

Review Of Planning Guidelines For Urban Lakes In India

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Abstract:

In 2001, The definition for urban lakes, which is given by the NLCP (National Lake conservation plan, India) is a “water body having a minimum 3M depth spread over more than 10 hectares and having no and very less aquatic vegetation”. The other guidelines given by the other institution for improving and development of urban lakes. Despite lot of action and planning policies, the condition of urban lakes remain the same. The aim of this research paper highlights the challenges faced by the urban lakes and study different guidelines and models used by the different cities municipal for improvement and protection of these lakes. The case study methodology used. The international and national both case studies consider for the study. This research paper is the review of other works in the same field.

Key words: Urban lakes, lakes in India, Urban planning

1. Introduction:

Urban lakes are the important part of any urban or peri urban area, which demands environment friendly approach (Anand, 2014). Urban lakes are not just the source of water in cities but, these lakes are responsible to maintain the microclimate of any city by reducing heat island effect. These lakes are responsible for controlling floods in these cities. After urbanization, the population growth of any Indian city increases since last decades. As per the last census data the population growth of Indian cities are 2.76 per annum (Kantkumar,2016) These cities demands for the land at the cost of degrading nature. Lakes in mega cities are loaded by the sewage and waste. These lakes are responsible for recharging ground water also. As per the current report the water level reducing rate in India is 36-67 percentage (Kumar et al. 2020). For the

development and making cities more sustainable, required the integrated planning approach.

1.1 Defining Lake:

As per the hydrology, the definition of the lake is accumulation of the water in a deep or shallow basin, surrounded by the land with some aquatic ecology. Lakes are broadly classified into two categories manmade and artificial lakes, but as per their origin, lakes can be classified as tectonic lakes, volcanic lakes and glacial lakes (Jain, 2016). The classification of lakes in any urban city are based on the pollution level and nutrient levels present in the water of the lakes. These are:

1. Oligotrophic lake: Low percentage of nutrient and pollution, used for drinking purpose.
2. Mesotrophic lake: Medium percentage of nutrient, but not suitable for drinking purpose.

3. Eutrophic lake: When nutrient level and pollution level are high and not safe for the aquatic animals. The algal boom formation on the surface of lake started.
4. Hyper eutrophic lake: when pollution and nutrient levels are too high.

There is no aquatic life and surface of lake are totally covered by the algal boom.

In mega cities the conditions of urban lakes mostly comes under eutrophic and hyper eutrophic (Nature Education Knowledge, 2013). The eutrophication of the lake and siltation is the natural process as per the aging of the lakes, however it will take centuries to start this process (Carpenter, 1981). The process of eutrophication and siltation accelerated after the human activities around the lake (Nature Education Knowledge, 2013).

1.2 Criteria for selection Urban Lakes in India:

The urban lakes was defined by the National lake conservation plan (NLCP) in 2008, that a water body which has depth more than or equal to 10M and size must be equal to or more than 3hectare consider as urban lakes (Report MoEF,2013). It has some aquatic ecosystem also. The NLCP body responsible for conservation and protection of lakes since 2001, under Ministry of Environment and forest (MoEF). Later the body was merge with National wetlands conservation program (NWCP) in 2013 and make a new body which have charge for protection and conservation of existing wetlands and lakes. But the guidelines remain the same. The total number of lakes consider under this Programme was 62 lakes in India from the different states and region. The NLCP highlights the issues of the fund and practically not feasible for all the lakes in India. The selection criteria are based on the other perimeter are:

1.21 Hydrological criteria:

The lake water body should be perennial. It should hold certain amount of water throughout the year, even in the time of summer (Report-MoEF, 2013).

1.22 Scientific criteria:

The lake water quality should be matter of concern by the state government or the water quality of the lake is highly degraded because of discharge of sewage, waste water and industrial waste. Lake is treated more like a dumping ground for the solid waste can be consider under the Programme (Report-MoEF, 2013). The reference for the surface water quality of the lake is consider as the bathing level water quality by CPCB (Central Pollution Control Board).

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|----------------------------------|--|
| Fecal coliform | Desirable : 500MPN/100ml Maximum: 2500MPN/100ml |
| Fecal Streptococci | Desirable : 100 MPN/100 ml Maximum: 500 MPN/100ml |
| pH | Between 6.5 and 8.5 |
| Dissolved Oxygen | 5 mg/l or more |
| Biological Oxygen Demand(3 days) | 3 mg/l or less |

Table 1: Water Quality for outdoor bathing(CPCB)

1.23 Administrative Criteria:

1.23.1 If lake water quality degraded or eutrophied although the main purpose of the lake water is for drinking water supply, domestic use and recreational use.

1.23.2 Lake categorized as a “unique fresh water ecosystem” (Report-MoEF,2013).

2. Statement of the Problem:

The NLCP (National Lake Conservation Programme) Programme mention only 62 lakes as an urban lakes. Some cities are totally ignore for example Pune city, Katraj lake, Pashan lake which comes under this criteria. The definition for urban lake is not complete, some lakes are dried during summer season and the water availability during this season is below the standard mention in the statement of urban lakes. The authorities more focus over the money related issues and the beautification of the lakes. As per the NLCP development statement for the urban lakes the 25% area should be developed for the human interaction and socio- cultural or recreational space (MoEF Report, 2013). There is no clarity by the authority over this proposal. The buffer zone around the urban lakes are not clearly specify by the NLCP (National lake conservation Programme) although the National Green tribunal Act implement the guideline for Karnataka state that the buffer zone around the urban lake must be 75m. No construction are recommended in this region. Later the act was challenged by the local builder groups in Supreme Court and buffer zone limit set as 30m around the urban lakes (The Economic times, 2019).

3. Status of the Lakes and other water bodies in India:

The lakes in India normally taken as a landscape feature and selling point for the builder lobby. The lakefront development is not the new concept in urban planning. Different various model have been developed by the different authorities, but maximum were failed in India (Down to Earth, 2015).

3.1 Bangalore city: The Lake Development Authority (LDA) of the Bangalore city still in process to develop a model for the Bellandur lake and Hebbur lake, where the approach was public private participation (PPP). This model consider stakeholder is the important variable for the development. Under the stakeholder birds, flora, fauna and human all are considered (Chandrakth, 2018).

In 2018, the National Green Tribunal (NGT) passed the order after the Karnataka builder encroachment case, that the buffer zone for all the lakes should be 30-75M. These guidelines apply to all the new constructions on lake catchment.

3.2 Lucknow city: On the other side the Lucknow Development Municipal Corporation also developed, the riverfront development for Gomti River, but after implementing all the policies and development, the result was worst. The entire ecosystem of the river was disturbed. The main focus over the striating and shortening of the river channel, by controlling its width, shape and river bed by constructing huge diaphragm wall on both the ends of the river, as a result the eight types of habitat of the fauna have been lost and the flood situation arises during heavy rainfall. Even the flood zone line has shifted to 450m from 240m due to diaphragm wall. The total length of this wall is 8.1km. The LDMC (Lucknow Development Municipal Corporation) was not considered a successful project for the human settlement and the ecosystem of the river (Dutta et al; 2018)

3.3 Ahmedabad city: the other example of urban development around the lake is Kankaria Lake, Ahmedabad. It was developed for public recreational activities. This lake front model is considered the best example of urban spaces. However, it is not considered a good example of an approaching ecosystem. The model was criticized by the environmentalist that the concretizing of shoreline affects the flora and fauna of the lakes (Bahudre et al., 2014). This

project took 2 years for implementation. It was open in 2008 for public activities, after 2008, the siltation of the lake has started because of the urban activities (Bahudre et al., 2014).

The another project was launched by the Ahmedabad Urban Development Authority (AUDA), which is on experimental basis. This project is “lake linking project”. Under this project the municipal links all the urban lakes by creating different storm water channels. The integration of storm water infrastructure and lake ecosystem creates adverse pressure on the water quality of the lakes (Anand, 2014). Researcher highlights the adverse effect of linking of the lakes, that hydrological interventions generate irreversible impacts on the lake ecosystem and receiving water by using EMP SWMM (Storm Water Management Model) software. Storm water must be harvest and judicially used for future need (Anand, 2014).

3.4 Kashmir : another case is the Dal Lake, Kashmir. Where the lake is degraded because of the urban activities around the lake. The lake, which was covered an area of 75sq.km in 1200AD has shrunk to 12m of depth by siltation. The reason behind the siltation is the construction of the new hotels and other structure on the lake catchment area. As per the Lakes and Waterways Development Authority (LWDA), Kashmir analysis report, 2015. It is observed that the percentage of the Nitrogen and Phosphorus increased in the Dal Lake water. The reason for increasing the percentage of the nitrogen and phosphorus is the direct disposal of the untreated sewage of the residential and hotels on the lake water (CSE, 2015).

3.5 New Delhi: as per the research 2010-11 to check the changes in the water bodies, the status of the 44 lakes was ascertained and the results found that the 21 lakes are already filled and dried because of urban activities (Singh et al., 2012). The other reason for the bad condition of the urban lakes are no clarity over the data and

ignorance by the governance system. This case was highlighted by CSE (Center for Science and Environment) in 2008, where in 2001 on the order of High Court a joint survey committee assess the number of natural water bodies in Delhi and submitted the list of 508 water bodies, on the other hand TAPAS(Delhi based NGO) submitted the list of 794. Later DDA (Delhi Development Authority) submitted the list of 580 water bodies in 2004. This list was not matched with the NGO (Non-Government organization) TAPAS.

3.6 Rajasthan, Pushkar : As per the CSE (Center for Science and Environment) report, 2010 the Pushkar lake started dried after the wrong planning steps. The project for improvement of Pushkar lake was started in 2009, January. The aim of this project is the clean up the catchment and concretize the existing channels that carry run-off. The total project cost of is 48 crore. After concretizing the channel, reduction in the ground water table and feeder track of this lake also dried up, as a result the lake reduced the 1.2m level. In fact the ecology of the lake was also disturbed.

3.7 Andhra Pradesh, Banjara Lake: The Banjara lake, also known as Hameed Khan Kunta is 80year old lake, which has 4.17ha size and 5.0m depth. The lake is surrounded by the Banjara hills in its west, small group of apartment's complex in its north, some slums on west side and Taj Banjara Hotel at South. The eutrophication started at the surface of the lake water because of the disposal of the sewage from the existing apartment side. The Andhra Pradesh Tourism Development Corporation Ltd (APTDC) in association with Taj GVK, has developed a conservation and management plan. The measure takes to improve the condition of lake water are monitoring and prevention of further pollution by treating the sewage entering the lake, lake aeration and other activities for improving its aesthetics (MoEF Report, 2013). The guidelines are not in details, what actions will

be taken to improve its aesthetics and surface water.

The exploitation of the urban lakes are not limited to the India but in other countries too.

4. International Status of the Urban Lakes:

4.1 United States of America (USA): As per the survey conducted by the Environment Protection Act, USA in 2010, it was found that there has been an increase in the percentage of nitrogen and phosphorus in the lake water bodies. The reason for this increase is the construction activities in the catchment area of the lakes.

Another similar research at Higgins Lake, Michigan found that the main reason for an increase in the percentage of nitrogen and phosphorus in lake water is the development of the residential construction in lake catchment areas (Water-resources investigations report (US), 2001). In another research related to the “effect of residential development on the water quality of the Higgins Lake, Michigan 1995-99”, has been reported that the built-up area should be 0.5 per acre of the catchment area in the shorelines of the lake not more (Minnerick, 2000).

4.2 Europe: research on European lakes, found that the threshold percentage of the agriculture and green area in the lake catchment should be between 30% to 50% in order to maintain the water quality of the lake. It should not exceed 50%, otherwise the increase in the percentage of nitrogen will not support the aquatic life (Davies et al., 2008). Another research in New Zealand it has been reported that the same threshold percentage should be 30% (Quinn, 2000).

4.3 Jakarta: another research carried on the urban lakes in Megacity Jakarta related to the risk and management plan for future sustainability reported that the builders have a high attraction for constructing residential area on the shoreline

of the lakes. The construction of the residential area in the catchment of the lakes is the reason for the siltation of the urban lakes and the reduction of the quantity and the quality of the lake water. In some urban areas of Jakarta, many lakes disappeared within four years after construction of the residential area within the catchment of the lakes (Cynthia et al., 2013).

5. Variable of the Lakes as per the hydrology:

5.1 Physical variables: The light, temperature and humidity are the physical variables of any lake. The attenuation of light by water are major factors controlling temperature and have potential photosynthesis, which provide food that support food web in the lake (Water on the web-Lake Ecology, 2010). The light decreases with the depth of lake. Light intensity at the lake surface varies seasonally with clouds.

5.2 Chemical variables: The Lake contains wide array of the molecules and ions from the watershed, the atmosphere and the lake bottom. The chemical composition of a lake is fundamentally a functional of climate, which affect its hydrology and its basin geology i.e. calcium and magnesium, high percentage shows hardness of water.

5.3 Biological variables: a typical lake has distinct zones of biological communities linked to the physical structure of the lake. These are littoral zone, limnetic zone and euphotic zone. The littoral zone are the near shore area, where sunlight penetrates all the way and allow to grow aquatic plants (macrophytes). These plants are food for the migratory birds. The euphotic zone are the zone, where the light level of 1% reaches. The sunlight in euphotic zones occur within epliminion, on the other hand the limnetic zone is the open water area, where light does not generally penetrate all the way to the bottom.

These variables varies as per the social and governance system (Bal, 2015). The different

types of model developed to make sustainable urban lake models. These model consider other variables and attributes also. One study was done based on the four cities urban lake model as macro level and at last Jaipur city consider for the micro level study by the researcher. These study evolve the other parameter which effect the urban lake. This model is known as SES (Social Ecological System) MODEL, which was developed by Ostrom (Ostrom et al.,2014). The main variables of the SES MODEL are:

- 1) Socio-economic, political settings(S)
- 2) Related Ecosystem(ECO)
- 3) Resource System(RS)
- 4) Resource Units(RU)
- 5) Governance System(GS)
- 6) Actor (A)
- 7) Interaction (I)
- 8) Outcome (O)

This model used to find out the solution for the urban lake and make a sustainable model.

6.Conclusion:

6.1 Despite lot of actions and guidelines, the situation of the urban lake remain the same. The NLCP (National Lake Conservation Plan), did not covered all the aspects for the urban lake. The list of urban lake not be limited to the 62 lakes.

6.2 At state level monitoring body required to check the status of the lake at every 3 to 4 months period of the time. As the earlier research reflect that the percentage of the BOD and COD change

as per the weather and climatic condition changes. The increase in the percentage of BOD and COD is the indicator for the high pollution level (Pimple,2015).

6.3 Another body required to implement the different method for improving the water quality and quantity of the body. As per the MoEF report, 2013 the Government have limited fund and not all the lakes of Indian cities can be consider.

6.4 The urban activities in lakes catchment area must be in controlled manner and analyze the impact before implementing.

6.5 The buffer zone 75m for the urban lake should be declared by the state government and free from the urban activities. This guidelines are applicable only for Karnataka lakes by their municipal corporation NGT(National Green Tribunal),2016. Later in 2019 the act was challenged by the Karnataka Builder group at the Supreme Court change the buffer zone limit 75m to 30m, which have adverse effect on Urban Lake (Kantkumar, 2018).

6.6 The percentage of the phosphorus and Nitrate must be check time to time (NLCP, 2008). As these are indicator for high urban activities in water catchment of the urban lakes.

6.7 As per the earlier researcher the SES MODEL will be successful, if implemented properly. It will also help to understand the current situation of the urban lakes (Bal,2015).

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