

A Positive Response to Urban Ecological Aspects Around an Urban Pond Through Urban Design Guidelines

Lakshmi S Shaji

Assistant Professor, Department of Architecture, TKM College of Engineering, Kollam, Kerala, India.

*Corresponding author: laksjmishajis@gmail.com

doi: <https://doi.org/10.21467/proceedings.112.24>

ABSTRACT

Cities are growing at a phenomenal pace and the speed has created a huge gap between the urban dwellers and nature. Though development of cities are driven by many economic factors and ecological driving factors are acknowledged in recent times, water resources still lack importance. The significance of urban water bodies are mainly in two ways: one is to help the survival of the water dependent ecosystem and landscape and the other is to recharge the water beneath the ground. Since ancient times water had a great role in human culture in many ways through rituals and lifestyle, especially in India. Creating huge man made reservoirs, for agriculture and day to day uses. Unfortunately, in recent times anthropogenic activities have created the worst phase of degradation of natural resources and mainly water. So as an urban designer there is a great social responsibility and commitment for building up a better and healthy city have a key role in integrating such natural resources positively with the newly heading urbanized world. In this study an attempt to make a qualitative analysis of the current scenario of urban ponds in Trivandrum has been made.

Keywords: Urban Ecology, Urban Pond

1 INTRODUCTION

Big and small water bodies, in the form of ponds, lakes and reservoirs, dot the landscape of a place. With time, the demand on water bodies has increased. The increased large scale use of water for various uses like industrial purposes, large scale agriculture, use of chemical fertilizers, pollution, power generation, recreation has created the overexploitation of water resources. The worst threat of such widespread development on the urban water bodies is the conversion of the resources into cesspools of urban sewage. Incessant landfilling of these water bodies is another major after effect of the so called development. With regard to treatment of wastewater, the ecotones between lakes and terrestrial ecosystems are crucial for protection of the water body ecosystem against anthropogenic impacts.

1.1 Defining Urban Pond

An Urban Pond is generally described as a water body of a smaller size, man-made or developing it from its natural origin found in urban areas. These ponds are used as multiple resources - about a million people use it for bathing, washing, pisciculture, performing religious rites and also use its adjoining areas as city parks. The ponds also have a great ecological importance in the urban environment - from microclimate control to biodiversity.



1.2 OBJECTIVE

To formulate urban design guidelines to positively relate urban ecological aspects around an urban pond with urban developments for a better and healthy life in a city.

2 BACKGROUND STUDY

2.1 Pond Ecosystem

A pond is a quiet body of water that is too small for wave action and too shallow for major temperature differences from top to bottom. It usually has a muddy or silty bottom with aquatic plants around the edges and throughout.

2.2 About Urban Water Bodies

Urban water bodies perform numerous ecological and indigenous functions. Each water body and the ecosystem possessed in and around it is unique to that particular context which serves in macro and micro aspects for the survival and functioning of the flora and fauna which in turn influences the urban dwelling ecosystem around it. However, some of the common predominant factors that characterize all urban water bodies are:

- They are greener than non-urban lakes.
- It requires extensive water treatment due to the presence of high chemical content beyond desirable levels.
- Diagnostic sediment signature in them varies from place to place.

2.2.1 Riparian Buffers

Riparian buffer is defined as the vegetative region around the water body, which is very important as the pond ecosystem itself. It is one of the significant and distinct region around a water body and is mainly influenced by the water content above the ground and below the surface. They are the "thin green lines" between all we do in uplands and the effect of that use on aquatic ecosystems.

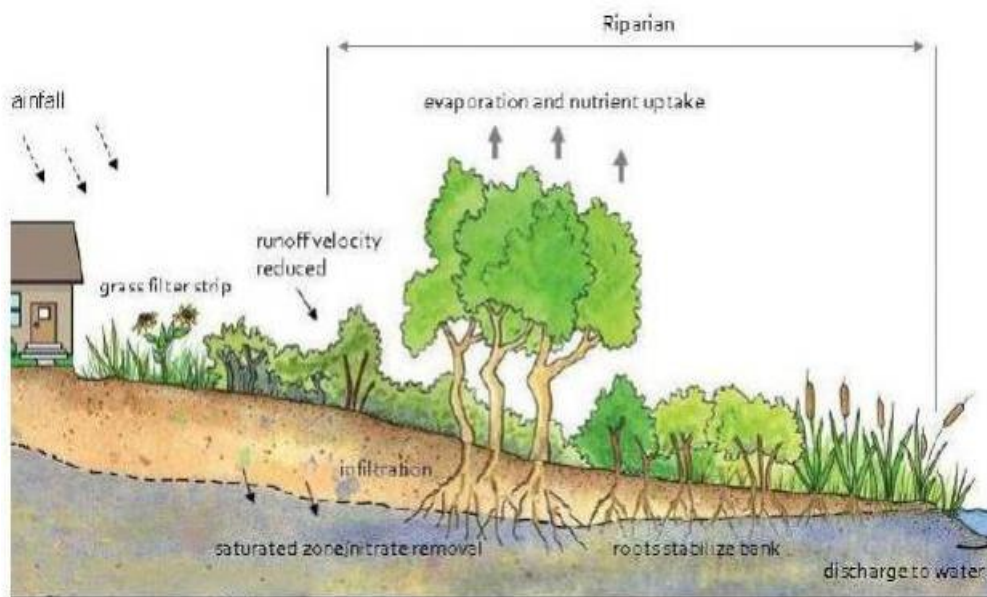


Figure 3.1: Section of Riparian Buffer

2.2.2 What Makes Riparian Areas Special?

Healthy riparian areas possess several unique functions and provide important ecosystem services and benefits to society including:

Water Quality Functions (sediment, nutrients, flows and temperature)

- Improve water quality by trapping sediment, sediment-bound nutrients and other contaminants from surface runoff.
- Reduce the velocity of sediment-bearing storm flows.
- Help prevent eutrophication of aquatic ecosystems.
- Riparian vegetation can moderate water temperature in small (low order) streams.

Flood Water run off and retention: Riparian areas reduce peak flows and downstream flooding

Bank and Shoreline Stabilization: Deep-rooted, native plants protect shorelines by reducing bank erosion, bank failure, sediment transport, and loss of valuable lands.

Habitat and Biodiversity

- Capture organic matter that is a source of food and energy for the aquatic ecosystem.
- Support an exceptional level of biodiversity due to natural disturbance regimes, a diversity of habitats, and small-scale climatic variations.

2.2.3 Enhancing Tree foliage

The extent of trees is an important aspect in improving the water quality and quantity by the natural retention and recharging process. Even the presence of one single tree improves the water status to a large scale.

2.3 Factors responsible for degradation of ponds

The unprecedented deterioration of urban water bodies and ponds are mainly due to:

- Population explosion,
- Inflow of Toxic industrial waste ,
- Agriculture which is highly dependent on chemical fertilizers and pesticides and
- Lifestyle that consumes humongous amounts of water.
- Pollution due to open drain and sewage into water
- Land reclamation

2.3.1 Eutrophication

Industrial effluents, run-off from agricultural fields, refuse and sewage, domestic wastes like food remnants, soaps, detergents and sewage are dumped into water bodies which break down and release nutrients in the lake water. Following ingestion of carbonic elements, carbon dioxide is released, while some of the elements are converted into nitrates and phosphates.

2.3.2 Siltation

Water flowing into a lake brings silt. Increased deforestation loosens the topsoil, which finds its way into lakes. Some of the silt is washed out when the lake overflows. However, the outflow of silt does not always match the inflow and silt settles at the bottom of the lake.

2.4 Environmental and Social Impact of waterbody Restoration

2.4.1 Environmental assessment

The restoration process of a water body should be followed by a thorough study which is time consuming and needs money for the process and long term management.

2.4.2 Economic Impact of waterbody conservation

The visual quality of the communities built around the lake is highly dependent on the condition of the Water Body and the lake-shore. The quality of a lake directly affects community property values and, therefore, the local tax base.

2.4.3 Social impact of waterbody conservation

Water bodies have been part of the historical as well as social landscape in cities for many centuries. Lakes continue to exist as Common Property Resources.

2.5 Policies regarding urban water body management

'UNEP's Global Perspective of Fresh Water Stress' states, "Conservation and restoration requires a systematic and comprehensive plan to study selective and representative freshwater ecosystems." The National Lake Conservation Policy, India (NLCP)' carved out of the Wetland Program focuses on urban lakes that are subjected to anthropogenic pressures.

2.5.1 World Lake Vision

- For a sustainable use of a water body the most important criteria is a healthy human nature rapport.
- A detailed study and research should lead to Policy development and decision making for water body management. And should have a strong backing of the scientific aspects and best practices globally.
- The management of lakes for their sustainable use requires the resolution of conflicts among competing users of lake resources taking into account the needs of present and future generations and of nature.

2.5.2 GOI support for Lake Conservation

National Lake conservation Programme: The Ministry of Environment and Forests implements the National Lake Conservation Plan, a Centrally Sponsored Scheme, aiming at restoration of water quality and ecology of the lakes in the country.

Activities covered under NLCP: Prevention of pollution from point sources by intercepting, diverting and treating the pollution loads entering the lake. The interception and diversion works may include sewerage and sewage treatment for the entire lake catchment area like:

- In situ measures of lake cleaning such as de-silting, de-weeding, bio remediation, aeration, bio-manipulation, nutrient reduction.
- Strengthening of bund, lake fencing, shoreline development, etc.
- Lakefront eco-development including public interface.
- Capacity building, training and research in the area of lake conservation.

2.6 Urban Design and Urban Water Ecosystems

The American designer Frederick Law Olmsted established urban park systems as a form of infrastructure that combined water systems, transportation systems, health concerns, biodiversity goals, and social goals.

Particularly in his design for Boston’s Emerald Necklace, Olmsted engaged in the activities of what is now considered the separate discipline of civil engineering, combining it with horticulture, public health, political economy, and design to propose a system that was uniquely American at the time.

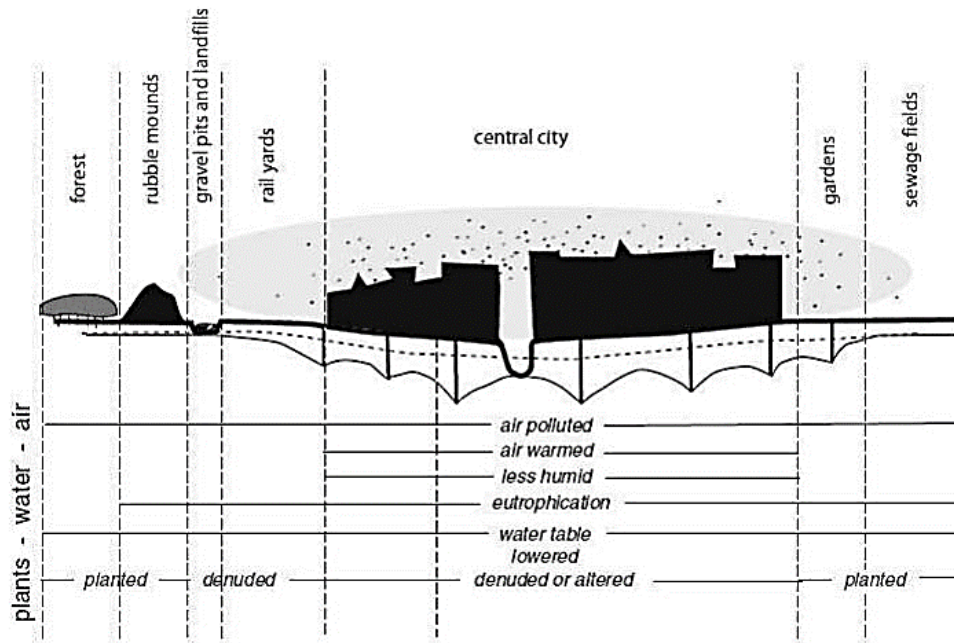


Figure 3.2: Urban ecological section showing alterations caused by urban conditions, translated and simplified from Sukopp.

3 URBAN DESIGN ATTRIBUTES OF URBAN POND UNDER VARIOUS ASPECTS

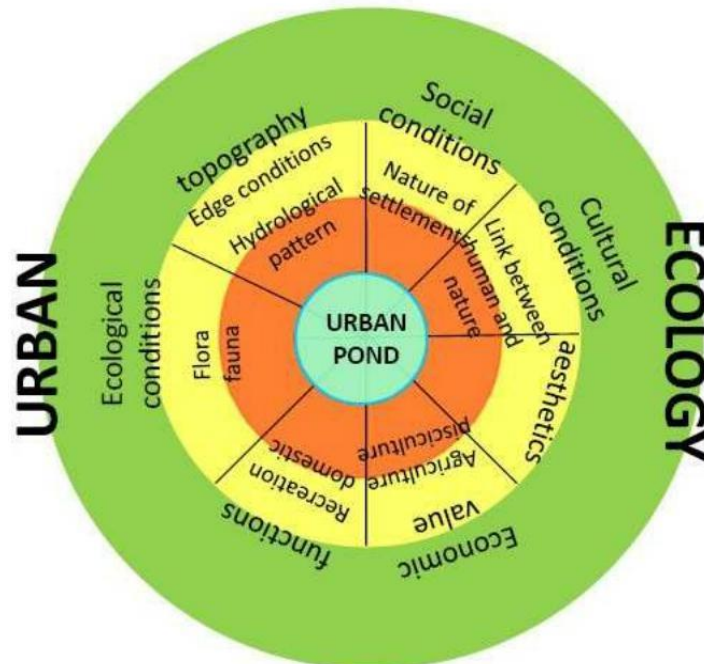


Figure 4.1: Urban design parameters which contribute towards the sustenance of ecological parameters around an urban pond.

From the background study and the case study review it was learned the broad conditions and the related urban design attributes which influence the urban ponds are:

1. Topography
 - Hydrological patterns.
 - Edge conditions.
2. Ecological conditions:
 - Flora.
 - Fauna
3. Social conditions:
 - Nature of settlements.
4. Cultural conditions:
 - Traditional elements.
5. Aesthetics:
 - Landscape elements
6. Functions:
 - Domestic.
 - Recreation.

3.1 Topography

3.1.1 Hydrological pattern

A large quantity of water is lost into soil through the process of evapotranspiration. The remainder will seep down till it reaches the saturation point. For example, clay or rock, and then will move down laterally. Lateral seepage provides flow to streams in dry weather. Depending on the soil permeability the extent of seepage varies, seepage may move deeper down into porous geological formations, called aquifers. The guidelines for development around an urban pond respecting the hydrological pattern:

- There should be a setback of 10 m for the built edge that comes around an urban pond.
- There should be a considerable distance from the septic tanks and waste pits from the water bodies depending on the soil composition.
- The construction activities and other anthropological factors should not hinder the natural hydrological drains.

3.2 Ecological Condition

The ecological condition around the immediate water body plays a vital role in the existence of the indigenous ecosystem around it. So, the surface runoff which may contain pollutants and chemicals should be properly managed to maintain the water quality, since it is a primary and direct impact on the resource and aquatic life. Small shrubs and grass alone will not prevent runoff. Runoff will only be reduced effectively if the turf grass is relatively tall (2 to 3 inches) and dense. Permeable surfaces like pervious concrete and permeable pavers are good solutions.

3.3 Social Condition

Earlier water used to be the key factor for the evolution of settlement and civilisation and the importance of water is significant through their lifestyle itself, this had a great influence in their attitude towards the water bodies. Since time changed, and when way of living changed the water bodies have become the dumpyard of cities.

- Incorporating a user friendly edge condition around the pond to inculcate a responsible attitude from the public.
- Elements like proper pedestrian networks with impermeable and vegetated surfaces.

3.4 Cultural Condition

The culture which has evolved from the way of living had created many cultural elements to link humans with nature, the sacred groves which were part of the Indian tradition were rich in ecological biodiversity acting as ecological buffers within a settlement. The festival in India is of great importance to the water bodies, all this instilled a re- sponsible attitude in humans towards nature. Elements linking human and nature. The Urban Pond Procession (UPP) is made up of a revolving group of volunteer artists, scientists, educators and concerned citizens who are all interested in collab- orating to promote the health of our urban ponds.

3.5 Economic Value

Urban ponds can have different economic values which can be used to make it an integrated component with people unlike a tettached situation what we see today. It can be a neighbourhood level ponds, an agriculture related waterbody or a public level recreational pond. All these different kinds of ponds can benefit economically by infiltrating pisciculture, culturing flowers.

3.6 Aesthetics

Integrating landscape features along with the functions around an urban pond can make the element of water more socializing and it will be sustained in a positive way along with regular maintenance and upgradation.



Figure 4.2: Landscape elements to integrate the ecological aspects with social life.

4 Findings from Primary Survey

Omanakulam which is situated just one km from the major urban centre, Ulloor is amidst a residential colony. As part of an eco restoration project it was taken up and beautification work was done which included reinforcing the edges and providing a pavement around the water body. Its integration with its surrounding built and social factors were not linked, for instance except for a few residential built all other plots are detached from the water body.

The characteristics of the residential built along one edge shows its relationship with the pond, but no physical elements like a seating space or a deck towards the waterbody would have enhanced its social integration with the pond. The concrete paving around the water body is not a suggestive measure for an eco friendly edging around the pond, this is a crucial transition patch between the land and water which should be sensitively treated with a vegetative profile. A pedestrian network for the residential inhabitants could have been provided beyond

Urban Pond at Venjavodu was also identified as part of the eco restoration project which is besides a major road connecting Sreekariyam to Chempazhanthy. The other two edges are surrounded by residential buildings and all these surrounding built edges are completely detached from the waterbody, no kind of integration is brought about socially, physically and functionally. Since it is besides a major public road it can also be integrated with a public recreation purpose. In the existing situation it is just closed edges on all sides. As understood from the primary survey, it is an essential factor to maintain the level of underground water in the surrounding areas who depend on wells. Apart from that some kind of social link should be brought about for its sustained existence.

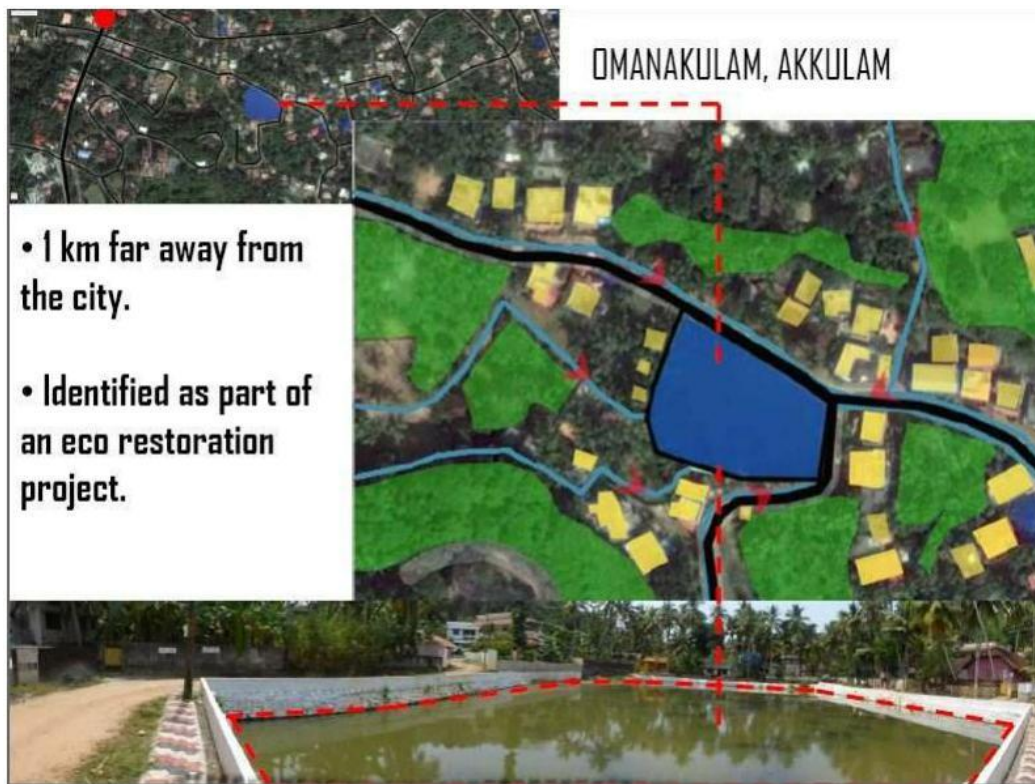


Figure 5.1: Omanakkulam.

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Figure 5.2: Features of Omanakkulam.



Figure 5.3: Features of Pond at Venjavodu.

This shows the edge conditions around the waterbody, which has completely disregarded the transition zone and the RCC reinforcement along the edges will hamper the flow of the natural drains. Functional elements like culturing fish can integrate the surrounding inhabitants positively with the ecological aspects of the waterbody. The edge which is bounded by the major public road could have been defined with stepped edges which will encourage the public to use this as an urban space.

Unlike the other cases this was not part of an eco restoration project , though the ponds are not well maintained the edges are rich with diverse ecosystem, and neighbouring people are using it for fishing and as recreational purposes. This is also just 2 kms away from the major city centre, a proper integration with the public can make it a suitable recreational space for the neighbourhood as well as a larger public. One edge is defined with dense settlement, it can be restructured to have a good public interface with the pond.

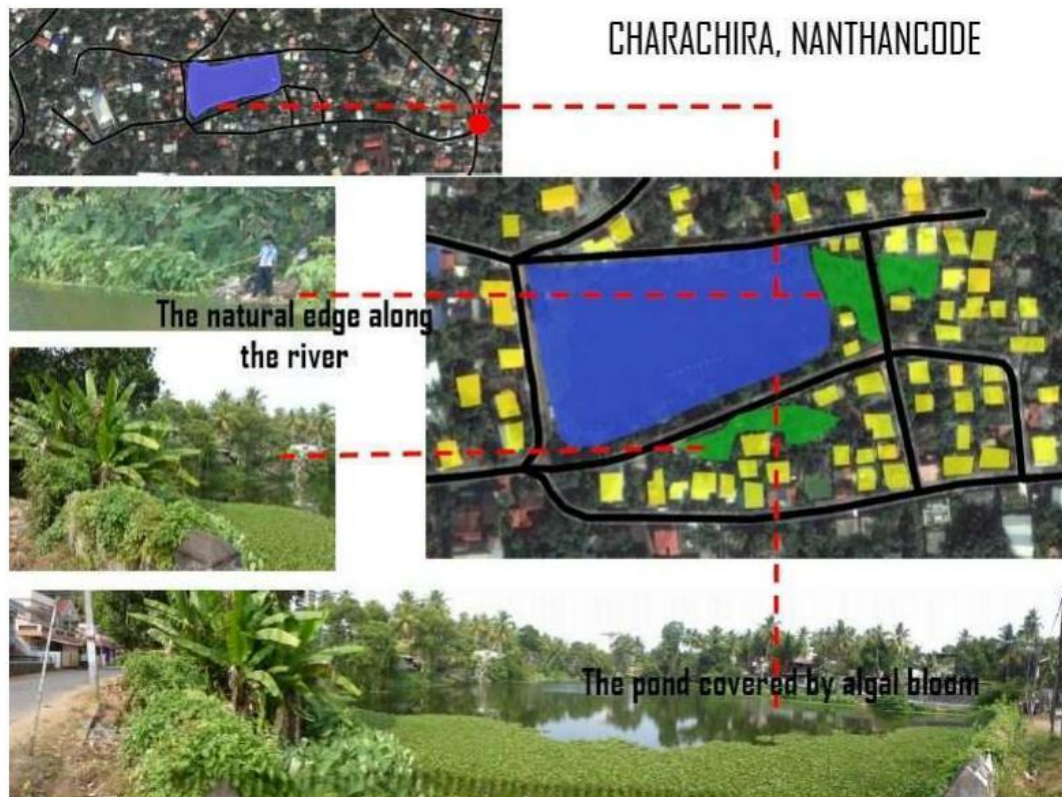


Figure 5.4: Pond at Charachira.

5 Conclusion

The identified parameters when analysed in the sites taken for study it was understood that, a general categorisation of guidelines cannot solve the issues related to an Urban Pond and its surrounding. A site specific understanding and overlaying with the identified parameters can result in a sustained solution. Despite their ecological and social importance ponds are undervalued, probably because of their small size and its common presence. But today's urbanising world, even a small patch of watershed area or water body, cannot be considered invaluable.

How to Cite this Article:

Shaji, L. S. (2021). A Positive Response to Urban Ecological Aspects Around an Urban Pond Through Urban Design Guidelines. *AIJR Proceedings*, 197-207.

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