EXTINCTION OF LAKES: THE FUTURE OF BANGALORE

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Abstract

Bangalore was called the City of Lakes, Pensioner's Paradise, the Garden City and the Air-Conditioned city of South India due to its salubrious climate. The city once had numerous lakes which met the drinking water, irrigation and fishing needs of the community. The lakes were known to have a positive impact on its ecology and the microclimate of the city. They not only replenished the ground water resources but also prevented flooding, treated waste water, arrested sedimentation and functioned as a productive ecosystem.

These lakes were mostly irrigation tanks with high bunds to store water, built over centuries during various periods like the Gangas, the Cholas and the Hoysalas. It was during the 16th C, Kempegowda built tanks and irrigation wells which were constructed with a traditionally interlinked cascade system.

Today, most of Bangalore's lakes have lost their significance or disappeared due to its rapid growth of population, urbanization and other factors.

This paper explores the factors responsible for the deteriorating condition of lakes which were once the life line of the city and also aims at comprehending the extent to which this has impacted the eco-system of the city.

Key Words: Urbanization, Pollution, Hazardous wastes, Encroachments, Flooding, Sustainable development

1. Introduction

Most cities in the world like New York, London, Paris, Beijing, Bangkok, Varanasi, Delhi all started its origin along river banks or estuaries, where the river meets the sea and grew and developed. But not so, in the case of Bangalore. Bangalore or the Benda Kalina Ooru was established by the feudal Lord Kempe Gowda under the Vijayanagara Empire in 1537. Since there were no perennial rivers, and the rivers Arkavathi, Vrishabavathi and Suvarnamukhi were seasonal, Kempe Gowda constructed large number of lakes (tanks) on the sloping terrain of Bengaluru. It was a commercial town with the two main streets running East-West and North-South, the Chikka Pete road and Doddapete road respectively. Kempe Gowda II, the successor, constructed the four towers around Bengaluru and legend has it that if the town extends beyond these towers, it cannot be protected and will be ruined! This was prophetic!

2. The Cascading system of Lakes in Bangalore

Bengaluru, which is 3000 feet above mean sea level, has no perennial rivers and so lakes became the main source of water supply for its survival. The average rainfall in Bengaluru is 800 to 900 mm per annum regularly. Due the terrain of Bangalore, the rainwater moves from the higher terrain to the lower areas (~20% of the rainfall, ~70% being evapotranspiration, the balance being percolation to ground-water). The rain water first flows into the lakes/ tanks which is at the higher levels, its excess then flows into the next level of lakes through *Rajakaluwes* (which were not less than 30 feet in width) which became inlets to the lakes and when the second level lakes filled up, the water overflows to the third level of lakes and so on till the excess water from the last level of lakes flows into the four natural drainage valleys of Hebbal Koramangala, Vrishabhavati, and Challaghatta.

Bangalore, the Land of a Thousand Lakes attributed its salubrious climate to the lakes. Even today in the Revenue Survey maps of Bangalore, there are 937 lakes in the Bangalore Urban district.

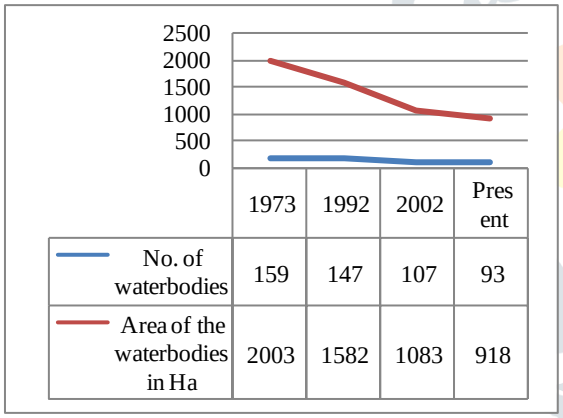
Fig.1: The Lakes and the Valley System of Bangalore.
Source: Lake Development Authority

3. The slow death of the Lakes in Bengaluru

The city of thousand lakes is now dying a slow death due to rapid urbanisation resulting in encroachments and discharge of industrial effluents and sewage

disposal. All the lakes or tanks in Bangalore were constructed in the 16th C by constructing bunds or dams across the natural valley systems. These lakes met the basic requirements of drinking water, irrigation and fishing needs of the society and were a positive influence on the ecology and microclimate of the city. This helps in recharging the ground water in the region, but also averted flooding, treated small amounts of effluents, restricted sediment loads and functioned as a productive ecosystem. There were 262 lakes and tanks in the city around the year 1961. But due to rapid urbanisation, increased demand for real estate and infrastructure needs the open spaces and water bodies were hugely affected. There was a sharp decline of 78% of water bodies and an increase of 466% of built up area from 1993 to 2012.

Graph 1: Decline of wetlands in Bangalore region



Graph 2: The Decline in the number of water bodies from the year 1973 to present in Greater Bangalore region.

The main reasons for the disappearance and death of these lakes are:

- Encroachments
- Infrastructure and Real estate development over these lakes due to Urbanisation
- Discharge of effluents and sewage waste into these lakes
- Lack of maintenance

Some of the lakes which have completely disappeared are

Shoolay lake	football stadium on Magrath road
Akkithimmanhalli lake	hockey stadium
Sampangi lake	Kanteerava sports complex
Dharmanbudhi Lake	Kempegowda Bus stand
Challaghatta lake	Karnataka Golf Association
Koramangala lake	National Games complex
Siddikatte lake	K R Market
Karanji tank	Gandhi Bazar
Nagashettihalli lake	space department
Kadugondanahalli lake	Ambedkar Medical college
Millers tank	Guru nanakBhavan and the Badminton stadium
Dasarahalli tank	Dr. Amedkar stadium
Langford tank	hockey field
koramangala tank	National games village complex
Puttenahalli	J P Nagar 7th phase

Table 1: The lakes that have disappeared

Some of the lakes which are soon disappearing due to pollutants, waste disposal and encroachments are: the Sarakki lake, the Jaraganahalli lake, Bellandur lake, Varthur lake, and so many more.

4. Case Studies

As per the study conducted by the Karnataka State Pollution Control Board (KSPCB), it has been observed that nearly 90 percent of Bangalore's lakes are on the verge of extinction and the dissolved oxygen content of the water in the city's lakes has gone below the desired level of 4mg/lt due to organic pollution. The study which covered around 60 lakes in the city has analyzed that most of these lakes are non-portable and unfit for recreation as they are infested with weeds and areas around the lakes are covered with heaps of garbage and fecal matter.

Since these lakes are non-potable, water for the city is pumped from long distance rivers. Due to this the lakes are neglected and hence turned into sewage-discharging ponds and garbage dumping sites. Lakes are deteriorating beyond the point of recovery. Weed infestation, encroachments, siltation, discharge of effluent both industrial and domestic are knelling the death for lakes in Bangalore.

In the case of Dasarahalli lake, the dissolved oxygen (DO) level is less than 0.3 mg/lt due to the inlet of industrial effluents and sewage let in from the Peenya Industrial area and the nearby residences. The Vengaiah lake due to the unplanned sewerage from the residential area is covered with weeds (water hyacinth)

and hence the DO level is below 1.6 mg/lt. The Lalbagh lake is in a catastrophic state due to the sewage leakages and most part of the lake is covered by weeds and the DO level is as low as 1mg/lt.

As shown in Table 1, some of the lakes have been converted to residential layouts, some have been used by state departments for public purposes like stadiums, bus stands etc. As for the lakes, on the outskirts of the city, the discharge of toxic substances including untreated urban sewage and industrial effluents, fertilizers and pesticides which run off from the agricultural fields pollute the lakes exorbitantly. Most of the lakes in Bangalore are in the advanced stage of eutrophication, an increase in the organic and inorganic nutrient content of the water body, resulting in an unbalanced ecosystem. The negative effect of this is the depletion of dissolved oxygen which affects aquatic life, mosquito breeding causing health hazards, growth of water hyacinth and other aquatic plants which cut off sunlight affecting photo-synthetic action.

5. 1. A case of Bellandur Lake

Bellandur Lake, the largest lake in the city is located towards the south east of the city. It is adjacent to Bangalore- HAL road. This lake was built by the Cholas and covers approx. 890 acres. It is one of the largest man-made lakes in South East Asia.

It is a rain fed tank. The lake is an integral part of the storm water drainage of the city. It receives water from three chains of tanks, the eastern stream, central stream and western stream. The water from here then feeds Varthur lake which is further east. The water flows down into the Pinakani river basin, feeding other tanks and recharging the ground water table.

In the past, before urbanisation the lake provided drinking water to the city. It attracted many migratory birds from different parts of the country. It was a fish trading centre. Aquatic plants and animals functioned as natural filters for the lake. It was once the kidney of the city thus making it a very important part of the ecology. People use to celebrate 'Theppotsava' an annual boat festival in this lake. In 1970, the lake provided water for as many as 18 villages. In the 1980's, there was a breakage in the chain of water tanks feeding the tank due to urbanisation. This resulted in less rain water reaching the lake. Meanwhile, industrial, municipal and domestic wastes were being disposed into the lake. The sewage and water reaching the lake was in excess to the rain water making it into an unhealthy artificial reservoir of sewage and waste. This led to deterioration of aquatic life, directly affecting the livelihood of the fishing community.

Presently the lake receives 40 percent of Bangalore's sewage water both treated and untreated. The water in the lake is dark, opaque and has an unpleasant odor. Large parts of the lake are covered by weed. Heavy foaming and fire in the lake has raised the alarm. Hardly any birds are visible around the lake. There has been a significant loss to the flora and fauna too.

Some of the major violations in Bellandur are listed below-

- Land use changes
- Construction activity
- Encroachment
- Excavation
- Dumping of building debris and other solid waste
- Discharge of industrial waste and untreated sewerage into the lake
- Diversion of lake water
- Fencing

Some of the adverse effects these violations have had on Bellandur are listed below-

- Illegal construction
- Slums
- Topography alteration
- Pollution
- Contaminated water
- Foam and Fire
- Removal of shoreline vegetation
- Depriving residents of clean air and water
- Health risks to residents in the neighbourhood
- Depriving local fishermen of their livelihood
- Drop in community activities like festival celebrations, in and around lake area

The phenomenon of froth and fire is killing Bellandur Lake. Detergents and unchecked sewage from households in the neighbourhood is responsible for water contamination in the lake. Industries located along the upstream of the lake are conveniently disposing toxic chemicals into the lake. The contamination of the lake by untreated sewage and effluents has surpassed the lakes assimilative capacity. Nitrogen, phosphorous and carbon enters the lake through pollutants. Nitrogen is taken up by aquatic plants n algae. Phosphorous and carbon gets trapped in sediments. Wind along with excess rain causes the sediments to swell. Swollen sediments along with running water from higher altitudes causes froth formation due to phosphorous, as explained in studies by Indian Institute of Sciences, Bangalore. The stench

of the foam is very strong. The lake froths easily overflow's on to the roads.

Illegal dumping of garbage along the banks of lake is another reason of concern. Garbage weed and dry grass in the area is regularly burnt without the supervision of garbage collectors. Even an accidental fire can flare the lake as the water contains flammable chemicals.

The polluted lake has received much criticism. Various government agencies have been involved in efforts to revive the lake. To control froth, the BDA had made slopes, sluice gates and more than 20 sprinklers. International firms from countries like UK, Germany and Israel have met with government agencies to express their interest in reviving the lake.

Pic 1: Bellandur lake, covered in a thick layer of vegetation, burned for hours on the evening of 16 February 2017 *Source: Photograph by Aaditya Sood*

Pic 2: Bellandur lake covered with froth and foam

5. 2. A case of Varthur Lake

Lakes catching fire have become a perpetual disaster in Bangalore. On 20th January 2019, fire broke out in the middle of the Varthur lake where the water meets the weeds and the grass engulfing with smoke the entire area of apartments and residences around. There was a major fire in Varthur lake in March 2017. There were three minor fires in 2018.

6. Some Solutions for Reviving the Lakes

The following steps could be taken for the re-development and improvement of lakes which is the need of the hour:

- The surviving lakes should be revived and developed.
- Efforts should be made to ensure that these lakes are not polluted by any form of discharge of effluents, industrial wastes, domestic wastes, etc.
- To further prevent silting of lakes, off shore development of large-scale tree planting must be undertaken
- All encroachments around and on the lakes must be removed.
- Existing tanks should be de-weeded and aquatic life must be developed.
- More tanks or lakes should be constructed along the natural valleys
- Encroachments blocking the natural drains should be cleared off.
- Protection, conservation, reclamation, restoration, regeneration and integration of lakes should be the priority in the development of the city.
- Monitoring and management of water quality and lake ecology.
- Lakes could be revived and used for educational and tourism purposes.

7. Conclusions

Bangalore/ Bengaluru is one of the fastest growing metropolitan cities of Asia. Clean air, water and atmosphere is the fundamental right of every citizen but that is getting hindered due to the unsustainable development.

The revival of the lakes is the need of the hour and all efforts should be made before it gets extinct.

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