

Living At the Water's Edge:

Reviving the Gomti Riverfront with a Nature-Based Design Approach

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Policy Statement:

The Gomti Floodplain is a demanding landscape. With the ever-increasing population, the demand for the ecosystem services provided by the river system is going to supersede the supply. As the river continues to be the primary source of water; it is projected that by 2025 Lucknow City will require a gross supply of 810 Ml/d drinkable water (Foster & Choudhary, 2009). Furthermore, as an Urban River, The Gomti is not just a water resource, it is also a high-value real estate.

The Gomti Riverfront development project; launched in 2015, aimed to tackle several urban issues, namely:

- 1. Curbing water pollution.
- 2. Mitigating flood hazards.
- 3. Riverfront Beautification: Construction of green scapes like parks & plazas.
- 4. Revenue generation by introducing activities for the public.

However, concretising and channelisation of the river have hampered its health further rather than aid it. The negative impact of modern grey infrastructure integration with natural systems is accounted for in the present-day condition of the Gomti River.

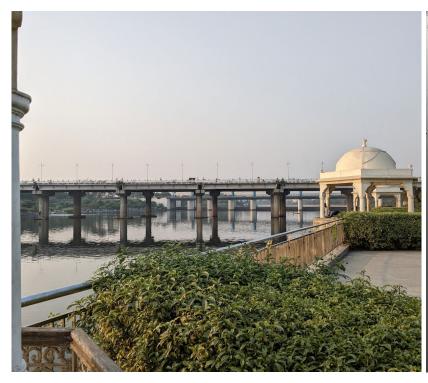




Figure 1: Concretized Edges of the Gomti Riverfront Today

For a well-functioning water ecosystem, understanding the three-dimensional connectivity of the city's water systems is essential (Kondolf, et al., 2006). Planning for the riverfront must ensure the health of the ancillary water systems. The Gomti Water system in Lucknow has several water systems of relevance in its catchment, namely:

- 1. Wetlands, Gomti floodplain, Lakes/ Ponds (Lateral Connectivity)
- 2. Rainfall & groundwater (Vertical Connectivity)
- 3. Canals/Drains & Tributaries (Longitudinal Connectivity)

And while India has adopted policies like Integrated Water Resources Management (IWRM) 1987 and Integrated River Basin Management (IRBM) 2002 to promote catchment-centric planning (Harsha, 2012); successful implementation, particularly in the case of River Gomti in Lucknow is yet to be observed. New policies like Mission Amrit Sarovar are pursued with the noble intent of increasing water security and hence, rejuvenating the river (Times News Network, 2022). But it is in their execution that they lack. With concretized lake edges, elevated higher than their catchment, these lakes are but mere tanks, and they don't function as an ecosystem.



Figure 2: Restored Lakes for Mission Amrit Sarovar (Times News Network, 2022)

Furthermore planning policies often disregard the current dependents & stakeholders, considering their activities as detrimental, with gentrification being the modus operandi of riverfront developments. However, the activities in the water systems are not harmful by themselves, it is the way they are practised that deteriorates the ecosystem.

The need now for city planners is to work with the natural water systems & the local stake-holders, rather than striving to control them. And the answer to that might be in Nature-Based Solutions. Nature-Based Solutions: as defined by IUCN aim to incorporate natural processes, low-cost, and sustainable methods to cater to socio-environmental challenges (IUCN, n.d.).

Based on the aforementioned parameters, the following are the recommendations for adopting a Nature-Based approach for future developments in the Gomti River Catchment.

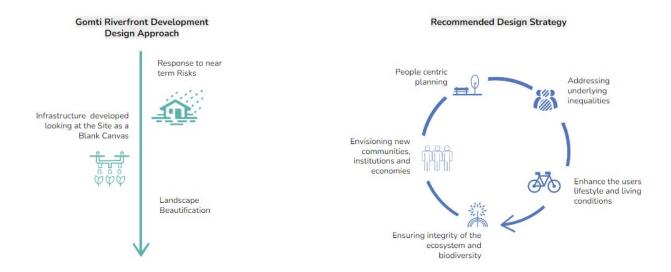


Figure 3: The design approach for Gomti till now vs. recommended

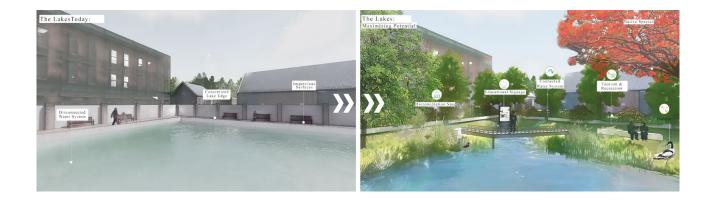


Catchment-Centric Planning Approach - Looking at the system as a whole:

Understanding the three-dimensional connectivity of the water systems in Lucknow Catchment, the essential elements to be considered for holistic future planning of the city's waterfronts are as follows:

Lateral Connectivity

A. Lake



- Policies need to ensure the preservation of existing lakes as they are often subject to reclamation in the name of land grab.
- Lakes are important reservoirs and are essential to be connected to the city water system for managing flood hazards. As such, the creation of more recharge avenues by stakeholders on different scales must be encouraged.
- Engineered habitats, like the introduction of floating wetlands or cleansing biotopes, can be incorporated to promote cleansing and sediment reduction while promoting eco-tourism: to ensure active maintenance.

B. Wetland





- Like lakes, wetlands in Lucknow are subject to reclamation and contamination by dependent stakeholders. Efforts must be made to curb malpractices & encroachment.
- Water chestnut cultivation is bioremediation by natural means if pursued organically; it functions as a sustainable horticultural production system (Jana, 2020; Marie, 2022).
 Policies can be put in place to promote the practice of sustainable agriculture by offering incentives to the stakeholders.
- Likewise grazing in wetlands, if carefully managed, can be beneficial because it can control weeds and invasive species. A clear demarcation of where and to what intensity the activity is feasible needs to be done. (Peters et al., 2015).
- The native habitat of the city wetlands must be conserved and enhanced. Eco-tourism hotspots should have minimal concretized construction, promoting local and natural building techniques.

B. Floodplain





- The floodplain in the city outskirts is subject to contamination by eutrophication in the river, soil erosion, and habitat losses.
- Agricultural residue is one of the causes of pollution (Kathpalia & Kapoor, 2002).
 Promoting ecosystem-friendly farming practices like permaculture, and regenerative farming can be fruitful in reducing the negative impact.
- Several exotic palm species and vast expanses of lawns, a bad representation of the local flora, and the riverine ecosystem adorn the current planting palette along the riverfront in the city centre. The high-maintenance lawns, with the concretized pathways, add additional water stress and urban heat to the already stressed landscape (Dutta, 2018). Sensitivity in the selection of species: based on site conditions is vital. Not all plants function the same.
- Floodplains are dynamic landscapes, altering as per the changing river pattern.
 Contetization of floodplains prohibits river flows, and negatively impacts the river's
 rechargeability & must be prohibited. Policies must be put in place to ensure that the
 porosity of the floodplains is maintained.

Vertical Connectivity





A. Rainfall

- Seasonal rain and groundwater, the main water supplies in the city, are limited and can perish.
- Recharging for water security should be promoted at all scales in the catchment, for which incentives can be provided to stakeholders.
- Impervious streetscape while easy to maintain, increases storm water run-off and flood instances. Efficient management of stormwater is critical, with minimal construction.
- Low-cost incentives like rain gardens, ponds, and swales, and increasing urban greenery can help aid recharge and reduce flood hazards, communities should be given incentives to encourage incorporating such natural systems.

B. Groundwater

- Groundwater and rainwater recharge are interlinked. Efforts must be made to reduce reliance on borewells for groundwater extraction in the city and to educate the masses about the detrimental impacts of the same.
- Reuse of greywater at residential, community, and riverfront scales should be promoted to reduce water load.

Longitudinal Connectivity

A. Canals & Tributaries





- In Lucknow, sewage and domestic waste in the waterways is the leading cause of deteriorating water quality. Efforts must be made to stop disposal at the source. And the waste, if present, should be removed by incorporating a physical or natural barricade (like bamboo grids or wire meshes) before it enters the waterway. These barricades can serve as checkpoints to be cleaned regularly to ensure unobstructed clean water flow.
- Naturalized bioengineered canals and tributaries with bioremediation species can help ensure clean water reaches the river while aiding groundwater recharge, and managing stormwater run-off and should be promoted

The Gomti River

- Physical barricades along the cityscape in the name of barrages and dams have stilled the river flow.
- Efforts should be made to ensure that the river has substantial water to maintain flow.
 As the rivers flow, they have self-cleaning tendencies: regenerating themselves (Kumar, n.d.), minimal natural processes need to be incorporated for cleaning.
- River health and flora fauna health are synonymous. The presence of biodiversity is a clear marker of a healthy and functioning ecosystem. (Gaurav et al., 2021). Natural Habitats should be restored to improve the river's health.
- Riverfront landscapes provide an immense opportunity to provide high-value natural getaways for improved human well-being through nature's restorative properties (Kaplan, 1995). Manicured landscapes are not required for this.

Promote Environmental Stewardship

- The disconnect of the people from the riverfront is the prime fact for the eventual demise of the riverine ecosystem (Nascimento, 2021). Convenient access to natural resources has led to a loss of understanding of the impact of our actions on them.
- As stakeholders often lack the know-how and skill set for efficient resource management, skill and capacity building from the ground is crucial. The resources should also be distributed equitably to all stakeholders (International Water Association, 2002).
- Education of city dwellers through the natural systems they visit for leisure can also promote sensitised actions by the residential and tourist communities.
- Consideration of stakeholders at all scales in the planning of the water system will promote community building and responsible stewardship for handling and managing the riverfront in the long run.
- All Stakeholders: Biodiversity, immediate and secondary users are important to be considered in planning. Ensuring the river's health is important to meet the ecosystem demands of the city, but stakeholders must be mindful to not exploit the resource.

Nature-Based Solutions, when incorporated into the development and planning of cities and waterfronts, can also help achieve several Sustainable Developments Goals (SDGs) and aid in disaster risk management (Global Program on Nature-Based Solutions for Climate Resilience, 2020). With rising climate catastrophes across the country, these become important factors to be considered. Furthermore, helping achieve SDGs can boost India's Smart Cities Mission; Lucknow being listed as one of them (Ministry of Housing and Urban Affairs, n.d.).

There are several upcoming projects at different scales in the catchment, to name a few:

- 1. Tributary: Restoration of the Kukrail Nala (The Times News Network, 2021)
- 2. Floodplain: Riverfront Park at Gaughat (The Times News Network, 2022)
- 3. Wetlands: The Hulas Khera near Karela Jheel, (Lucknow News, 2022), & Ekana wetland (Sharda, 2020)

It is critical to ensure these ventures do not follow the tracks of the 2015 Gomti – riverfront project. And it is the people that depend on this ecosystem that need to be educated; for them to acknowledge the importance of nature for a resilient future. (Gajjar, 2016). Nature-Based Solutions incorporate actions to protect, sustainably manage and restore natural ecosystems while addressing societal challenges. Reinstating natural processes and physical habitats can also be cost-effective: with minimal revenue required for execution and maintenance. And perhaps taking a step back from the modern grey infrastructure design approach to a more grounded natural solution is the best way forward for the urban river.

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