

Considerations for Developing an Eco-friendly Riverfront

Version 2

Updated on 16th December 2025

Background

Riverfronts are dynamic interfaces between urban life and natural ecosystems. Historically, rivers have supported cities by providing water, transport, livelihoods, and cultural identity. However, rapid urbanisation, encroachment, pollution, and infrastructure-heavy development have severely degraded many river ecosystems. In recent years, riverfront development has gained momentum across cities, often aiming to revitalise neglected water bodies and create vibrant public spaces. While these projects bring visibility and investment, they also pose risks of ecological damage if not planned with environmental sensitivity.

As the need for climate-resilient and inclusive urban development grows, it becomes imperative to approach riverfront planning through an eco-centric lens. This guideline on the Do's and Don'ts of Eco-Friendly Riverfront Development serves as a practical reference for urban planners, Urban Local Bodies (ULB) and other stakeholders. It highlights key principles and actions to ensure that riverfront projects not only enhance urban aesthetics but also restore ecological balance, support biodiversity, respect the river's natural hydrology, and safeguard the rights and roles of local communities.

Key Thematic Areas

The Do's and Don'ts for developing the river front has been categorised based on the following key thematic areas:



**Protection of
River's Natural
Features**



**Sustainable
Design and
Materials**



**Climate
Proofing**



**Biodiversity
Conservation**



**Integration of
Socio-economic
and cultural
aspects**



Protection of River's Natural Features

Do's

- ✓ Understand the type and characteristics of the river on which the riverfront is being planned, whether it is perennial or non-perennial, and whether its course is straight, meandering, braided, etc. This analysis is essential for assessing the river's flow patterns, floodplain and identifying areas suitable for riverfront development
- ✓ The natural floodplains, wetlands, marshlands, etc along the river should be preserved as much as possible to avoid hinderance in existing ecosystem functions
- ✓ The river edge should be kept natural wherever possible, and if soil stabilisation or bank protection is required then the natural material, like riparian buffer development, gabion walls, bioengineering materials for edge development, should be used
- ✓ Riverfront development should ensure that the natural connectivity between the river and the groundwater system is not disrupted. The linkage is important for the lateral flow of water between the river and groundwater aquifers.

Don'ts

- ✗ Avoid hardscaping or concretising the river edge as much as possible to allow it to perform its natural ecosystem functions such as supporting local biodiversity, groundwater recharge, flood regulation etc.
- ✗ Don't reclaim land from the riverbed, whether for temporary or permanent structures, as it reduces space for the river to flow and increases the risk of flooding. Also, don't create permanent structures within the river that alter or stop the natural flow of the river.
- ✗ Avoid altering the river's natural course by introducing hard infrastructure such as embankments, retaining walls, or channelization within the river's flow path. Such interventions can disrupt the river's natural hydrology, reduce its ability to recharge groundwater



Example 1

The River edge of the MARIBYRNONG RIVER has been kept natural for it to perform its ecological function

Example 2
Restoration of the groundwater-fed natural springs/water bodies and wells in the floodplains under the Kham Riverfront Development



Example 3

Preservation of existing marsh lands and other natural features in Hunter's Point South Park Waterfront in New York



Sustainable Design and Materials

Do's

- ✓ Riverfront design should prioritize open and green spaces, along with continuous, safe, and inclusive access to the river, such as trails, promenades, and seating areas with unobstructed views
- ✓ The design should encourage the use of eco-friendly construction materials, including reclaimed wood, permeable pavements, locally sourced stone, and recycled metals, to reduce environmental impact and support sustainability
- ✓ Traditional water structures such as ghats, stepwells, temples, and cultural ritual spaces should be protected and thoughtfully integrated into the riverfront design to preserve the site's heritage and cultural identity
- ✓ A comprehensive and sustainable waste management system must be incorporated into the riverfront design. It should address all forms of waste, including solid, liquid, and organic, to prevent pollution and protect river health
- ✓ Use renewable energy sources like solar panels, organic waste to reduce carbon footprints and promote energy efficiency

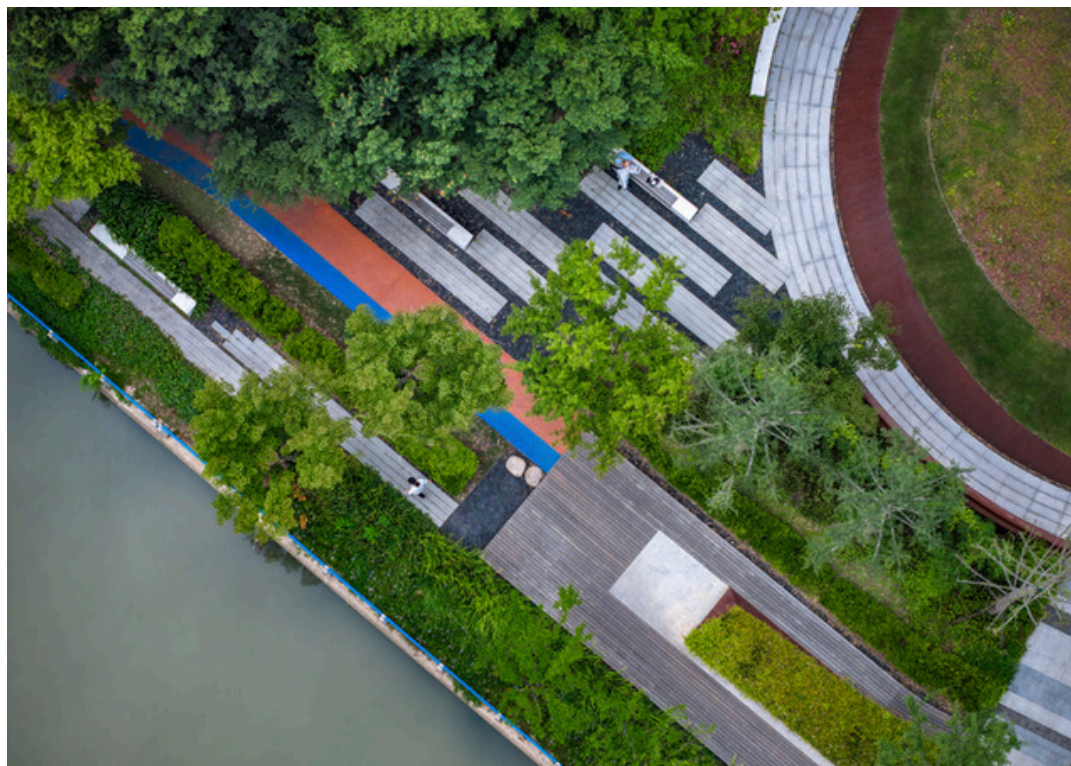
Don'ts

- ✗ Do not allow the discharge of solid waste, sewage, or effluents from any infrastructure built along the riverfront. For example, toilets and sanitation facilities near the riverfront must be connected to proper treatment systems and should not release waste directly into the river
- ✗ Avoid the interruption to any of the existing traditional practices linked to the river and associated riparian communities
- ✗ Avoid the use of asphalt or other impermeable surfaces as much as possible, as they trap heat, increase surface runoff, and prevent natural groundwater recharge.



Example 1
Use of recycled material and integration of green space in Kham Riverfront in Aurangabad

Example 2
Provision of open and green spaces in the Jinqiao Caojiagou Riverfront, China



Example 3
Provision of clear views of river from promenades and green spaces in the Guawahati Riverfront



Biodiversity Conservation and Integration of Socio-economic Aspects

Do's

- ✓ Assess the existing biodiversity along the river to understand its ecological condition and evaluate the potential impacts, of the proposed riverfront design
- ✓ Protect and restore the existing green cover, and where new planting is required, use native vegetation that supports local aquatic and terrestrial biodiversity
- ✓ The riverfront should build upon existing socio-economic activities along the river and introduce new opportunities that strengthen the local economy, support livelihoods, and empower surrounding communities, while also minimizing the impact of these activities on the river.
- ✓ The design should ensure access to all sections of society, including informal workers, vendors, local communities, disable people etc. The planning process of the riverfront should also incorporate consultations with the riparian communities
- ✓ The design should incorporate information about the river's natural resources, diverse biodiversity and cultural history to connect people to the river and foster awareness. Art installations that reflect the community's heritage and culture should be provided

Don'ts

- ✗ Do not remove natural habitats or existing tree cover during riverfront development, as this can disrupt local biodiversity and alter microclimate
- ✗ Avoid any kind of polluting activities along the riverfront. The pollution or waste being discharged from any existing activities must also be regulated in the design of the riverfront.
- ✗ Avoid planting invasive, non-native species and water intensive plantation in the riverfront landscape design, as they can outcompete native flora and negatively impact local ecosystems
- ✗ Avoid overuse of lighting that creates light pollution and affects birds and other species



Example 1
Restoration of
existing trees and
vegetation along
the Guwahati
Riverfront

Example 2
Community
awareness
campaign along
the Kham
Riverfront



Example 3
Provision of
different activities
like flower garden,
kite festival etc. to
connect people to
Sabarmati
Riverfront



Climate Proofing

Do's

- ✓ The riverfront should not alter the floodplain's capacity to hold water during monsoon season. If any modification is made, it should be able to perform its ecological function of managing the floods. Flood level markers such as high flood line must be taken into account while designing riverfronts.
- ✓ Incorporate flood-resilient design elements, such as elevated trails, adaptable seating areas, floodable landscapes and platforms using locally sourced materials that can withstand fluctuating water levels and seasonal inundation
- ✓ Design the riverfront to respond to urban climate challenges such as flooding, heatwaves, and water scarcity. Integrating green spaces, riparian buffers, and nature-based solutions like bioswales, rain gardens, and sponge parks can significantly enhance resilience and help manage stormwater more sustainably
- ✓ The riverfront design should maintain the local contours as much as possible. It should also include catchment analysis to understand the run-off generation, flow patterns etc. for sustainable stormwater management

Don'ts

- ✗ Avoid constructing permanent structures in flood-prone zones, as rivers are dynamic systems and such development increases the risk of flooding and erosion
- ✗ Minimize the use of impermeable, heat-retaining surfaces like asphalt or concrete, as they contribute to urban heat islands and increase surface runoff



Example 1
Provision of floodplain park named Asita East park to absorb the monsoon water along Yamuna River

Example 2
Optimal green and open spaces in Perth Riverfront to manage the urban heat and high water level in Swan river



Example 3
Provision of flood resilient design in the Yanweizhou Park, China

ANNEXURES - Eco-Sensitive Urban Riverfront Development Case Studies

Case 1

Eco-Sensitive Development in Yamuna Floodplain

Delhi, India



Asita East Park (above) and Asita West park (below) are sites for the ecological restoration of the floodplains using native species and natural water catchment methods, offering extensive public spaces



Kalindi Biodiversity park with developed forests and grasslands to support wildlife and infiltration.

- **Yamuna Floodplain restoration** led by Delhi Development Authority (DDA) includes 11 restoration projects covering approximately 1,600 hectares along the 22-km urban stretch from Wazirabad to Okhla Barrage.
- These initiatives prioritise eco-sensitive riverfront development by creating green buffers, wetlands, parks, and recreational zones that enhance flood resilience, water infiltration and habitat connectivity while curbing encroachments.
- These projects have attempted to transform encroached, polluted lands into ecological zones with features like native plantations, restored waterbodies and nature trails to revive the river's natural ecosystem

Incorporated Guiding Principles



GP1



GP3



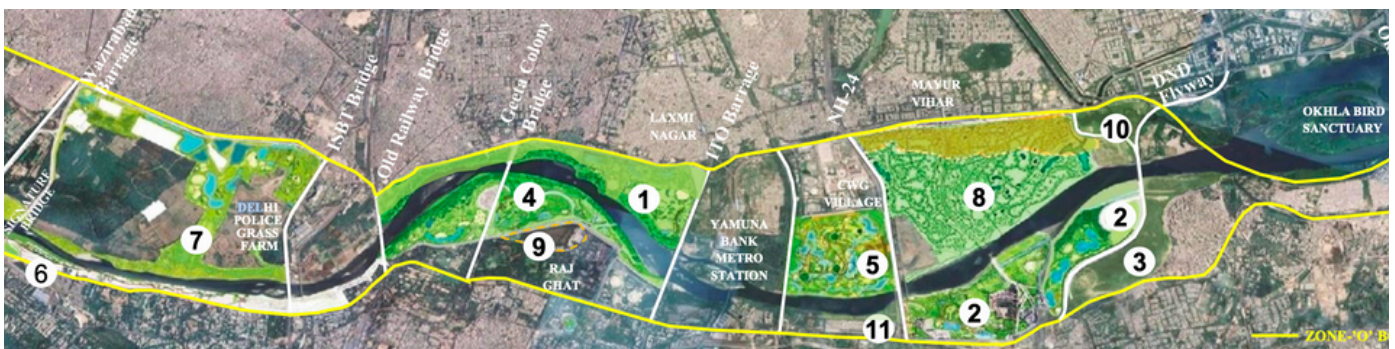
GP4



GP5

Draft Master Plan (2041) Provisions for Zone 'O'

- As per Delhi's Draft Master Plan (2041), the Zone 'O' refers to the Yamuna River floodplain, a critical ecological area where construction is prohibited to maintain the river's health and prevent flooding, and acting as a natural buffer



Map showing Zone 'O' with major sites identified under the Yamuna Floodplain Restoration Projects undertaken by the Delhi Development Authority including 1) Asita East, 2) Kalindi Aviral, 3) Kalindi Biodiversity Park, 4) Asita West, 5) Amrut Biodiversity Park, 6) Ghat area, 7) Yamuna Vanasthali, 8) Mayur Nature Park, 9) Eco-tourism area and 10) Hindon Sarovar.

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Case 1

Eco-Sensitive Development in Yamuna Floodplain

Delhi, India

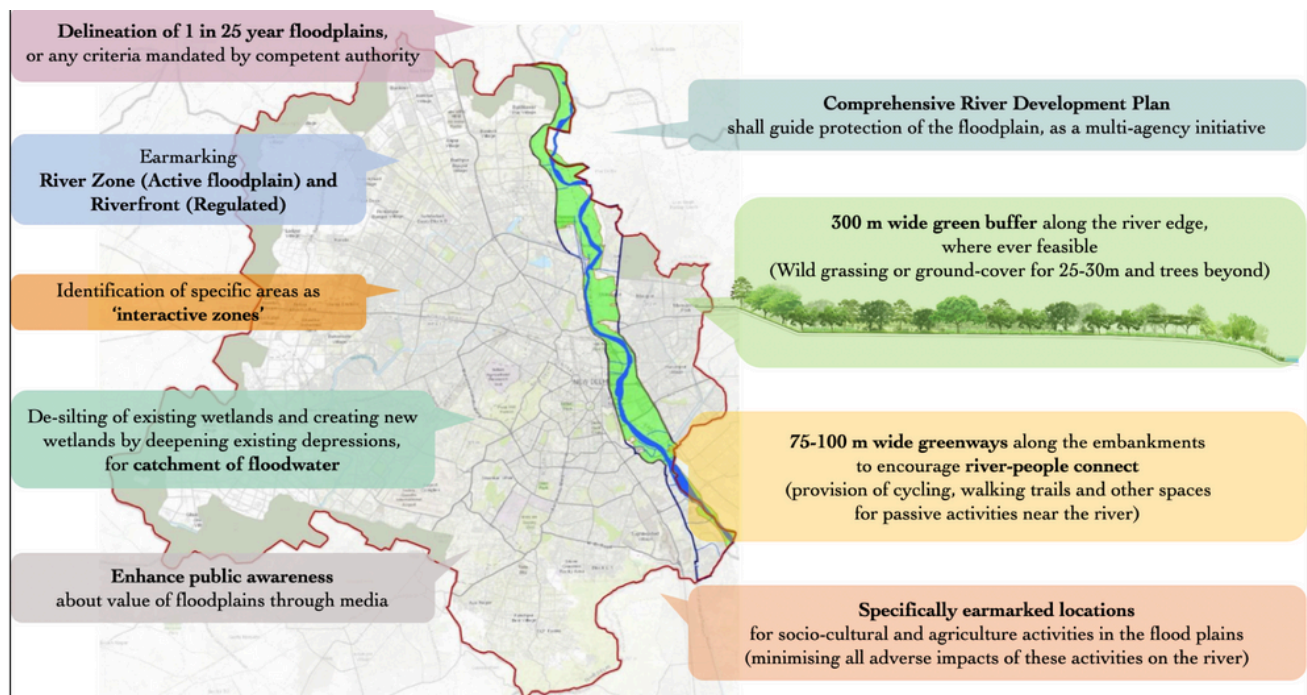


Kalindi Aviral project focusing on wetland restoration, avian habitats and green corridors. 15 ha - Baansera Park with bamboo plantation falls within the 163 ha of the Kalindi Aviral project



Vasudev Ghat restored for cultural access with redeveloped ghats, plantations and pathways, integrating riverine heritage without disrupting hydrology

- Yamuna Floodplain Restoration has prioritised river's natural features through a robust regulatory framework.
- Court orders, expert-committee mandates and EIA prescriptions guided a comprehensive approach on legal/regulatory protection of natural features, floodplain protection and biodiversity.
- Strict zoning, setback rules, habitat-preservation clauses and monitoring obligations halted the encroachment and favoured soft-engineering restoration.
- Thereby making ecological protection firmly a legal requirement for design and implementation in the floodplains of Yamuna in Delhi



Provisions for Floodplain Management as per Draft Master Plan for Delhi (2041).

Case 2

Jhelum Rajbagh Riverfront Development

Srinagar, India



Jhelum riverfront re-developed as a vibrant hotspot for public use and cultural interaction

- Vision and goal setting of the Jhelum Riverfront Development project has clearly prioritised 'sustainability' that guides the choice of eco-friendly design and materials.
- The project emphasises flood-resilient, low-impact development suited to Srinagar's fragile riverine environment. This translated into using permeable pavements, locally sourced stone and timber, bio-engineering for embankment stabilisation, and energy-efficient lighting.
- This vision of a 'climate-responsive, culturally grounded riverfront' ensured that material selection and design strategies minimised ecological disturbance while enhancing long-term resilience.

Incorporated Guiding Principles



GP1



GP2



GP3



GP4

- The riverfront design also ensures recreational activities with restaurants, houseboat cafés and sensory lighting landscapes that enable night-time activities
- All these facilities have self-managed wastewater and solid waste systems in place, including on-site sanitation systems for the houseboats.



Riverfront nightscapes reimagined with riverside walk enabled with energy-saving sensory lighting

ANNEXURES - Eco-Sensitive Urban Riverfront Development Case Studies

Case 2

Jhelum Rajbagh Riverfront Development

Srinagar, India



Vegetated rip-rap bank treatment on the interconnected water channel of Jhelum to maintain the natural interlinkages within the ecosystem



Existing trees have been retained into the design and leveraged to provide shaded public areas. Landscape elements and sculptures made out of scrap metal, which are popular as photo points



Weir maintained by Irrigation and Flood Control Department, acting as a solid-waste trap.



For sustainable operation and maintenance of the riverfront stretch, revenue is being generated from the advertisement boards



With the successful revamp of the 2.5 km stretch in Phase 2, the design is now being extended to the 11 km of the Jhelum passing through the old city "Shehre-Khaas", wherein the cultural and heritage nodes, the ghat and the on-river navigation will be the major areas of intervention.

Case 3

Coimbatore Lakefront Development

Tamil Nadu, India



Selvachintamani Wetland (above) developed to treat primary and secondary treated used water from drains and the treatment plant naturally before the water flows into the lakes. Seasonal flooding fertilises soil, and terraced landforms serve as a natural stormwater management infrastructure



Bund strengthening (above) using ring bunds and native plantation for improved resilience at lake edges

- **Coimbatore Lakefront Development** adopted an integrated, ecological, and participatory approach to restore and reconnect eight interconnected lakes.
- Distributed across 1,250 acres and 30kms of lake perimeter, the city-wide program focuses on treating pollution at source, strengthening lake hydraulics, and re-establishing the lakes' role in stormwater management, groundwater recharge, and flood mitigation through integrated planning.
- The approach includes hydrological studies, environmental and social impact assessments, and strong stakeholder consultations with municipal bodies, experts, NGOs, and local communities.
- Design interventions include decentralized wastewater treatment systems (DEWATS and phytoid wetlands), floating wetlands for tertiary treatment, repair and restoration of sluice gates and surplus weirs, bund strengthening, desilting, and creation of green slopes with native planting to enhance biodiversity.

Incorporated Guiding Principles



GP1



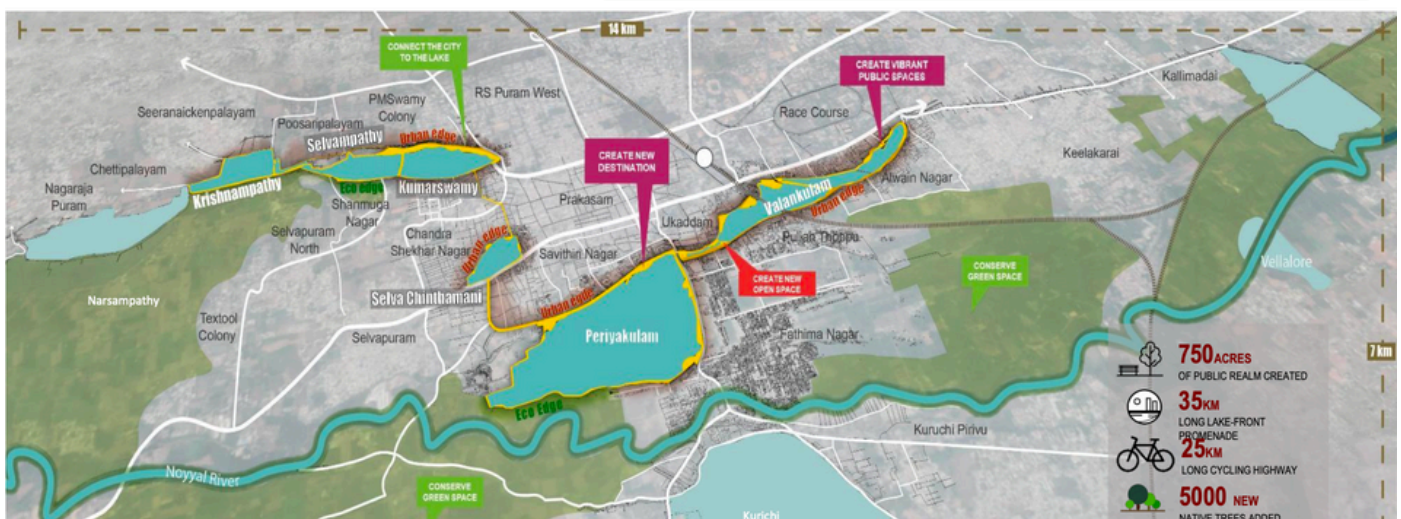
GP3



GP4



GP5



City-wide system of interconnected lakes restored using wetlands, improved sluice gates, and green slopes at the lake edges

Case 3

Coimbatore Lakefront Development

Tamil Nadu, India



Public space (above) around the lake developed using a combination of natural grass and semi-pervious paverblocks



Sloped water-edge planting using native species to improve biodiversity and absorb sudden shocks

- Continuous lakefront promenades, cycling corridors, ecological greenways, plazas, play areas, viewing decks, and cultural/community spaces have been integrated to reconnect people with water while maintaining ecological integrity.
- As a result, Coimbatore has transformed degraded lake edges into a resilient blue-green public realm, restoring year-round water presence, improving water quality, and significantly enhancing groundwater recharge and flood resilience.
- The project created 750 acres of public realm, 35km of lakefront promenade, 25km of long cycling highway, and added around 5,000 new native trees, and enabled substantial biodiversity recovery, including migratory bird habitats.



Restoration of lake and its edge (above) integrating native plantation and rocks on sloped edge, with cycle lanes as public promenades

References

- City of Mildura. (n.d.). A Guide to Riverfront Development: Connecting Communities to the Water. Mildura Rural City Council.
- City of Los Angeles. (2019). Los Angeles River Design Guidelines. Bureau of Engineering, City of Los Angeles.
- City of Maribyrnong. (n.d.). Maribyrnong Waterfront: A Way Forward. Maribyrnong City Council, Australia.
- City of Perth. (n.d.). Masterplan for Perth City Riverfront. City of Perth, Western Australia.
- City of Chicago. (2019). Chicago River Design Guidelines. Department of Planning and Development, City of Chicago.
- American Planning Association. (2006). Ecological Riverfront Design (Planning Advisory Service Report No. 578). Washington, DC: APA Planning Advisory Service. [Authors: Margie Ruddick, Anne Whiston Spirn, et al.]

