic minerals like lead, cadmium, phosphate, ammonia and chromium are much higher than acceptable levels in ground water in Dhaka city most prominently in Hazaribagh and Armanitola areas of the city. The experts felt that the toxic chemicals will ultimately affect the ground water in other parts of the city in phases. According to WASA, about 450 water pumps in Dhaka operate to meet the present demand for water. If the water level goes down to 70 meters due to continuation of the present rate of extraction of ground water, a large number of WASA pumps will become inoperative in next 4 to 5 years. According to Dr. Mozammel Haq of BUET, the maximum subsidence of 2.73 cm in Dhaka city occurred near the New Airport during the period between 1990 and 1999.^[11] The maximum land subsidence occurred at such a place where the level of ground water is higher than in other parts of the city. According to the experts, if land subsidence in the capital had any relation with the fall of ground water level, then the maximum land subsidence

would have occurred in Gulshan-Baridhara-Banani and Motijheel area where the level has gone down more than in any other area of the city

Furthermore,

- The laboratory result of Gulshan Lake indicated that the water body is flabby for any kind of use.
- As lake contains high level of BOD (Biochemical Oxygen Demand) and COD (Chemical Oxygen Demand) added with low amount of dissolved oxygen designate poor water quality.
- High concentration of ‘Coliform Bacteria’ in the lake water is the indicator of water-borne pathogenic diseases includes ear infections, dysentery, typhoid fever, viral and bacterial gastroenteritis and hepatitis ‘A’.
- Reducing oxygen level of the lake ‘Coliform Bacteria’ creates a hazardous condition for aquatic environments

4. Solution of the problems

Considering this grave situation, strategies need to implement the above issues through a community based cost effective biological treatment of polluted water of the lakes. The biological treatment of lake water will be done through water hyacinth based hydroponics, a technology which has been used in other countries of the world.

- The study has wrapped up with some significant and effective recommendations like delineating the boundary according to the design of *Rajdhani Unnayan Kartipakkha (RAJUK)* to identify the encroachers and evict them.

- ‘Waste water fed aquaculture’ system can be proved as an example of combination of environmental protection and development.

- Lake conservation committee could be formed comprising all stakeholders of the surrounding area of the lake who would be bound to make people aware about the welfare of the lake.

- Household discharge management should be implemented.

- Solid waste management would restrict accumulation of the waste near the bank of the lake free movement of lake water.

- Using of ‘Hydroponics Technology’; floating cultivation which could play a significant role to reduce the emission of methane gas.

- Industrial waste water discharge mostly from the Tejgaon, Badda and Mohakhali industrial areas which are the hazardous staffs that pollute the lake water as well as affect aquatic ecosystem.

- DPSIR model may be introduced to monitor the lake management system

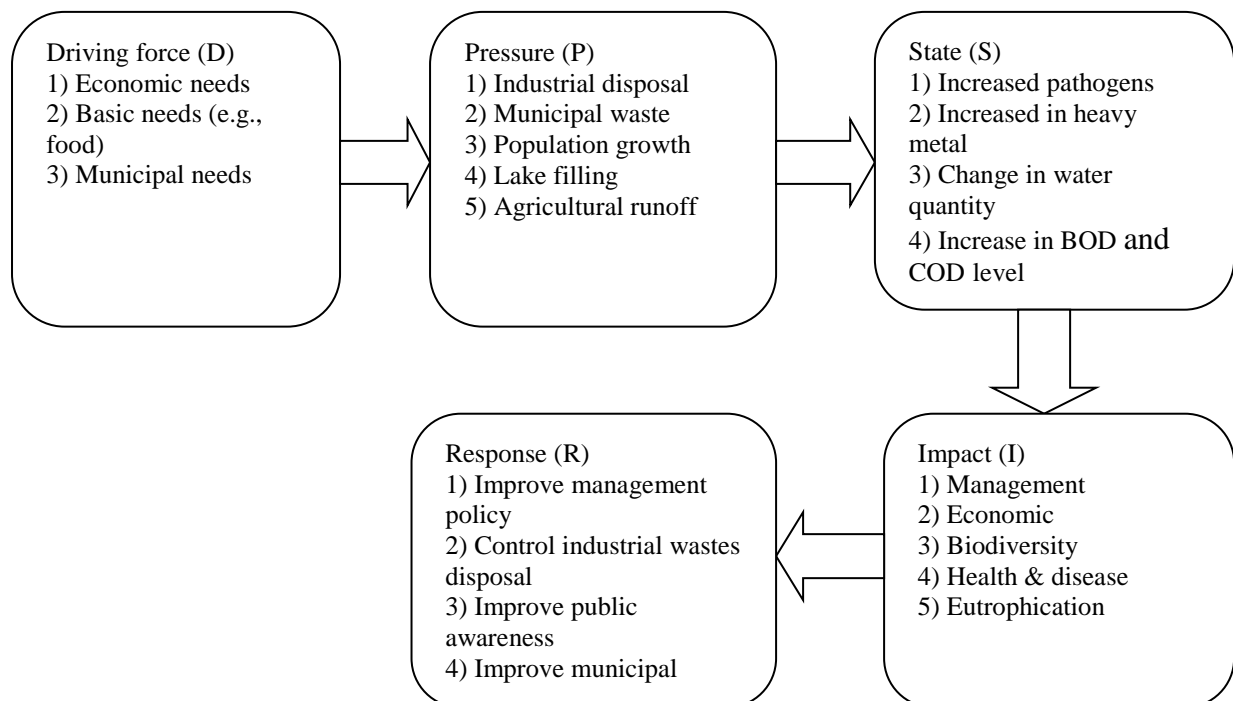


Fig-2 Drivers, Pressure, States, Impacts, Responses (DPSIR) model for lake management in Dhaka

5. Challenges ^{[5], [11]}

- The growth of water hyacinth is one of the lake's biggest problems. The proliferation of water hyacinth is currently controlled by removing it from a water body. Using water hyacinth to remove nutrients from water bodies and to produce biogas is another technically feasible option for the control of water hyacinth, but its environmental and economic performances are not well understood. ^[5]
- Currently, there are several popular methods for preventing the spread of, or eradicating the water hyacinth: biological, chemical and physical control.
- Physical removal method, however, is costly and generally not economically feasible. If it is disposed of in a landfill, water hyacinth can generate methane and carbon dioxide. These gases will eventually enter the atmosphere and can contribute to climate change.
- The use of water hyacinth to produce biogas has two major advantages. For one, the biomass of water hyacinth is used rather than disposed of as a waste. For another, the emission of landfill gas is avoided.

6. Discussions ^[12]

Water-related and water-based systems and particularly the mutual interrelationships and their interactions between the individual water systems and urban water bodies (including groundwater) are extremely important from the context of urban environment. The scientists today, all over the world, are increasingly emphasizing the importance of integrated approaches to solve the numerous pressing problems conservation and improvement of quality of urban water engineering. The urban wetland is today considered as an entity with all its internal and external interactions. The scientists are focusing on the water-based infrastructure in the city - potable water, sewerage, drainage, discharge and recharge technologies (e.g. recycling, source controls) and their interrelations in the networks. The impact of the networks on the water environment (water resources, groundwater, and watercourses) and vice versa is increasingly discussed for proper functioning of a city. As a result, it's imperative that the various water bodies are conserved and the quality of water of these water bodies be improved systematically and in a sustainable way. In this regard, issues of groundwater aquifers in urban areas and water planning (including the interactions of urban water amenities with city planning and landscaping), design, analysis, information support (GIS/Satellite-Imaging), operational management and associated economics are critically associated with social and economic as well as resource management. Development and dissemination appropriate data relevant to water management, up-to-date and reliable digital information, tools and methodologies as well as software on urban water and water bodies should be made available to the scientific, educational and professional community, specialists in civil, water and environmental engineering, other relevant engineering disciplines and urban planning. Other disciplines include environmental chemistry, biology and toxicology and many others.

7. Conclusion

The challenges rises in terms of lake management in Dhaka, Bangladesh, are immense. This study illustrated a continued decline in water quality across six water bodies in Dhaka, highlighting the centralization of water resources near more affluent neighborhoods. If these patterns continue unchecked into the future, water access for the most vulnerable citizens in Dhaka will become increasingly challenging. This is of special concern in regard to safe drinking water. Researchers and policymakers are not blind to these problems and continue to recommend short-term and long-term lake management strategies and policies. Without public participation, and inadequate means for enforcing mandates, these recommendations will gain little traction. High illiteracy and poverty rates pose furthermore problems, serving to limit educational efforts and preventing individuals (e.g. farmers) from pursuing alternative and more ecologically friendly strategies.

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