Rejuvenation of a dying water body in Agartala City

A Case Study of Kumaritila Lake

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FORWARD

Water bodies, whether lakes or ponds, are essential for sustaining all kinds of lives. Many water bodies in urban areas are threatened by excessive deposition of different kinds of wastes generated by human activities. This trend is against the natural principle of justice to nature and sustainable development. There is growing awareness for the protection and conservation of the existing lakes and ponds. Tripura state is blessed with a large number of water bodies. However, some of these have suffered badly due to human activities. Kumaritilla Lake is one such water body. This booklet presents an interesting insight of the restoration of this lake, and shows us the way forward to protect and conserve other degrading and dying water bodies.

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1. Introduction

Tripura is a small State in north-eastern part of India and the third-smallest State in the country. It has an area of 10,491 km$^2$ (4,051 sq mt) and is bordered by Bangladesh in the north, south, and west, and by the Indian states of Assam and Mizoram in the east. In 2011, the State had 36,71,032 residents, constituting 0.3% of the country's population. According to 2011 census, Tripura has a literacy rate of 87.75%. The State has several lakes and natural water bodies of ecological and tourist importance. Kumaritilla Lake is one of the attractive water body in the Agartala city. Due to increasing use of this lake by the people of the area for their daily needs, the water quality of the lake suffered heavily due to deposition of solid wastes and, at one point in time, the lake water became un usable and there was very little re-charging by natural process.

Looking at the serious degradation of the Kumaritilla Lake, the Hon’ble High Court of Tripura directed the Local Urban Body to restore the lake and rejuvenate it by restoring its natural purification process. Accordingly, Agartala Municipal Corporation took steps to implement the direction of the Hon’ble High Court under its strict monitoring. Since then, the Kumaritilla Lake has got back its natural ecological balance.

This case study presents an account of the rejuvenation history of Kumaritilla Lake.

2. Lake Profile

Administratively, the Kumaritilla Lake is part of the Sadar Sub-Division of West Tripura District. Originally, the lake had a water surface area of about 5 acres. Geographically, the lake is situated in south-eastern part of the Agartala city centre and has a geo-coordinates of 23°51’18.38” N latitude and 91°17’ 27.69” E longitude. Hydromorphologically, it is a natural sedimentation reservoir with a surrounding made of soft
sedimentary formation. Lake receives an average annual rainfall of about 2000 mm mostly during the months of May-October. The soil in lake area is silty clay loam to clay loam. Depth of the Lake varies from an average of 0.5 m in the periphery to an average of 2 m in the centre. Water level in the middle of the lake fluctuates from a low of 1m in the peak of hot summer to a maximum of 3m in the peak of monsoon.

3. Reasons behind the degradation of Kumaritilla Lake

Primary and secondary data were collected from different sources, public opinion surveys were conducted, and physical observations of the lake and its surroundings were made in order to obtain pertinent data relating to the recent history of the lake, to identify the possible causes of different natural and human activities on the lake eco-system. A study on the water quality, use of lake water, and any commercial activity was also made.

Causes of Lake Degradation

1. Organic pollution from anthropogenic activities and human settlements on all sides of the lake in the past 40 years;

2. Discharge of untreated or inadequately treated sewage and other waste water from surrounding residential houses and commercial establishments;

3. Dumping of solid wastes without restriction;

4. Dumping of construction and demolition wastes, and plastic wastes without restriction;

5. Inflow of waste water containing effluents from workshops and other establishments using artificial dyes, oil, paints, varnish, greese, etc.
4. **Importance of Lake Restoration**

Lakes are sensitive part of the environment in a local context. By definition, a lake is a water body that holds certain volume of water in all seasons of the year. Lakes generally serve as a natural source of fresh water to the people who use it for various personal and domestic purposes. A well-maintained lake is an importance source of water for irrigation, fishing and for community purposes. Apart from these, lakes serve as the catchment for rain water, act as re-charger of ground water, and helps in preventing water logging and flooding. Lakes support a wide variety of flora and fauna. Urban Lakes or water bodies play the role of succour in extreme hydrological conditions like drought and in floods. They also impact the local environment by providing tasteful experience of the scene and offer recreation opportunities. Big size perennial lakes attract several animals, birds in particular, from distant places to collect food, and for quenching thirst, and these promote eco-tourism for urban people. Thus, lakes have several ecological, social and community advantages. Therefore, it is necessary that every responsible citizen should be sensitive towards the use and conservation of lakes and consider these as an inseparable part of the whole ecosystem.

5. **Impact of urbanization on lakes**

   i) **Short-term**

Various problems are associated with urban water bodies. These include (i) high influx of sediments from human settlements in the vicinity, agriculture, and forests, (ii) disposal of untreated/partially treated sewage and industrial wastes, (iii) solid wastes, (iv) improper management of storm water, (v) use of lake water for construction purposes, (vi) exploitation of lakes for recreation, fishing, land reclamation purposes, etc. Due to rapid increase in urban population in recent decades, there are increasing encroachments on the bank of the lakes which cause shrinkage of lake size, deterioration of water quality, and
disturbance to the biodiversity of the lake.

ii) **Long-term**

If pollution load due to rapid urbanization continues for a long time, then lakes can suffer long-term ecological damages as under:

a. **Eutrophication**: Industrial effluents, run-off from agricultural fields, disposal of refuse, sewage and domestic wastes like food remnants, washed away soaps, and detergents dumped over a period of time serve as nutrients to algae and other micro flora and fauna present in the lake water. Many of these organisms can digest these nutrients and flourish in short time, uses dissolve oxygen and carbonic elements of the water, and release carbon dioxide and produce large quantities of nitrates and phosphates. These processes result in significant lowering in the concentration of dissolved oxygen. As a result, aquatic life-forms like fish cannot survive and natural purification process gradually stops. This process is called eutrophication.

b. **Siltation**: During rainy season, dust, soil, earth and other solid material are carried by water run-off to nearby water bodies. Most of these get deposited in the bottom of water body as sediments. Street vendors, street dwellers and un-authorised road-side constructions also contribute to the process of siltation.
6. **Pre-Restoration Status of Kumaritilla Lake**

Due to neglect from all concerned for a long time, Kumaritilla lake gradually decayed into a waste land with lots of weeds and bushes, and a grazing ground for cattles. People used it as a dumping ground for disposal of garbages, solid wastes etc [Fig.1(a)].

During the study period, the lake was found to be heavily covered with aquatic weeds and hyacinths. The lake presented a pathetic view of extreme negligence by the civil society. Cultural eutrophication, which represents negative impact of increasing human activities in a water body, was observed to a great extent which is considered to be the major cause of decay of the Kumaritilla Lake.

![Figure 1(a). Kumaritilla as a degraded site with lots of bushes and weeds all over](image1a)

![Figure 1(b). Decomposing water remaining in the middle of the lake surrounded with silts and hyacinths](image1b)

Uncontrolled dumping of solid waste, immersion of idols during religious activity, soil erosion in catchment area of the lake are among the major reasons for the decrease in size of the lake area and a decrease in the depth of the lake also. Such degradation in catchment area and siltation in the lake has happened for a long time. For such reasons the original surface area of Kumaritilla Lake decreased drastically after restoration from an original of 5 acres to the present time of 3.93 acres only.
7. **Restoration Phase**

Restoration of Kumaritilla Lake occurred in two phases. **In the first phase**, water plants viz. hyacinth/duckweeds /kachuripana /jalkumbhi along with several grasses, bushes and trees were cleared using mechanical devices [Fig.2(a)]. De-Silting of the lake was done using excavator, tipper, loader, etc [Fig.2(b)]. Outlets were constructed for over flowing of water from the lake. To prevent dumping of solid waste into the lake, adequate numbers of bins are placed along walkways on all sides of the lake to encourage people to use these for disposing solid wastes. The banks of the lake on all sides were developed to a slope of 60° from the surface of water level to facilitate flow of water run-off from the surrounding heights. **In the second phase**, pedestal lights were installed for illumination of the walking track. A water fountain is also installed in the centre of the lake for aeration with a view to increase the oxygen (DO) level of the lake which is necessary to support aquatic life. Due to the initiative of some of the local residents of the area and the intervention by the hon’ble High Court of Tripura, the lake was restored to a considerable extent by the Agartala Municipal Corporation and the Tripura State Pollution Control Board.

![Figure 2(a). Excavator in action for cleaning of solid wastes, weeds and trees.](image)

![Figure 2(b). Excavator in action for de-silting of the lake.](image)
8. **Post-Restoration Phase**

The restored lake provides a vibrant and refreshing ambience to the local environment. People comprising local residents and those from nearby areas visit the lake for monitoring and evening walk and enjoy the feel of gentle wind that often blows touching the surface of lake water. Natural beauty of the lake is evident to a visitor by its holding capacity filled with water, a green sloping bank of 20-30 ft. width on all sides bordered with a 7 ft. high grill-railing [Fig. 4(a)], a 10 ft.-wide paved walkways, bins placed at short intervals [Fig. 4(b)], a functioning fountain in the centre of the lake [Fig. 5(a)], pedestal and street lights along the walkways [Fig. 6(a)], and a children park [Fig. 5(b)]. Taken together, these attributes of the restored lake is eye-catching and generate inspiring feelings to ones who can spend some time there. The lake is now a health spot-cum meeting point-cum-recreation place.
Figure 5(a) A decorative fountain in the centre of the lake.

Figure 4(a) A children park is built for the play time.

Figure 6(a) Street lights along the walk ways.

Figure 6(b). People visit the lake and spend some time for a refreshing lake view.

Figure 7(a) Recording of environmental data around the lake.

Figure 7(b) An evening view of the lake.
9. **Maintenance and prospect of the Lake development**

(i) The Lake can further gain its existing beauty and environmental value by plantation of tree saplings all around it to provide shade to the lake water and shelter for birds and other animals;

(ii) Earth-gradients of the nearby areas should be developed so as to facilitate free flow of rain water to the lake for round-the-year recharging of soil and for maintaining a decent water level;

(iii) Horticulture department can develop a belt of all-season flowering plants to give the lake a garden look. Flower plants will attract butterflies and other pollinating agents and these will add recreational and environmental values of the lake;

(iv) Sewage, sullage, and toxic wastes should not be permitted to flow into the lake or in nearby areas. Washing, boating etc. should not be allowed in the lake. Depth of the lake should be maintained by desilting it every few years.
Popular Water bodies in Agartala

- Laxminarayan Bari Dighi
- Dimsagar lake
- Collegetilla lake
- Durga Bari Dighi
- Lalbahadur Dighi