

The background of the cover is a stylized illustration. At the top, there are green hills. Below them, on the left, is a black silhouette of a traditional Indian temple with multiple domes and flags. In the center, there is a black silhouette of a factory with two smokestacks emitting smoke. To the right of the factory, there are several black silhouettes of houses and trees. In the foreground, there is a blue river. On the left side of the river, there are two blue fish. In the center of the river, there is a black silhouette of a boat with two people inside. On the right side of the river, there is a large, detailed peacock with its tail feathers fanned out. The overall style is a mix of traditional Indian art and modern graphic design.

**GNAMAMI
GANGE**



National Institute of Urban Affairs

COMPONENTS AND GUIDANCE NOTE

November 2020

**A Strategic Framework for Managing
Urban River Stretches in the
Ganga River Basin**

URBAN RIVER MANAGEMENT PLAN (URMP)



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Urban River Stretches in the
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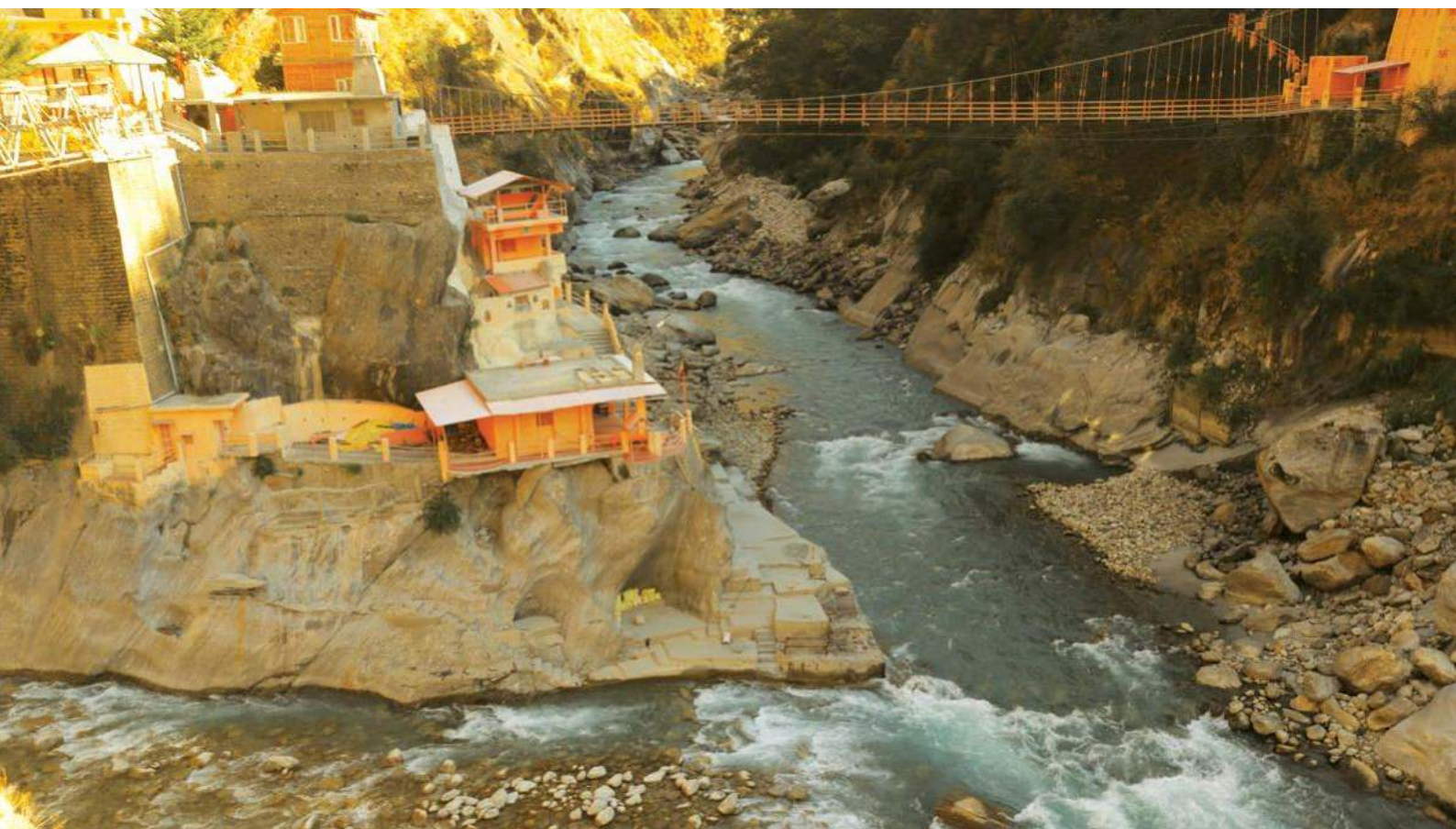
PURPOSE OF THIS DOCUMENT

The overall objective of this document is to assist cities along the Ganga River to 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 cities.

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

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

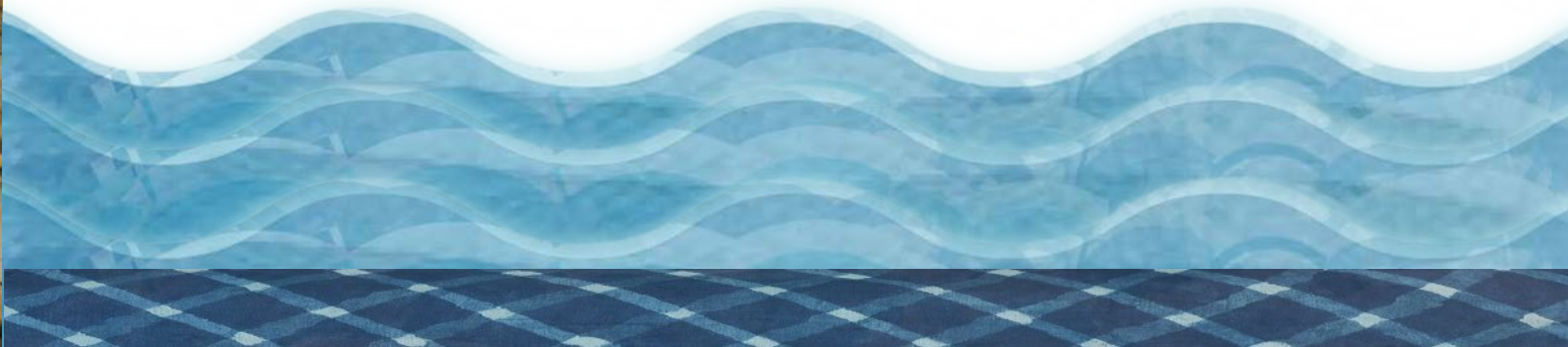
It is expected that all river cities in the Ganga River Basin with population more than 1 lakh will develop their URMPs in the next two to five years.





“ There is a need for new thinking for ‘River Cities’. There is need for the residents of these cities to ask, ‘What can we do for the rivers?’. Cities should be responsible for rejuvenating their rivers. It has to be done not just with the regulatory mindset but also with developmental and facilitatory outlook. ”

**Hon'ble Prime Minister during the first meeting of
National Ganga Council held on 14th December, 2019**



Message from Hon'ble Minister for Jal Shakti, Government of India

गजेन्द्र सिंह शेखावत
Gajendra Singh Shekhawat



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

Message

The bond between Rivers and Cities, embodied in a symbiotic relationship, has been the hallmark of civilizations. Unfortunately, over the years, increased development pressures in cities have caused a discord in this relationship. As the knowledge about river systems improves, there is an ever growing understanding that healthy rivers have the potential to significantly boost the socio-economic development of a city. Hon'ble Prime Minister during the meeting of National Ganga Council had stressed upon the need for new thinking for '*River Cities*' and river-centric thinking in planning for cities on the banks of rivers learning from the experience of *Namami Gange*.

I am pleased to launch this strategic framework called "Urban River Management Plan.", which has been designed to help cities manage the rivers within their stretches using a systems approach. The framework builds on the principles of sustainable development and addresses the 'environment', 'economic' and 'social' elements or river management conjunctively. It emphasizes on the need for a multi-stakeholder approach for managing urban river stretches that fosters synergies and reduces trade-offs among the various stakeholders. The inter-disciplinary nature of work that has gone into preparing this framework is quite evident from the involvement of Ministry of Jal Shakti, through the National Mission for Clean Ganga (NMCG) and the Ministry of Housing and Urban Affairs, through the National Institute of Urban Affairs (NIUA). I congratulate both the organizations for producing this much needed decision support system for our river cities.

I am optimistic that city officials will adopt this system to herald an era of harmonious long-term relationship between rivers and cities.

(Gajendra Singh Shekhawat)



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Message from Director General, National Mission for Clean Ganga, Ministry for Jal Shakti, Government of India

Rajiv Ranjan Mishra

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



Namami Gange — India's first comprehensive integrated mission — has from its very inception, aimed to bring about a remarkable transformation in river conservation. Its approach to achieving the vision of restoring wholesomeness to River Ganga and its tributaries, is multilayered with 'Nirmalta' and 'Aviralta' being its two pillars. *Namami Gange* emphasizes on 'rejuvenating' instead of merely 'cleaning' the rivers in Ganga basin. Along with traditional techniques of creating sewage infrastructure, water quality monitoring and industrial effluent treatments, *Namami Gange* also focusses on multiple areas of policy, restoring the riparian ecosystems, and maintaining health of the river. Thus, the interventions planned under the Mission have dynamically expanded and adapted to include various aspects such as river-sensitive urban planning, biodiversity mapping and management, historical and cultural considerations, and reinforcing a connect between people and rivers, among others. This publication is a testament to such non-conventional endeavors taken up by the Mission.

Learning from the National Ganga River Basin Management Plan, it is irrefutable that rejuvenation of rivers cannot be achieved successfully without corrective and comprehensive actions taken by cities to share ownership of the river near their boundaries. The River-City connect is a symbiotic relationship which is to be nurtured especially for long-term transformative solutions to river rejuvenation. The Hon'ble Prime Minister in his address at the National Ganga Council 2019 emphasized on the fact that there is need for a new thinking, a paradigm shift in approach where the River Cities ask what they can do for rivers. *Namami Gange* has, therefore, embarked on this journey to bring rivers to the forefront and mainstream them into a City's urban planning processes. The strategic framework propounded in this document is meant to serve as a decision support system for cities to facilitate a shift in that direction. The framework essentially requires cities to plan and implement their actions under a ten-point agenda to ensure that the River cities act as inter-related operational units working towards a common vision for the river. These expected actions are a mix of soft (planning-related) and hard (project-related) interventions, which encompass multiple aspects of urban river management. The document also details out a host of such potential interventions that cities may take up, which can serve as food for thought for city officials in developing their city specific Urban River Management Plan. An exercise is underway to implement this framework as a pilot in Kanpur city.

I encourage all river cities in the Ganga River Basin to make full use of this framework to scale up river-sensitive development. Rest assured, this will benefit the cities more than anyone else. A river is, unquestionably, among a city's greatest natural assets. Let us start by treating it as one.



A handwritten signature in blue ink, appearing to read 'R. Mishra', with a long, sweeping horizontal stroke extending to the right.

Rajiv Ranjan Mishra

Message from Director, National Institute of Urban Affairs, Ministry of Housing and Urban Affairs, Government of India

Hitesh Vaidya

Director, National Institute of Urban Affairs,
Ministry of Housing and Urban Affairs,
Government of India



India is a rapidly urbanizing country, and has been so for the last couple of decades. This urbanization, while boosting the economy, has brought its share of challenges as well. Primary among these is balancing economic growth with environmental sustainability. NIUA's mandate, since its establishment in 1976, has been to provide contemporary state-of-the-art knowledge and capacity development support to cities as they define their development trajectories. Over the last few years, our focus has been on proliferating sustainable and integrated solutions in cities that make optimal use of natural resources, and are environmentally friendly. It is against this backdrop that we developed this framework called Urban River Management Plan, in association with NMCG, with the overall ambition to promulgate river-sensitive development in our cities.

The framework is quite unique on several counts. First, it treats the river as a system. A system that encompasses diverse elements from the river itself, to its surrounding ecosystem and related services, to the livelihoods it supports, to the people that rely on it for recreational and spiritual purposes. Second, it has been developed as a generic framework that is applicable for any river city in the Ganga River Basin, and India at large. Yet, because each river city is different from others, the framework allows for city-specific nuances to be captured. Third, it is not a standalone system. Instead, it has been designed to complement and synergize with existing plans and on-going missions in the city. Fourth, it focuses on both long-term interventions that essentially require a city to undergo a transformative change for the better, as well as short-term interventions to address immediate concerns and challenges. And fifth, it refrains from proposing a common model for urban river management. It recognizes that because each city is unique, its plan to manage the river within its stretch will also be unique. The framework is, therefore, meant to serve as a guiding tool for cities to discover their own models of managing their rivers.

Our nation is poised at a very crucial juncture where the choices we make today will have long lasting implications. There is no question that our cities are the engines of economic growth, and the primary medium through which the nation's vision of Aatmanirbhar Bharat will be achieved. Adopting river sensitive development will help achieve this vision in a much more sustainable manner.



National Institute of Urban Affairs

A handwritten signature in blue ink, appearing to read 'Hitesh Vaidya', with a stylized flourish.

Hitesh Vaidya

ACKNOWLEDGEMENTS

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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
CPCB	Central Pollution Control Board
CPHEEO	Central Public Health and Environmental Engineering Organization
CSR	Corporate Social Responsibility
DO	Dissolved Oxygen
DPR	Detailed Project Report
FSSM	Faecal Sludge and Septage Management
FSTP	Faecal Sludge Treatment Plant
IEC	Information, Education and Communication
IIT	Indian Institute of Technology
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
NBC	National Building Code
NRCD	National River Conservation Directorate
OSS	Onsite Sanitation System
SLIP	Service Level Improvement Plan
STP	Sewage Treatment Plant
ULB	Urban Local Body
UN DESA	United Nations Department of Economic and Social Affairs
URDPFI	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

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GLOSSARY OF TERMS

The following definitions are to be used for this document:

Active flood plain	is an area on either side 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 adjacent to the river up to an elevation based on the elevation reached by a flood peak of a given frequency (for example, the 100-year floodplain).
Lake	is a large body of slowly moving or standing water that occupies an inland basin of appreciable size.
Nala	is a local natural stream carrying water or (wastewater) that merges with a higher order stream or river in the downstream.
Pan city	is a term used in the document 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 rivers flowing throughout the year are termed as perennial rivers, those that flow during monsoon season are termed as non-perennial rivers.
Riparian buffer	is a strip of vegetation on either bank of the river meant to protect the river from development pressures.
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 an area where water is the primary factor controlling the environment and the associated plant and animal life. Wetlands occur where the water table is at or near the surface of the land, or where the land is covered by water.



section A

BACKGROUND & CONTEXT

A1. Rivers & Urban Development

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. Much of the current undesirable state in rivers can be attributed to disruptive anthropogenic activities. These are somehow more prevalent in urban areas (cities). Therefore, any improvement in the river's health cannot be achieved without first addressing the issues in urban areas. While cities in the Ganga River Basin have largely been responsible for the deterioration of the river, they will have a central role to play in its rejuvenation.

About 34% of India's population lives in urban areas.¹ The number and size of Indian cities has been increasing over the years. 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. UN DESA (2018) suggests that this trend is expected to continue in the future as well (Figure 1).

Increased urbanization is almost always associated with opportunities for economic development. However, these development activities very often have a negative impact on the environment. One of these impacts

is on riverine systems, resulting from indiscriminate abstraction and pollution in the rivers and waterbodies. The Ganga River Basin has been increasingly witnessing these impacts.

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 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

What is the need for an Urban River Management Plan?

Any improvement in the river's condition cannot be achieved without first addressing the issues in urban areas.

Cities have been a major part of the problem and will need to be part of the solution as well.

1 UN World Urbanization Prospects Report (2018)

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.

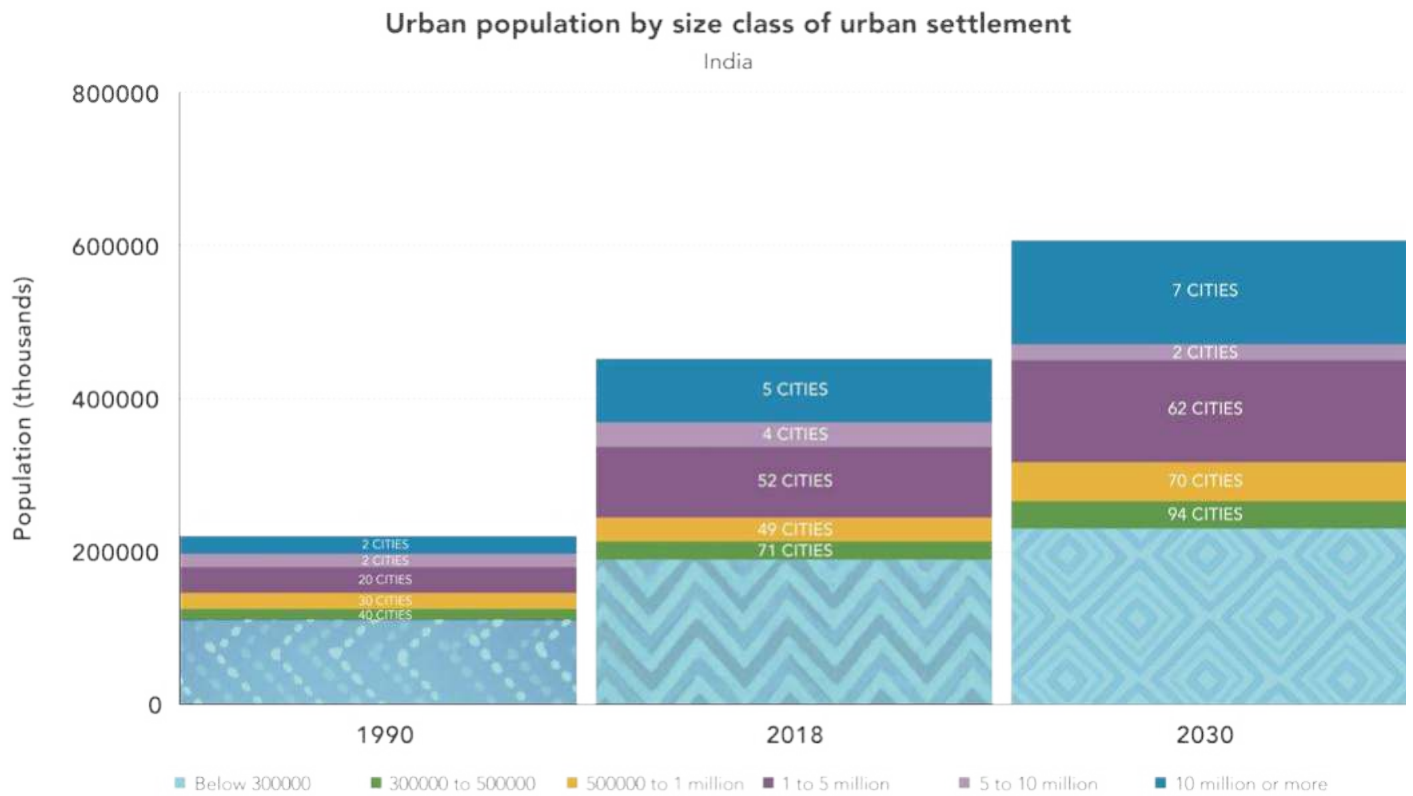


Figure 1: Trend of past and expected urbanization in India (Source: UN DESA (2018))



A2. Theory of Change

This current situation in most urban rivers in the basin is presented in **Figure 2**, which highlights 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 restrict the river's natural path and flow. Third, water is abstracted for various uses without consideration for the environmental flow 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.

Improving the health of river is gaining increasing international prominence, and has become a prime mandate of governments all over the globe, including that of India. The 2030 Developmental Agenda also accentuates the importance of river conservation and restoration, through the dedicated Sustainable Development Goal 6. The emphasis of this document's theory of change is on inculcating a sense of responsible urban development that shows respect to the river, as seen 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 river cities in the Ganga River Basin should aspire to achieve this state.



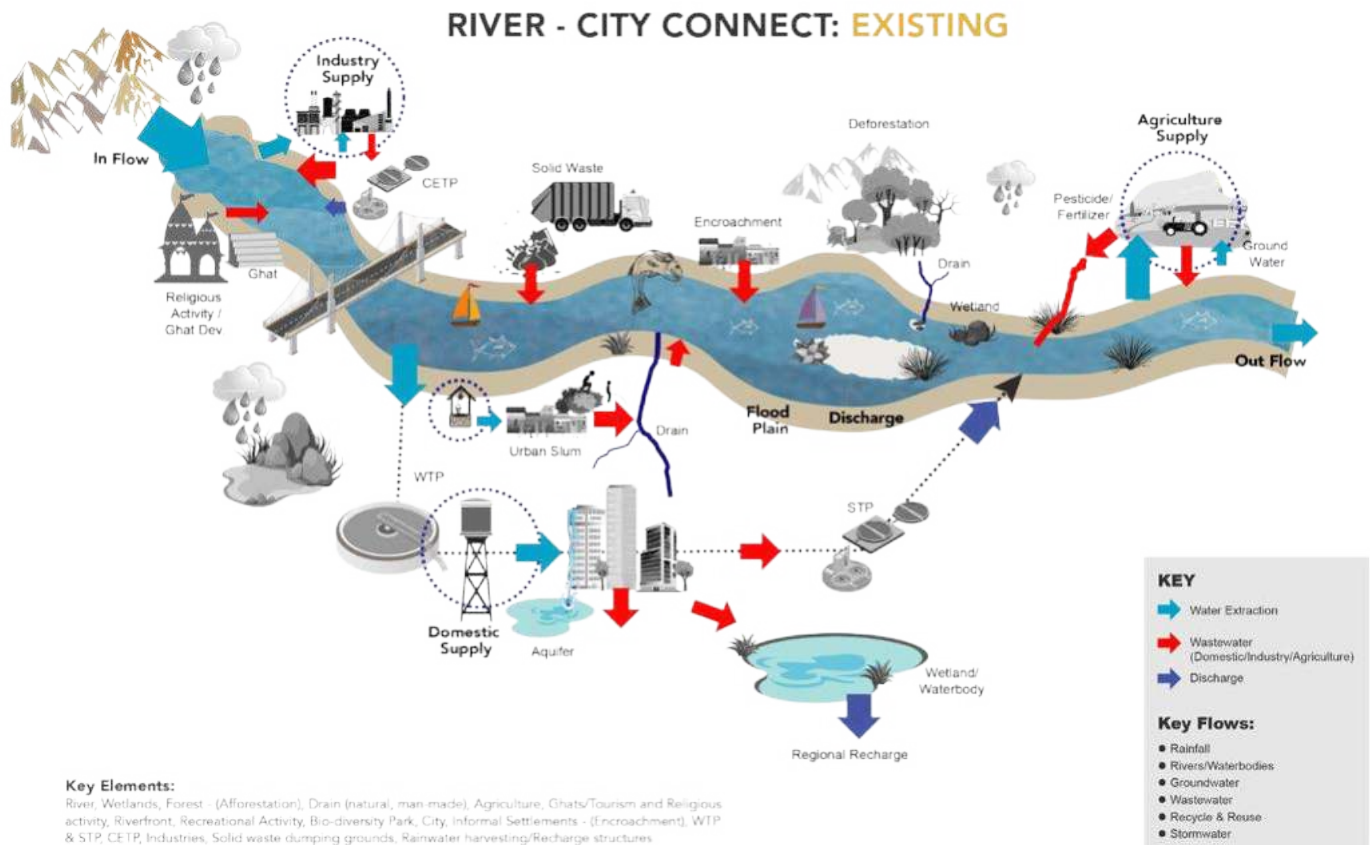


Figure 2: Existing situation of the river and city interaction

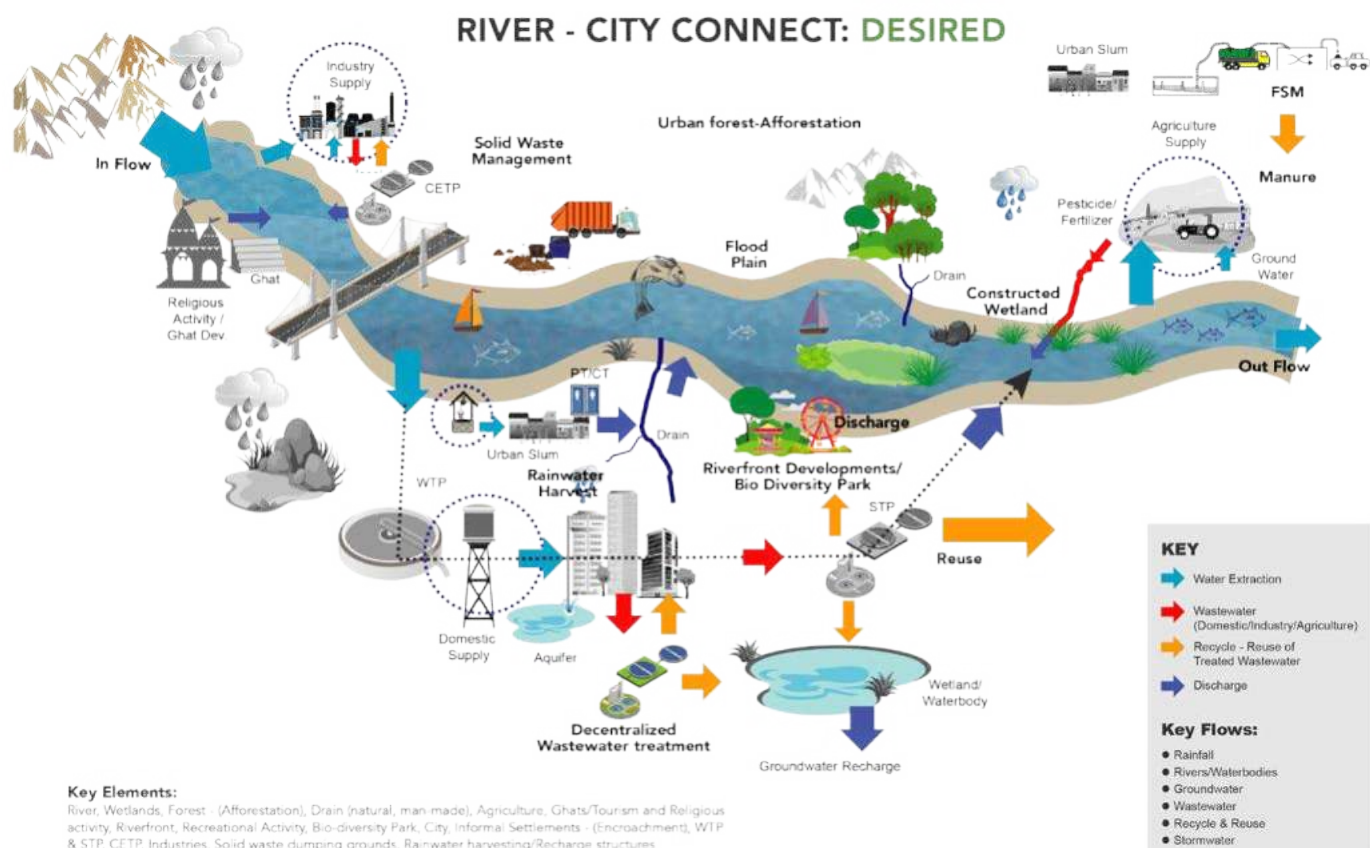


Figure 3: Desired situation of the river and city interaction



भोसले घाट
BHIMSAL GAT
भोसले घाट
BHIMSAL GAT

section B

There are 97 cities along the main stem of the Ganga River. To begin with, it is expected that the Class I towns (cities with population greater than 1,00,00) among these will prepare their URMPs. Later, other river cities in the basin are expected to follow suit. 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. The URMP framework has been developed for precisely this purpose. This section elaborates on the thought process, and methodology followed to develop this framework

INTRODUCING THE URBAN RIVER MANAGEMENT PLAN [URMP] FRAMEWORK

B1. Design Philosophy of URMP Framework

The sole objective of this document is to help river cities in the Ganga River Basin to achieve the state presented in *Figure 3*. It does so by creating a holistic, yet simple, strategic framework called *Urban River Management Plan (URMP)* that shall be adopted by the river cities to manage the rivers within their stretch.

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

- Environmentally responsible
- Economically beneficial
- Socially inclusive

B1.1 Design Principles

Following are the design principles on which the URMP framework has been developed, also depicted in *Figure 4*.

1. Simple: The URMP framework has been intentionally kept simple and concise. The objective is not to create an overwhelming set of guidelines 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 Urban Local Bodies (ULBs) who are already tasked with several other responsibilities, simplicity of the plan would receive more buy-in.

2. Generic but yet city-specific: The overall framework of the URMP has been designed to be generic to ensure that all river cities in the Ganga River Basin have a common vision and associated objectives for managing the river. However, since each city is unique in character, the framework also allows for city-specific considerations to be captured in the URMP. This aspect is elaborated in detail in the next section.

3. Synergistic: The URMP is not meant to re-invent the wheel. Instead, it acknowledges the role and importance of other Plans that a city may have, and complements those. These include Master Plan, City Sanitation Plan, City Development Plan, among others. The URMP also seeks synergies with on-going urban missions, such as the Atal Mission for Rejuvenation and Urban Transformation (AMRUT), Smart City Mission, and Swachh Bharat (Urban), in the city with the intent to dovetail certain aspects of the URMP into these missions.

4. Sustainable: Given that financial constraints are one of the main reasons why several ambitious plans fail, the framework ensures that there is a clear line of funding and finances for the various interventions to be undertaken within the URMP.

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 upgraded from time to time to respond to emerging needs. In order to do so, the framework has made provisions for the progress under the URMP to be measurable and quantifiable.

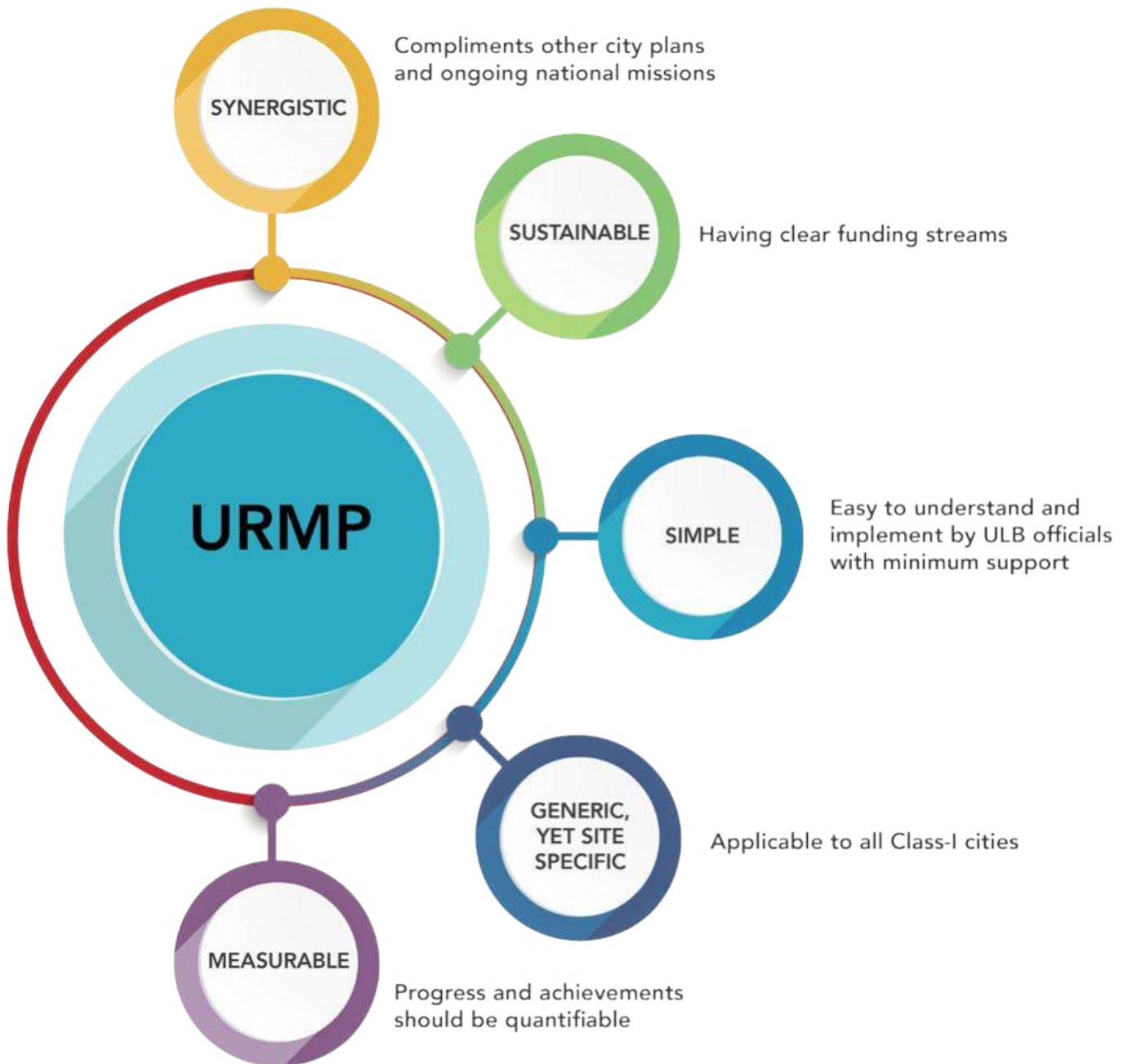


Figure 4: Design principles of the Urban River Management Plan framework

B2. Overview of the Urban River Management Plan Framework

In line with the design principles mentioned in the previous section, the URMP framework has two distinct parts as presented in **Figure 5**, represented by two colored boxes. The first, corresponding to **blue boxes**, is the generic part that is applicable to all river cities in the Ganga River Basin. This is so that all the river cities have common elements, visions, objectives, and a monitoring and evaluation (M&E) mechanism in order to ensure that all river cities act as inter-connected units to collectively contribute to the overall basin-scale management of the river.

The second, corresponding to **green boxes**, is the city-specific part that comprises interventions and financing for the interventions. The purpose of this second part is to provide cities with the option to decide on the best possible interventions and as well as financing streams based on their local context and conditions. Hence while all river cities have common objectives, they have the flexibility to decide on the appropriate actions required to achieve the objectives.

For example, one of the objectives is to leverage on the economic potential of the river. Now, one city may decide to do so by creating facilities for water sports and adventure activities. Another may decide to run a daily river cruise to encourage tourism. Yet another may opt for a floating river market. The choice of the intervention is, therefore, up to the city depending on what it perceives as the most suitable.

Similarly, the city can decide upon the appropriate financing streams based on what it considers more feasible.

The elements, visions, objectives and M&E mechanism is the same for all the cities preparing the URMP.

The choice of interventions and financing are up to the city.

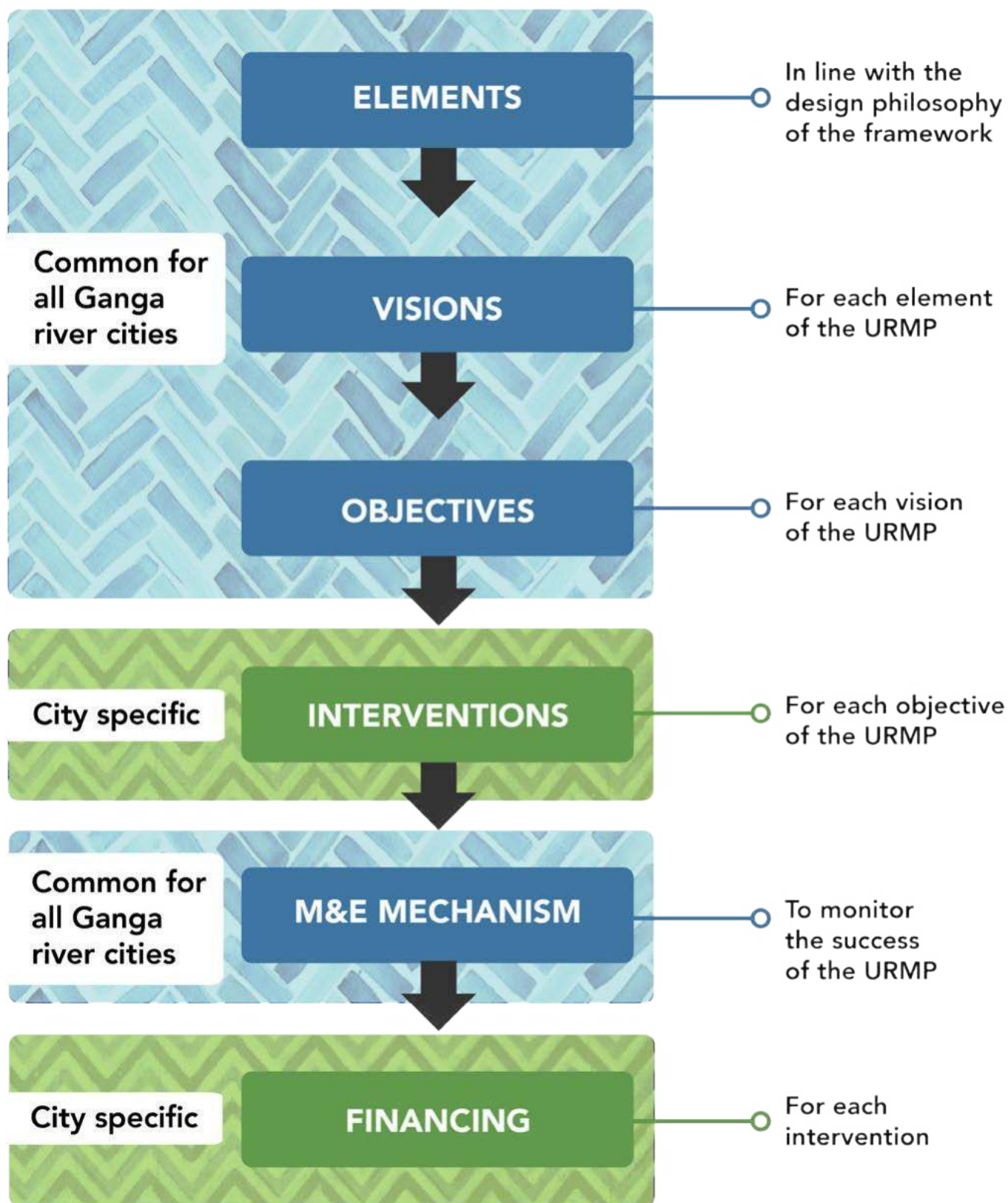


Figure 5: Conceptual framework of the Urban River Management Plan

B3. Historical Brief of the URMP

A consortium of Indian Institutes of Technology (IITs), led by IIT Kanpur has published general guidelines³ for Class I towns (population greater than 1 lakh) for the development of URMPs. The guidelines include seven categories of recommendations as follows:

1. **Removal of encroachments** and land acquisition for riverbank beautification and related development works.
2. **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.
3. **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.
4. **Prevention of the discharge of untreated sewage** into the river through construction of sewers and 'nala' diversion works
5. **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.
6. **Reuse of tertiary treated sewage** within the city or elsewhere for industrial, irrigation, horticultural, non-potable domestic and commercial uses, groundwater recharge, etc.
7. **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 city and/or elsewhere.

This document builds on these guidelines to help define the common URMP framework for the river cities in the Ganga River Basin.

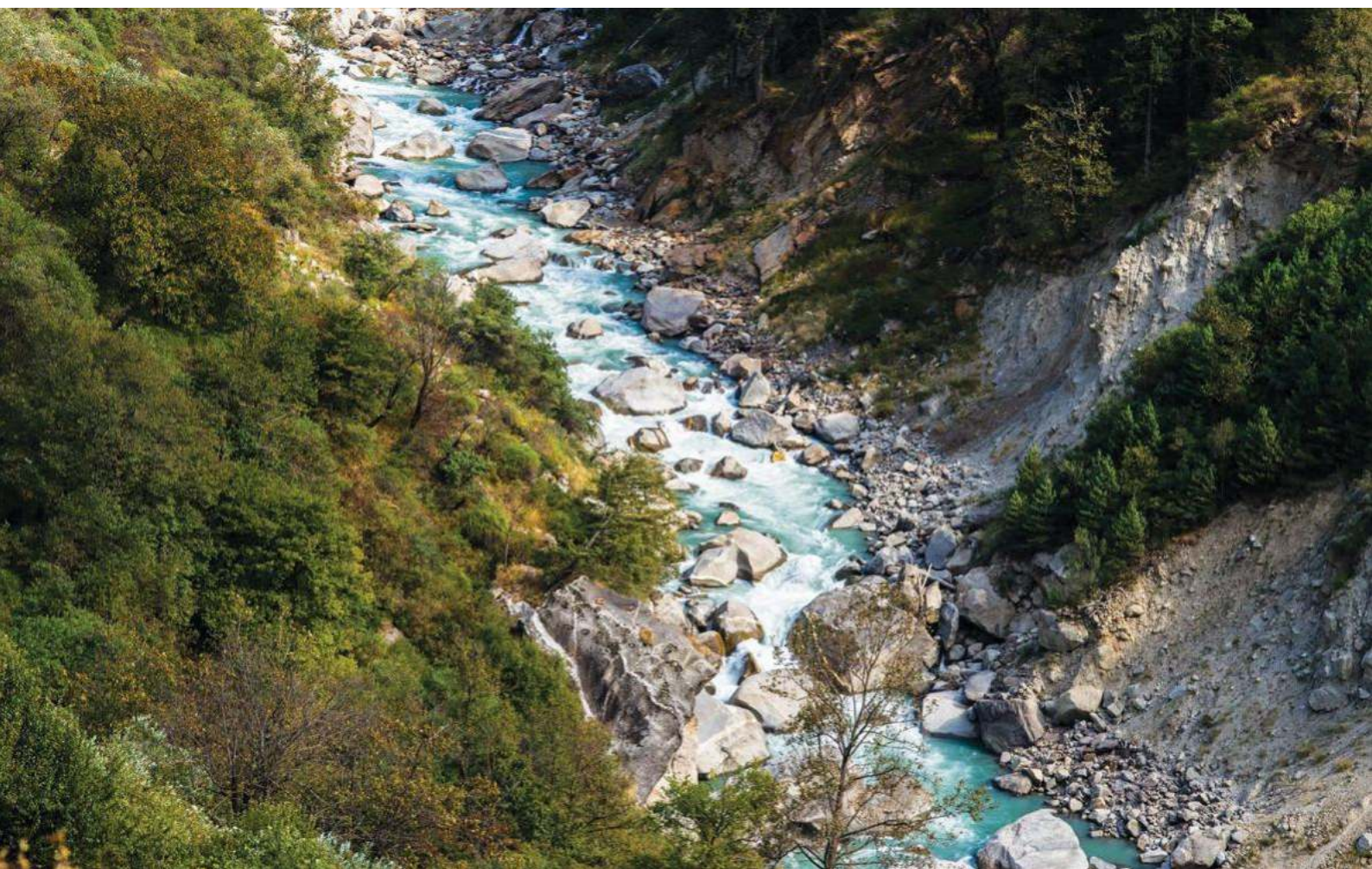


3 Guidelines for the Preparation of Urban River Management Plan for all Class I Towns in Ganga River Basin http://cganga.org/wp-content/uploads/sites/3/2018/11/002_EQP.pdf

B4. Legal Sanctity of the URMP

The URMP is being developed by the National Mission for Clean Ganga (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 River Ganga (Rejuvenation, Protection and Management) Authorities Order, 2016⁴ 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 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.



B5. Benefits of the URMP for the city

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 backdrop, there are several benefits that a city can reap through the URMP. Some of these are listed below.

- 1. Environmental benefits:** These include rich biodiversity, clean air, clean water, improved groundwater levels.
- 2. Economic benefits:** These include Improved livelihood opportunities, tourism growth, attractive external investment.
- 3. Social benefits:** These include vibrant places for religious, cultural and recreational events, serene and scenic picnic spots.

Furthermore, protection of the river and its environment is mandated by the law. Constitution of India, Article 51 (A), 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 Act of 1992, Urban Local 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.

**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.**

B6. Timeframe

- It is desired that the overall period of the URMP shall be made to coincide with the Master Plan, or Development Plan that the city has. This will ensure that the URMP acts as a sub-component of the overarching Master Plan. However, if for some reason this is not possible, cities have the flexibility to decide upon an appropriate time frame depending upon the actions that need to be taken.
- There will be different timelines for specific interventions that are to be carried out under the URMP. Broadly, these interventions may be categorized as short-term and medium-term interventions depending on the priorities of the city.
- Short term interventions may be undertaken within a period of 2-3 years, whereas long term interventions may be completed within a period of 10 years.
- It would also be useful if some relevant interventions are in line with the time frames of the different ongoing urban missions (e.g. Smart City Mission, AMRUT, Swachh Bharat-Urban, etc.) in order to be supported by an existing funding opportunity.





section c

This section looks at each component of the URMP framework in detail. The framework has SIX components. These are elements, vision statement, objectives, interventions, Monitoring and Evaluation mechanism, and financing mechanism. All cities that prepare their URMPs will need to include these six components.

DETAILING THE URBAN RIVER MANAGEMENT PLAN [URMP] FRAMEWORK

C1. Elements of the URMP

In line with the design philosophy of the URMP mentioned in Section B, the Plan for each city shall have three elements:

1. Environmental (corresponding to the environmentally responsible trait of the philosophy)
2. Economic (corresponding to the economically beneficial trait of the philosophy)
3. Social (corresponding to the socially inclusive trait of the philosophy)

C2. Vision Statements of the URMP

Each city's URMP shall have the following vision statements. This is also pictorially depicted in **Figure 6**.

C2.1 Vision Statement for the ENVIRONMENTAL Element

The river will be able to support a habitat for riverine 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 flora and fauna to flourish in their natural states.

C2.2 Vision Statement for the ECONOMIC Element

The river will provide opportunities for economic development: Rivers support the livelihoods of several communities, through the various ecosystem services it provides. The vision for this element of the URMP seeks to enhance this aspect in a sustainable and river-friendly manner.

C2.3 Vision Statement for SOCIAL Element

The river will be celebrated among the citizens: Historically, cities have developed along the banks of the rivers in India. For such cities, 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 for this element, therefore, seeks to create an environment to make the citizens treasure the river and celebrate it as a valuable common asset.

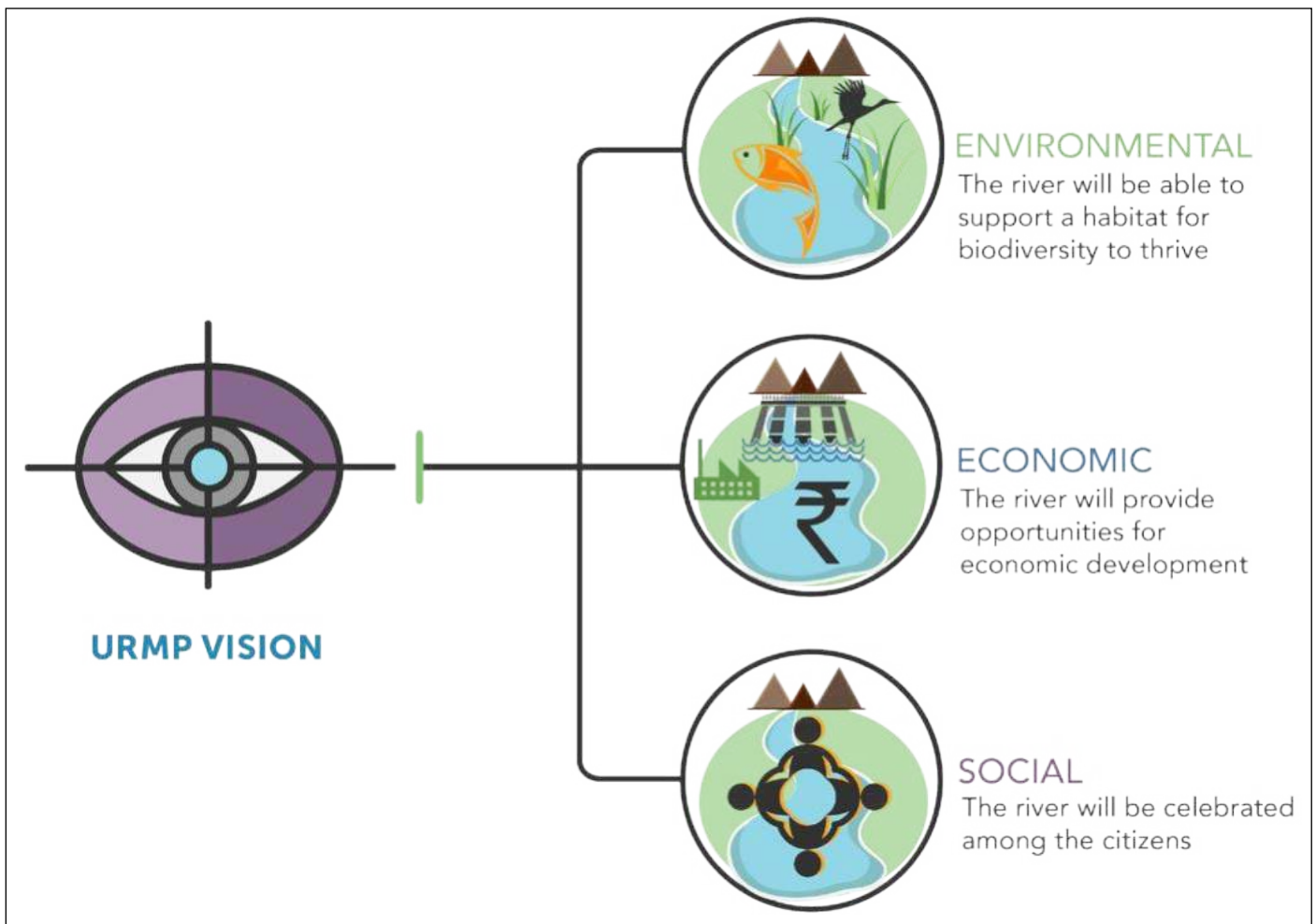


Figure 6: Vision statements for the different elements of the URMP

C3. Scope of the URMP

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 actions.

Strategic Approach: The URMP shall target two types of actions. The first type of actions 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.

The URMP shall target both soft measures (using urban planning tools) and hard measures (practical projects)

C4. Objectives & Interventions of the URMP

Ten objectives have been fixed to achieve the visions of the URMP. These objectives address each of the URMP elements, i.e. environmental; economic, and social. 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 river cities in the Ganga River Basin. Hence, the URMP of every city will have the same objectives. However, the interventions/projects to achieve these objectives can vary from place to place, considering the local context.

The objectives of the URMP for each element and vision are presented in **Table 1**.

Table 1: The objectives of the URMP Framework

DESIGN PHILOSOPHY	Environmentally responsible	Economically beneficial	Socially inclusive
ELEMENT	ENVIRONMENTAL	ECONOMIC	SOCIAL
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	<ol style="list-style-type: none"> 1. To ensure effective regulation of activities in the floodplain 2. To keep the river free from pollution 3. To rejuvenate waterbodies and wetlands in the city 4. To enhance the riparian buffer along river banks 5. To adopt increased reuse of treated wastewater 6. To ensure maximum good quality return flow from the city into the river 	<ol style="list-style-type: none"> 7. To develop eco-friendly riverfront projects 8. To leverage on the economic potential of the river 	<ol style="list-style-type: none"> 9. To inculcate river-sensitive behaviour among citizens 10. To engage citizens in river management activities

A detailed description of each objective, along with potential interventions for each, is provided hereafter.

C4.1 Objectives for Environmental Element

OBJECTIVE 1: TO ENSURE EFFECTIVE REGULATION OF ACTIVITIES IN THE FLOODPLAIN

Rationale: A floodplain is defined as the area inundated by a flood that occurs once in a fixed number of years, typically hundred years for major rivers. The Development Plan/Master Plan of cities ideally would have some or the other regulations for land use and permissible activities in the river flood plains (if not the entire flood plain, then at least part of it). However, in several cities 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 of interventions: The range of interventions under this objective could include establishing zoning regulations, adopting river-sensitive planning norms, stricter law enforcement, awareness raising, capacity building of farmers, relocation strategies for unauthorized colonies, among others.



OBJECTIVE 2: 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 recipients of untreated wastewater from towns and cities. The wastewater discharged by

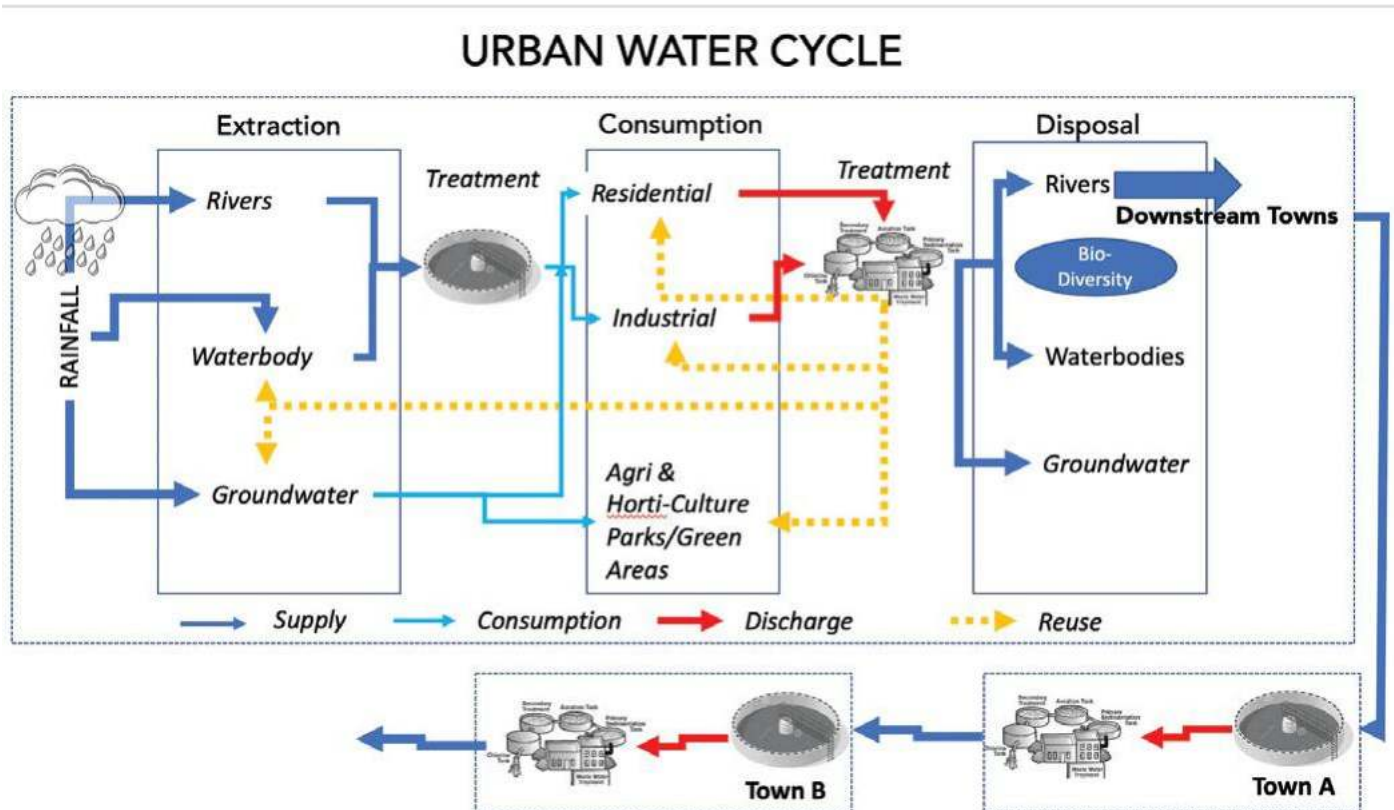


Figure 7: Relation between upstream and downstream cities in terms of wastewater discharge

one city becomes source of water supply for another city downstream as seen in Figure 7, thereby creating a cycle of health hazards.

Scope of interventions: 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, incentivizing industries and large residential societies to install in-house treatment plants, etc.



OBJECTIVE 3: TO REJUVENATE WATERBODIES AND WETLANDS IN THE CITY

Rationale: In many cities, waterbodies and wetlands are intrinsically connected to rivers either through their drainage patterns or groundwater flow. Rejuvenating water bodies and wetlands can go a long way in reducing the burden on rivers. They improve groundwater recharge, which in turn helps augment the water supply of a city, and reduces the stress on rivers. Similarly, rejuvenated wetlands are natural “wastewater treatment plants” that can significantly mitigate the pollution load entering a river. The recreational benefits that these two interventions offer are an added incentive to the city.

Scope of interventions: 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.



OBJECTIVE 4: TO ENHANCE THE RIPARIAN BUFFER ALONG RIVER BANKS

Rationale: A riparian buffer is a longitudinal stretch of vegetation on either bank of a river, whose significance cannot be over-emphasized. It acts as a shock absorber for the river and its aquatic ecosystem from detrimental developmental activities. The buffer zone also protects the urban area from the impact of floods. Ideally, the riparian buffer should be a continuous stretch with a width of twelve to fifteen meters. Smaller cities may be able to achieve this faster. However, the present conditions should not dictate the ambition of the future, and cities must take up whatever is possible today, and aspire for the ideal condition in its long-term planning, syncing it with the Master Plan.

Scope of interventions: The only intervention required under this objective is to develop a rich continuous buffer of vegetation



along the river on either bank. The plantation strategy must account for the soil conditions, water depth, native plant species, and the nature of ground profile.

OBJECTIVE 5: TO ADOPT INCREASED REUSE OF TREATED WASTEWATER

Rationale: Reuse of wastewater is an excellent avenue to relieve the stress on rivers. This would result in lesser freshwater extracted from the river and more water available to maintain the environmental flow in the river. 75-80% of the freshwater supplied to a household returns as wastewater. This vast volume is nothing short of a new resource of water. Furthermore, in every city there is usually limited scope for direct reuse of treated wastewater. However, the remaining can easily be used to revive water bodies, and groundwater recharge, thereby augmenting the future supply of the city.

Scope of interventions: Potential avenues for the use of treated wastewater are for agriculture, horticulture, dual piping (wherever possible) where treated wastewater is used for flushing, road cleaning, bus/metro cleaning, reviving water bodies, groundwater recharge, among several others.



OBJECTIVE 6: TO ENSURE ADEQUATE GOOD QUALITY RETURN FLOW FROM THE CITY IN THE RIVER

Rationale: This is based on the premise of a city making its contribution to maintain the environmental flow of the river. In its simplest form, environmental flow is water required by a river to sustain its natural habitat. Usually a city has very little control over the environmental flow in the river, given that this is regulated by national or state authorities. However, this should not absolve the city of its responsibility to the river. There is no definitive guideline of how much a city should give back to the river as this depends on site-specific factors. Cities will have to take stock of the rivers within their stretches, and decide upon an optimal contribution after adjusting for in-house uses. It is expected that the amount of return flow should be in proportion to the amount of water the city takes from the river. If the city decides on reserving a portion of the treated wastewater for return flow, it must ensure that the effluent meets the effluent standards set by CPCB.

Scope of interventions: The interventions under this objective can include diverting a part of the storm water into rivers. Another possibility is to release treated wastewater in the local drains. Given that recycling and reuse of treated wastewater is also important for non-potable uses within the city, the releases in the river will have to be carefully balanced.



C4.2 Objectives for Economic Element

OBJECTIVE 7: TO DEVELOP ECO-FRIENDLY RIVERFRONT PROJECTS

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, as well as become a source of revenue.

Scope of interventions: The city can choose the scale and scope of the riverfront development as per its need. They need not be large massive structures like promenades, condominiums, plazas, etc. Small scale projects such as parks, picnic spots, urban forests, ghats and herbal gardens can be equally effective in bringing back the people to the river.



OBJECTIVE 8: TO LEVERAGE ON THE ECONOMIC POTENTIAL OF THE RIVER

Rationale: Cities must begin to realize that a river has tremendous economic value through the ecosystem services it provides, and livelihoods it can support. Already cities across the globe have boosted their economies through river-centric activities. Rivers can help cities progress up the economic ladder, which every city aspires. Needless to say, the scale and extent of such activities must account for carrying capacity of the river.

Scope of interventions: There are several economic uses of the river such as navigation, agriculture, fishery, water sports, river cruises, riverside markets, floating markets, among others.



C4.3 Objectives for Social Element

OBJECTIVE 9: TO INCULCATE RIVER-SENSITIVE BEHAVIOUR AMONG CITIZENS

Rationale: Citizen support is vital for long-term sustainability of urban river systems and the success of any initiative by urban local bodies. This support becomes far easier to solicit when citizens are aware of the issues at hand, and how they can help address those. Cities need to develop a dedicated strategy to spread awareness about the benefits of healthy rivers through innovative dissemination mechanisms. This will be stepping stone for the desired behavioural change.

Scope of interventions: 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, games, celebrating a river day, etc. could also be considered.



OBJECTIVE 10: TO ENGAGE CITIZENS IN RIVER MANAGEMENT ACTIVITIES

Rationale: This is important to make a shift from 'citizens as spectators' to 'citizens as actors'. This also sends out the message that river management cannot be the government's mandate alone. Residents 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 transformation in the mindset of people towards ecological assets of the city.

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



Citizen Engagement

- Citizen Groups
- Monitoring Riverwater Quality
- River Clean-up Activities

NOTE: Please see Section E for detailed examples of potential interventions for the URMP.



C5. 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 a herbal garden to large-scale projects like construction of a Sewage Treatment Plant (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, installing sensors for river pollution monitoring could be covered under Smart Cities Mission. For other interventions, there are a range of financing options that a ULB can explore. Many of these options are quite common and have already been used by ULBs in the past. This section highlights these options.

C5.1 Viability Gap Funding (VGF)

It is a one-time or deferred grant from the government for those projects that may not be financially viable although 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% 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 that will be selected by the Government or 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 ambit of the URMP could avail VGF:

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

C5.2 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 will enhance the land value in the neighbouring areas. Hence, the occupants of these areas should pay for this enhancement they receive. 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 Ratio and Floor Space Index rules
- Vacant land tax
- Tax increment financing

VCF 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 in such projects because the revenue potential is significant, along with a high footfall. Such development can also trigger the development of public transportation infrastructure because of which the land value will keep increasing over time.

C5.3 Centre/State Finance Commission Grants

The 14th Finance Commission has a five-year (2015-20) allocation of Rs. 87,143 Crore for the ULBs. The Commission recommends grants for three purposes: (i) disaster relief, (ii) local bodies, and (iii) revenue deficit. The Finance Commission grants are provided to the ULBs mostly to strengthen basic services. In context of the URMP, these could include water supply, sanitation (including septage management), solid waste management, storm water drainage, developing river-friendly cremation sites, etc.

C5.4 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 forest land diverted to non-forest uses. These funds can be used to carry out activities related to strengthening the riparian buffer along the river banks. The funds can also be used to rejuvenate wetlands, and infrastructure development to support the rejuvenate.

C5.5 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 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.



A company's CSR commitment is at least 2% of the average net profits of the company made during the three immediately preceding financial years.

C5.6 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 2 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 2: 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)	<ul style="list-style-type: none"> Only for infrastructure projects It must be PPP model; 20% of total project cost funding possible. 51% or more private investment 	<p>Categories</p> <p><100 Crore</p> <p>100-200 Crore</p> <p>>200 Crore</p>	<ul style="list-style-type: none"> Water supply Solid Waste Management Tourism, Convention centre Public sanitation facilities 	<p>https://www.pppinindia.gov.in/schemes-for-financial-support</p>
Value Captured Finance (VCF)	<p>Applicable for areas, which have seen/will see an increase in land value because of government projects.</p>	<p>Variable and project dependent</p>	<p>Any</p>	<p>http://smartcities.gov.in/upload/5901982d9e461VCFPolicyFrameworkFINAL.pdf</p>
Compensatory Afforestation Management & Planning Authority (CAMPA) Fund	<p>Only for:</p> <ul style="list-style-type: none"> Compensatory afforestation Soil moisture conservation Wildlife management and catchment area treatment Training and awareness raising 	<p>Variable; every year, disbursed to states. In 2019, the amount was INR. 47, 436 Crore</p>	<ul style="list-style-type: none"> Urban afforestation programs, River bank erosion protection Setting up biodiversity parks 	<p>http://moef.gov.in/wp-content/uploads/2017/06/CAMPA-guidelines.pdf</p>
Centre/ State Finance Commission	<ul style="list-style-type: none"> Basic and performance type grants Ratio of Basic to Performance grant is 80:20 for urban local bodies 	<p>Five-year allocation 2015-20 for ULBs</p> <p>INR 87,143 Crore</p>	<ul style="list-style-type: none"> Water supply Sewerage Public sanitation Drainage network 	
CSR/Private Sector	<ul style="list-style-type: none"> CSR is mandatory for companies with net worth of INR 500 Crore or more; or turnover of INR 1,000 Crore or more; or Net Profit of INR 5 Crore 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 	<p>Depending upon the company</p>	<p>Project areas that may interest companies:</p> <ul style="list-style-type: none"> Afforestation Sports & Culture Ghat development Riverfront development Riverside parks and gardens Community engagement 	<p>http://www.mca.gov.in/MinistryV2/csrdatasummary.html</p>
Capital and Revenue Grants of Urban Local Bodies (Entry Fees)	<p>Recreational areas and supporting facilities</p>	<p>Depending on the facility</p>	<ul style="list-style-type: none"> Riverside parks and gardens Biodiversity parks River tourism Sporting activities zone Riverfront development 	

C6. 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.

C6.1 Monitoring Indicators

The implementation of the URMP shall be monitored through 10 indicators, one for each objective of the URMP framework. These indicators shall collectively culminate into an index called Urban River Management Index (URMindex). The URMindex 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 3**.

The Monitoring and Evaluation mechanism shall be applied separately for every river flowing through the city.

Table 3: 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.

Details of each indicator are mentioned hereafter.

C6.1.1 Indicator 1: Floodplain management score

Corresponding objective of the URMP framework: To ensure adequate regulation of activities in the floodplain.

Description of the indicator: The indicator is based on the total number of floodplain management points that a city scores in accordance to **Table 4**. The table lists down a number of desirable features of a well-managed and regulated flood plain. Ideally, cities should strive to meet all the conditions in **Table 4**.

How to measure the indicator: Depending upon the ground reality, the city's total floodplain management points is calculated by adding up the points for all the features in the Table that the city has already implemented.

Table 4: Calculation of floodplain management points

No.	Desirable feature	Floodplain management points
1	Floodplain boundaries clearly demarcated	15
2	Floodplain boundaries protected through embankments, roads, or other means	5
3	Demarcation of no development zone adjacent to the river in the active floodplain	5
4	Strict enforcement in no development zone	10
5	Updated database of existing land use in floodplain available	10
6	Master Plan has clearly indicated permissible and non-permissible activities in the floodplain/river zone	15
7	All regulations in the Master Plan are enforced (10 points if at least 50% of the regulations are enforced)	15 (10)
8	Presence of river friendly landscaping (e.g. constructed wetlands, bioswales, etc.)	5
9	Strict monitoring mechanism in place	5
10	No solid waste dumping on river banks	10
11	Only organic farming practiced in river zone	5
	Total Points	100

The floodplain management score is then calculated as below:

If flood plain management points > 90	flood plain management score = 5
If flood plain management points =70– 90	flood plain management score = 4
If flood plain management points =50– 69	flood plain management score = 3
If flood plain management points =30– 49	flood plain management score = 2
If flood plain management points <30	flood plain management score = 1

Frequency of assessment: This indicator should be assessed once a year, ideally through a surprise inspection of the floodplain by a neutral agency appointed for this purpose.

C6.1.2 Indicator 2: Net Dissolved Oxygen (DO) score

Corresponding objective of the URMP framework: To keep the river free from pollution.

Description of the indicator: Net Dissolved Oxygen (DO) is the difference between the DO at the city's outlet and DO at its inlet. The central premise of this indicator is that at the very least, the city

should strive to ensure that the quality of water leaving the city is the same as that entering the city.

How to measure the indicator:

$$\text{Net DO} = \frac{\text{DO outlet} - \text{DO inlet}}{\text{DO inlet}} \times 100 \text{ where } \text{DO}_{\text{outlet}} = \text{DO at outlet}; \text{DO}_{\text{inlet}} = \text{DO at inlet}$$

The Net DO score is then calculated as below:

If Net DO > 0	Net DO score = 5
If Net DO = 0	Net DO score = 4
If Net DO = (minus) - 5 – <0	Net DO score = 3
If Net DO = (minus) - 10 – (minus) - 5.1	Net DO score = 2
If Net DO < – (minus) 10	Net DO score = 1

NOTE: Only DO has been used to measure the effective implementation of this objective because DO is a core parameter for biodiversity to thrive, which is an overall vision of this element of the URMP.

Frequency of assessment: This indicator should be assessed every month (i.e. 12 times a year). The Net DO Score can be given only if the corresponding criteria is matched on at least 10 out of the 12 occasions.

C6.1.3 Indicator 3: Water body revival score

Corresponding objective of the URMP framework: To rejuvenate waterbodies and wetlands in the city.

Description of the indicator: This indicator makes a qualitative assessment of the water bodies in the city that are in an acceptable condition. Ideally, all water bodies greater than 1 acre in area should be taken up for rejuvenation. However, the city can decide on the size criteria based on its local conditions. For a water body to be deemed in an acceptable condition, the following conditions must be met.

- No presence of solid waste in or around the water body
- No discharge of untreated wastewater in the water body
- Presence of a boundary protection around a water body
- No visible eutrophication in the water body
- Minimum DO of 4 mg/l
- No reduction in volume of water from previous year

How to measure the indicator:

$$\text{Water body revival factor} = \frac{\text{Number of water bodies in acceptable condition}}{\text{Total number of water bodies}} \times 100$$

The water body revival score is then calculated as below:

If water body revival factor = 100	Water body revival score = 5
If water body revival factor = 80– 99	Water body revival score = 4
If water body revival factor = 60– 79	Water body revival score = 3
If water body revival factor = 40– 59	Water body revival score = 2
If water body revival factor < 40	Water body revival score = 1

Frequency of assessment: This indicator should be assessed once a year.

C6.1.4 Indicator 4: Riparian buffer score

Corresponding objective of the URMP framework: To enhance the riparian buffer zone along river banks.

Description of the indicator: This indicator makes a quantitative assessment of the length of the riparian zone on the river banks within the city's jurisdiction. Satellite data can be easily used for this purpose. Only riparian buffer of width greater than 7.5m shall be considered in the analysis of this indicator.

How to measure the indicator:

$$\text{Riparian buffer factor} = \frac{\text{Total length of riparian buffer (within city limits)}}{\text{Total length of river edge in the city}} \times 100$$

The riparian buffer score is then calculated as below:

If riparian buffer factor = 90–100	riparian buffer score = 5
If riparian buffer factor = 70–89	riparian buffer score = 4
If riparian buffer factor = 50–69	riparian buffer score = 3
If riparian buffer factor = 30–49	riparian buffer score = 2
If riparian buffer factor < 30	riparian buffer score = 1

Frequency of assessment: This indicator should be assessed once a year, preferably using satellite imagery.

C6.1.5 Indicator 5: Wastewater reuse score

Corresponding objective of the URMP framework: To adopt increased reuse of treated wastewater.

Description of the indicator: This indicator measures the amount of treated wastewater that the city is able to use for various uses. The treated wastewater must conform to the quality standards prescribed by CPCB for that stretch of the river flowing through the city.

How to measure the indicator:

$$\text{Wastewater reuse factor} = \frac{\text{Wastewater reused annually}}{\text{Wastewater generated annually}} \times 100$$

The wastewater reuse score is then calculated as below:

If wastewater reuse factor = 80–100	wastewater reuse score = 5
If wastewater reuse factor = 60–79	wastewater reuse score = 4
If wastewater reuse factor = 40–59	wastewater reuse score = 3
If wastewater reuse factor = 20–39	wastewater reuse score = 2
If wastewater reuse factor < 20	wastewater reuse score = 1

Frequency of assessment: This indicator should be assessed once a year. However, the concerned agencies may need to collect the data on a monthly basis.

C6.1.6 Indicator 6: Return flow score

Corresponding objective of the URMP framework: To ensure maximum good quality return flow from the city into the river.

Description of the indicator: This indicator measures a city's return flow to the river against its intended

commitment for it. As mentioned in the objective, every city will decide upon an optimal return flow amount (Committed Return Flow), primarily based on how much water it takes from the river. This indicator is meant to measure how well the city matches its commitments.

How to measure the indicator:

$$\text{Return flow factor} = \frac{\text{Actual annual return flow} - \text{Committed annual return flow}}{\text{Committed annual return flow}} \times 100$$

The return flow score is then calculated as below:

If return flow factor ≥ 0	return flow score = 5
If return flow factor = – (minus) 5–<0	return flow score = 4
If return flow factor = (minus) -10 – (minus) - 5.1	return flow score = 3
If return flow factor = (minus) - 20 – (minus) - 10.1	return flow score = 2
If wastewater reuse factor < – (minus) - 20	return flow score = 1

Frequency of assessment: This indicator should be assessed once a year. However, the concerned agencies may need to collect the data on a monthly basis.

C6.1.7 Indicator 7: Eco-friendly riverfront score

Corresponding objective of the URMP framework: To develop eco-friendly riverfront projects.

Description of the indicator: This indicator makes a qualitative assessment of the economic and social benefits of the riverfront projects of a city.

How to measure the indicator: For each riverfront project in the city, the eco-friendly riverfront points are calculated by adding up the points for all the features in the **Table 5** that the city has already implemented. An average of score of all riverfront projects will then be taken.

Table 5: Calculation of eco-friendly riverfront points

No.	Desirable feature	Eco-friendly riverfront points
1	The riverfront project is a source of revenue for the ULB	15
2	The riverfront project supports commercial activities like shops, stalls, etc	15
3	The riverfront project has a footfall of more than 100 people/day	10
4	The riverfront project is listed as an attraction spot on travel-related websites	15
5	The riverfront project has good waste management facilities	15
6	The riverfront project is made up of predominantly natural material	10
7	The riverfront project has soft landscaping elements	10
8	The riverfront project does not block the natural path of the river	10
	Total Points	100

The eco-friendly riverfront score is then calculated as below:

If eco-friendly riverfront points > 80	eco-friendly riverfront score = 5
If eco-friendly riverfront points =60– 79	eco-friendly riverfront score = 4
If eco-friendly riverfront points =40– 59	eco-friendly riverfront score = 3
If eco-friendly riverfront points =20– 39	eco-friendly riverfront score = 2
If eco-friendly riverfront points <20	eco-friendly riverfront score = 1

Frequency of assessment: This indicator should be assessed once a year, ideally through a surprise inspection of the floodplain by a neutral agency appointed for this purpose.

C6.1.8 Indicator 8: River economy score

Corresponding objective of the URMP framework: To leverage on the economic potential of the river.

Description of the indicator: There are multiple economic uses of a river. This indicator looks at the range of these uses that a city has tapped into and the livelihoods that the river supports. Going forward, it would be best if the city has data required to quantify the river-related economy, which then can become a more direct indicator.

How to measure the indicator: The total river economy score is calculated by considering the number of economic uses that city utilizes the river for from the list below:

- The river is used for navigation (inland or inter-city) or cruises
- The river is used for water sport activities
- The river supports livelihoods of fisherfolk
- The river support livelihoods of farmer
- The river supports religious and/or cultural tourism
- Any other economic use that can be verified

The river economy score is then calculated as below:

If the river has 3 or more economic uses	river economy score = 5
If the river has 2 economic uses	river economy score = 4
If the river has 1 economic use	river economy score = 2
If the river has no economic use	river economy score = 1

Frequency of assessment: This indicator should be assessed once a year, ideally through a surprise inspection of the floodplain by a neutral agency appointed for this purpose.

C6.1.9 Indicator 9: Citizen sensitization score

Corresponding objective of the URMP framework: To inculcate river-sensitive behaviour among citizens.

Description of the indicator: This indicator measures the processes followed by the city in order to sensitize citizens about the river-related issues and challenges.

How to measure the indicator: The citizen sensitization points are calculated by adding up the points for all the features in **Table 6** that the city has already implemented.

Table 6: Calculation of citizen sensitization points

No.	Desirable feature	Citizen sensitization points
1	Dedicated Information, Education and Communication (IEC) programme for the river-related aspects	20
2	River related sensitization is part of existing citizen awareness raising programmes	15
3	Presence of a dedicated website for river-related aspects	5
4	Use of traditional sensitization media (e.g. hoardings, murals, competitions, radio)	10
5	Use of social media for river-related sensitization	10

6	A dedicated river day for the city	10
7	Earmarked budget for citizen sensitization	15
8	Sensitization of school children through special events	10
	Total Points	100

The citizen sensitization score is then calculated as below:

If citizen sensitization points > 60	citizen sensitization score = 5
If citizen sensitization points =50–60	citizen sensitization score = 4
If citizen sensitization points =30–49	citizen sensitization score = 3
If citizen sensitization points =20–29	citizen sensitization score = 2
If citizen sensitization points <20	citizen sensitization score = 1

Frequency of assessment: This indicator should be assessed once a year, ideally through a surprise inspection of the floodplain by a neutral agency appointed for this purpose.

C6.1.10 Indicator 10: Citizen engagement score

Corresponding objective of the URMP framework: To engage citizens in river management activities.

Description of the indicator: This indicator makes a qualitative assessment of the extent of citizen engagement in river-related activities and decisions.

How to measure the indicator: The total citizen engagement score is calculated by considering the number of modalities that city uses to engage its citizens in river management activities as per the list below:

- Participation of citizens in river health monitoring
- Participation of citizens in river clean-up activities
- Presence of citizen groups for river conservation
- Presence of citizens in committees related to river decisions
- CSR funds invested in river-related projects
- Any other citizen engagement modality that can be verified

The citizen engagement score is then calculated as below:

If the city has >= 3 modalities of citizen engagement	citizen engagement score = 5
If the city has 2 modalities of citizen engagement	citizen engagement score = 4
If the city has 1 modality of citizen engagement	citizen engagement score = 2
If the city has no modalities of citizen engagement	citizen engagement score = 1

Frequency of assessment: This indicator should be assessed once a year, ideally by a neutral agency appointed for this purpose.

C6.2 Calculating the URM_{index}

Each indicator has a value between one and five. An average of all the indicators will yield the URM_{index}.

$$URM_{index} = \frac{I_1 + I_2 + I_3 + I_4 + I_5 + I_6 + I_7 + I_8 + I_9 + I_{10}}{10}$$

From this calculation, it is apparent that each indicator has equal weightage in calculating the URM_{index}.



Section D

This section elaborates on the use of planning tools in a city's Master Plan for addressing key challenges and concerns related to urban rivers that require long-term persistent efforts.

INCORPORATING RIVER CONSIDERATIONS IN A CITY'S MASTER PLAN

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

A. Urban planning-related using various planning instruments. It is expected that these actions/recommendations would be adopted in the city's Development/Master Plan or any other long-term plan for the city.

B. Project-based interventions for river management. It is expected that cities will initiate the relevant projects that are required to enhance the river outlook in the city.

Section C has already covered the possible project-based interventions for the URMP. Detailed example of these interventions can be found in Section E. This section particularly elaborates on planning-based interventions that can be pursued through a Master Plan or City Development Plan (CDP), hereafter referred to as only Master Plan for ease of reading.

A city's Master Plan is a long-term strategic blueprint that outlines the broad contours of the development landscape the city will take. It is a statutory document that lays out the vision for the city for a set time period, and advocates the strategies that the city will have to follow in order to achieve the vision. Master Plans in India are typically prepared for a 20-year horizon, but there are cities with 15- or 25-year Master Plans as well. Integrating river thinking into a Master Plan would mean creating a space for the river in the city's long-term vision for which a dedicated strategy can be developed.



D1. Master Plan Tools to Address Aspects 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 this document 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 challenges associated with urban rivers. Figure 8 presents an overview of these, which are discussed briefly hereafter:

D1.1 Localizing national policies

As per the Urban and Regional Development and Plans Formulation and Implementation (URDPFI) Guidelines (2015), one of the objectives of the 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 onsite sanitation management); Swachh Bharat Abhiyaan, 2014 (for both toilets 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 city should devise specific localized strategies to bring out the customized implementation of these policies.

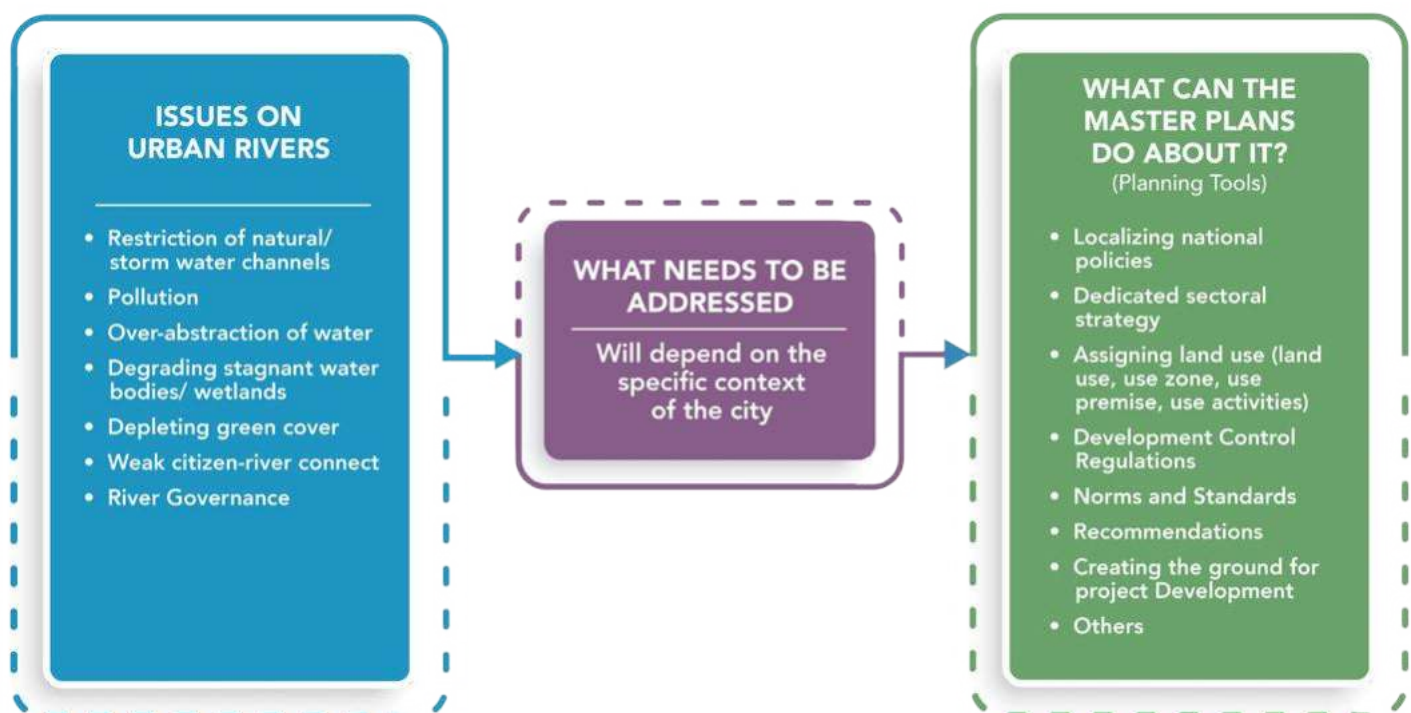


Figure 8: Master Plan Tools for River Management

D1.2 Dedicated sector-specific strategy

One of the Master Plan's greatest strength is to propose a dedicated strategy for a specific sector. This includes a strategy for river management. Typically, this strategy would provide directions on how the river zone would be used in the planning horizon, and create an enabling environment to help implement the directions.

D1.3 Assigning land use

Traditionally, this has been one of the core functions of the Master Plan. Fundamentally, it is to allocate different land use types within the city to allow for systematic urban development. Typically, the major categories of these uses are Residential, Commercial, Industrial, Recreational, Circulation, Public and Semi-public use, Institutional, etc. Each land use category is sub-divided into land use zones, which is further divided into land use premises. Finally, for each land use premise there are 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 need to 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.

D1.4 Development Control Regulations

These include development regulations for building construction 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 demarcated, there can be different considerations for regulations within that particular zone. For example, in areas vulnerable to flooding, 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.

D1.5 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, return flow, setback distances, allowable 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, wastewater effluent, among others.

D1.6 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.

D1.7 Creating the grounds for project development

Specific riverfront development projects like ghat development, large-scale river 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.

NOTE: For more details of these tools, and their application in practice, please refer to the publication *Mainstreaming Urban River Management into Master Plans*⁵ developed by NIUA-NMCG, which has several case studies and examples to provide greater clarity.





Section E

This section describes some of the interventions that can be implemented for each objective of the URMP. 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 interventions. The cities have the freedom to identify and choose any other intervention so long as the objectives are fulfilled.

EXAMPLES OF POTENTIAL INTERVENTIONS UNDER THE URMP

E1. Potential Interventions for Objective 1: “To ensure effective regulation of activities in the floodplain”

The interventions for this objective fall under two categories—developing appropriate regulations; and enforcing them.

E1.1 Developing Appropriate Regulations

The interventions in this category are based on the Master Plan tools and instruments explained in Section D in order to create long-term mechanisms for sustainable management of the river. Additionally, the following aspects would be important to consider:

- The notification of the National Mission for Clean Ganga, as an authority under the Environment Protection Act, lays down certain principles and guidelines for floodplain protection, regulation, and demarcation in the Ganga Basin⁶. These could serve as a useful reference for cities in the long run.
- Marking a no-development zone on either side of the river edge and enforcing strict regulations through the city's Master Plan is a good starting point. The National Green Tribunal Order for the stretch between Haridwar and Unnao⁷ could be referred to decide on an appropriate width of the no-development zone.
- Relocation and re-settlement strategies for informal clusters in the river zone.
- Strict regulations for use of pesticides, dumping of solid waste, and wastewater discharge in the river zone.

E1.2 Enforcing the Regulations

The interventions under this category could consider:

- Robust monitoring mechanism to check the efficacy of the enforcement of regulations that includes:
- A high resolution satellite imagery based GIS database of the floodplain.
- Periodic inspections of the river zone to identify hotspots and problem areas.
- Economic instruments such as ‘Polluter Pay Principle’ with hefty penalties for non-conformers.
- Recognition and Awards for top performing industries and Resident Welfare Associations. These could be in the form of “River Awards” or linked to existing “Green Certification”.

6 https://nmcg.nic.in/writereaddata/fileupload/47_AuthorityNotification.pdf

7 <https://newsable.asianetnews.com/india/ngt-declares-100m-from-edge-of-ganga-as-no-development-zone>

E2. Potential Interventions for Objective 2: "To keep the river free from pollution"

E2.1 Examining and Strengthening the Existing Sewerage System

The biggest source of pollution in rivers in the Ganga River Basin is untreated wastewater. The several policies and initiatives launched by the government have had some impact over the years. However, the problem persists. This intervention requires the ULB to assess their existing sanitation system, and identify gaps and means to strengthen it using both conventional and non-conventional approaches.

Traditionally, municipalities have relied on centralized citywide sewerage systems with extensive sewer networks and STPs. However, for smaller cities this may not always be feasible because of lack of technological know-how, 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 coverage 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 development of centralized sewer systems, the Central Public Health and Environmental Engineering Organization (CPHEEO) Manual on Sewerage and Sewage Treatment Systems published in 2013 can be referred. The manual provides detailed instructions 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 published by the former Ministry of Urban Development (developed by IIT Madras) published in 2012 can be referred to. The synopsis of these guidelines is presented in **Figure 9**.

As per the guidelines, setting up de-centralized wastewater management systems 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 capacity and efficiency; infrastructure concerns; human resource capacities), that need to be plugged and strengthened.

(ii) **Project identification phase:** This is to identify potential areas in the 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:** This is to screen and rank the alternatives for technology choice, funds (government & non-government), detailed assessment of social, legal, environmental and institutional aspects.

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

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



Figure 9: Phases required for setting up decentralized wastewater management systems (MoUD, 2012)

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-www-policy-workbook.pdf>

E2.2 Developing Faecal Sludge and Septage Management (FSSM) Plan

There are hardly any Class A towns/cities in the Ganga River Basin that can claim 100% sewered network coverage. A majority of the households in these cities 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 Faecal Sludge Treatment Plant, FSTP, or co- treatment option at an existing 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 are captured in **Figure 10**.

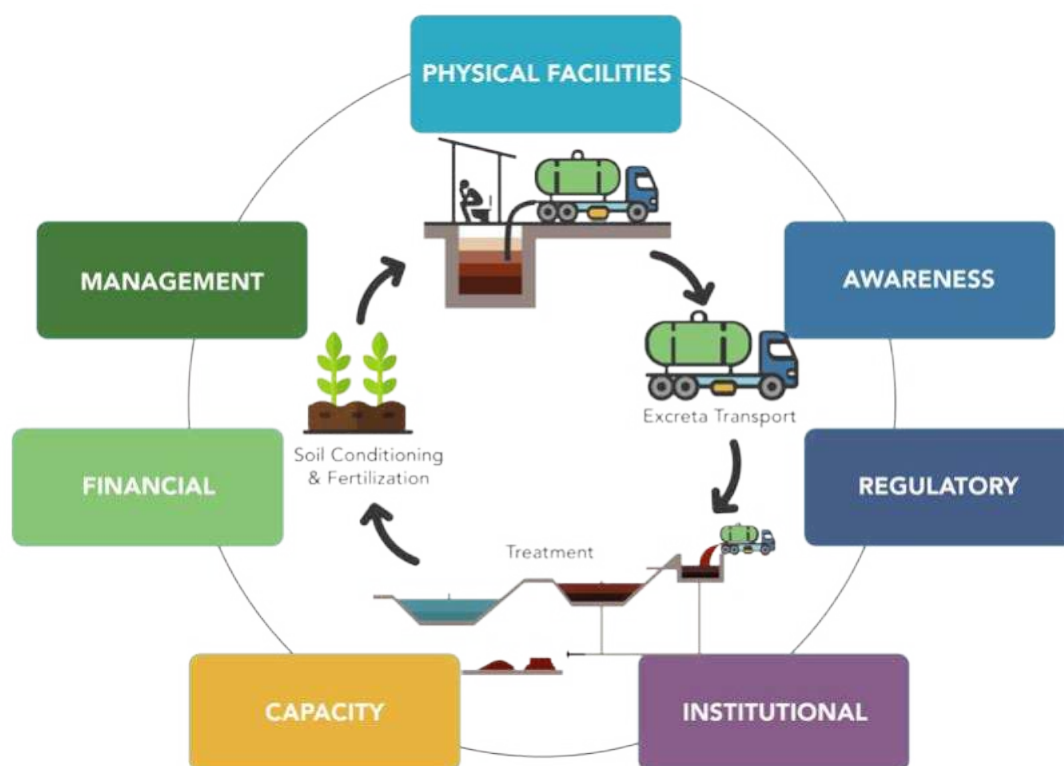


Figure 10: Key elements of a Faecal Sludge and Septage Management System

The Ministry of Housing and Urban Affairs (MoHUA) 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 Onsite Sanitation Systems (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 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>

E3. Potential Interventions for Objective 3: "To rejuvenate water bodies and wetlands in the city"

E3.1 Revival of Urban Waterbodies (Lakes, Ponds, Wetlands)

Water bodies are among the greatest natural assets in a city. They provide an added social, psychological and environmental value to the city. Most cities have several water bodies. Unfortunately, several of these have succumbed to 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 city.

Reviving urban waterbodies is a systematic process that requires a certain set of activities to be followed. The 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 11**, and described hereafter.

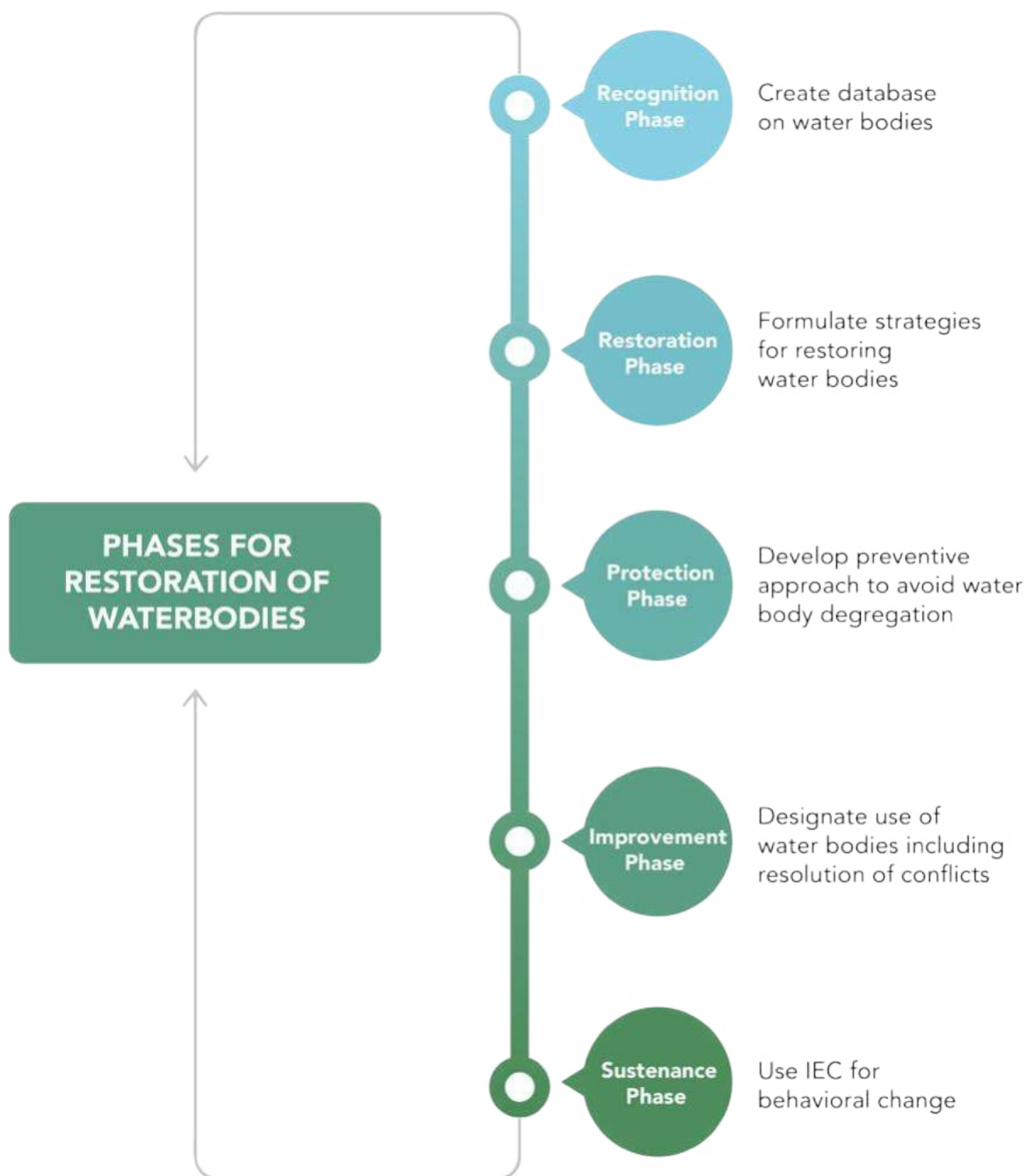


Figure 11: Snapshot of CPCB guidelines for restoration of waterbodies

(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 their 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 emphasizes 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 of drainage basin including preservation of drainage channels; removal of encroachments and blockades; and flood control measures.

(iv) **Improvement phase:** This phase deals with the overall improvement of 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 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 Department http://www.iddkarnataka.gov.in/assets/pdf/pre_feasibility_studies/23.Prefea_lake_cons.pdf



E4. Potential Interventions for Objective 4: "To enhance the riparian buffer along the river banks"

The sole intervention under this objective is to develop and implement a riparian buffer development strategy for the river banks, and implement this strategy. These simple strips of vegetated land can offer an enormous number of environmental benefits, including:

- Restoring and maintaining the physical and biological integrity of the water resources
- Removing pollutants from urban stormwater
- Stabilizing stream banks resulting in reduced erosion and sedimentation
- Providing infiltration of stormwater run-off
- Maintaining base flow of streams
- Contributing organic matter that serves as a source of food and energy for the aquatic ecosystem
- Providing tree canopy to shade streams and regulate temperature

The US EPA recommends a simple strategy for developing the riparian zone, which has been replicated in several other parts of the world. This involves dividing the buffer width (around 15 m) into two zones of equal width, called streamside zone (immediately adjacent to the river) and outer zone (interface with the city side). This is pictorially represented in **Figure 12**.

However, cities may also implement a three-zone riparian buffer (more of riparian flora in the riverside, small and medium shrubs in the middle zone, pathway alongwith native trees in the landward portion) as per availability of land in the river zone.

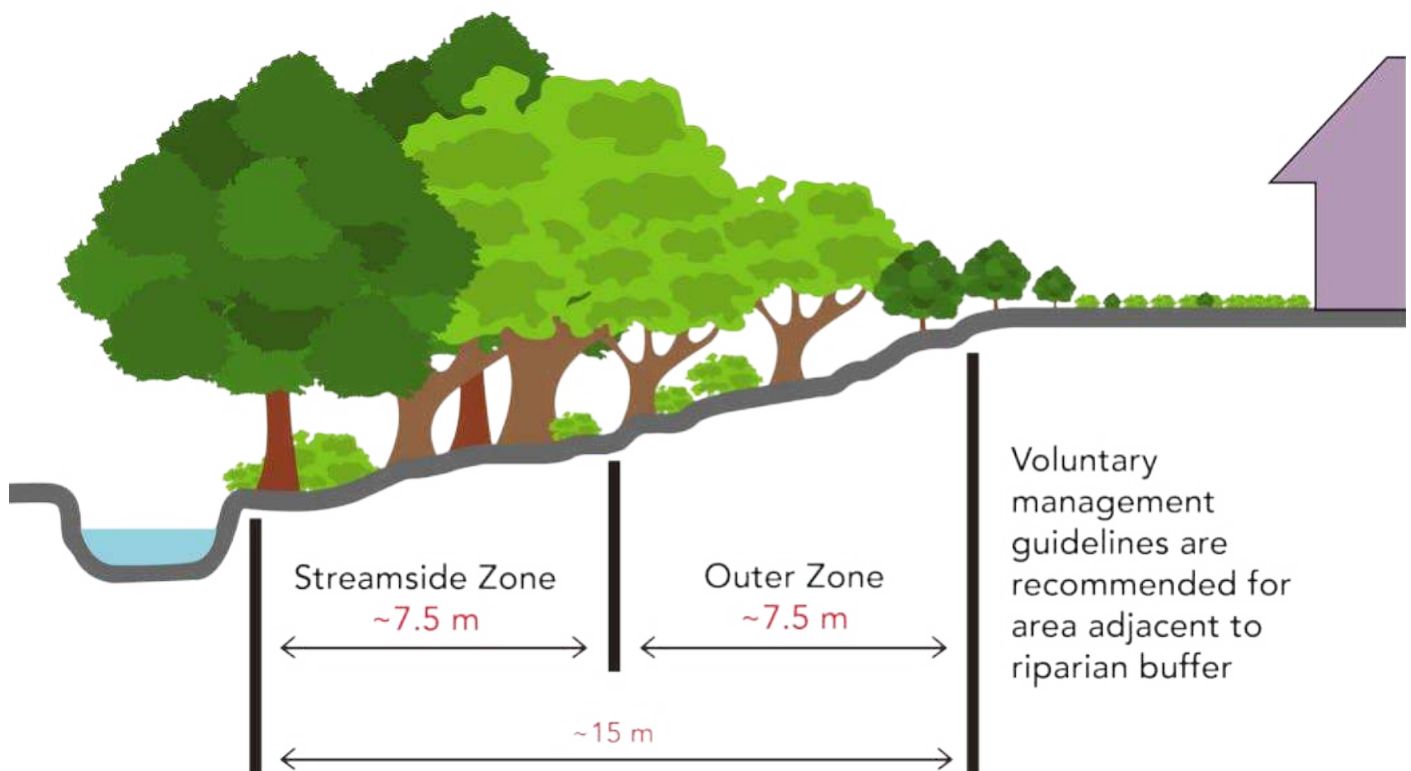


Figure 12: Typical riparian zonation used worldwide

Streamside Zone

Because of its critical importance in protecting water quality, this zone has the most stringent restrictions.

Permitted Activities (recommended but not mandatory)

- Footpaths
- Road crossings
- Utility rights-of-way
- Flood control structures

Restricted Activities

- Removal of existing vegetation (except where necessary to accommodate permitted uses)
- Soil disturbance (grading or filling)
- Use of pesticide or fertilizer
- Presence of livestock
- Use of motorized vehicles
- Construction of permanent structures

Outer Zone

The primary purpose of this zone is to protect the streamside zone, and to provide distance between the streamside zone and any upland development. While the retention of the natural vegetation is encouraged, some form of management is allowed.

Permitted Activities:

- Removal of mature tree cover (retention of shrub layer and herbaceous groundcover is required to allow for infiltration of run-off)
- Bike paths
- Stormwater management facilities
- Approved recreational uses

Restricted Activities:

- Soil disturbance (grading or filling)
- Use of pesticide or fertilizer
- Presence of livestock
- Construction of permanent structures

PRIMARY REFERENCE:

- A model riparian buffer implementation plan (2003). Superior Watershed Partnership. <http://superiorwatersheds.org/images/riparianbufferreportnew.pdf>

OTHER REFERENCE:

- Protecting our waterways: Creating a successful riparian buffer . Dan River Basin Association, USA. https://www.danriver.org/content/danriver/uploads/PDF/programs/riparian_buffer_catalog.pdf
- Local Biodiversity Strategy and Action Plan for Pimpri Chinchwad Municipal Corporation
- Minimum Width Requirements for Riparian Zone in Victoria

E5. Potential Interventions for Objective 5: “To adopt increased use of treated wastewater”

E5.1 Constructing Groundwater Recharge Structures with Treated Wastewater

The need for groundwater recharge is becoming increasingly important 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. Treated wastewater can serve as a stable and long-term source for groundwater recharge. 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 techniques for groundwater recharge are easy, cost-effective and sustainable in the long term. **Figure 13** presents a holistic perspective of the mechanics of groundwater recharge in an urban setting.

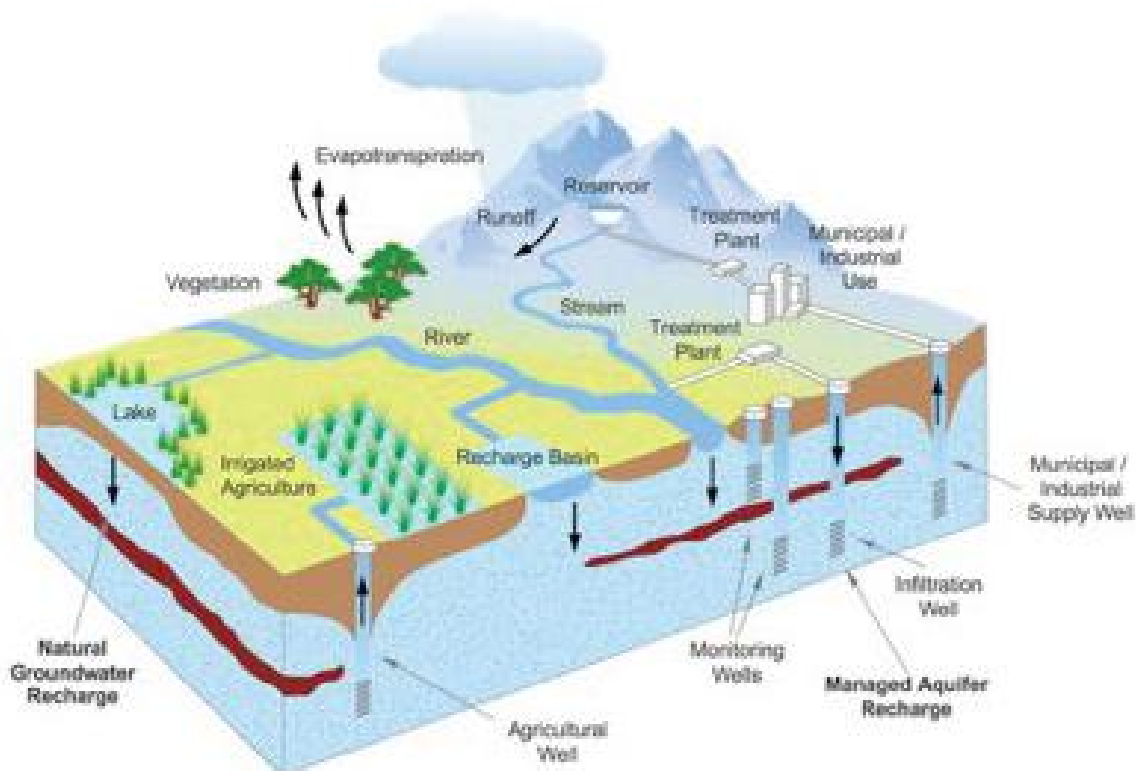


Figure 13: Groundwater mechanics in a typical urban setting
(Source: Department of Water Resources, California)

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, geology, depth of water table, and other technical elements. The Central Ground Water Board (CGWB) 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: Aspects to be considered for groundwater recharge schemes (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:** There are a number of techniques/ methods used in different contexts and geographic regions. This section describes appropriate techniques for artificial recharge. 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 elaborates 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 REFERENCE:

- 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 REFERENCE:

- 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>

E6. Potential Interventions for Objective 6: “To ensure adequate good quality return flow from the city into the river”

The main intervention under this activity will be to decide upon an appropriate return flow that the city can return to the river. There is no set common reference standard for how much a city should return. This will need a scientific study and depend upon a number of factors, which include:

- Existing flow in the river
- Overall environmental flow requirement of the river in the city stretch
- Extent of proposed envisaged wastewater reuse
- Stormwater runoff
- Drains and channels emptying out in the river

Other interventions that a city could target, which are also low hanging fruits include:

- Regular desilting of drains to ensure more stormwater reaches the river
- Ensuring that stormwater does not mix with wastewater

E7. Potential Interventions for Objective 7: “To develop eco-friendly riverfronts”

E7.1 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 15**. These are:

- 1. 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.



Figure 15: Principles for biodiversity planning in cities (Parris et al. 2018)

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.

- 6. 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

2. 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.

3. 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.

4. 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.

5. Principle 5 – Interactions: Biological interactions including competition for resources, symbiosis, herbivory,

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 that can help mitigate impacts associated with the hostility of built structures within it.

- 7. 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.

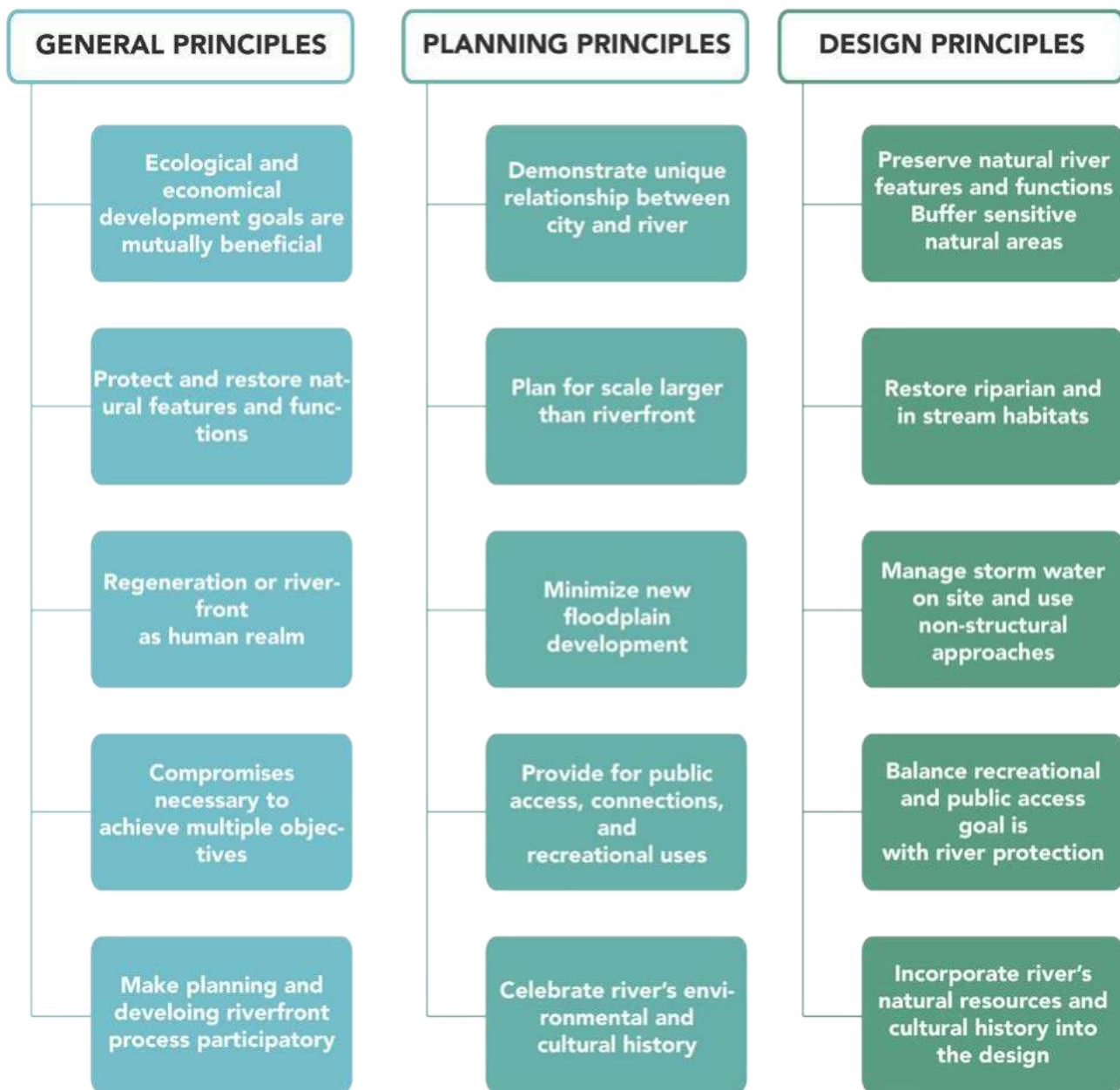
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- Hua and Chen (2019). Prioritizing urban rivers' ecosystem services: An importance-performance analysis. *Cities*, Volume 94: Pages 11-23. <https://doi.org/10.1016/j.cities.2019.05.014>

E7.2 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, side-lining the ecological elements. It is, therefore, important that all the three pillars of sustainable development — environment, economic and social — 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**.



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

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

E8. Potential Interventions for Objective 8: “To leverage on the economic potential of the river”

E 8.1 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 17**) 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 17), 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.



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 cities, 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/>

E 8.2 Creating Eco-friendly River Tourism Opportunities (e.g. water sports, river navigation)

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 cities 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:

- The carrying capacity of the river must be the governing factor to decide upon the scope and nature of river tourism activities.
- A detailed EIA must be undertaken, which will form the basis for deciding on the allowable/prohibited activities.
- 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.
- 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.
- 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>

E9. Potential Interventions for Objective 9: “To inculcate river-sensitive behaviour among citizens”

E9.1 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 17**, and described hereafter.

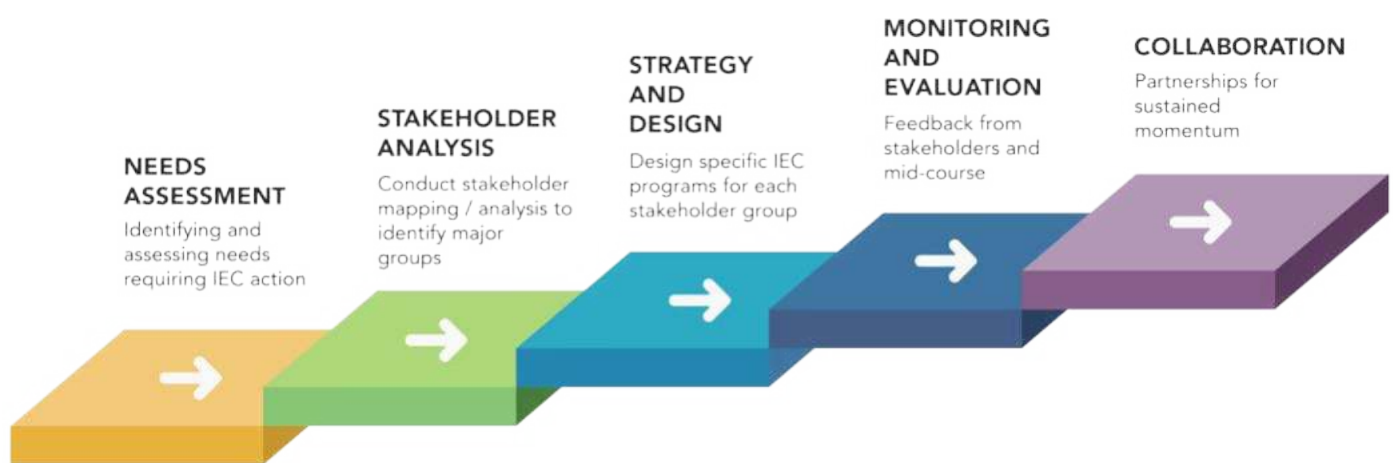


Figure 17: Key elements of an IEC program

- (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/>



E10. Potential Interventions for Objective 10: “To engage citizens in river management activities”

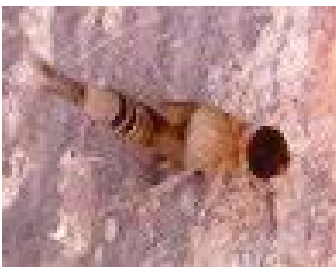
E10.1 Setting up a community-based river health monitoring mechanism

A number of countries are involving communities and the general public in river health monitoring activities. The purpose of doing so is to facilitate the establishment of a personal connect between the communities and the river, leading to more citizen-driven proactive actions for river management. Provided below are some examples from both developing and developed countries.

In 2016, the International Centre for Environmental Management (ICEM) established a community-based system to monitor the health of the Ayeyarwady and Thalawin Rivers in Myanmar led by riparian communities along both rivers. The indicators were chosen to be easy to measure and relevant to the conditions in the river. They are:

- River flow (by taking fixed-point photos with a cell phone over time)
- River height (using a measuring pole)
- River channel condition (recorded by taking photos from a fixed point at the same location over time, and noting the date and a description of significant events)
- River bank condition (recorded by taking photos from a fixed point at the same location over time, and noting the date and description of significant events)
- Water quality (recording colour, taste and smell of river water and recording significant events)
- Water turbidity (using the Turbidity Chart or Hydrocolour (App) with photos taken with a mobile phone or camera)
- Counting solid waste and debris floating down the river (from a fixed point over time)
- Fish monitoring (recording the abundance, type and size of fish caught both by groups of fishers and individuals)
- Event monitoring (recording significant events relating to the condition and use of the river, to provide an overview and synthesis of events in different sectors on a yearly calendar)

Likewise, the Asian Institute of Technology established a river health monitoring system in the Songkhram catchment of Thailand involving school children and teachers in the monitoring. The monitoring results are provided to the city administration, which becomes part of their official monitoring system.



MAYFLIES



DRAGONFLIES



Community engagement for river health monitoring. (Top) School children collecting and identifying macroinvertebrate samples, (Bottom) Zoomed view of the macroinvertebrates under a USB microscope.

REFERENCE:

- West Virginia Save our Streams: Quality Assurance and Quality Monitoring Manual. <http://dep.wv.gov/WWE/getinvolved/sos/Documents/SOPs/WVSOSQAQCManual.pdf>

E10.2 River Clean up Drives

Involving citizens in voluntary river clean-up activities at periodic intervals is widely adopted practice across the world. It creates an environment for collective action for a common good, and also sets the premise for long-term behavioral change. The photographs below depict some river clean up activities in India and abroad.



Community engagement for river clean-up activities – Mumbai (top left), Pune (Top right), Philippines (Bottom left), and Delhi (bottom right)



Section F

This section provides a suggested method to be followed by the cities preparing the URMP. Cities are free to modify the process as per their choice and requirement.

As already mentioned, the elements, vision statements, objectives and the M&E mechanism for all cities will be same. Hence, the city's main efforts will have to go in identifying the interventions for each objective, and financing those interventions. A clear time-bound action plan to roll out these interventions is at the heart of any city's URMP document.

**PROCESS TO BE
FOLLOWED BY CITIES
FOR PREPARING
THE URMP**

Developing the URMP is simple but requires systematic flow of information and coordination among the relevant stakeholders. **Figure 18** presents the schematic of the flow of the preparation process, details of which are summarized hereafter.



Figure 18: Process 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 city 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 city

This step is required to ascertain the status quo of the city 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; sewerage and non-sewerage 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; bye-laws; stakeholder mapping; etc.)
- Environmental assets: (water bodies; groundwater levels; forests; wetlands; parks; protected areas/ecosensitive zones; etc.)
- Social aspects: (religious and cultural establishments, especially along the river; crematoria; dhobi Ghats; boating locations; etc.)
- Economic aspects: (major economic sectors in the city, existing tourism, etc.)
- Relevant existing and planned project: (projects being carried out or planned under AMRUT, Smart City Mission, Swachh Bharat, and other missions)

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. It will be useful for the nodal agency to organize a workshop with these agencies to present the various components of the URMP framework—vision, elements, objectives, interventions, financing mechanism, and M&E mechanism. It is important to point out to the stakeholders that the vision, elements, objectives and M&E are the same for all river cities in the Ganga River Basin. This is to ensure that a common framework is applicable across the basin. The interventions to achieve the objectives and the financing mechanism, however, can be chosen by the cities based on their specific needs and choices. A Working Group of officers (from the different agencies) can be formed, led by the nodal agency to take the URMP forward.

Step 4: Identify the interventions for each of the TEN objectives

This is the main part of the URMP. This step prepares the ground for operationalization of the URMP. The core group will identify the various interventions under each element of the URMP (environment; social; and economic) 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 19** for a template of the intervention brief that may be used for this purpose.

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

Name of the intervention Indicate the intervention. Be as specific as possible	
Element: Specify which element of the URMP (environment/social/economic) is being addressed by this intervention.	Scope: Clarify whether this is pan-city or along the riverbank.
Objective: Specify which of the ten objectives is addressed by this intervention.	Time frame for implementation: Indicate the time required for implementation
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 environmental economic and social benefits (which ever are applicable) that will be reaped because of the intervention.	Map/Diagram/Picture: This section shall include some visuals to explain the context or problem statement
Implementation of the intervention: Highlight the larger picture of how the intervention will be implemented, without getting into finer details (which are expected to be covered later 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.	
Responsible agency: Specify which agency will be responsible for preparing the DPR for this intervention, and oversee its implementation.	Synergistic links: Identify possible synergies with other initiatives/plans such as Smart City Mission, AMRUT mission, Swachh Bharat Mission; and other city-related plans
Contribution to the URM_{index}: Identify which particular indicator (among the ten) will this intervention impact	
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.	
Funding source: Indicate the source of funding for the implementation of the intervention.	

Figure 19: Template for an intervention brief

CREDITS

Vector backgrounds:

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National Mission for Clean Ganga (NMCG)
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www.lbb.in



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