URBAN RIVER MANAGEMENT PLAN (URMP)

ELEMENTS AND GUIDANCE NOTE

OCTOBER 2019

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OBJECTIVE OF THIS GUIDANCE DOCUMENT

The overall objective of this document is to assist cities along the Ganga River (referred to as ***Ganga towns*** hereafter in the document) improve the state of the river in their stretch. While the central focus is on the Ganga, the document also applies to other rivers flowing through these towns.

The document proposes a planning framework called **"Urban River Management Plan (URMP)**" to achieve the objective. The URMP will help the Ganga towns systematically and holistically plan for interventions to revive and maintain the rivers in their areas in a sustainable manner. The URMP is embedded in the central idea that maintaining healthy rivers in the Ganga towns is crucial to enhance liveability in the towns.

The National Mission for Clean Ganga (NMCG) and the National Institute of Urban Affairs (NIUA) have developed a common URMP framework for all Ganga towns. This guidance document explains the various elements of the URMP framework. It also provides detailed directions on how the Ganga towns can prepare their own URMPs.

It is expected that all Ganga towns will develop their URMPs in the next two years.

Table of Contents

Acronyms

AMRUT	: Atal Mission for Rejuvenation and Urban Transformation
CAMPA	: Compensatory Afforestation Fund Management and Planning Authority
CDP	: City Development Plan
CGWB	: Central Ground Water Board
CSP	: City Sanitation Plan
CPCB	: Central Pollution Control Board
CPHEEO	: Central Public Health Engineering Environment Organization
CSR	: Corporate Social Responsibility
DO	: Dissolved Oxygen
DPR	: Detailed Project Report
FSSM	: Faecal Sludge and Septage Management
FSTP	: Faecal Sludge Treatment Plant
GDP	: Gross Domestic Product
IEC	: Information, Education and Communication
IIT	: Indian Institute of Technology
IITK	: Indian Institute of Technology , Kanpur
MoHUA	: Ministry of Housing and Urban Affairs
MoUD	: Ministry of Urban Development (former)
M&E	: Monitoring and Evaluation
NIUA	: National Institute of Urban Affairs
NMCG	: National Mission for Clean Ganga
NUSP	: National Urban Sanitation Policy
NBC	: National Building Code
NRCD	: National River Conservation Directorate
OSS	: Onsite Sanitation Systems
SBM (U)	: Swachh Bharat Mission (Urban)
SLIP	: Service Level Improvement Plan
STP	: Sewage Treatment Plant
ULB	: Urban Local Body
UN DESA	: United Nations Department of Economic and Social Affairs
URDFPI	: Urban and Regional Development and Plans Formulation and Implementation
URMP	: Urban River Management Plan
URM_{index}	: Urban River Management Index
VCF	: Value Capture Finance
VGF	: Viability Gap Funding

List of Figures and Tables

Glossary of Terms

The following definitions are to be used for this document:

Active flood plain	:	is an area on the two sides of a river that gets inundated by a flood having a mean recurrence interval of 2.33 years.
Afforestation	:	is the planting of trees to restore or re-establish forest cover.
Catchment	:	is the entire land area whose runoff from rain, snow or ice drains into a water body or a water course (before the water course joins another river or discharges into a water body.)
Drain	:	is a natural or artificially constructed channel of different shapes (circular, box, trapezoid) carrying the storm water during monsoon season.
Ecological Flow	:	is the regime of flows required to maintain the ecological integrity of a river and the goods and services provided by it.
Ecology	:	is the totality of relations between organisms and their environment. It includes the composition, distribution, amount, number and changing states of organisms within and among ecosystems.
Embankment	:	is a raised wall of earth, stone or other material to hold back water within a water body or water course; it includes levees constructed on either side of a river as a flood protection measure.
Faecal Sludge or Septage	:	are interchangeably used words for the raw or partially digested slurry that contains both solid and liquid waste that accumulates in onsite sanitation systems (OSS) e.g. septic tanks.
Floodplain	:	is the land area susceptible to inundation by flood waters. These are the zones susceptible to inundation by a base flood including areas where drainage is or may be restricted by fabricated structures, which have been or may be covered partially or wholly by floodwater from the base flood.
Lake	:	in terms of sizes lie between wetlands and ponds. Their catchments are large and may involve more than one catchment. They can cover trans boundaries.
Nala	:	is local natural stream carrying water or (wastewater) that merges with higher order stream/river in the downstream.
Pan City	:	is a term used in the manual to indicate interventions planned for the entire city and not limited to a particular area.
Pond/Waterbody	:	is a depression on land or a lowland area that usually holds water or remains saturated through most of the year, such as a lake, tank, pond, marsh or swamp.
River	:	is a Geomorphic unit that carry water fed through either rain or snow. The river flowing throughout year are termed as Perennial River, those that flow during monsoon season are termed as Non-perennial River.

River Basin : is the entire catchment (*of a water body or watercourse*) including the soil, water, vegetation and other natural resources in the area.

River Health : is a measurement of how well is river able to sustain its natural properties, and provide a habitat for natural aquatic life to thrive.

Wetland : is shallow water body where there is permanent water logging. The ecosystem of wetlands supports wide variety of flora and fauna. Wetlands could be near coastal/estuarine environment or on mainland where rivers feed wetlands. Migratory birds often visit wetlands. Livelihood is associated with wetlands. Wetlands could cover small or vast areas of hundreds of square kilometers. An international convention called “Ramsar” is devoted to wetland conservation.

1. Rivers and Urban Development

About 34% of India's population lives in urban areas[1]. The number and size of Indian cities has been increasing over the years. For example, as per the Census of India (2011), there were nearly 8,000 towns and cities in India, out of which several observed rapid growth compared to the previous decade. The UN DESA (2018) suggests that this trend is expected to continue in the future as well (***Figure 1***). Traditionally, increased urbanization has been associated with opportunities for economic development, which has had a positive impact on the Gross Domestic Product. However, these development activities have also had a negative impact on the environment. One of these impacts is pollution in the rivers and waterbodies, resulting mostly from indiscriminate discharge of untreated wastewater and industrial effluents. The Ganga River Basin has been increasingly witnessing these impacts.

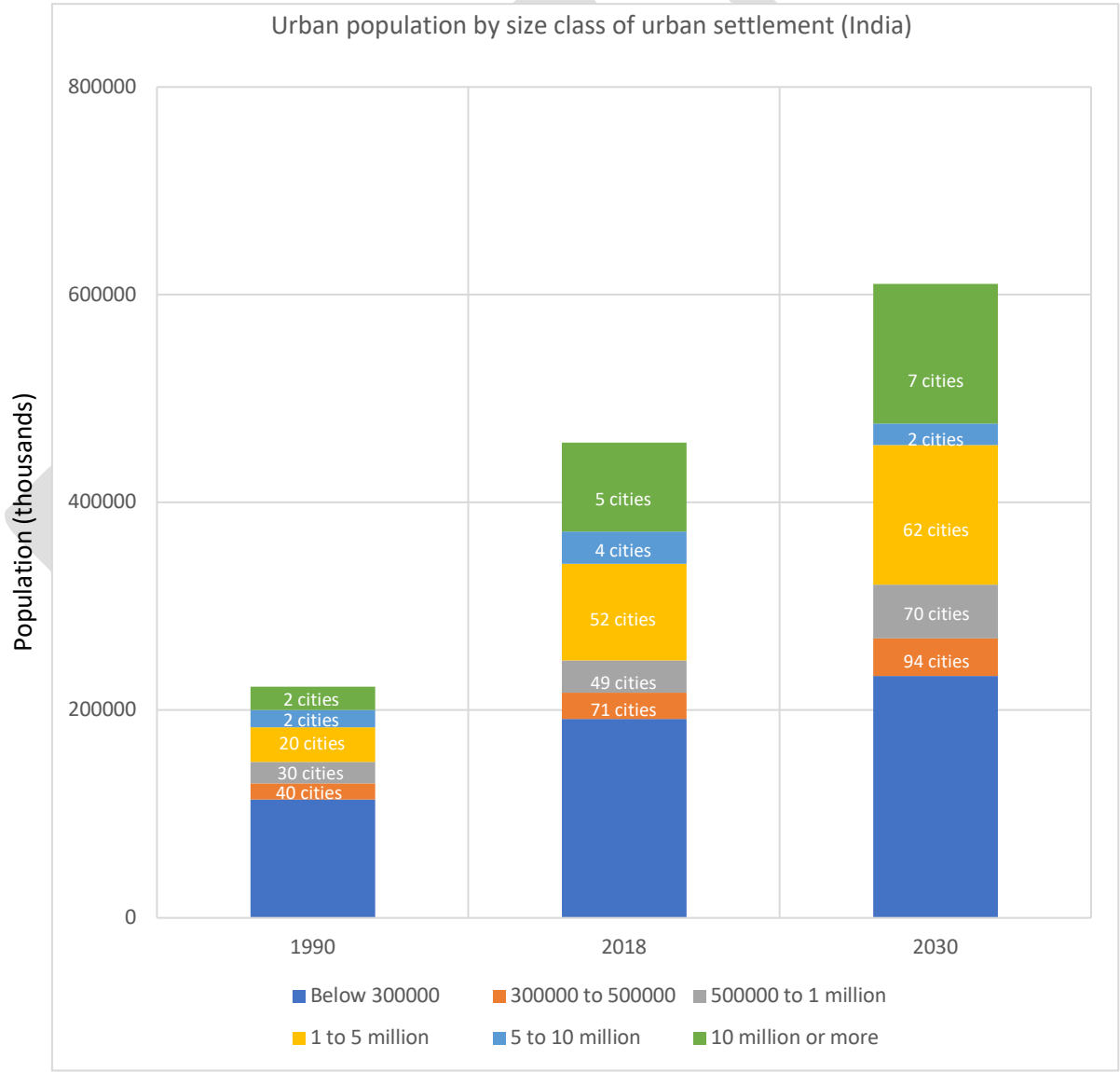


Figure 1: Trend of past and expected urbanization in India (Source: UN DESA (2018))

The Ganga river basin with an area of 1,080,000 sq. km is one of the largest river basins in the world. It flows through the Indo-Gangetic plains of the country before merging in the Arabian

[1] UN World Urbanization Prospects Report (2018)

Sea. The river was declared as a national river in the year 2008. The basin is the most populated river basin in the world and is home to half the population of India including two-thirds of the nation's poor people. The basin provides over one-third of the available surface water in India and contributes to more than half the national water use of which ninety percent is diverted to irrigation[2].

1.1 The River and City Interaction

Throughout the history of humankind, rivers have always been the lifeline of any civilization. The trend continues until today. However, because of contemporary socioeconomic development, rivers have been facing growing threats from several quarters—unsustainable withdrawals, pollution, and habitat deterioration, among others. This current situation in most rivers is presented in ***Figure 2***. As gleaned, there are several concerns. First, untreated wastewater from domestic units, industries and agricultural fields finds its way into the river. Second, unauthorized colonies and slum settlements along the riverbanks add to the pollution problem. Third, water is abstracted indiscriminately for various uses, without a thought for the carrying capacity of the river. Fourth, there is hardly any recycling and reuse of water. Fifth, improper solid waste management increases the pollutant load in the river.

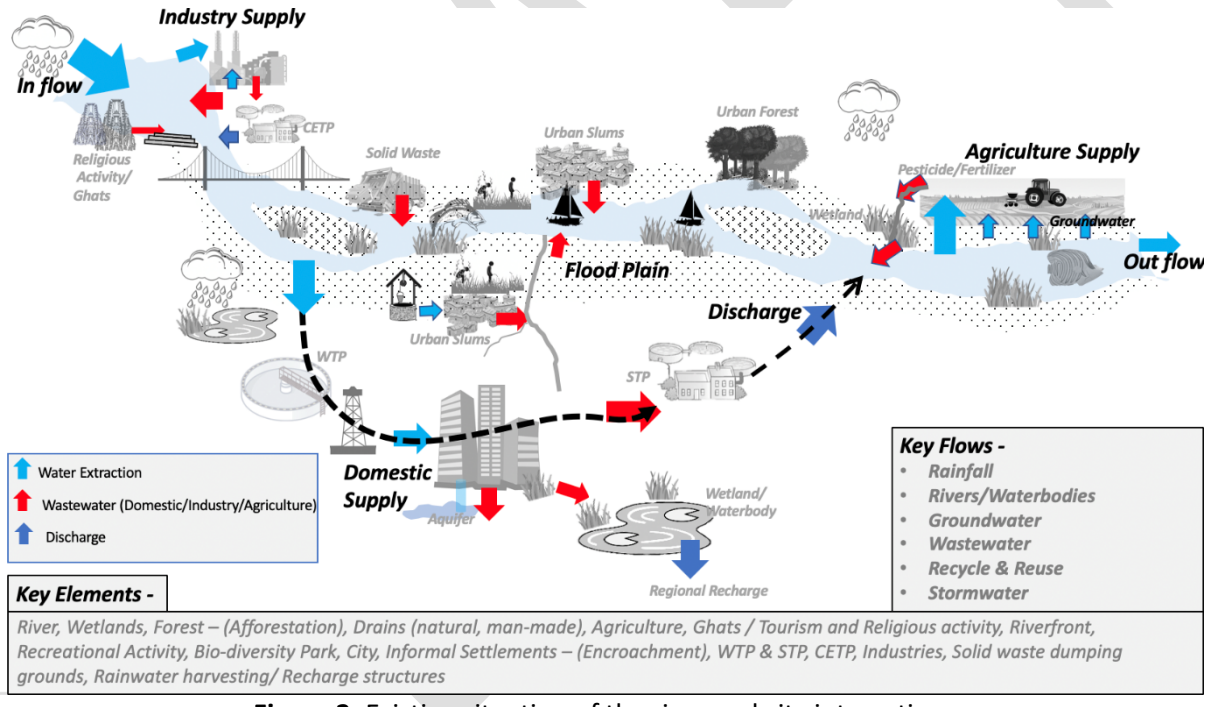


Figure 2: Existing situation of the river and city interaction

Given its significance for human civilization, improving the health of river is, therefore gaining increasing international prominence, and becoming a prime mandate of governments all over the globe, including that of India. The 2030 Developmental Agenda also emphasizes on river conservation and restoration (through the Sustainable Development Goal 6). The thrust is on inculcating a sense of responsible urban development that shows respect to the river, as seen

[2] Bons, C.A. (Ed.), 2018. Ganga River Basin Planning Assessment Report. Main volume and Appendices. Deltares with AECOM and Future Water for the World Bank and the Government of India, Report 1220123-002-ZWS-0003.

in ***Figure 3*** (desired river-city interaction). As seen, all wastewater is treated and disposed safely, making the river pollution free. There is adequate wastewater recycling and reuse that reduces the stress on the river. Both centralized and de-centralized solutions are used to manage the sanitation in the city. The Ganga towns should aspire to achieve this state.

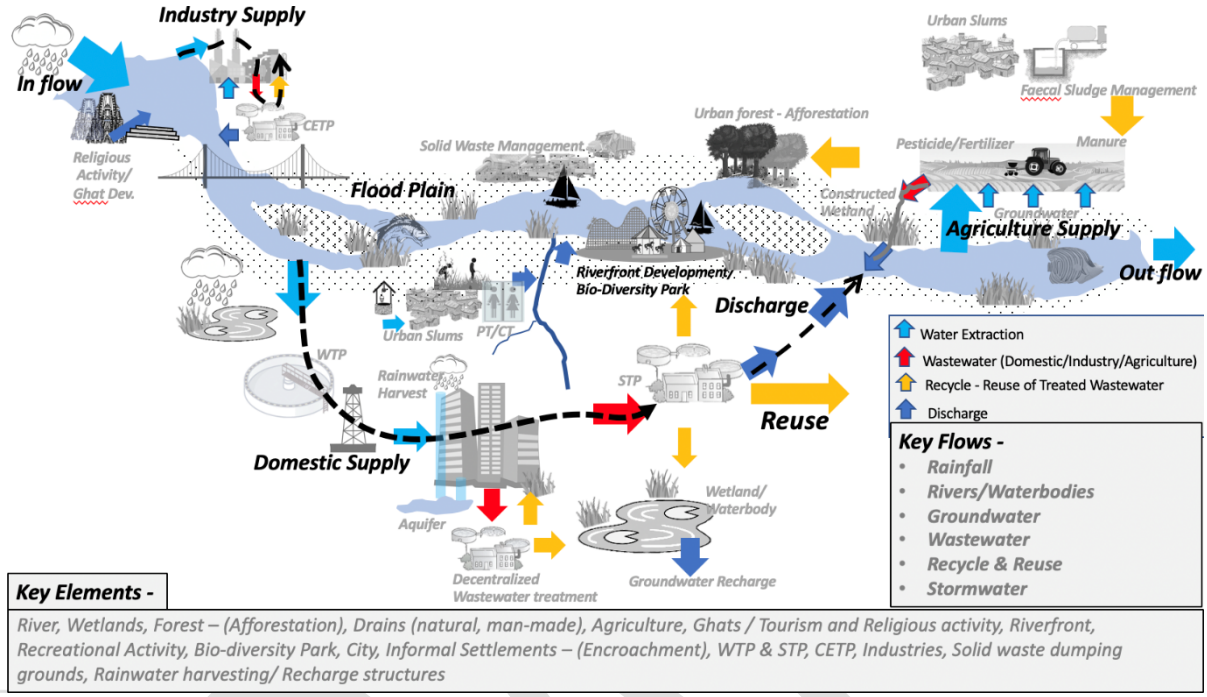


Figure 3: Desired situation of the river and city interaction

1.2 Introducing the Urban River Management Plan

This document has been developed to help the Ganga towns achieve the state presented in ***Figure 3***. It does so through a planning framework called **"Urban River Management Plan (URMP)**".

The URMP framework has two distinct parts as presented in ***Figure 4***. The first is a generic part that is applicable to all Ganga towns. This part includes the elements, visions, objectives, and M&E mechanism. The second is a town-specific part that comprises interventions required to achieve the objectives. This essentially means that the Ganga towns have the flexibility to choose appropriate interventions to suit their local context in order to meet the common objectives. For instance, one of the objectives is to keep the river pollution free. One town may decide to strengthen their centralized sewerage infrastructure to meet this objective. Another town may opt for decentralized non-sewered solutions. Yet another may focus on softer approaches using a mix of incentives and disincentives. The choice of the intervention is, therefore, up to the town depending of what it perceives as the most suitable. This document also provides examples of potential interventions that the towns can refer to and adopt.

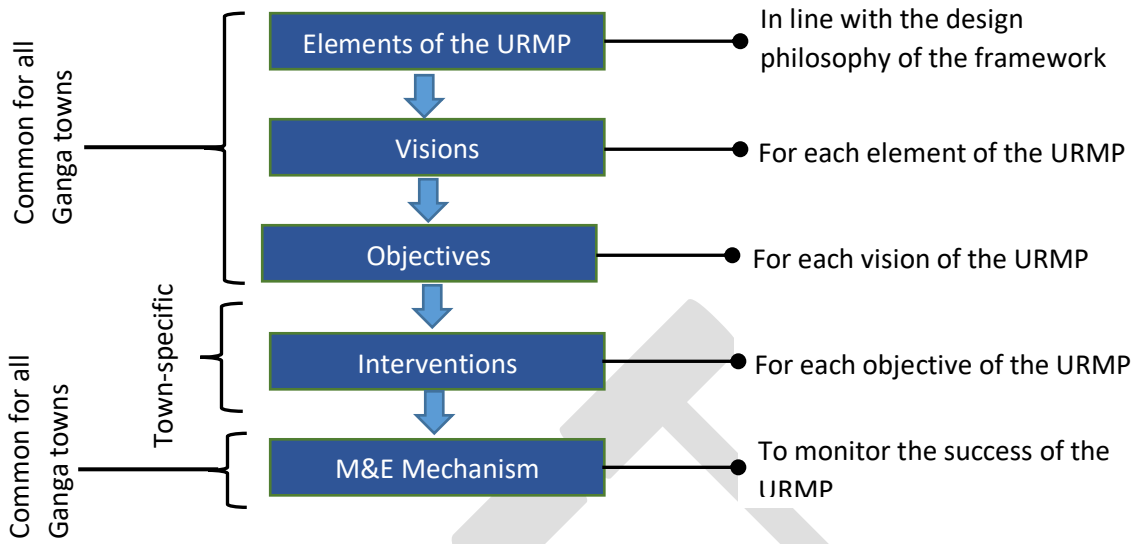


Figure 4: Conceptual framework of the Urban River Management Plan

1.3 Need for the URMP and its Benefits

In 2017, NMCG released the "Vision Ganga"[3] document that describes the overarching framework and approach of the Mission in restoring the wholesomeness of the Ganga River. The document indicates that one of the key objectives of the Ganga River Management Plan is to ensure that "*all existing, ongoing and planned anthropogenic activities in the basin shall be reviewed or scrutinised in a transparent, inclusive manner (with consensus of all affected people and stakeholders) for the overall health of the basin*". Much of the current undesirable state of the River Ganga can be attributed to these disruptive anthropogenic activities, which somehow are more prevalent in urban areas (cities). ***Therefore, any improvement in the state of the river cannot be achieved without first addressing the issues and drivers in urban areas. Cities in the Ganga River Basin, hence, will have a central role to play in the rejuvenation and replenishment of the river.***

From experiences within the country and around the world, it is becoming increasingly evident that ***economic development does not have to come at the cost of the environment***. In fact, true sustainable economic development will be impossible to achieve without harmonizing environmental considerations. With this as a preamble, the benefits of developing a URMP are described below:

I. **It is the city that will benefit the most from the URMP:** The URMP is for the city/ town. Its benefits will be reaped within the boundaries of the city. Every activity carried out under URMP will pay off exponential dividends and ultimately lead to improved quality of life.

II. **Protection of the river and its environment is mandated by the law:** The rationale for the URMP finds its roots in the Constitution of India, Article 51 (A), which exhorts every citizen of India *to protect and improve the natural environment including forests, lakes, rivers and wild life, and to have compassion for living creatures*. Additionally, as per the 12th Schedule of the 74th Constitutional Amendment of 1992, Urban Local

[3] Vision Ganga (2017) https://nmcg.nic.in/pdf/Vision%20Ganga%20Eng_Compressed.pdf

Bodies (ULBs) are expected to carry out several tasks that include *urban forestry, protection of the environment and promotion of ecological aspects.* Therefore, implementation of the URMP by ULBs is in line with constitutional duties.

III. **There is an opportunity to develop a unique river city:** River cities have their own charm. Throughout history, rivers have always been at the heart of civilization. With time, this changed to the extent that civilization become completely disconnected with the rivers. Not all cities are blessed with rivers. River cities, therefore, have the exceptional opportunity to leverage on a natural asset, and turn the city into a unique urban form.

1.4 Previous Work on the URMP

A consortium of IITs, led by IIT Kanpur has published general guidelines[4] for Class I towns (population greater than 1 lakh) for the development of URMPs. The guidelines include eight categories of recommendations as follows:

I. **Removal of encroachments** and land acquisition for riverbank beautification and related development works.
II. **Restriction/banning of certain activities** on the riverbank or in the river, viz., open defecation, disposal of solid waste, washing of clothes, wallowing of cattle, throwing of floral offerings, disposal of corpses, routine bathing (as opposed to ritual bathing), etc.
III. **Development/restoration of the riverbank** area, i.e., construction/restoration of *Ghats*, provision of public baths and toilets, construction of walkways, parks, other public spaces, access roads, commercial establishments, etc.
IV. **Prevention of the discharge** of untreated sewage into the river through construction of sewers and '*nala*' diversion works
V. **Pumping and other infrastructure** for conveyance of collected/diverted sewage-to-sewage treatment plants and construction/renovation of sewage treatment plants capable of treating the sewage to tertiary levels.
VI. **Reuse of tertiary treated sewage** within the town or elsewhere for industrial, irrigation, horticultural, non-potable domestic and commercial uses, groundwater recharge, etc.
VII. **Disposal of sludge generated** due to sewage treatment in an acceptable manner and reuse of sludge and sludge-derived products, i.e., manure, compost, etc. within the town and/or elsewhere.

This document builds on these guidelines to help define the common URMP framework for the Ganga towns.

1.5 Legal Sanctity of the URMP

The URMP is being developed by NMCG, which serves as the implementation arm of the National Council for Rejuvenation, Protection and Management of River Ganga (after the dissolution of the National Ganga River Basin Authority), under the Ministry of Jal Shakti. The

[4] Guidelines for the Preparation of Urban River Management Plan for all Class I Towns in Ganga River Basin http://cganga.org/wp-content/uploads/sites/3/2018/11/002_EQP.pdf

River Ganga (Rejuvenation, Protection and Management) Authorities Order, 2016[5] authorizes NMCG to "*take any other measures which may be necessary for continuous flow of water and abatement of pollution in River Ganga and its tributaries*", among other orders. The URMP is one of the instruments through which the NMCG is implementing the principles to be followed for rejuvenation, protection and management of River Ganga.

The aforementioned Order also empowers NMCG to *"issue directions to the State Ganga Committees, District Ganga Committees* ***or local authorities and other authorities in*** *the implementation of the River Ganga Basin Management Plan and any other matter connected with affairs of the River Ganga and its tributaries".* It is envisaged that the URMP will fall under the ambit of this direction.

2 Design Philosophy of URMP Framework

The URMP framework is based on the three pillar of sustainable development—Economics, Social, and Environment. Hence, it is envisaged that the interventions carried out under the URMP will be:

- Environmentally responsible
- Social connectors
- Economically beneficial

2.1 Design Principles

Following are the design principles on which the URMP framework has been developed, also depicted in ***Figure 5***.

1. **Simple**: It is important that the URMP is kept simple and concise. The objective is not to create a comprehensive set of guidelines for managing the urban river but instead develop a template for effective and tangible actions to be taken. In addition, given that the URMP will have to be developed by ULBs who are already tasked with several other responsibilities, simplicity of the plan would receive more buy-in.
2. **Generic/replicable**: The framework for the URMP has intentionally been kept generic so that all Class A towns in the Ganga River Basin would be able to use it. The structure is such that it fosters replicability.
3. **Sustainable**: Given that financial constraints are one of the main reasons why several ambitious plans fail, the URMP shall clearly identify the line of funding and finances for the various interventions to be undertaken under it.
4. **Synergistic:** The URMP is not meant to re-invent the wheel. Instead, it acknowledges the role and importance of other city/town-specific plans such as the Master Plan, City Sanitation Plan, City Development Plan, and other related Plans. The URMP also seeks synergies with on-going urban missions such AMRUT, Smart City, Swachh Bharat (urban), among others. The intent is to dovetail certain aspects of the URMP (e.g. service infrastructure) into these missions.
5. **Measurable:** The URMP must have a provision for 'reflection and course correction'. This essentially means the URMP will be a living document that is continuously

[5] *River Ganga (Rejuvenation, Protection and Management) Authorities Order, 2016* https://nmcg.nic.in/pdf/AuthorityNotification.pdf

upgraded from time to time to respond to emerging needs. In order to do so, it is important that the progress made under the URMP is measurable and quantifiable.

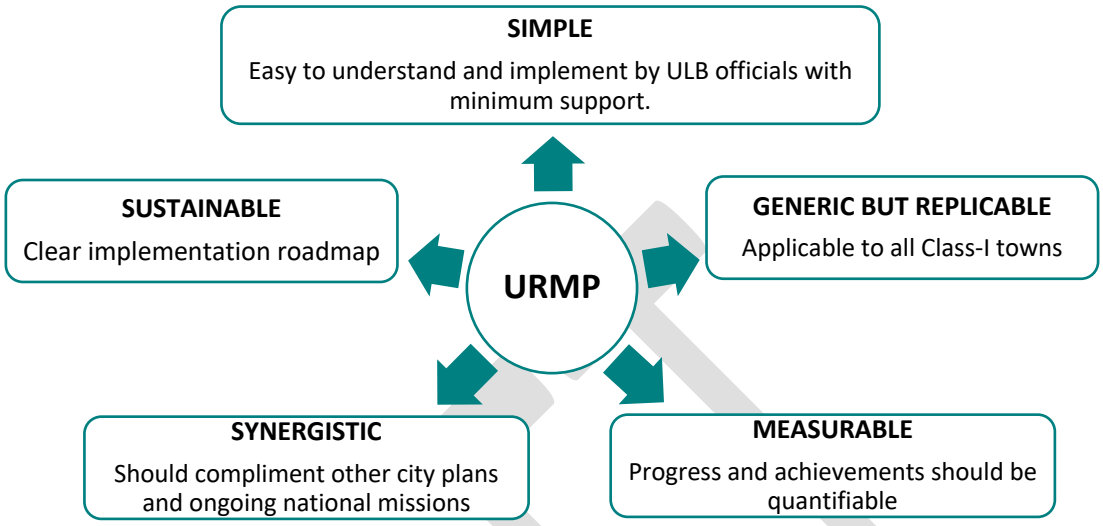


Figure 5: Design principles of the Urban River Management Plan

2.2 Time Frame

- The period of the URMP shall be made to coincide with the Master Plan, or development plan that the city has. However, there will be different timelines for specific interventions, as elaborated in detail later in Section 5.
- Once the URMP is prepared, there will be scope for improvising interventions considering new demands, emerging technologies, and new knowledge.

3 Framework for the URMP

There are 97 Class 1 towns along the main stem of the Ganga River. To begin with, it is expected that URMPs will be prepared for all these towns. Later, this can be extended to the river towns of other tributaries of the Ganga. A common framework is, therefore, required to ensure that the character of the URMP is consistent across cities, and is able to contribute to the overall enhancement of the basin.

3.1 Elements of the URMP

In line with the design philosophy of the URMP, the Plan shall have three elements:

(1) **River health** (corresponding to the *enviromentally responsible* trait of the philosophy)
(2) **Social cohesion** (corresponding to the *social connectors* trait of the philosophy)
(3) **Economic value** (corresonding to the *economically beneficial* trait of the philosophy)

3.2 Vision Statements of the URMP

The vision for each element of the URMP shall be as follows. This is also pictorially depcited in ***Figure 6***.

3.2.1 Vision Statement for River Health Element

The river will be able to support a habitat for biodiversity to thrive: This is the ideal situation from an environmental point of view. Rivers in the Ganga basin are usually unable to meet this condition in the urban stretches. This vision of the URMP seeks to change this trend by developing healthy rivers that are able to provide an environment for diverse species of plants and animals to flourish in their natural states.

3.2.2 Vision Statement for Social Cohesion Element

The river will be celebrated among the citizens**:** Historically**,** towns have developed along the banks of the rivers in India. For such towns, the river was always the focal point for religious, social, and recreational purposes. However, over the years this connect between the citizens and rivers has diminished, and completely lost in some cases. This vision of the URMP, therefore, seeks to create an environment to make the citizens treasure the river and celebrate it as a valuable common asset.

3.2.3 Vision Statement for the Economic Value Element

The river will provide opportunities for economic development: Rivers support the livelihoods of several communities, through the products it offers—timber, food, employment opportunities, among others. The vision for this element of the URMP seeks to enhance this aspect in a sustainable and river-friendly manner.

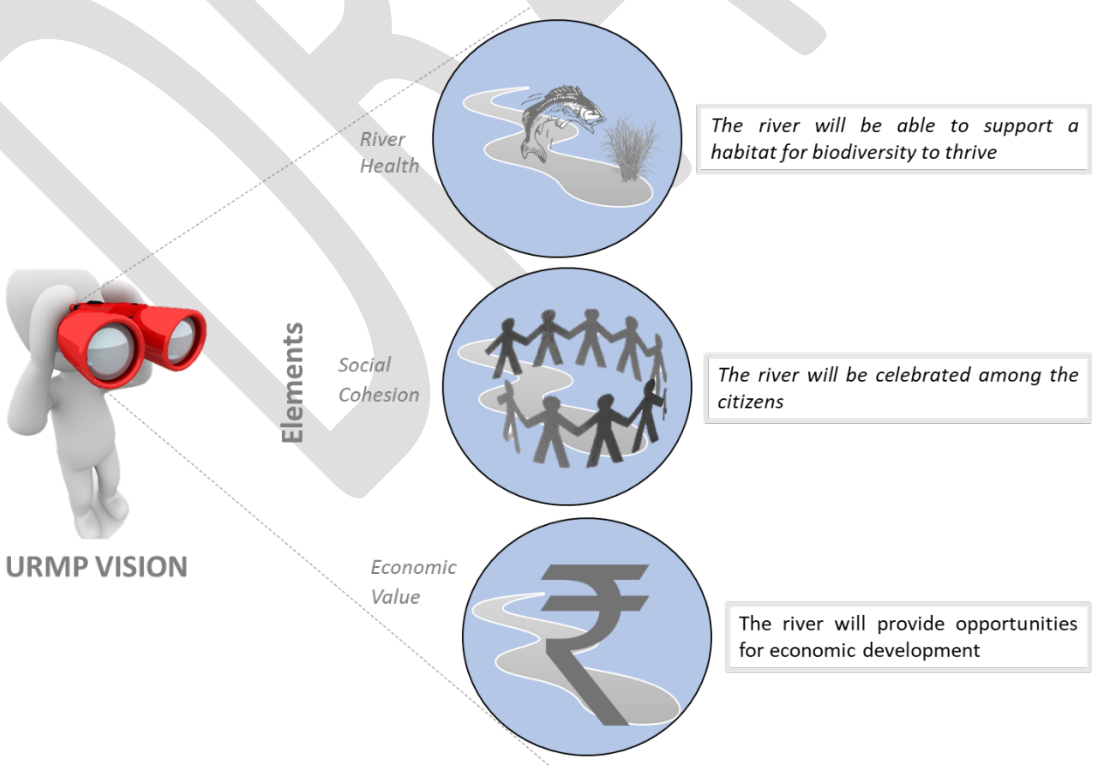


Figure 6: Vision statements for the different elements of the URMP

3.3 Scope

The scope of the URMP shall be as follows:

Coverage and Extent: Given that river management goes much beyond the riverbank area, the URMP shall include both pan-city and riverbank specific interventions.

Strategic Approach: The URMP shall target two types of interventions. The first type of shall adopt a *soft approach* that uses urban planning tools to integrate river-sensitive norms and practices into long-term planning for the city. The second type shall employ *hard measures* to implement projects/interventions required to meet the URMP objectives.

3.4 Objectives

Ten objectives have been fixed to achieve the visions of the URMP. These objectives address each of the URMP elements, i.e. river health; social cohesion; and economic value. The objectives will be achieved through actions/activities/interventions in the form of various projects. **It is important to note that these objectives are common for all Ganga towns. Hence, the URMP of every town will have the same objectives.** However, the interventions/projects to achieve these objects can vary from place from place, considering the local context.

The generic part of the URMP framework (excluding the M&E mechanism) comprising the elements, vision and objectives are presented in ***Table 1.***

Table 1: The common elements of the URMP Framework

DESIGN PHILOSOPHY	**Environmentally responsible**	**Economically beneficial**	**Social connectors**
ELEMENT	River health	Economic value	Social cohesion
VISION	*The river will be able to support a habitat for biodiversity to thrive*	*The river will provide opportunities for economic development*	*The river will be celebrated among the citizens*
OBJECTIVES	1 To keep the river free from pollution 2 To revive and rejuvenate stagnant waterbodies and wetlands 3 To ensure effective regulation of activities in floodplain areas 4 To ensure adequate return flow from the city into the river 5 To control erosion of river banks 6 To promote conservation, recharge and reuse of water	7 To develop eco-friendly riverfronts 8 To promote sustainable river tourism	9 To increase awareness on river-sensitive behaviour 10 To engage citizens in river management activities 1

The ten objectives of the URMP (corresponding to each element of the URMP) are described hereafter.

3.4.1 Objectives for River Health Element

3.4.1.1 Objective 1: To keep the river free from pollution

Rationale: Pollution is the biggest concern for the rivers in the Ganga River Basin. Rivers are the ultimate avenues for discharge of untreated wastewater from towns and cities. The wastewater discarded by one city becomes source of supply for another city downstream as seen in ***Figure 7***, thereby creating a cycle of health hazards.

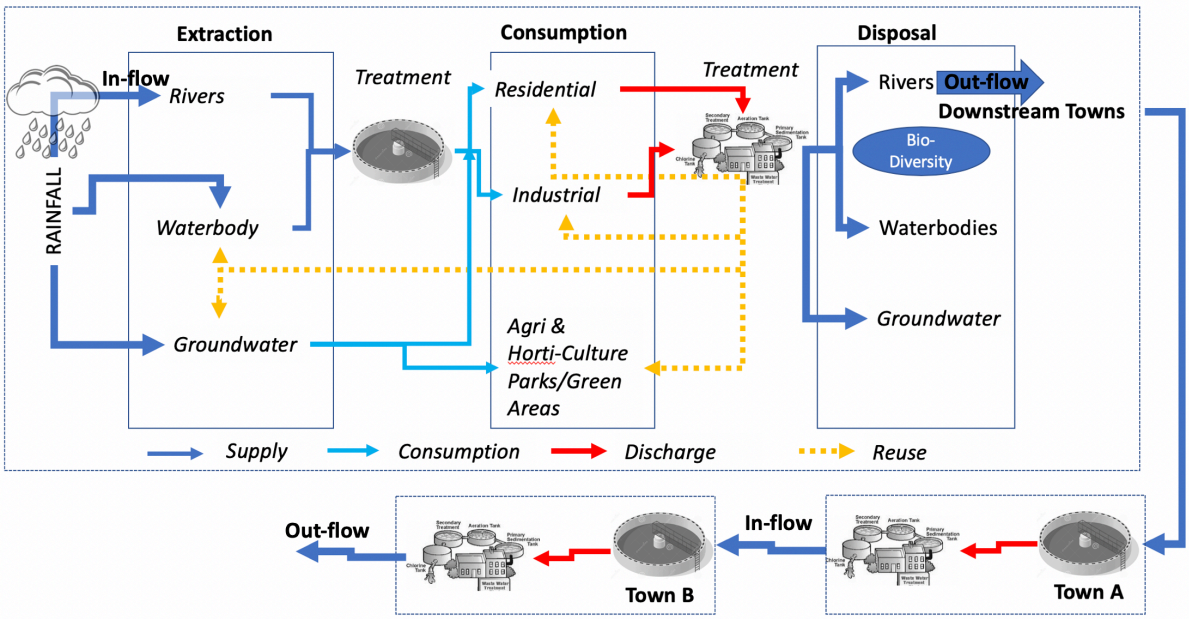
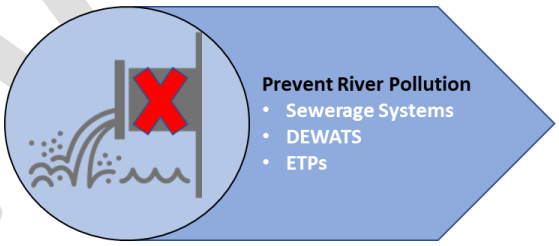


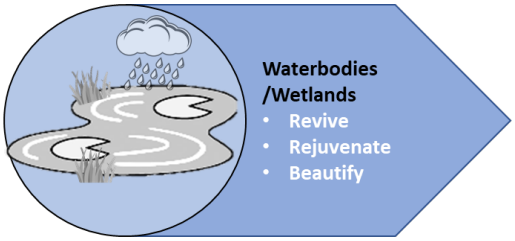
Figure 7: Relation between upstream and downstream towns in terms of wastewater discharge



Scope: Both structural and non-structural measures are required to achieve this objective. The structural measures include laying the required sewage infrastructure (i.e. sewer network, interceptor drains, sewage treatment plants, etc.), and ensuring that the infrastructure is in working condition. Where it is not possible to have complete sewerage coverage, decentralized solutions are also a good option. Non-structural measures include community workshops to encourage citizens to connect their households to the sewer network, awareness raising, setting up citizen groups, etc.

3.4.1.2 Objective 2: To revive and rejuvenate stagnant waterbodies and wetlands

Rationale: Water bodies and wetlands are intrinsically linked to rivers. A significant number of wetlands are located near rivers, and act as a natural buffer to protect the river from pollution. They also serve as sinks when the water level in the river rises. Stagnant water bodies like lakes and ponds are an alternate source of water to provide for the needs of the city, thereby reducing the stress on the river. However, in most Ganga towns water bodies and wetlands are poorly maintained.

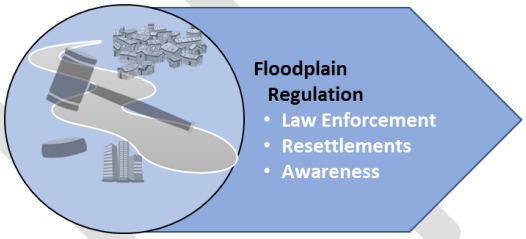


Scope: Under this objective, the activities could focus on revival of dried up waterbodies, rejuvenating polluted waterbodies, beautifying waterbodies for commercial and recreational purposes, among others.

3.4.1.3 Objective 3: To ensure effective regulation of activities in floodplain areas

Rationale: The Developmental Plans/Master Plans of cities would have some or the other regulations for activities/land use/permissible activities in the river flood plains (if not the entire flood plain, then at least part of it). However, in several Ganga towns these areas have been encroached upon by unauthorized colonies, or used for unauthorized activities such as agriculture, sand mining, etc. Ensuring that only permitted activities and structures are allowed in the floodplains is crucial for the river's health.

Scope: The range of interventions under this objective could include stricter law enforcement, awareness raising, capacity building of farmers, relocation strategies for unauthorized colonies, among others.



3.4.1.4 Objective 4: To ensure adequate return flow from the city in the river

Rationale: Rivers require a certain flow to help sustain the natural ecosystem it supports. This is called the environmental flow (e-flow). In most cases, the flow in a river is controlled by national/State agencies upstream, with the city having no control over it. However, the city can help contribute to the e-flow by ensuring that the local drains passing through the city and emptying out into river have sufficient good quality water flowing in it.

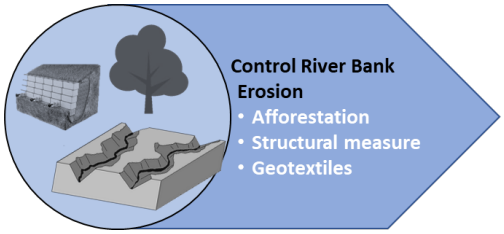
Scope: The interventions under this objective can include diverting a part of the storm water into rivers. Another possibility is to divert treated wastewater in the local drains. Given that recycle and reuse of treated wastewater is also important, the releases in the river will have to be carefully designed.

3.4.1.5 Objective 5: To control erosion of river banks

Rationale: River bank erosion occurs both naturally and through human impact. Rivers and streams are dynamic systems as they are constantly changing. The natural process of riverbank erosion can produce favourable outcomes such as the formation of productive floodplains and alluvial terraces. Some stable rivers have a healthy amount of erosion. However, unstable rivers and the erosion taking place on those banks are a cause for concern. Riverbank erosion have several impacts. First, it increases the sediment load in the river that has an adverse impact on the aquatic habitat. Second, it has the potential to damage the

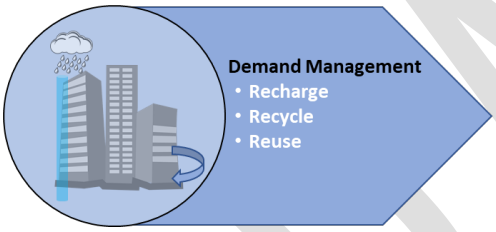
foundations of buildings near the riverbanks. Third, it has the potential to weaken the structures of riverfront development projects.

Scope: Riverbank erosion can be reduced in several ways. The single most effective method of erosion control in rivers is restoring bank vegetation. Allowing the vegetation to colonize and establishing a significant root system will strengthen the bank. Other alternatives include use of geotextiles, soil erosion mats, and other structural measures.



3.4.1.6 Objective 6: To promote conservation, recharge & reuse of water

Rationale: Water is fast becoming a precious commodity. Tapping into new sources of water may not be feasible anymore. There is, therefore, a need to move away from supply-side management to demand-side management, where focus is reducing the stress (demand) on traditional water sources (such as rivers). Conserving water, recharging groundwater, and reuse of wastewater are typical examples of how this could be done.



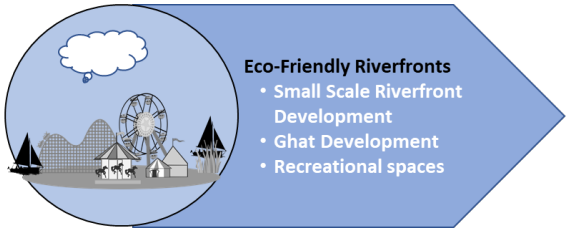
Scope: This objective could be achieved in several ways. Perhaps the most critical one is to ensure that a good portion of the treated wastewater effluent is reused for non-potable purpose. Given that almost eighty percent of water supplied emerges out as wastewater, reuse of wastewater itself, has the potential to reduce the stress on water sources by more than half. Other measures include installing groundwater recharge wells, conducting awareness campaigns to conserve water, etc.

3.4.2 Objectives for Economic Value Element

3.4.2.1 Objective 7: To develop eco-friendly riverfronts

Rationale: Riverfronts add both aesthetic and economic value to the river. It serves as a medium to bring the river to the forefront. It is also a major avenue for recreation opportunities. In doing so, riverfronts become a wonderful instrument to connect citizens to the river. Riverfronts can also help in climate change adaptation. Recent studies suggest that one of the most crucial requirements for climate change adaptation is social cohesion. Resilient infrastructure can handle some of the shocks, but when there is a crisis, it is the social bonding between people that will help them prevail. Riverfronts are ideal avenues for strengthening this bonding.

Scope: The town can choose the scale and scope of the riverfront development as per its need. Not all riverfront developments projects have to be at a grand scale. These projects can range from a simple *Ghat* development to a full-fledged riverfront promenade or plaza.



3.4.2.2 Objective 8: To promote sustainable river tourism

Rationale: In many parts of the world, river tourism has made considerable contribution to the city's economy. It supports the livelihoods of different sections of society, and therefore contributes to the overall development of the town. As a result, there is an inherent respect for the rivers among its citizens. The river tourism potential in Ganga towns is relatively untapped. If harnessed in a sustainable and eco-friendly manner, it can go a long way in creating a tangible value for the rivers.

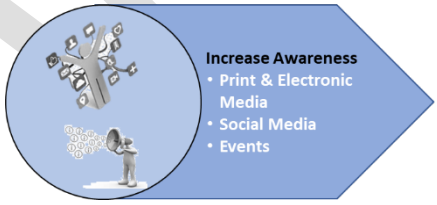
Scope: There are several river tourism activities such as water sports, river cruises, riverside markets, floating markets, among others.

3.4.3 Objectives for Social Cohesion Element

3.4.3.1 Objective 9: To increase awareness on river-sensitive behaviour

Rationale: It is becoming increasingly evident that the support of citizens is imperative for the success of any citywide initiative. This support becomes far easier to procure when citizens are aware of the issues at hand, and how they can help address those. Hence, there is a need for a focussed strategy to spread awareness about the benefits of healthy rivers. This will be stepping stone in inculcating river-sensitive behaviour among the citizens.

Scope: The print and electronic media are the usual avenues for implementing this objective. However, other non-traditional means such as social media, children's camps, hoardings, app-based dissemination, etc. could also be considered.



3.4.3.2 Objective 10: To engage citizens in river management activities

Rationale: This is a classical way of getting citizens to play their role in the management of the river. It works on the premise that river management cannot be the government's responsibility alone. Citizens will need to step and share the onus of responsibility. Most progressive societies have some or the other form of this governance model. In the long run, it will help create a shift in the mind-set of people towards ecological assets of the city.

Scope: The modalities through which this objective can be achieved include setting up community groups for monitoring the river health; citizen groups to interface between the government and public; among others.

4 Incorporating Urban River Management in Long-term Planning

The URMP emphasizes on two broad category of actions. These are:

A. **Urban planning-related** using various planning instruments. It is expected that these actions/recommendations would be adopted in the town's Development/Master Plan or any other long-term plan for the city.
B. **Project-based interventions** for river management. It is expected that towns will initiate the relevant projects that are required to enhance the river outlook in the town.

This section elaborates on the former.

4.1 Planning Scales

Figure 8 shows the typical ways in which rivers are addressed through plans in India. On the one hand are the regional large-scale river basin management plans, which are advocated by national missions and priorities. For example, the National Water Policy (2012)[6] prescribes that "*Integrated Water Resources Management (IWRM) taking river basin/sub-basin as a unit should be the main principle for planning, development and management of water resources*". Similarly, one of the goals of the National Water Mission (2008) is "*promotion of basin level integrated water resources management*", which is achieved through river basin management plans.

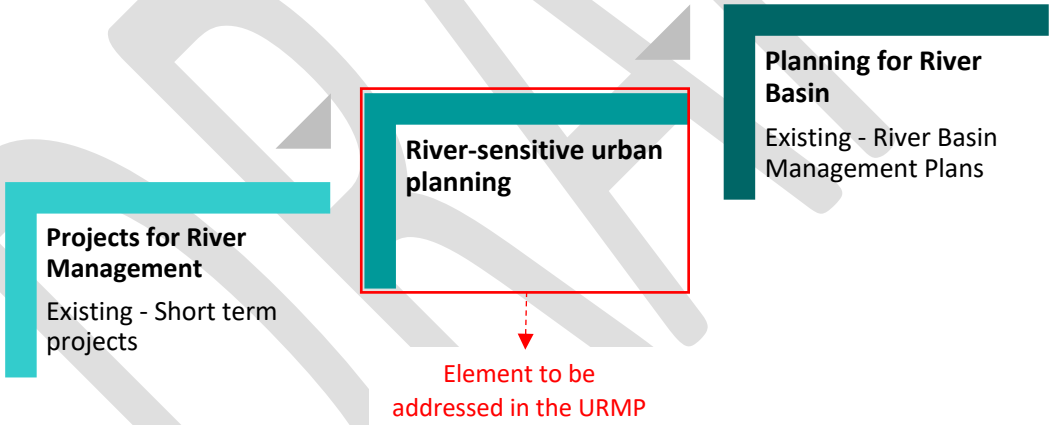


Figure 8: Typical levels of planning for river management in India

On the other hand, some cities have plans for specific elements of the river, mostly in the form of projects on riverfront development, landscape, and recreation. Examples include the Dravyawati Riverfront (Jaipur), Sabarmati riverfront (Ahmedabad), Yamuna biodiversity park (Delhi), among others.

It is; however, quite evident between these two aspects there is a space which is relatively unaddressed. This is related to river-sensitive planning, which essentially treats the river as an asset and ensures that the developmental activities in the city are not detrimental to the river. Hence, any planning for the city at large will need to take cognizance of the river and its interaction with the city.

[6] National Water Policy (2012) http://jalshakti-dowr.gov.in/sites/default/files/NWP2012Eng6495132651_1.pdf

Most cities have long-term vision plans, which outline the broad aspirations of the city, and the direction it should take in order to achieve those. As per the Urban and Regional Development and Plans Formulation and Implementation Guidelines (URDPFI, 2015)[7] there is a hierarchy of plans as presented in ***Table 2***.

Table 2: Overview of the planning systems frameworks in India (URDPFI, 2015)

Planning System	Scope and purpose of the plan	Time frame
Core area of Planning		
Perspective Plan	To develop vision and provide a policy framework for urban & regional development and further detailing	20-30 years
Regional Plan	To identify the region and regional resources for development within which settlement (urban and rural) plan to be prepared and regulated by the District Planning Committee.	20 years
Development Plan	To prepare a comprehensive Development Plan for urban areas, Peri-urban areas under control of Development authority/ Metropolitan Planning Committee.	20-30 years (Review every 5 years)
Local Area Plan	To detail the sub-city land use plan and integration with urban infrastructure, mobility and services.	5-20 year (Review every 5 yrs.)
Specific and Investment Planning		
Special Purpose Plan	To identify the needs of the special areas which require special plan within the framework of the development plan.	5-20 year (within city utilities 30 year plan)
Annual Plan	To translate Development Plan in the context of annual physical & fiscal resource requirement. To monitor plan implementation with performance milestones.	1 year
Project/ Research	To focus on project related investments, costing and returns & for the studies required prior to or post plan formulation. This should be a continuous process to support planning and implementation at all stages and promotes innovation in practice.	5-20 year

Perspective Plan: This is usually developed at a State level, and focuses in the spatio-economic policies, strategies, and programmes towards the development of the State. The plan is based on state resource mapping, analysis, and assessment of potential resources. The scope of this plan covers the social, economic, environmental and spatial development goals, policies and priorities relating to the activities that have spatial and financial implications.

Regional Plan: Regional plans are developed to ensure consistent and seamless treatment of the planning philosophy for a region, whose specific areas may be under the jurisdiction/purview of different planning Acts/Statutes. These include Town and Country Planning Act, Municipal Laws, Urban/Metropolitan Planning/ Development Act, Improvement

[7] Urban And Regional Development Plans Formulation And Implementation (URDPFI) Guidelines, 2015 http://mohua.gov.in/upload/uploadfiles/files/URDPFI%20Guidelines%20Vol%20I.pdf

Trust Act, Industrial Development Act, Cantonment Board Act, Major Ports Act etc. Often these laws are mutually exclusive, which may lead to planning conflicts and sub-utilization of land. The Regional Plan helps avoid such issues.

Development Plan: Development plan is a statutory plan prepared (under relevant Act) within the framework of an approved perspective plan. The approved development plan allows the local authority to implement development of the land area specified under the plan with the help of local area plans and projects. The term "Development Plan" is used differently in States. Some States use it for an integrated multi-sector plan, such as the District Development Plan. Some states call it a Master Plan. Here, both the plans, Development plans and Master plans have the same functions and impose similar controls, with variation in the use of nomenclatures by States.

Local Area Plan: The purpose of Local Area Plans is to facilitate micro-planning to help decentralisation and improve implementation of Development Plans/Master Plans.

Special Purpose Plan: Special Purpose Plan are prepared for specific development sectors depending on its economic and environmental importance. These plans need to be within the framework of the Regional Plan, Development/Master Plan or Local Area Plan in the jurisdiction of the local authority.

Annual Plan: An Annual Plan contains the details of the new and ongoing projects that the local authority intends to implement during each financial year for necessary financial resource mobilisation and monitoring its performance. The annual plan is to be prepared by the local authority in each financial year to identify the new projects, which the authority will undertake for implementation during the year, taking into account the physical and fiscal performance of the preceding year, the priorities, the policies and proposals contained in the approved Regional Plan, Development Plan or Local Area Plan.

Projects/Research: Conceived within the framework of the Perspective plan, Development/Master plan or any of the plans in the planning system, projects are the working layouts with all supporting infrastructure and documents including cost, source of fund and recovery providing all necessary details for execution including finance, development, administrative and management.

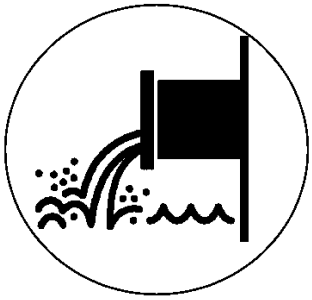
It is envisaged that this section of the URMP would be adopted in the Development/Master Plan of a city. For the purpose of consistency, these will be referred to only as Master Plan hereafter in this document.

4.2 Urban Issues that have a Bearing on River Management

The negative impacts of rapid urbanization in cities on its rivers are multifaceted. These impacts go far beyond the usually publicized concern of water pollution, extending to structural changes in the natural state of the water channels. As the urban centres have expanded in number and size, the negative impacts on river ecosystems have become more

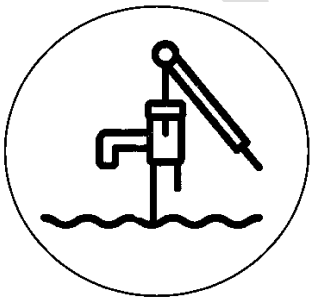
severe and widespread. The core areas of concern for river management caused by urbanization include:

Restriction of natural/ storm water channels: The River needs its space to perform its various functions, one of which is acting as a sponge to prevent flooding. However, in many Ganga towns unplanned development and encroachment along riverbanks have severely restricted natural channels. Furthermore, channelization and excessive concretization further confine the river because of which the entire geomorphology and ecology of the river gets disturbed.



Pollution: This is arguably the most severe concern in Ganga towns. Pollution from various sources—domestic and industrial sewage; agricultural runoffs; solid waste dumping; among others— are taking a toll on the rivers. In many cases, large stretches of the rivers are literally flowing sewers. As the cities heavily depend on these rivers, river pollution poses serious health issues. More importantly, the entire riparian ecosystem is heavily affected, sometimes threatening its very existence.

Over-abstraction of water: As the rate of urbanization in cities grows, the stress on water resources to meet the rising demand also increases. In peri-urban areas, agriculture water demand aggravate the situation. As the result, rivers and aquifers are fast depleting, causing changes in hydro-morphology and natural hydrological regimes of water channels.



Degrading stagnant waterbodies/ wetlands: Urban water bodies (stagnant) and wetlands are a very important avenue to stabilize the groundwater levels, in addition to providing various social and environmental benefits. They serve as an important source for groundwater recharge, augmenting groundwater levels, and thereby reducing the stress on river water resources. However, in several Ganga towns, water bodies are in a dilapidated state—resulting from encroachment, and pollution.

Depleting green cover: Green cover is very important from a river management point of view. On riverbanks, it serves as an erosion control mechanism. In other areas, it helps augment groundwater levels, and provide a habitat for biodiversity to thrive. Unfortunately, the general trend is that as cities become more urbanized, there is a decrease in the green cover.

Weak citizen-river connect: Traditionally, the river was at the centre of various societal practices—cultural, religious, livelihood-related, and recreational. While this is still prevalent in some Ganga towns, somehow many towns (especially the larger cities) have lost their connect with the river. Re-igniting this connect is very important so that citizens will voluntarily take on some of the responsibility for maintaining the rivers in the desired condition.

River governance: River governance encompasses several aspects—accountability of different stakeholders, coordination between agencies, citizen engagement, monitoring and evaluation, and finances, among others. Most Ganga towns lack a holistic mechanism for river governance. Some aspects of these can easily be taken up at the Master Plan level.

4.3 Master Plan Tools to Address Issues Related to River Management

The Master Plan is a legally binding document for the city. Hence, there is a unique opportunity for the URMP to leverage on these documents to bring about a change in the way rivers are managed in cities. The Master Plan has several tools that can be used to address the issues mentioned in the previous section. ***Figure 9*** presents an overview of these, which are discussed briefly hereafter:

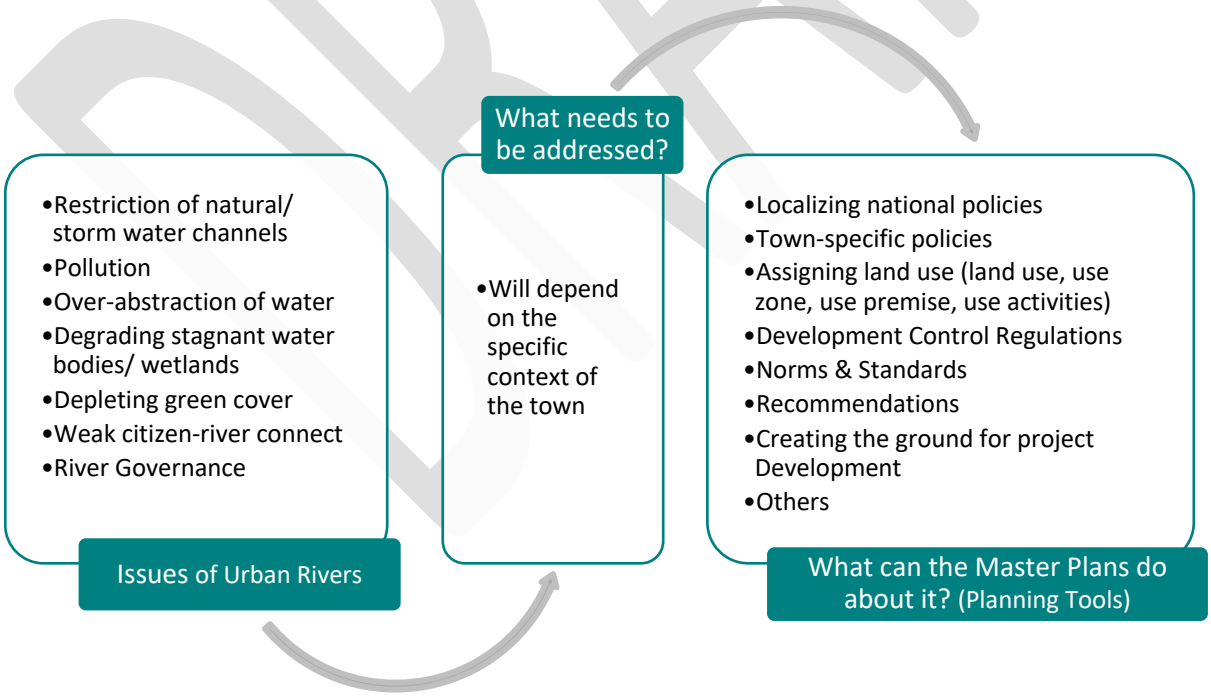


Figure 9: Master Plan Tools for River Management

Localizing national policies: As per the URDPFI Guidelines (2015), one of the objectives of the Development/Master Plan is to provide necessary details and intended actions in the form of

strategies and physical proposals for various policies established at a higher level. Several policies/initiatives at the national and State level have direct implications on river management aspects. These include the *National Policy on Faecal Sludge and Septage Management*, 2017 (for sanitation management); *Swachh Bharat Abhiyaan, 2014* (for both wastewater and solid waste management); *Jal Shakti Abhiyaan*, 2019 (for water bodies rejuvenation, water conservation, afforestation, and groundwater recharge); *Draft National Forest Policy*, 2018 (for forest management); National Water Policy, 2012 (which has considerable river-related clauses); *National Water Mission*, 2011 (for climate-change related implications), *Street Vendors Act*, 2014, among others. The Master Plan of a town should devise specific localized strategies to bring out the customized implementation of these policies.

Town-specific policies: The Master Plan also has the flexibility to propose policies that are very relevant for the town, and which may not be covered at the national/state level. Examples of such policies include citizen engagement policy, blue-green policy, and urban forestry policy, among others.

Assigning land use: This has traditionally been one of the core functions of the Master Plan. The basic idea is to allocate different land use types within the town to allow for systematic urban development. For example, the Delhi Master Plan 2021 has nine land use categories—residential, commercial, industrial, recreational, transportation, utility, government, public and semi-public facilities, green belt/and water body. Each land use category can be further sub-divided into *land use zones*. For example, the Delhi Master Plan has three land use zones under the 'green belt/and water body' land use category. These are plant nursery; green belt/agricultural greens; and river and water body. The land use zone can be further divided into *land use premises*. Land use premise can be permitted across different land use zones. For example, a commercial land use zone could have a use premise of 'local shopping centre' but this premise may be permitted in the residential land use zone as well. Finally, each use premise there are a certain *use activities* that can be permitted.

For proper management of the land adjacent to the river, appropriate land uses and use zones have to be assigned within the Master Plan guiding the development for the entire area. Protective and eco-sensitive areas shall be earmarked separately to cater to their specific development needs. Moreover, specific permissible and restricted activities have to be identified clearly for imposing controlled use of the river space without disturbing its natural character. In addition, the definitions of various use zone premises as well as use restrictions (uses permitted, conditionally permitted and uses prohibited) have to also be clearly specified, with a focus on maintaining the eco-sensitivity of the area.

Development Control Regulations: These include development regulations for proposed land use categories involving building regulations and building bye-laws, architectural controls, specific development controls for all areas, especially eco-sensitive areas. For river cities, once the floodplain zone has been clearly demarcated, there can be different considerations for regulations within that particular zone. For example, in area liable to flooding in a 25-year frequency flood, residential buildings could be permitted with certain stipulation of

construction on stilts (columns), minimum plinth levels, prohibition for construction of basements and minimum levels of approach roads, only double story buildings in urban areas, utilization of ground floors for schools and other non-residential purposes.

Norms and Standards: Norms are used as a tool to ensure consistency in the planning approach for the development landscape in the city. River specific norms for development within the river zone can help facilitate restricted and regulated development within the area. Hence, there can be norms for minimum buffers in river zones, environmental flow, setback distances, extent of channelization, etc. Standards, from a river point of view, are tools to ensure the quality of the riverine resources do not suffer because of urban development activities. Standards could be quantitative or qualitative value. For example, there are standards for river water quality, groundwater quality, river biodiversity, among others.

Recommendations: The Master Plan is also very well placed to make recommendations on current and emerging aspects that need to be addressed. For example, climate change is likely to alter river flows, thereby disturbing the ecology that depends upon on it. Similarly, in view of depleting rivers and groundwater, it is becoming increasingly evident that water demand management is the only way forward for large urban areas to meet their water demand. The Master Plan has the authority to provide tangible recommendations and directions to the various agencies to take action in this regard.

Creating the grounds for Project development: Specific riverfront development projects like ghat development, cleaning projects, development of eco-recreational sites, eco-tourism infrastructure can be identified as model projects within the Master Plan for development of river cities.

For more details, please refer to the publication "**Mainstreaming river management into city planning**"[8] developed by NIUA-NMCG, which also has case studies and examples to provide greater clarity.

5 Potential Interventions under URMP

This section describes some of the interventions that can be implemented as part of the URMP in order to achieve its objectives. Only brief descriptions of the interventions are provided. However, references are provided for each intervention that offer comprehensive details of how to implement the interventions. **It is important to note that these are only indicative suggestions. The towns have the freedom to choose any other intervention so long as the objectives are fulfilled.**

The interventions are presented, hereafter, for each element of the URMP.

[8] Link to be provided shortly

5.1 Potential Interventions for River Health Element

5.1.1 Revival of Urban Waterbodies (Lakes, Ponds, Wetlands)

Water bodies are one of the biggest natural assets in a town. Their presence provide added social, psychological and environmental value to the city. Most cities or towns have several water bodies. Unfortunately, these have had to endure the most of developmental pressures. Preservation, conservation and rejuvenation of water bodies in urban areas is important to ensure both the quality of life of its citizens, as well as enhance the environmental outlook of the area.

Reviving urban waterbodies is a systematic process that requires a certain set of activities to be followed. The Central Pollution Control Board (CPCB) has published *Indicative Guidelines for Restoration of Waterbodies (polluted lakes, ponds, rivers)* in 2019 that can serve as a reference for implementing this intervention. Accordingly, the process should include five phases as shown in ***Figure 10***, and described hereafter.

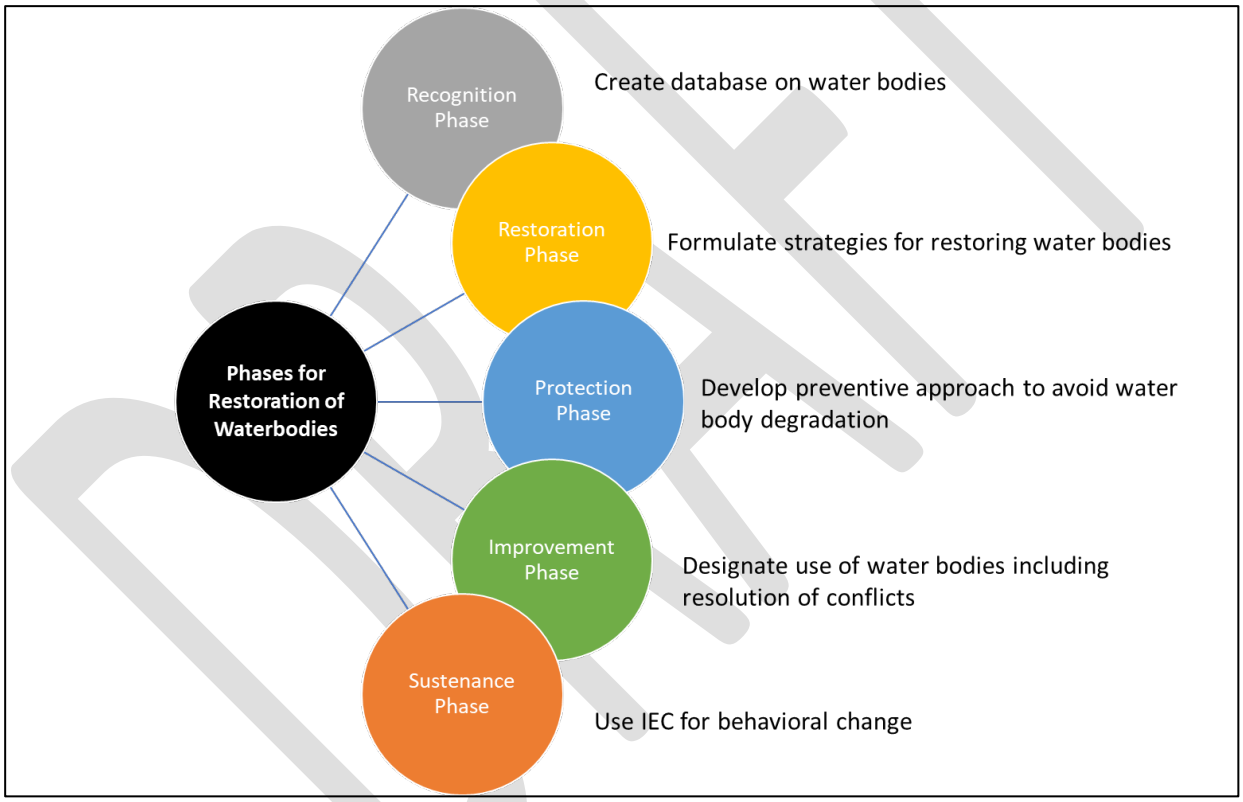


Figure 10: Snapshot of CGWB guidelines for restoration of waterbodies

(i) ***Recognition phase***: This section provides advice on how to collect and maintain information about water bodies—both stagnant (lakes, ponds, etc.) and flowing (rivers and streams). The purpose of doing so is to develop an inventory of existing and lost water bodies, and ascertain the reasons for deterioration.

(ii) ***Restoration phase***: This section offers information on how to formulate strategies for restoring water bodies. It provides guidance on how to identify sources of pollution, its quantification, and conducting a detailed gap analysis. It also details out the various steps to be followed for restoration of water bodies.

(iii) ***Protection phase***: This section is focused on developing a long-term, preventive approach to prevent the causes of waterbody degradation. It elaborates on aspects related to sewage management; industrial effluent management; management of waste; de-siltation; de-weeding; prohibition of discharges or disposal of waste or washing activity and action against violators; stabilization of earthen bunds and the drainage channels as well as silt and soil erosion control measures; protection drainage basin including preservation of drainage channel; removal of encroachments and blockades; and flood control measures.

(iv) ***Improvement phase***: This phase deals with the overall improvement in the water body and its uses including resolution of conflicts among competing users of lake resources, taking into account the needs of present and future generations.

(v) ***Sustenance phase***: This phase focuses on sustained Information, Education and Communication (IEC) activities for ensuring long-term behavioural changes. Activities under this could include awareness raising; training; promoting public participation; dissemination of information; setting up recreational centres.

Primary Reference:

- CPCB (2019) - Indicative Guidelines for Restoration of Waterbodies (polluted lakes, ponds, rivers) https://cpcb.nic.in/openpdffile.php?id=UmVwb3J0RmlsZXMvODkwXzE1NjAxNjU0NTFfbWVkaWFwaG90bzE2MDQxLnBkZg==

Other References

- CPHEEO (2013) - Advisory on Conservation and Restoration of Water Bodies in Urban Areas http://mohua.gov.in/upload/uploadfiles/files/Advisory%20on%20Urban%20Water%20Bodies.pdf
- MoWR, RD and GR (2017). Guidelines for the Scheme on Repair, Renovation and Restoration (RRR) of Water Bodies under PMKSY(HKKP) http://pmksy-mowr.nic.in/documents/RRR_PMKSY_Guidelines_2017.pdf
- (MoEF&CC and NRCD, 2016) Guidelines-National Plan for Conservation of Aquatic Ecosystems. http://nrcd.nic.in/npca/writereaddata/fileups/Guidelines-NPCA.pdf
- Karnataka Infrastructure Development Departmenthttp://www.iddkarnataka.gov.in/assets/pdf/pre_feasibility_studies/23.Prefea_lake_cons.pdf

5.1.2 Examining and Strengthening the Existing Sewerage System

The biggest source of pollution in rivers in the Ganga River Basin is untreated wastewater. There have been several policies and initiatives launched by the government, that have had considerable impact over the years. However, the problem persists. This intervention requires the ULB to take a close look at their existing sanitation system, and identify means to strengthen it using both conventional and unconventional means.

Traditionally, municipalities have relied on centralized citywide sewerage systems with extensive sewer networks and Sewage Treatment Plants (STPs). However, for smaller cities this may not always be feasible because of technical barriers, financial constraints and inadequate work force. Hence, there is a need for de-centralized (and non-sewered) approaches to complement the centralized systems to strengthen the sanitation situation of the city.

Decentralized approaches are short duration projects, economical in terms of capital and O&M expenses and provides opportunities for local recycle and reuse of treated wastewater for low quality water demands (gardening, horticulture, construction and flushing). For centralized sewer systems, the CPHEEO "Manual on Sewerage and Sewage Treatment Systems" published in 2013 can be referred. The manual provides detailed guidelines for planning and designing of sewerage system, O&M of sanitary infrastructure and overall systems management. For de-centralized systems, the "Guidelines for Decentralized Wastewater Management" by the Ministry of Urban Development (developed by IIT Madras) published in 2012 can be referred to. The synopsis of the guidelines is presented in ***Figure 11***.

As per the guidelines, strengthening of existing sewerage system will typically include the following key phases:

(i) ***Evaluation of the existing system:*** This is to ascertain the status quo of the wastewater management in the city. This phase is expected to reveal key gaps (in terms of hotspots for sewerage coverage; sewerage treatment efficiency; infrastructure concerns; human resource capacities), that need to be plugged and strengthened.

(ii) ***Project identification phase:*** Potential areas in city where decentralized sewerage system can complement the centralized system. Newly developing zones, and poor settlements can be preferred first.

(iii) ***Project pre-feasibility & feasibility phase***: Screening and ranking of alternatives for technology choice, funds (government & non-government), detailed assessment of social, legal, environmental and institutional aspects.

(iv) ***Detailed Project Report***: DPR for project implementation essentially covering architectural designs, technical specifications for engineering components, recycle and reuse options, financials for tender documents.

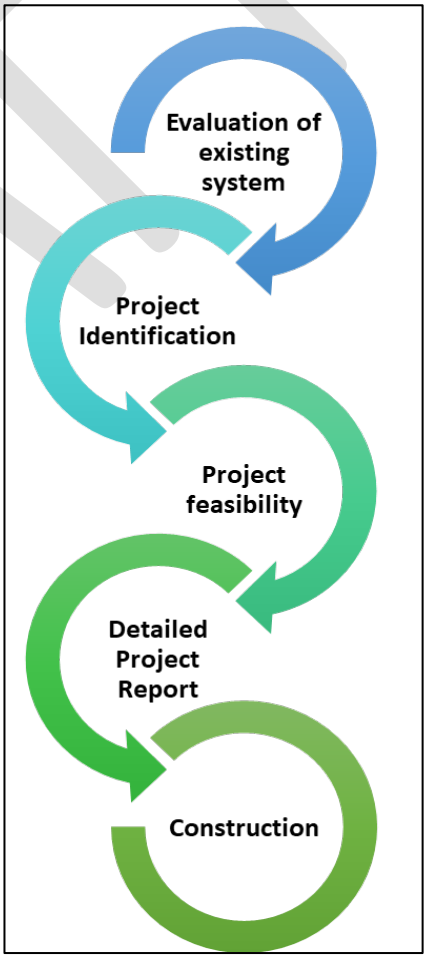


Figure 11: Phases required for strengthening sewerage systems (MoUD, 2012)

(v) ***Construction phase****:* This phase focuses on execution of project components as detailed in DPR and tendered for construction.

References:

- CPHEEO (2013) – Manual on Sewerage and Sewage Treatment Systems, Third Edition – Revised and Updated http://mohua.gov.in/publication/latest-manual-on-sewerage-and-sewage-treatment-systems-2013.php
- Guidelines for Decentralized Wastewater Management (2012) http://cpheeo.gov.in/upload/uploadfiles/files/Guidelines%20for%20Decentralized%20Wastewater%20Management.pdf
- MoUD (2012) – Recent Trends in Technologies in Sewerage System http://mohua.gov.in/upload/uploadfiles/files/swgrtech_0.pdf
- MoHUA (2018) – Urban Water Supply and Wastewater – Policy Workbook https://smartnet.niua.org/sites/default/files/resources/2-urban-wsww-policy-workbook.pdf
- REFERENCE FOR DEWATS

5.1.3 Developing Faecal Sludge and Septage Management (FSSM) Plan

There are hardly any Class A towns in the Ganga River Basin that can boast of a 100% sewered coverage. A majority of the households in the basin still use on-site sanitation systems (e.g. septic tanks, soak pits, etc.). Improper disposal of the sludge from these systems into drains, and water bodies is one of the major reasons for the state of polluted rivers. FSSM, is, therefore very much the need of the hour in cities. A typical FSSM system involves mechanized desludging of a septic tank/pit latrine using a suction emptier machine, which then stores the collected waste in a sealed container and transports it to a treatment facility. At the treatment facility (either a dedicated FSTP or co- treatment in STP), the faecal sludge/septage undergoes various stages of physical, chemical and biological treatment. The final residual product from the treatment plant is either recycled/reused or disposed safely in the surrounding environment that would comply with all pollution and quality standards. The various elements of a FSSM system in captured in ***Figure 12***.

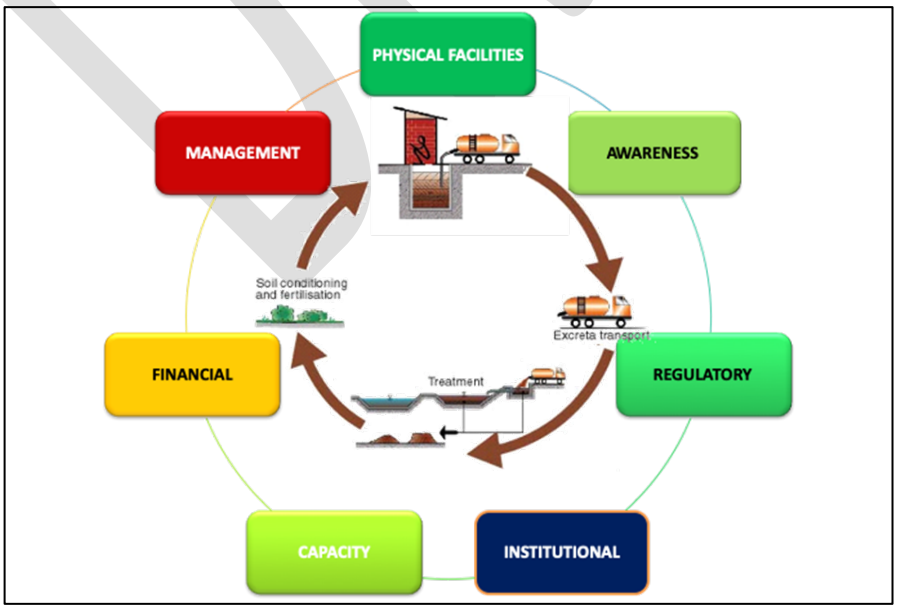


Figure 12: Key elements of a Faecal Sludge and Septage Management System.

The Ministry of Housing and Urban Affairs released the National Policy on Faecal Sludge and Septage Management (FSSM) in 2017 that highlights the role of FSSM in achieving 100% access to safe sanitation. A typical FSSM plan would include (but may not be limited to) the following:

A. Assessing the existing situation across the sanitation service chain
   - Assessment of type/number of toilets, type of on-site sanitation (septic tanks, soak pits, on-site packaged treatment plants), creation of database, spatial mapping
   - Assessment of current OSS emptying services – scheduled/on-demand, formal/informal operators, infrastructure available for desludging (type), challenges in desludging (inaccessible areas)
   - Existing legal and regulatory framework (laws, regulations, enforcement)
   - Mapping of stakeholder across the value chain
   - Financial strength of ULB, institutional capacities for FSSM planning and implementation
B. Planning for citywide Integrated Faecal Sludge & Septage Management (IFSM)
   - Planning for scheduled desludging covering entire city/town including areas currently non-serviceable
   - Planning for faecal sludge and septage treatment
   - Strategy for stakeholder engagement
   - Awareness generation and capacity building activities
C. Record-keeping, reporting (MIS), monitoring and feedback systems
D. Private sector participation for septage management activities

Primary References:

- National Policy on Faecal Sludge and Septage Management (FSSM, 2017) http://amrut.gov.in/upload/newsrelease/5a5dc55188eb0FSSM_Policy_Report_23Feb.pdf
- Septage Management: A Practitioner's Guide (2017). Centre for Science and Environment, New Delhi.

Other References:

- Guidelines for Faecal Sludge and Septage Management in Bihar (2018) http://www.indiaenvironmentportal.org.in/files/file/Guidelines%20for%20Faecal%20Sludge%20and%20Septage%20Management%20in%20Bihar.pdf
- Greater Visakhapatnam Municipal Corporation Faecal Sludge and Septage Management Policy and Operational Guidelines (2017) https://scbp.niua.org/sites/default/files/Vishakhapattanam%20FSSM%20Guidelines.pdf

5.1.4 Constructing Groundwater Recharge Structures

The need for groundwater recharge is becoming increasingly acute in most of the cities in the Ganga River basin. The benefits of groundwater recharge are not only related to augmenting the water supply but also to reduce the impacts of flooding. Furthermore, in coastal cities, this also has the benefit of reducing saltwater intrusion. To ensure proper and effective groundwater recharge, it is important to plan an artificial recharge scheme in a scientific manner. It is, therefore, imperative that proper hydro-geological investigations are carried out for selection of sites for artificial recharge of groundwater. The available techniques for groundwater recharge are easy, cost-effective and sustainable in the long term. Individuals

and village communities with locally available materials and work force can adopt many of these. ***Figure 13*** presents a holistic perspective of the mechanics of groundwater recharge in an urban setting.

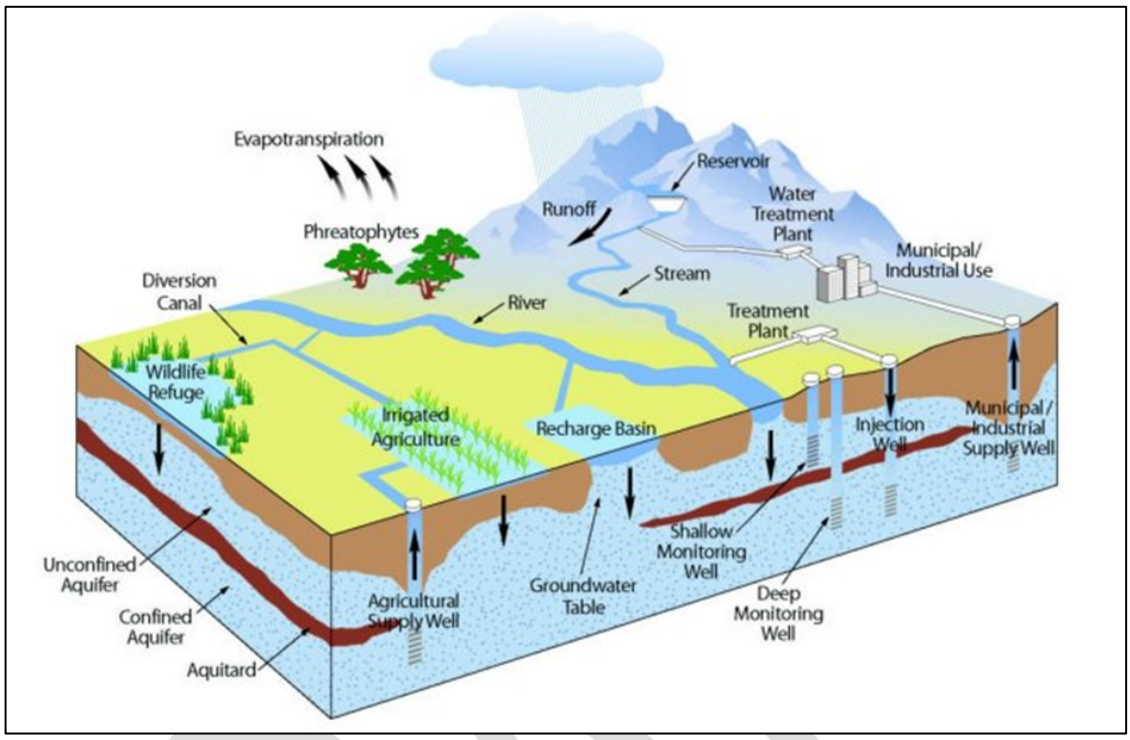


Figure 13: Groundwater mechanics in a typical urban setting (Source: Department of Water Resources, California)

Traditionally, groundwater recharge structures have been constructed to capture rainwater (rainwater harvesting) falling in the city through recharge pits, recharge wells, direct bore well recharge, and household level rainwater harvesting units. There are practical examples of these implemented in cities across the Ganga River Basin. **However, in contemporary practice, there has been an emphasis on using treated wastewater as a source for groundwater recharge**. This not only helps in reducing the dependence on traditional water sources (by reducing the stress on those), it also helps in completing the wastewater management cycle effectively. No matter what the source of recharge is, designing large-scale recharge structures needs understanding of rainfall, local topography, slope, depth of water table, and other technical elements. The Central Ground Water Board published a Manual on Artificial Recharge of Ground Water in 2007 that can be used as a reference in this regard. The various aspects covered in the manual are depicted in **Figure 14**.

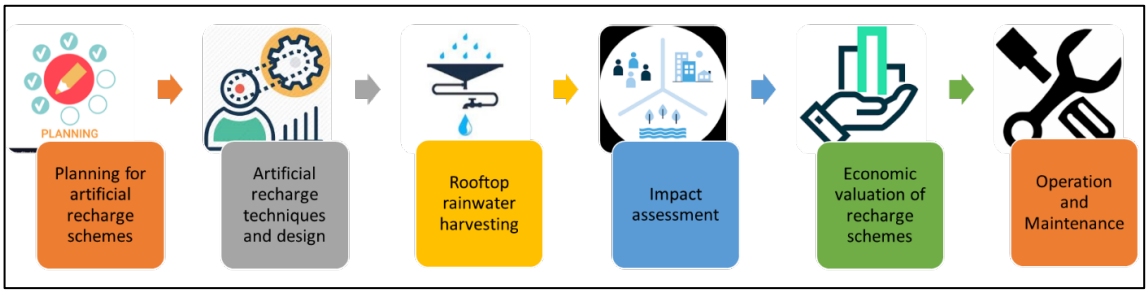


Figure 14: Elements of groundwater recharge (CGWB, 2007).

(i) ***Planning for artificial recharge schemes***: This includes establishing the need for groundwater recharge (if not done already), estimation of sub-surface storage capacity, prioritization of areas for artificial recharge, investigations for proper planning, appraisal of economic viability, and finalization of a physical plan.

(ii) ***Artificial recharge techniques and design***: This section is intended to help the user decide upon an appropriate technique for artificial recharge. There are a number of techniques/ methods used in different contexts and geographic regions. These can be broadly classified into direct methods such as surface spreading techniques, runoff conservation structures, and sub-surface techniques, and indirect methods such as induced recharge and aquifer modification techniques.

(iii) ***Rooftop rainwater harvesting***: This section provides detailed information on the various components of rooftop rainwater harvesting, data requirement for planning these systems, technical suitability, economic viability, water quality and health-related aspects, and design of these systems.

(iv) ***Impact assessment***: This section throws light on how to monitor the recharge structures in terms of water level, water quality, efficiency, and operational monitoring.

(v) ***Economic valuation of recharge schemes***: This section provides clarification on how to carry out an economic valuation of recharge schemes using various modalities such as benefit cost analysis, and socio-economic and financial appraisals.

(vi) ***Operation and Maintenance***: This section focuses on an often-neglected aspect of groundwater recharge interventions—maintaining it. It, therefore, elaborates on aspects such as operational data requirements, preventive maintenance, and how to address potential problems.

Primary References:

- Manual on Artificial Recharge of Ground Water (2007). Central Ground Water Board http://cgwb.gov.in/documents/Manual%20on%20Artificial%20Recharge%20of%20Ground%20Water.pdf

Other References:

- A Water Quality Guide to Managed Aquifer Recharge in India (2014). CSIRO Land and Water Flagship, Australia and UNESCO International Hydrological Programme https://recharge.iah.org/files/2016/11/A-Water-Quality-Guide-to-MAR-in-India-2014.pdf

5.2 Potential Interventions for Economic Value Element

5.2.1 Developing River Markets

River markets (or floating markets) have traditionally been an integral part of river cities, serving as an avenue for trade and commerce and contributing to the city's economy. This also helped strengthen the connection between the city and the river. However, with time, these markets started to be replaced by other larger markets further away from the river. In today's time, it may be difficult for river markets to be the avenue for the main source of trade and commerce, especially in larger cities. However, as is evident in many cases around the world (e.g. Bangkok, Ayutthaya, and Chiang Mai in Thailand; Lokbaintan and Banjarmasin in Indonesia; Colombo in Sri Lanka; Bangladesh), these can certainly serve as a secondary source. More importantly, it can help ensure that the connect between the city and the river is enhanced and valued.

There are some good examples of river markets in India as well. A floating market exists in Srinagar in Jammu and Kashmir on the Dal Lake (***Figure 15***) that operates daily, with vendors selling produce grown on the banks of the lake. A similar market called '*Floating Triveni Super Store*' operates in Kerala that offers subsidised rates on sales. In 2018, a floating market was opened in *Patuli*, Kolkata (***Figure 15***), on a canal adjacent to the Eastern Metropolitan Bypass. It features more than 200 vendors and 100 boats selling fish, fruit and vegetables. Such unique concepts can be replicated in other cities located on riverbanks, or where large waterbodies exist.

Figure 15: Floating river markets in Dal Lake, Srinagar (left) and Patuli, Kolkata (right)

In addition to fruits and vegetables, these markets could also support aquaculture activities, given that the Ganga River is home to 143 species of fish. In many cities, a vibrant river market is a top tourist attraction, thereby boosting the local economy.

Based on the experiences of cities that have river markets, following are some guidelines for developing river markets:

(i) ***Admission of Vendors and Products***– This should detail out the application process for vendors who wish to set up their stalls (permits, licenses, taxes, insurance, etc.). It should also provide directions on eligible/non-eligible products and packaging requirements.

(ii) ***General Market Rules***– These should provide information on daily operations, booth assignments, cancellation policies, disposal of waste, enforcement policy, grievance policy, and related aspects.

(iii) ***Vendor Fees and Space***– This should throw light on the dimensions and allocation of booths, the type of infrastructure provided to vendors, fees that the vendors will have to pay the market association, and other details.

(iv) ***Promotion*** – This will elaborate promotional activities that the market association authority should undertake in order to improve the visibility and the footfall in the markets.

Support from Central Inland Fisheries Research Institute, Inland Waterways Authority of India will be instrumental for planning river markets.

In recent years, there has been a burst of riverfront development projects across Indian cities. Examples include Sabarmati River Front (Ahmedabad), Dravyavati River Front (Jaipur), and Ganga River Front (Patna), among others. Most of these projects are on a large-scale, requiring significant funding and budgets. Small and medium towns, however, may not have access to that kind of funding. River markets are a wonderful alternative to leverage on the economic potential of the river as well as to promote the river-city connect to preserve riverine environment.

References:

- Red River Market. 2019 Vendor Guidelines https://www.redriver.market/guidelines
- Margaret River Farmers Market. Rule and Guidelines. https://www.margaretriverfarmersmarket.com.au/about-mrfm/guidelines/

5.2.2 Eco-sensitive Riverfront Development

Riverfront development is a unique opportunity to bring the river to the 'front yard' of the city from the generally neglected state in which they are usually found. It, thus, has the potential to turn the river from an eyesore into a cynosure. Each new investment along the rivers encourages activity, unleashes vitality and increases land value, while providing places for people to enjoy. While there have been a burst of riverfront development projects in India, there has also been criticism that these have focused more on the economic aspects, sidelining the ecological elements. It is, therefore, important that all the three pillars of sustainable development—economic, social and ecology—are taken into consideration when designing these projects. NMCG (in collaboration with the World Resources Institute) has recently published a Guidance Note for Urban Riverfront Development. The note details the protocols for the design, implementation, and governance of riverfront developments. It also outlines mechanisms to ensure smooth O&M for riverfront development projects.

From purely a design point of view, it would be useful to refer to a report published by the American Planning Association (2004) that provides guidelines for ecologically sound riverfront planning and design practices. The report recommends five *General Principles* for ecologically sound riverfront design; five *Planning Principles* to emphasize on the celebration of the river, and provide broad public access for riverfront recreation; and eight *Design Principles* suggesting how to implement the general and planning principles. These are summarized in ***Figure 16***.

Main References:

- Reviving India's Riverfronts Guidance Note for Urban Riverfront Development. NMCG and WRI (2019)
- Ecological Riverfront Design: Restoring Rivers, Connecting Communities, American Planning Association, Advisory Service Report, 2004 https://www.csu.edu/cerc/documents/EcologicalRiverfrontDesign.pdf

Other References

- Chicago River Design Guidelines, Department of Planning & Development, City of Chicago, January 24, 2019
- https://www.chicago.gov/content/dam/city/depts/zlup/Planning_and_Policy/Publications/Chicago_River_Design_Guidelines/chicago_river_design_guidelines_2019.pdf

- A Guide to Riverfront Development - Connecting communities to the water, Riverlife
- http://riverlifepgh.org/wp-content/uploads/2016/10/A-Guide-to-Riverfront-Development.pdf

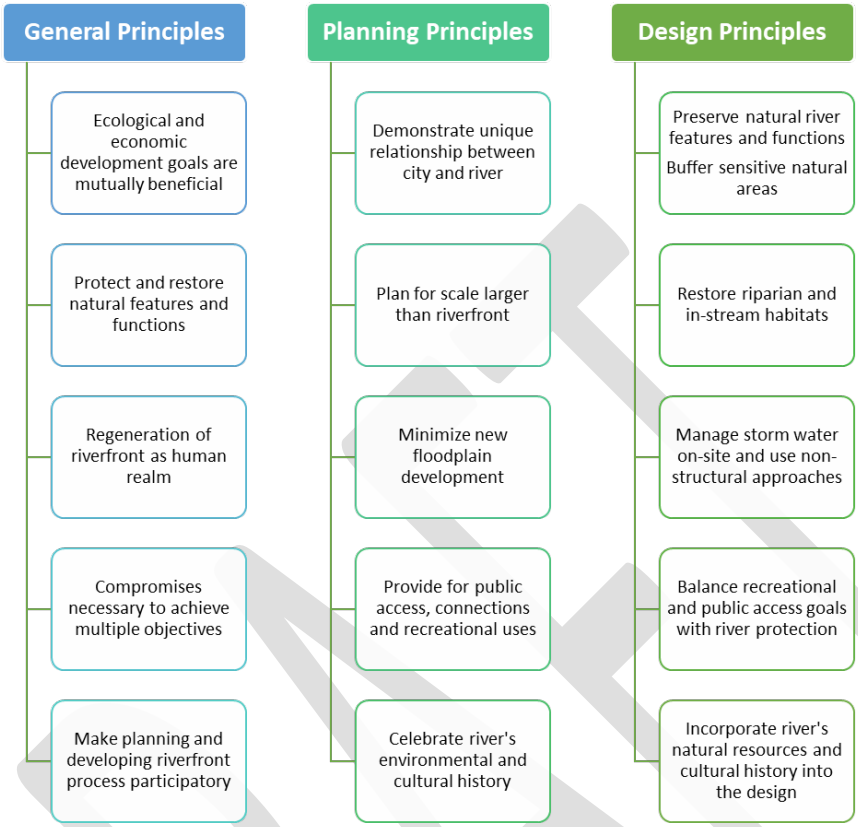


Figure 16: Principles for ecological riverfront design (American Planning Association, 2004)

5.2.3 Creating Eco-friendly River Tourism Opportunities (e.g. water sports, river navigation, etc.)

There is a huge potential for water sports (and related activities) in the rivers of the Ganga river Basin. However, this has largely been untapped. Examples of prevailing activities include Rishikesh city in Uttarakhand State, which is a popular destination for white water rafting. Studies have shown that around 36 km stretch of the Ganges from *Kaudiyala* to *Rishikesh* towns with 12 major rapids provides ideal natural conditions for exciting water sports activity. Similarly, there is enormous potential to develop inland waterways for both commerce and tourism, which have not been taken up on a large scale. River tourism is a lucrative trade with the potential of making a major contribution to the local economies through employment on cruise ships, pleasure boats, and parks and recreational facilities along the riverbanks.

From a policy point of view, there is a strong emphasis on creating avenues for eco-friendly river tourism opportunities in India. Various state government/UT administrations provide assistance for development of tourism infrastructure, including water related sports. Similarly, the Ministry of Tourism also provides support for infrastructural facilities to promote water tourism. Furthermore, the Ministry of Shipping and the Ministry of Tourism have jointly identified eight tourist circuits for river cruise tours, and is taking measures to develop necessary infrastructure. Hence, the enabling environment for flourishing river tourism is very much there.

Some key aspects that need to be considered to develop river tourism activities are:

- Developing core infrastructure, including all weather navigable channels with requisite navigable aids and proper berthing facilities; embarkation/disembarkation arrangement for customers in the form of a jetty or pontoon; ticket counters; camping sites; first aid stations; observatory/safety stations; among others.
- Developing supporting infrastructure such as approach roads, parking areas, commercial establishments, and tourist amenities, among others.
- Maintenance of law and order at terminals, jetties, river fronts etc.
- Proper operation and maintenance of all facilities.
- Taxation and revenue sharing mechanism between the city and the service providers.

Specific considerations:

(i) The carrying capacity of the water body must be the governing factor to decide upon the scope and nature of river tourism activities.

(ii) A detailed EIA must be undertaken, which will form the basis for deciding on the allowable/prohibited activities.

(iii) It must be ensured that stringent environmental safeguards are adopted for the design and implementation of the tourism sites. These include using ecological friendly construction material; providing required setbacks and buffers; designing a comprehensive waste management system (both solid and liquid); minimal use of fossil fuels; noise control measures; and related features.

(iv) As per the National Tourism Policy, the Department of Tourism in co-ordination with the Directorate of Ports and Inland water transport, Department of Water Resources, National Institute of Water Sports, or any other suitable agency will identify and demarcate specific areas where water sports operators can operate their equipment.

(v) The Department of Tourism or competent authority will demarcate areas for swimming zones and water sports activity zones by installing proper demarcating materials like floating buoys, etc. The demarcated areas would comprise water sports corridors, water sports activity area, safe swimming and bathing areas, etc.

References:

- Guidelines for Surface Adventure Water Sports Activities 2016 - Andaman & Nicobar Islands Surface Adventure Water Sports Guidelines 2016 https://www.andamantourism.gov.in/Brochures/Water_Sports_Guidelines_2016.pdf
- RFP document for promoting water sports activities in notified water bodies of Madhya Pradesh for planning, design strategy, monitoring, documentation and supervision of water sports activities taken up by the MPTB under Paryatan Neeti 2016 http://off.mpstdc.com/Content/TenderDoc/Application%20Ad%20Watar%20Sports%20counsaltant.pdf
- National Tourism Policy (2002) – Department of Tourism, Ministry of Tourism and Culture, GoI http://tourism.gov.in/sites/default/files/policy/National%20Tourism%20Policy%202002.pdf

5.3 Potential Interventions for Social Cohesion Element

5.3.1 Developing Biodiversity Parks

The scope and nature of developmental activities that are permitted in the river floodplains are usually limited to ensure minimum impact on the river environment. There are, therefore, limited options. In view of these constraints, it is important for cities to make optimal use of the floodplain area. One of the activities that can be considered is the development of Biodiversity Parks, which are increasingly becoming an attractive option in cities. Floodplains are fertile areas, and hence, there is already a good degree of fauna that can be found there. Biodiversity parks seek to enhance the spread and quality of these areas. Biodiversity parks not only conserve natural resources of an area but also have educational and cultural value– especially for environmental sustenance in urban centres. The underlying principle of the Biodiversity Park is to recreate self-sustaining ecosystems with native flora and fauna characteristics of the area for enhancing the quality of urban environment. Biodiversity parks differ from National Parks or wildlife sanctuaries in the nature of legal notification and protection. Biodiversity parks are usually not legally notified as protected areas, unless they are already part of a protected area. There are several examples of biodiversity parks in India, notably Delhi, which has six of these parks. In the absence of standard references that provide guidelines for developing biodiversity parks, some good research papers can provide useful insights. For example, a widely cited paper by Parris *et al*. (2018), advocates seven principles for biodiversity planning in cities as summarized in ***Figure 17***. These are:

(i) ***Principle 1-Protection***: The first principle is to identify and protect areas of high biodiversity (both current and potential) in the floodplains. It is rarely possible to recreate entire ecological communities or ecosystems once they are lost. Hence, it is often more effective to keep existing biodiverse areas than to attempt to recreate them in the future. Such areas may include patches of remnant vegetation, wetlands, natural drainage lines, or larger green spaces containing varied habitat types.

(ii) ***Principle 2-Connectivity***: The second principle is to maintain or re-establish connectivity between areas of habitat to allow the movement of animals and the propagules of fungi and plants (spores, pollen and seeds) across the urban landscape. Such movement is important for the maintenance of genetic diversity and the long-term persistence of populations and diverse ecological communities.

(iii) ***Principle 3-Construction***: The third principle is to construct ecological features that can provide habitat for a range of plant and animal species. To retain biodiversity, parks need

to construct ecosystem components that enhance not just the number but also the diversity of spaces for species.

(iv) ***Principle 4-Cycles***: Water, nutrient and energy recycling are critical for sustaining ecosystem services and biodiversity. Conversely, the ecosystem services these cycles provide (such as clean water and the removal of pollutants) depend on diverse biological communities. Biodiversity parks must look to effectively manage these biogeochemical cycles.

(v) ***Principle 5-Interactions***: Biological interactions including competition for resources, symbiosis, herbivory, predation, pollination and parasitism are important processes that shape the biodiversity of a given location. It is important to acknowledge and plan for these interactions while designing the biodiversity parks.

(vi) ***Principle 6-Benevolence***: There are some obvious adverse impacts of urbanization on biodiversity, such as fish death due to polluted water, migration of birds due to air pollutions, etc. However, in many cases, the negative impacts are more subtle. For example, artificial light at night can interfere with circadian rhythms, sleep patterns and navigation in animals. It is important that biodiversity parks modify current design practices and standards by incorporating ecological knowledge and evidence can help mitigate impacts associated with the hostility of built structures within it.

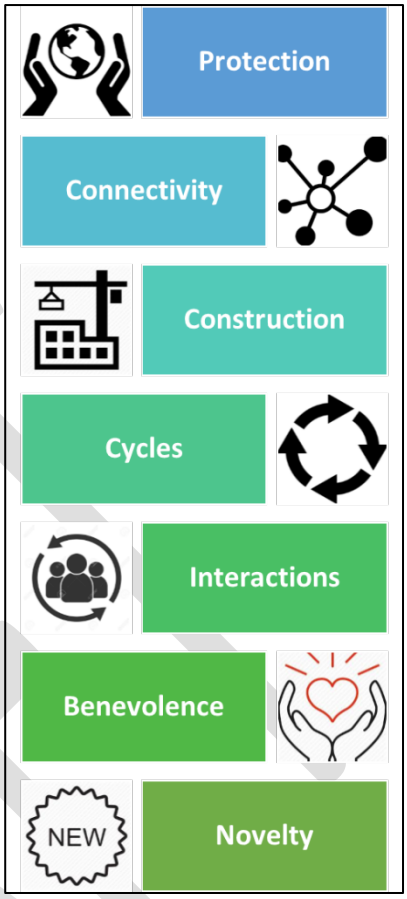


Figure 17: Principles for biodiversity planning in cities (Parris et al. 2018)

(vii) ***Principle 7-Novelty***: Novel ecological communities and novel ecosystems are characterized by the presence of new combinations of native and exotic species, without historical analogue. For biodiversity to persist or increase in urban environments, areas supporting novel ecological communities need to be acknowledged as important habitats even though their abiotic and biotic conditions may differ from those of the remnant ecosystems. Urban biodiversity exists not only in reserves and parks, but also in ecosystems such as private gardens, constructed wetlands, business parks, wastelands and post-industrial sites.

References:

- Parris et. al (2018). The seven lamps of planning for biodiversity in the city. *Cities*, Volume 83: Pages 44-53. https://doi.org/10.1016/j.cities.2018.06.007
- Hua and Chen (2019). Prioritizing urban rivers' ecosystem services: An importance-performance analysis. *Cities*, Volume 94: Pages 11-23. https://doi.org/10.1016/j.cities.2019.05.014

5.3.2 Information, Education and Communication (IEC) Strategy for River Management

The success of any initiative for river management will depend on how well citizens are engaged. It is widely acknowledged that several projects have failed because the target beneficiaries were not engaged through the project planning and implementation stages. IEC is an approach aimed to change or reinforce positive behaviour in a target audience regarding a specific problem in a defined period. The aim of designing IEC in the present context is to inculcate a more river-sensitive behaviour in the citizens, and re-establish the connect with the river that has diminished over time. The IEC strategy should combine different approaches and explore various media in order to enable relevant stakeholders to play an active role in protecting and sustaining river health.

The key steps to guide the development of a comprehensive IEC program are depicted in ***Figure 18***, and described hereafter.

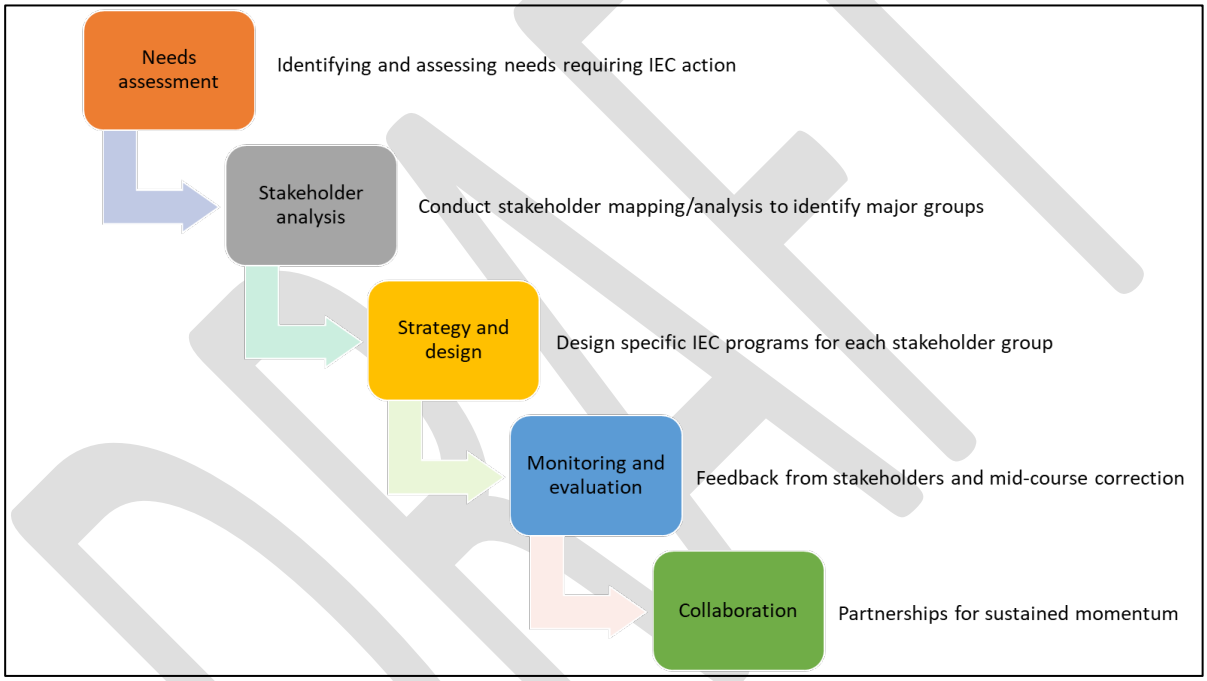


Figure 18: Key elements of an IEC program

(i) ***Conduct needs assessment***: This includes identifying and assessing the specific needs that require IEC action. The needs can be categorized into general sensitization-related and technical-related to help plan for different actions.

(ii) ***Stakeholder analysis***: The IEC content and delivery will vary as per stakeholder groups. Hence, it is important to conduct a stakeholder mapping/analysis to identify the major groups. These could include government agencies; industries; farmer communities; religious leaders; schoolchildren; women's groups; and general citizens.

(iii) ***Strategy and design*****:** The IEC strategy should specifically consider each stakeholder group and devise an explicit strategy that addresses three main elements–Who needs to be communicated with? What needs to be communicated? and How should it be communicated? Specific IEC programmes should be designed addressing these elements.

(iv) ***Monitoring and Evaluation:*** Like any other progressive initiative, IEC is a dynamic process. It is, therefore, important to solicit feedback from stakeholders on the IEC

activities with the objective to ''reflect, learn, and modify'. The M&E framework for IEC should include tangible indicators that are capable of providing insight for mid-course correction (if required), and new directions for the future.

(v) ***Collaboration****:* In order to scale up the effect of IEC initiatives, it will be important to have partnerships with like-minded partners (e.g. NGOs, RWAs, Schools, Colleges, etc.). It may not always be possible for the city officials (ULBs) to keep up a sustained momentum for IEC. These partners can, therefore, help plug this gap. Furthermore, it will be useful to collaborate with academia to develop relevant state-of-the-art IEC material based on sound scientific research.

References:

- ADB (2010) - Demonstrating Information, Education, and Communication Campaign Using Community-Based and Multimedia Strategies for the Rehabilitation of Pasig River and Its Waterways https://www.adb.org/results/water-pda-demonstrating-information-education-and-communication-campaign-using-community-based-and
- Middleton J. (1983) - IEC planning: eight state-of-the-art principles https://www.ncbi.nlm.nih.gov/m/pubmed/12312734/

6 Financing Mechanism for URMP

Finances are usually the deciding factor that dictate the realization of a plan. It is, therefore, important that the URMP clearly indicates the source and modality of procuring the finances for implementing the interventions. The URMP interventions could range from small-scale projects like construction of public toilet blocks to large-scale projects like construction of a STP. Each of these interventions will require financing for both capital and O&M expenditures. As mentioned earlier, it would be ideal if the URMP could leverage on the funding from national missions. For example, AMRUT funding can be used for sewerage related projects. Similarly, fixing sensors for river pollution monitoring could be covered under the funding from Smart Cities Mission. However in case of specific interventions (e.g. Riverfront Development) which cannot directly converge with ongoing missions of government, following indicative financial options could be explored by ULBs. Many of these options are quite common and have already been used by ULBs in the past.

6.1 Viability Gap Funding (VGF)

It is a type of a one-time or deferred grant from the government for those projects that may not be financially viable though they are economically justified and necessary. The VGF scheme was launched in 2004 by the Ministry of Finance to support projects that comes under Public Private Partnerships. The grant could be up to 20 per cent of the total capital cost of the project. The project shall be implemented i.e. developed, financed, constructed, maintained and operated during the project term by a Private Sector Company to be selected by the Government or Government agency or specified Government agency through a process of competitive public bidding process**. Support under this scheme is available only for infrastructure projects**.

The following interventions under the URMP could avail VGF:

- Water supply & sewerage projects.
- Solid waste management infrastructure.
- Tourism and convention centres
- Riverfront development

6.2 Value Captured Finance (VCF)

Value capture is based on the principle that private land and buildings that benefit from public investments in infrastructure and policy decisions of the government, should pay for it. For example, construction of a riverfront development project could enhance the land value in the neighbouring areas. Hence, the occupants of these areas should pay for this enhancement. This gives the government the opportunity to launch new projects even with a small resource base. The main types of VCF instruments are:

- Land value tax
- Development charge
- Fee for change of land use
- Betterment levy
- Transfer of development rights
- Premium on the relaxation of Floor Area Ration and Floor Space Index rules
- Vacant land tax
- Zoning relaxation for land acquisition
- Tax increment financing

This option could be useful and explored for the riverfront development projects where the land value is expected to increase. The private sector will also be interested because the revenue potential is very high, with high footfall. Such development can also trigger the development of public transportation infrastructure because of which the land value will keep increasing over time.

6.3 Centre/State Finance Commission Grants

The 14th Finance Commission had a five-year (2015-20) allocation of Rs. 87,143 cr. for the ULBs. The commission recommended grants to states for three purposes: (i) disaster relief, (ii) local bodies, and (iii) revenue deficit. The finance commission grants are provided only for the basic services to the ULBs. The commission has recommended two main type of grants i.e. Basic and Performance. Basic grants are intended to support the delivery of basic civic services. In context of the URMP, these could include water supply, sanitation (including septic management), solid waste management, storm water drainage, burial and cremation grounds, etc. Performance Grant has been designed to serve the purpose of ensuring reliable audited accounts, data of receipts and expenditure and improvement in own revenues. The ratio of basic to performance grant is 80:20 for urban local bodies. The instalment release for the grants are June and October. To access these grants ULBs have to prepare a plan in line with the Service Level Improvement Plan-(SLIP) of AMRUT guidelines.

6.4 CAMPA Fund

The Compensatory Afforestation Fund Management and Planning Authority (CAMPA) funds are meant to promote afforestation and regeneration activities as a way of compensating for forestland diverted to non-forest uses. These funds are collected from developers who have

razed forestland for construction projects. Afforestation has several implications for the river environment. First, it helps to control erosion in the river. Second, it provides a natural habitat for the riverine ecosystem. Third, it helps to act as a buffer between the river and urbanized landscape. Fourth, it provides ideal locations for biodiversity parks and other similar features.

CAMPA fund can be used by cities to increase the forest cover in the identified sections of the city. It can also be used to regenerate forest ecosystems, wetlands, and infrastructure development to support the regeneration.

6.5 Corporate Social Responsibility funds

Corporate Social Responsibility (CSR) of a company is its initiative to assess and take responsibility for the company's effects on the environment and impact on social welfare. The term generally applies to the company's efforts that go beyond what may be required by regulators or environmental protection groups.

The companies on whom the provisions of the CSR shall be applicable are contained in Sub Section 1 of Section 135 of the Companies Act, 2013. As per the section, companies having net worth of INR 500 Crore or more; or turnover of INR 1000 Crore or more per year; or net profit of INR 5 Crore or more during any financial year shall be required to constitute a Corporate Social Responsibility Committee. The Committee is tasked with ensuring that the **companies shall spend, in every financial year, at least two per cent of the average net profits of the company made during the three immediately preceding financial years**.

6.6 Capital and Revenue Grants of Urban Local Bodies (Entry Fees)

Entry fees to recreational areas controlled by the ULBs are a way of collecting additional funds. These entry fees are sometimes applicable for parks, gardens, parking areas, entertainment zones, zoos, planetarium, etc. Many of the proposed interventions in URMP like lakes, riverfront development, bio-diversity parks, sports and tourism zones along river would qualify for the collection of the entry fees. The ULBs can make conditions and provisions to collect entry fee as their revenue to meet O&M costs of the facility created.

Table 3 presents an overview of these financial instruments. It also has weblinks (wherever applicable) that provide more details on how to apply/access the funds under these instruments.

Table 3: Overview of possible financial instruments for URMP interventions

Financial Instrument	Criteria	Provision	URMP interventions that can be covered	How to access the grant/funding
Viability Gap Funding (VGF)	• Only for infrastructure projects • It must be PPP model; • 20% of total project cost funding possible. • 51% or more private investment	Slots <100 cr. 100-200 cr. >200 cr.	• Water Supply, • SWM, • Tourism, Convention Centre • Public Sanitation Facilities	https://www.pppinindia.gov.in/schemes-for-financial-support
Value captured Finance (VCF)	• Applicable for areas, which have (or will), see an increase in land value because of government projects.	Variable and project dependent	• Any	http://smartcities.gov.in/upload/5901982d9e461VCFPolicyFrameworkFINAL.pdf
Compensatory Afforestation Management & Planning Authority (CAMPA) Fund	Only for: • Compensatory afforestation • Soil moisture conservation • Wildlife management and catchment area treatment • Training and awareness raising	Variable; every year, disbursed to states Current year announcement Rs. 47, 436 cr.	• Urban afforestation programs, • River bank erosion protection • Setting up biodiversity parks	http://moef.gov.in/wp-content/uploads/2017/06/CAMPA-guidelines.pdf
Centre/State Finance Commission	• Basic and Performance type grants • Ratio of Basic to Performance grant is 80:20 for urban local bodies	Five year allocation 2015-20 for ULBs Rs. 87,143 cr.	Finance commission grants are provided only for the basic services to the ULBs	
CSR/Private Sector	• CSR is mandatory for companies with net worth of INR 500 cr. or more; or turnover of INR 1,000 cr. or more; or Net Profit of INR 5 cr. or more during any financial year • Company should spend at least 2% of the average net profit made during the three immediately preceding financial years	Depending upon the company	Project areas that may interest companies: • Afforestation • Water supply • Sports & Culture • Ghat development • Riverfront development • Riverside parks and gardens • Community engagement	http://www.mca.gov.in/MinistryV2/csrdatasummary.html
Capital and Revenue Grants of Urban Local Bodies (Entry Fees)	• Recreational areas and supporting facilities	Depending on the facility	• Riverside parks and gardens • Biodiversity parks • River tourism • Sporting activities zone • Riverfront development	

7 Monitoring & Evaluation

Monitoring and Evaluation (M&E) is a vital element of the URMP. It provides a mechanism to evaluate the progress of implementation of the URMP vis-à-vis its objectives.

7.1 Monitoring

The implementation of the URMP would be monitored through 10 indicators, which could collectively culminate into an index called URM_{index}. The URM_{index} is measured on a scale from one to five, and is useful to paint a snap shot of the situation, which can be used to monitor the implementation of the URMP, and develop overall strategies and policies for enhancement. The interpretation of URM_{index} is presented in ***Table 4***.

Table 4: Interpretation of the URM_{index}

URM_{index}	**Interpretation**	**What it means?**
<1.5	Poor level of urban river management	*The city is incapable of meeting the basic requirements for effective urban river management. The river is neglected and used indiscriminately without proper planning and management. There are serious concerns for all dimensions of urban river management.*
1.6-2.5	Elementary level urban river management	*Basic actions required to ensure urban river management are evident. However, there are still major gaps and serious concerns with regards to almost all dimensions of urban river management.*
2.6-3.5	Average level of urban river management	*The city has a satisfactory urban river management system. However, some dimensions of urban river management are still a cause of concern.*
3.6-4.5	High level of urban river management	*The city is well-placed with most of the dimensions of urban river management. The dimensions may not be at par with each other, but the overall situation is still nonetheless satisfactory.*
4.6-5.0	Ideal level of urban river management	*The city is an ideal example of urban river management. There are evidences of exemplary actions against every dimension of urban river management, suggesting that the plans and policies in regards to urban river management are working well.*

Table 5 presents the ten indicators that shall be used to monitor the URMP implementation. There is one indicator for each of the objectives of the URMP. ***Table 5*** also provides details for the estimation of the indicators. As far as possible, the units of the indicators have been kept in a percentage form. This is to help in the normalization of the indicators. However, is some cases, especially for the social cohesion indicators, this is not possible. In this case, absolute values will have to be used for the normalization.

Table 5: Indicators for the estimation of the URM_{index}

Objective	Indicator	Indicator Code	Estimation
RIVER HEALTH ELEMENT			
1. *To keep the river free from pollution*	Dissolved Oxygen (DO) adherence factor (%) ***OR*** Native aquatic species factor (%)	RH_1 ***OR*** RH_1	$\frac{\text{DO concentration}}{\text{Permissible DO concentration}} \text{x } 100$ ***OR*** $\frac{\text{Native aquatic species count}}{\text{Historic aquatic species count}} \text{x } 100$
2. *To revive urban water bodies*	Water body revival factor (%)	RH_2	$\frac{\text{Number of water bodies in acceptable condition}}{\text{Total number of water bodies}} \text{x } 100$
3. *To ensure effective regulation of activities in the active floodplains*	Implementation of flood plain regulations (%)	RH_3	$\frac{\text{Area of floodplain where regulations are followed}}{\text{Total area of floodplain}} \text{x } 100$
4. *To ensure adequate return flow in the river*	Ecological flow factor (%)	RH_4	$\frac{\text{Average dry season flow}}{\text{Long} - \text{term average dry season flow}} \text{x } 100$
5. *To control erosion of river banks*	Riparian buffer factor (%)	RH_5	$\frac{\text{Total length of riparian buffer (on each side of the river)}}{\text{Total length of river (on each side) in the city}} \text{x } 100$
6. *To promote wastewater reuse*	Wastewater reuse factor (%)	RH_6	$\frac{\text{Wastewater reused}}{\text{Wastewater generated}} \text{x } 100$
ECONOMIC VIABILITY			
7. *To develop eco-friendly waterfronts*	Riverfront land value factor (%)	EV_1	$\frac{\text{Land price of areas surrounding waterfronts}}{\text{Average land price in other stretches of the river}} \text{x } 100$
8. *To promote river-sensitive tourism activities*	Footfall factor (%)	EV_2	$\frac{\text{Number of tourists visting waterfronts}}{\text{Number of tourists}} x \ 100$
SOCIAL COHESION			
9. *To increase awareness about rivers*	Citizen awareness	SC_1	Number of sensitization events/programmes organized
10. *To engage citizens in river management activities*	Citizen engagement factor	SC_2	Number of people engaged in river/water management

Normalizing the indicators: As mentioned earlier, the URM_{index} will take a value between one and five. For this, it is essential that each of the indicators are also standardized in the range 1 to 5. This is called normalizing the indicators. ***Table 6*** presents the criteria for normalizing the various indicators.

Table 6: Criteria for normalizing the indicators

Sl. No	Indicator	Indicator Code	Normalization criteria
1	Dissolved Oxygen (DO) adherence factor (%)	RH_1	***If:***
			$100 \le RH_1 < 150$; $RH_1 = 5$
			$90 \le RH_1 < 100$; $RH_1 = 4$
	OR	***OR***	$80 \le RH_1 < 90$; $RH_1 = 3$
			$70 \le RH_1 < 80$; $RH_1 = 2$
			$RH_1 < 70$ or ≥ 150 $RH_1 = 1$
			If:
	Native aquatic species factor (%)	RH_1	$RH_1 \ge 100$; $RH_1 = 5$
			$90 \le RH_1 < 100$; $RH_1 = 4$
			$80 \le RH_1 < 90$; $RH_1 = 3$
			$70 \le RH_1 < 80$; $RH_1 = 2$
			$RH_1 < 70$ or $RH_1 = 1$
2	Water body revival factor (%)	RH_2	***If:***
			$RH_2 = 100$; $RH_2 = 5$
			$90 \le RH_2 < 100$; $RH_2 = 4$
			$70 \le RH_1 < 90$; $RH_2 = 3$
			$50 \le RH_2 < 70$; $RH_2 = 2$
			$RH_2 < 50$; $RH_2 = 1$
3	Implementation of flood plain regulations (%)	RH_3	***If:***
			$RH_3 = 100$; $RH_3 = 5$
			$90 \le RH_3 < 100$; $RH_3 = 4$
			$70 \le RH_3 < 90$; $RH_3 = 3$
			$50 \le RH_1 < 70$; $RH_3 = 2$
			$RH_3 < 50$; $RH_3 = 1$
4	Ecological flow factor (%)	RH_4	***If:***
			$RH_4 \ge 100$; $RH_4 = 5$
			$90 \le RH_4 < 100$; $RH_4 = 4$
			$70 \le RH_4 < 90$; $RH_4 = 3$
			$50 \le RH_4 < 70$; $RH_4 = 2$
			$RH_4 < 50$; $RH_4 = 1$
5	Riparian buffer factor (%)	RH_5	***If:***
			$75 < RH_5 \le 100$; $RH_5 = 5$
			$60 < RH_5 \le 75$; $RH_5 = 4$
			$50 < RH_5 \le 60$; $RH_5 = 3$
			$40 < RH_5 \le 50$; $RH_5 = 2$
			$RH_5 < 40$; $RH_5 = 1$
6	Wastewater reuse factor (%)	RH_6	If:
			$RH_6 = 100$; $RH_6 = 5$

			$90 \le RH_6 < 100$;	$RH_6 = 4$
			$70 \le RH_6 < 90$;	$RH_6 = 3$
			$50 \le RH_6 < 70$;	$RH_6 = 2$
			$RH_6 < 50$;	$RH_6 = 1$
7	Riverfront land value factor (%)	EV_1	If:	
			$EV_1 \ge 100$;	$EV_1 = 5$
			$90 \le EV_1 < 100$;	$EV_1 = 4$
			$70 \le EV_1 < 90$;	$EV_1 = 3$
			$50 \le EV_1 < 70$;	$EV_1 = 2$
			$EV_1 < 50$;	$EV_1 = 1$
8	Footfall factor (%)	EV_2	If:	
			$80 < EV_2 \le 100$;	$EV_2 = 5$
			$70 < EV_2 \le 80$;	$EV_2 = 4$
			$60 < EV_2 \le 70$;	$EV_2 = 3$
			$40 \le EV_2 \le 60$;	$EV_2 = 2$
			$EV_2 < 40$;	$EV_2 = 1$
9	Citizen awareness	SC_1	If:	
			$SI_2 > XX$;	$SI_2 = 5$
			$XX < SI_2 \le XX$;	$SI_2 = 4$
			$XX < SI_2 \le XX$;	$SI_2 = 3$
			$XX < SI_2 \le XX$;	$SI_2 = 2$
			$SI_2 = XX$;	$SI_2 = 1$
10	Citizen engagement factor	SC_2	If:	
			$SI_2 > XX$;	$SI_2 = 5$
			$XX < SI_2 \le XX$;	$SI_2 = 4$
			$XX < SI_2 \le XX$;	$SI_2 = 3$
			$XX < SI_2 \le XX$;	$SI_2 = 2$
			$SI_2 = XX$;	$SI_2 = 1$

Calculating the URM_{index}: In order to calculate the URM_{index} each indicator will have to be normalized in the range 1 to 5, using the criteria in Figure 13. Hence, each indicator will have a value between one and five. An average of all the indicators will yield the URM_{index}. From this calculation, it is apparent that each indicator has equal weightage in calculating the URM_{index}.

7.2 Evaluation

Given that most of the interventions of the URMP are expected to finish in the short- to medium-term, it is worthwhile to evaluate the progress of implementation every year. ***Table 7*** presents the frequency at which the data for the indicators should be collected. However, the reporting will be on annual basis.

Table 7: Monitoring frequency for the indicators

Sl. No	Indicator	Indicator Code	Monitoring frequency
1	Dissolved Oxygen (DO) adherence factor (%) ***OR*** Native aquatic species factor (%)	RH_1 ***OR*** RH_1	Daily Yearly
2	Water body revival factor (%)	RH_2	Yearly
3	Implementation of flood plain regulations (%)	RH_3	Yearly
4	Ecological flow factor (%)	RH_4	Daily
5	Riparian buffer factor (%)	RH_5	Yearly
6	Wastewater reuse factor (%)	RH_6	Daily
7	Riverfront land value factor (%)	EV_1	Monthly
8	Footfall factor (%)	EV_2	Daily
9	Citizen awareness	SC_1	Yearly
10	Citizen engagement factor	SC_2	Yearly

8. Process for preparing a URMP

Developing the URMP is simple but requires systematic flow of information and coordination among the relevant stakeholders. ***Figure 19*** presents the schematic of the flow of the preparation process, details of which are summarized hereafter.

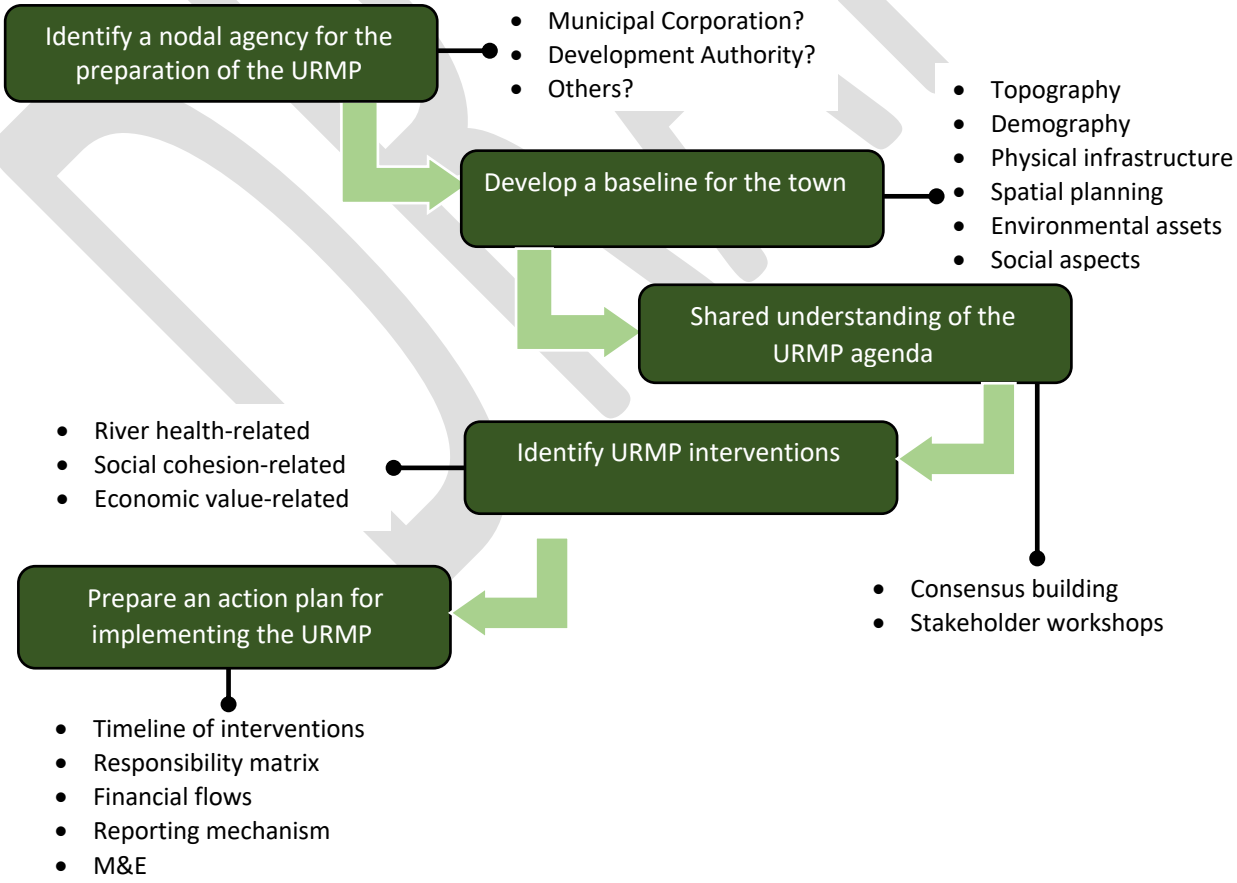


Figure 19: Steps for preparing the URMP

Step 1: Identify a nodal agency for the preparation of the URMP

While it is expected that all related organizations and agencies will be involved in the preparation of the plan, there will be a nodal agency to coordinate and lead the activities required for the preparation of the plan. It is envisaged that the Municipal Commissioner of the town will take a call on the most appropriate choice for this nodal agency. Possible options include the Municipal Corporation, City Development Authority, or others.

Step 2: Develop a baseline for the town

This step is required to ascertain the status quo of the town with respect to various parameters that have a bearing on the river. Secondary (and if required primary) data will have to be collected from all concerned agencies to develop the baseline. As far as possible, the baseline should be presented spatially to ensure that site-specific nuances are captured. The contents of the baseline shall include (but not be limited to) the following categories:

- *Topography*: (contours; slopes; geographic boundaries; river zone; soil; climate; floodplain; groundwater; etc.)
- *Demography*: (population density; location of unauthorized/slum settlements; demographic profile; etc.)
- *Physical infrastructure*: (sewerage infrastructure; drainage network; sewered and non-sewered areas; on-site sanitation systems; community/public toilets; solid waste collection centres; water supply systems; etc.)
- *Spatial planning*: (planning zones; administrative boundaries; land use; use zones/use premise; stakeholder mapping; etc.)
- *Environmental assets*: (water bodies; forests; wetlands; parks; protected areas/ecosentive zones; etc.)
- *Social aspects*: (religious and cultural establishments, especially along the river; crematoria; dhobi Ghats; boating locations; etc.)

Step 3: Set the stage for shared understanding of the URMP objectives and expected outcomes

This step requires all the concerned stakeholders to have a shared understanding of the URMP and what it intends to achieve. The stakeholder mapping (carried out as part of the baseline) will help in identifying the relevant agencies. A half–day workshop with these agencies shall be organized to present the various components of the URMP framework—vision, elements, objectives, interventions, M&E. It is important to point out to the stakeholders that the vision, elements, objectives and M&E are the same for all Ganga towns. This is to ensure that a common framework is applicable across the basin. The interventions to achieve the objectives, however, can be chosen by the towns based on their specifics. A core group of officers (from the different agencies) shall be formed, led by the nodal agency to take the URMP forward.

Step 4: Identify the interventions required to achieve the URMP objectives

This step prepares the ground for operationalization of the URMP. The core group will identify the various interventions under each element of the URMP (river health; social

cohesion; and economic value) that shall be undertaken. Both short-term (project-based) and long –term (planning-based) interventions will be identified. These interventions will be discussed with a larger group of stakeholders to arrive at a consensus and achieve cooperation for subsequent activities. For each intervention, it will be useful to develop an intervention brief to summarize the various aspects of the intervention. See ***Figure 20*** for a template of the intervention brief.

Step 5: Prepare an action plan for implementing the URMP

In the final step, an action plan has to be prepared for implementing the interventions. The action plan will include the following:

- Timeline of implementing the various interventions starting with the ToR development for DPRs; followed by the actual DPR preparation; and schedule of implementation activities
- Responsibility matrix
- Financial flows
- Mechanism for implementing agencies to report to the nodal agency
- Mechanism for M&E

<table>
<tr><td colspan="3">Name of intervention:
Indicate the intervention. Be as specific as possible.</td></tr>
<tr><td colspan="2">Element:
Specify which element of the URMP (river health; social cohesion, and economic value) is being addressed by this intervention. River Health.</td><td>Scope:
Clarify whether this is pan-city or along the riverbank.</td></tr>
<tr><td colspan="2">Objective:
Specify which of the ten objectives is addressed by this intervention.</td><td>Time frame for implementation:
Indicate the time required for implementation</td></tr>
<tr><td colspan="2">Problem Statement:
Provide a background of why the intervention is needed. As far as possible, facts and figures should be used to build the case. The section must also highlight the economic, social and environmental benefits (which ever are applicable) that will be reaped because of the intervention.</td><td>Map/Diagram/Picture:
This section shall include some visuals to explain the context or problem statement</td></tr>
<tr><td colspan="3">Implementation of the intervention:
Highlight the larger picture of how the implementation will be implemented, without getting into finer details (which are expected to be covered in the DPR for the intervention). The section must, however, provide sufficient details on the technical and administrative aspects that are imperative to implement the intervention.</td></tr>
<tr><td>Responsible agency:
Specify which agency will be responsible for preparing the DPR for this intervention, and oversee its implementation.</td><td colspan="2">Synergistic links:
Identify possible synergies with other initiatives/plans such as Smart City Mission, AMRUT mission, Swachh Bharat Mission; and other city-related plans</td></tr>
<tr><td colspan="3">Contribution to the URM_{index}
Identify which particular indicator (among the ten) will this indicator impact</td></tr>
<tr><td colspan="3">Pre-requisites for terms of reference for developing the DPR:
List down the items that will be required to prepare a ToR for the DPR for this intervention.</td></tr>
<tr><td colspan="3">Funding source:
Indicate the source of funding for the implementation of the intervention.</td></tr>
</table>

Figure 20: Template for an intervention brief