



URBAN RIVER MANAGEMENT PLAN KANPUR



KANPUR NAGAR NIGAM
Uttar Pradesh



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Uttar Pradesh

ACKNOWLEDGEMENT

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Disclaimer

The interventions proposed in this URMP document (Version1) are detailed concept plans prepared in consultation with the working group and city stakeholders . For its implementation, a Detailed Project Report (DPR) needs to be prepared.

Publication Year 2021

“

There is a need for
new thinking for
River Cities

Hon'ble Prime Minister, India

*National Ganga Council
Meeting, Kanpur, 2019*

”



“Any city that takes care of its rivers will reap multiple economic, environmental, and social benefits. I am happy to see that Kanpur has taken a positive step in this direction by preparing a dedicated urban river management Plan for the Ganga and Pandu Rivers.

My congratulations to Team Kanpur for a pioneering this novel initiative in India”

Durga Shanker Mishra
Secretary, Ministry of Housing and Urban Affairs,
Government of India

Rivers have been called the cradle of civilization. How we manage our rivers today will have consequences for our children and future generations. I appreciate and commend the city of Kanpur for its Urban River Management Plan. This should inspire our cities on river banks to come up with their own river management plans”



Pankaj Kumar
Secretary, Ministry of Jal Shakti, Government
of India

“

“

“Managing an urban river requires an inherent understanding of the symbiotic connection between river and city. It needs actions on multiple fronts: urban planning, infrastructural provisions, regulations, economics, and citizen engagement. The Urban River Management Plan encapsulates all of these. It is a pleasure to see Kanpur came up with the first such Plan in the country. I am optimistic that in the next few years, many more cities will follow suit”.



Rajiv Ranjan Mishra
Director General, National Mission for Clean Ganga



Hitesh Vaidya
Director, National Institute of Urban Affairs

“There is an intrinsic historical relationship between cities and rivers. Strengthening and enhancing this relationship is vital for achievement of true sustainable development. NIUA is proud to be associated with this initiative by the city of Kanpur to give rivers the attention they deserve, and integrate them in the development landscape of the city”.

”

“

" URMP is Simple, Sustainable, Generic, Measurable, and Synergistic Plan. Truly it is a matter of pride for the Kanpur city to prepare the country's first dedicated plan that attempts to improve the health of rivers passing within its territory. City administration shall do all possible to implement the interventions recommended in the URMP to improve health of the Ganga and Pandu Rivers".



Shivasharanappa G N
Commissioner, Kanpur Nagar Nigam

”

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Message from Former Municipal Commissioner, Kanpur Nagar Nigam



The Ganga is the longest river of India, its maximum length is covered in the state of the Uttar Pradesh. The Kanpur, second largest city of the state is developed right on the banks of river Ganga. The Pandu is a tributary of the Ganga river and marks the southern boundary of the city. Many waterbodies, wetlands, and natural drains carve the landscape of the city. The city is an important education, economic hub of the state along with growing interest for tourism industry.

Urban river management plan (URMP) is a unique framework proposed to preserve wholesomeness of rivers. In the context of Kanpur city, URMP seems very much relevant as well as important. I am thankful to Sh. Rajiv Ranjan Mishra, Director General, *Namami Gange Mission* (NMCG), Ministry of Jal Shakti and Sh. Hitesh Vaidya, Director, NIUA to recommend Kanpur to be the first city of India to adopt and implement the URMP framework.

The making of URMP for Kanpur initiated with its launch at IIT, Kanpur in May 2019. The Director General, NMCG, then PS, UDD of UP state; DM, Kanpur; KNN gave momentum to URMP exercise in Kanpur.

The baseline assessment for identifying key issues from city related to URMP was supported by officers of various departments at Kanpur Nagar Nigam. Officers from Jal Nigam, KDA, Forest, Tourism, irrigation groundwater cell at Kanpur and UP pollution control board shared important information, documents, data to understand the gaps and provided useful suggestions/project for Kanpur URMP.

The National Institute of Urban Affairs, New Delhi team supported making of URMP, Kanpur. Two important workshops, First on introduction of URMP framework and Second on identification of URMP projects for individual objectives were facilitated by NIUA team.

I believe that URMP is a living document and it requires constant upgradation. This URMP document mainly focus on how a city can approach its implementation process and identify projects to address key issues.

Akshay Tripathi

Municipal Commissioner (Former),
Kanpur Nagar Nigam

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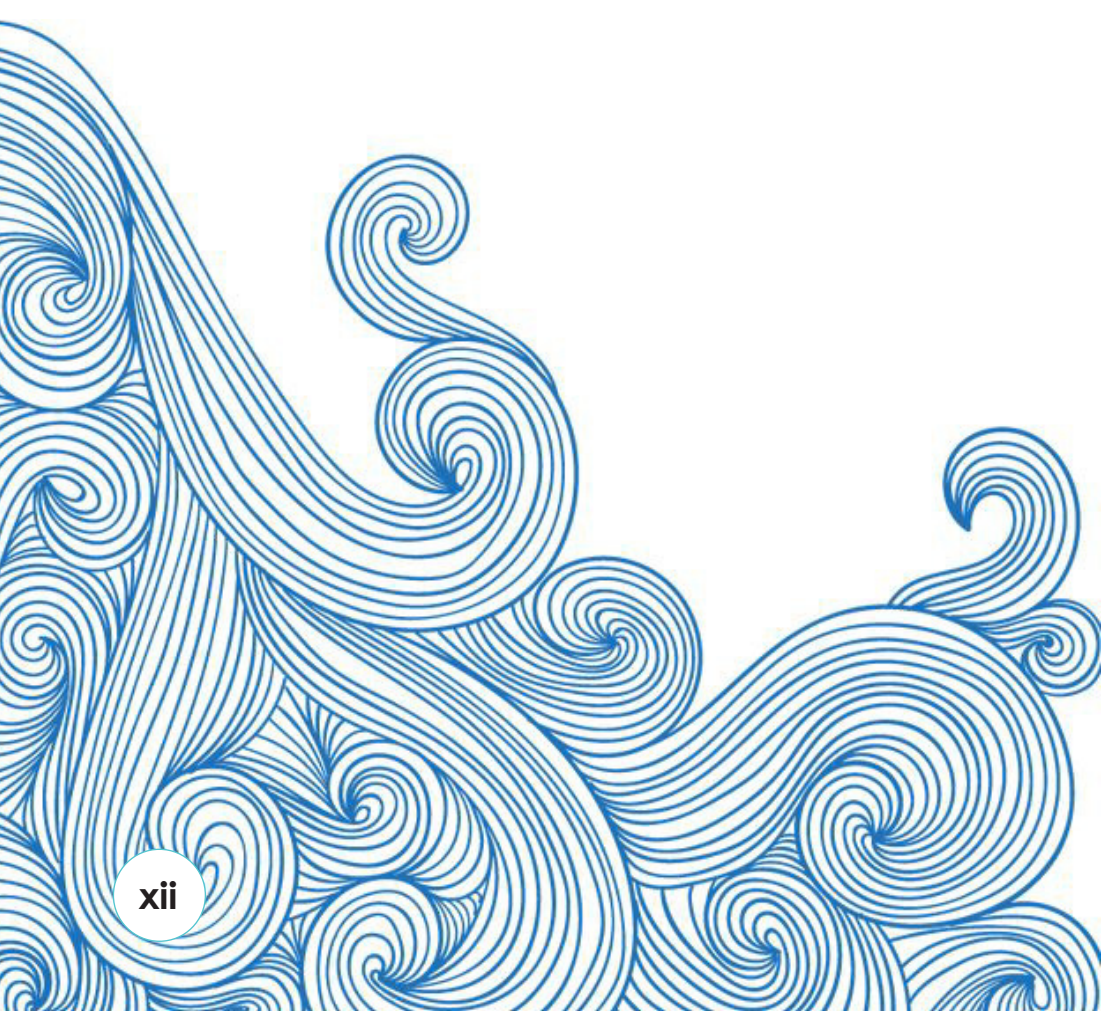
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ACRONYMS

CDP	City Development Plan
CETP	Central Effluent Treatment Plant
CPCB	Central Pollution Control Board
CSP	City Sanitation Plan
CSR	Corporate Social Responsibility
DPR	Detailed Project Report
DUDA	District Urban Development Agency
FAR	Floor Area Ratio
FSSM	Faecal Sludge and Septage Management
IITK	Indian Institute of Kanpur
KDA	Kanpur Development Authority
KNN/KMC	Kanpur Nagar Nigam/Kanpur Municipal Corporation
LPCD	Litres Per Capita Per Day
LULC	Land Use Land Cover
MLD	Million Litres Per Day
NIUA	National Institute of Urban Affairs
NMCG	National Mission for Clean Ganga
MoHUA	Ministry of Housing and Urban Affairs
MSW	Municipal Solid Waste
MT	Metric Tons
NGO	Non Governmental Organization
OSS	Onsite Sanitation Systems
PSI	Population Service of India
RCUES	Regional Centre for Urban and Environment Studies
SDG	Sustainable Development Goal
SoP	Standard Operating Procedure
STP	Sewage Treatment Plant
TPD	Tons Per Day
UDD UP	Urban Development Department, Uttar Pradesh
UGD	Underground Drainage
UPPCB	Uttar Pradesh Pollution Control Board

Executive Summary

There is an ever-growing understanding that a river and a city have a symbiotic relationship. On the one hand, a river provide a range of ecosystem services (provisioning, regulating, cultural, and supporting) to the city. On the other hand, river-sensitive development in cities helps the river maintain its natural flow and other characteristics.

The purpose of this document (Urban River Management Plan, URMP) is to develop a dedicated strategy for managing the extent of the Rivers Ganga and Pandu—that flow through the city of Kanpur—in an efficient and sustainable manner. The document is based on the Strategic Framework for Managing Urban River Stretches developed by the National Institute of Urban Affairs (NIUA), in association with the National Mission for Clean Ganga (NMCG).

The URMP proposes **nineteen tangible and practical actions for managing the two rivers under a ten-point agenda** (or objectives) to ensure the “Nirmal” and “Aviral” nature of the rivers in the city. The level of detail for the interventions is restricted to the concept idea for general understanding. Detailed Project Reports (DPRs) will be prepared for each intervention based on the concept ideas proposed in the document.

This version of the URMP (Version 1.0) for Kanpur City is meant to be short-term in nature, targeting actions over a 2-3 year period. However, the URMP document is a living document, which will address issues related to river management on continuous basis in subsequent versions.

Approach adopted for preparing the URMP for Kanpur

As a first step, a core working group comprising of eleven members from eight organizations, chaired by the Commissioner, Kanpur Nagar Nigam (KNN), was set up to lead the development of the URMP for Kanpur.

Next, a rapid baseline assessment was carried out to understand the ground reality of river-related issues and challenges faced by the city. The assessment was based on secondary data, published reports, and projects implemented by KNN. The baseline included information on planning provisions related to rivers, waterbodies, wetlands, drains etc; status of river pollution, groundwater status, encroachments in floodplain etc; latest status of service level benchmarks; and ongoing projects in the city on rivers, waterbodies and drains.

On the basis of the rapid baseline assessment, nineteen projects/interventions were identified that will be taken up in Kanpur's URMP 1.0.

Stakeholder consultation workshops were also organized periodically to seek input from different actors for the development of the URMP. The team from NIUA and NMCG helped facilitate the various activities.

From inception to its finalization, the URMP preparation process in Kanpur took almost a year. This includes 4 months of inactivity because of the Covid-19 crisis.

Based on the rapid baseline assessment; the core working group made a qualitative assessment to prioritise the objectives of the URMP. Table 1 (Pg 14) presents the results of this assessment. Interventions corresponding to “high” and “very high” priority have been included in the URMP 1.0.

Envisaged benefits of the URMP for Kanpur city

It is envisaged that implementing the URMP will yield several tangible and intangible benefits, as listed below.

- It will improve the environmental outlook of the city, making it more appealing to residents and visitors as well as help in providing ancillary benefits such as air pollution control, thriving biodiversity, flood mitigation, and improved groundwater recharge.
- It will improve the connect between the residents and the rivers by creating avenues for recreation, social bonding, and leisure. This will be one of the factors for improving the quality of life of the residents.
- It will fuel the city's economic development by boosting river-related economy and providing livelihood for multiple stakeholders. This will also help create a conducive environment for attracting investment opportunities in the city.
- The technological interventions proposed in the URMP will contribute to the state-of-the-art digital governance for the city, which is in line with the city's overall aspiration.
- The URMP will create a premise for shared governance with citizens taking on a more active role in managing the city's environmental assets, in the process instilling a sense of ownership around actionable items.

Interventions proposed in URMP

The core working group in consultation with other stakeholders have identified nineteen projects/interventions for URMP 1.0. The table on next page presents the relevant details of these interventions that includes the agency(ies) responsible for implementation, estimated costs, and the source of funding for each intervention (Refer next page).

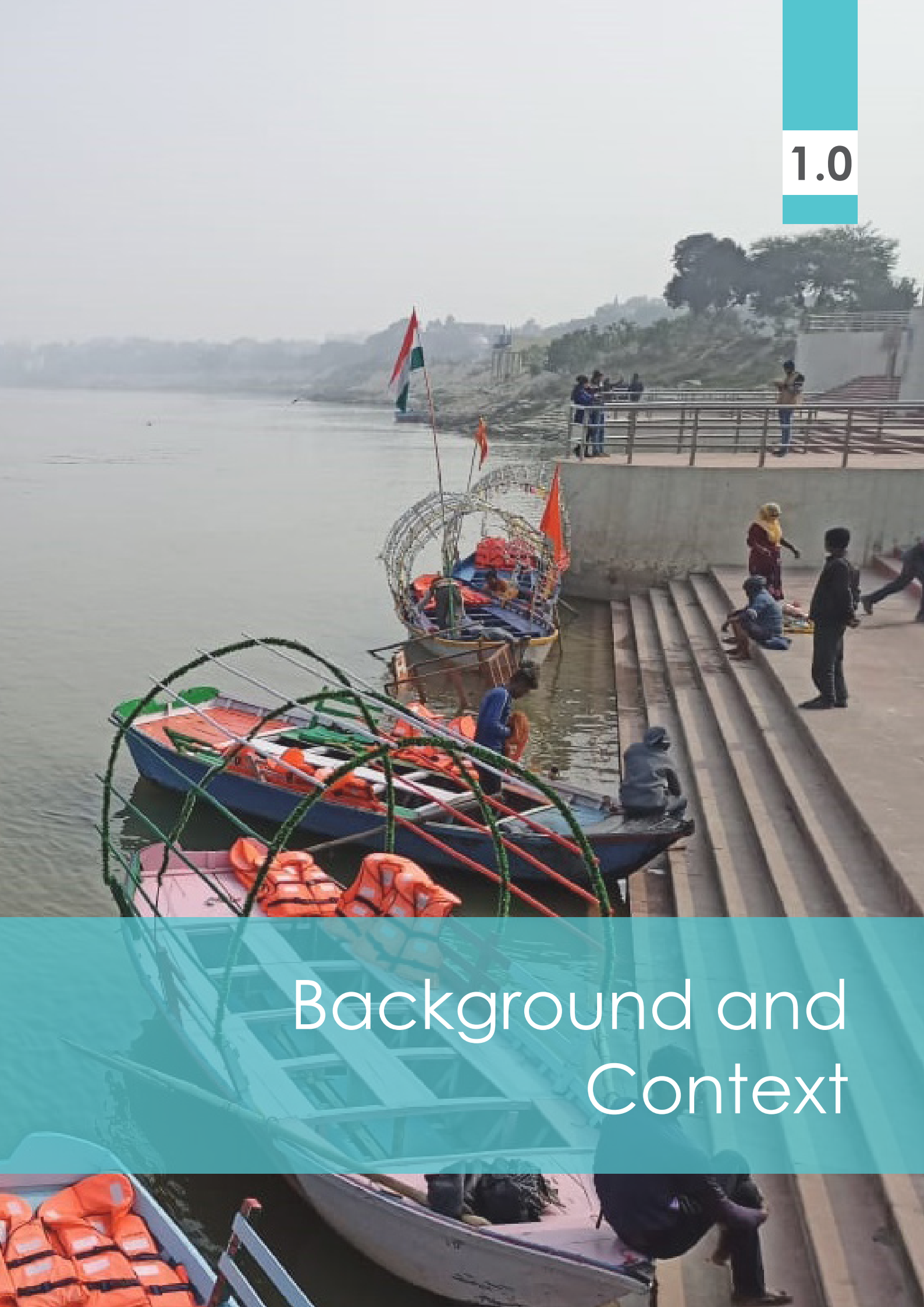
Commissioner,
Kanpur Nagar Nigam

Proposed interventions for Kanpur's URMP 1.0

S No.	URMP Objective	Interventions (or projects)
1	To ensure effective regulation of activities in floodplain	Intervention 1: Enhance river-related development control regulations, planning norms, and bye-laws in the Master Plan 2041
2	To keep rivers free from pollution	Intervention 2: Integrate river water quality information into Smart City Command and Control Centre
		Intervention 3: Strengthen Faecal Sludge and Septage Management (FSSM) in the city 3a: Develop a database of 92,000 households for facilitating FSSM implementation 3b: Carry out geo-tagging of 50 desludgers 3c: Conduct technical assessment for co-treatment of FSSM at functional STPs
		Intervention 4: Implement DEWATs for 700m stretch of drain in Barra locality in Zone 5.
		Intervention 5: Clear all solid waste along river banks in both Pandu and Ganga Rivers
		Intervention 6: Develop a comprehensive GIS-based scientific databases for water bodies
3	To rejuvenate waterbodies and wetlands in city	Intervention 7: Provide a protective boundary fencing for all waterbodies
		Intervention 8: Revive and develop two waterbodies (Mama Talav, Mangla Vihar) as recreational avenues
		Intervention 9: Develop riparian zone along Pandu river in 13 recommended pockets covering 20 hectare land
4	To enhance the riparian buffer along river banks	Intervention 9: Develop riparian zone along Pandu river in 13 recommended pockets covering 20 hectare land
5	To adopt increased reuse of treated wastewater	Intervention 10: Commission a study for establishing the practical modality of using maximum treated wastewater in the city.
		Intervention 11: Reuse treated wastewater for horticulture within 3km of all STPs
6	To ensure maximum good quality return flow from city into river	Intervention 12: Conduct a comprehensive scientific assessment of the water balance in the city, and develop a water budget dashboard
		Intervention 13: Clean drains in two major sub-catchments of sizes 10 km ² and 7 km ² of the Ganga and Pandu Rivers respectively
7	To develop eco-friendly riverine projects	Intervention 14: Develop a Ganga park at Atal Ghat
8	To leverage on the economic potential of river	Intervention 15: Develop a floating restaurant facility upstream of the Ganga Barrage (KDA boat club)
		Intervention 16: Develop a cultural theme boat ride between Ganga Barrage and Bithoor stretch
9	To inculcate river sensitive behaviour among citizens	Intervention 17: Develop a dedicated river-based sensitization programme that will include the following <ul style="list-style-type: none"> • Celebrating of river day on annual basis • Organizing competitions for school children • Live performances by youth, local artists on select Sundays • Hoardings, digital displays
10	To engage citizens in river management activities	Intervention 18: Engaging citizens for river water quality monitoring
		Intervention 19: Engaging citizens for river clean-up activities
TOTAL ESTIMATED BUDGET		

	Responsible agency	Estimated Budget (INR)	Source of Finance
	KDA	0	
		2,04,00,000	
	KNN	1,00,000	Jal Jeevan Mission (Urban), Smart City Mission, SBM (U), Self-funding
	Jalkal Vibhaag		
	Jalkal Vibhaag	18,00,000	
	Jal Nigam	15,00,000	
	KNN	1,50,00,000	
	KNN	5,00,000	
		13,70,00,000	
	KNN and KDA	1,00,00,000	Jal Shakti Abhiyan, Jal Jeevan Mission (Urban), Self-funding
	KNN	8,70,00,000	
	KNN	4,00,00,000	
		10,00,00,000	
	Forest Dept	10,00,000	CAMPA, Forest Department
		1,25,00,000	
	KNN	25,00,000	Smart city mission, Jal Jeevan Mission (Urban)
		1,00,00,000	
		40,00,00,000	
	KNN	25,00,000	Smart City Mission, Jal Jeevan Urban Mission, Self-funding
	KNN	15,00,000	
		3,50,00,000	
	KNN	3,50,00,000	Self-funding, Kanpur Development Authority (KDA)
		35,00,00,000	
	KDA	15,00,00,000	State Tourism Dept, KDA
	KDA	20,00,00,000	
		50,00,00,000	
	KNN		Jal Jeevan Mission (Urban), Swachh Bharat Mission 2.0, Smart City Mission, Self-funding
		50,00,00,000	
	KNN	25,00,000	
	KNN	25,00,000	
		55,89,00,000	





Background and Context

The Urban River Management Plan (URMP) for Kanpur has been developed with the overall vision to ensure the harmonious integration of the Rivers Ganga and Pandu in the development landscape of the city. The city is cognizant that the rivers have the potential to provide multiple benefits to its residents, and therefore, the interventions proposed in the Plan are aimed at treating the two rivers as valuable assets of the city.

The URMP for Kanpur has been developed in accordance to the framework proposed by the National Mission for Clean Ganga (NMCG, under the Ministry of Jal Shakti) and the National Institute for Urban Affairs (NIUA, an autonomous body under the Ministry of Housing and Urban Affairs).

1.1 Overall structure of the URMP of Kanpur

The URMP for Kanpur looks at the holistic management of the Ganga and Pandu rivers in a sustainable manner. The Plan, therefore, is based on the three pillars of sustainable development, i.e. environment, economy and social. The interventions/projects proposed under URMP are environmentally responsible, socially inclusive, and economically beneficial (ref. Fig 1) Each pillar also corresponds with a vision statement for the plan. These visions also represent the envisaged outcomes of the URMP in the long term.

The URMP's vision shall be achieved through a set of ten objectives, six of which are environmental, and two each for the economic and social visions. Each objective is unique and addresses a niche aspect of urban river management.

The “actionable items” of the Plan are in the form of interventions, which are a mix of on-the-ground projects and planning/regulatory actions.

There is a clear financing stream identified for each project-based intervention, which comes from multiple sources—self-funding, funding from urban missions, and funding from other sources.

Finally, the Plan establishes ten performance indicators, corresponding to the ten objectives, to measure the outcomes of the implementation of the Plan.

It is important to note that the URMP is a living document that will evolve over time as more knowledge and resources become available. This version of the URMP (URMP V 1.0) targets only interventions that shall be implemented in the short-term (up to 3 years).

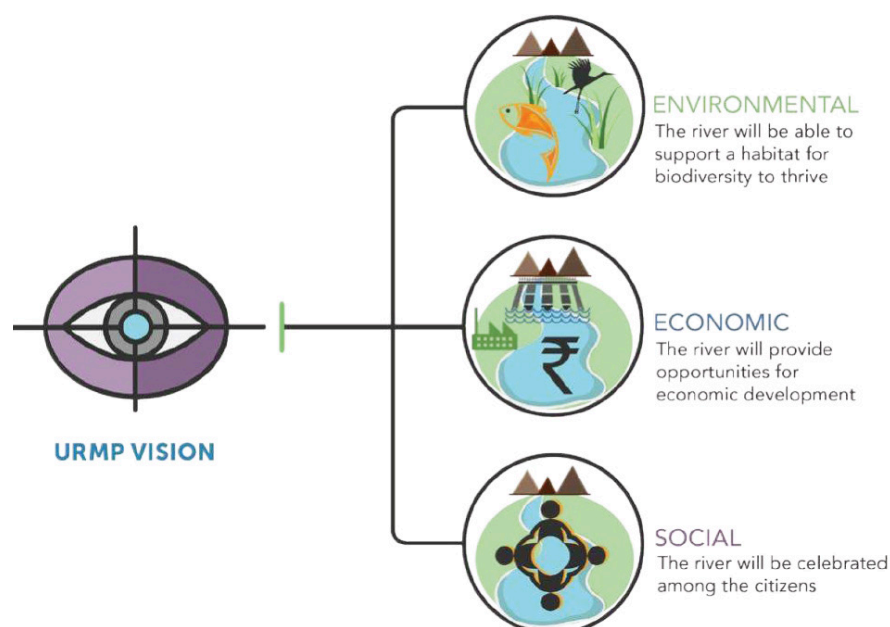







Diagram showing URMP Vision

Figure 1 : Structure of the URMP for Kanpur City

Elements	Environmental	Economic	Social
 Vision	The river provides a habitat for biodiversity to thrive	The river provides opportunities for economic development	The river is celebrated among the citizens
 Objectives	<ol style="list-style-type: none"> To ensure effective regulation of activities in the floodplain To keep the river free from pollution To rejuvenate waterbodies and wetlands in the city To adopt increased reuse of treated wastewater To enhance the riparian buffer along river banks To ensure maximum good quality return flow from the city into the river 	<ol style="list-style-type: none"> To develop eco-friendly riverfronts To leverage economic potential of river 	<ol style="list-style-type: none"> To inculcate river-sensitive behaviour among citizens To engage citizens in river management activities
 Interventions	Project Based Planning Based		
 Financing	Self-funding Urban Missions (Smart Cities, Jal Jeevan Urban, Swachh Bharat 2.0) Other sources (CAMPA, Municipal bonds)		
 Monitoring Indicators	<ol style="list-style-type: none"> Floodplain management Net Dissolved Oxygen Water body revival Riparian buffer Wastewater reuse Return flow 	<ol style="list-style-type: none"> Eco-friendly riverfront River economy 	<ol style="list-style-type: none"> Citizen sensitization Citizen engagement



1.2 Kanpur city profile

Kanpur is the twelfth most populous city in India ¹ and second most in the State of Uttar Pradesh (UP)². It is located 90 kms South West of Lucknow, the capital of UP.

Situated on one bank of the River Ganga, Kanpur is among the oldest industrial towns of North India. It is bounded by the Ganga River in North and the Pandu River in the South.

As per Census 2011, the city had a population of 27,65,348 (~2.7 million). However, as per KNN official records, in the year 2019-20 there were total 5,22,242 households translating to a total population of approximately 32,50,000 (~3.2 million). Equating to almost 19% growth in population over the last eight to nine years, which is quite significant. Owing to the significant population growth, nearly 25-30% of the population is estimated to be living in slums.

The climate in Kanpur is warm and temperate. The temperature ranges between a minimum of 2°C in the winters to a maximum of 48°C in peak summers. The monsoon season is from July to September, with the total rainfall in the district varying between 450 mm and 750 mm. However, in the Kanpur city (urban area) the rainfall is comparatively less and varies from 250mm to 350mm. The maximum rainfall recorded is 600mm. On an average, Kanpur city experiences 40 rainy days.

The topography of the city is mostly flat. The central region is high ground from where the local drains/nalas originates and flow towards either Ganga or the Pandu rivers. Geologically, the entire Kanpur district/nagar is composed of recently deposited alluvium. Rivers, alluvial plain, waterbodies, wetlands, cliffs, and ravines are the main geomorphic features of Kanpur and its surroundings. The flood plain of the Ganga River is not prominent in the city limits because of the cliffy banks. However, a well-defined floodplain is visible outside the city boundary.

Kanpur has Municipal Corporation status, and is administered by the Kanpur Nagar Nigam (KNN), spread over 260 km². The KNN is divided into six administrative zones and 110 wards. The city is widely considered as the commercial capital of the State of U.P.³. It is a hub for economic and educational activities in state. It is famous for the textile and leather industries. Although, these industries have boosted the economy of city and the region, they are also partly responsible for polluting the Ganga river. However, with pro-active measures taken by the Government, the river pollution has reduced significantly.



MAP 1: Kanpur Nagar Nigam extent between Ganga and Pandu River

¹ <https://www.census2011.co.in/city.php>

² Office of the Registrar General and Census Commissioner (web), Delimitation Commission of India (web), Rand McNally International Atlas 1994, School of Planning & Architecture (web) referred from <http://www.citypopulation.de/php/india-uttarpradesh.php>

³ <http://kmc.up.nic.in>



2.0



Approach for the URMP Kanpur development

The city of Kanpur, Uttar Pradesh is the first city of India to prepare a dedicated URMP following a framework (link below) developed by NIUA and NMCG. URMP making initiated with a launch workshop at IIT Kanpur in May 2019 in presence of key officials from the Centre, State and City. During URMP making phase three workshops were organized by NIUA to handhold the URMP making process.

A dedicated working group was formulated to prepare the Kanpur URMP. Commissioner, Kanpur acted as a Chair. Officials from all concerned departments of KNN, as well as from KDA, Jal Nigam, UPPCB, Groundwater, Irrigation, Forest, Tourism, IIT Kanpur, PSI India were invited in the workshops for their feedback on city assessment and identification of suitable interventions for Kanpur URMP.

Making of Kanpur URMP v.1.0 took almost one year due to Covid 19 related pause in various activities.

URMP Link: <https://niua.org/intranet/sites/default/files/963.pdf>

2.1 Overall approach for the URMP development in Kanpur

The development of the URMP for Kanpur involved three major activities. These are:

- Setting up a core working group of inter-agency officials
- Conducting a thorough baseline assessment of the relevant parameters in order to depict the status-quo of existing ground reality.
- Organizing stakeholder workshops for developing shared understanding of the URMP objectives and expected outcomes.

The development of the URMP was led by KNN, with the support from other relevant agencies in the city. NIUA and NMCG served as mentors throughout the Plan development process.

An inception workshop was organized on 16 and 17 May 2019 to kick-off the development of the URMP. The primary purpose of the workshop was to sensitize the different stakeholders on the need for the URMP and its benefits for the city, while at the same time carry out a multi-stakeholder SWOT analysis of the city.

In Pic 1, from left to right: Prof. Abhay Karandikar (Director, IIT Kanpur), Mr. Santosh Sharma (Commissioner, KNN), Mr. G. Ashok Kumar (Executive Director, Projects, NMCG), Mr. Manoj Singh (Principal Secretary, Urban Development, UP), Mr. Vijay Vishwas Pant (District Magistrate, Kanpur), and Mr. Rajiv Ranjan Mishra (Director General, NMCG).



Pic. 1: Inauguration of the inception workshop with the traditional lamp lighting



Pic. 2: Prof. Vinod Tare (IIT Kanpur) explaining the river health-human development nexus



Pic. 3: NIUA-NMCG team facilitating the SWOT analysis

2.2 SWOT Analysis

During the inception workshop at IIT Kanpur, NIUA-NMCG team held moderated discussions with officials from different departments. The following represents the SWOT profile of Kanpur city.

STRENGTHS

- Kanpur already has the required infrastructure for wastewater management. For example, it has four operational STPs with capacities 210 MLD, 130 MLD, 43 MLD and 42 MLD.
- One of the major polluting drains—The Sisamau Nala—has already been tapped into and diverted to an STP.
- Being the industrial capital the city has enough financial resources within the city that can be leveraged for the implementation of the URMP.
- Existing water bodies in the city can serve as strategic assets in the preparation of the URMP.
- IIT Kanpur has been a positive influence in helping Kanpur address the concerns in the Ganga.

WEAKNESS

- Industrial pollution has been a chronic issue with marginal progress made to abate it.
- The Western bank has been severely encroached in certain locations. Addressing this problem will be challenging.
- There is a big gap between the capacity of the wastewater treatment plants and the actual wastewater that is treated.
- Kanpur is prone to flooding along the riverbanks. This, coupled, with inadequate waste management in these areas compound the problem.
- Some political decisions have adversely affected the river health. For example, the tanneries were supposed to be closed during the Kumbh Mela in 2019. However, because of political issues, this was not possible.
- There is a general lack of river sensitivity among the citizens. The successful implementation of the URMP will depend upon its citizens. Hence, efforts to address this concern must be strongly taken up in the URMP.

OPPORTUNITIES

- Given the number of industries in Kanpur, there is tremendous potential for wastewater reuse.
- Kanpur is among the cities chosen for the Smart Cities Mission (SCM). The URMP development has strong synergies with the actions being taken under the SCM.
- People in Kanpur enjoy a very active social life. This trait can be leveraged upon in beautifying the riverfront, which will provide citizens with more avenues to socialize.

THREATS

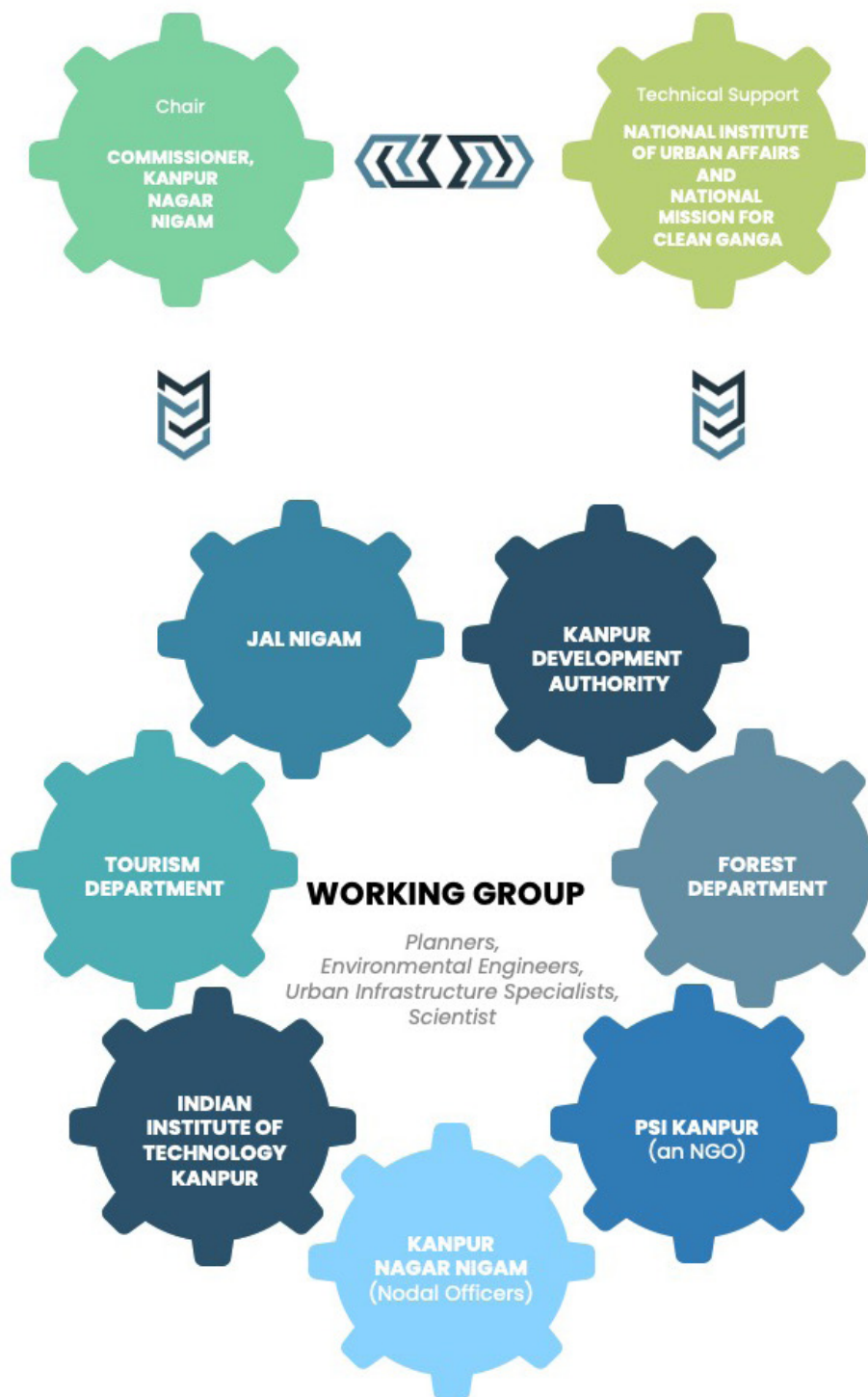
- Kanpur has strong industrial associations. They will have an important role to play in the implementation of the URMP. Given that they have their unique agenda, it will be very important for them to see a value in the URMP in order to get their support.
- The population in Kanpur has been increasing steadily over the years, and is expected to continue in the future. This will create additional stress on the riverine resources.
- There has been uncontrolled development in the city over the years. This trend may be continue in the future unless adequate planning interventions are not put into place.
- Kanpur receives significant industrial pollutant load from upstream towns like Kannauj and Farukhabad.
- Given that Kanpur is a successful industrial city, increased migration from neighbouring areas will only add to the existing problems.
- In addition to wastewater management, solid waste management is also becoming a major cause of concern. This compounds the overall pollution situation in the rivers.



2.3 URMP, Kanpur working group

After the inception workshop, officials from the relevant departments/agencies were identified to be part of the URMP working group. The purpose of the working group was to create a dedicated platform for these officials to brainstorm and work on the various aspects of the URMP, which primarily involved conducting the baseline assessment, and identifying relevant project interventions for the URMP. The Commissioner, KNN led the working group, which comprised twelve other officers (Figure 2). Details of the members of the working group are placed in Annex 1. Two nodal officers were appointed by the Commissioner (Annex 2) to drive the coordination with different agencies.

Figure 2: URMP working group



The primary responsibility of the nodal officers and working group was;

1. Collecting and analyzing secondary data, reports and necessary information related to the URMP from various agencies. NIUA provided handholding support in finalizing the baseline assessment and the URMP, Kanpur report.
2. Organizing stakeholder consultation workshops with support from the NIUA team.
3. Identifying suitable interventions for URMP based on the baseline assessment and stakeholder consultation.

2.4 Baseline assessment

A rapid baseline assessment was carried out to identify key river-related issues in the city under the following heads.

- **Planning:** Regulatory provisions related to rivers, waterbodies, wetlands, drains etc.
- **Pollution:** In rivers and groundwater etc.
- **Service level benchmarks (SLBs):** Related to water, wastewater and solid waste management
- **Ongoing projects:** Related to the rivers, waterbodies and drains.

The assessment was based on the secondary data provided by various government agencies such as KNN, Kanpur Development Authority (KDA), Jal Nigam, District Urban Development Agency (DUDA), Uttar Pradesh Pollution Control Board (UPPCB), and Groundwater Department among others. The Master Plan for Kanpur 2021, KDA bye-laws, City Development Plans, City Sanitation Plan, Slum Free Action Plan, and other reports from Central and State agencies were also referred for developing the assessment. Additionally, data and reports from NMCG, published research articles, and news posts were also used for strengthening the assessment.

GIS maps for the baseline parameters were already available with KNN, GIS cell. These maps were further updated by the NIUA team by incorporating additional analysis and key information related to URMP.

Based on the outcomes of the baseline assessment, the URMP Working Group made a qualitative analysis to determine the priorities of each objective of the URMP. Table 1 presents the results of this analysis.

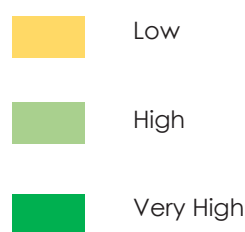
Table 1: Qualitative ranking of URMP objectives as per baseline assessment

SN	URMP Objective	Current status	Priority in URMP	Remarks
1	Regulation of activities in flood plain	★	High	River-related provisions are present in KDA bye-law 2008. The NGT order of 2017 has also provided some directions in this regard. Implementation of the regulations has been a challenge.
2	Pollution free river	★	High	3 STPs are already fully operational, 1 STP is under construction and 2 new STPs are planned. The major polluting drains (e.g. Sisamau Nala) have already been tapped. FSSM planning has started with some initial progress. River quality monitoring is carried out regularly. However, while the city has kept Ganga free from pollution, the pollution in Pandu River is a concern. Furthermore, solid waste management continues to be an issue.
3	Rejuvenate water bodies and wetlands	🗨️*	Very High	Most of the 80+ water bodies are in a neglected condition. No database is available. Groundwater depletion observed in several areas.
4	Enhance Riparian buffer	🗨️*	High	60% of the stretch along the Ganga River has a reasonably good buffer. However, only 25% of the stretch along the Pandu River has a buffer.
5	Increased use of treated wastewater	★★	Very High	40-65% of the treated wastewater is currently reused. Regulations are in place to encourage wastewater reuse for horticulture but there has been limited progress on this account.
6	Max. good quality return flow	🗨️*	High	No scientific estimates available for the city's water budget. Some storm-water drains in high yield sub-catchments are blocked.
7	Eco friendly Riverfront projects	🗨️*	Low	Most of the riverfront projects are in the form of Ghats (24 number). There is lack of variety in riverfront projects, although some interesting projects such as biodiversity parks, riverfront park, are in the pipeline.
8	Leveraging on economic potential of the river	🗨️*	High	The only current economic activities associated with rivers are boating (around 20 registered boatmen), informal fishing, and local commerce near ghats. The economic potential of rivers in Kanpur is largely untapped.
9	River Sensitive behaviour among citizen	★★	High	Wall art has been extensively used for sensitization. An "Anubhuti Kendra" in the Kanpur Zoo has been established to raise awareness about the Ganga.
10	Engage citizens in River Management Activities	🗨️*	High	Citizen engagement is mostly restricted to soliciting their feedback on issues that concern them. No mechanism in place to seek their active involvement in management activities.

STATUS



PRIORITY MATRIX



2.5 Stakeholder Consultation workshops

A number of formal and informal stakeholder meetings/workshops were organized for the preparation of the URMP. To begin with, the workshops/meetings were aimed towards facilitating a shared understanding of the URMP, its objectives, and scope. The latter workshops/meetings were organized for identifying and finalizing the interventions for the URMP.

The team from NIUA and NMCG supported the organizations in the workshops. Additionally, a number of one-on-one meetings were organized between representatives of different agencies to help inform the development of different aspects of the URMP.

For the ease of communication and quick facilitation, a URMP Working Group on WhatsApp was also created where information was shared from time to time.

Annex 3 provides participants list and working group



Pic. 4: Akshay Tripathi, Commissioner, KNN in a URMP working group meeting



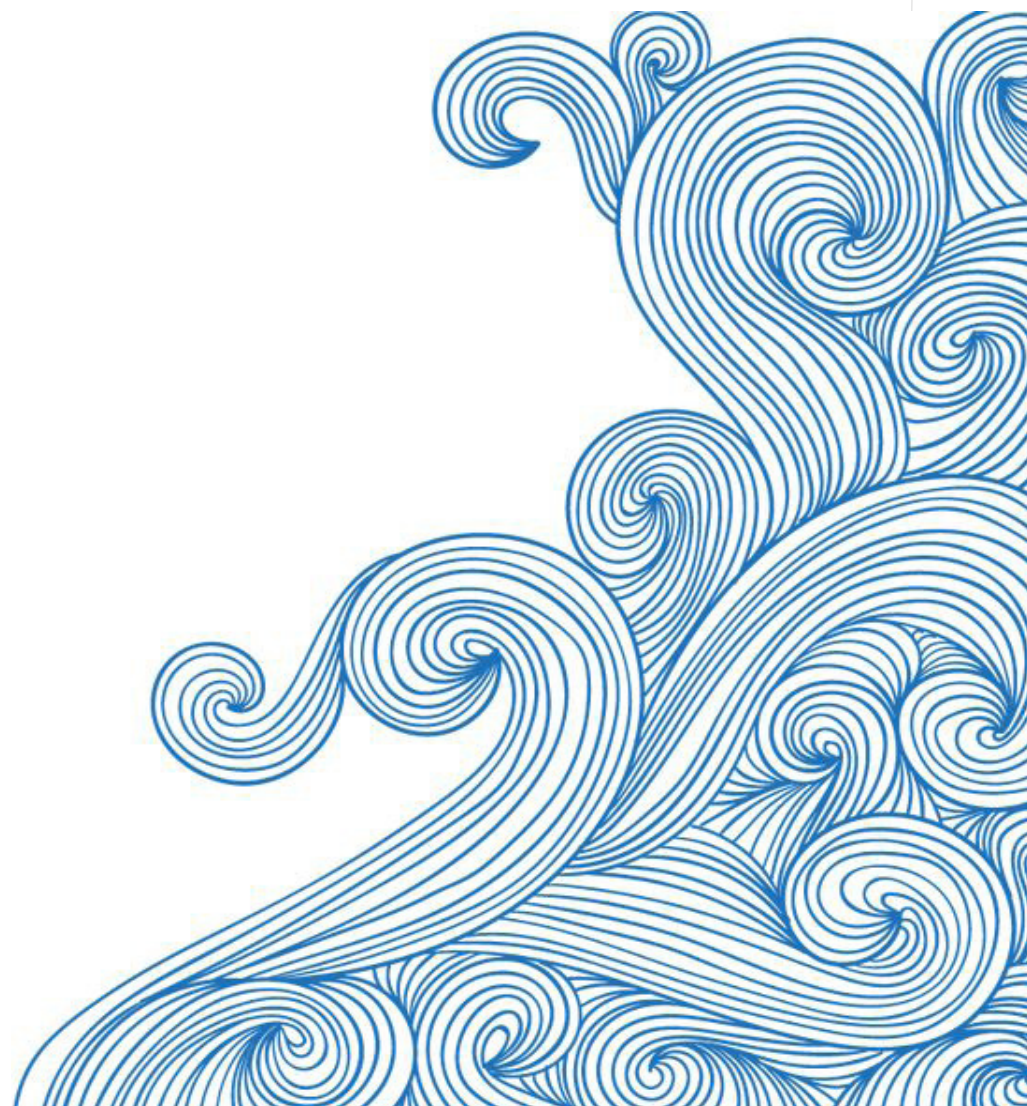
Pic. 5: Glimpses of focused group discussions in the first stakeholder workshops



Pic.6: Concluding workshop to finalize the URMP interventions

2.6 Timelines

The preparation of URMP Kanpur V 1.0 took almost one year time which includes almost six months pause in activities due to Covid 19 restrictions. A rapid assessment was initiated to map the status quo of Kanpur city with respect to river management issues. The assessment based on the secondary data analysis, boat rides along river banks, visits to waterbodies etc. identified issues concerning river's health and recommend suitable interventions. One-on-one meetings were held with officers of all concerned agencies present in the city.







Proposed interventions in URMP, Kanpur

URMP of any river city should be a living document and updated from time to time. The purpose of URMP is to recommend suitable interventions/projects for each of 10 URMP objectives to improve Environmental, Social and Economic aspects related to rivers. It is also possible that for a particular river city only some objectives are relevant and thus interventions are also recommended accordingly.

For Kanpur URMP V.1.0 total 19 individual interventions are recommended based on discussions held in city stakeholder consultation workshop. This section covers details of those interventions, their implementation process, estimated costing and possible financial stream to cover expenditure to implement them. Some of the interventions are unique like preparing organized database of waterbodies of city, tourism activities like floating restaurants etc. Perhaps none of the city in the country has included them in their plans.

It is recommended that interventions suggested in the URMP are implemented within 2-3 years timeline. It will help Kanpur to reap their benefits immediately without waiting for long.



3.1 Interventions to ensure effective regulation of activities in floodplain

This objective recommends strengthening the planning provisions in the Master Plan, related to conservation and management of rivers and its associated elements like drains and water bodies. Ensuring that only permitted activities and structures are allowed in the floodplains is crucial for the river's health.

KDA is in the process of finalising the new Master Plan (2041) which will soon replace the existing Master Plan (2021). While the existing Plan does include a few provisions for the Ganga river protection, it misses out on key elements such as provisions to protect the wholesomeness of the rivers and drains, designated floodplains and to regulate the developmental activities within the floodplain. Accordingly, as part of URMP, the Master Plan (2041) will incorporate the following suggestions/recommendations.

3.1.1 Include the Ganga and Pandu Rivers in the overall vision or objective of the Plan 2041

Master Plan 2021

Currently, the objectives of the Kanpur Master Plan 2021 (in action) include:

- Prevention of unplanned development
- Accommodate population in residential areas
- Appropriate transportation system
- Provide adequate community facilities
- Decentralization of commercial activities
- Adequate provision of open/ green areas
- Identifying solutions to control pollution
- Preventing conversion of agricultural lands

[Ref. Section 1.4 of the document]

Master Plan 2041

One of the objectives of the Kanpur Master Plan 2041 can be to

"Conserve and manage the Ganga and Pandu Rivers in a sustainable manner, and enhance their connect with the city"

Kanpur is fortunate to have the Ganga and Pandu Rivers flow through it. These rivers have a strong historic, cultural, social, and spiritual connection with the city. This recommendation will send the right message to citizens and all stakeholders that the city values the rivers as an important agenda in its future plans.

In the last few years, the focus has been on cleaning and rejuvenating the Ganga. However, the Pandu River has been generally neglected leading to a rise in pollution in the river. It would be best to take corrective action today to avoid long-term impacts.

3.1.2 Recommendation 2: Incorporate the river-related directions made in national or state policies or initiatives

Master Plan 2021

The Kanpur Master Plan 2021 makes no provision regarding the matter

RATIONALE: A number of National/State policies and initiatives have provided directions that have a bearing on river management. It is good for the Master Plan to incorporate these to the extent possible to ensure that the development in Kanpur is aligned with national directions. Some of these policies include:

- National Water Policy, 2012
- Uttar Pradesh Groundwater Management and Regulation Act 2019
- Uttar Pradesh Groundwater Management and Regulation (First Amendment) Rules 2020
- UP Rainwater Harvesting and ground water recharge standards, techniques and design
- Action Plan for Restoration of Polluted Stretch of River Ganga from District Kannauj to District Varanasi, UP
- UP State Water Policy.

Master Plan 2041

Appropriate directions from the policies may be adopted by the Kanpur Master Plan 2041 as Development Regulations or recommendations:

- Rainwater harvesting structures to be mandatory for all new construction with a plot area of 300 sq. m or more.
- All existing groundwater users: commercial/ industrial/ infrastructural or bulk users to be charged on the basis of the quantity used.
- Prohibition on pollution of ponds, rivers, wells etc.; ban on direct recharge from open areas into the aquifers.
- Commercial, industrial, infrastructural or bulk user withdrawing ground water above a determined threshold to be mandated to recycle water for purposes as may be suitable.
- Revival and rejuvenation of rivers, ponds, wells etc.

3.1.3 Recommendation 3: Direct and mandate concerned agencies for developing a thorough baseline for the rivers and its associated elements

The Kanpur Master Plan 2021 makes no provision regarding the matter

However, it acknowledges the issues and problems faced in the Ganga River, which is the main source of city's drinking water.

It highlights that the river is highly polluted due to direct discharge of polluted residual flow from various industries and drains, disposal of waste water from tanneries with hazardous chemicals, and disposal of half burnt or unburnt bodies as religious rituals; and the pollution levels are significantly above the prescribed standards.

[Ref. Section 6.7 of the document]

The Kanpur Master Plan 2041 may mandate a suitable government agency to prepare a robust GIS based spatial database for the rivers and its associated elements within the city. The database should include (but not limited to):

- Physical mapping of the two rivers
- Delineating the floodplains
- Mapping major drains, wetlands, and water bodies
- Delineating buffer areas and existing land use in the river zone and other elements.
- Hydrological parameters (flow, discharge, depth, etc.) in the river and other elements.
- Water quality parameters (DO, BOD, E-Coli, Heavy metals, etc.)
- Biodiversity mapping in the river and other elements

RATIONALE: The baseline here refers to a database of information on the river and its associated elements like water bodies, wetlands, and drains. Such a baseline is absolutely imperative to help design proper scientific solutions for river management in the city. Currently, only limited data and information related to the river and its associated elements is collected and available (e.g. water quality) in Kanpur. Significant pertinent data is not collected.

3.1.4 Recommendation 4: Incorporate the river-related directions made in national or state policies or initiatives

The Kanpur Master Plan 2021 makes no provision regarding the matter

RATIONALE: A riparian buffer is a longitudinal stretch of vegetation on either bank of a river. It is meant to do two things. The first is to act as a shock absorber and cushion the river and its aquatic ecosystem from detrimental developmental activities in the city. The other is to protect the city from the impacts of floods.

Around 25 km of riparian buffer already exists along the bank of the Ganga in Kanpur. This is around 60% of the total stretch. However, only 17 km (25% stretch) of riparian buffer exists on the banks of Pandu River.

The Master Plan may provide an elaborate strategy for enhancing the riparian buffer along both the rivers, especially the Pandu. The strategy should include the following:

- Earmarking a fringe of 30 m for the buffer, wherever possible.
- Assigning an appropriate land use for the riparian buffer
- Clarifying land ownership in the buffers
- Direct the concerned agency to develop a riparian planting action plan using the native species

3.1.5 Recommendation 5: Assign a dedicated land use/use zone category to the river and its associated elements

Master Plan 2021

The Kanpur Master Plan 2021 has a separate land use category for River & Drains in the existing LU table (1997-98).

[Ref. Section 5 of the document]

The proposed land use table for 2021, however, does not have any such separate category, [Ref. Section 8 of the document].

RATIONALE: Assigning a separate land use/use zone category to the river and its associated elements will help in assigning appropriate use premises and river-friendly activities.

Master Plan 2041

The Master Plan 2041 could have a clearly defined land use/use zone category for the river and its floodplains, within the existing and proposed land use tables.

Both the Ganga and Pandu Rivers and their floodplains could be clearly marked in the land use plan as well, under the appropriate land use/use zone category.

3.1.6 Recommendation 6: Enhance the Development Control Regulations (DCR) in the river zones of both rivers

Kanpur Development Authority (KDA) bye-laws of 2008 and 2018 mention the following in context of the Ganga River:

- Only repair and renovation of already existing buildings in consultation with INTACH will be allowed within 200m from the river bank. In major pilgrimage centers on the bank of the Ganga River, development of temples and other religious structures within 200m from the river bank will be allowed to be developed under the following conditions-
- Ground coverage 35% as well as FAR 1.5 will be permitted in the river zone
- Plan of the proposed development should ensure that no pollution to the river will be caused. Plan will be approved on clearance from Jal Nigam/ Jal Sansthan or Development Authority.
- Drainage will not be allowed to be discharged directly into the river. Instead, arrangements will be made for it to be carried to Nallas etc.

DCRs for protecting water bodies

The existing land use of any natural water body, lake, stream, etc. above 1 acre falling under any proposed land use in the Master Plan/ Zonal Development Plan, will remain unchanged, for ensuring ground water recharge. It is essential to list such areas, along with details of their location and area, and proper provisions have to be made for their protection within the Master Plans/ Zonal Plans/ Layout Plans.

[Ref. Section 11.1.6 of the document]

DCRs for permissible/prohibited/regulated activities in the river zone

STPs should not be constructed close to the riverbed, preferably there should be a distance of 500 m plus from the edge of the river (NGT, 2017)

- Dharamshalas etc. will not be permitted if sewerage system is not in place in the concerned location.

The Master Plan 2041 may continue with similar development regulations for all development within the river zone.

Additionally, the Master Plan 2041 may clearly suggest

- Any new development/ re-development of the area must be in compliance with the Development Control Regulations for the River Zone
- A phased strategy for restoring the river zone to be prepared by the concerned agency

RATIONALE: The existing KDA bye-laws only considers the Ganga River and thus provisions are restricted to Ganga River and not to Pandu River.

The Master Plan 2041 may continue with similar provisions for protection of all waterbodies above 1 acre.

- The land use plan may also mark all existing water bodies above 1 acre, and designate appropriate land use
- The Master Plan 2041 may direct the concerned authorities to prepare a database for all water bodies within the city (given that there is hardly any information about these)

In addition to the existing provisions, the Master Plan 2041 may direct the concerned authorities to

- Demarcate the 'no development zone' and 'interactive zone', for regulating all development within the flood plains of both the rivers
- Enlist the prohibited, regulated, and permissible activities within each of these zones
- Devise a phased strategy for relocation of prohibited activities
- STPs should not be constructed close to the riverbed, preferably there should be a distance of 500 m plus from the edge of the river (NGT, 2017)

3.1.7 Recommendation 7: Enhance the Development Control Regulations (DCR) in the river zones of both rivers

Master Plan 2021

The Kanpur Master Plan 2021 makes no provision regarding the matter

RATIONALE: A The existing KDA bye-laws only considers the Ganga River and thus provisions are restricted to Ganga River and not to Pandu River.

Master Plan 2041

The Master Plan 2041 may recommend the following standards for protecting the catchment areas -

- A buffer of 75 m buffer as "No Development and Construction Zone" to be maintained around waterbodies (lakes / ponds), as per the revenue records. The minimum size of water bodies/lakes applicable in this context to be decided by local stakeholders.
- A buffer of 50 m for primary, 35 m for secondary and 25 m for tertiary drains (measured from the edge of drains) to be maintained

Alternatively, the plan may direct a competent authority to identify and establish adequate buffer standards (as per requirement and land availability analysis) for water bodies and drains within the city.

3.1.8 Recommendation 8: Enhance the Development Control Regulations (DCR) in the river zones of both rivers

The Kanpur Master Plan 2021 has a separate section for execution of plans with water harvesting, with the following provisions:

- Approx. 5% land of plots greater than 20 acres shall have a provision for water bodies/ lakes under parks or open spaces, within their layout plans, in order to ensure ground water recharge. Min. area of such water body should be 1 acre and min. depth should be 6m. Provisions for water harvesting should be made while approval of building plans.
- Construction of check dams on Pandu River and Gujaini Drain, after detailed survey and technical testing, to raise the ground water levels naturally by retaining excess water during rainy season from draining out in the Ganga river.

[Ref. Section 10 of the document]

Construction of wastewater recycling system/ use of recycled water shall be ensured at all plots (under all types of land uses) having min. 10000 lit of daily discharge.

(KDA Building Construction and Development Bye-Laws 2017 (Revised))

Specific Development Controls for rainwater harvesting provisions include:

- Rainwater harvesting may be made mandatory for plots of area equal to or more than 100sqm developed by government tribunals/ private developers/ cooperative societies.
- In areas other than those having waterlogging issues, all plots of area equal to or more than 300sqm and on all group housing schemes, provision may be made for collection of rainwater (available from roofs and open areas) and groundwater recharge (through suitable recharge structures)

The Master Plan 2041 may continue with the existing provisions for promoting recharge and reuse.

In addition, the Master Plan 2041 may direct the concerned authority to identify potential groundwater recharge zones within the city. These should be earmarked under appropriate land use category within the land use plan.

3.1.9 Recommendation 9: Develop and Institutionalize regulations for solid waste dumping in the river zone

Master Plan 2021

The Kanpur Master Plan 2021 makes no provision regarding the matter

Master Plan 2041

The Master Plan 2041 may direct the concerned authority for removal of all existing formal/ informal dumping sites within the River Zone in a sensitive and empathetic manner. In addition, it can make the following recommendations–

- Complete prohibition for dumping of solid waste in or around the River Zone or any other eco-sensitive sites, by imposition of strict penalties through local bodies
- Strengthening of waste collection system from unauthorized sector along the rivers
- Promotion of public awareness campaigns

3.1.10 Recommendation 10: Reviving the existing fly ash dumping site in the river zone

The Kanpur Master Plan 2021 makes no provision regarding the matter

Pollution of fly ash overflowing from fly ash pond at Panki Thermal Power Plant is one of the main contributors of river pollution in the river

The Master Plan 2041 may direct the concerned authority to devise an action plan for –

- Shifting to cleaner means of power generation in a phased manner
- Rejuvenation of the existing fly ash pond and its re-development after adequate treatment (for recreational or other uses)



These documents can be accessed on: <https://urbanrivers.niua.org/>





3.2 Interventions to keep the rivers free from pollution

Pollution is one of the main reasons for the deteriorating state of rivers. Rivers are the ultimate recipients of untreated wastewater from towns and cities. Keeping rivers free from pollution is the first step towards achieving its rejuvenation.

3.2.1 Baseline assessment

Kanpur was one of the major pollution hotspot in the Ganga basin owing to the discharge of untreated domestic wastewater and highly toxic industrial waste from the tannery units into the Ganga River.

3.2.1.1 Liquid Waste Management in Kanpur City

The total wastewater generation is estimated to be 320 MLD. The present sewage treatment capacities of all Sewage Treatment Plants (STPs) combined stands at 414 MLD (3 STPs are fully operational, two proposed and one under construction). The city is divided into four sewerage districts and six zones for sewage management. As seen in Table 2 the sewerage coverage in zones 4,5 and 6 is less compared to other zones in the city. Zone 5, which mainly comprises of Pankhi Industrial Area has minimum sewerage coverage. Further, this zone has the highest number of community toilets, which is because of migrant labours residing in this zone, who do not have an individual household toilet facility.

Table 2: Status of zone wise sanitation management

Zone no.	Sewerage coverage (%)	Public toilets	Community toilets
1	42	69	32
2	46	20	76
3	44	81	42
4	36	48	79
5	32	2	90
6	34	30	50

Source: KNN, 2020

While the city has surplus sewage treatment capacity, the coverage of sewerage network is only 64%⁴ and collection efficiency of this network laid is approximately 90%. Hence, the STPs are underutilized.

The Sisamau Nala (drain), one of the biggest contributor of pollution load in the Ganga River has been completely tapped and the sewage flow is diverted to Jajmau STP for treatment. The treated effluent is discharged into drains and is re-used by farmers for agriculture in downstream areas. The treatment efficiency of STPs is estimated at 70% based on the effluent samples tested for meeting the discharge standards.

The other major contributor of pollution in Kanpur have been the tannery units. Many of these units have been shut down or shifted to other location to reduce river pollution. The existing CETPs in Jajmau are being strengthened and new ones are being built to effectively treat the tannery waste.

The city has made great progress in terms of reducing pollution load entering into Ganga River owing to several sewerage infrastructure developments funded under the National Mission for Clean Ganga. However, the Pandu River flowing through western part of the city still receives large volumes of domestic sewage and industrial effluents. The Pandu River merges with the Ganga River downstream of the KNN boundary.

⁴Service Level Benchmarks Report (2018-19)

3.2.1.2 River water quality monitoring in Kanpur City

The water quality of Ganga and Pandu Rivers is monitored by both Uttar Pradesh Pollution Control Board (UPPCB) and Central Pollution Control Board (CPCB). There are total nine monitoring points along the Ganga River, which includes three real time monitoring stations managed by CPCB, and six manual stations monitored by UPPCB on a monthly basis.

As per the monitoring results, the Ganga River water quality in Kanpur generally falls under Class “B”, which is fit for bathing and non-potable usage (industry, irrigation). The water quality downstream of Ganga Barrage until Jajmau bridge is well within permissible limits, but it sharply deteriorates in terms of DO, BOD and E.Coli downstream of Jajmau bridge.

In case of Pandu River and other 20 drains within the city, the water quality monitoring is done by UPPCB at 34 fixed points, however the data is not available in public domain.

3.2.1.3 Septage/FSSM Management

Approx. 92,000 households (18% of the total households) rely on OSS systems, present mainly in the form of septic tanks and leach pits. The blackwater from toilets is disposed into OSS at household level, whereas the greywater from bathroom and kitchen sink is directly discharged into the open drains. The septic tanks/pits once filled are being de-sludged by the households by availing service from private de-sludging operators operating informally within the city. There are around 50 desludging trucks in the city and each truck has a capacity to de-sludge a maximum of 5 cubic meters per trip.

The total daily faecal sludge/septage generation in the city is estimated at 95-100 KLD⁵ (0.1 MLD). For effective Faecal Sludge and Septage Management (FSSM) in Kanpur City, Population Services International (PSI), a Lucknow based NGO is providing technical support to Jalkal, KNN. The current status of FSSM value chain and activities undertaken by PSI is summarized in the Table 3.

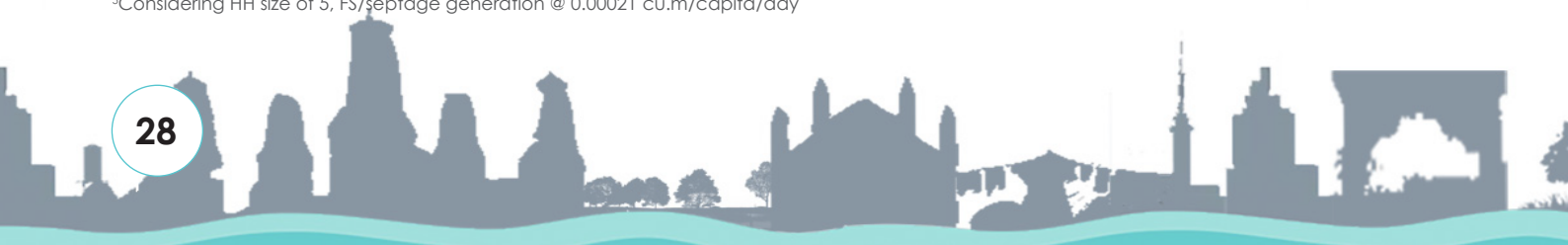
Table 3 - FSSM status in Kanpur

FSSM value chain stage	Status in Kanpur	Remarks
Containment (OSS – pits, septic tanks, soak pits etc.)	Not known	92,000 HH in city are connected to septic tanks. Ward wise database not available. Similarly information on Public and Community toilets disposal (septic tank/network) not available
Conveyance (Transportation via desludging tankers)	50 desludging vehicles available within the City, each having capacity of 5 cu.m.	PSI Kanpur has facilitated dialogue between Jal Kal, formal association of private desludgers formed, licensing of desludging tank operators is under progress
Treatment (Co-treatment at STP, stand-alone FSTP)	Co-treatment allowed in Binagawa STP having 240 MLD capacity which is currently under-utilized. Max. daily receipt at STP 15-20 tanks (~75-100 cu.m) Other STPs in city are not assigned for co-treatment	High penalty for desludgers registered under the association for discharging sludge in open, however due to lack of monitoring protocols, open disposal of sludge cannot be ensured
Reuse (Manure, Soil Conditioner)	Currently co-treatment opted	This might require detailed investigation particularly for controlled farm spreading

Source :- Inputs from Jalkal, KNN & PSI

There is very little information available regarding the liquid waste disposal system available for the 250 public toilets and 369 community toilets.

⁵Considering HH size of 5, FS/septage generation @ 0.00021 cu.m/capita/day



3.2.1.4 Solid Waste Management (SWM) in Kanpur City

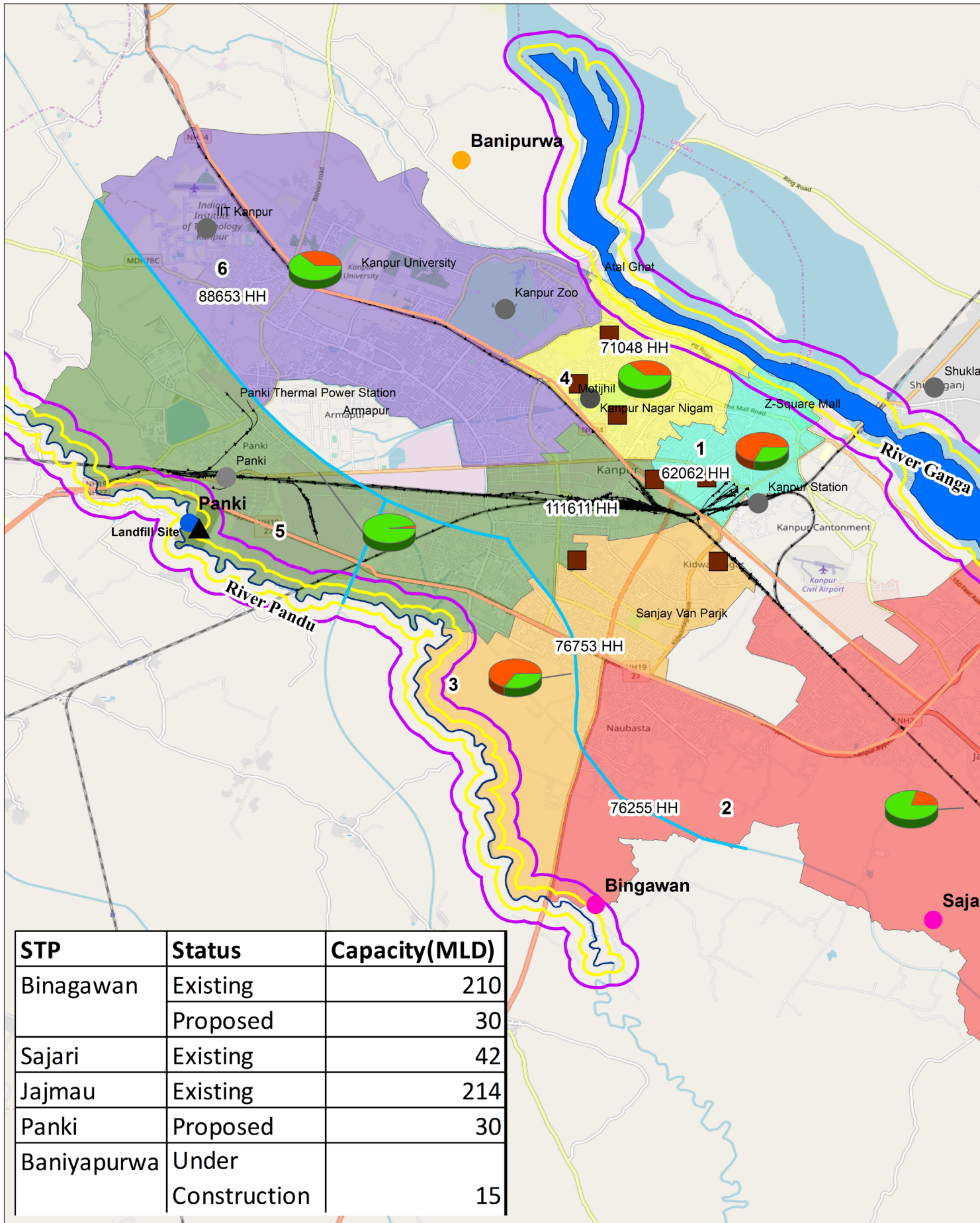
The city generates approximately 1,430 metric tonnes per day (TPD) of solid waste. The capacity of waste processing and disposal facilities is 1127 TPD, translating into collection gap of almost 300 TPD. Much of this uncollected waste ends up in the 20 natural drains of the city causing blockages, contaminating surface and ground water and also causing incidences of urban flooding. For example, in 2018-2019, there were 10-15 water-logging incidences because of blockages in drainage network (SLB, 2019).

The solid waste dumps are visible along the roads and the river banks, especially near the Jajmau bridge. The illegal constructions on the banks of the Ganga river directly discard solid/liquid waste in the river. The solid waste from these drains flows into Ganga and Pandu River thereby polluting the rivers.

Map 2 presents the overview of the sanitation situation in Kanpur



Pic.7: Pictures of the solid waste dumps along the river



MAP 2: Sanitation infrastructural provisions and management in Kanpur

URMP Baseline Sewage and Sanitation Management Assessment

Legend

- Canal
- NGT Order 500Mt
- KDA Bye-Law 200Mt
- Railway Network
- Road
- Solid Waste Dumping Site
- Landfill Site
- River

STPs

- Existing
- Proposed
- Under Construction

Toilet Coverage(%)

- Public Toilet
- Community Toilet

Zone Wise Sewage Coverage(%)

- 32
- 34
- 36
- 42
- 44
- 46

HH: Household

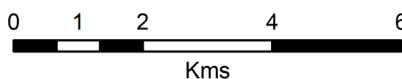
Note :

Total No. of Zone in KMC - 6
 Total No. of Wards in KMC - 110
 Total Area of KMC - 260 Sq Km

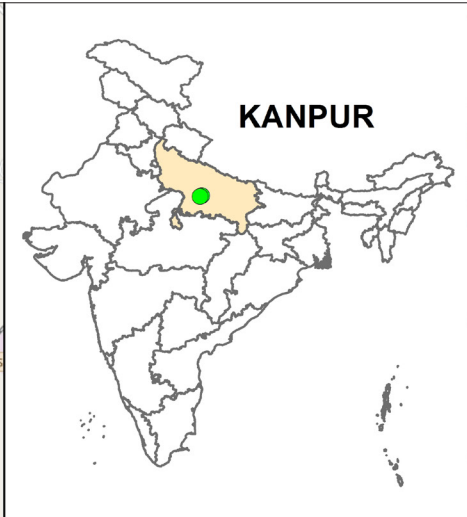
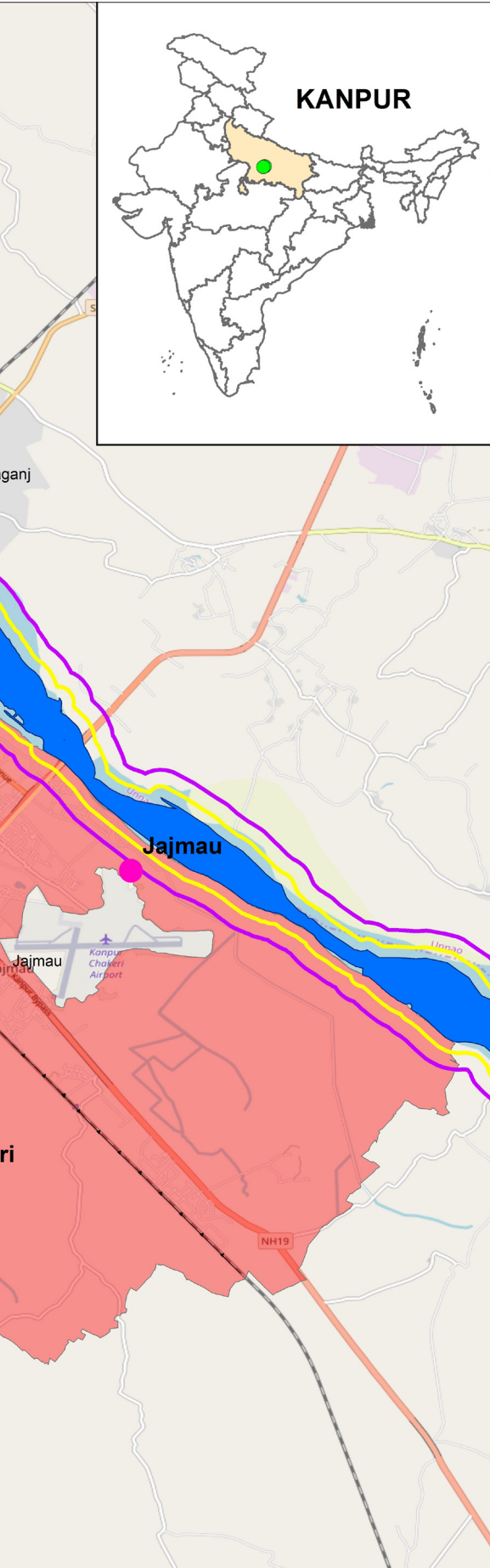
*URMP-Urban River Management Plan
 *KMC-Kanpur Municipal Corporation

Scale :

1 : 100,000



Source : Kanpur Nagar Nigam



3.2.2. Interventions to keep river free from Pollution

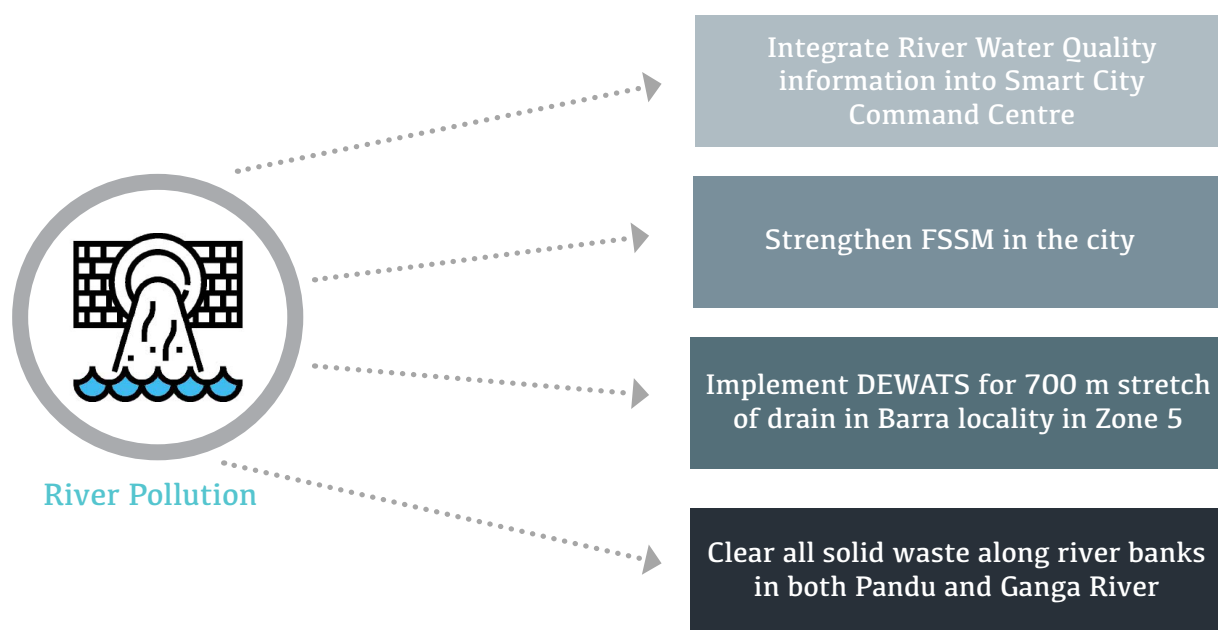


Figure 3: Interventions to keep river free from pollution

Based on the baseline assessment, the key concerns to be addressed under this objective are:

- Increasing the sewer network coverage given that only 60% of total households are connected to the network.
- Strengthening the FSSM strategy and implementation in the city.
- Increasing the number of STPs with capacity and facilities to undertake co-treatment
- Given that only the Binagawan STP has co-treatment facilities, it is important to conduct a technical feasibility regarding the quantum of faecal sludge that can be discharged at the STP without hampering the treatment process and achieving the treated effluent quality for safe disposal into drains/ivers.
- Addressing the solid waste problem along banks of Ganga River, blockages in drains within the city, clogged waterbodies due to open dumping of solid waste
- Sharing of water quality monitoring data between monitoring agencies and KNN

To begin with, four interventions will be undertaken under this objective in the URMP 1.0. Details of this are presented in Table 4.

Table 4: Summary of interventions to keep rivers free from pollution

SN	Activity	Agency responsible	Timeline (months)							
			3	6	9	12	15	18	21	24
1	Integrate river water quality information into Smart City Command and Control Centre	KNN, with support of CPCB, UPPCB								
2	Strengthen FSSM in the city	Jal Nigam, support from Jal Kal								
3	Implement DEWATs for 700m stretch of drain in Barra locality in Zone 5.	Jal Kal, with support from consultants								
4	Clear all solid waste along river banks in both Pandu and Ganga Rivers	KNN, Health department								

3.2.2.1 Integrate river water quality information into Smart City Command and Control Centre

This involves creating a dashboard in the Smart City Command and Control Centre for river quality data, which can be accessed by key decision makers as well as the general public. The schematic of the mechanism is presented in Figure 4.

The intervention will include three activities. First, a formal mechanism will be set up for CPCPB and UPPCB to share the river water quality data with KNN on a regular basis. Second, the IT team at the Command and Control Centre will prepare a digital dashboard and android app to collate analogue form of data into a digital form with infographics. Third, the IT team will develop a mechanism for the sharing the data with the relevant stakeholders.

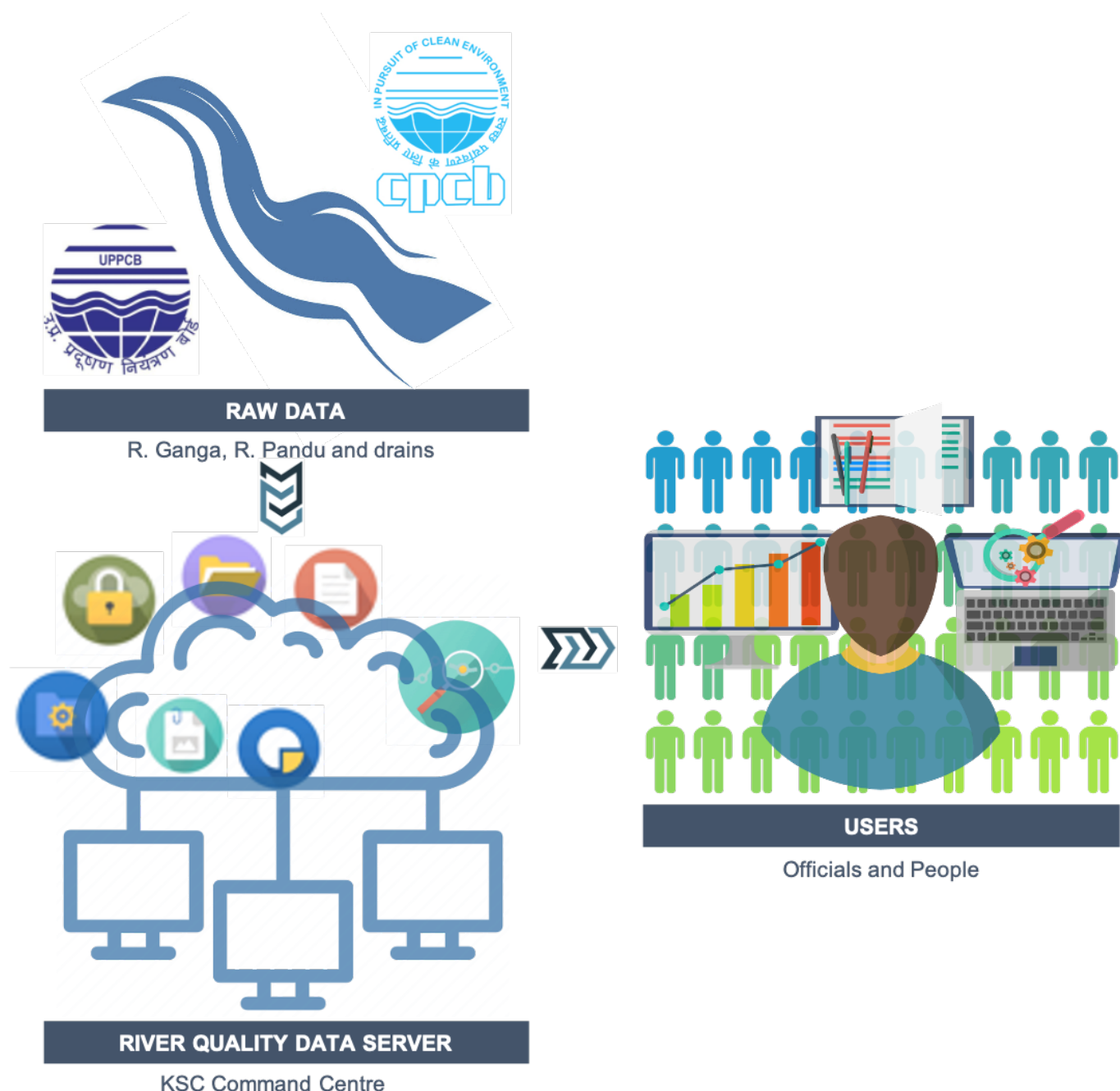


Figure 4: Schematic for integrating river quality data into the Smart City Command and Control Centre

3.2.2.2 Strengthen FSSM in the city

Three sub-interventions will be carried out under this intervention, and depicted in Figure 5.

- o Prepare a database of households, community toilets, and public toilets connected to OSS. The database will include key information like household size, type of OSS and its dimension, wastewater sources (toilet, kitchen, bathroom), date of last desludging, accessibility to OSS, etc. Based on the OSS database, a plan for scheduled desludging of all OSS within Kanpur City will be prepared considering a 3 year desludging frequency for households and annual desludging for public/community toilets ⁶.
- o Monitoring of private desludging vehicles through GPS tracking system. On the lines of solid waste collection vehicles being monitored through GPS tracking, all the desludging vehicles will be registered and GPS mounted for ensuring safe transport and disposal of septage at dedicated sites. The tracking of vehicles will be linked to Smart City Command and Control Centre for real time monitoring of desludging vehicle movement.
- o Assess technical feasibility of co-treatment in all STPs in the city. This will involve conducting technical feasibility of co-treating faecal sludge/septage at operational STPs within Kanpur City (Binagawan, Sajari, Jajmau), and preparing Detailed Project Reports (DPRs) for co-treatment based on the feasibility studies to provide physical infrastructure required for co-treatment ⁷. NIUA has provided technical guidance documents^{8,9} for this purpose.

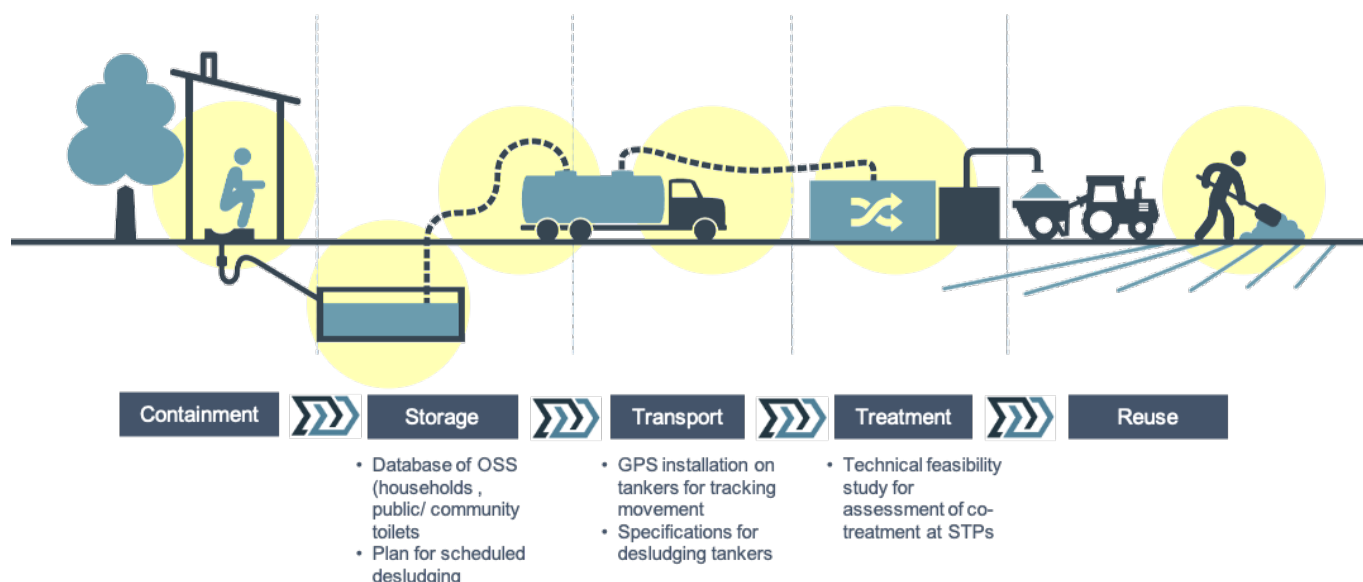


Figure 5- Specific interventions across FSSM value chain

⁶refer annexure xx for flyer on scheduled desludging in Wai and Sinnar towns implemented by PAS, CEPT University

⁷refer annexure xx for checklist for assessing of STPs for co-treatment of faecal sludge)

⁸https://niua.org/scbp/sites/default/files/Septage_Co-Treatment_Report_15-09-2020.pdf

⁹https://niua.org/scbp/sites/default/files/Co-Treatment%20Feasibility%20in%20Dehradun__0_.pdf

3.2.2.3 Implement DEWATs for 700m stretch of drain in Barra locality in Zone 5.

Until Kanpur achieves 100% sewer network coverage, nature based Decentralised Wastewater Treatment Systems (DEWATS) will be adopted (wherever possible) to reduce the pollution load entering Pandu River.

As shown in Figure 5, DEWATS will be implemented for a drain section of about 700m length in Barra locality (Zone 5) on pilot basis. The catchment of this drain (shaded in blue) is around 0.5 km² and is mainly a low-income socio-economic settlement. A drain passing through this region carries liquid waste from an upper catchment (yellow arrow) and merges with the Pandu river. Observations at three points (polluted nala pt. 1 to 3) indicate a highly polluted drain. There are three small to medium sized waterbodies (blue) which are also highly polluted due to waste disposal from surrounding colonies.

The actual capacity of DEWATS unit will be decided after detailed survey and topographical assessment of the potential catchment that includes household surveys for sanitation infrastructure at household level, socio-economic status of population, among others.

3.2.2.4 Clear all solid waste along river banks in both Pandu and Ganga Rivers

This intervention will involve three activities. First, is to conduct an assessment/survey of solid legacy waste that needs to be removed from the river stretches and city drains. The assessment will include identifying the sources of waste generation to the extent possible. Second, is to organize a cleaning drive on mission mode to remove legacy waste. Third, is to institute a mechanism for regular solid waste removal from river banks, which shall be part of the city's service delivery.

3.2.3 Budget and sources of funding for interventions to keep rivers free from pollution

The expected budget for the interventions, along with the sources of funding are presented in Table 5. The actual costs will vary when DPRs or detailed activities are developed.

Table 5: Overview of budgetary requirement for interventions to keep rivers free from pollution

Intervention	Estimated Cost (INR)	Remarks	Source of funding
Integrate river water quality information into Smart City Command and Control Centre	1,00,000	Existing infrastructure and human resources at smart city command and control room to be used, Server, & PC to store water quality data might be additional cost	Smart City Mission, Jal Jeevan Urban Mission, Jal Nigam
Strengthen FSSM in the city			
a) Database of 92,000 OSS households	1,800,000	@ Rs. 200/household	
b) Geo-tagging of 50 desludgers	1,500,000	@ 30,000/Desludger	
c) Technical assessment of Co-treatment feasibility of sludge in STPs	1,500,000	@ Rs.500,000/STP	
Implement DEWATs for 700m stretch of drain in Barra locality in Zone 5.	15,000,000	Construction of 50 KL DEWATS (@ 30,000/KL). Land cost not included in the estimate.	AMRUT, smart city mission's innovation fund
Clear all solid waste along river banks in both Pandu and Ganga Rivers	500,000	Some portion of the funding can be linked to existing solid waste management activities in the city	KNN, Jal Kal
Total Estimated Cost	2,04,00,000		

DEWATS unit to abate drain pollution in Barra, Kanpur



MAP 3: Proposed site for DEWATS project







3.3 Interventions to rejuvenate waterbodies and wetlands in the city

In urban areas, waterbodies, and wetlands are intrinsically connected to rivers and are integral to city's overall water management strategy. However, waterbodies are fast losing their prominence due to urbanization demands and often end up in neglected state. Rejuvenating water bodies and wetlands can reap long lasting benefits including reducing the burden on rivers for water requirement in urban areas, mitigating the pollution loads entering the rivers, and providing recreational benefits.

3.3.1 Baseline assessment

There are around 80 waterbodies ¹⁰ of various sizes in the city as per the official records. As per KDA bye laws, all waterbodies greater than one acre in size should be mapped, with ground truthing. KNN has prepared a GIS map of all waterbodies within KNN limits. However, the information on depth, area, water holding capacity, ownership etc. of each waterbody has not been documented as yet.

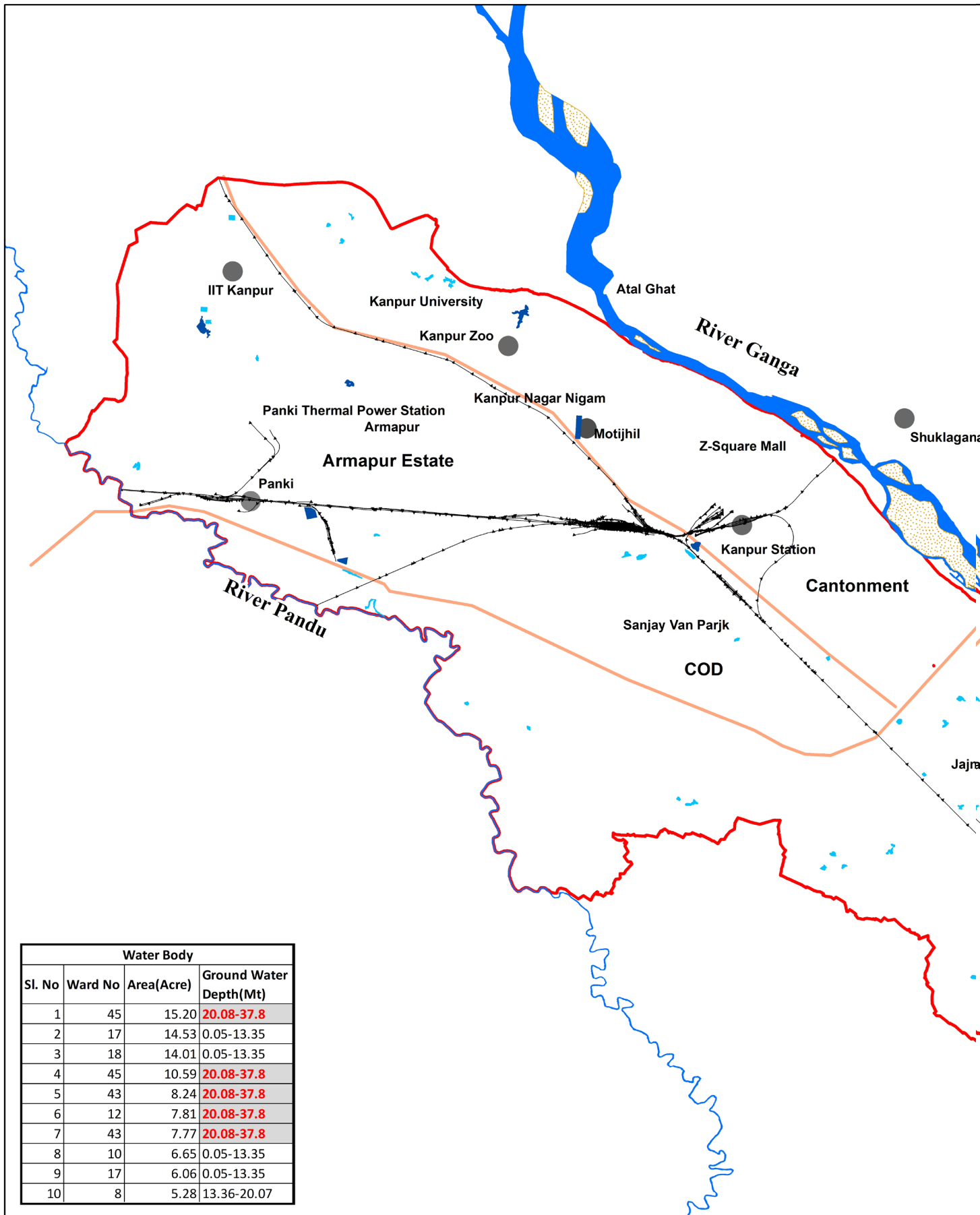
Majority of the waterbodies in Kanpur are in a polluted state due to the untreated discharge of domestic liquid waste and open dumping of solid waste from the settlements residing on the fringes of these waterbodies. Some water bodies that have been recently rejuvenated (or planned for rejuvenation) include Moti Jheel, waterbody in Allen Zoo, and 'Kachuva Talab'. Maps 4 and 5 present the location of waterbodies as per their size, and highlight their present condition respectively.

3.3.2 Interventions

Based on the baseline assessment, the key concerns to be addressed under this objective are:

- o Avoiding shrinking/loss of waterbodies due to land use land cover change and encroachment.
- o Avoiding pollution of water bodies and the associated loss of biodiversity.
- o Documenting the salient natural features and ownership of waterbodies

¹⁰ There are 106 water bodies as per satellite images








Map 4: Location of waterbodies in KNN boundary, greater than one acre in area





Current Status Water Bodies

Legend

-  KMC* Boundary
-  Railway Network
-  Road
-  River
-  Sand Bars

Water Body

-  >5 Acre
-  1 - 5 Acre



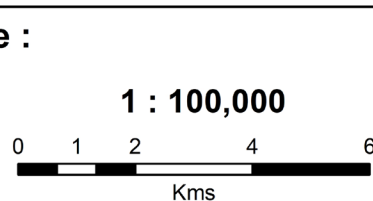
Note:

Water Bodies with Area above 1 acre have been used in this map
 Water Bodies mapped by KMC reassessed using 2019 Sentinel Satellite Image and further ground truthed and categorised using Google Image October 2020

The table provides Ground Water Depth of Kanpur based on the research paper published in Researchgate - Natural Resources Research · December 2014 Edition

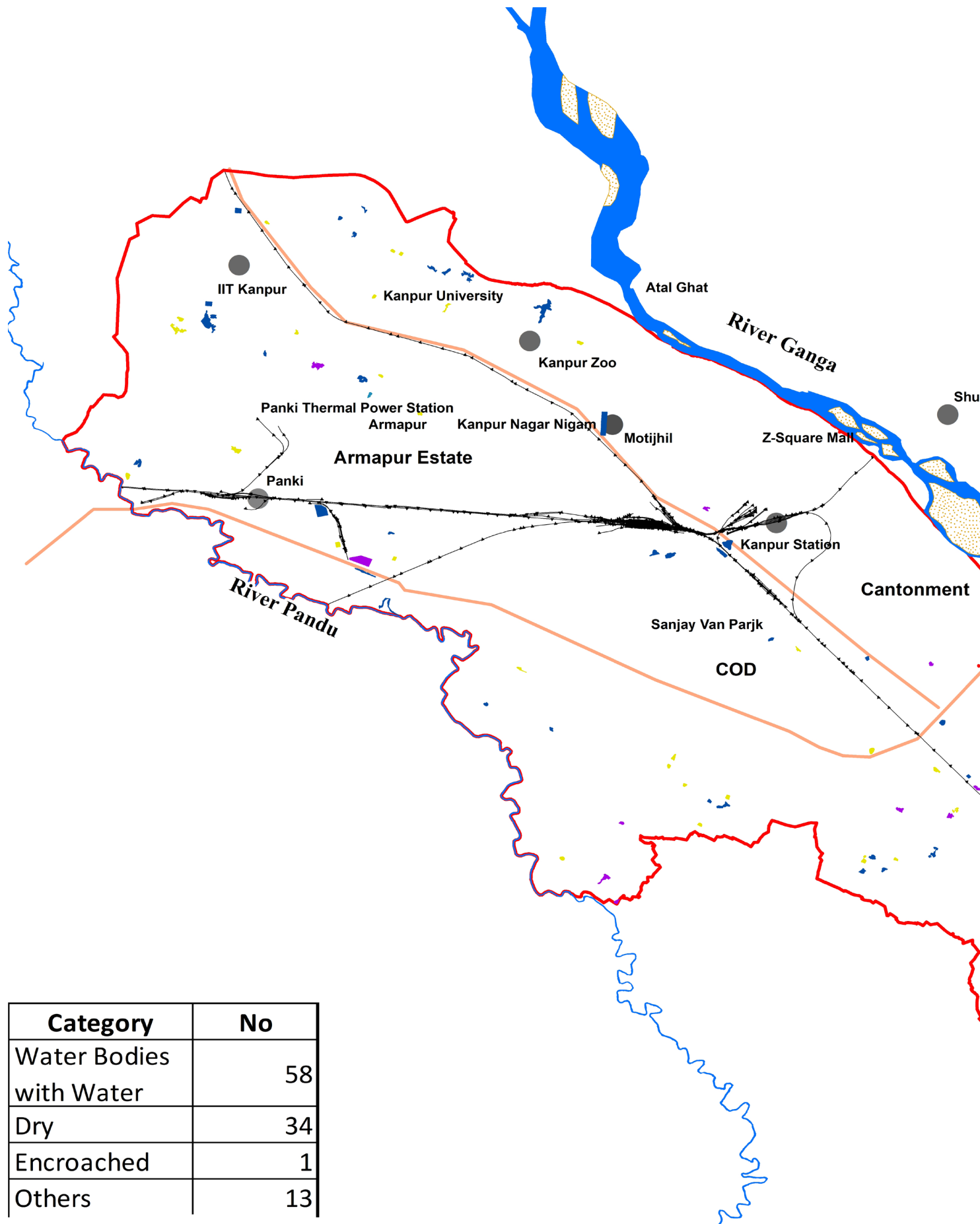
*KMC-Kanpur Municipal Corporation

Scale :



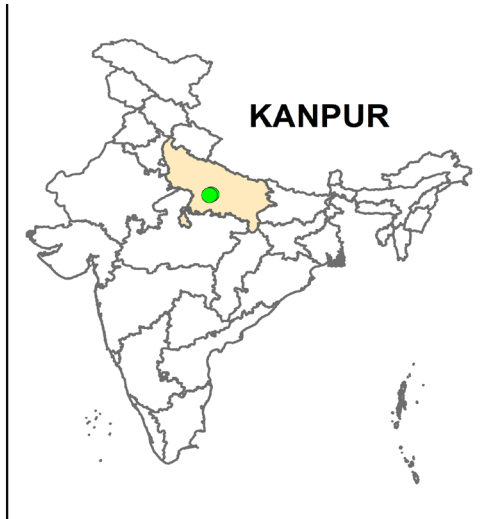
Source : Kanpur Nagar Nigam

©National Institute of Urban Affairs








Category	No
Water Bodies with Water	58
Dry	34
Encroached	1
Others	13

Map 5: Status of waterbodies within KNN Boundary







Water Bodies Status (as on October 2020)

Legend

-  KMC* Boundary
-  Railway Network
-  Road
-  River
-  Sand Bars

Water Bodies Status

Category

-  Water Bodies with Water
-  Dry
-  Encroached
-  Others**

Note :

Water Bodies with Area above 1 acre have been used in this map

Water Bodies mapped by KMC reassessed using 2019 Sentinel Satellite Image and further ground truthed and categorised using Google Image October 2020

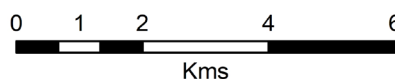
Water Body: Category- Others**:

Partially dry having Open Spaces/Buildings or Industries nearby

*KMC-Kanpur Municipal Corporation

Scale :

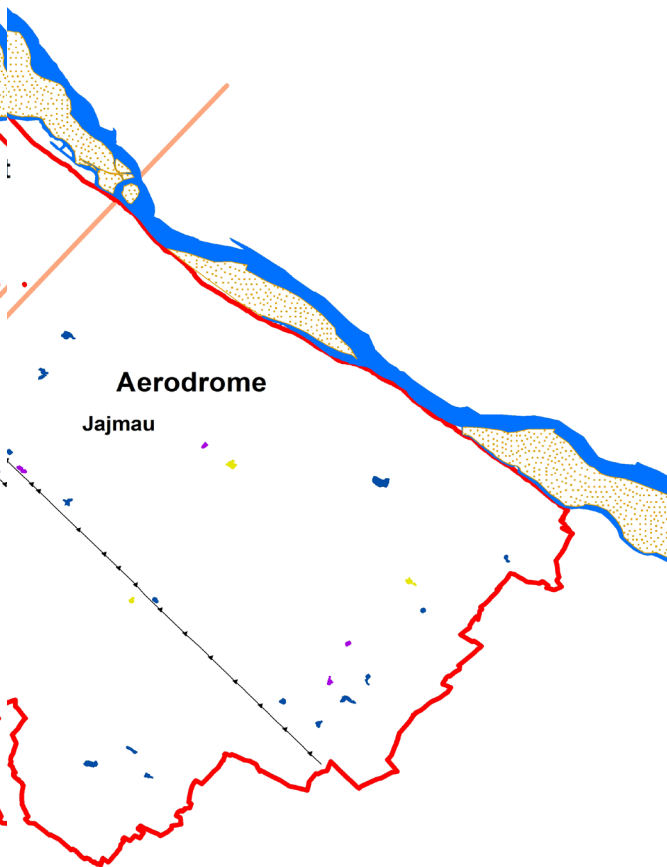
1 : 100,000



Source : Kanpur Nagar Nigam

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huklaganj



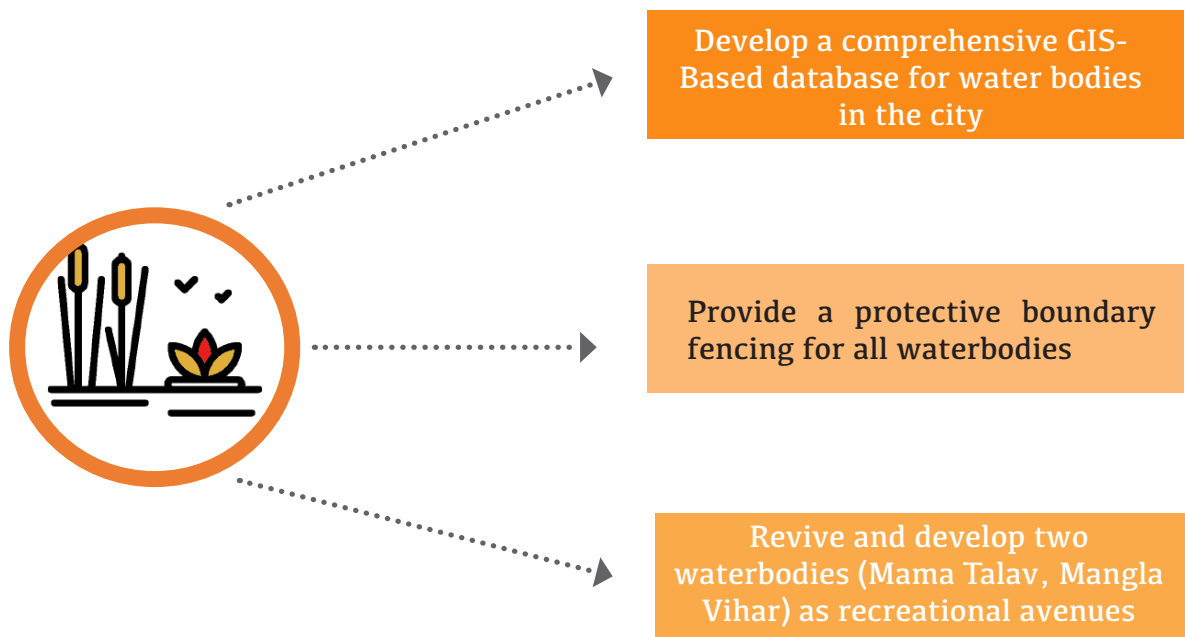


Figure 6: Interventions to rejuvenate water bodies and wetlands in the city

To begin with, three interventions will be undertaken under this objective in the URMP 1.0. Details of this are presented in Table 5.

Table 5: Summary of interventions to rejuvenate water bodies and wetlands in the city

SN	Activity	Agency responsible	Timeline (months)							
			3	6	9	12	15	18	21	24
1	Develop a comprehensive GIS-based database for the water bodies in the city	KNN & KDA	[Timeline grid with shaded cells indicating activity duration]							
2	Provide a protective boundary fencing for all waterbodies	KNN								
3	Revive and develop two waterbodies (Mama Talav, Mangla Vihar) as recreational avenues	KNN								

3.3.2.1 Develop a comprehensive GIS-based database for the water bodies in the city

A GIS-based database of all the water bodies in the city (greater than 1 acre in area) will be developed. The database has four categories of parameters—General; Physical; Chemical; and Ecological parameters, as listed in Table 6.

Table 6: Indicative list of parameters for the waterbodies database

SN	Aspect	Information
1	General	<ol style="list-style-type: none"> 1. Name 2. Location 3. Ownership 4. Land Use/use zone as per Master Plan 5. Neighbouring land use category as per master Plan 6. Existing neighbouring land use 7. Classification (natural or artificial) 8. Type of recreational activities (if any) 9. Revenue Generation (if any) 10. Livelihood dependency (if any)
2	Physical	<ol style="list-style-type: none"> 1. Boundary 2. Average depth 3. Water sources 4. Water use(if any) 5. Elevation above mean sea level 6. Presence of solid waste (Y?N) 7. Width of buffer (if existing)
3	Chemical	<ol style="list-style-type: none"> 1. Dissolved oxygen 2. pH 3. Temperature 4. Faecal Coliform
4	Ecological	<ol style="list-style-type: none"> 1. Type of trees and plants surrounding water body 2. Presence of algal bloom (Y/N) 3. Type of aquatic species present

CPCB has use-based classification of surface waters in India

A. Drinking water source without conventional treatment but after disinfection

1. Total Coliforms Organism MPN/100 ml shall be 50 or less
2. pH between 6.5 and 8.5
3. Dissolved Oxygen 6 mg/l or more
4. Biochemical Oxygen Demand 5 days 20 °C 2 mg/l or less

B. Outdoor bathing (organised)

1. Total Coliforms Organism MPN/100 ml shall be 500 or less
2. pH between 6.5 and 8.5
3. Dissolved Oxygen 5 mg/l or more
4. Biochemical Oxygen Demand 5 days 20 °C 3 mg/l or less

C. Drinking water source after conventional treatment and disinfection

1. Total Coliforms Organism MPN/100 ml shall be 5000 or less
2. pH between 6 and 9
3. Dissolved Oxygen 4 mg/l or more
4. Biochemical Oxygen Demand 5 days 20 °C 3 mg/l or less

D. Propagation of wild life and fisheries

1. pH between 6.5 and 8.5
2. Dissolved Oxygen 4 mg/l or more
3. Free Ammonia (as N) 1.2 mg/l or less

E. Irrigation, industrial cooling, controlled waste disposal

1. pH between 6.0 and 8.5
2. Electrical Conductivity at 25 °C micro mhos/cm maximum 2250
3. Sodium absorption ratio maximum 26
4. Boron maximum 2 mg/l

Source : http://www.cpcbenvi.nic.in/water_pollution_main.html#

3.3.2.2 Develop a comprehensive GIS-based database for the water bodies in the city

A cast iron railing boundary fencing as shown in Figure 7 will be constructed to protect all water bodies from encroachment. Adequate access points will be provided to ensure that the citizens are able to access the water bodies.



Figure 7: Example of cast iron railing fencing for boundary protection of water bodies

3.3.2.3 Revive and develop two waterbodies (Mama Talav, Mangla Vihar) as recreational avenues

Two water bodies will be revived under this intervention. These include Mama Talav (Longitude 80.36, Latitude 26.48; Ward 8) and Mangla Vihar Talav (Longitude 80.37, Latitude 26.40; Ward 53). Both the waterbodies are significantly polluted due to liquid waste discharge and solid waste dumping from surrounding low socio-economic settlements. Figure 7 and 8 show the locations and the existing condition of the water bodies.

Mama Talav and Mangal Vihar are very old waterbodies surrounded by low-income group settlements. Currently, their peripheries are a dumping sites for municipal solid waste, and diversion of grey water from the nearby settlements is clearly visible.



Figure 8: Google Earth image of Mama Talav (top); solid waste along its boundary (bottom)



Figure 9: Google Earth image of Mangala Vihar (top); solid waste along its boundary (bottom left); and handpump used as water source in the vicinity (bottom)



The revival plan of two waterbodies will involve following three broad activities.

Ensure water in waterbodies	Remove Pollution in waterbodies	Beautification of waterbodies
<ul style="list-style-type: none"> • Ensure catchment protection and demarcating inflow and outflow of waterflow • Divert stormwater and adopt rainwater harvesting • Divert treated wastewater from surrounding colonies with DEWATs • De-silting of waterbodies, silt traps in inflow channels 	<ul style="list-style-type: none"> • Solid waste management • Adopting in situ treatment with bio-remediation, floating constructed wetland etc. • Connect households with sewerage network/septic tanks with soak pits • For non-sewered colonies install small capacity DEWATs to treat wastewater and divert it in waterbodies 	<ul style="list-style-type: none"> • Connect people to waterbody with community spaces, play areas in surrounding • Develop promenade along waterbody • Provide vegetation buffer strips

Figures 10 and 11 present the concept plans for the beautification of the two water bodies.



Figure 10: Concept plan for the beautification of Mama Talav

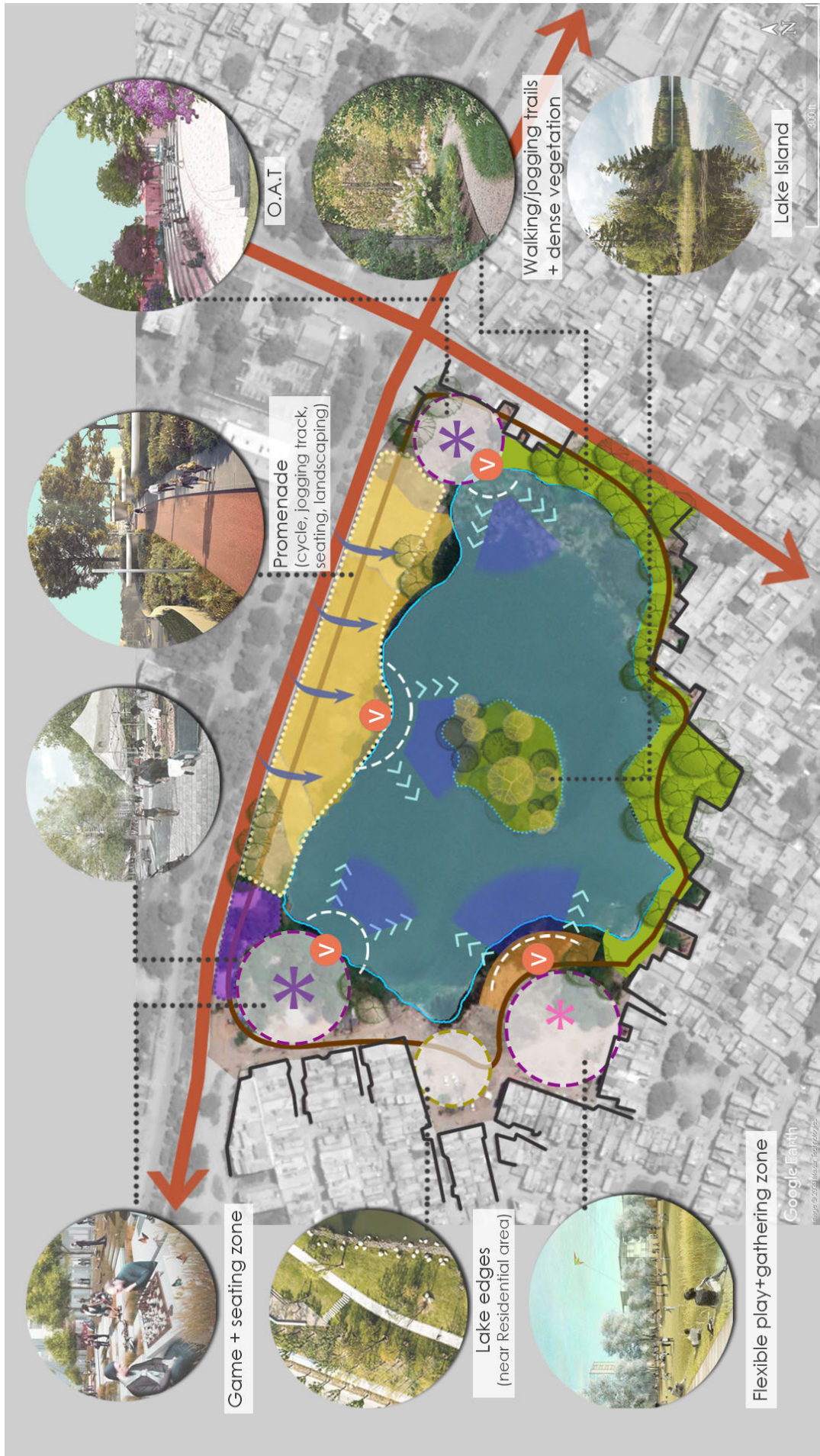
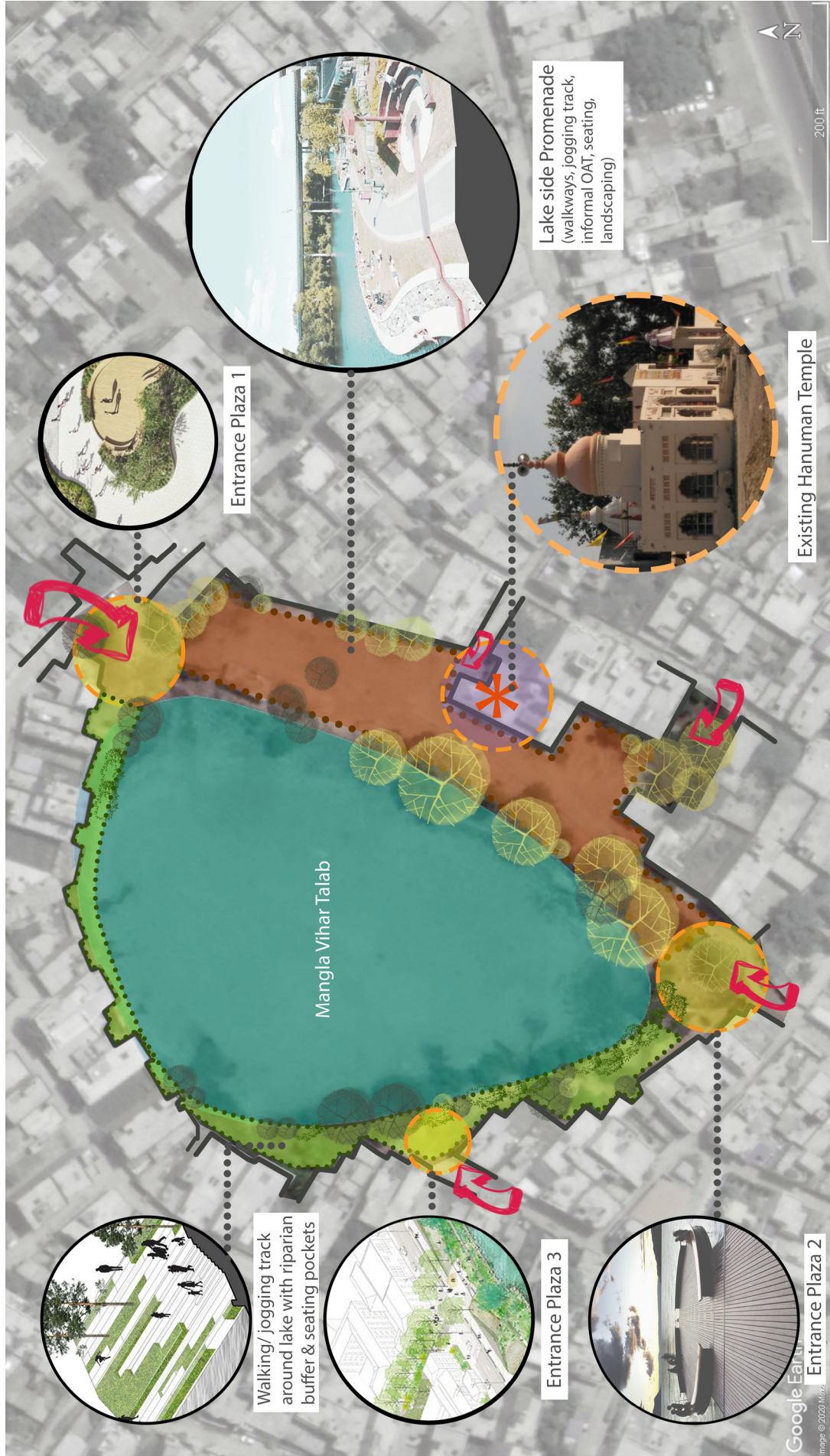


Figure 11: Concept plan for the beautification of Mangla Vihar



The Mama Talav and Mangla Vihar are two waterbodies with the potential to be vibrant places for citizens of Kanpur for recreational purposes. Moreover, Kanpur Nagar Nigam can also potentially generate revenue by creating some utilities around these waterbodies to maintain them sustainably.

The proposed plan first suggests to remove solid waste dumped surrounding of the waterbodies and naturally clean the water. The dense vegetation buffer strip in the Mangla Vihar waterbody prevents the pollution from entering in the waterbody. A jogger track is proposed to improve health of people in freshwater. The linear stretches in the frontal area are recommended to be developed as promenade for people to walk and enjoy the beauty of revived waterbody. The open areas surround the waterbody are recommended to be play areas, game zones, restaurants and Open-Air Theatre (OAT). Similar concept is proposed for the Mangla Vihar waterbody.

Both the concept plans to revive the waterbodies are prepared by using the concept of inclusivity of surrounding social environment and give maximum benefit to the people in the area as well as other citizens of Kanpur

3.3.3 Budget and sources of funding for interventions to rejuvenate waterbodies and wetlands

The expected budget for the interventions, along with the sources of funding are presented in Table 7. The actual costs will vary when DPRs or detailed activities are developed.

Table 7: Overview of budgetary requirement for interventions to rejuvenate waterbodies and wetlands

Intervention	Estimated costing (INR)	Remarks	Funding Source
Develop a comprehensive GIS-based database for the water bodies in the city	1,00,00,000	Exact costs will depend upon number of parameters selected for the database.	Jal Jeevan Urban Mission
Provide a protective boundary fencing for all waterbodies	8,70,00,000	Total perimeter of all waterbodies estimated at 58,000 m Fencing cost = INR 1500/m	Jal Jeevan Urban Mission; Jal Shakti Abhiyaan
Revive and develop two waterbodies (Mama Talav, Mangla Vihar) as recreational avenues	4,00,00,000	Cost includes physical surveys, desilting, pollution abatement strategies, socio-economic surveys, basic utilities, & infrastructure.	Jal Jeevan Urban Mission; Self-funding
Total	13,70,00,000		









3.4 Interventions to enhance riparian buffer along the River Bank

The riparian zone is an area adjacent to rivers/natural drains (along its stretch) covered by natural or planted vegetation. This zone acts as a buffer between the waterbody and the land, protects the river banks from erosion, captures silt and naturally absorbs the pollution from urban areas. Riparian zones can also absorb additional water during flooding. Provision of riparian zone along the stretches of Ganga and Pandu River can significantly contribute to the prevention of encroachment, pollution entering the rivers and urban flooding.

3.4.1 Baseline assessment

There are at least 4 stretches between Atal Ghat and Jajmau bridge with dense linear vegetation (Fig. 6) along Ganga river which are essentially the riparian buffer stretches. The stretches cover 60% length of the Ganga River within KNN boundary. However, in terms of vegetation coverage area, it is very less. Compared to Ganga, the Pandu river has very sporadic stretches of riparian zone (25%) considering its length in the city.

The KNN and Forest Department office have carried out significant afforestation activities in the city, and along the stretches of the Ganga River. The afforestation along river banks is mostly observed in Bithoor area. Almost 50 acres of plantation has been done under various schemes by the Forest Department. CSR funding from SAIL has also resulted in plantation in 20 hectare land in SAIL campus.

3.4.2 Interventions

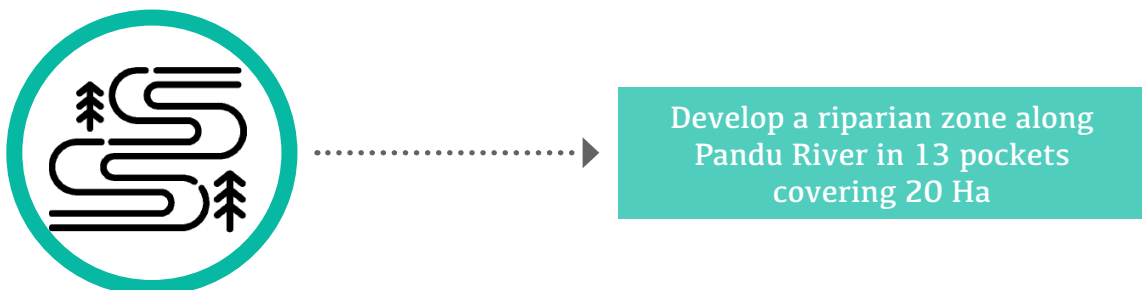


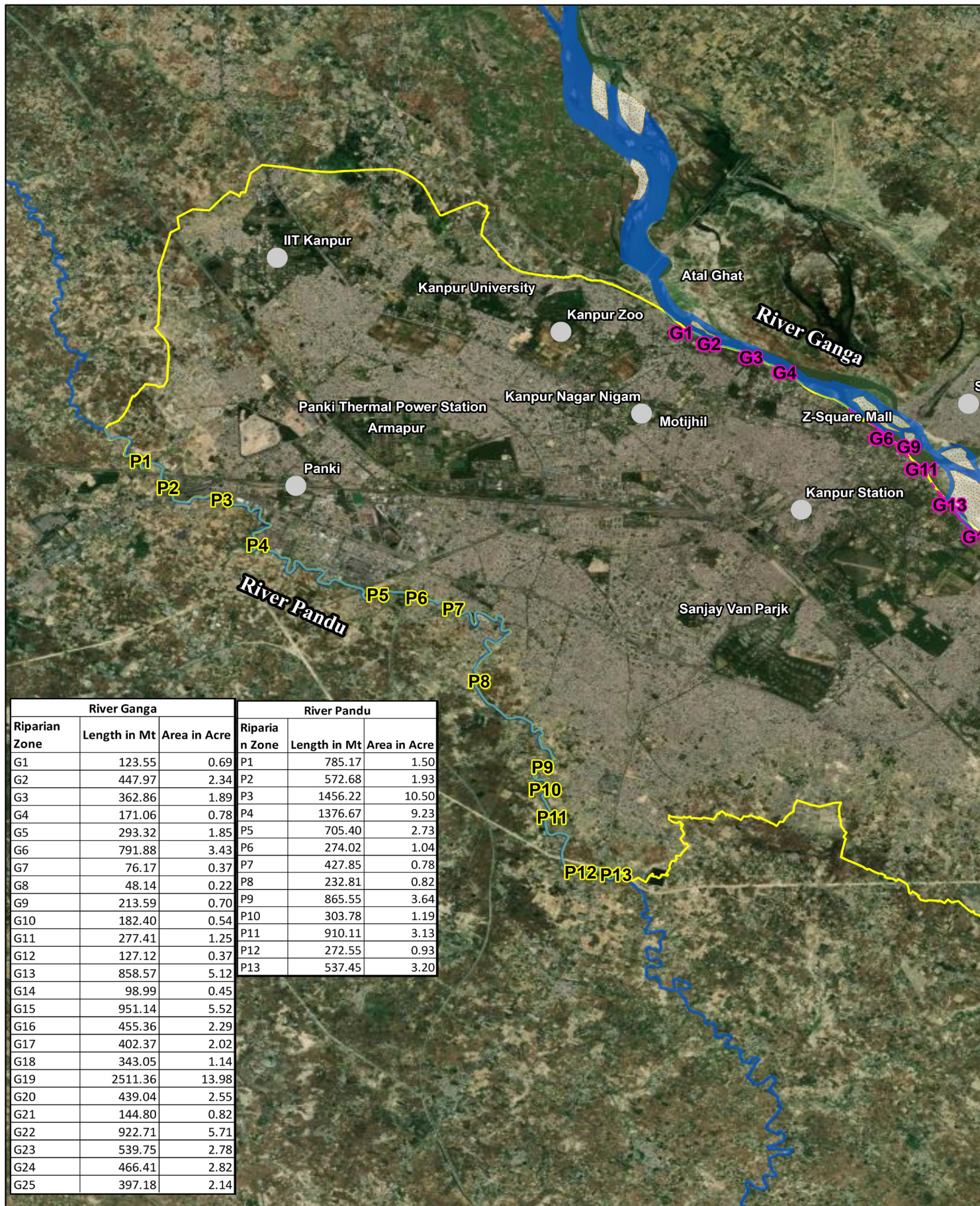
Figure 12: Intervention to enhance Riparian buffer

Based on the baseline assessment, the key concern to be addressed under this objective is to enhance the riparian buffer along the Pandu River.

Accordingly, a single intervention will be undertaken under this objective in the URMP 1.0. Details of this are presented in Table 8.

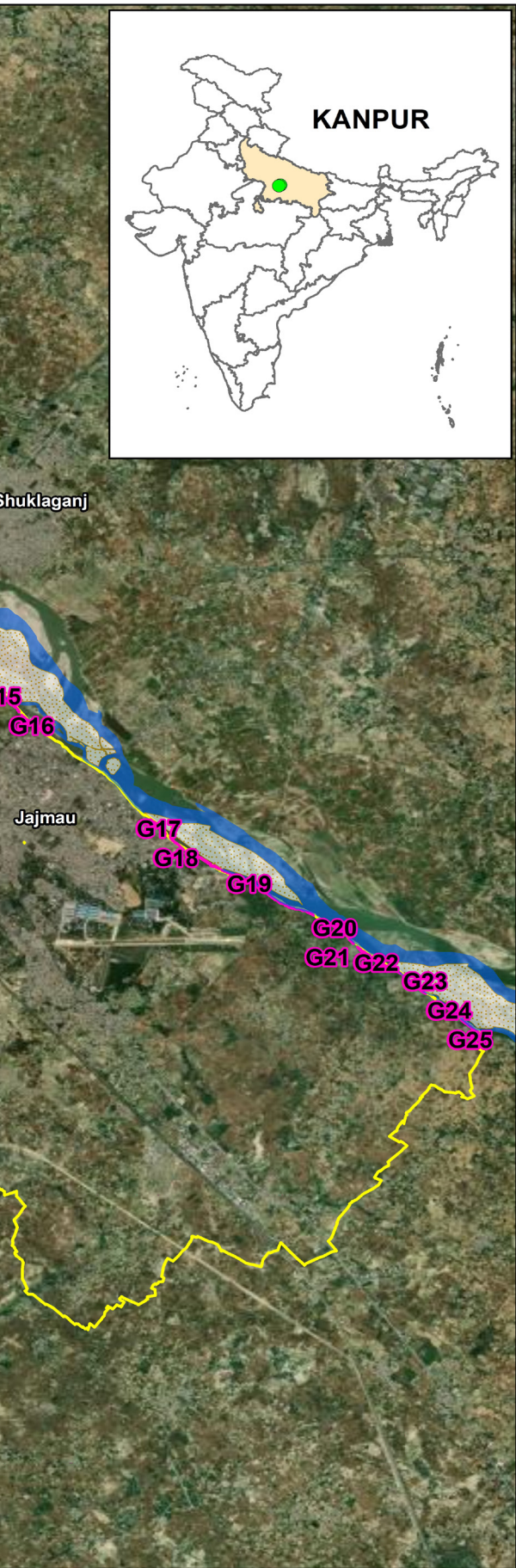
Table 8: Summary of intervention to enhance riparian buffer

SN	Activity	Agency Responsible	Timeline (months)					
			6	12	18	24	30	36
1	Develop a riparian zone along Pandu River in 13 pockets covering 20 Ha	KDA/KNN/Forest/Irrigation						



River Ganga			River Pandu		
Riparian Zone	Length in Mt	Area in Acre	Riparian Zone	Length in Mt	Area in Acre
G1	123.55	0.69	P1	785.17	1.50
G2	447.97	2.34	P2	572.68	1.93
G3	362.86	1.89	P3	1456.22	10.50
G4	171.06	0.78	P4	1376.67	9.23
G5	293.32	1.85	P5	705.40	2.73
G6	791.88	3.43	P6	274.02	1.04
G7	76.17	0.37	P7	427.85	0.78
G8	48.14	0.22	P8	232.81	0.82
G9	213.59	0.70	P9	865.55	3.64
G10	182.40	0.54	P10	303.78	1.19
G11	277.41	1.25	P11	910.11	3.13
G12	127.12	0.37	P12	272.55	0.93
G13	858.57	5.12	P13	537.45	3.20
G14	98.99	0.45			
G15	951.14	5.52			
G16	455.36	2.29			
G17	402.37	2.02			
G18	343.05	1.14			
G19	2511.36	13.98			
G20	439.04	2.55			
G21	144.80	0.82			
G22	922.71	5.71			
G23	539.75	2.78			
G24	466.41	2.82			
G25	397.18	2.14			

Map 6: Existing Riparian Zones of Ganga and Pandu River



Existing Riparian Zones

Legend

-  KMC* Boundary
-  River
-  Sand Bars
-  Drain
-  Riparian Zone - 30 Mt Buffer Line(Pandu River)

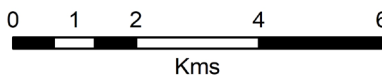
Note:

Riparian Zones have been delineated using Google Earth Image
 River Ganga: 25 Riparian Zones
 River Pandu: 13 Riparian Zones

*KMC-Kanpur Municipal Corporation

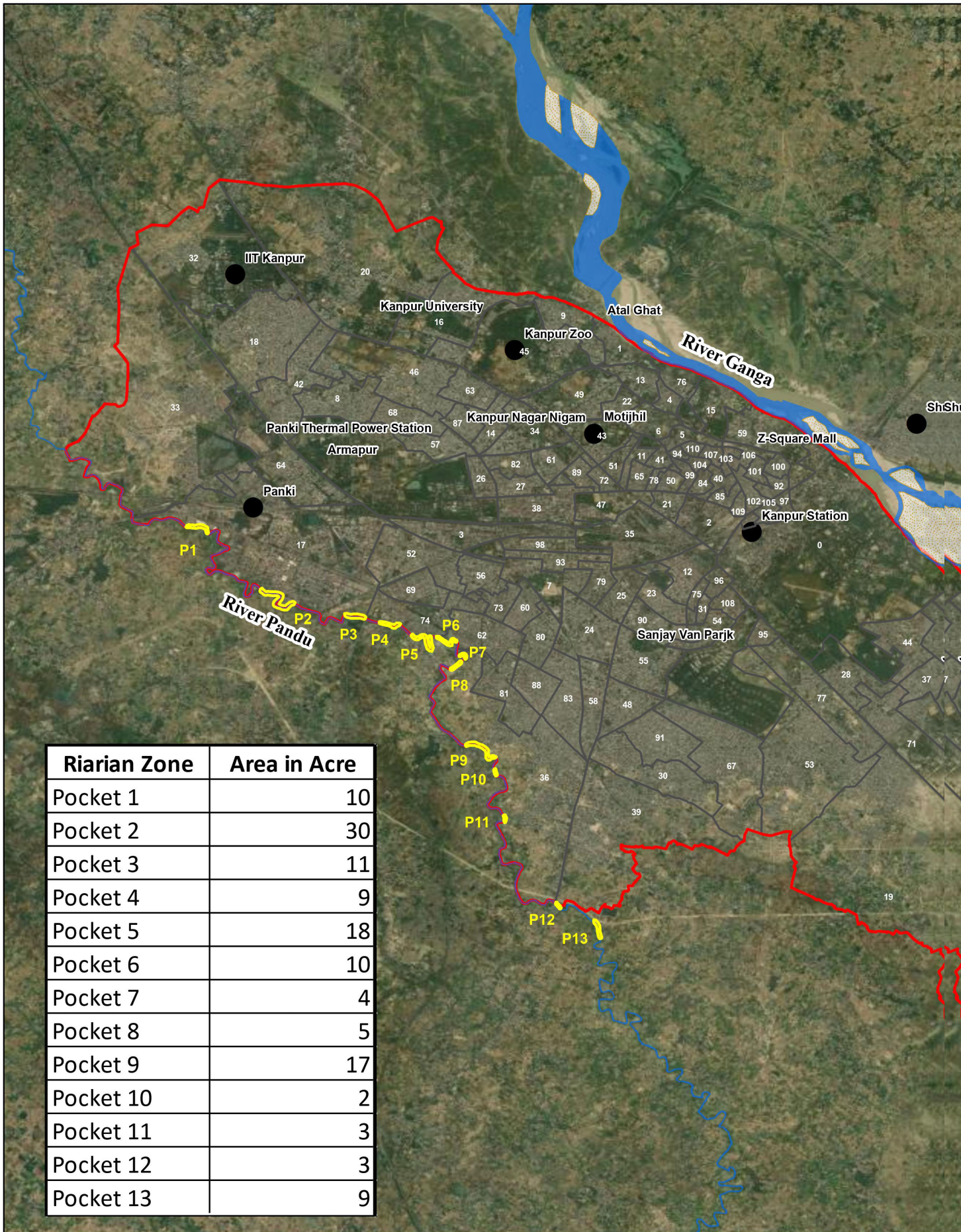
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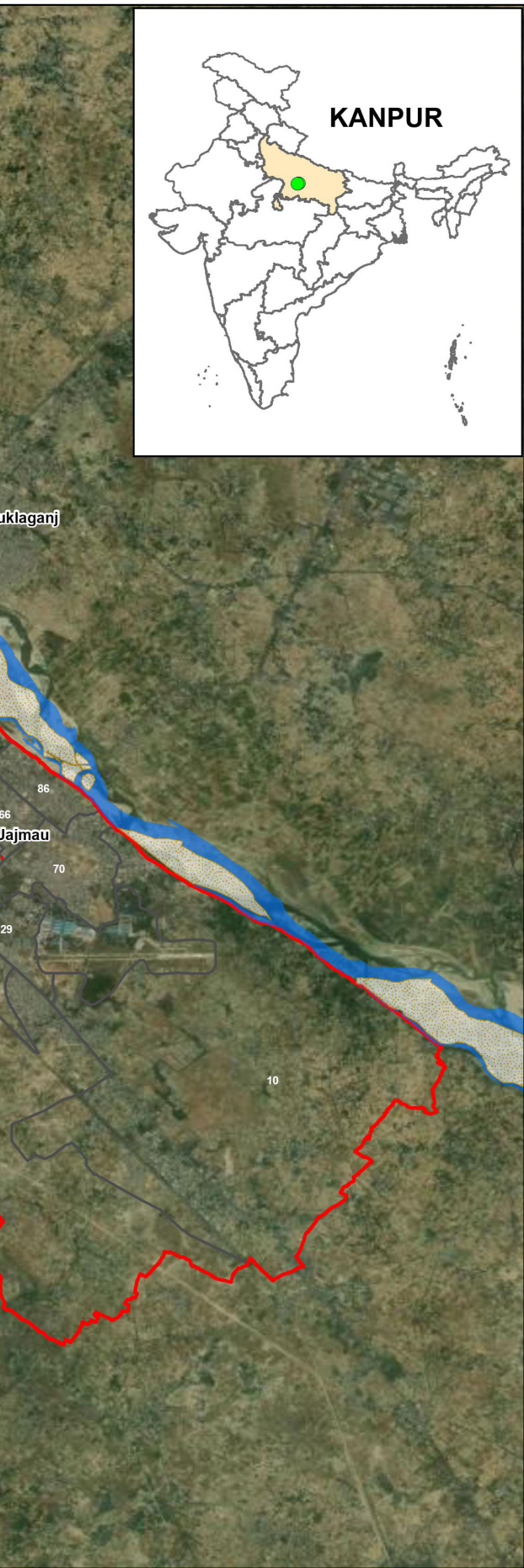


Source : Kanpur Nagar Nigam

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






Map 7: Proposed Riparian Zones along Pandu River



Riparian Zones

Legend

-  KMC* Boundary
-  KMC Ward Boundary
-  River
-  Sand Bars
-  Drain
-  Riparian Zone - 30 Mt Buffer Line(Pandu River)

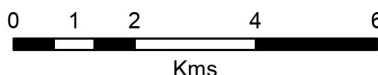
Note:

13 Riparian Zones along the River Pandu have been delineated and shown in the Map

*KMC-Kanpur Municipal Corporation

Scale :

1 : 100,000



Source : Kanpur Nagar Nigam

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3.4.2.1 Develop a riparian zone along Pandu River in 13 pockets covering 20 Hectares

Thirteen land pockets covering 21-acre of land area have been identified along the Pandu River that can be developed as riparian buffer zones. The locations of the proposed riparian buffers strips are presented in Map 7, while the relevant details of the strips are in Table 9.

Table 9: Details of proposed riparian stretches along the Pandu River

Stretch No	Area (Ha)	KNN Ward No.	Reference location
1	1.25	17	Saraimita
2	3.80		
3	1.77		
4	1.41		
5	1.50	74	Ravidasapuram
6	2.96		
7	0.97	74 & 62	Ravidasapuram + Barragaon
8	0.67	36	Bingawan
9	0.95		
10	2.67		
11	0.47		
12	0.52		
13	0.52	39	Hanspuram
Total	19.46		

A 30m wide riparian buffer zone from the edge of river is proposed to be implemented in the identified stretches. The buffer will have three zones as shown in Figure 13.

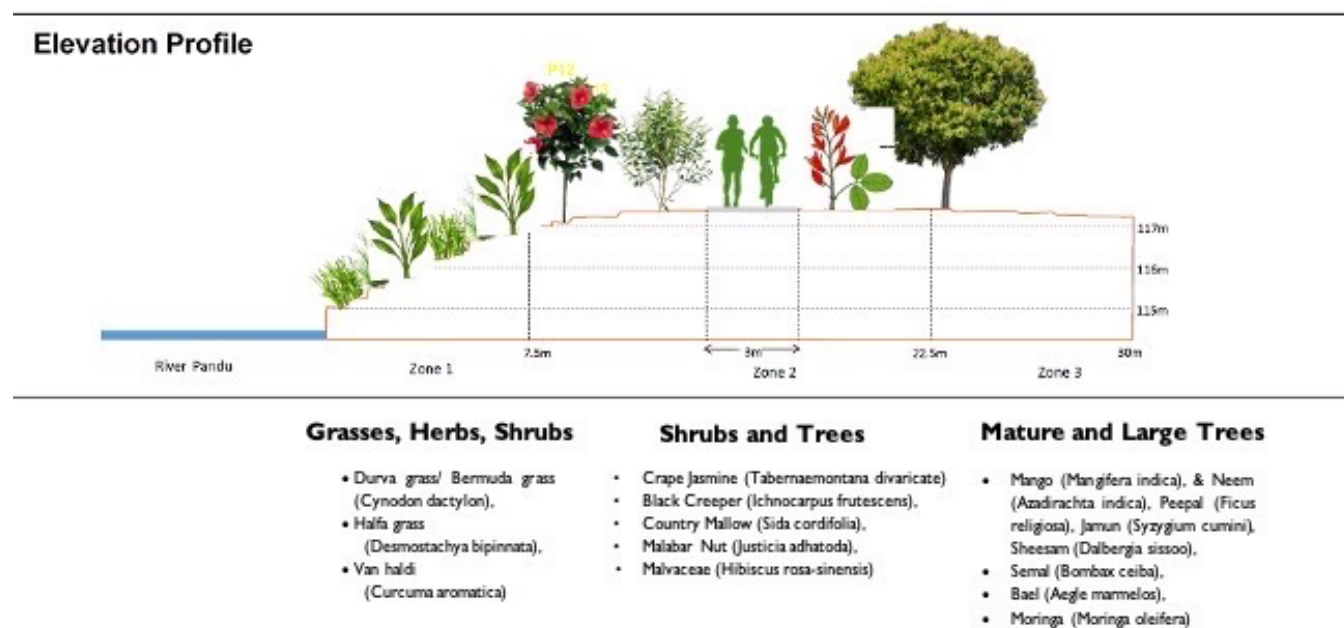


Figure 13: Proposed profile of the Riparian zone along Pandu River

The buffer will have three zones as shown in Figure 13.

Zone wise suitable plant species for the riparian buffer for the Pandu River is listed in Table 10.^{11,12,13}

Table 10: Details of suitable plant species for the riparian buffer for the Pandu River

Zones	Function	Width (m)	Type of Vegetation	Recommended Species
Zone1 Lower/ Riverside	<ul style="list-style-type: none"> Slows down runoff and traps sediments Creates habitat for invertebrates and other wildlife. 	7.5	<ul style="list-style-type: none"> Grasses, Herbs, Shrubs detritus, large woody debris etc. 	<ul style="list-style-type: none"> Durva grass/ Bermuda grass (Cynodon dactylon), Halfa grass (Desmostachya bipinnata), Van haldi (Curcuma aromatica)
Zone2 Middle	Removes pollutants from subsurface flow of water	15	Shrubs and trees	<ul style="list-style-type: none"> Crape Jasmine (Tabernaemontana divaricate) , Black Creeper (Ichnocarpus frutescens), Country Mallow (Sida cordifolia), Malabar Nut (Justicia adhatoda), Malvaceae (Hibiscus rosa-sinensis)
Zone3 Higher or Upper	Removes pollutants from groundwater	7.5	Mature and large trees	<ul style="list-style-type: none"> Mango (Mangifera indica), & Neem (Azadirachta indica), Peepal (Ficus religiosa), Jamun (Syzygium cumini), Sheesam (Dalbergia sissoo), Semal (Bombax ceiba), Bael (Aegle marmelos), Moringa (Moringa oleifera)

3.4.3 Budget and sources of funding for interventions to enhance the riparian zone

The expected budget for the interventions, along with the sources of funding are presented in Table 11. The actual costs will vary when DPRs or detailed activities are developed.

Table 11: Overview of budgetary requirement for interventions to enhance the riparian buffer

Intervention	Estimated costing (INR)	Remarks	Funding Source
Develop a riparian zone along Pandu River in 13 pockets covering 20 hectares	10,00,000	Calculated at Rs. 50,000/ hectares	CAMPA, Forest Department, CSR
Total	10,00,000		

This intervention is under the jurisdiction of multiple agencies from the land ownership perspective. The agency owning the land parcel would have to propose riparian zone development and bear the expenditure. Considering this, Forest Department, KDA, KNN and Irrigation Department can either independently or jointly develop land for the proposed plantation.

¹¹ Shrivastava, Prabodh; Singh, M.P. (2013). https://www.ijsr.in/upload/1737396216CHAPTER_21.pdf

¹² http://environmentclearance.nic.in/writereaddata/FormB/EC/EIA_EMP/31102018GM7NXS78EIAReport.pdf

¹³ Riparian Floral Diversity of Ganga river by IIT Consortium (2012). http://cganga.org/wp-content/uploads/sites/3/2018/11/032_ENB_RIPARIAN_0.pdf





3.5 Interventions to adopt increased use of treated wastewater

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. It is estimated that 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 treated wastewater can easily be used to revive water bodies, and groundwater recharge, thereby augmenting the future supply of the city.

3.5.1 Baseline assessment

Kanpur generates around 320 MLD of wastewater from the four sewerage districts of Kanpur City. Out of this only about 50% reaches the STPs for treatment. After treatment, as per the SLB data, almost 40-65% of the treated wastewater is re-used mainly for irrigation purpose and in the Pankhi thermal power plant.

The Draft Policy on Wastewater Recycle and Reuse in Urban Local Bodies, Uttar Pradesh (2019) recommends the reuse of treated wastewater for watering in parks, garden and horticulture practices to the extent possible. In Kanpur, there are almost 200 parks/gardens under the ownership of KNN that still continue to use groundwater. KNN has already planned the reuse of treated wastewater within a 3km radius of the respective STPs. However, due to challenges of transporting of wastewater through tankers and pipelines, it is currently not followed.

Likewise, there is good potential for reuse of wastewater through several other avenues such as washing of buses, cleaning roads, watering public fountains, watering golf courses, among others. However, there is hardly any data or information in this regard to inform the decision making in the city.

3.5.2 Interventions

Based on the baseline assessment, there are two key concerns that need to be addressed under this objective. These include:

- Investigating the feasible reuse potential of treated wastewater across the city, as well as establishing practical mechanisms to tap into it.
- Replace the use of groundwater with treated wastewater in parks and gardens in the vicinity of existing and proposed STPs.

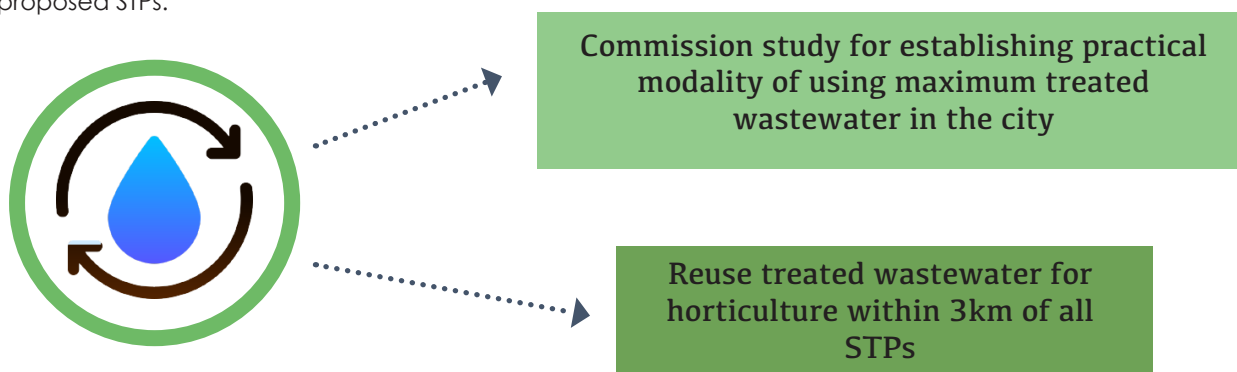


Figure 14: Interventions to adopt increased use of treated wastewater



Accordingly, two interventions will be undertaken under this objective in the URMP 1.0. Details of these are presented in Table 12.

Table 12 : Summary of interventions to increase the use of treated wastewater in the city

SN	Activity	Agency responsible	Timeline (months)							
			3	6	9	12	15	18	21	24
1	Commission a study for establishing the practical modality of using maximum possible treated wastewater in the city.	KNN								
2	Reuse treated wastewater for horticulture within 3km buffer zone of all STPs	KNN								

3.5.2.1 Commission a study for establishing the practical modality of using maximum treated wastewater in the city.

The total amount of treated wastewater available for reuse is around 160 MLD (given that only about 50% of the wastewater generated is treated). Around 40-60% (avg. 50%), i.e. 80 MLD, of this treated effluent is reused in agriculture and Pankhi thermal power plant. Thus, the remaining 80 MLD is theoretically available for reuse.

This intervention will involve commissioning a study with two objectives:

- Ascertaining the full feasible potential of reusing treated wastewater for various purposes such as horticulture, irrigation, cleaning roads, washing buses, meeting industrial water demand, reviving water bodies, and creating artificial water bodies, among others.
- Establish a practical mechanism to reuse the potential wastewater for the intended purposes. The practical mechanism will touch upon infrastructural requirement for transporting the wastewater and its storage, cost-benefit analysis, operation and maintenance, etc.

3.5.2.2 Commission a study for establishing the practical modality of using maximum treated wastewater in the city.

Table 10 presents the details of all parks and water bodies (greater than 1 acre) within 3kms of individual STPs, while Map 8 has their spatial representation. The total water requirement of all parks within 3 kms of the STPs is 4,84,420 litres = 0.48 MLD or 0.5 MLD. Thus, there is enough treated wastewater available to meet the horticulture demand in the vicinity.

To begin with, treated wastewater will be transported to the parks and gardens through tankers. Each park will construct an underground sump with a minimum capacity of 12 metre cube to accommodate the water received from three tankers. The actual capacity of the sump will depend upon the area of the park (and should ensure that at least three days of water supply can be stored).

KNN will also commission a feasibility study for construction of drainage infrastructure for long-term transport the treated effluent to the target areas.

The horticulture demand in the vicinity of the STPs is a very small fraction of the total treated wastewater available. Therefore, it is important to examine the large-scale use of this treated wastewater. One such large-scale use is for reviving water bodies. Table 12 indicates that there are at least 22 water bodies (greater than 1 acre area) in the vicinity. The study commissioned in 3.5.2.1 will prioritize the investigation of these water bodies from the standpoint of 'revival'.



Table 13: Numbers of parks and waterbodies within 3km of STPs

STP	Treatment capacity/estimated wastewater availability	Waterbodies status within 3km buffer of STP	Parks status in 3km buffer of STP
Jajmau	214 MLD	<ul style="list-style-type: none"> 3 waterbodies Total area of waterbodies 8.86 acres 	<ul style="list-style-type: none"> 6 parks Total area of parks 2.43 acres Total Water requirement- 24,000 lit.
Binagawa	210 MLD (existing) 30 MLD (proposed)	<ul style="list-style-type: none"> No prominent waterbody 	<ul style="list-style-type: none"> 20 parks Total area 6.13 acres Total Water requirements 62,000 lit.
Sajari	42 MLD (existing)	<ul style="list-style-type: none"> 9 waterbodies Total area of waterbodies 17.6 acres 	<ul style="list-style-type: none"> 1 park 0.13 acre Total Water requirements 1,250 lit.
Baniapura	15 MLD (proposed)	<ul style="list-style-type: none"> 6 waterbodies Total area of waterbodies 22.94 acres 	<ul style="list-style-type: none"> 7 parks 3.32 acres Total Water requirements 33,500 lit.
Panki	50 MLD (proposed)	<ul style="list-style-type: none"> 4 waterbodies Total area of waterbodies 28.5 acres 	<ul style="list-style-type: none"> 47 parks 36 acres Total Water requirements 3,60,000 lit.

Source: Jal Nigam

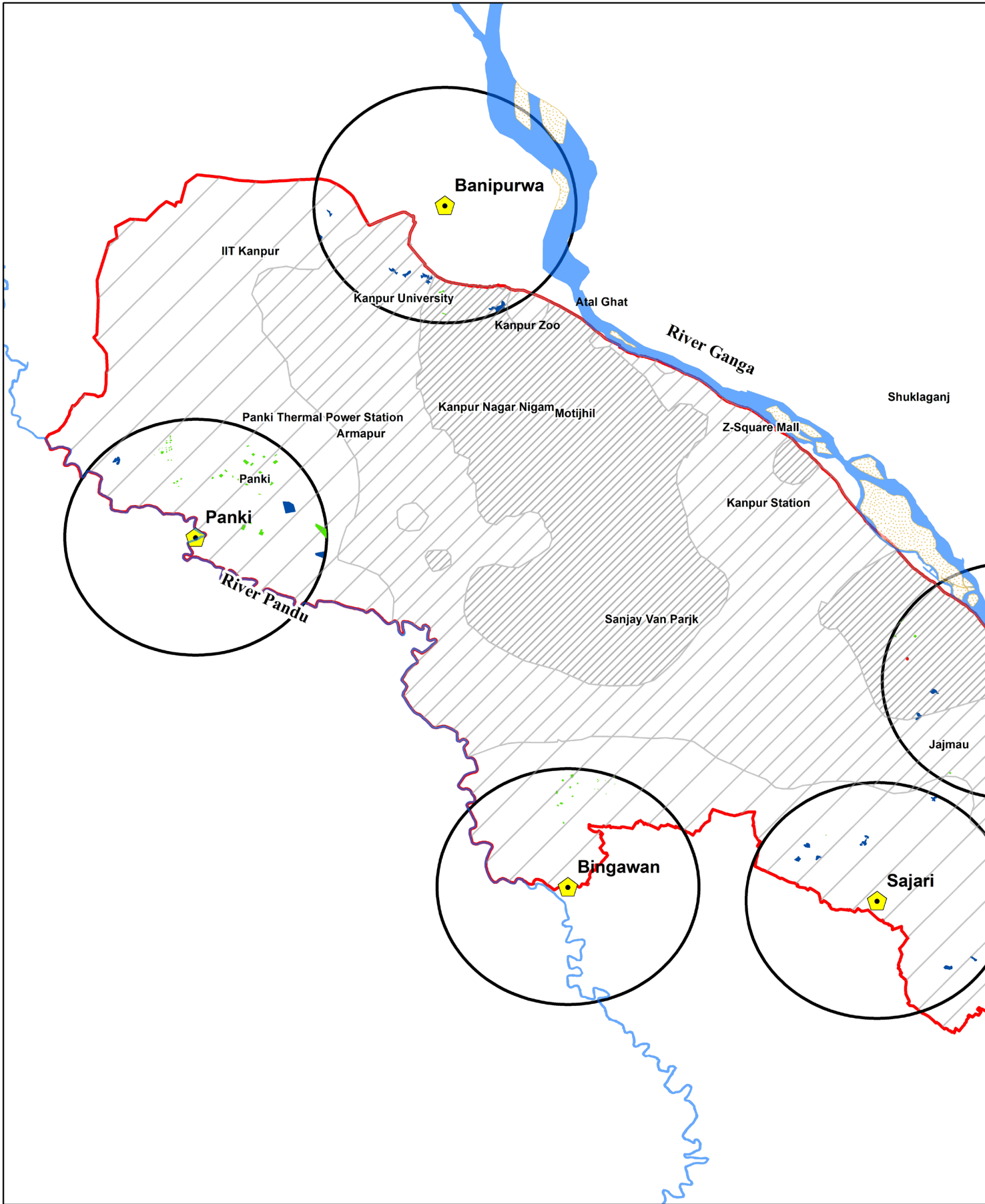
Note : Parks watering requirements @ 25,000 litres/hectare

3.5.3 Budget and sources of funding for interventions to increase the reuse of treated wastewater in the city

The expected budget for the interventions, along with the sources of funding are presented in Table 14. The actual costs will vary when DPRs or detailed activities are developed.

Table 14: Overview of budgetary requirement for interventions to increase the reuse of treated wastewater in the city

Intervention	Estimated costing (INR)	Remarks	Funding Source
Commission a study for establishing the practical modality of using maximum possible treated wastewater in the city.	25,00,000		Smart City Mission
Reuse treated wastewater for horticulture within 3km buffer zone of all STPs	1,00,00,000	Procurement of 5 dedicated tankers to transport treated wastewater (@ INR 20 lakh per tanker)	Jal Jeevan Mission Urban
Total	1,25,00,000		



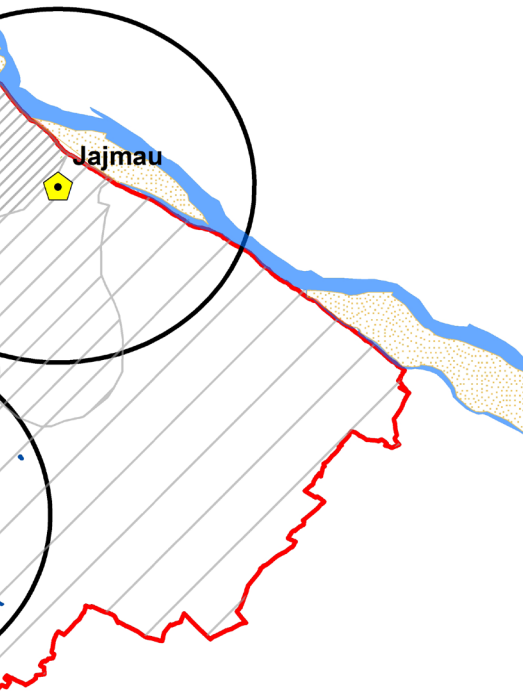
Map 8: Parks and waterbodies within 3km of SIPs



Buffer Area Map Kanpur STPs

Legend

- KMC* Boundary
 - River
 - Sand Bars
 - STP
 - 3Km Buffer
- ### Ground Water Level
- Depth in Mt
- 0.05-13.35
 - 13.36-20.07
 - 20.08-37.8
 - Parks within 3km. Buffer of STPs
 - Water Bodies(>1Acre) within 3 Km. Buffer of STPs



Note:

KMC has started a practice to reuse the Treated Waste Water within 3 Km Buffer Areas of STPs
 This map shows Parks & Water Bodies within the 3 Km radius to reuse the Treated Waste Water.
 Areas with high Ground Water Extarction are for the reference to prioritise the Water Bodies to be recharged with the Treated Waste Water

*KMC-Kanpur Municipal Corporation

Scale :

1 : 100,000

0 1 2 4 6

Kms



Source : Kanpur Nagar Nigam
 NBSS, New Delhi

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3.6 Interventions to ensure good quality return flow from city into the rivers

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. 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.

3.6.1 Baseline assessment

A Standard Operating Procedure (SoP) has been prepared for the Ganga River to maintain the minimum Ecological flow (E-flow) for wet (November to March) and lean/dry (April and May) seasons. It is available for the Kanpur Ganga barrage. However, currently there is no data/estimates on quantity of return flows that Kanpur city needs to maintain in line with the SoP as mentioned above. Furthermore, there is no information on how much water flows from the city into the rivers because the city has never carried out a water balance (or water budget) exercise.

There are around 20 drains which empty out in the Ganga and Pandu rivers. However, the carrying capacity of some of these drains are severely compromised due to solid waste and silt accumulation

3.6.2 Interventions

Based on the baseline assessment, there are three key concerns that need to be addressed under this objective. These include:

- Developing an understanding of the quantum of flow that the city contributes to the river, and ascertaining whether this contribution is adequate
- Removing all obstructions in the drains that impede the flow emptying out in the Ganga and the Pandu
- Restoring natural courses of drains

Accordingly, to begin with, two interventions will be undertaken under this objective in the URMP 1.0. Details of this are presented in Table 15

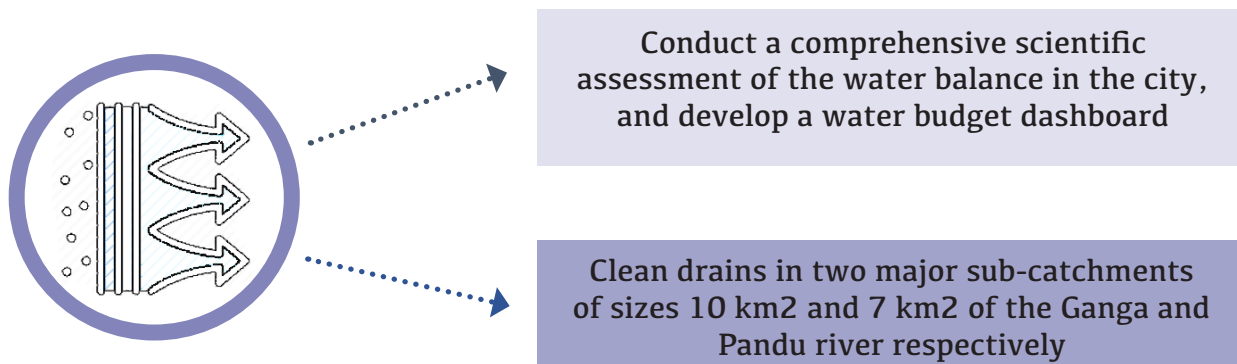
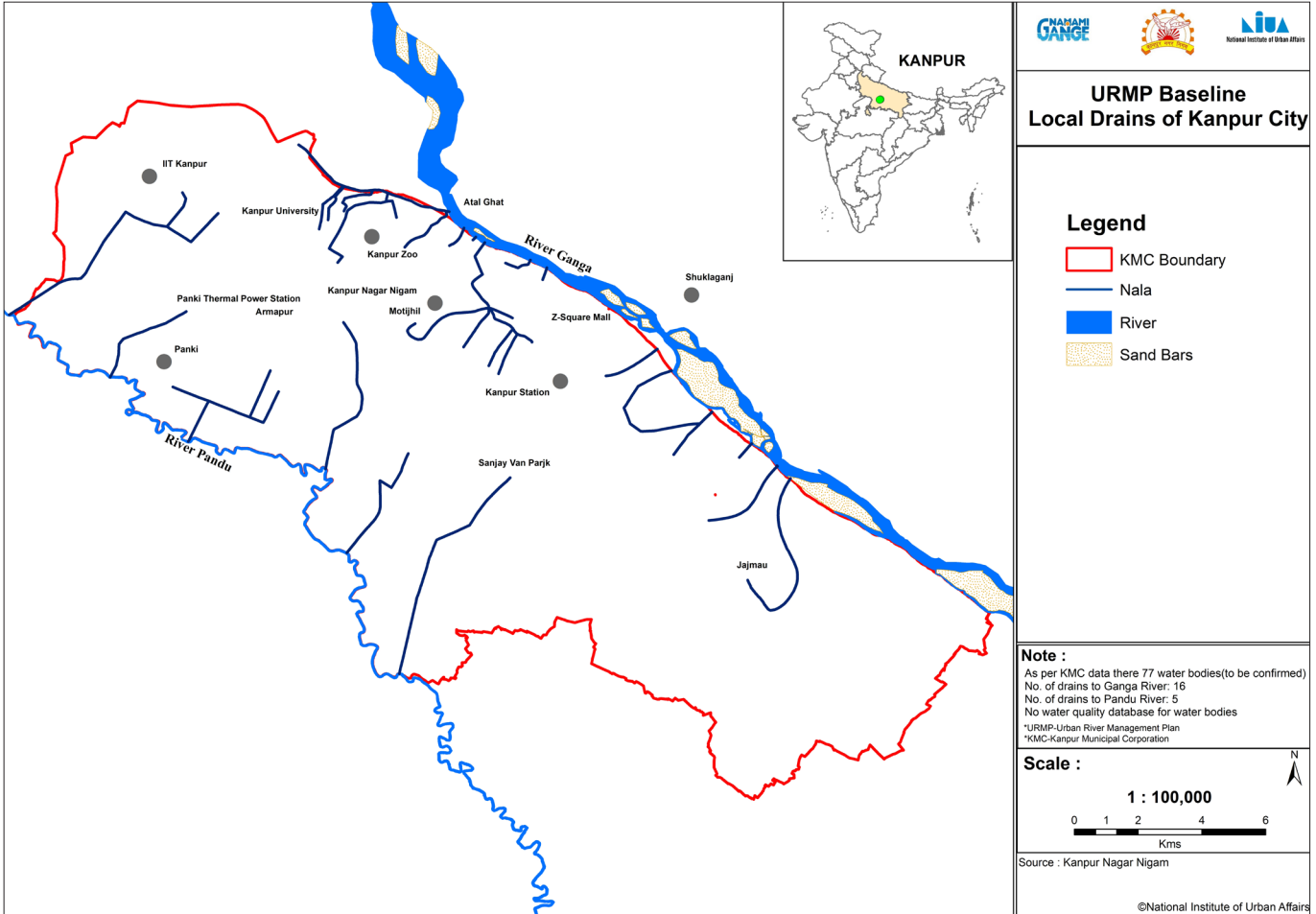


Figure 15: Interventions to maximise good quality return flow

Table 15: Summary of interventions to increase the use of treated wastewater in the city

SN	Activity	Agency responsible	Timeline (months)							
			3	6	9	12	15	18	21	24
1	Conduct a comprehensive scientific assessment of the water balance in the city, and develop a water budget dashboard	KNN, Irrigation Department								
2	Clean drains in two major sub-catchments of sizes 10 km ² and 7 km ² of the Ganga and Pandu Rivers respectively.	KNN								



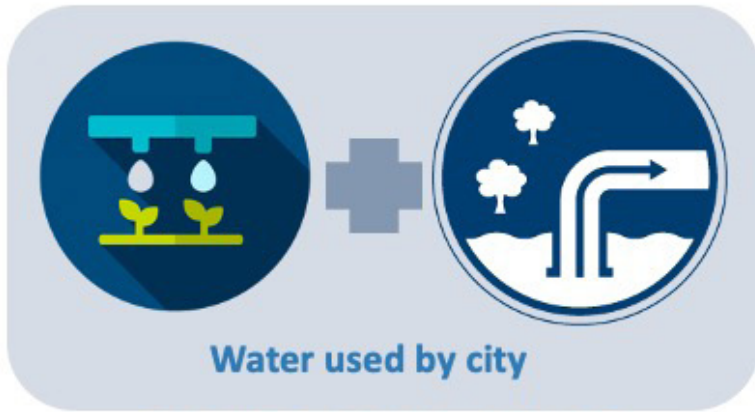
Map 9: Drains originating in Kanpur city

3.6.2.1 Conduct a comprehensive scientific assessment of the water balance in the city, and develop a water budget dashboard

A comprehensive scientific assessment of the water balance will be carried out to have a robust understanding of the inflows and outflows of water in the city. The concept diagram for the assessment is presented in Figure 16, which requires collecting information on the following:

- **Water withdrawal:** River water, Groundwater, Treated wastewater
- **Water use:** Domestic, Industry, Commercial, Public use
- **Storage:** Groundwater (including infiltration)
- **Overload flow:** Runoff
- **Losses:** Evapotranspiration

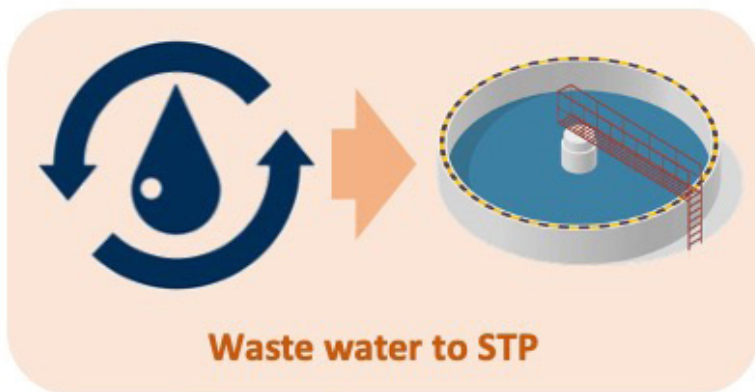
Based on the water balance outcomes, KNN will decide upon an appropriate contribution of return flow into the Ganga and Pandu Rivers.



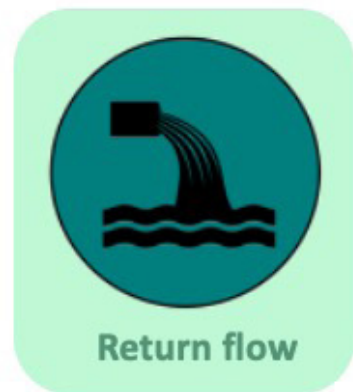
$310 \text{ MLD} + 120 \text{ MLD} = 430 \text{ MLD}$



$144 \text{ MLD (50\% efficiency)}$



$90\% \text{ efficiency of } 320 \text{ MLD} = 288 \text{ MLD}$



21 MLD (15\% GW)

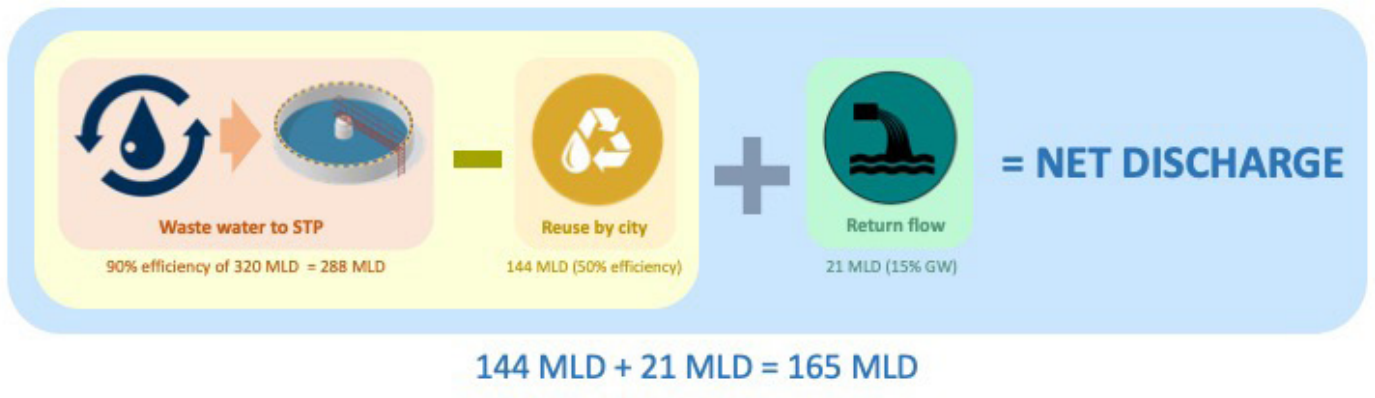


Figure 16: Diagram showing estimated water balance calculation for Kanpur City

Water balance dashboard: KNN will install a water balance dashboard at the Smart City Command and Control Centre, which will be updated periodically. This is expected to help city administrators understand the situation of inflow and outflow parameters and inform decision making related to sustainable management of water resources in the city. The schematic of the water budget dashboard is presented in Figure 17.

3.6.2.2 Clean drains in two major sub-catchments of sizes 10 km² and 7 km² of the Ganga and Pandu Rivers respectively.

As seen in Map 10, there are seven major drains discharging into the Ganga River. The catchment area of these drains vary in size from 10 sq kms (in Azad Nagar area) to 1 sq km. The largest drain of the city originates in the Kanpur University area and enters Ganga river at Atal Ghat. Similarly, for the Pandu River the map shows the catchments of four major drains, with the largest one of 7 km² (in Sajar STP area). The water flow in most of these drains is restricted because of the accumulation of silt and solid waste, due to which the carrying capacity of drains has been reduced.

Considering the total annual rainfall of 650 mm in Kanpur City, the catchments of 10 km² and 7 km² have the theoretical potential to contribute 93,000 Million Litres of stormwater in the Ganga river in single monsoon season (using a conservative runoff coefficient of 0.5). This is a substantial amount and can make a significant contribution to the return flow. Hence, this intervention of the URMP will focus on prioritizing the cleaning up the major and minor drains in these two catchments. In the next version of the URMP, the remaining catchments will be taken up.

The intervention will also include installing flow meters at the outlets of the two drains emptying into the Ganga River to get periodic information about the return flow.

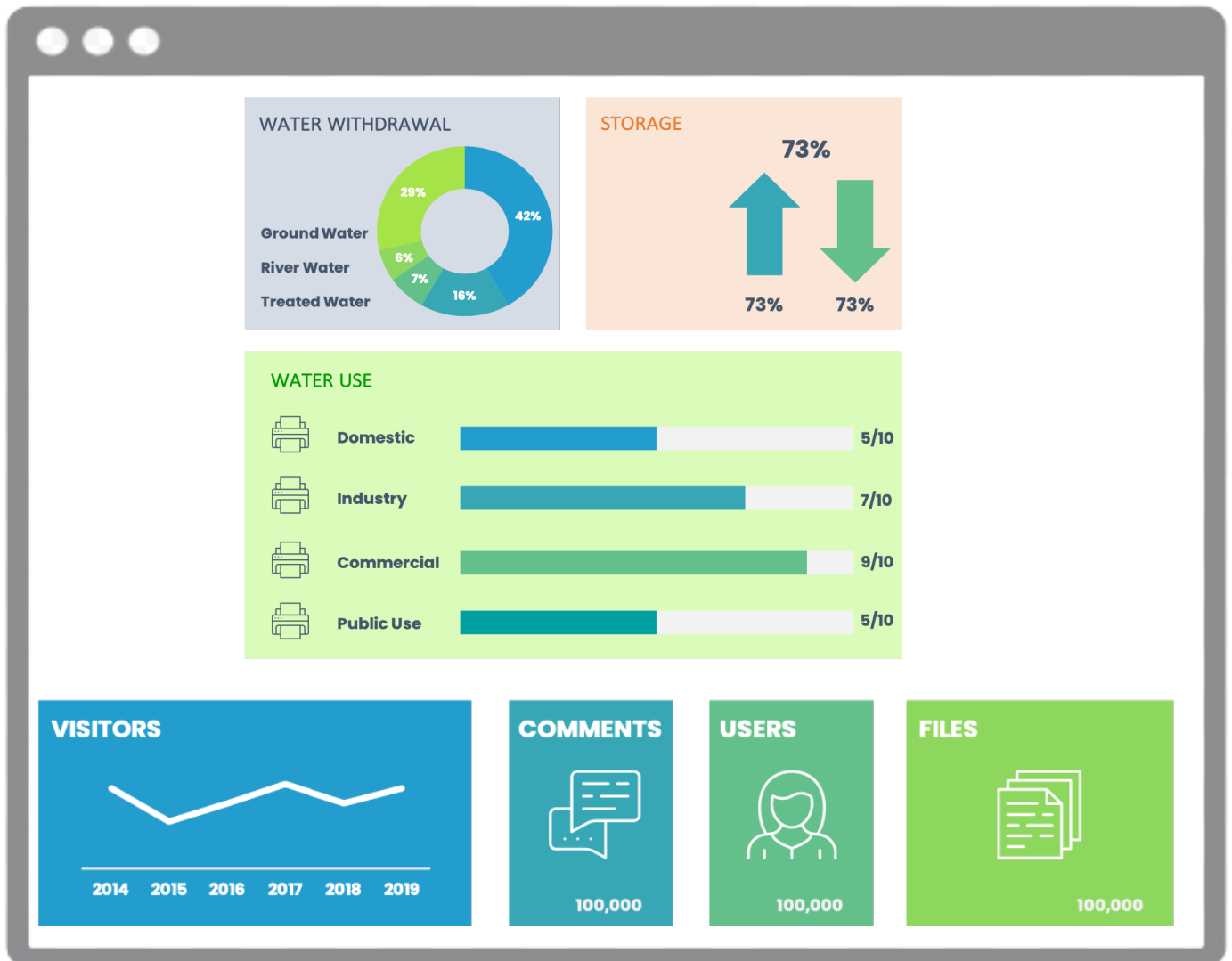


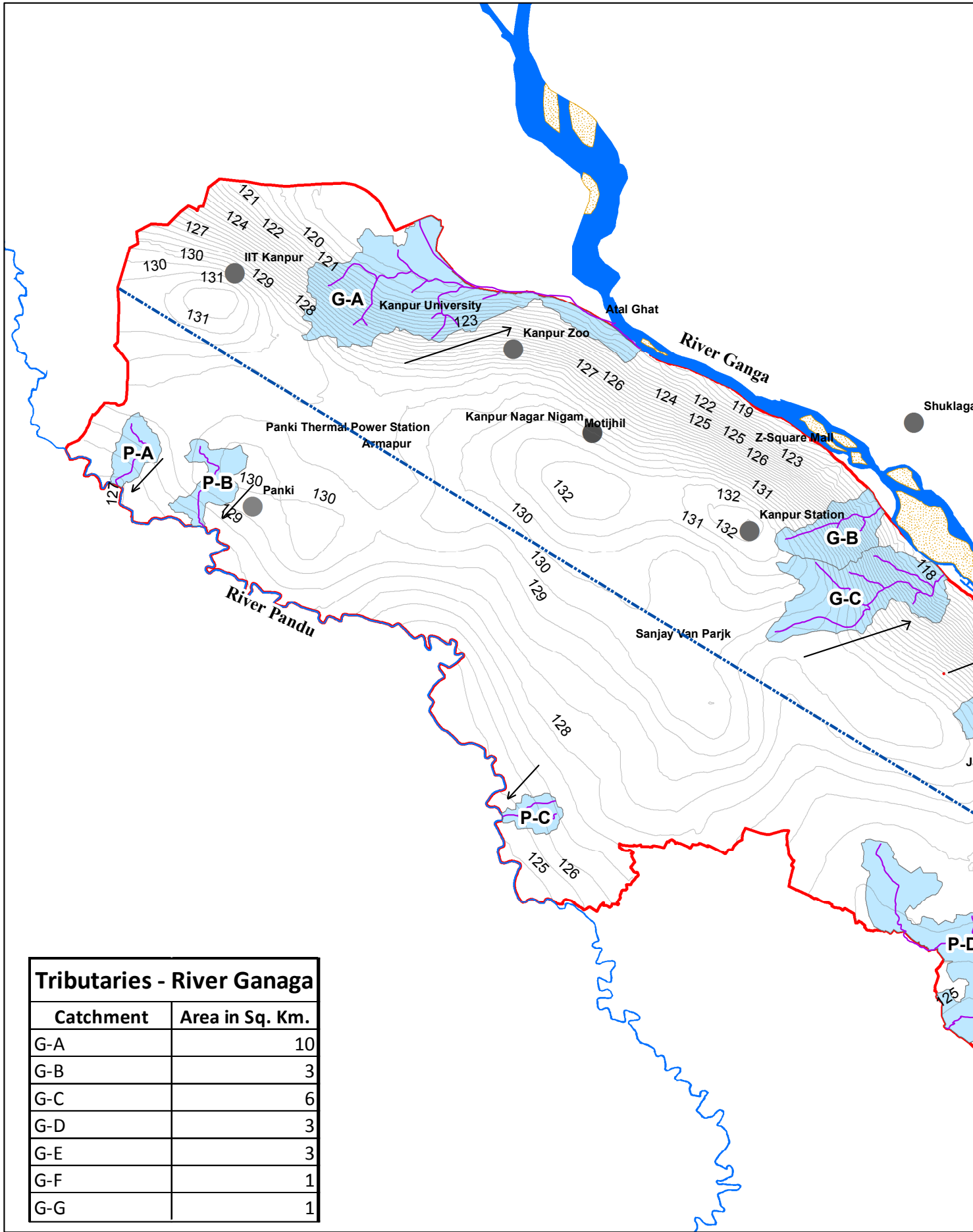
Figure 17: Representation of water balance dashboard for Kanpur City

3.6.3 Budget and sources of funding for interventions to ensure good quality return flow from the city into the rivers

The expected budget for the interventions, along with the sources of funding are presented in Table 16. The actual costs will vary when DPRs or detailed activities are developed.

Table 16: Overview of budgetary requirement for interventions to ensure good quality return flow from the city to its rivers

Intervention	Estimated costing (INR)	Remarks	Funding Source
Conduct a comprehensive scientific assessment of the water balance in the city, and develop a water budget dashboard	25,00,000	Includes ground truthing wherever required	Smart Cities Mission, Jal Jeevan Urban Mission
Clean drains in two major sub-catchments of sizes 10 km ² and 7 km ² of the Ganga and Pandu Rivers respectively.	20,00,000		Self-funding
Total	45,00,000		



Map 10: Selected micro watersheds in Kanpur





Selected Micro Watersheds

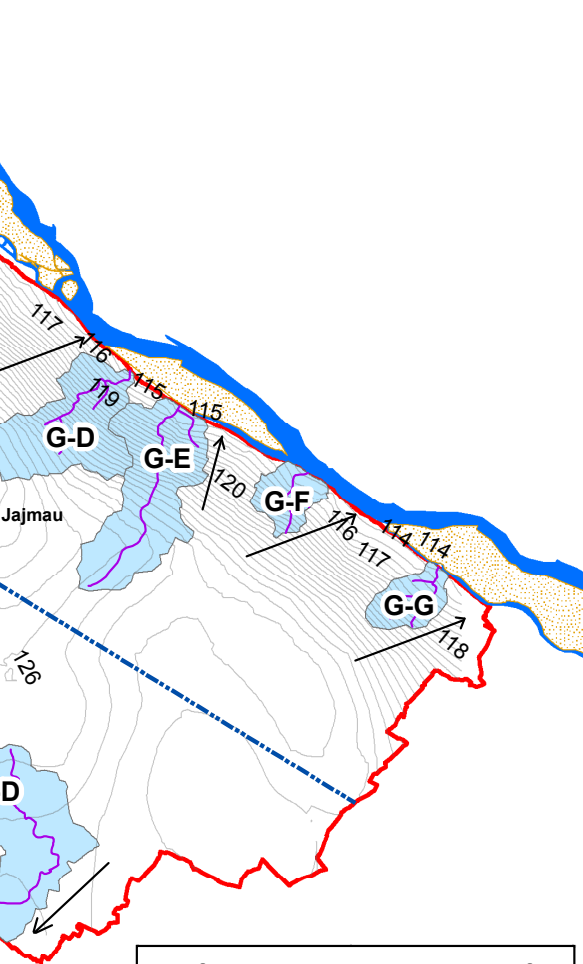
Legend

- KMC* Boundary
- KMC Ward Boundary
- Railway Network
- Road
- River
- Sand Bars
- Contour

Drainage Basin

- Drainage
- Catchment Area
- Catchment Divide

ganj



Jajmau

D

Note:

Drainage and Catchment Areas have been delineated using SOI Topographical Sheets(1977, 2011) and Digital Elevation Model

*KMC-Kanpur Municipal Corporation

Scale :

1 : 100,000



Tributaries - River Pandu

Catchment	Area in Sq. Km.
P-A	1
P-B	2
P-D	7
P-C	1

Source : Kanpur Nagar Nigam

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आटल घाट कानपुर

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3.7 Interventions to develop eco-friendly riverfront projects

Riverfronts add both aesthetic and economic value to the river. It serves as a medium to bring the river to the forefront, as well as a major avenue for recreation opportunities. In doing so, riverfronts become a wonderful instrument to connect citizens to the river and become a source of revenue for the city.

3.5.1 Baseline assessment

The stretch of Ganga River in Kanpur is almost 21 kms, and there are 24 ghats located on its banks. However, apart from ghats, there are no other riverfront structures. Most of the ghats within the city limits are used for religious purposes. The most recently constructed Atal Ghat, however, is being used for recreational activity. Among the 24 ghats, Atal Ghat, Sarsaiya Ghat, and Bhairon Ghat receive the maximum footfall.

The length of the Pandu River in Kanpur is around 20 km. However, there are no riverfront structures along its banks.

3.5.2 Interventions

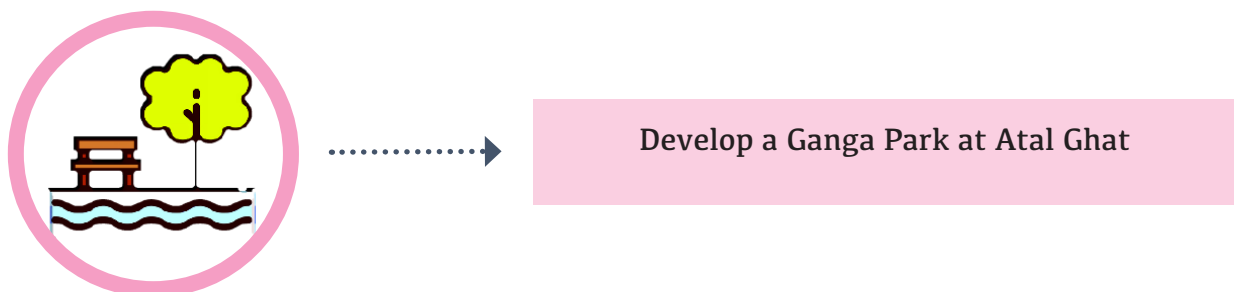


Figure 18: Intervention to develop eco friendly riverfront projects

Based on the baseline assessment, there are two key aspects that need to be addressed under this objective. These include:

- Constructing diverse kinds of riverfront projects (apart from Ghats) to add more variety and liveliness to the river edge
- Target some form of riverfront development along the Pandu River

Table 17: Summary of interventions to develop eco-friendly riverfront projects

SN	Intervention	Agency responsible	Timeline (months)							
			3	6	9	12	15	18	21	24
1	Conduct a comprehensive scientific assessment of the water balance in the city, and develop a water budget dashboard	KNN and KDA								

3.7.2.1 Develop a Ganga Park at Atal Ghat

The newly built Atal Ghat attracts many visitors daily. The Ghat has been developed in a traditional way with concrete as a dominant material. There is a plot of vacant land behind the ghat that is currently a site for solid waste dumping. This site will be cleared, developed into a Ganga Park with several eco-friendly features. The design concept plan of the Ganga Park with key highlights and unique features are presented in Figure 19



Figure 19: Concept plan of the Ganga Park

Details of different elements of the proposed Ganga Park at Atal Ghat

Sl. No.	Unit	Details	Sl. No.	Unit	Details
1	OAG	Open Air Gym	12	MAG	Museum and Art Gallery
2	CPA	Children's Play Area	13	RGF	Recreational Garden having Fruit-bearing Species
3	FG	Flower Garden	14	NIC	Nature Interpretation Center
4	HGBF	Herbal Garden and Butterfly Park	15	BL	Boat Landing
5	HG	Herbal Garden	16	EG	Existing Ghat
6	AWB	Artificial Waterbody	17	C	Cafeteria
7	N	Nursery	18	P	Parking
8	OACS	Open Air Community Space	19	TB	Toilet Block
9	MUT	Multiuse Trail	20	WA	Water ATM
10	VP	View Point	21	TIC	Tourist Information Center
11	SS	Sitting Space	22	RUC	Road Under Construction

3.7.3 Budget and sources of funding for interventions to develop ecofriendly riverfronts

The expected budget for the interventions, along with the sources of funding are presented in Table 18. The actual costs will vary when DPRs or detailed activities are developed.

Table 18: Overview of budgetary requirement for interventions to develop ecofriendly riverfronts

Intervention	Estimated costing (INR)	Remarks	Funding Source
Develop a Ganga Park at Atal Ghat	3,50,00,000	For the elements in Figure 20	KNN, KDA and CSR
Total	3,50,00,000		





जल पुलिस कानपुर गंगा



3.8 Interventions to leverage economic potential of the river

A river has tremendous economic value through the ecosystem services it provides, and livelihoods it can support. Cities across the globe have demonstrated that local economy can be boosted 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 the carrying capacity of the river.

3.8.1 Baseline assessment

The economic potential of the Rivers Ganga and Pandu in Kanpur is massive. Thus far, the city has just tapped into a very small part of it until now. This is mostly in the form of boating, religious activities on the Ghats, and some fishing. Several pilgrims visit the Ghats of Kanpur and Bithoor on a daily basis. Boating is mainly practiced at the Atal and Sarsaiya Ghats. There are around 50 boats docked at these Ghats, which ferry pilgrims to take a holy dip in Ganga River. KNN has initiated a process for boatmen to register their boats and receive an official licence. So far, around 20 boatmen have been registered. Small shops and stores that mostly sell puja items and flowers are common site on most ghats. Access to most of the Ghats is not very convenient, and parking for vehicles is an issue. Atal Ghat is an exception in this regard.

Over the last few years, there have been some initiatives in the pipeline to improve the river-related economy. For example, a biodiversity park has been planned upstream of the Ganga Barrage. The KDA boat club is another such project. It was planned to be located downstream of the Ganga Barrage but due to unavailability of sufficient water depth throughout the year, the location has been shifted to upstream of the barrage. Currently, the boat procurement process for the club is in the final stage.

Atal Ghat has good potential to be developed as a major tourist attraction. It is located strategically at the interface of Kanpur and Bithoor (which is the birth place of Lord Rama's sons Luv and Kush).

In September 2020, the U.P. Government announced a riverfront project for the city of Kanpur. Considering the local topography and resettlement issue of colonies developed along banks of Ganga River, feasibility of the riverfront project will require detailed investigation.

3.8.2 Interventions

Based on the baseline assessment, there are two key aspects that need to be addressed under this objective. These include:

- Broaden the scope of economic activities along the Ganga River in an eco-friendly manner.
- Improve access to the river edge at specific locations.
- Explore cultural tourism circuit between Kanpur and Bithoor.
- Initiate economic activities along the Pandu River.

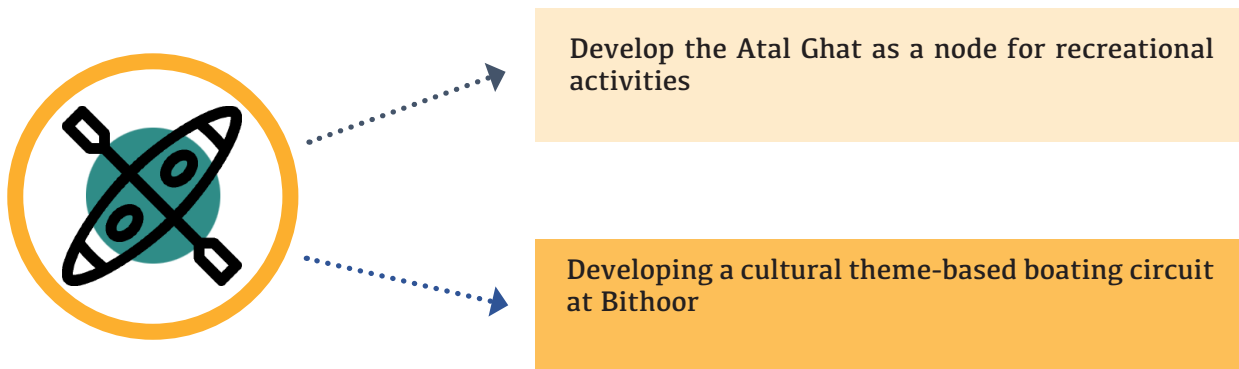


Figure 20: Interventions to leverage economic value of the river

Accordingly, to begin with, two interventions will be undertaken under this objective in the URMP 1.0. Details of this are presented in Table 19

Table 19: Summary of interventions to leverage on the economic value of the river

SN	Intervention	Agency responsible	Timeline (months)					
			6	12	18	24	30	36
1	Developing a floating restaurant at Atal Ghat	KNN, KDA, Irrigation and Tourism Department						
2	Developing a cultural theme-based boating circuit at Bithoor	KNN, KDA, Irrigation and Tourism Department						

Figure 21 shows the key elements of the proposed theme boat ride. These include

- o Arrival area: This is at the Atal Ghat, where tickets for the ride will be available for different options as explained later in this section. The arrival area will also have a waiting zone with facilities for refreshment and restrooms.

Route-1: Starts from the arrival area (Atal Ghat) to Bithoor for cultural theme ride

- o Proposed exhibition centre: Located on the opposite bank of Ganga River at Bithoor city

Route-2: Start from the arrival area (Atal Ghat) to the Sarsaiya Ghat

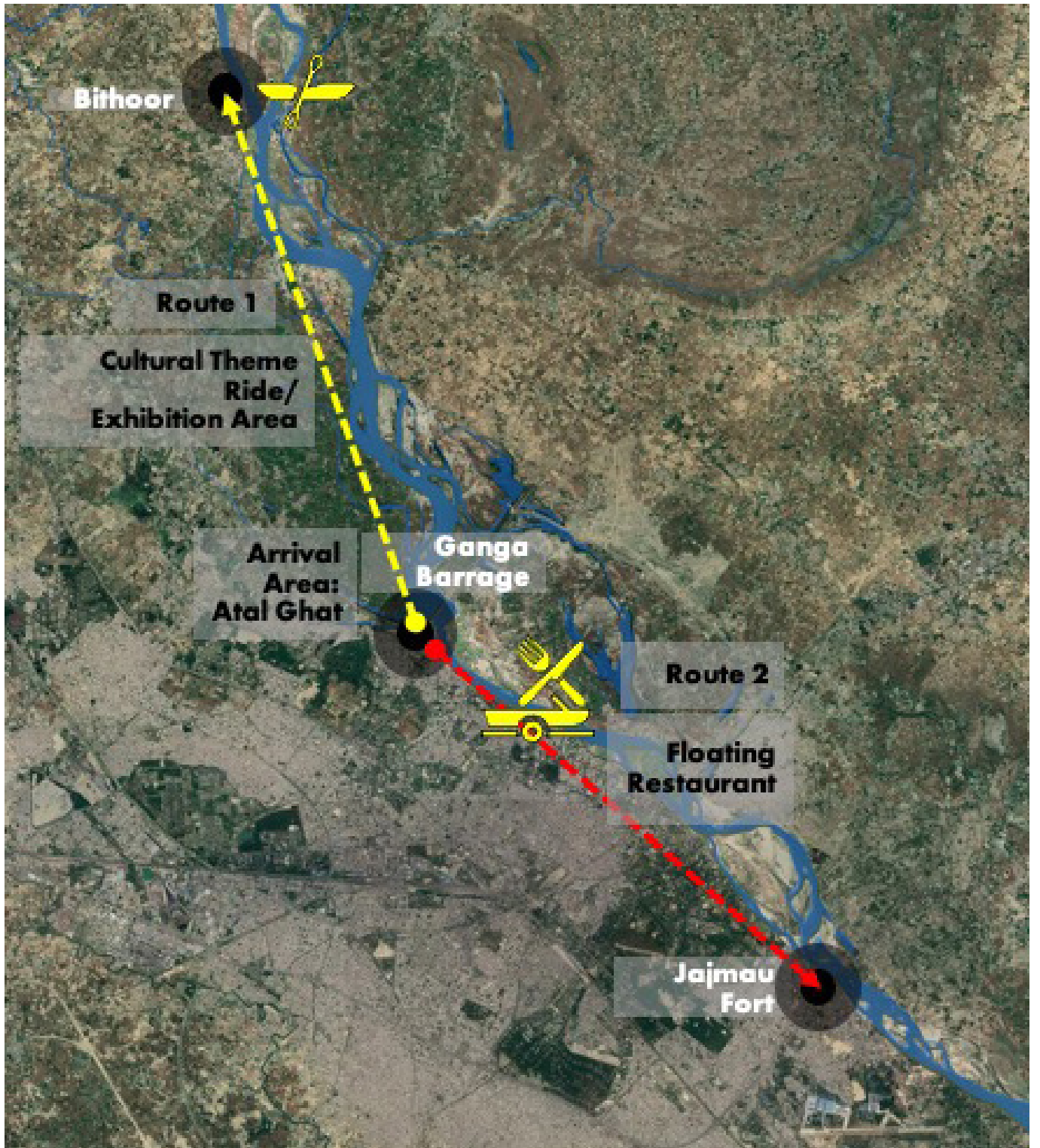


Figure 21: Proposed routes for the boat ride

3.8.2.1 Develop a floating restaurant at Atal Ghat

Floating restaurants is a popular concept in Hong Kong, Thailand, and Europe. Atal Ghat is proposed as a node for floating restaurants (small size river boats) in Kanpur. The floating restaurants are expected to run throughout the year, except in the monsoon season. Given that the water level in the river downstream of the Ganga Barrage is generally between 1-2m, the floating restaurants will be housed on Dinghy/motorboats with 12-15 passengers capacity. Figure 13 presents the proposed route for the floating restaurants, between the Atal Ghat and Sarsaiya Ghat.

A few pre requisites for developing the floating restaurants are small dock yard, bollards, pilings, pre-cooked food handling & catering equipment, necessary fire safety equipment, life jackets, life guards, and high speed emergency boats.

As seen in Figure 22, berthing facilities, passenger safety and convenience, ticketing, and food catering will be managed along the docking areas planned at regular intervals at the riverfront/ river edge.

Figure 23 presents the sequence of activities/infrastructure that will be needed to operationalize the floating restaurants.

This concept offers alternative livelihood options to the local boat owners, restaurants, youth employed with hospitality industry, while providing a unique experience for the customers.

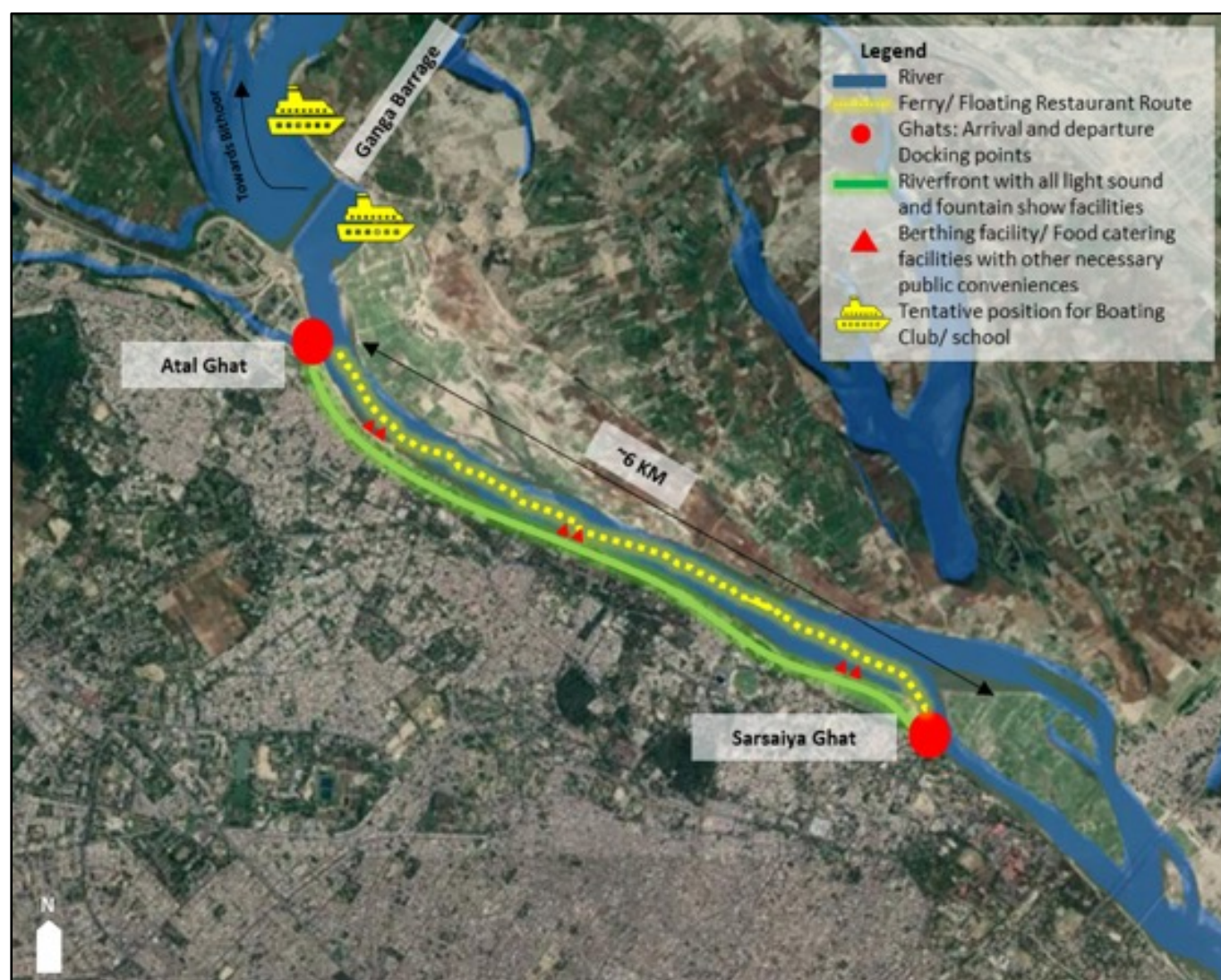


Figure 22: Map showing facilities along the floating restaurant route

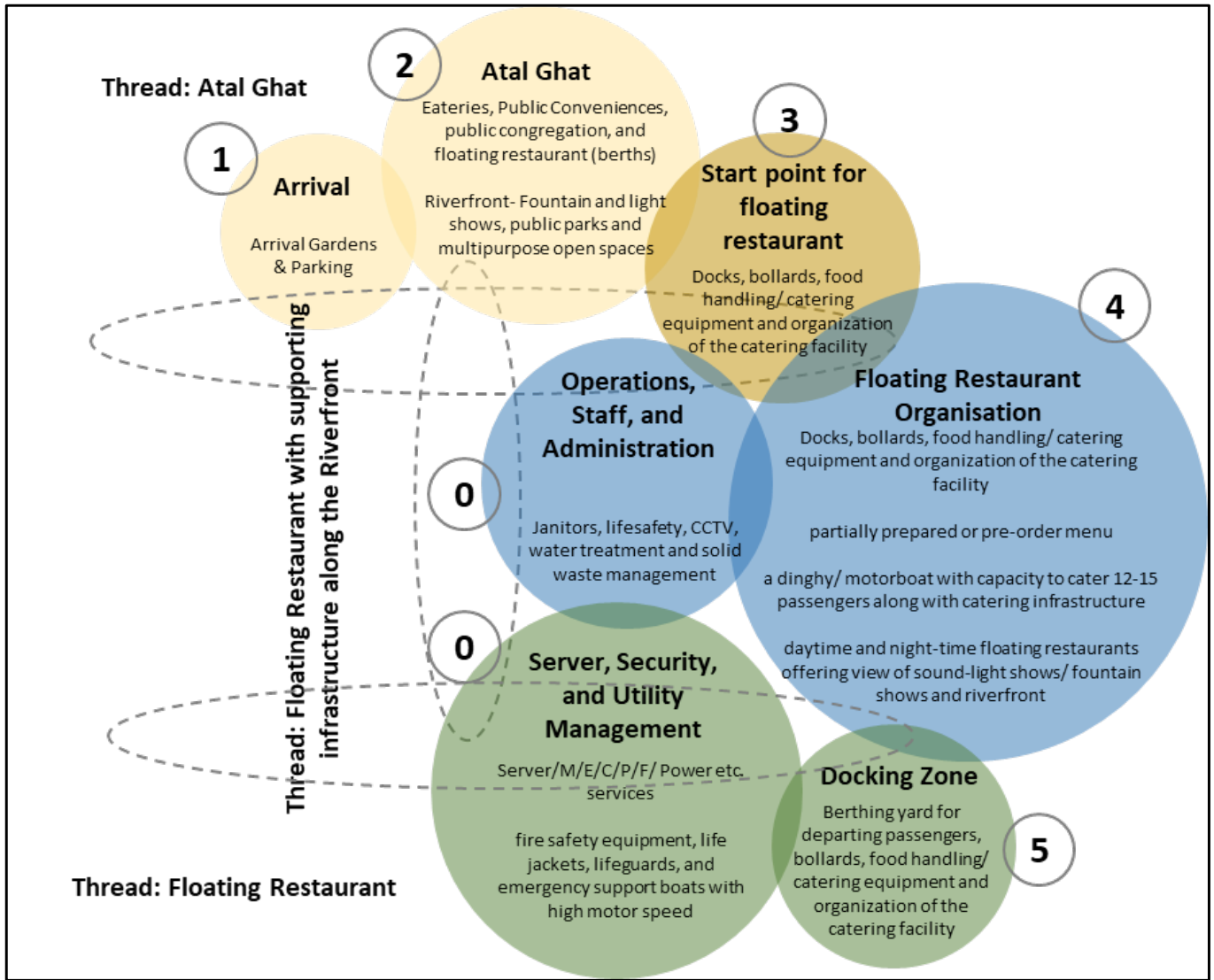


Figure 23: Flow diagram of activities/infrastructure required for the floating restaurants

3.8.2.1 Developing a cultural theme-based boating circuit at Bithoor

The core idea of this intervention is to interlink the tourism activities in Kanpur and Bithoor, a small town 23 km North of Kanpur. The town is enlisted as a municipality of Kanpur metropolitan area.

Bithoor has both religious as well as national significance. It is the birthplace of Luv and Kush from the Ramayana. Bithoor has been closely associated with the Indian independence movement, especially the Indian Rebellion of 1857. It was at one time home to many of the rebellion's most prominent participants including the Rani of Jhansi, Lakshmi Bai.

Despite being a small town, Bithoor recorded 1,500,000 tourists in the year 2019. Most of the tourists stay in Kanpur city, contributing to local economy. Themed boat rides have been a popular means of exhibiting the stories, history, wildlife, etc. by virtue of adventure along with the nature. There are many such cases where themed boat rides have been exemplary in attracting tourist and providing experience wrapped in information. For instance, Sanskruti Darshan by Akshardham Temple at New Delhi , Pandora- the world of Avatar by Walt Disney in Florida, boat safari (through a virtual forest) in Singapore etc.

The religious and cultural heritage of Bithoor make it a very attractive prospect for such a themed boat ride. The intervention has been conceptualized in such a way that the river-related tourism in the Kanpur-Bithoor stretch is formalized, streamlines, and subsequently enhanced.



The cultural theme ride includes the following two legs of the journey.

1. Arrival: Tickets for the cultural-themed boat ride be available at the Atal Ghat, Ganga barrage with 2-3 journey options: (a.) Ghat visits AND/OR (b.) Boat ride to the exhibition AND/OR (c.) Heritage walk etc.
2. Leg 1: Starting boat ride/ journey through road to the Bithoor Ghats which can be coupled with a heritage walk to encapsulate the essence of the rich culture, connection with the Ramayana, and Indian National Freedom Struggle as mentioned above.
3. Leg 2: Cultural themed boat ride to the exhibition center and back to congregation deck.
4. Departure: Return via road / boat back to Ganga barrage exiting the town of bithoor.

The following map depicts the proposed locations for this intervention which can also be clubbed with the heritage walk to the old remnants of the archaeological and architectural heritage of the Bithoor (Dhruv Teela, archaeological site) town offering boat ride to all the ghats.

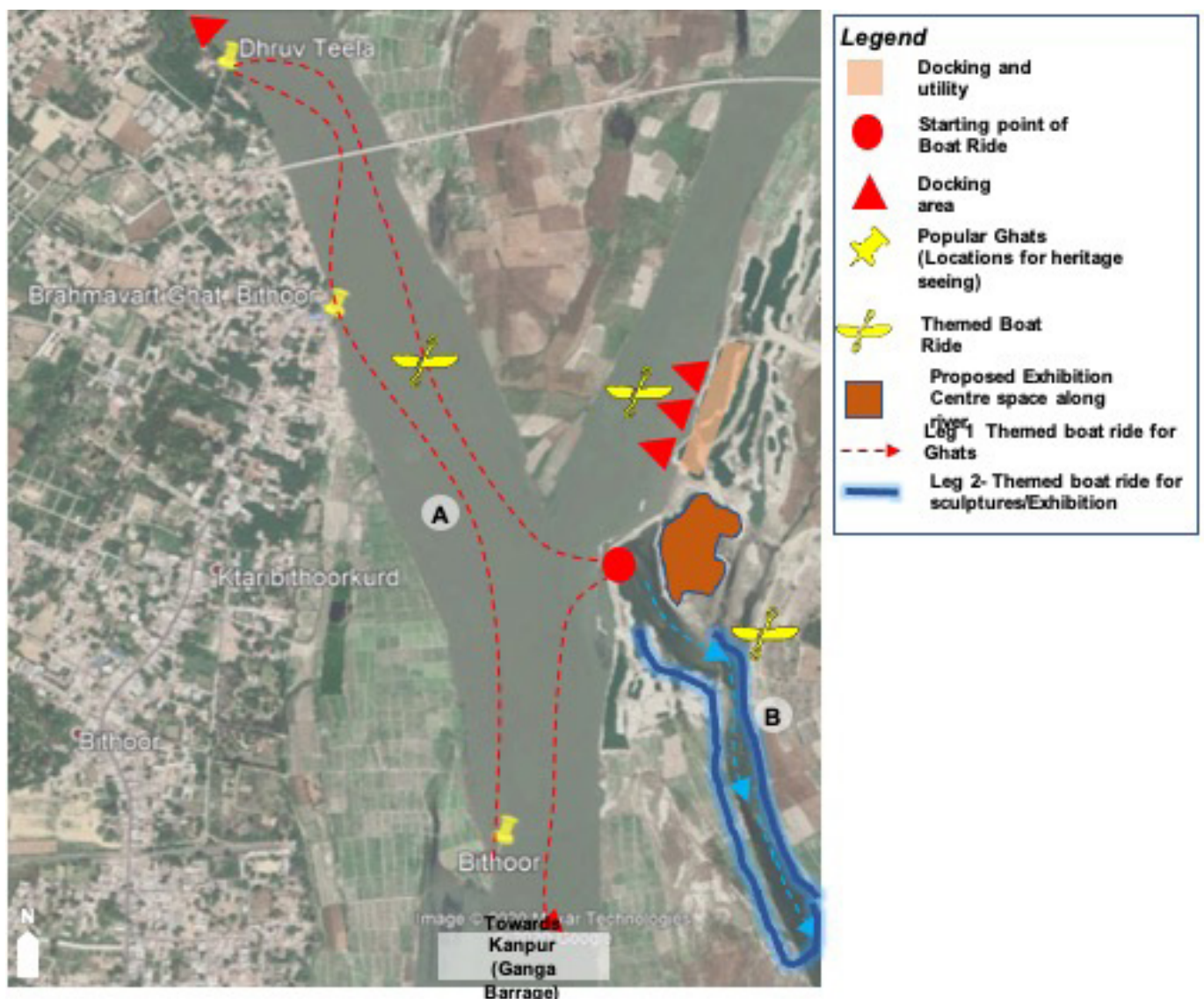


Figure 24: Flow diagram of activities/infrastructure required for the floating restaurants

Conceptual Flowchart of Activities - cultural theme ride

The boating activity of any sort involves a few primary components like docking area, dedicated movement bays, visitor arrival and departure area, boarding deck, ticketing area, operations and management chambers, visitor safety and emergency boat/ capsules, changing rooms, and other tourist utilities.

With the introduction of themed facilities like sculptures, lights, sound, and interactive activities, depending upon the design, additional architectural, civil, and mechanical area requirements have been added.

Figure 25 below describes list of activities and the primary components involved based on the proposed interventions as mentioned above.

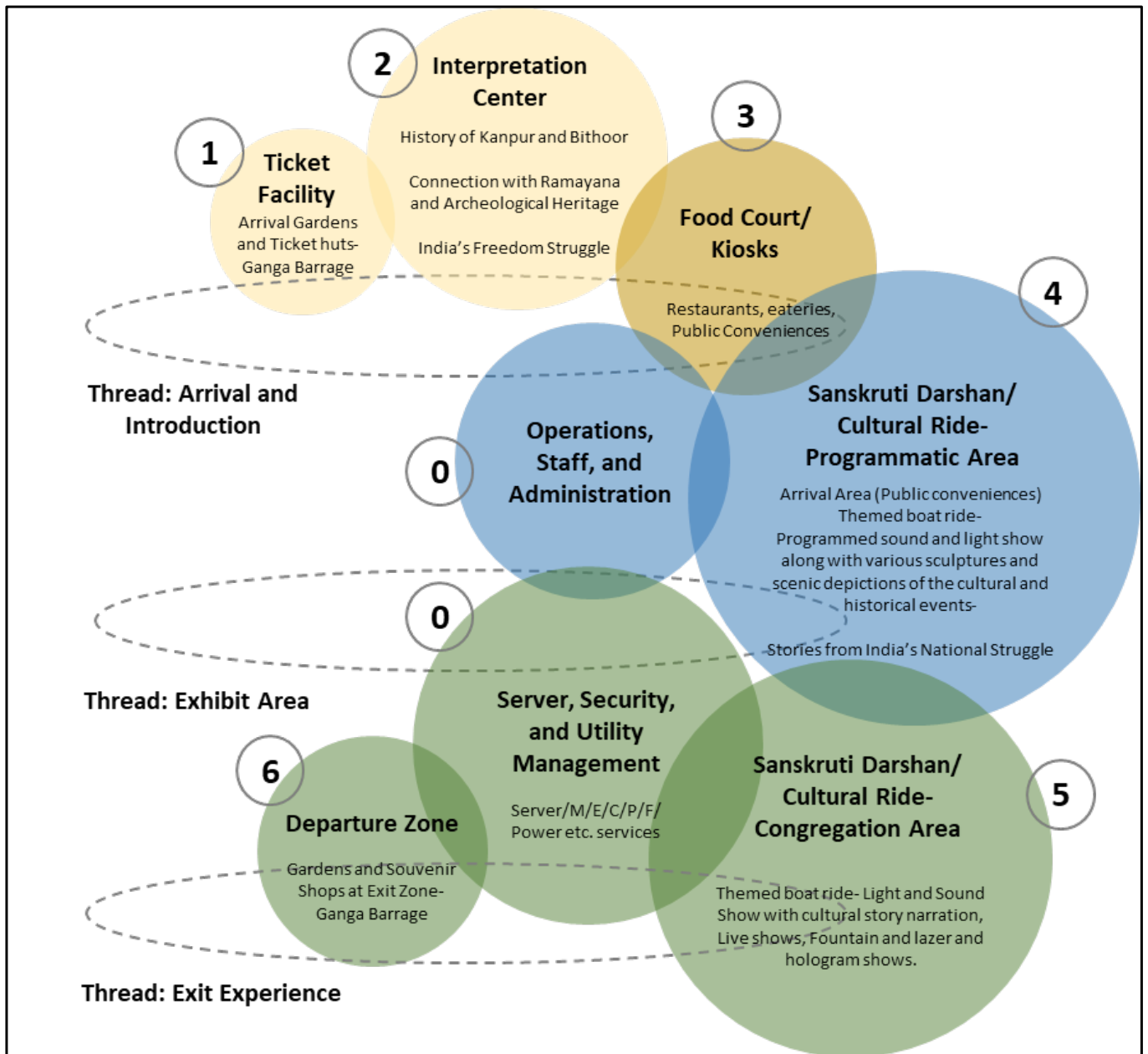


Figure 25: Flow diagram of activities/infrastructure required for cultural theme ride

3.8.3 Budget and sources of funding for interventions to develop ecofriendly riverfronts

The expected budget for the interventions, along with the sources of funding are presented in Table 20. The actual costs will vary when DPRs or detailed activities are developed.

Table 20: Overview of budgetary requirement for interventions to develop ecofriendly riverfronts

Intervention	Estimated costing (INR)	Remarks	Funding Source
Developing a floating restaurant at Atal Ghat	15 Crores	Boats* (marine grade motorized), docking facility, congregation area with common facilities, cooking zone,	UP Tourism Department, KDA, KNN
Developing a cultural theme-based boating circuit at Bithoor	20 Crores	Boats* (marine grade motorized), prepare canal route, cultural theme set up	
Total	35 Crores		

* 10 boats, 8 seater

All the costs are excluding land costs and include all fixtures, fittings, furnishings, utilities, and establishment rates. O&M cost-1 cr./annum







3.9 Interventions to inculcate river-sensitive behaviour among citizens

Citizen support is vital for long-term sustainability of urban river systems and the success of any initiative by urban local bodies. Soliciting support becomes easier when citizens are invested and feel accountable for the issues. 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.

3.9.1 Baseline assessment

Currently there are a number of avenues used by the city to raise awareness among the citizens on the value of rivers, and the need to protect them. For example, the use of river-themed wall paintings has been extensively adopted in the city at many locations, particularly along the roads approaching various ghats. These paintings depict ghats, riverine biodiversity, and people's interaction with the river.

KNN has also used platforms like FM radio and social media to create awareness among citizens for the Swachh Bharat Mission, one of the objectives of which is to help reduce the solid waste dumping in the rivers. The Forest Department has recently opened an "Anubhuti Kendra" located in the Kanpur Zoo, dedicated for educational and sensitization activities on the Ganga River.

There are almost 200 religious centres (temples, mosques, church etc.) along the banks of Rivers Ganga and Pandu, which can further serve as useful avenues for enhancing river sensitive behaviours among the citizens.

3.9.2 Interventions

There are a number of existing instruments among target groups for river-related sensitization in Kanpur. While these have had some effect, there is good room for improvement in terms of behavioural change. There is, therefore, a need to adopt new and innovative forms of sensitization in order to enhance the behavioural change in the citizens. Accordingly, to begin with, one intervention will be undertaken under this objective in the URMP 1.0. Details of this are presented in Table 21.

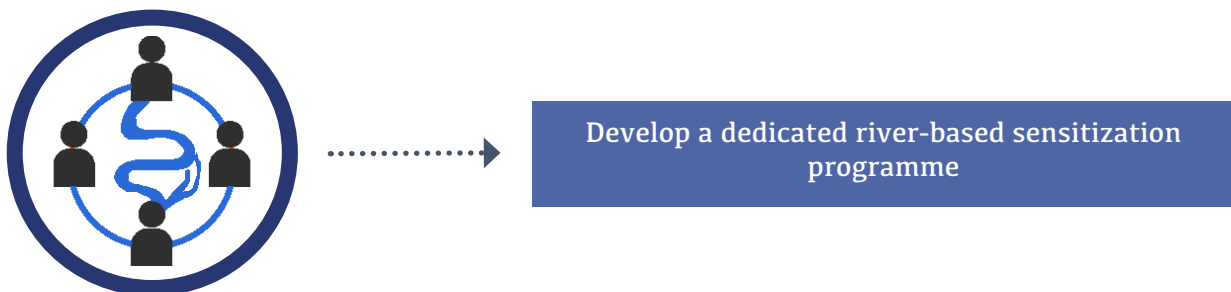


Figure 26: intervention to improve river sensitive behaviour among citizens

Table 21: Summary of interventions to inculcate river sensitive behaviour

SN	Activity	Agency responsible	Timeline (months)					
			6	12	18	24	30	36
1	Develop a dedicated river-based sensitisation programme that will include the following: <ul style="list-style-type: none"> • Celebrating river day on annual basis • Organising competition for school children • Live performances by youth, local artists • Hoardings, digital displays 	KNN						

3.9.3 Budget and sources of funding for interventions to inculcate river-sensitive behavior among citizen

The expected budget for the intervention, along with the sources of funding are presented in Table 21. The actual costs will vary when DPRs or detailed activities are developed.

Table 22: Overview of budgetary requirement for interventions to inculcate river-sensitive behavior among citizens

Intervention	Estimated costing (INR)	Remarks	Funding Source
Develop a dedicated river-based sensitization programme that will include the following: <ul style="list-style-type: none"> • Celebrating river day on annual basis • Organizing competitions for school children • Live performances by youth, local artists Hoardings, public information systems, digital displays	50 Lakhs	Lumpsum for the URMP V 1.0	KNN
Total	50 Lakhs		







3.10 Interventions to engage citizens in river management activities

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. An inclusive and participatory approach will allow residents to be a key stakeholder. This will allow them to step-up and share the onus of keeping the river clean. 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.

3.10.1 Baseline assessment

Currently, the engagement of citizens in river management activities is mostly in areas of research by the academic and research institutes in the city.

3.10.2 Interventions

To begin with, two interventions will be undertaken under this objective in the URMP 1.0. Details of these are presented in Table 23

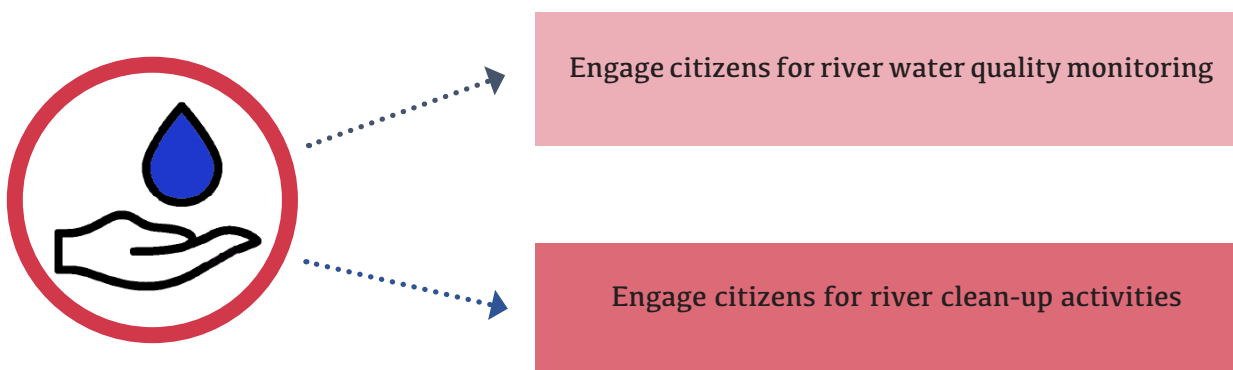


Figure 27: interventions to engage citizens in River Management Activities

Table 23: Interventions to inculcate river-sensitive behaviour among citizens

SN	Intervention	Agency responsible	Timeline (months)					
			6	12	18	24	30	36
1	Engage citizens for river water quality monitoring	KNN						
2	Engage citizens for river clean-up activities	KNN, KDA, Irrigation and Tourism Department						

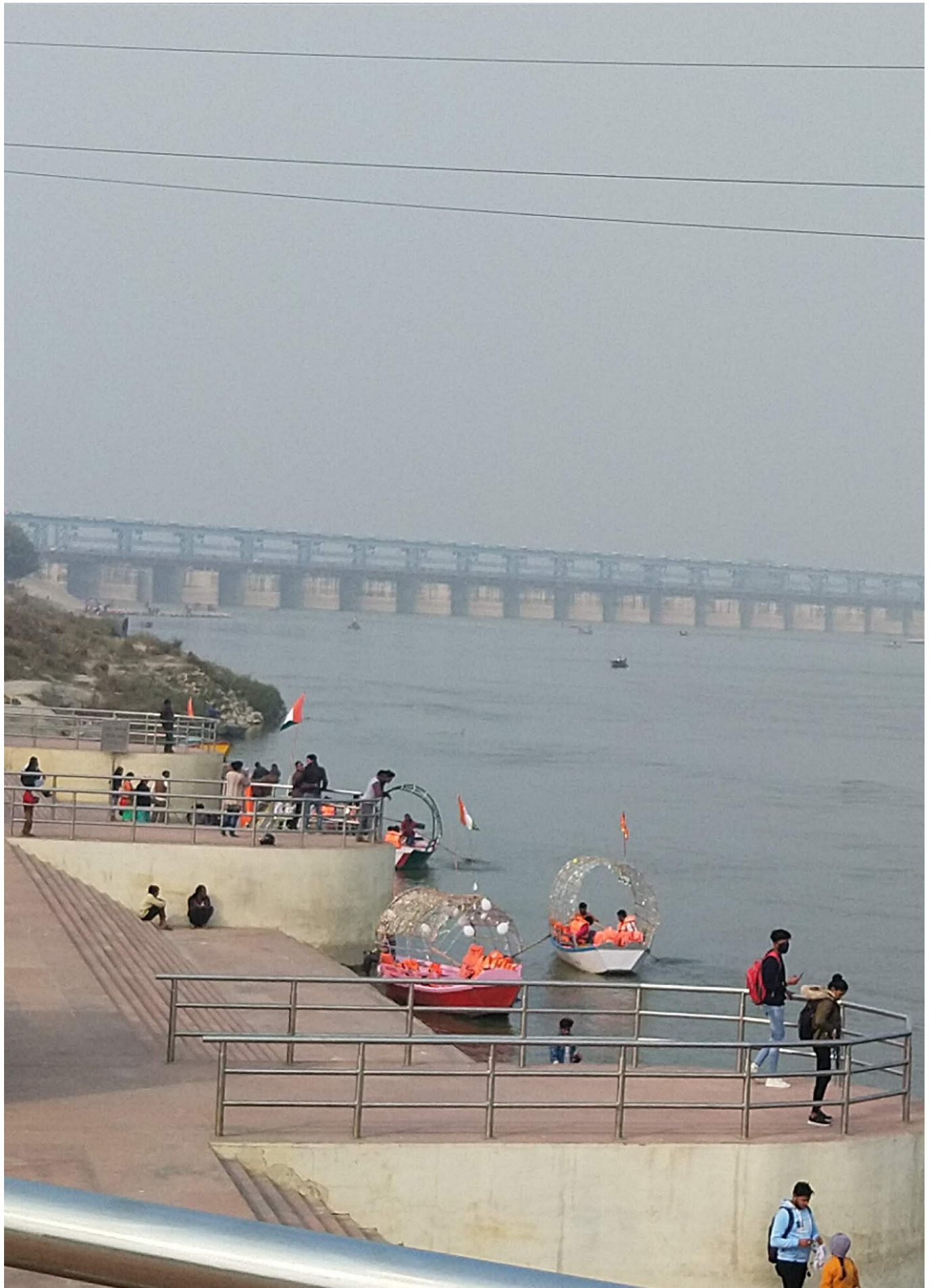
3.10.2.1 Engaging citizens for river water quality monitoring

The intervention comprises setting up a group of community volunteers for monitoring the river water quality. From experiences around the world, it is observed that school children make a very good volunteering group.

3.10.3 Budget requirements

Lump sum estimate of INR 10,00,000 on annual basis









URMP Kanpur M&E Plan

URMP framework provides clear pathway to monitor progress of project implementation recommended under URMP. To monitor progress of interventions for each objectives mix of qualitative and quantitative indicators are given in the framework. For M&E of URMP Kanpur, the URMP group is advised track the progress of improvement in the city by assigning applicable ranking to the indicators. Overall, URMP index given in the framework will enable city to gauge status of health of the River Ganga and Pandu.

4.1 URMP Kanpur M&E Plan

The implementation of the URMP shall be monitored through ten indicators, as per the overarching guidance note for the URMP framework proposed by NMCG and NIUA². Table 24 presents the details of these indicators. A baseline for these indicators will be developed within the first six months of the implementation of this URMP, and will be continued to be monitored as per the desired frequency.

An annual meeting will be organized chaired by the Commissioner to take stock of the progress made under the URMP, and examine the trend of the indicators.

Table 24: URMP progress monitoring indicators

S. No	Name of indicator	Estimation measure (Details of calculations to be followed are in Guidance note for the URMP framework)	Monitoring frequency
1	Floodplain management score	Based on consideration of desirable features of a well-managed and regulated flood plain.	Annual
2	Net Dissolved Oxygen (DO) Score	Based on the evaluating difference in DO at the downstream and upstream locations for each river.	Monthly
3	Waterbody revival score	Based on a qualitative assessment of the water bodies in the city that are in an acceptable condition.	Annual
4	Riparian buffer score	Based on a quantitative assessment of the length of the riparian zone on the river banks within the city's jurisdiction	Annual
5	Wastewater reuse score	Based on the amount of treated wastewater that the city is able to use for various uses	Monthly
6	Return flow score	Based on a measures of a city's return flow to the river against its intended commitment for it.	Monthly
7	Eco-friendly riverfront score	Based on a qualitative assessment of the economic and social benefits of the riverfront projects of a city.	Annual
8	River economy score	Based on the number of river-related economic activities carried out in the city, in a eco-friendly manner	Annual
9	Citizen sensitization score	Based on the modalities used for citizen sensitization	Annual
10	Citizen engagement score	Based on the modalities used for engaging citizens in river management activities	Annual

2 <https://niua.org/intranet/sites/default/files/963.pdf>





Annexures

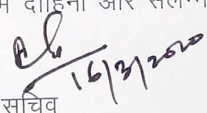
Annexure 1: Officer order of proposed working group

नगर आयुक्त महोदय,
नगर निगम, कानपुर।

कृपया कानपुर नगर हेतु अरबन रिबर मैनेजमेन्ट प्लान पर दिनांक-20.02.2020 को आपकी अध्यक्षता में नगर निगम सभागार कक्ष में एक वर्कशाप आयोजित की गई थी, जिसमें अरबन रिबर मैनेजमेन्ट प्लान को प्रभावी रूप से क्रियान्वयन किये जाने हेतु एक वर्किंग ग्रुप गठित करने का निर्णय लिया गया था, जिसमें अलग-अलग विभागों के निम्नलिखित अधिकारियों इस ग्रुप के सदस्य होंगे :-

- | | |
|--------------------------|---|
| 1. डा0 प्रमीला निरंजन, | मुख्य नगर स्वास्थ्य अधिकारी, नगर निगम, कानपुर। |
| 2. श्री रामबाबू राजपूत, | सचिव, जलकल विभाग नगर निगम, कानपुर। |
| 3. कु0 पूजा त्रिपाठी, | सहायक नगर आयुक्त, नगर निगम, कानपुर। |
| 4. श्री मो0 एहसान, | प्रोजेक्ट मैनेजर, गंगा प्रदूषण नियंत्रण इकाई, उ0प्र0 जल निगम। |
| 5. डा0 सुरेश के. गुर्जर, | ई0ओ0 (टेक.), आई0आई0टी0, कानपुर। |
| 6. श्री आर0पी0 प्रजापती, | सब डिवीजनल फारेस्ट आफिसर, वन विभाग, कानपुर। |
| 7. श्री मुकेश अग्रवाल, | अधिकांसी अभियन्ता, कानपुर विकास प्राधिकरण। |
| 8. श्री मोहित सिंह, | टूरिस्ट आफिसर, टूरिस्म विभाग, कानपुर। |
| 9. श्री के0पी0 सिंह, | सीनियर मैनेजर, पी0एस0आई0, लखनऊ। |
| 10. श्री परवेज खान, | जी0आई0एस0 एक्सपर्ट, नगर निगम, कानपुर। |
| 11. श्री राहुल अवस्थी, | यू0एस0आई0 (अमृत), नगर निगम, कानपुर। |
| 12. श्री अपूर्वा राय, | मैनेजर, पी0एस0आई0, कानपुर। |

अतः उपरोक्त अधिकारियों को इस वर्किंग ग्रुप के सदस्य के रूप में नामित किये जाने की अनुमति प्रदान करते हुये सम्बंधित को प्रेषित किये जाने वाले पत्र जोकि पत्रावली में दाहिनी ओर संलग्न है, पर हस्ताक्षर करने का कष्ट करें।


सचिव
जलकल विभाग नगर निगम,
कानपुर

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11	Dr. Suresh K. Gurjar	IIT Kanpur	EO (Tech.)	9414671807	sgurjar@iitk.ac.in

The above list of working group members is based on first workshop held in February 2020 at KNN

Names highlighted in bold are changed or have different responsibilities

The current nodal officers are Environmental Engineer, KNN and Urban Infrastructure specialist, KNN

Annexure 2: Officer order of nodal officers for URMP, Kanpur



**Office of The Municipal Commissioner
Kanpur Municipal Corporation**

Letter No.:- 1127/8/9
Dated :- 11/01/2021

Office Order

Sub:-Appointing Nodal officers for support in preparing Urban River Management Plan (URMP), Kanpur

National Mission for Clean Ganga (NMCG), Ministry of Jal Shakti and the National Institute of Urban Affairs (NIUA), Ministry of Housing and Urban Affairs (MoHUA) have developed a framework for the Urban River Management Plan (URMP). Based on this framework, NIUA is preparing URMP for Kanpur city, the first in India for which this framework will be implemented.

In this regards, NIUA team conducted a workshop on 20th February 2020, in Kanpur Nagar Nigam, conference room. A working group of key officials from various departments was formed to prepare the URMP for Kanpur.

Following officials are appointed as nodal officers to coordinate with NIUA team to prepare URMP for Kanpur.

1. Shri R K Pal, Environmental Engineer, Kanpur Municipal Corporation.
2. Shri Rahul Awasthi, Urban Infrastructure Specialist, Kanpur Municipal Corporation.


Municipal Commissioner,
Kanpur Municipal Corporation

CC to:-

1. Additional Municipal Commissioner(AMC-I), KMC.
2. Shri R K Pal, Environmental Engineer, KMC.
3. Shri Rahul Awasthi, Urban Infrastructure Specialist, KMC.


Municipal Commissioner,
Kanpur Municipal Corporation

Annexure 3 : List of participants Workshop,1 - 20 January 2020

Sl. No	Name	Organization	Designation	Contact	Email id
1	Parvez Khan	KNN	GIS Expert	8601800882	parvezknn@gmail.com
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13	Mukesh Agarwal	KDA	EE	9639004433	
14	Dr. S. K. Gurjar	IIT Kanpur	EO (Tech.)	9414671807	sgurjar@iitk.ac.in
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19	N. K. Agnihotri	KNN	Map Suptt.	8429525882	
20	Kailash Singh	KNN	CE	8601802601	
21	S. K. Arora	KDA	AE	7379173786 9616513036	
22	Rahul Uttam	DUDA	Manager	7052152434	
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25	Mohit Singh	Tourism	Tourist Officer	9450154137	kanpurtouristoffice@gmail.com
26	K. P. Singh	PSI	Senior Manager Programme	9795576367	kaushal@psi.org.in
27	Dr. V. K. Singh	KNN	GS	8601800899	
28	Rahul Awasthi	KNN	UID	8601800820	
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30	H. K. Kansa	GPCU	GM	9473972738	
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Annexure 4: List of participants Workshop, 2 – 12 January 2021

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5	K. P. Anand	Jal Sansthan	EE	9235853818	gmjkanpur@gmail.com
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