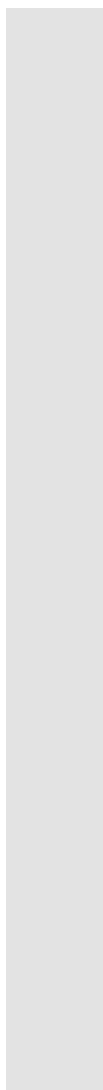




A Guide towards River-Sensitive Urban Planning

Comparison and Contrast of River Consideration in the Master Plans of Selected Cities



Publication

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Title

Comparison and Contrast of River Consideration in the Master Plans of Selected Cities

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गजेन्द्र सिंह शेखावत
Gajendra Singh Shekhawat



जल शक्ति मंत्री
भारत सरकार
Minister for Jal Shakti
Government of India

Under the visionary leadership of the Hon'ble Prime Minister, India is poised to achieve growth with sustainability and self-reliance. This includes balancing urban growth with conservation of ecosystem and in particular integrated urban water management.

India's rivers are a vital component of our environmental ecosystem, and they have an important role to play in economic growth, through their wide range of ecosystem services. The intrinsic relationship between rivers and cities is well established. While rivers fuel a city's development, it is equally important for cities to serve as caretakers to rivers. Hon'ble Prime Minister clearly underscored this during the National Ganga Council meeting by emphasis upon the need to develop a new approach for planning for river cities with a collaborative and developmental mind set. A process for mainstreaming river into urban planning accordingly has been initiated under the Namami Gange mission.

I am happy to note that the progress made in this direction is being documented through this knowledge product, explaining the position of river in different Master Plans. I am sure it will help in bridging the gap between planning and implementation and also inspire cities to re-imagine the way rivers can be integrated into the vision for the city and process of urban planning.

Sh. Gajendra Singh Shekhawat
Hon'ble Minister for Jal Shakti,
Government of India

Message

Hon'ble Minister for Jal Shakti,
Government of India



Foreword

National Mission for Clean Ganga,
Ministry of Jal Shakti,
Government of India



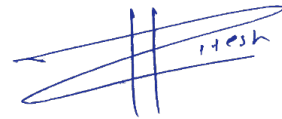
Throughout the history of humankind, rivers have always been the lifeline of any civilization. The trend continues until today. However, because of contemporary socio-economic development, this lifeline of civilization has been facing burgeoning threats from several quarters – unsustainable withdrawals, pollution, and habitat deterioration, among others. Much of the current undesirable state of rivers can be attributed to disruptive anthropogenic activities. These are somehow more prevalent in urban areas (cities). Therefore, any improvement in the river's condition cannot be achieved without first addressing the issues in urban areas. While cities have largely been responsible for the deterioration of rivers, they will have a central role to play in their rejuvenation.

The first step to achieving this rejuvenation is creating a value for the rivers among the various stakeholders. One way to do so would be to mainstream river thinking into a city's long-term vision and plans to ensure the city makes adequate provisions to protect and manage the river consistently over time. This knowledge product seeks to review the Master Plans of selected cities with a view to understand the treatment meted out to the rivers in the planning process. There are several implications of this knowledge product. First, it apprises the readers of the different planning tools and instruments that various cities have used to create a value for the river in the planning process itself. Second, it highlights the gaps and key areas of concern that cities (especially in the Ganga river basin) need to address to holistically manage the river within their limits. Third, it provides a glimpse into some of the innovative planning practices and initiatives adopted by cities to enhance urban river management.

I hope this knowledge product will provide the readers with enough insights to support and promulgate river-sensitive development in cities.

Sh. Rajiv Ranjan Mishra
Director General,
National Mission for Clean Ganga (NMCG),
Ministry of Jal Shakti,
Government of India

Over the last few decades, countries across the globe have made rapid strides in improving the socio-economic condition of their citizens. Unfortunately, this quest for economic development has come at the cost of the environment. It is now becoming increasingly evident that true sustainable development cannot be achieved without due consideration for the environment, of which rivers are a vital component. Cities have a long and intrinsic relationship with their rivers. While on one hand a river significantly influences the form of a city, on the other hand, the development of cities as urban landscapes can also influence the shape of their rivers. As a result, rivers have become an essential element of urban composition. Therefore, the judicious treatment of the river in urban planning is of paramount importance. This knowledge product is an attempt to flesh out the details of this treatment in selected river cities around the world. It highlights the various planning instruments, parameters, and initiatives taken by the city authorities to protect and conserve the urban stretches of rivers. I hope the information provided in this document will catalyse researchers and practitioners to improve on the current practices, and design innovative and more ambitious planning instruments to mainstream river in the planning process.



Sh. Hitesh Vaidya

Director,
National Institute of Urban Affairs (NIUA),
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Government of India

Foreword

National Institute of Urban Affairs,
Ministry of Housing & Urban Affairs,
Government of India



Why Master Plans?

The Master Plan is a legally binding document, according a unique opportunity to mainstream river-sensitive planning within its mandate.

The objective of this knowledge product is to present how different river cities in India and abroad have made provisions for river management in their Master Plans.

The Master Plan is a legally binding document (at least in India) that outlines the long-term perspective of the city. Incorporating river management in the Master Plan, therefore, is meant to ensure that the river is valued as an asset over the tenure of the Plan.

The knowledge product presents the current planning tools/instruments used by different cities for river management, and highlights the key gap areas that ideally should be addressed to ensure a holistic and sustainable management of rivers.

Master Plans

Considered in this document:

- Ganga Basin Towns
- Other Indian River Cities
- International River Cities

Dehradun Master Plan, 2025
Haridwar Master Plan, 2025
Allahabad Master Plan, 2021
Kanpur Master Plan, 2021
Patna Master Plan, 2031
Landuse & Dev Contr. Plan Kolkata MA
Landuse & Dev Control Plan 2021, Haldia
Sahibganj Master Plan, 2040
Rajmahal Master Plan, 2040



Master Plans for selected Ganga Basin towns *

Master Plan for Delhi, 2021
Agra Master Plan, 2021
Comprehensive Dev Plan Ahmedabad, 2021
MP for Chennai Metro. Area, 2026



Other major river cities in India

New Orleans Master Plan, 2030
Ulaanbaatar Master Plan, 2030
Municipal Development Plan, City of Calgary



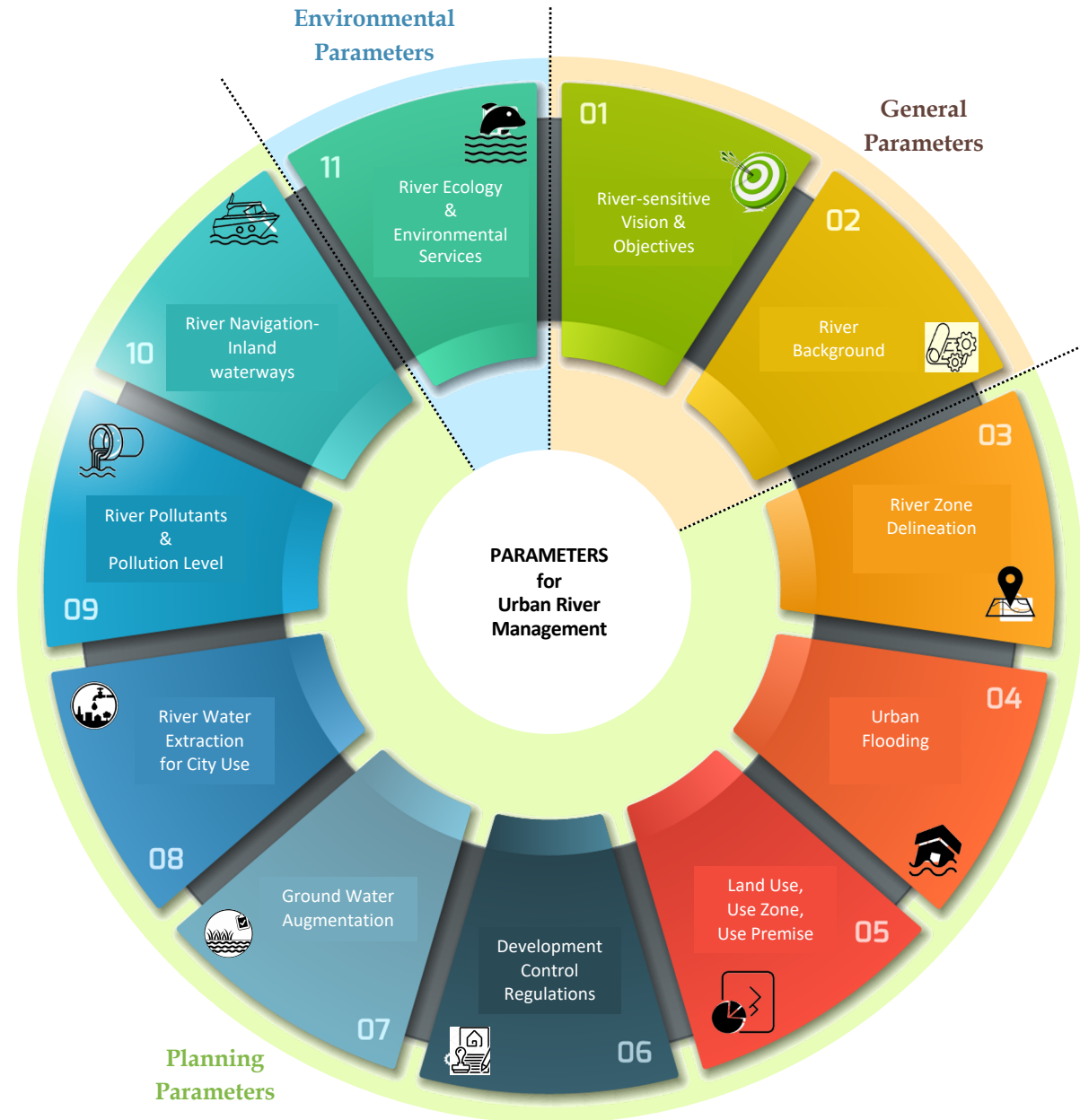
International river cities

*Out of the the 97 towns along the main stem of river Ganga, Master Plans have been selected as per availability and accessibility (available on the state/ town Planning & Development Department website)

Parameters

11 parameters for Urban River Management that have been adopted by different Master Plans, are reviewed.

These *General, Planning & Environmental* parameters defining the city planning, shall involve cognizance of river and its floodplain ecology.



Comparison of river consideration in the Master Plans

Parameters for Urban River Management

Mentions without details Mentions with details**

Selected Master Plans

Ganga Towns

| |
|--|
| Dehradun Master Plan, 2025 |
| Haridwar Master Plan, 2025 |
| Allahabad Master Plan, 2021 |
| Kanpur Master Plan, 2021 |
| Patna Master Plan, 2031 |
| Land use & Development Control Plan Kolkata MA |
| Land use & Development Control Plan 2021, Haldia |
| Sahibganj Master Plan, 2040 |
| Rajmahal Master Plan, 2040 |

Indian River Cities

| |
|--|
| Master Plan for Delhi, 2021 |
| Agra Master Plan, 2021 |
| Comprehensive Development Plan Ahmedabad, 2021 |
| MP for Chennai Metropolitan Area, 2026 |

International River Cities

| |
|-------------------------------------|
| New Orleans Master Plan, 2030 |
| Ulaanbaatar Master Plan, 2030 |
| Municipal Development Plan, Calgary |

General Parameters

| River-sensitive Vision/ Objectives | River Background |
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CORE GAP SECTORS

Planning Parameters

| River Zone Delineation | Urban Flooding | Land Use, Use Zone, Use Premise |
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Planning Parameters

Environmental Parameters

| Development Control Regulations | Ground water Augmentation | River Water Extraction for City Use | River Pollutants and Pollution level | River Navigation | River Ecology/ Environmental Services | Relative Scoring (11 components)* |
|---------------------------------|---------------------------|-------------------------------------|--------------------------------------|------------------|---------------------------------------|-----------------------------------|
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| | | | | | | 7 |

- The key gap areas in the analyzed Master Plans include:
 - Lack of a concrete vision for the river
 - No proper delineation of the river zone
 - Insufficient Development Control Regulations specific to the river zone
 - Inadequate coverage of river ecology and environmental services related aspects
- Most of the Ganga Basin towns severely lack a river-sensitive approach within their Master Plans

*'Relative Scoring' - assigned to compare the treatment of river within the Master Plans
 **'Mentions without details' – The aspect merely reflected in the planning document (assigned 0.5 point)
 'Mentions with details' – The aspect detailed out with specific strategies/ proposals within the planning document (assigned 1 point)



River in Dehradun District

Dehradun Master Plan 2025

Ganga & Yamuna River



Parameters reflected in Master Plan

River Background

- Plan identifies the rivers flowing through the city
- Mention about historical construction of streams for irrigation
- Encroachment of river & drains identified as an issue
- Regional river-tourism context provided

Land use, use zone, use premise

- Plan earmarks existing land use as 'Green Belt/ Nallahs/ River'
- Land zone for rivers, drains, watersheds identified in the plan
- Land allocated for plantation along water bodies to avoid erosion, prevent encroachment and serve as recreational & recharge areas (10m along major rivers and watersheds, 5m along other drains)
- Proposal for construction of bridges over the rivers

Ground water augmentation

- Proposal for rainwater harvesting in recharge areas and all plots above 125sqm

River water extraction for city use

- Mention of water supply/ demand/ wastage quantum
- Mentions the need for a proposal to supply sufficient water

River pollutants

- Sewage disposal areas identified

Activities permissible in 'Water Enclosure'

Permissible use-

- River, stream & drain
- Riverbank parks & plantation
- Artificial reservoirs

Permissible use with permission from development authority-

- Max. 25sqm. construction in artificial reservoirs



Ganga at Haridwar

Haridwar Master Plan 2025

Ganga River



Parameters reflected in Master Plan

River Background

- Promulgated as a religious/ cultural centre of Ganga ghat

Land use, use zone, use premise

- Plan earmarks existing and proposed land use as 'agriculture/green area', with 'River/stream/drain' use zones
- Categories of activities identified within the river zone – 'Permissible'/'approval of authority'/'forbidden'
- Specifically residential, heavy/ harmful industries, objectionable activities not permissible
- Tourism spots identified along the banks

Ground water augmentation

- Proposal for development of traditional water sources and afforestation of watershed areas for revival. Water catchment for preventing soil erosion and decay of green cover, due to intense rainwater surface flow
- Provision for Rain Water Harvesting in all uses above 250sqm

River water extraction for city use

- Quantum of water requirement and supply mentioned

River pollution

- Mention about pollution due to encroachment
- Introduction to the sewerage system

River navigation

- Tourism potential of the river identified

Development regulations within the river zone -

- Proposal for development and restriction of encroachment on riverbanks, and their use as open areas for festivals as well as environment catalysts
- Recommendation for using relatively sloping land and lower terrain near river/ drains, as parks/ play areas/ planted greens, and relatively higher terrain as residential
- Controlling of irregular mining activities near river/ drains, and proposal for dense plantation in the areas
- Plantation in sloping areas, and 10 to 20m along drains devoid of full development with afforestation activities promoted
- Allocation of land for plantation
- All construction except roads completely restricted in areas near river. Min. 50m along the banks of river, and 10m along other drains to be used for afforestation



River Ganga at Aanadeshwar Mandir, Kanpur

Kanpur Master Plan 2021

Ganga & Pandu River



Parameters reflected in Master Plan

Land use, use zone, use premise

- Plan earmarks existing land use as 'river & drains'
- River edge development to include development for eco-friendly tourism and activities
- Development of green area along rivers
- Zoning Regulations – areas shall be earmarked as
 - Special/ heritage zone
 - Rainwater Harvesting

Ground water augmentation

- Emphasis on promoting rain water harvesting

River pollution

- Various sources of pollution have been identified
- Emphasis on the pollution issue (pollution levels higher than determined standards)

Zoning Regulations

- Special/ heritage zone
 - Can include riverfront development or environmentally sensitive areas to avoid their deformation
 - Earmarking such areas and identifying permissible activities
- Rainwater Harvesting
 - Existing use of any water bodies above 1acre falling within any proposed landuse, to remain unchanged.
 - Enlisting such areas with their details and protection proposal

Execution of water harvesting plans

- Mention of dipping ground water levels
- Layouts for plans over 20acres to incorporate reservoir/ water bodies of approx. 5% land for ground water recharge, within parks and open areas
- Min. area of such water bodies to be 1acre and depth 6m, and layout to be provided with building/ floor plans.
- Construction of check dams to store rain water during peak season, for naturally increasing ground water levels.



Yamuna during Megh Mela Festival, Allahabad

Allahabad Master Plan 2021

Ganga, Yamuna & Saraswati River



Parameters reflected in Master Plan

River-sensitive Objective

Development of riverfront as a captivating area, making the zone pollution free

River Background

- Plan identifies the rivers flowing through the city
- Plan provides details of Kumbh Mela organized on river banks

Land use, use zone, use premise

- Plan provides guidance on River bank development
- Proposal for a green belt and parks along river bank, to serve as an open/ beautiful environment and an entertainment spot

Development Control Regulations

Plan defines 'Green Belt', with details of permissible activities

Ground water augmentation

- Provision of rain water harvesting, within building byelaws
- Existing use for natural water bodies above 1 acre falling within any land use, shall remain unchanged

River water extraction for city use

- Present/ projected water requirement mentioned
- Provisioning additional land requirement for water supply facilities through zonal plans

River pollutants

- Proposal for sewage & drainage Master Plan with comprehensive/ functional treatment for unserved areas, and details of untreated discharge, drain outfall, etc.
- Proposal for land allocation in each zone for sewage farms
- Sources of river pollution identified in the plan

River navigation - Inland waterways

- Plan allocates land for navigation facilities
- Proposal to extend navigation routes
- Proposal to develop Ganga-Yamuna rivers as regional/ local transportation routes.
- Provision of Water Transportation Depots through zonal plans

Green Belt Development Regulations –

Religious activities within 200m from river edge with regulations-

- Ground coverage 35%, FAR 1.5, permissible as per public facilities. Plot area not less than 1 acres
- Plan to safeguard river water from pollution to be submitted along building map, for necessary approvals
- Drainage/ sewer network to avoid direct discharge into the river
- Construction of septic tanks for areas without sewage facilities
- Lal Dora area be earmarked. Residential construction permitted for stay more than 10 yr. No colonization permissible

Proposing use of waste water for -

- Conversion into energy sources
- Water bodies after adequate treatment
- Irrigation
- Bio-electricity production



Gandhi Ghat, Patna

Patna Master Plan 2031

Ganga, Sone, Gandak & Punpun
River



Parameters reflected in Master Plan

River Background

Plan identifies the rivers flowing through the city, along with details of their area

Urban flooding

- Flood levels/ flood mapping/ vulnerability assessment, & integrated drainage plan have been incorporated
- Need for bunds/ embankments, storm water canals mentioned

Land use, use zone, use premise

- Plan earmarks existing land use as 'River/ Flood Plain'
- Plan earmarks proposed land use as
 - 'Special Reservations Zone (Bio Conservation Zone)'
 - 'Natural Heritage'
- Permitted & prohibited uses have been enlisted

Development Control Regulations

No landfill within 100mt. of navigable river

River water extraction

- Supply for part of the town, and irrigation for agricultural zones
- Surface water resources are under-utilized for drinking, due to high investment cost

River navigation

Inland waterway route, terminal, traffic, transport highlighted

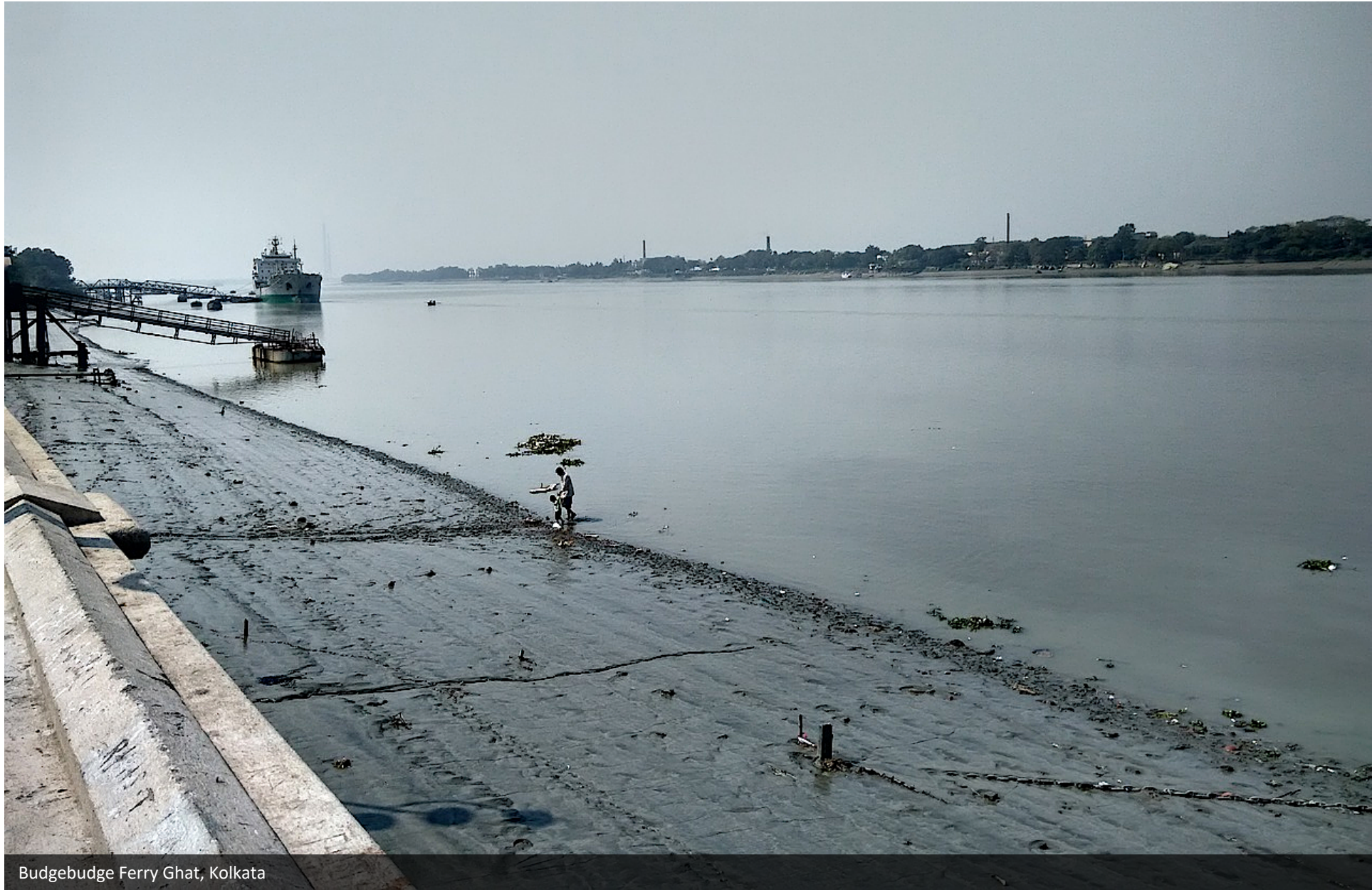
Proposed Land use

- **Special Reservations Zone (Bio Conservation Zone)** - Lagoons and area along river, used for enhancing aesthetic value of river and for river front development/ public recreational activities
- **Natural Heritage** – River areas

Use Zones/ Permissible activities –

Bio-Conservation Zone

- **Uses Permitted** - Boating, Picnic huts, Camping sites, Special Training camps, higher order Educational/ technical/ research institutes (conditional)
- **Uses Prohibited** – any development between the River/Canal/Stream and the embankment
- **Uses Permitted** - River side green areas, Water Treatment Plant, Sewage Treatment Plant, Solid waste Treatment Plant, solid waste dumping grounds (conditional)
- **Uses Prohibited** - not related to Environmentally Sensitive Use Zone
- **Uses Permitted** - Riverfront Developments



Budgebudge Ferry Ghat, Kolkata

Land Use & Development Control Plan, Kolkata

Ganga River



Parameters reflected in Master Plan

River-sensitive Objectives

Development Policy states efforts to be made for -

- Development of river-front with pedestrian plaza and other conforming facilities along the river-bank
- Preserving wetlands, tanks, ponds, water bodies, wherever possible

Ground water augmentation

- Regulations stating no canal, pond, water body or wetland shall be filled up (unless allowed by authority taking in view drainage/ ecology & environment/ pisciculture/ fire fighting)

Development Control Regulations:

Prohibited buildings in Development Control Zone 'RF' (Riverfront):

- Existing/ new industrial building or extension
- Hazardous building
- New/ extension of existing buildings – residential, business, educational, institutional, mercantile (wholesale), mixed use, storage
- New/ extension of existing assembly buildings, excluding clubs, restaurants, eating houses, passenger stations, transport terminals, crematoria, bathing ghats
- Khatala (where cattle are kept)

Building restrictions for development Control Zone 'RF':

- Max. permissible height – 5.00m (without stilts) or 6.50m (including stilts).
- Min. height of stilt – 3.00m and stilted portion not allowed to be walled up or covered along the sides.
- Buildings alongside the river shall not be more than 20.00m long, with a clear linear gap of 50.00m between two buildings
- Max. permissible covered area – 200.00 sqm.



Haldia Port

Land Use & Development Control Plan (LDUCP) 2021 for Old Haldia Planning Area

Ganga River



Parameters reflected in Master Plan

River Background

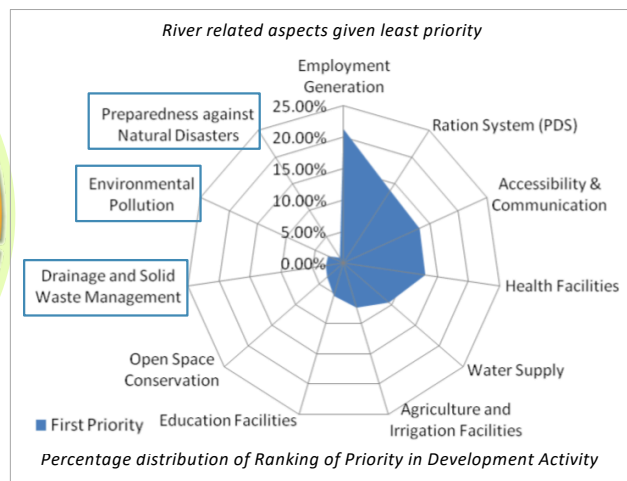
- Mentioned as a port area
- Planning principles stating areas of Heritage value will be given due importance and incorporated in the plan. Owing to its natural location, tourism activities will be proposed, especially along the river.

Land use, use zone, use premise

- Plan earmarks existing land use as 'water bodies/wetland'
- Plan earmarks proposed land use as–
Level I: Water Bodies,
Level II: River/Stream/Canal/Lake/ Pond
- Land use shall earmark agricultural land, river basins, flood prone areas, streams and canals, water bodies
- Land allocation for regional infrastructure like WTP, STP, following the natural contours
- Alignments of the streams and canals shall be demarcated as per the drainage master plan
- Tourism activities shall be proposed along the river

Ground water augmentation

- Preserving wetlands, tanks, ponds, water bodies



Zoning Regulations:

- The river bank shall be protected by a green belt / plantation
- 'Activities/ Uses Permitted', 'Permissible on application to Competent Authority (with conditions)', and 'Activities/Uses Prohibited' in 'Water Bodies (W)' Use Zone are enlisted (as below)

| Uses/Activities permitted (a) | Uses/Activities Permissible on application to the Competent Authority (b) | Uses/Activities Prohibited (c) |
|--|---|---|
| Rivers, canals | Fisheries | |
| Streams, water spring | Boating, water theme parks, water sorts, lagoons | All uses not specifically permitted in column (a) and (b) |
| Ponds, lakes | Water based resort with special by-laws | |
| Wetland, aqua culture pond | Any other use/activity incidental to water bodies Use Zone is permitted | Use/Activity not specifically related to Water bodies Use not permitted herein |
| Reservoir | | |
| Water logged/marshy area | | |
| Recreational with special bye laws | Heritage interpretation centre, art galleries and sculpture complex | Use/activity not specifically related to Special Heritage Use Zone not permitted herein |
| Public- semi public with special bye laws | Educational and research institutions | Multi-storeyed building |
| Commercial with special bye laws | Social and cultural institutions | Multiplex, Shopping Mall |
| Theme parks, Archaeological Parks/ Gardens | Craft based cottage industries | Dumping ground |
| Amphitheatres | Hotels, guest houses, lodges, resorts | Sewage Treatment |
| | | All uses not specifically permitted in column (a) and (b) |
| Open Air Museums/ exhibition space with special bye laws | Boating, picnic huts, camping sites, special training camps | No development of any kind is permitted between the River/Canal/Stream and the embankment |
| River front developments | Theme parks, yoga parks, sports centres and community recreational areas, international convention centre | |
| River side green areas | Parking areas, visitor facilities | |
| Scenic value areas | Incidental residences | |
| | Art academy, media centres, food courts, music pavilions | |
| | Educational, technical, research institutes of higher order | |



Yamuna in Delhi

Master Plan Delhi 2021

Yamuna River



Parameters reflected in Master Plan

River Background

Plan identifies the rivers flowing through the city, along with details of their area

Land use, use zone, use premise

- Plan earmarks existing and proposed land use as 'Green Belt & Water Body', with 'River & Water Body' use zone
- Landscaping drains and waterfront as interconnected parkways

Ground water augmentation

- Mention of recharge & annual rainwater harvesting potential
- Proposal for Integrated Water Resource Management - 'zero run-off drainage', 'regulated flood plain reservoirs', balancing ponds/ retention ponds/ sediment traps, for storing monsoon overflow with segregated wastewater disposal system
- Proposal to use treated wastewater for ground water augmentation

River water extraction

- Mention of river water allocation/ ranney wells in Yamuna flood plains, transit losses, inter-State river water allocation
- Proposal for increase in raw water allocation

River pollution

- Details of BOD/ total coliform levels
- Drain outfalls identified
- Pollution control measures and eco-sensitive land use controls

Focal points of the plan

Rejuvenation of Yamuna through-

- adequate flow by release of water,
- refurbishment of trunk sewers,
- treatment of drains,
- sewerage of unsewered areas,
- treatment of industrial effluents,
- recycling of treated effluents,
- removal of coliforms at STPs

Yamuna Action Plan

Recommendations of a committee formed to draw up an Action plan for the cleaning / rejuvenation of the Yamuna River-

- Min. flow to be ensured by Riparian states by releasing adequate water
- Refurbishment of Trunk Sewerage System, that is in highly dilapidated condition and has been silted
- Treatment of the flows from major drains falling in the river, by laying internal sewerage system/ installation of decentralized treatment plants
- Laying of Sewer Lines in the un-sewered areas of the city
- Clearing slum clusters from riverbed
- Treatment of Industrial Effluent before discharge into the drains/river, through better capacity utilisation and laying of conveyance system wherever required
- Re-use of Treated Effluent
- Coliform removal at STPs to permissible levels in treated wastewater



Yamuna in Agra

Agra Master Plan 2021

Yamuna River



Parameters reflected in Master Plan

Land use, use zone, use premise

The plan proposes -

- Parks, recharge zones and tourism activities in open areas adjacent the river
- Plantation within 3m on both sides of the major drains

Ground water augmentation

- Proposal for adequate Sewage/ Water Treatment plants with new/ improved technologies
- Proposal for barrage upstream of river
- Proposal for water harvesting, reducing wastage while transmission/ distribution

River water extraction

Mention of details regarding quantum of water supply

River pollution

Details of treated and untreated sewage/ drainage discharge in the river

Specific proposal for water harvesting

- Identification & protection of existing natural water bodies, permitting no other land use
- Area around water bodies to be developed as tourist zones, wherever possible
- Water reservoir (min. 1 acre and 6m deep) on almost 5% area, for all plans over 20 acres, with parks/ open areas
- For all plans less than 20 acres, provision of recharge well/ tank, as per determined standard of the park/ green belt
- Zoological/ Hydro-zoological survey to propose ground water recharge
- Permanent structures not more than 5% of the park area. Footpaths/ tracks of permeable/ semi-permeable perforated blocks
- Less water consuming plants for roads, parks and open areas
- Permeable pavements along roads for ground water recharge
- Proposal for rooftop rain water and recharge structures in all existing/ to be constructed official complexes.
- Recharge through percolation pits catching water from terraces/ open areas of all uses having an area above 1000sqm.



Ahmedabad Riverfront

Ahmedabad Comprehensive Development Plan 2021

Sabarmati River



Parameters reflected in Master Plan

Urban flooding

Plan identifies the flood risk areas

Land use, use zone, use premise

The plan provides guidance on Special Planned Area Development -

- Sabarmati Riverfront Development (SPD-1) - special area zone, planned and developed, contains various uses along with adequate provision of open spaces, parks and gardens. Located in 11.5kms stretch along river covering about 200 Ha of land
- FSI as applicable
- Permissible Uses as per SRFD Master plan

Development Control Regulations

- Regulations regarding min clearance from the water body
- No development in area designated for water body, pond and talab in Development Plan excluding riverfront
- Special regulations pertaining to ground coverage, margins, height of building, use of building etc. that will prevail over General Development Regulations.

Ground water augmentation

Rain water harvesting proposal, through rain water disposal (channelling rain water discharge from a building-unit to a public storm water drain) and mandating rain water harvesting/ storage as per building sizes.

Minimum Distance from Water body

- Minimum clearance of 30mts between boundary of the bank where there is no embankment and any development work or part thereof
- Minimum clearances of 15mts between embankment of a river and any building or part thereof or any other clearance as may be prescribed under any other general or specific orders of Government and appropriate Authority whichever is more



Cooum River in Chennai

Master Plan for Chennai Metropolitan Area 2026

Coom & Adyar River



Parameters reflected in Master Plan

River Background

Plan identifies the rivers flowing through the city, along with details of their area

River Zone Delineation

- Floodplain zoning and restrictions

Urban flooding

- Details of past occurrences
- Contour details
- Flood risk mapping and strategies to reduce damage
- Drainage Master Plan proposed

Land use, use zone, use premise

- Greens along riverbanks

Development Regulations

- Restricted developments in Aquifer Recharge area

Ground water augmentation

- Desilting, improvements and conservation of lakes
- Details of ground water levels and quality

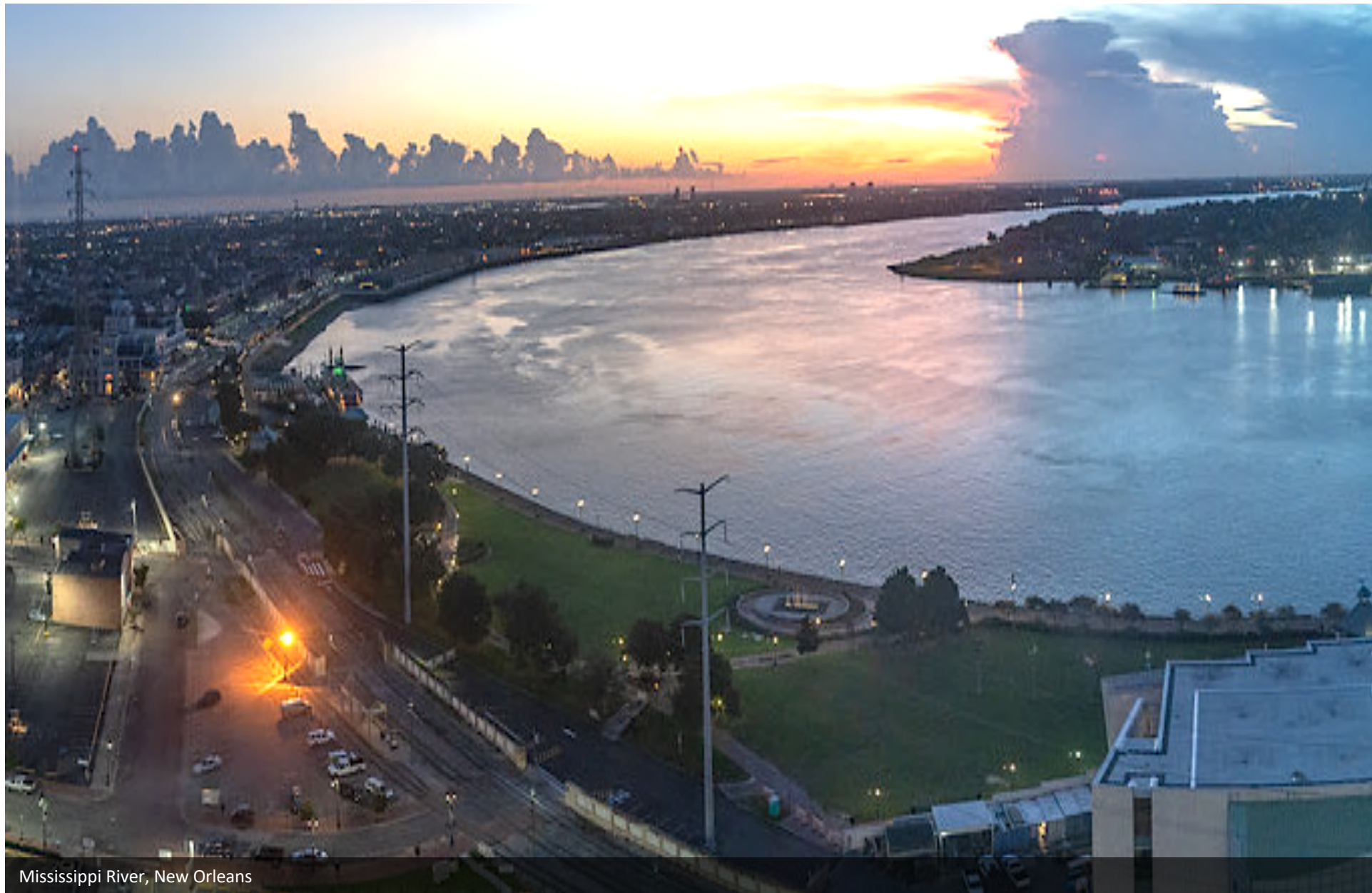
River pollution

- Waterway basin-wise sewage generation, no. of outfalls details

Floodplain zoning

- Follow GoI notification, declaring the costal stretches of seas, bays, estuaries, creeks, rivers and back-waters upto 500m from the High Tide Line (HTL) as Coastal Regulation Zone (CRZ)
- Restrictions on both sides in case of rivers, creeks and backwaters
 - To be kept clear of all activities
 - Suitable trees and plants to be planted
 - Free from artificial development
 - Pollution from industrial and town wastes must be avoided

| CRZ | Permissibility |
|---------|---|
| CRZ-I | Ecologically sensitive areas between high and low tide line, natural gas exploration and salt extraction permitted |
| CRZ II | Areas up to shoreline of the coast, unauthorized structures not allowed |
| CRZ III | Rural and urban areas outside CRZ-I and CRZ-II, only agriculture-related activities and public facilities permitted |
| CRZ IV | Aquatic areas up to territorial limits |



Mississippi River, New Orleans

New Orleans Master Plan 2030

Mississippi River



Parameters reflected in Master Plan

River-sensitive Vision

River-centric vision for city development

River Background

Reinventing city's Crescent Plan to reinforce the river's critical role

Urban flood management

Planning for flood protection, stabilization of neighborhoods (disaster risk, climate change mitigation strategies)

Landuse, use zone, use premise

- Eco-friendly uses proposed
- New public parks and recreation areas developed

Development Control Regulations

No structures permissible except those necessary to support specific conservation aims or low-impact amenities

Ground water augmentation

- Feasibility of river as a potential for managing groundwater
- Conservation/ storm-water management techniques

River water extraction for city use

Water supply, WTP that purify river water, capacity information

River pollution

Details of sewage and drainage system

River navigation

Potential of new ferry connections for fast/ efficient mass transit

River Ecology/ Environmental Services

Reduce the city's carbon footprint - reducing leakage of treated water and overreliance on pumped drainage

Vision for New Orleans, 2030

- A city that celebrates its relationship to water and uses water-management strategies to provide amenities to neighborhoods wherever possible

Landuse, use zone, use premise

- **Natural Area** - Increase, retain and preserve ecologically sensitive habitats by conserving, improving, and/or restoring for aesthetic value, biodiversity, natural disaster resilience, natural resource and wildlife conservation, and nature-oriented recreation
- **Celebrate the city's relationship to water-** linked by green-blue corridors (landscaped canals, rain gardens, restored wetlands) that improve public understanding of water systems, spur adjacent private economic investment
- Reclaim river and lake waterfronts for lively public spaces

- Crescent Park - linear park, along riverfront with paths to discourage run-off, and adaptive reuse of wharves
- Lafitte Greenway – pedestrian/ bicycle urban trail, with landscaping, bio-swales, storm-water retention features

Establish Riverfront Advisory Committee



River in Ulaanbaatar

Ulaanbaatar Master Plan 2030

Tuul River



Parameters reflected in Master Plan

River Background

Plan identifies the rivers flowing through the city

River-sensitive Vision and Priorities

- Vision - City is Environmentally Friendly
- Objectives - safe, healthy, green city, resilient to climate change
- Strategies - Establish sustainable environmental management

River Zone Delineation

Designates rivers as special protection areas and renew the existing protection area boundaries

Urban Flooding

- Flood control areas should be identified
- Infrastructure to store/ redirect flood waters, where required

Land use, use zone, use premise

- Green/Open Space - areas for recreation, ecological conservation and to enjoy nature
- Establish waterfront open space along rivers and streams, with connected parks/ green space for residents and tourists.

Ground water augmentation

Ground water sources mapped

River water extraction for city use

- Drinking water sources - groundwater aquifers and river water
- New infrastructure will be constructed to provide water

River pollution

- Existing waste water treatment plant should be improved using state-of-the-art technologies and additional plants should be established to meet the demand

- Ulaanbaatar city Green Belt – at the edges to contain size of city and limit development in high flood risk areas, areas in the city’s drinking water catchment and restricted area (natural preservation areas, water resource protection areas). Include existing strictly restricted areas.

- Implement river enhancement projects



Bow Bridge, Calgary

Municipal Development Plan, Calgary, 2009 (60 yr. plan)

Bow & Elbow River



Parameters reflected in Master Plan

River-sensitive Objectives

Protect, conserve/enhance water quality/ quantity by assigning land use and framework that protects the watershed

River Background

- Identifies rivers flowing through the city, with watershed details
- Proximity to riverfront adds value to open space system

Urban flooding

- Regulating land uses/ development within Flood Hazard Areas
- Flood hazard mapping (using 100 year flood event)

Land use, use zone, use premise

- Maintain and enhance the riverfront as an active, liveable, pedestrian/bicycle-oriented amenity
- Maintain/ improve public access to major water bodies/ rivers
- Open space typology - Rivers and creeks; River valleys
- Riverfront Areas - development of park and pathway system, with public plazas/ seating/ landscape features along the riverbank sensitive to existing natural habitat

Ground water augmentation

Protect Watersheds-drains, springs, wetlands, ponds, streams, lakes

River water extraction for city use

Provision, alignment, capacity of water distribution mains

River pollution

Provision, alignment, capacity of sewer/ stormwater mains/ trunks

River Ecology/ Environmental services

- Network - rich with wildlife habitat, and natural vegetation
- Protect biodiversity in river valleys, ravines, coulees, wetlands
- Riparian Strategy - Sustaining Healthy Rivers and Communities

Protecting aquatic and riparian habitats

- Ensure “no net loss” principles of significant wetland habitat and preserve existing wetlands as a priority over reconstruction.
- Protect aquatic habitats through preservation, restoration and creation of wetland bank sites.
- Protect riparian areas to meet habitat, water quality and public access through environmental reserve dedications and design alternatives.
- Encourage and enable protection of source water and groundwater recharge areas.

Top priorities to reducing flood impact-

- Appropriate land use and development regulations;
- Mitigate the potential impact or obstruction of floodwaters;
- Enhance Calgary’s flood resiliency by employing a comprehensive approach to flood risk reduction measures
- Align policies and regulations to meet the minimum standards
- All buildings located in the floodway, flood fringe or overland flow area must be designed to prevent:
 - damage by floodwaters;
 - damage by elevated groundwater;
 - incremental increase of upstream river water levels.



River Ganga in Varanasi, Kanpur and Devprayag

National Mission for Clean Ganga



It is an authority notified under the Environment (Protection) Act, 1986 in the Ministry of Jal Shakti, to take measures for prevention, control & abatement of environmental pollution, and to ensure continuous adequate flow in the river Ganga and its tributaries.





National Institute of Urban Affairs







It is a premier institute under the Ministry of Housing & Urban Affairs, Government of India that advances inter-disciplinary research, capacity building, knowledge management and policy making on issues relevant to cities across India.

For further information

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* Note – All online sourced images have been downloaded from open sources

Cover Images: Devprayag – Confluence of Bhagirathi & Alaknanda (front)
River Ganga in Varanasi (back)

Credits: Ms. Pratima Marwah, Ms. Vishakha Jha