Lakes Series | Insight Article #2

# How do we solve Bangalore's lake problem?

By Veena Srinivasan, Apoorva R,
Priyanka Jamwal and Sumita Bhattacharyya

Centre for Social and Environmental Innovation, ATREE

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Credits: Sumita Bhattacharyya

- There has been limited progress on solving Bangalore's lake problem because we lack consensus on what needs to be done and what is effective. To address this:
- The first step is to create consensus on the goals of lake restoration and its end uses through participatory lake visioning,
- The second step is to set quantitative goals for lake restoration based on the common lake vision,
- The third step is to build an evidence base of solutions on lakes to allow learning.
- Finally, we need to view lakes as a system, closely interconnected to the water and wastewater infrastructure of the city. We need comprehensive planning that is consultative.

*This article is the second in a multi-part series on lakes that aims to provide a comprehensive overview of lake-related problems in Bangalore and approaches to address them. This article explains how participatory lake visioning and comprehensive planning can help in lake restoration.*

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*Credits: Sarayu Neelakantan*

Bangalore's lakes face many problems - some of the more visible ones being water pollution, drying lakes and urban floods [1]. Yet despite considerable effort and investment of public and private money, we have made little visible progress in addressing these.

## Why we disagree...

The lack of progress is not however due to a lack of good intentions. In some cases, stakeholders simply disagree on what needs to be done. They disagree for a variety of reasons: differing values and differing facts.

Given that lakes have changed so much from their original purpose as irrigation tanks, people disagree on what the goals of restoration should be. Are we trying to get back to seasonal, rainfed lakes? Or given the city's acute scarcity of water, should we, as a city, view lakes as places to store treated sewage for reuse, and recharge of groundwater? Or should we simply accept that as the city grows, lakes will inevitably get some partially treated sewage? Given the expense of collecting and treating sewage, should we just treat lakes as natural wetlands, that serve as nature-based treatment systems for partially treated sewage? Should we accept that nutrient-rich lakes will be covered with vegetation, rather than open water bodies?

People also disagree on what works. Much of the research on lakes in the western world stems from relatively pristine, temperate lakes that are natural in origin. Bangalore's lakes are man-made, tropical, and filled with partially treated sewage. Worse, the lakes are constantly changing – with new inlets and outlets, drain blockages, and new pollution sources emerging as the city grows. There are no good predictive models of how Bangalore's lakes function. And we do not know what works and does not work in terms of wetland size, design, bio-enzymes, etc. in these warmer, high-nutrient environments.

*To reach consensus and address lake problems, a common lake vision is necessary. We need an evidence-base of solutions and predictive models of lake management.*

Here, we list steps that can help address lake health.

## Step #1: Create consensus through participatory lake visioning

One of the main reasons why government agencies and lake groups are often at loggerheads is that they lack a common vision of what the goals of lake restoration and end uses should be.

Wetland birds at Rachenahalli lake (2017) *[Photo Credit: Shashank Palur]*

**Different stakeholders want to use the lake for different purposes.**

With urbanisation, the direct dependence on lakes for washing, fisheries, fodder and foraging has diminished. Urban middle and upper-classes connect with lakes mainly for their aesthetic, cultural and conservation values. Lakes have walking paths and parks and are used by residents for morning walks, bird-watching and other recreational activities. Conservationists value lakes for their biodiversity. People in the vicinity of lakes value their role in groundwater recharge. Some communities use lakes for cultural and religious practices such as idol immersions.

Participatory lake visioning offers a way to democratically set goals for lake management. This approach can help bring people, civil society, researchers and the government together to reach consensus and collectively solve lake problems. This involves regular discussions that bring together stakeholders – those who use the lake and those who have the power and the mandate to manage and regulate the lake. This needs to happen at the level of each lake, involving local citizens, area-level government officers and area-level elected representatives. This can help identify the problems affecting the lake and the people. Ward committee meetings can provide a democratic platform for visioning at this level.

For each lake, all relevant stakeholders need to first identify and agree upon the uses of the lake. Such a consensus is necessary to define lake restoration goals.

Brainstorming session on Lake Development Vision for Nallurhalli lake (2019) [*Photo Credit: Biome Environmental Trust*]

## Step #2: Establish quantitative goals for restoration

Once stakeholders agree on the lake vision, they can set appropriate goals for lake restoration. These goals should include parameters that represent the interests of all stakeholders. For example – for fishermen, the dissolved oxygen (DO) levels in the lakes serve as a crucial water quality parameter; while for citizens who are interested in lakes for bird conservation, both chemical contaminants and maintaining DO levels to support aquatic life matter. In such cases, the end-use that demands the best water quality drives the goal for restoration.

**We need a mechanism to set goals for lakes restoration.**

In India, there are defined water quality criteria for "designated best uses" for surface water bodies. There are five designated best use classes ranging from drinking water use to irrigation use, with poorer water quality being acceptable for the latter. Typically, water quality is tested and then, water bodies are tagged into one of these five classes. As these classes only allow the tagged lakes to be

used for a specific use, this may not fulfil the uses required by the stakeholders.

*What is needed is the converse; a mechanism to designate first the end-use class of a water body and then, manage it in a manner to meet the quality criteria.*

One example is lakes being rejuvenated under the central government-funded National Lake Conservation Plan, where the restoration target has been set to bathing water quality standards [2].

**We need a broader set of criteria to represent lake health.**

Although we have a set of water quality criteria for classifying surface water bodies, this is insufficient to represent urban lake health. A broader set of criteria for lake health would ensure that several end uses are fulfilled. Such criteria would include fish catch per unit effort, aquatic plant species diversity and abundance, mosquito larvae abundance and greenhouse gas emissions.

**We need water quality criteria and benchmarks that are context-specific.**

The existing water quality criteria defining designated best use classes are outdated. They assume pristine or rural catchments and therefore, fail to recognise industrial and emerging contaminants in urbanising contexts. There is a disconnect between the water quality standards for effluent discharge and surface water bodies [3]. The standards use a very small set of criteria to test and classify water quality in lakes. For instance, the Karnataka State Pollution Control Board (KSPCB) classifies lakes into two categories – 'satisfactory' and 'unsatisfactory' based on a water quality index that lacks parameters for chemical contaminants. Under such criteria, even lakes such as Jakkur which support fisheries and are perceived to be clean by local residents are tagged as being 'unsatisfactory'. We need the parameters defining a healthy lake to be set based on the watershed context – a revised list of parameters may be needed in cities.

There is an urgent need to revise water quality standards, so that they are context-specific to the ongoing activities in the catchment, especially if we envision the lake for wastewater reuse. KSPCB needs to modify the water quality standards used to classify lakes [4]. Once standards are set, benchmarking exercises to identify 'healthy' lakes and compare lakes across the city can be undertaken.

*Inclusion of a broader set of criteria for lake health is a change that active citizen lake groups in the city need to advocate for.*

Wastewater flows from Bangalore used for irrigation downstream of Byramangala Tank (2016) [*Photo Credit: Water Lab, ATREE*]

## Step #3: Build an evidence-base of solutions and foster learning

Constructed wetland at Jakkur lake (2016) [*Photo Credit: Chandan Gowda*]

To address lake pollution, various solutions ranging from sewage treatment plants to floating islands and aerators are being implemented in different lakes. Yet, we have little evidence on what solutions are effective and viable for the city's lakes. There are no clear design principles for these solutions, despite their potential for scaling up across India.

To achieve this, we need to identify what interventions are effective, both at the catchment and lake level. To do this, we need to monitor water quality and quantity inflows regularly and create the evidence base of which interventions improve lake health and under what conditions. In cases where new innovative approaches are being tried, a "living labs" approach to restoration is much needed. New solutions should be tested on a pilot basis with clear protocols for data collection before and after treatment, and for evaluation of effectiveness.

In Bangalore, data that can inform decisions on lake management are largely absent. We need an open public database on lake health. But we also need to be innovative in integrating new types of data. Conventional laboratory water quality tests need to be complemented with low-cost citizen science toolkits for monitoring of water quality and biodiversity (e.g. emergent macrophytes, diatoms and birds), and emerging satellite earth observation techniques.

We also need a mechanism to facilitate learning through publicly accessible data platforms. Documenting success stories will foster collective learning. Over time, practices that work effectively can be collated into a set of best management practices guidelines for the city lakes.

## Step #4: Build communities towards an integrated "blue-green-grey water infrastructure plan"

While individual lake groups have been reasonably successful in the restoration of individual lakes; this is not sufficient. As the lakes in the city are interconnected, the benefits of managing them in isolation are limited. It is very important that lake visioning understands the cascading lake linkages. This can help prevent shifting a pollution problem affecting one lake to another lake. As an integral part of the city's drainage network, lakes have the potential to be utilised for flood control, groundwater recharge and as sources of freshwater.

*The cascading nature of lakes makes it important to view lakes as a system rather than in isolation.*

In-situ lake water quality monitoring using a low-cost testing kit (2018) [*Photo Credit: Richu Baby*]

To do this, we need a process to bring together lake visioning discussions from the ward-level to the lake-series level (that spans across multiple wards in the city). Instituting citizen lake-series federations in partnership with the BBMP offers one possible pathway to facilitate such discussions.

Data show that even after planning and setting up wastewater treatment infrastructure, even in 2031 more than 300 million litres of wastewater will still flow untreated in stormwater drains everyday [5]. Therefore, it seems inevitable that we will need nature-based "green infrastructure" solutions, in combination with traditional "grey infrastructure" engineering solutions.

Ultimately, the city needs a comprehensive blue-green-grey water infrastructure plan [6] that uses a combination of conventional wastewater treatment, constructed wetlands and in-stream treatment to improve water quality and rainwater storage. The planning needs to be consultative, involving citizens and the government. At the moment, the technical plans (wastewater engineering, drain construction and widening) are not coordinated with the decisions taken by different government agencies. Citizens do not understand the implications of such fragmented decisions on individual lakes or cascading lake series and are, therefore, taken by surprise when unintended outcomes occur.

Bangalore, as a global city, deserves clean waterways and lakes. This requires not only coordination between government agencies and citizen groups but also a clear and consistent vision. It also requires space to experiment with new innovative solutions. So, rather than each lake reinventing the wheel, we need ways to build on collective knowledge and wisdom.

## Acknowledgements

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## Suggested Readings

[1] Srinivasan, V. and Apoorva R., 2020, What is the problem with Bangalore's lakes? Lake Series, Insight Article #1. CSEI, Ashoka Trust for Research in Ecology and the Environment, Bangalore.

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[3] Jamwal, P., Lele, S. & Menon, M., 2016, Rethinking water quality standards in the context of urban rivers. Eighth INSEE Biennial Conference, 2016, Bengaluru.

[4] Water (Prevention and Control of Pollution) Act, 1974; (Section 17, Clause 1(g)).

[5] Database/ Information for Preparation of Revised Master Plan 2031 for Bengaluru, Bangalore Development Authority.

[6] Y. Depietri and T. McPhearson, "Integrating the Grey, Green, and Blue in Cities: Nature-Based Solutions for Climate Change Adaptation and Risk Reduction," in Nature-Based Solutions to Climate Change Adaptation in Urban Areas: Linkages between Science, Policy and Practice, N. Kabisch, H. Korn, J. Stadler, and A. Bonn, Eds. Cham: Springer International Publishing, 2017, pp. 91–109.