



URBAN RIVER MANAGEMENT PLAN AYODHYA



AYODHYA NAGAR NIGAM
Uttar Pradesh

Naya ghat extent along Sarayu River, Ayodhya



Boat ride in Sarayu River, Ayodhya





URBAN RIVER MANAGEMENT PLAN AYODHYA

AYODHYA NAGAR NIGAM
Uttar Pradesh



ACKNOWLEDGEMENTS

Project Mentors

Shri. G.Asok Kumar, Director General, National Mission for Clean Ganga (NMCG);
Shri Himansu Badoni, Executive director (Projects), NMCG
Shri. Hitesh Vaidya, Director, National Institute of Urban Affairs (NIUA)

Project Leader & Working Group Chair

Shri. Vishal Singh, Municipal Commissioner (Ayodhya Nagar Nigam) and VC (Ayodhya Development Authority)

URMP Working Group, Ayodhya

Ayodhya Nagar Nigam | Ayodhya Development Authority | Jal Nigam | Public Waterworks Department | Tourism Department | Forest Department | Groundwater Department | Irrigation and Flood works Department

NIUA Team

Rahul Sachdeva | Jyoti Verma | Manju Rajeev Kanchan | Sahil Bhardwaj | Banibrata Choudhury | Victor Shinde

NMCG Team

Dheeraj Joshi | Sumit Chakraborty | Ashwini Dubey

Design and Illustrations

Manju Rajeev Kanchan | Jyoti Verma | Sahil Bhardwaj

Photographs courtesy

Jyoti Verma

Disclaimer

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

Publication Year 2023





Message from Director General, National Mission For Clean Ganga



Shri. G. Asok Kumar



Not all cities are blessed with natural rivers.



Rivers are an invaluable asset for any city. However these pristine resources are in a grave peril due to the anthropogenic influences. While our cities have been making multiple attempts at river rejuvenation to address specific challenges ; there is an immediate need for a comprehensive effort towards holistic planning and management of river systems within the city.

It is indeed a great pleasure to see that the city of Ayodhya has undertaken this initiative to prepare its Urban River Management Plan on the basis of the framework developed by NMCG and NIUA.

I take this opportunity to laud the city officials for taking such a progressive step with a hope that this will inspire other river cities across India to manage their rivers in an environmentally, economically and socially sustainable manner.

Thank you.

Message from Director , National Institute of Urban Affairs



Shri. Hitesh Vaidya



If water is the elixir of life, rivers are the veins that drive this life



Healthy rivers are, therefore, in so many ways are vital for sustenance of humankind itself. Nowhere is this need more relevant than in our cities, which are rapidly progressing up the economic ladder, in many cases at the cost of rivers.

I am delighted to see this dedicated urban river management plan for the city of Ayodhya. This is a vital step in the right direction towards sustainable development. Successful implementation of this plan will, no doubt, enhance the charm, livability, and vitality of the city. I congratulate the Municipal Commissioner and the city officials for showing the foresight in developing this plan. My best wishes for its successful implementation.

Thank you.

नगर निगम अयोध्या



पत्रांक :

दिनांक :

Message from Municipal Commissioner, Ayodhya



Shri. Vishal Singh



Ayodhya also happens to be the first major city in the main artery of Ghagra River



The Sarayu River is the largest tributary of the Ganges by volume and the second longest tributary of the Ganges by length after the Yamuna. Situated on the banks of Sarayu, Ayodhya is one of the seven sacred cities for Hindus (Mokshdayini Sapt Puris i.e., salvation-endowing cities of India) along with Mathura, Haridwar, Varanasi, Kanchipuram, Ujjain and Dwarka. Ayodhya also happens to be the first major city in the main artery of Ghagra River. The city holds a place of pride among the devotees of Lord Rama (Shri Ram), as Shri Ram Janambhoomi. Many waterbodies, wetlands, and natural drains carve the landscape of the city. The city is also an important economic and religious hub of the state and the revered Shri Ram Temple which upon completion is expected to catapult Ayodhya to a global tourist destination.

Urban River Management Plan (URMP) is a unique framework embedded in the central idea that maintaining healthy rivers is crucial to enhance liveability and productivity in the cities. With the city gaining prominence at the religious forefront, stress on Sarayu and its associated water systems can easily be anticipated which makes the URMP Framework all the more relevant in the context of Ayodhya city towards establishing citizen connect with Sarayu and its waterscape. I am thankful to Sh. G Asok Kumar, Director General, Namami Gange Mission (NMCG), Ministry of Jal Shakti, and Sh. Hitesh Vaidya, Director, NIUA in extending their support towards Ayodhya Nagar Nigam for the preparation of URMP Ayodhya

URMP Ayodhya is a result of support and valuable inputs received from the officers of various departments at Ayodhya Nagar Nigam and Ayodhya Development Authority towards bridging the data gaps in addition to identifying critical project interventions that can be implemented by the city as part of Ayodhya URMP.

The knowledge imparted across the pages of URMP document are dynamic and organic which therefore requires a periodic upgradation. I truly believe that this framework document shall be instrumental in acting as a support system towards making Ayodhya more river centric and in sync with its traditional roots while growing infra-structurally with time.

Vishal Singh
Municipal Commissioner
Ayodhya Nagar Nigam









CONTENTS



Executive Summary

 1.	Introduction	12
 2.	Approach	46
 3.	Proposed Interventions	61
 4.	M & E Plan	108



List of Images

- Image 1: Vision of URMP
- Image 2: 10 point URMP objectives
- Image 3: Location of Ayodhya in India
- Image 4: Length of Sarayu within Ayodhya
- Image 5: Construction of embankment along the Sarayu River
- Image 6: Agricultural activities are being practiced along the Sarayu River
- Image 7: People taking holy bath in the Sarayu River
- Image 8: Bioremediation for treating wastewater flowing in drains
- Image 9: 32 KLD capacity Faecal Sludge Treatment Plant (FSTP)
- Image 10: Co-treatment unit for Faecal Sludge/Septage at STP
- Image 11: Laal Diggri pond after rejuvenation
- Image 12: Status of a kund in Ayodhya before and after rejuvenation
- Image 13: Ayodhya river front with little or no riparian buffer / softscape
- Image 14: A distant view of the naturally occurring riparian buffer along the opposite edge of the River Sarayu
- Image 15: Riparian buffer replaced with embankment along a stretch of the Sarayu river edge.
- Image 16: Absence of riparian buffer along a stretch of Sarayu river front.
- Image 17: One of the remaining riparian buffer stretches along the Sarayu River
- Image 18: Boating activity at Ram ki Paidi Ghat along the Saryu River
- Image 19: Religious activities at Naya Ghat along the Sarayu River
- Image 20: A snapshot of objective wise scores for Ayodhya
- Image 21: - Inception meeting held with officials from ANN and other departments
- Image 22: Planning Instruments as per River Sensitive Master Plan guidelines developed by NMCG and NIUA
- Image 23: Masterplan case of Hyderabad
- Image 24: FSSM value chain
- Image 25: UWDT interface and the assessment parameters
- Image 26: Fatehganj Pond data base
- Image 27: Vidya Kund data base
- Image 28: Proposed profile of 6m buffer around waterbody
- Image 29: Sample profile section for a riparian buffer along River Sarayu
- Image 30: Sample montage of naturalised embankment along River Sarayu.
- Image 31: The proposed site location (a mix of sand and deposition)
- Image 32: Schematic showing the design element that can be integrated in the proposed site
- Image 33: Example of a natural river edge with riparian buffer and sand spits/sand bars etc.
- Image 34: Treated wastewater reuse strategy in Ayodhya
- Image 35: View of Guptar Ghat along Sarayu
- Image 36: View of river edge along Sarayu in the cantonment area
- Image 37: Monkey proof waste bin sample models that can be used along Sarayu ghats.
- Image 38: Reverse vending machine sample models that can be used along Sarayu ghats.
- Image 39: A photomontage showing rain garden patch incorporated in Guptar Ghat along River Sarayu.

Image 40: A photomontage showing how an embankment along Sarayu will appear post greening
 Image 41: Examples of green integrated urban furniture for use along riverfronts
 Image 42: Guptar Ghat Riverfront Beautification project by ADA
 Image 43: Conceptual landscape design proposal for Ram Van Marg Park
 Image 44: Suggestive practices for achieving wholistic inclusivity across Sarayu Riverfronts
 Image 45: Kayaking
 Image 46: Proposed location for kayaking on Saryu River
 Image 47: Hon'ble Prime Minister enjoying the ride on e-boat in Varanasi
 Image 48: A representative image of Dolphin Point
 Image 49: View of freshwater turtles along the river island edge in Sarayu River
 Image 50: Potential activities that can generate economy as part of the river sanctuary
 Image 51: Proposed extent of river sanctuary and the diversity supported
 Image 52: Informal agriculture site on riverine island of Sarayu River
 Image 53: The concept of agri-tourism and how the existing activities can be used for leveraging economy in Ayodhya
 Image 54: Benefits of agri-tourism for the associated stakeholders
 Image 55: Youth taking active involvement in conservation
 Image 56: Some activities that can be carried out during Sarayu Utsav
 Image 57: Some activities that can be carried out during Sarayu Sandhya

List of Tables

Table 1: URM index and its interpretation
 Table 2: Floodplain management points for Ayodhya
 Table 3: Chart for floodplain management score
 Table 4: Quality stats for Sarayu River
 Table 5: DO score table
 Table 6: Waterbody revival score table
 Table 7: Riparian buffer score table
 Table 8: Wastewater reuse factor table
 Table 9: Return flow factor table
 Table 10: Eco-friendly riverfront points table for Ayodhya
 Table 11: Eco-friendly riverfront score table
 Table 12: Eco-friendly riverfront score for Ayodhya
 Table 13: Economic potential scoring
 Table 14: Citizen sensitisation score for Ayodhya
 Table 15: Citizen sensitisation scoring
 Table 16: Citizen engagement scoring
 Table 17: Indicative list of parameters for the waterbodies database
 Table 18: Riparian modifications along Sarayu river edge
 Table 19: *Permissible planting pallette for riparian buffer and riverfront
 Table 20: *Permissible planting pallette for riparian buffer and riverfront
 Table 21: Potential reuse areas and their water requirements within 3km buffer
 Table 22 - URMP progress monitoring indicators

List of Maps

Map 1: Base map of Ayodhya

Map 2: Map showing city profile

Map 3: Map showing the waterbodies of Ayodhya city

Map 4: Map showing the existing riparian edges along Sarayu River

Map 5: Map showing the location of ghats along Sarayu

Map 6: Map showing the location of the embankment under construction along Sarayu

Map 7: Map showing existing sewage treatment infrastructure in the city

Map 8: Map showing existing & proposed riparian stretches within ADA limit

Map 9: Map showing FSTP and STP locations in Ayodhya city

Map 10: Map showing 3km buffer



Acronyms

ANN	Ayodhya Nagar Nigam
ADA	Ayodhya Development Authority
BOD	Biological Oxygen Demand
CAMPA	Compensatory Afforestation fund Management and Planing Authority
CPCB	Central Pollution Control Board
CSR	Corporate Social Responsibility
DO	Dissolved Oxygen
DPRs	Detailed Project Reports
FSTP	Faecal Sludge Treatment Plant
FSSM	Faecal Sludge Septage Management
IEC	Information, Education and Communication
M&E	Monitoring and Evaluation
MLD	Million Litres Per Day
NIUA	National Institute of Urban Affairs
NMCG	National Mission for Clean Ganga
OSS	On-site Sanitation Systems
UPSPCB	Uttar Pradesh State Pollution Control Board
URMindex	Urban River Management Index
URMP	Urban River Management Plan
UWDT	Urban Waterbodies Diagnostic Tool
USDA	United States Department of Agriculture
STP	Sewage Treatment Plant
VGf	Viability Gap Funding



EXECUTIVE SUMMARY



There is an ever-growing understanding that a river and the city through which it flows are the two sides of the same coin i.e. a city exists as long as its river and associated natural waterscapes are healthy. In addition to providing a range of ecosystem services (provisioning, regulating, cultural, and supporting) to the city, river-sensitive development in cities also 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 River Sarayu that flows through the city of Ayodhya –in an efficient, sustainable and eco-friendly 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 **22 tangible and practical actions** for managing Sarayu under a ten-point agenda (or objectives) to tap into the potential of River Sarayu’s “Nirmal” , “Aviral” , “Jan” , “Gyan” and “Arth” facets.


This is the result of a thorough secondary research and rapid baseline assessment carried out by NIUA team in association with Ayodhya city’s core working group chaired by the Commissioner, Ayodhya Nagar Nigam. Each intervention proposed in this report has been developed with due support and guidance from the associated stakeholders through stakeholder consultation workshops that were spearheaded by NIUA team periodically. The level of detailing for each of the interventions is limited to prima - facie based generic conceptualisation. It is envisaged that Detailed Project Reports (**DPRs**) will be prepared for each intervention based on the concept ideas proposed in the document.

In line with the URMP objectives, a qualitative assessment was undertaken to indicate the priority of objectives to be addressed along with the proposed interventions while formulating the URMP for Ayodhya City. Graphics on (**Page no. 9,10**) presents relevant details corresponding to these interventions i.e. the agency(ies) responsible for implementation, and potential funding sources.

This version of URMP (Version 1.0) for Ayodhya City is meant to be short-term in nature, targeting actions over a 2-3-year period. It is envisaged that implementation of the URMP will yield several tangible and intangible benefits for the city in the years to come. However, the URMP document is a living document, which will grow to support the city as it grows in terms of infrastructure while addressing issues pertaining to river management periodically in subsequent versions so that the city continues to progress in a river centric religious continuum.



Commissioner
Ayodhya Nagar Nigam and Ayodhya Development Authority



SUMMARY OF PROPOSED INTERVENTIONS UNDER URMP

<p>1</p>  <p>Regulation of Activities in Floodplain</p>	<p>Intervention</p> <p>1. Recommendations for River Centric Master Plan</p>	<p>Responsible Agency</p> <p>ADA</p>	<p>Potential Finance Source</p> <p>ADA</p>
<p>2</p>  <p>Pollution Free River</p>	<p>Intervention</p> <p>2. City FSSM Plan</p>	<p>Responsible Agency</p> <p>ADA</p>	<p>Potential Finance Source</p> <p>SBM, AMRUT</p>
<p>3</p>  <p>Rejuvenate Waterbodies and Wetlands</p>	<p>Intervention</p> <p>3. Waterbodies Database 4. Waterbodies diagnosis using UWDT 5. Protection of waterbodies by providing a 9m buffer</p>	<p>Responsible Agency</p> <p>AMC & ADA</p>	<p>Potential Finance Source</p> <p>NMCG Smart City Fund AMRUT 2.0</p>
<p>4</p>  <p>Enhance Riparian Buffer</p>	<p>Intervention</p> <p>6. Riparian buffer enhancement 7. Opposite edge riparian buffer conservation 8. Planting pallet for riparian buffer 9. Pilot riparian stretch</p>	<p>Responsible Agency</p> <p>ADA Forest Dept.</p>	<p>Potential Finance Source</p> <p>NMCG CAMPA</p>
<p>5</p>  <p>Increased Reuse of Treated Wastewater</p>	<p>Intervention</p> <p>10. Reuse strategy within 3km catchment area of existing STP</p>	<p>Responsible Agency</p> <p>ADA</p>	<p>Potential Finance Source</p> <p>CFC, NMCG, AMRUT, Jal Jeevan Mission, PMKSY</p>

<p>7</p> <p>Eco-friendly Riverfront Projects</p>  	<p>Intervention</p> <p>11. Eco-friendly strategy for existing riverfront – Ram ki Paidi – Naya GhatM Plan 12. Ram Van Marg Park Landscape Design</p>	<p>Responsible Agency</p> <p>ADA Irrigation Dept.</p>	<p>Potential Finance Source</p> <p>CSR,NMCG, ADA,AMC, Tourism Dept.</p>
---	---	--	--

<p>8</p> <p>Leveraging on the Economic Potential of the River</p>  	<p>Intervention</p> <p>13. River-linked recreational activities for boosting tourism in Ayodhya city 14. Sarayu River Sanctuary within the existing ADA limit 15. Promoting organic farming through agri-tourism</p>	<p>Responsible Agency</p> <p>ADA, Tourism Dept. Forest Dept. Agriculture Dept.</p>	<p>Potential Finance Source</p> <p>CSR, NMCG, ADA, AMC, Tourism Dept. CAMPA</p>
--	---	---	--

<p>9</p> <p>River-sensitive Behaviour among Citizens</p>  	<p>Intervention</p> <p>16. Sensitise youth for river conservation 17. Sarayu Nadi Utsav celebration 18. Celebrate Sarayu Sandhya 19. Dedicated river day as Sarayu Diwas</p>	<p>Responsible Agency</p> <p>AMC & ADA</p>	<p>Potential Finance Source</p> <p>CSR, NMCG, ADA, AMC</p>
---	---	---	---

<p>10</p> <p>Engage Citizens in River Management Activities</p>  	<p>Intervention</p> <p>20. Connecting youth with Sarayu 21. Sarayu Connect Application 22. Create a Sarayu Samiti</p>	<p>Responsible Agency</p> <p>ADA, AMC, Tourism, Irrigation, Groundwater, Forest Dept.</p>	<p>Potential Finance Source</p> <p>SBM, AMC ADA, NDTM, CSR</p>
--	--	--	---

01





INTRODUCTION



1. Introduction

The concept of Urban River Management Plan (URMP) 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 (**Image 1**). Each pillar also corresponds with a vision statement for the plan which further represents the envisaged outcomes of the URMP in the long run.

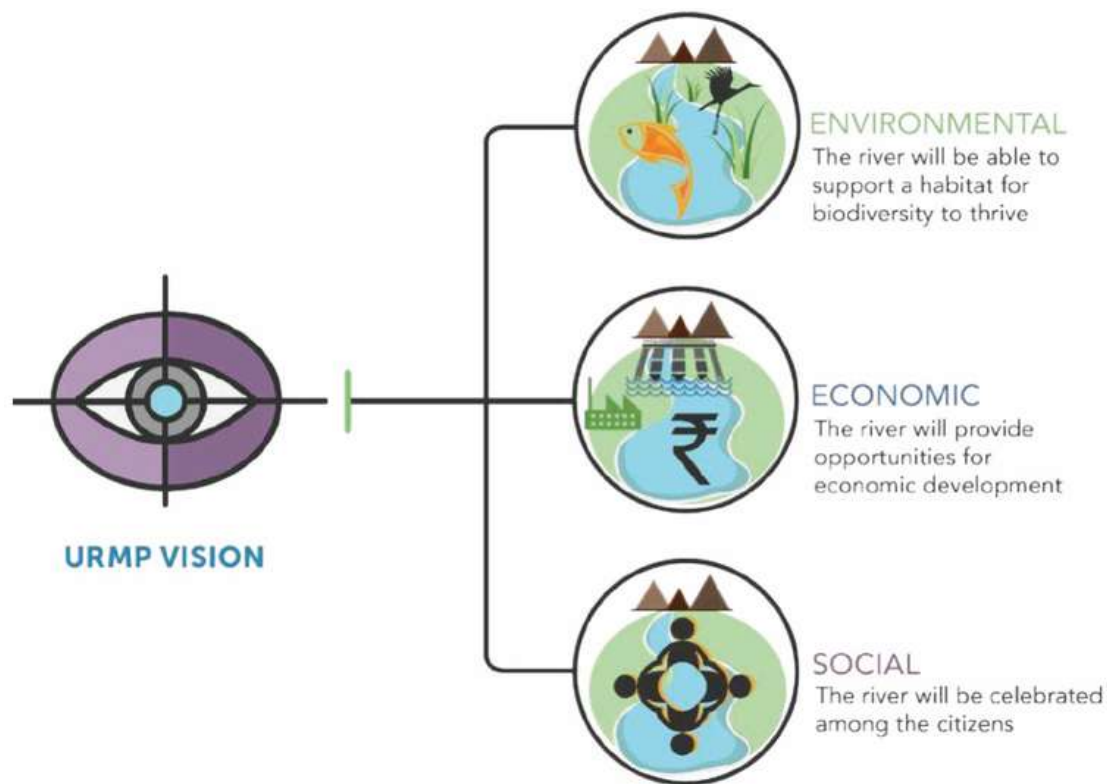


Image 1: Vision of URMP

URMP's vision shall be achieved through a set of ten objectives (**Image 2**), 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.

Monitoring and Evaluation (M&E) is a vital element of the URMP. It provides a mechanism to evaluate how a city is performing on each of the URMP objectives. The need for the URMP

shall be evaluated through 10 performance indicators, one for each objective of the URMP framework. These indicators shall collectively culminate into an index called the Urban River Management Index (URMindex). The URMindex is measured on a scale from one to five, and is useful to paint a snapshot of the situation, which can be used to prepare and monitor the implementation of the URMP, and develop overall strategies and policies for the enhancement of the URMP. The interpretation of the URMindex can be observed in (Table 1).

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.

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 a mix of interventions that shall be implemented from short-term (up to 3 years) to long term (more than 2 yrs).

URMP Ayodhya has been developed with the overall vision to ensure a seamless yet holistic integration of River Sarayu and associated natural waterscapes within the urban fabric of Ayodhya city in a sustainable manner. The city takes immense pride in the rich heritage and the importance of Sarayu in the eyes of the residents which is why the interventions proposed in the document are aimed at treating Sarayu as a valuable asset of the city. The indicator score for each of the objectives of URMP has been evaluated for Ayodhya city in the following section to understand how they are performing and also to identify the areas for interventions.



Image 2: 10 point URMP objectives

Table 1: URM index and its interpretation

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



1.1 Baseline Assessment

1.1.1 City introduction

Ayodhya City is located at Latitude 26°47'59.08"N & longitude 82°12'18.59"E in the Ayodhya district. The city of Ayodhya is an important pilgrim place for Hindus and is one of the seven holiest cities of India that includes Mathura, Haridwar, Varanasi, Kanchipuram, Ujjain and Dwarka. Ayodhya is located in the centre of the state of Uttar Pradesh, in the northern region of India. It is well connected with other places by road, as it is located on the main highway, which runs through the town on the way from Lucknow to Gorakhpur. The twin towns Faizabad and Ayodhya combined forms the Ayodhya Municipal Corporation.

The topography of Ayodhya is comprised of alluvial soil, sand, gravels. The major river is Saryu which is passing through north of Ayodhya at an elevation of 93 m. Water table in the city varies from 3.75 m to 7.75 m.

Ayodhya has a humid subtropical climate, typical of central India. Summers are long, dry and hot, lasting from late March to mid-June, with average daily temperatures near 32°C. This is followed by the monsoon season which lasts till October, with annual precipitation of approximately 1,067mm (42.0 inches) and average temperatures around 28°C.

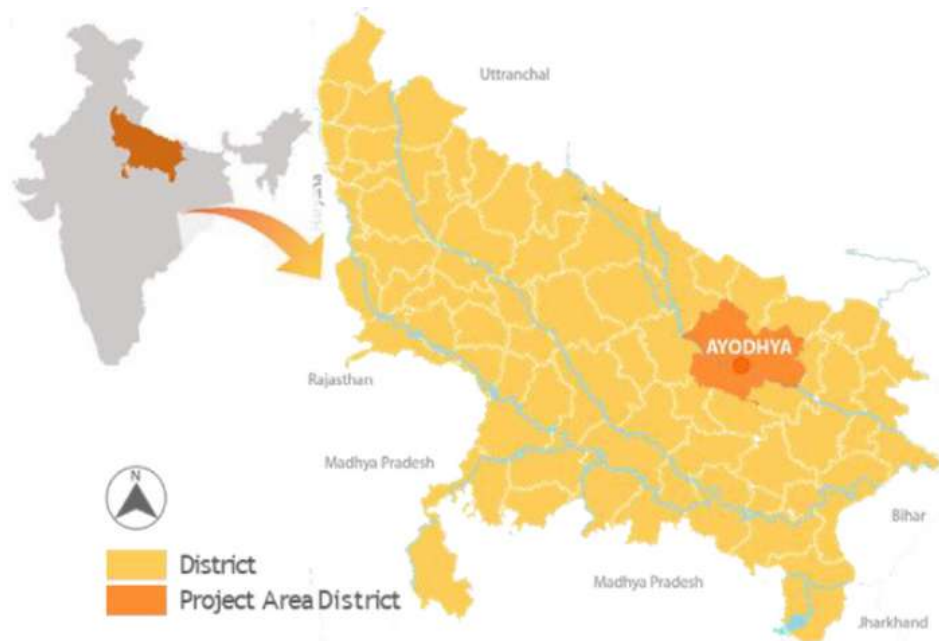


Image 3: Location of Ayodhya in India

The total area of the Ayodhya Nagar Nigam (ANN) is around 31.5 sq.km and the area of Ayodhya Development Authority (ADA) is around 133.67 sq.km which is now proposed to increase to 873 sq.km after adding 343 villages and 2 towns (**Map 1**).

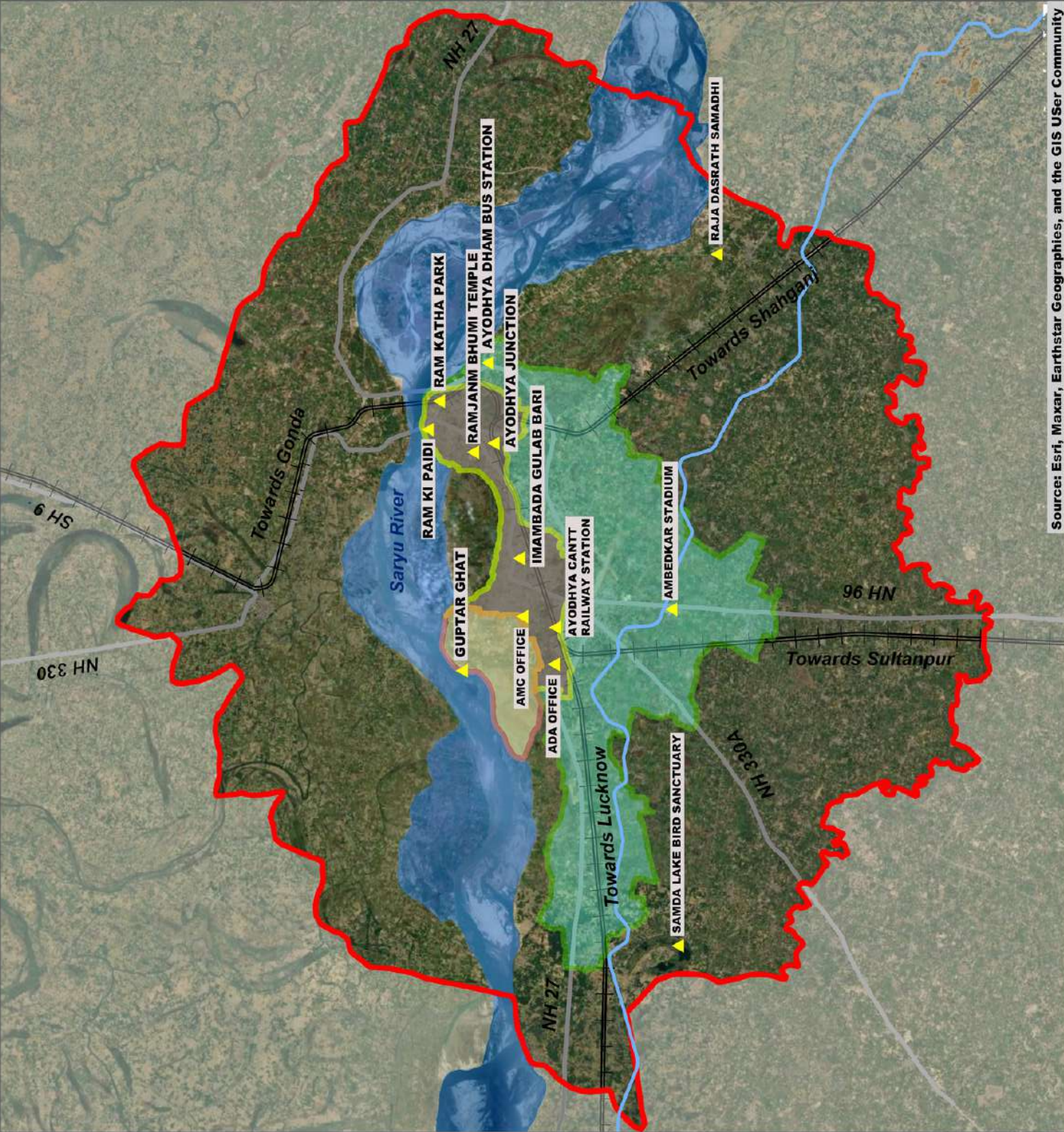
1.1.2 Sarayu (Ghaghra River)

The Ghaghra River (called Sarayu in Ayodhya) is a trans-boundary river originating on the Tibetan Plateau in the Mapchachungo glaciers near Lake Manasarovar. The river is also known as Manchu and Karnali in Nepal and is the longest river of Nepal. It merges with Ganga River in Bihar’s Saran district after running for almost 1080 km.

Ghaghra is the largest tributary of the Ganga by volume and the second longest tributary by length after the Yamuna River. Some of the prominent tributaries of Ghaghara river are Seti, Bheri, Sarayu, Rapti, Choti and Gandak. The Gangetic River dolphin (*Platanista gangetica*) has its upper range in the Karnali basin. The Ghaghra River is home to Nepal's last potentially viable Ganges River dolphin population. Ghaghra enters India at Kotia Ghat near Royal Bardia National Park, Nepal Ganj, where it is known as the river Girwa for about 25 km.

The total catchment area of the Ghaghra river is 1,27,950 sq.km. As per census 2011, the total population in Ghaghra Basin is 25,864,960, out of which 2,083,813 (8.06 %) is urban and 23,781,147 (91.94%) is rural. The Saryu River flows along the northern city limits of Ayodhya. The length of the river flowing is approx. 46.7 km if we consider the ADA limits whereas it is 37.8 kms if boundary of the municipal corporation is considered (**Image 4**).

URMP Ayodhya: Administrative Map



Legend

- Saryu River
- Sharda_Canal
- Railway
- Highway
- Landmarks
- Cantonment Area
- AMC Limit
- ADA Existing Limit
- ADA Extended Limit

ADA Extended Area- 873 sqkm
 ADA Existing Area- 134 sqkm
 AMC Area- 31.5 sqkm

Source-
 1. Ayodhya Development Authority
 2. Google Earth Imagery



Scale : 1 cm = 0.5 km

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Map 1: Base map of Ayodhya

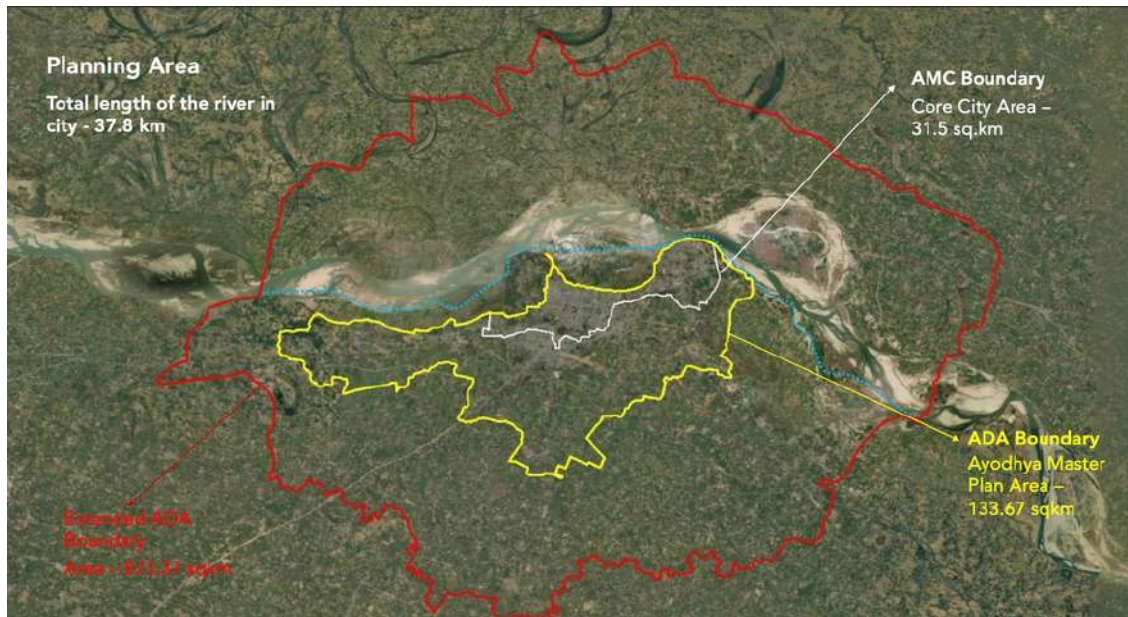


Image 4: Length of Sarayu within Ayodhya

1.2

URMP Baseline

The first step towards preparation of the URMP, a rapid baseline assessment was carried out to identify key river-related issues in the city. The assessment was based on the secondary data provided by various government agencies such as Ayodhya Nagar Nigam (ANN), Ayodhya Development Authority (ADA), Uttar Pradesh Jal Nigam, Forest Department, Irrigation and Flood Control Department, Tourism Department, Groundwater Department etc. The Master Plan for Ayodhya 2031, Ayodhya vision document, City Development Plan, City Sanitation Plan, and other reports from Central and State agencies were also referred for developing the assessment.

1.3

Objective 1 – Regulation of activities in Floodplains

Rationale: A floodplain is defined as the area inundated by a flood that occurs once in a fixed number of years, typically hundred years for major rivers. The Development Plan/Master Plan of cities ideally would have some or the other regulations for land use and permissible activities in the river flood plains (if not the entire flood plain, then at least part of it). However, in several cities these areas have been encroached upon by unauthorized colonies, or used for unauthorized activities such as agriculture, sand mining, etc. Ensuring that only permitted activities and structures are allowed in the floodplains is crucial for the river's health.

Scope of interventions: The range of interventions under this objective could include establishing zoning regulations, adopting river-sensitive planning norms, stricter law enforcement, awareness raising, capacity building of farmers, relocation strategies for unauthorized colonies, among others.

1.3.1 Baseline assessment

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

The Ayodhya Master plan for 2031 is under finalisation. The existing Plan has few important provisions for the Sarayu River protection like 30 meters from the river boundary is mentioned as a restricted zone. Similarly, 6 mt buffer zone is proposed for all the water bodies in the ADA limit. However, the Plan does not have explicit, clear provisions to protect the wholesomeness of the rivers and drains, and designated floodplains to regulate the developmental activities within the floodplain.

The area of the Development Authority is going to expand and the other bank of the Sarayu river also to be included in the Authority area for which the Master plan preparation has started. The planning area of ADA has increased from 133 sq.km to 873 sq.km. At present there is no floodplain demarcation done along the Sarayu and flooding is controlled through engineering solutions like embankments and ghats on the right side of the River (image 5). The opposite side of the river is being used for agricultural activities (Image 6).

1.3.2 Indicator value calculation

The first indicator of the URMindex is the floodplain management score to ensure the regulation of activities in the floodplain. This indicator is based on the total number of floodplain management points that a city scores according to the identified desirable features of a well-managed and regulated floodplain. Ideally, cities should strive to meet all these desirable conditions.

Table 2: Floodplain management points for Ayodhya

S.No	Desirable features	Floodplain management points	Points scored by Ayodhya
1	Floodplain boundaries clearly demarcated	15	0
2	Floodplain boundaries protected through embankments, roads or other means	5	0
3	Demarcation of no development zone adjacent to the river in the active floodplain	5	5
4	Strict enforcement in no development zone	10	5
5	Updated database of existing land use in floodplain available	10	5
6	Master Plan has clearly indicated permissible and non-permissible activities in the floodplain/river zone	15	5
7	All regulations in the Master Plan are enforced (10 points if at least 50% of the regulations are enforced)	15 (10)	10
8	Presence of river friendly landscaping (e.g. constructed wetlands, bioswales, etc.)	5	1
9	Strict monitoring mechanism in place	5	0
10	No solid waste dumping on river banks	10	10
11	Only organic farming practiced in river zone	5	0

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

The floodplain management score is then calculated as below :

Table 3: Chart for floodplain management score

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

The flood plain management score for Ayodhya City is 2



Image 5: Construction of embankment along the Sarayu River



Image 6: Agricultural activities are being practiced along the Sarayu River



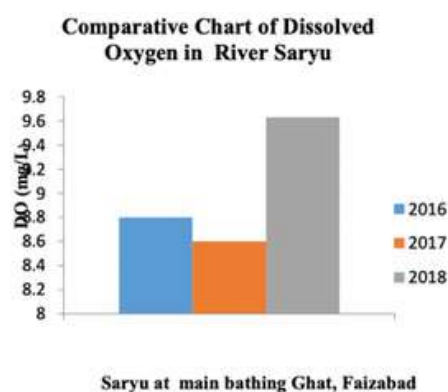
Objective 2 – Pollution Free River

Rationale: Pollution is the biggest concern for the rivers in the Ganga River Basin. Rivers are the ultimate recipients of untreated wastewater from towns and cities. The wastewater discharged by one city becomes source of water supply for another city downstream, thereby creating a cycle of health hazards.

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

1.4.1 Baseline assessment

Pollution is one of the main reasons for the deteriorating state of rivers. In case of Sarayu, due to low density development along the river, it is still in a good condition but to maintain the same, Ayodhya needs to upgrade their infrastructure looking at the rapid development and expansion of Ayodhya city. Uttar Pradesh Pollution Control Board (UPPCB) does the monthly testing of river water to monitor the its health at two locations i.e. upstream – Guptar ghat and downstream – Samshan Ghat. This would give an indication of the quality of river when it enters and exits the city limits.



As seen from the data (**Table 4**), the city has been able to maintain the water quality with very little or no change in vital parameters indicative of the health of river water. As per the water quality criteria of the Central Pollution Control Board (CPCB), the Saryu water falls under Category C and is fit as drinking water source after conventional treatment and disinfection.

Table 4: Quality stats for Sarayu River

S.No	River	pH	BOD	COD	DO	Chloride	Hardness
1	Sarayu River - Upstream	7.63	2.6 mg/l	10.08mg/l	8.6 mg/l	21.36 mg/l	208.06 mg/l
2	Sarayu River - Downstream	7.97	2.8 mg/l	11.20 mg/l	8.46 mg/l	24.146 mg/l	214.06 mg/l



Image 7: People taking holy bath in the Sarayu River

For capturing and containing the faecal matter from households, community/public toilets, commercial establishments, institutions and industries, the city largely depends on the on-site sanitation system (OSS) as around 90% of the household are connected to the same. Different schemes worth Rs. 2200 Cr. are underway for creating water and sewerage infrastructure in the city. Out of the 1,10,000 no. of households, around 10,207 HHs have been connected to the sewer system and remaining is targeted for connection by 2026. According to the projected population of Ayodhya for 2031, a sewage treatment plant of a capacity is 109.95 MLD will be required. Currently, Ayodhya has a total of 12 MLD of existing treatment capacity and in the same campus, a 6 MLD STP is under construction. A 33 MLD STP has been sanctioned under HAM model under Namami Gange mission. With this the cumulative sewage treatment capacity in the city would be around 51 MLD.

There are a total of 16 drains flowing through the city carrying approx. 26.94 MLD of domestic sewage and treated/managed through various means before being released into the river.

- Guptar/Nirmali Drain (2.04 MLD) - Ponding at cantonment area
- 10 drains (20.9 MLD) - Ponding at Parikrama path
- 5 drains (3 MLD) - Diverted through I&D to 12 MLD STP

The wastewater flowing in 11 drains (approx. 23 MLD) is treated through bio-remediation measures (**Image 8**) and rest is diverted to the STP for treatment and further disposal. A new faecal Sludge Treatment Plan (FSTP) of 32KLD (**Image 9**) capacity has been constructed, 30 kms from the city center to cater the needs of the on-site sanitation system. Also, a new Co-treatment facility (**Image 9**) is under construction in the campus of 12 MLD STP. Currently both the systems are functional, however the faecal sludge/septage volumes received at these treatment sites is not significant due to lack of collection/transport infrastructure availability and non-existent management protocols.



Image 8: Bioremediation for treating wastewater flowing in drains

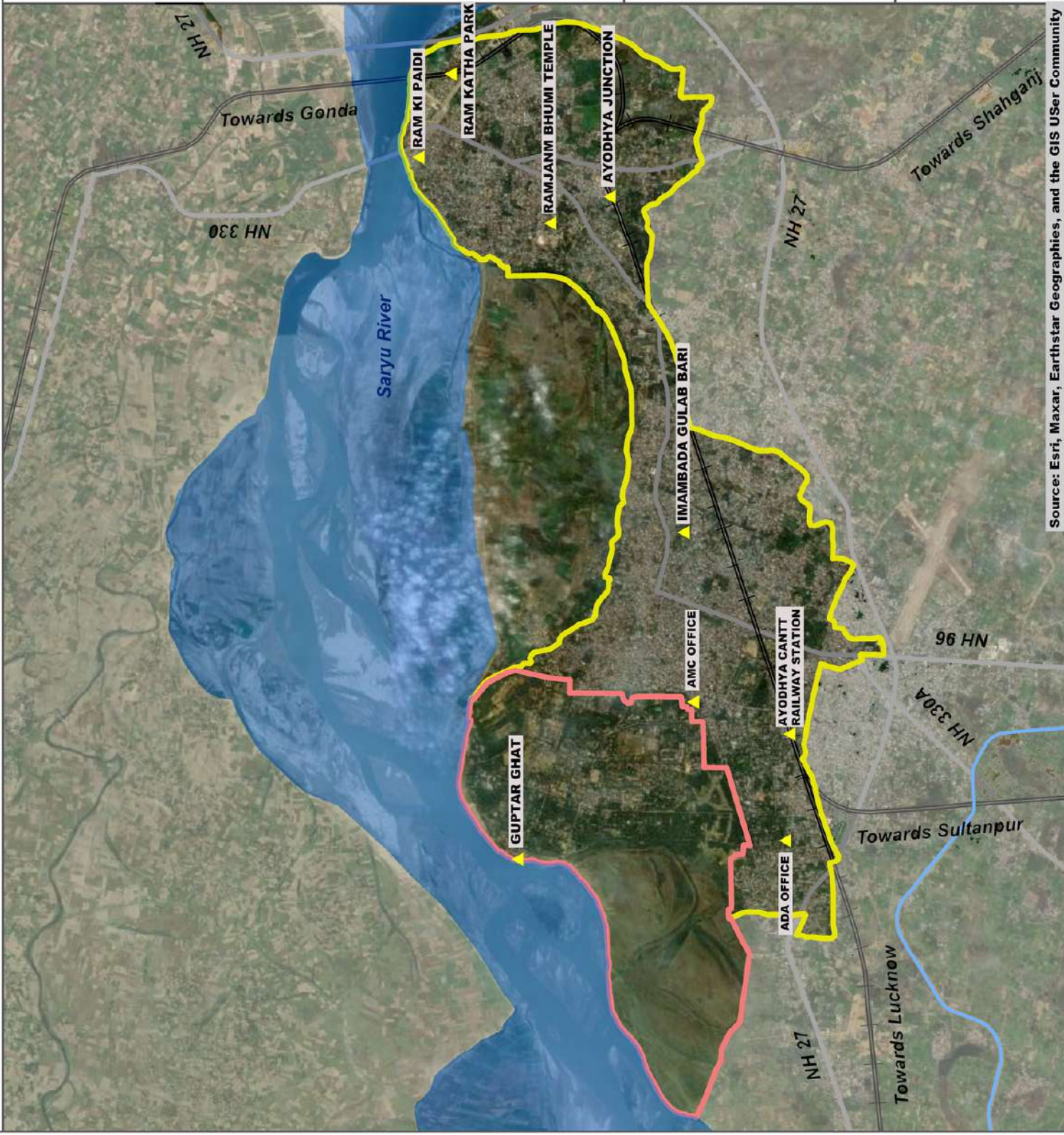


Image 9: 32 KLD capacity Faecal Sludge Treatment Plant (FSTP)



Image 10: Co-treatment unit for Faecal Sludge/Septage at STP

URMP Ayodhya: City Profile



Legend

- Saryu River
- Sharda_Canal
- Railway
- Highway
- Landmarks
- Cantonment Area
- AMC Limit

Source-
Ayodhya Development Authority
Google Earth Imagery



Scale : 1 cm = 1 km

Source: Esri, Maxar, Earthstar Geographies, and the GIS User Community

Map 2: Map showing the drains of Ayodhya city

The city due to its religious significance sees a daily floating population of around 50,000 people which increases to 1 lakh on important religious dates. Due to these large gatherings, management of ghats (sweeping, solid waste removal) has become difficult for the city, although three times a day sweeping is being done at the ghats by the Nagar Nigam. Women changing rooms on ghats double up as toilets and the issue of open defecation emerges during the major religious event. After the religious event, a large amount of solid waste is also left behind by the visitors in the form of food waste, plates, plastic, and flowers which ultimately find their way to the river. The solid waste in drains is captured at various locations before the drains discharge into the river.

The city has a MoU with Phool.co for recycling flower waste being generated from the temples to incense sticks, leather made from flower called as fleather, thermocol alternative florafoam etc. which are sold across their online platform website and in retail stores situated in Hyderabad, New Delhi, Goa, Jaipur, Mumbai and Bengaluru.

1.4.2 Indicator value calculation

The amount of Dissolved Oxygen (DO) in water is a key indicator of the water health and its presence and absence define its use premises. Net Dissolved Oxygen (DO) is the difference between the DO at the city's outlet and DO at its inlet. The central premise of this indicator is that at the very least, the city should strive to ensure that the quality of water leaving the city is the same as that entering the city.

How to measure the indicator:

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

$$\text{Net DO} = (8.4 - 8.6/8.6) \times 100 = (-2.3)$$

The Net DO score is then calculated as below:

Table 5: DO score table

S.No	Desirable features	DO score points
1	If Net DO > 0	Net DO score = 5
2	If Net DO = 0	Net DO score = 4
3	If Net DO = (minus) - 5 - <0	Net DO score = 3
4	If Net DO = (minus) - 10 - (minus) - 5.1	Net DO score = 2
5	If Net DO < - (minus)10	Net DO score = 1

Net DO score for Ayodhya = 3



Objective 3 – Rejuvenate Waterbodies and Wetlands

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

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

1.5.1 Baseline assessment

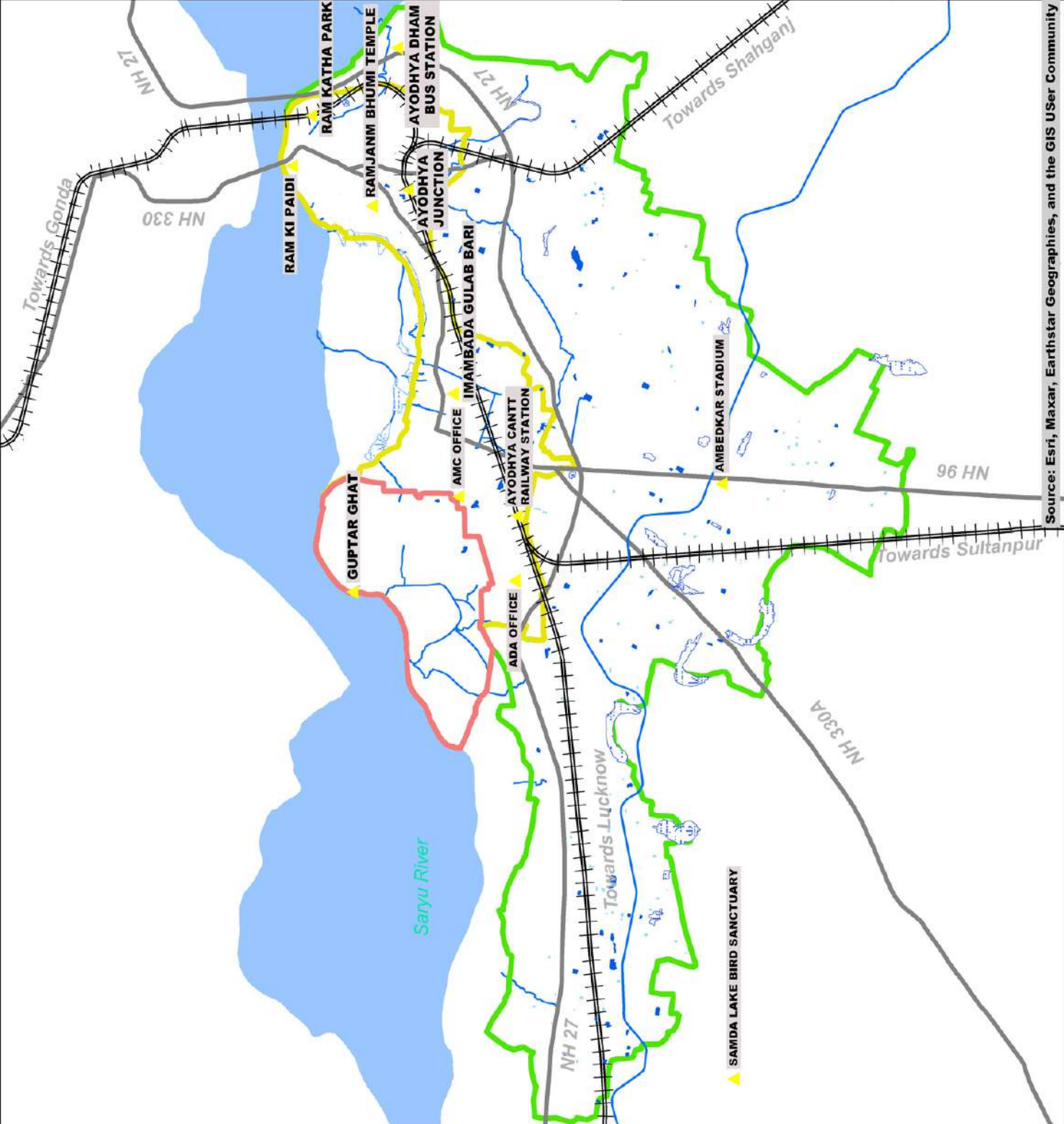
Rich in water bodies and wetlands, Ayodhya have 108 recognized water bodies (**Map 3**) as reported by Ayodhya Development Authority. The Lakeman of India, Mr. Anand along with the authority is currently working on the rejuvenation of more than 8 water bodies in Ayodhya. These waterbodies include Lal Diggi (**Image 11**), Brahma Kund, Khajua Kund, Dashrath Kund, Manumuni Kund, Agni Kund, Sita Kund, Vidya Kund. Although the ADA and ANN is working progressively towards the rejuvenation of the water bodies but there is no readily available database for these water bodies like depth, arial extent, water holding capacity, ownership of water bodies, water quality etc.

Since Ayodhya is in its transitional phase of development as a city, there is an increase in the encroachment and pollution load of these water bodies.



Image 11: Laal Diggi pond after rejuvenation

URMP Ayodhya: Waterbodies & Wetlands



Legend

- Saryu River
- Sharda_Canal
- Railway
- Highway
- Landmarks
- Cantonment Area
- AMC Limit
- ADA Existing Limit
- City Drains
- Natural Treatment Areas
- Waterbodies above 1 Acre
- Waterbodies upto 1 Acre
- Wet Areas

RAJA DASRATH SAMADHI

Source-
 1. Google Earth Imagery
 2. UPPPCB Action Plan for Saryu River



Scale : 1 cm = 1 km

Source: Esri, Maxar, Earthstar Geographies, and the GIS User Community

Map 3: Map showing the waterbodies of Ayodhya city

Although the ADA and ANN is working progressively towards the rejuvenation of the water bodies (**Image 12**) but there is no readily available database for these water bodies like depth, aerial extent, water holding capacity, ownership of water bodies, water quality etc. Since Ayodhya is in its transitional phase of development as a city, there is an increase in the encroachment and pollution load of these water bodies.



Image 12: Status of a kund in Ayodhya before and after rejuvenation

1.5.2 Indicator value calculation

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

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

Waterbody revival factor = Number of waterbodies in acceptable condition/Total number of waterbodies (100)

Table 6: Waterbody revival score table

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

There are some interventions taken by city for rejuvenation of existing waterbodies but there is no holistic approach being applied in Ayodhya for understanding the existing condition of all the existing water bodies, so it has been given a waterbody revival score of 1

1.6

Objective 4 - Enhance Riparian Buffer

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

Scope of interventions: The only intervention required under this objective is to develop a rich continuous buffer of vegetation along the river on either bank. The plantation strategy must account for the soil conditions, water depth, native plant species, and the nature of ground profile.

1.6.1 Baseline assessment

The existing quality and length of the riparian buffer along the Saryu River within the city administrative limits is less (3.42 km out of 42.11 km riverfront length within the extended ADA limit). Likewise the opposite edge of length 46.7 km has only 0.5 km extent of riparian buffer. Together this certifies a clear need for actions under the Objective 4 of the URMP Framework which deals with the enhancement of the riparian buffer. In the context of the riparian buffer it needs to be understood that the buffer does not merely include the green vegetative cover but also includes the natural scrubland and sand bars/spits along the river planform as well.

The ADA, ANN and Forest Department office have carried out and are doing significant afforestation activities in the city, and along the stretches of the Sarayu River. The afforestation along river banks is mostly observed in Guptar ghat area. In the context of arial expanse lying within Ayodhya Development Authority (ADA), riparian buffer however is limited to fragmented pockets (**Image 14**) and sandy edges as it stands encroached majorly by concretised impermeable ghat edges (**Image 13**), agriculture expansion, species invasion, embankments (**Image 15, 16**) and unauthorised urban development. The natural river edge is a combination of vegetated sand spits, scrubs, agro lands and riparian buffer. Absence of this prevents the overall ability of riverine riparian planform to deliver its best in terms of runoff flow interception, increased sedimentation through capture of incoming runoff and filter sediment, river edge stabilisation, water infiltration etc.

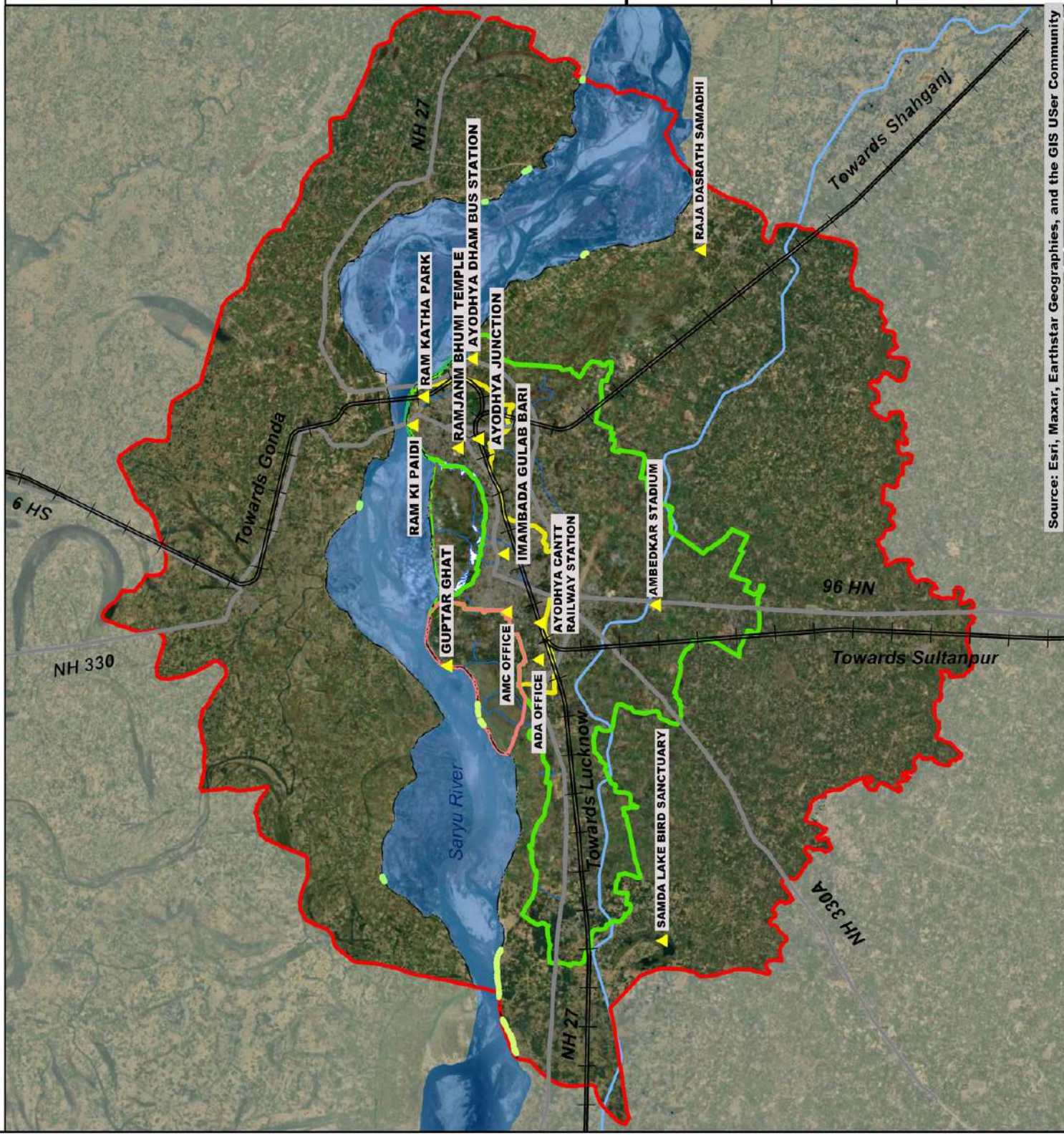


Image 13: Ayodhya river front with little or no riparian buffer / softscape

URMP Ayodhya: Existing Riparian Buffer



- Legend**
- Saryu River
 - Sharda_Canal
 - Railway
 - Highway
 - Landmarks
 - AMC Limit
 - ADA Existing Limit
 - ADA Extended Limit
 - Embankment
 - 30m Riparian Buffer
 - Existing Riparian Stretches



Width of ideal riparian buffer should be 30m from the river edge. Existing riparian buffer shows stretches having vegetation within the 30m buffer.

Source-
Google Earth Imagery



Scale : 1 cm = 2 km

Source: Esri, Maxar, Earthstar Geographies, and the GIS User Community

Map 4: Map showing the existing riparian edges along Sarayu River

Present day Ayodhya within ADA limit has a very minimal expanse of naturally occurring riparian buffer however the opposite river edge has a different story to tell as there still exists a huge expanse of lands with riparian vegetation (**Image 17**) and sandy edges that are conquered partially or less by anthropogenic activities. These edges are home to wildlife such as gharials, freshwater turtles etc. Therefore, there is a need to conserve the remaining varieties of these natural edges as well. As per the present day scenario, this extent does not fall under the ADA Limit but as there are plans for inclusion of lands on the opposite edge of Sarayu within the revised ADA Limit. Therefore it would be long before those pristine riparian buffers succumb under the thrust of intense urban development.



Image 14: A distant view of the naturally occurring riparian buffer along the opposite edge of the River Sarayu



Image 15: Riparian buffer replaced with embankment along a stretch of the Sarayu river edge.



Image 16: Absence of riparian buffer along a stretch of Sarayu river front.





Image 17: One of the remaining riparian buffer stretches along the Sarayu River.

Despite the significant afforestation activities by ADA, ANN and Forest Department office along the stretches of the Sarayu River, the count of plant species present as part of the riparian buffer such as Shesham (Indian Rosewood), Arjun, Imli (Tamarind tree), Mahua (Butter tree), False Ashoka, etc. are declining rapidly and additionally there is a lack of diversity in plant species present within existing riparian buffer. At present, the plants are majorly sourced from Banbeerpur nursery, Udyan nursery and from Guptar Ghat company garden.

1.6.2 Indicator value calculation

As part of enhancing riparian buffer along river banks, URMP also proposes a riparian buffer factor which is basically an indicator to develop a quantitative assessment of the length of the riparian zone on the river banks within the city's jurisdiction provided the width of the riparian buffer is greater than 7.5m. Annual assessment, preferably using satellite imagery is the best preferred ideal scenario for this indicator.

Riparian buffer factor is calculated using the formula:-

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

Post calculation, the score is calculated based on the tabulation shown below: -

Table 7: Riparian buffer score table

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

The riparian buffer factor for Ayodhya is 8.07 and therefore scores a value of 1.



Objective 5 – Increased Reuse of Treated Wastewater

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

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

1.7.1 Baseline assessment

Currently, in city of Ayodhya, there is no model or mechanism for the reuse of treated wastewater. Around 10 MLD of treated wastewater is being generated in the city and around 10% of this generated treated wastewater is being used for different purposes like road cleaning, horticulture etc. as and when required. Around 109 MLD of wastewater will be generated in the city once all the households get connected to the sewer network.

The reuse of treated wastewater for industrial application was explored by ANN but it required transporting of treated water for more than 12 km, necessitating investing significant capital for laying of dedicated pipeline for conveyance of treated wastewater.

1.7.2 Indicator value calculation

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

Wastewater reuse factor = (Wastewater reused annually/ Wastewater generated annually) x 100

Wastewater reuse factor = (1/10) x 100 = 10

Table 8: Wastewater reuse factor table

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

Ayodhya scores 1 in this indicator.



Objective 6 – Maximum Good Quality Return Flow

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

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

1.8.1 Baseline assessment

Currently, the entire volume of wastewater generated within Ayodhya city finds its way into the Sarayu River after appropriate treatment. Also the monsoon flows finds its way into the river through natural storm water drains present within the city.

1.8.2 Indicator value calculation

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

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

Table 9: Return flow factor table

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

Since Ayodhya City is maximising the return flow to Saryu River at this point of time, the return flow score is 5. However it is desirable that the city put in use the treated wastewater and storm water flows to optimal reuse for various potable and no-potable purposes so that the stress on consumption of fresh water sources could be reduced.



Objective 7 – Eco-friendly Riverfront Projects

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

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

1.9.1 Baseline assessment

The stretch of Sarayu River in Ayodhya city is around 38km and consists of more than 25 ghats and different heritage structures in the form of ashrams, dharamshalas, havelis etc. There are two major ghats in Ayodhya which are Naya Ghat (also known as Ram ki Pairi) and Guptar Ghat, which is a newly developed ghat. Most of these ghats are used for religious activities. Among all these ghat, Naya Ghat (Ram ki Paidi) receives the maximum footfall.

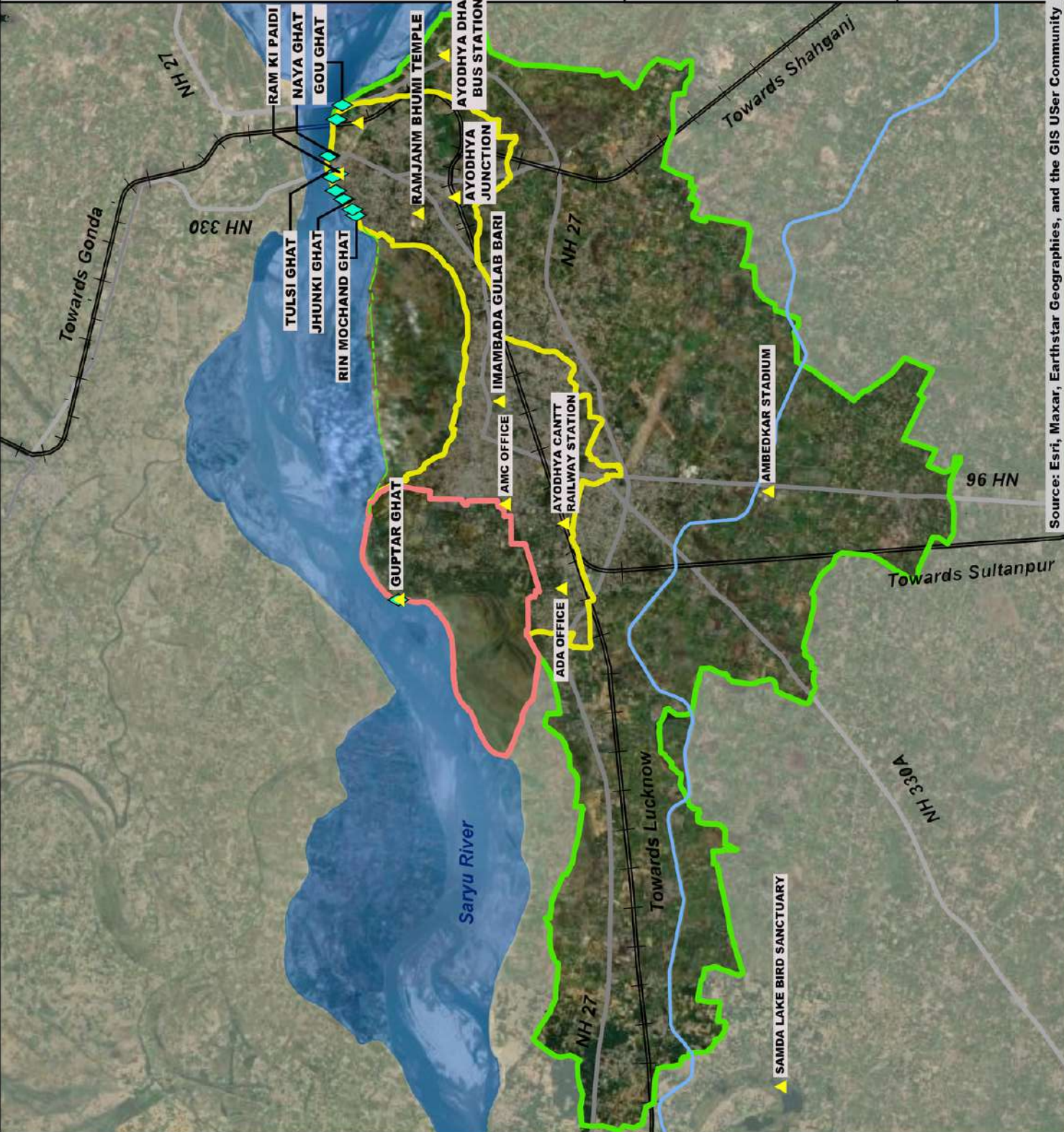
The city administration is planning to connect all the ghats (**Map 5**) and create a continuous stretch along the river edge (42.11 km) that would have a motorable road for tourists to catch river glimpses.

1.9.2 Indicator value calculation

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

Each riverfront project is matched against a set of desirable features whose eco-friendly riverfront points are calculated by adding up the points for all the features in the Table that the city has already implemented. An average of score of all riverfront projects will then be taken to calculate the eco-friendly riverfront score.

URMP Ayodhya: Ghats



Legend

- Saryu River
- Sharda_Canal
- Railway
- Highway
- Landmarks
- Cantonment Area
- AMC Limit
- ADA Existing Limit
- Embankment
- Ghats

RAJA DASRATH SAMADHI

Source-
Google Earth Imagery



Scale : 1 cm = 1 km

Source: Esri, Maxar, Earthstar Geographies, and the GIS User Community

Map 5: Map showing the location of ghats along Sarayu

Table 10: Eco-friendly riverfront points table for

<i>Ayodhya</i>				
S.No	Desirable features	Eco-friendly riverfront points	Guptar Ghat	Naya Ghat
1	The riverfront project is a source of revenue for the ULB	15	0	0
2	The riverfront project supports commercial activities like shops, stalls, etc.	15	10	0
3	The riverfront project has a footfall of more than 100 people /day	10	10	10
4	The riverfront project is listed as an attraction spot on travel - related websites	15	15	15
5	The riverfront project has good waste management facilities	15	5	5
6	The riverfront project is made up of predominantly natural materials	10	5	5
7	The riverfront project has soft landscaping elements	10	5	5
8	The riverfront project does not block the natural path of the river.	10	10	5
Total		100	60	45
Eco-friendly riverfront score		3		

Table 11: Eco-friendly riverfront score table

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

In the context of Ayodhya, the river front projects are considered as a single riverfront project for assessment namely Guptar Ghat and Ram Ki Paidi/Naya Ghat. Apart from these, there is a stretch of the riverfront comprising a small extent of riparian buffer and vacant unused ghat. Although this is a decent mid score, the existing quality and diversity of riverfront projects is low which clearly certifies the need for objective 7 of URMP Framework in the context of Ayodhya which deals with the development of eco-friendly riverfronts.

The eco-friendly riverfront points for the mention two projects as well as the cumulative tabulation for calculation of the eco-friendly riverfront score has been shown below.

Table 12: Eco-friendly riverfront score for Ayodhya

S.No	Name of project	Cummulative Eco-friendly riverfront points
1.	Guptar Ghat	60
2.	Ram Ki Paidi/ Naya Ghat	45
Eco-friendly riverfront score		3

Ayodhya scores 3 for this objective.



Objective 8 – Leveraging on the Economic Potential of the River

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

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

1.10.1 Baseline assessment

One of the major factors while designing a river management plan is the economy a city can generate leveraging on its water resources and providing services. While it is necessary to conserve river, it is also important to create revenue for a city without negatively impacting the river's health. Given the river's width, flow, and religious significance, the Sarayu has enormous economic potential. One of the major activities that are happening is boating from Naya and Guptar Ghat with around 50 boats docked at these ghats (**Image 18**) to give visitors an experience of Sarayu river. There are small shops and laaris that sell flowers and food items.



Image 18: Boating activity at Ram ki Paidi Ghat along the Saryu River

The city has begun to explore strategies to boost the city's river-related economy; for example, the Guptar ghat is being created on the themes of Ashok Vatikas to connect people with the history of Ayodhya as well as the Sarayu river. On Diwali earlier this year, the Naya Ghat broke the record for lighting the most diyas (earthen lamps) in Ayodhya by burning over 15 million lamps at the Ram ki Paidi ghat.

1.10.2 Indicator value calculation

The URMP uses the range of economic uses that a city has tapped into and its livelihoods that the river supports. The indicator measures the total river economy score considering the number of economic uses a city utilizes the river from the list below:

- The river is used for navigation or cruises.
- The river is used for water sports.
- The river supports the livelihoods of fisherfolk.
- The river supports the livelihoods of the farmer.
- The river supports religious and cultural tourism.
- Any other verified economic use.

Table 13: Economic potential scoring

S.No	Desirable features	Score
1	If the river has 3 or more economic uses	River economy score = 5
2	If the river has 2 economic uses	River economy score = 4
3	If the river has 1 economic use	River economy score = 2
4	If the river has no economic use	River economy score = 1

Since out of the given six indicators, the ghats is supporting 2 economic activities, the indicator score for this objective is 4.



Objective 9 – River-sensitive Behaviour among Citizens

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

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

1.11.1 Baseline assessment

Currently, the city has undertaken very few measures to raise citizen understanding (**Image 19**) of the importance of rivers and the need to protect them. The use of river-themed wall paintings has been adopted in the city at many locations, particularly along the ghats.



Image 19: Religious activities at Naya Ghat along the Sarayu River

1.11.2 Indicator value calculation

This indicator focuses on inculcating river-sensitive behaviour among citizens. This indicator measures the processes followed by the city in order to sensitise citizens about river-related issues and challenges.

The citizen sensitisation points are calculated by adding up the points for all the features identified under the indicator that the city has already implemented.

Table 14: Citizen sensitisation score for Ayodhya

S.No	Desirable features	Flood plain management points	Points scored by Ayodhya
1	Dedicated Information, Education and Communication (IEC) programme for the river-related aspects	20	0
2	River related sensitization is part of existing citizen awareness raising programmes	15	0
3	Presence of a dedicated website for river-related aspects	5	0
4	Use of traditional sensitization media (e.g. hoardings, murals, competitions, radio)	10	5
5	Use of social media for river-related sensitization	10	0
6	A dedicated river day for the city	10	0
7	Earmarked budget for citizen sensitization	15	0
8	Sensitisation of school children through special events	10	10
Total		100	15

The citizen sensitisation score is then calculated as below:

Table 15: Citizen sensitisation scoring

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

As there are very few initiatives that have been taken by the city to create awareness of citizen, the city has scored 1.



Objective 10 – Engage Citizens in River Management Activities

Rationale: This is important to make a shift from ‘citizens as spectators’ to ‘citizens as actors’. This also sends out the message that river management cannot be the government’s mandate alone. Residents will need to step and share the onus of responsibility. Most progressive societies have some or the other form of this governance model. In the long run, it will help create a transformation in the mindset of people towards ecological assets of the city.

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

1.12.1 Baseline assessment

There are currently no dedicated programmes or activities in Ayodhya city to engage individuals in the management of the Sarayu River.

1.12.2 Indicator value calculation

This indicator focuses on engaging citizens in river management activities. This indicator makes a qualitative assessment of the extent of citizen engagement in river-related activities and decisions.

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

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

The citizen engagement score is then calculated as below:

Table 16: Citizen engagement scoring

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

Since the city has not involved citizen in managing river, the objective score is 1

1.13 URMP Index – City Score

Each indicator has a value between one and five. An average of all the indicators will yield the URMin dex.

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

From this calculation, it is apparent that each indicator has equal weightage in calculating the URMin dex.

Ayodhya’s URMin dex has come out to be 2.2 (Image 20) which interprets as elementary-level urban river management.



Image 20: A snapshot of objective wise scores for Ayodhya

Lush vegetation across a river island on Sarayu



02



APPR

A boat ride along Sarayu

BOAT FOR URMP PREPARATION



2. Approach

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

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

2.1 City onboarding (introductory meeting and formation of the working group)

The inception meeting amongst officials of Ayodhya Nagar Nigam and NIUA for preparation of URMP for Ayodhya City was held on 17th June 2022 (**Image 21**). The main objective of the meeting was to interact with relevant city officials and introduce them to the URMP Framework, the expected outcome of the engagement between NIUA and Ayodhya Nagar Nigam, and way forward action points towards the preparation of the river management plan.



Image 21: - Inception meeting held with officials from ANN and other departments

2.2 Ayodhya URMP 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, Ayodhya Nagar Nigam led the working group, which comprised thirteen other officers. Details of the members of the working group are placed below. A nodal officer was appointed by the Commissioner to drive the coordination with different agencies.

The Working Group constitutes of the following officials from Ayodhya Nagar Nigam and Ayodhya Development Authority :-

- Shri. Vishal Singh, Commissioner
- Shri. Sachchidanand Singh, Additional Municipal Commissioner
- Shri. Anoop Singh, EE, Jal Nigam
- Shri. Sanchay Shukla, PE, Jal Nigam
- Shri. Sunil Kumar Singh, PM, Jal Nigam
- Shri. A.P. Singh, AEPD, PWD
- Shri. J.Kushrawa, JE, PWD
- Shri. R.P. Yadav, DD, Tourism
- Shri. K.N. Sudhir, SDO, Forest
- Shri. Santosh Kumar, A.E.E, UPPCB
- Shri. Raj Kanal, T.A, Ground Water Department
- Shri. S.K. Prasad, EE, Flood Works Diversion
- Shri. Gorky Kaushik, Town Planner, ADA
- Shri. Jay Singh, EE, Irrigation

The primary responsibility of the nodal officer and working group was :-

- Collecting and analysing secondary data, reports and necessary information related to the URMP from various agencies. NIUA provided handholding support in finalising the baseline assessment and the URMP, Ayodhya report.
- Organising stakeholder consultation workshops with support from the NIUA team.
- Identifying suitable interventions for URMP based on the baseline assessment and stakeholder consultation.

2.3 Stakeholder's workshop for identifying URMP interventions

For the preparation of the URMP, a number of formal and informal stakeholder meetings/workshops were held. To begin, the meetings were intended to foster a shared knowledge of the URMP, its objectives, and scope. The latter meetings were held to identify and finalise the URMP interventions. A number of one-on-one sessions were also conducted between representatives from various agencies to help shape the creation of various components of the URMP. A URMP Working Group, WhatsApp group was also developed for convenience of communication and speedy facilitation, where information was provided on occasion.

03



PROPOSED

A mural work along Sarayu riverfront



INTERVENTIONS





3.1 Interventions to ensure effective regulation of activities in floodplain

3.1.1 Intervention

This objective focuses on enhancing the planning provisions in the master plans, related to the rejuvenation and conservation of river Sarayu and its associated element like water bodies, drains, groundwater etc. It is important to ensure that the river and its flood plain is protected from any encroachment as it is very crucial to list permitted activities and structures that are allowed in the floodplains for ensuring river's health.

The existing Ayodhya Master Plan is under finalisation and has a few important provisions for the Sarayu River protection. However, the Plan does not have explicit, clear provisions (**Image 22**) to protect the wholesomeness of the river and the floodplain. The planning area of the ADA has increased from 133 sq.km to 873 sq.km. At present there is no floodplain demarcation done along the Sarayu and flooding is controlled through engineering solutions like embankments and ghats. The master plan for the extended area of area 873 sq.km is now under preparation and needs to incorporate the following recommendations.



Image 22: Planning Instruments as per River Sensitive Master Plan guidelines developed by NMCG and NIUA

Land use allocation

The Ayodhya Master Plan for the extended area 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 river stretch in the extended boundary of ADA
- Delineating the floodplain
- Mapping major drains, wetlands, and water bodies
- 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

Planning Strategy

A lot of agricultural activities are being carried out in river flood plains and river islands formed during the summers. The city needs to look into regulating agricultural activities, especially in floodplains and river islands. Following are some recommendations for the master plan:

- Regulation on type of crops produced in the floodplain and river islands (recommended and non-recommended crops considering water consumption, native or invasive species, biodiversity etc)
- Promoting native species with economic benefits for farmers like millets, Camel Grass (Vetiver), oilseed cultivation with subsidies and incentives etc.
- Promoting less use of chemicals (phasing out of chemical use)
- Capacity building of farmers

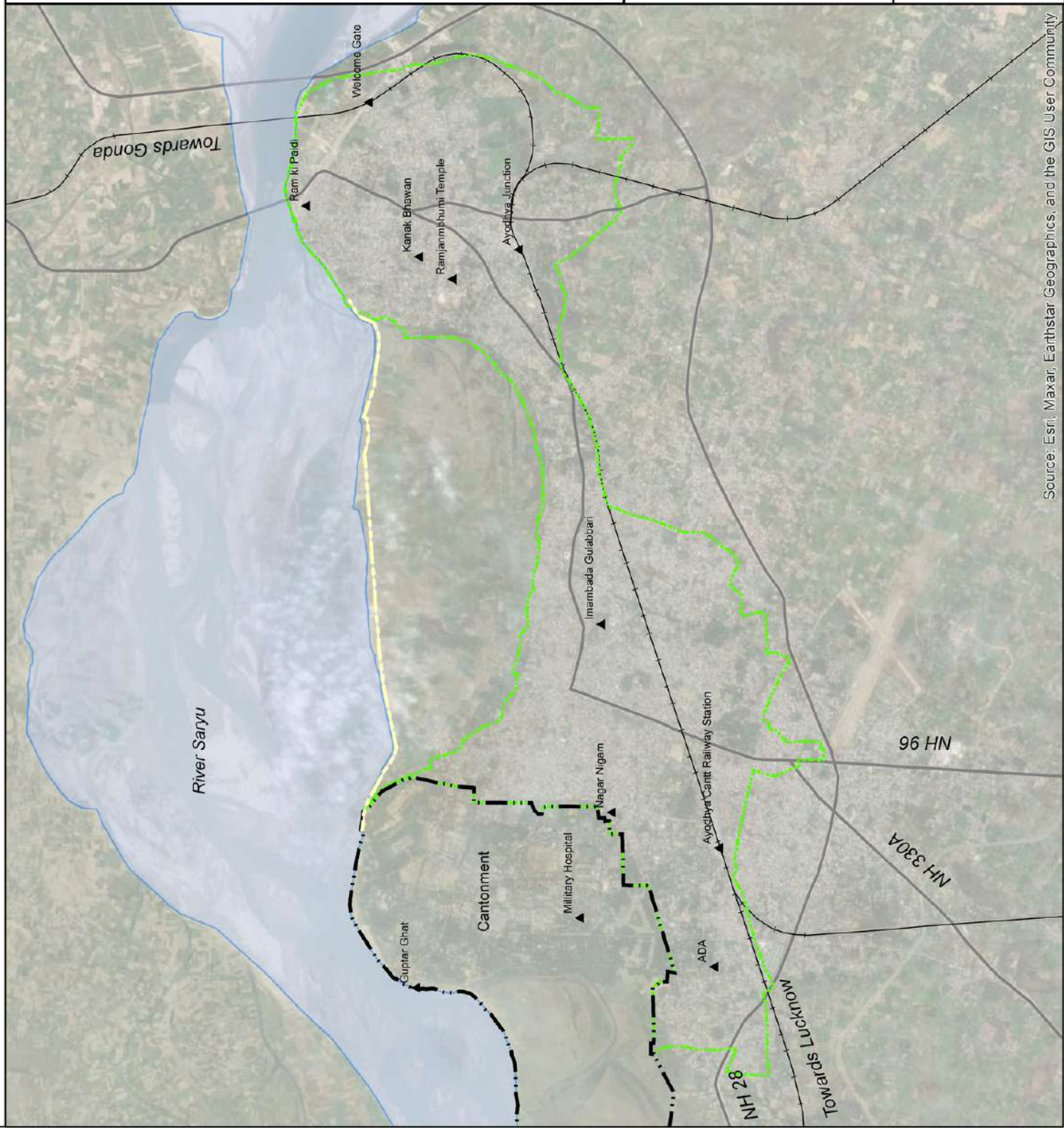
Development control regulations for river zone

- The Master Plan could have a clearly defined land use/ use zone category for the river and its floodplains, within the existing and proposed land use tables. The River and its floodplain could be clearly marked in the land use plan as well, under the appropriate land use/use zone category.
- Demarcate the 'no development zone' and 'interactive zone', for regulating all development within the flood plain of Sarayu river
- 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)
- 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.
- Enlist the prohibited, regulated, and permissible activities within each of these zones
- Devise a phased strategy for relocation of prohibited activities

For example

- Non-Permitted use - Hospitals, nursing homes, police stations, fire stations, commercial, industrial, hazardous facility
- Permitted use - Parks/Gardens, playgrounds, sports facilities including stadium, swimming pools

URMP Ayodhya: Floodplain Management



Legend

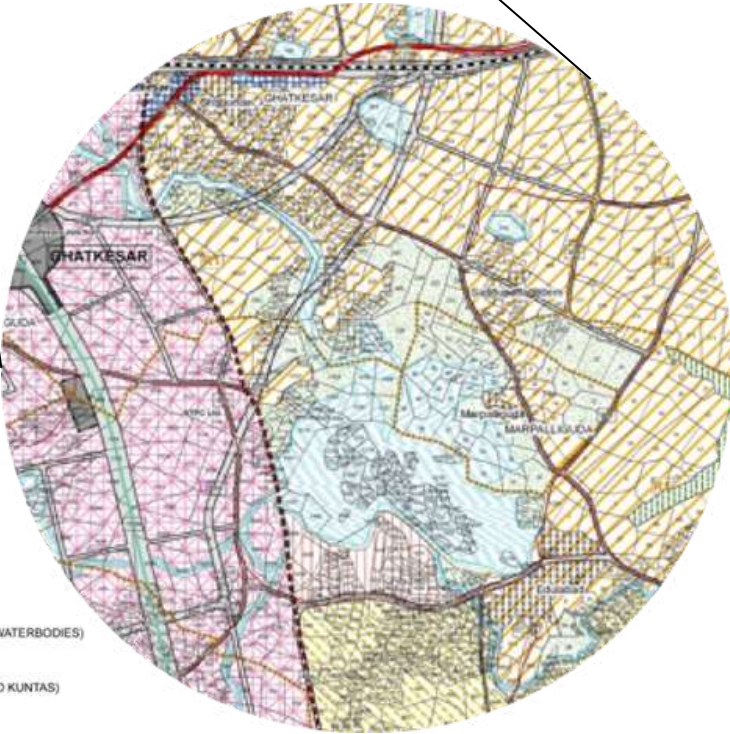
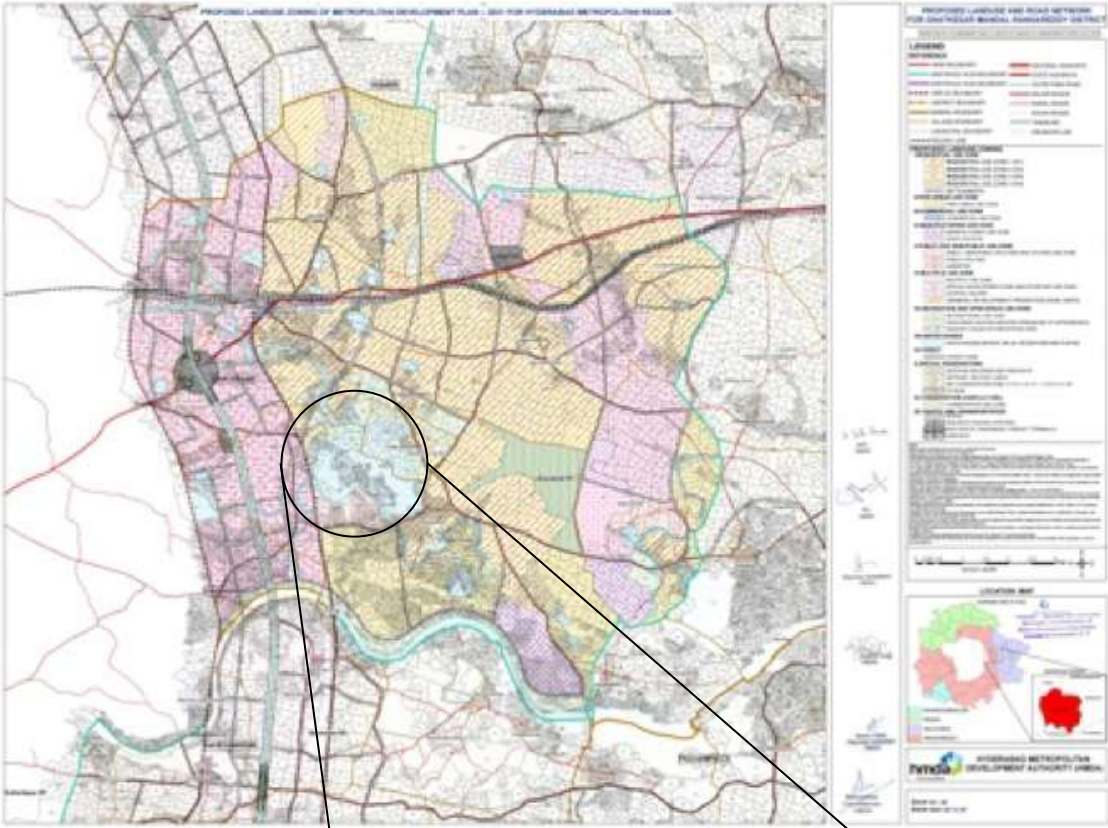
- ▲ Landmarks
- +— Railway
- Highway
- Saryu River
- Embankment
- Cantonment Area
- AMC Limit



Scale : 1 cm = 1 km

Map 6: Map showing the location of embankment under construction along Sarayu

The case of Hyderabad (**Image 23**) has been presented below to show how the buffer area around the river and water bodies can be marked in the master plan. A dedicated use zone should be marked for river, floodplain, water bodies and buffer around them.



- VII. RECREATION AND OPEN SPACE USE ZONE**
 - RECREATIONAL USE ZONE
 - OPEN SPACE BUFFER (AROUND FORESHORE OF WATERBODIES)
 - HIMAYATH SAGAR AFFORESTATION ZONE
- VIII. WATER BODIES**
 - WATER BODIES (RIVERS, NALAS, RESERVOIRS AND KUNTAS)
- IX. FOREST**
 - FOREST ZONE

Image 23: Masterplan case of Hyderabad

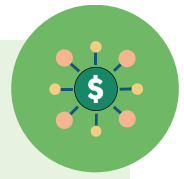


Summary of the intervention



Responsible Agency

Ayodhya Development Authority



Estimated Budget

N/A



Timeline

Long Term (More than 18 months)



Potential Funding Sources

ADA

Synergies with Missions

Namami Gange

Drains opening into the Sarayu

सुलभ शौचालय
गोलाघाट श्री उद्योगजी जी
शौचालय स्वारथ मंत्रालय
निर्माण कार्य कथवन्म्या-मुनम
एन्टर वेगलम मोरमरविम
अनिलकुमार मन्तर ७. १५





3.2 Interventions to keep the rivers free from pollution

3.2.1 Citywide planning for management of liquid waste from on-site sanitation systems (Fecal Sludge and Septage Management Plan)

The city of Ayodhya is doing considerably well in terms of maintaining the health of Saryu River by provision of STPs for treatment of domestic sewage as well as adopting bio-remediation as drain (**Map 7**) treatment measure to treat liquid waste flows by tapping the same before it enters the river. The laying of sewer network in the city is under progress and is expected to be completed by 2026 connected 100% of the households to sewerage system. Currently almost 90% of the households are using septic tanks with or without soak pits or single/twin pit toilets for disposal of fecal waste. This if not managed properly could pose potential health and environment hazard. The ADA boundary is expected to expand considerably and with addition of new areas depending on on-site sanitation system, faecal sludge and septage management is of prime importance for the city of Ayodhya.

The city has infrastructure in the form of a dedicated 32 KLD Faecal Sludge Treatment Plant and a co-treatment unit installed at 10 MLD STP for treating the faecal sludge/septage desludged from OSS. However, the city does not have mechanisms in place to ensure timely emptying of septic tanks and safe conveyance of liquid waste to treatment facility.

It is proposed that Ayodhya prepare a citywide FSSM strategy/plan for safe collection and disposal of faecal sludge/septage. The following set of actions are envisaged under each component of the FSSM value chain (**Image 24**) as mentioned below:

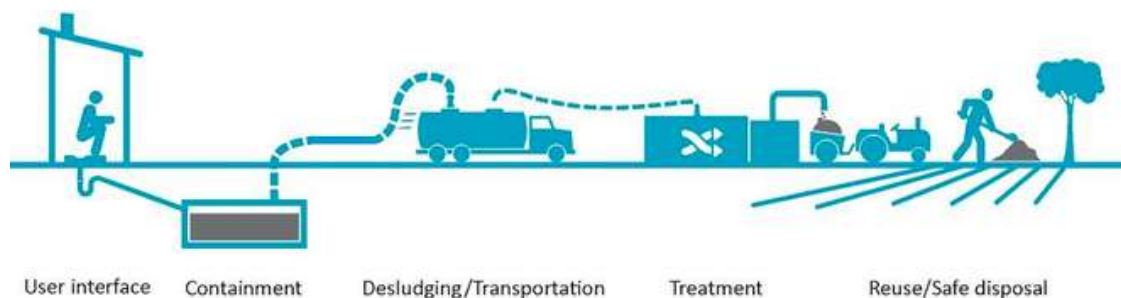


Image 24: FSSM value chain

Containment:

- Create a database of properties having toilets connected to septic tanks with or without soak pit, single/twin pit toilets
- Detailed inspection of each OSS and making the structure desludging ready by provision of access manholes or any other changes required for efficient desludge of OSS structure

Emptying/collection

- Preparation of scheduled desludging plan for regular emptying of OSS every 3 years
- Regulations and penalties for periodic cleaning of septic tanks
- Empanelment and Licensing private operators for carrying out the activity of desludging of OSS

Transport/conveyance

- Provision of transfer stations for collection of septage in smaller vehicles and transport to FSTP (situated approx. 30 kms from city center) in large vacuum trucks

Reuse/disposal

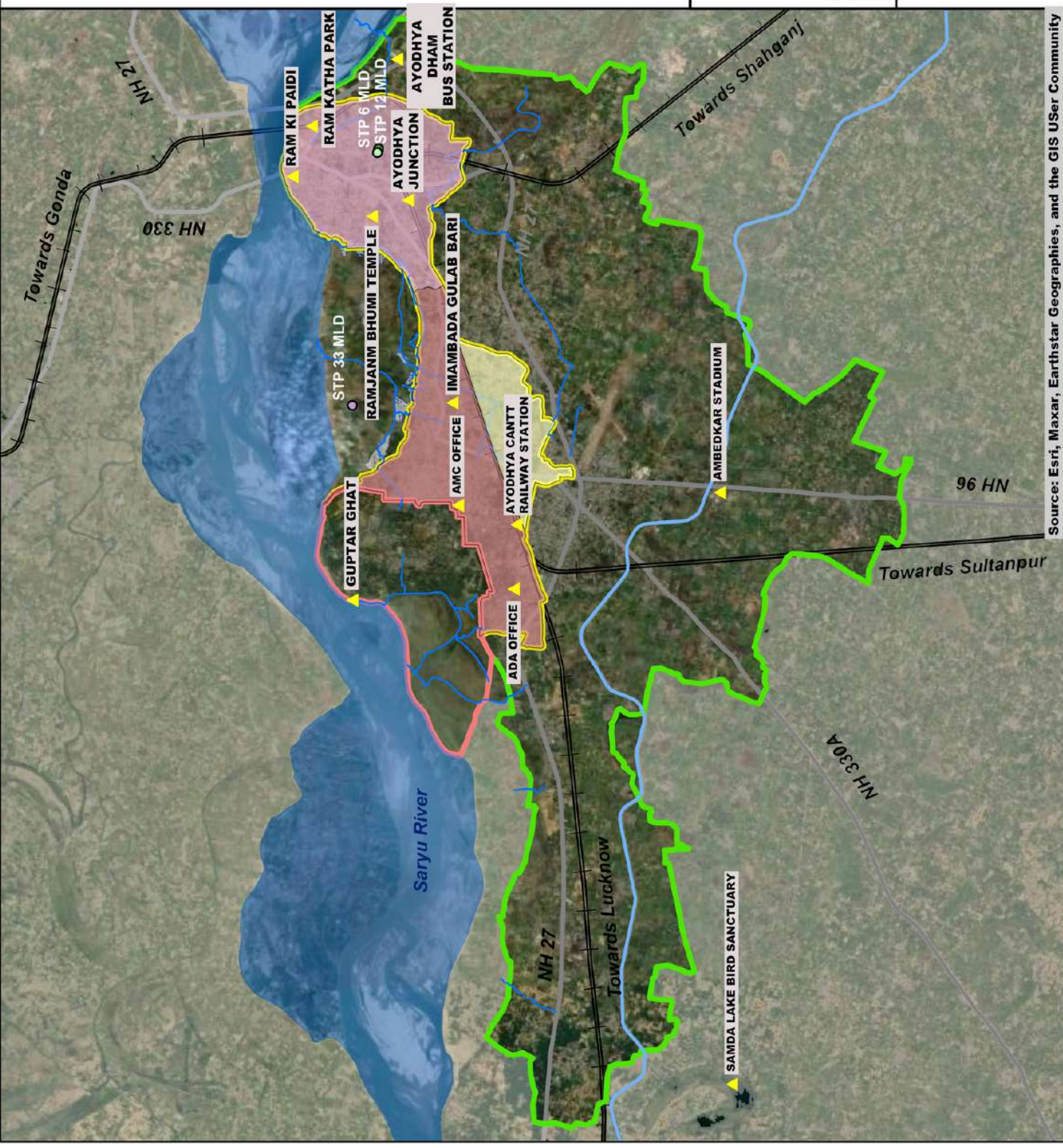
- Reuse plan for treated sludge as soil conditioner/fertiliser

To carry out above mentioned activities, it is imperative for the city to create awareness amongst citizens to support the FSSM and capacity building of relevant stakeholders to ensure successful implementation

Summary of the intervention



URMP Ayodhya: Wastewater Management



Legend

- Saryu River
 - Sharda_Canal
 - Railwayway
 - Highway
 - Landmarks
 - Cantonment Area
 - AMC Limit
 - ADA Existing Limit
 - Ayodhya City Drains
 - Ponding Areas
- STP**
- Existing
 - Proposed
 - Under Construction
- Sewerage Zones**
- District 1-Part 2
 - District 1-Part1
 - District 2
- having sewer network
work under progress

Source-
Uttar Pradesh Jal Nigam
Ayodhya Development Authority



Scale : 1 cm = 1 km

Source: Esri, Maxar, Earthstar Geographies, and the GIS User Community

Map 7: Map showing existing sewage treatment infrastructure in the city

A wetland along Parikrama - Kosi road infested by water hyacinth





3.3 Interventions to rejuvenate waterbodies and wetlands in the city

3.3.1 Generating a database of all the waterbodies in Ayodhya

A city's health depends on how a city manages its river. Waterbodies and wetlands are an integral part of any city and hold a direct connect with the health of a city's river. Despite being one of the most important factor, waterbodies and wetlands are constantly being encroached, harmed and are vanishing at a very fast pace. Reviving and rejuvenating these waterbodies 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.

Ayodhya city is blessed with various waterbodies in the form of ponds, lakes, kunds, wetlands etc. Many of these waterbodies are ancient and has cultural, heritage and religious significance. The city is progressively working on rejuvenating its waterbodies and bringing them back to their glory. However the city does not have an account of these natural resources, in absence of which the city is not in a position to make informed decisions aimed at managing these waterbodies. There is currently a database available consisting of 108 waterbodies (**Refer Map 3, on page no. 27**), however it is estimated that the area under the development authority has waterbodies somewhere in the range of 500-1000 in numbers.

Under this intervention the following activities are proposed:

- Creation of a Waterbody database
- Assessment of health of waterbodies based on Rapid Urban Waterbodies Diagnostic Tool.
- Protection of existing waterbodies by providing a 9m buffer.

3.3.1 Generating a database of all the waterbodies in Ayodhya

It is proposed to develop an inventory of all the waterbodies based on the template covering four key aspects i.e. General, Physical, Chemical and Ecological. The set of parameters under each of these aspects are as follows:

Table 17: Indicative list of parameters for the waterbodies database

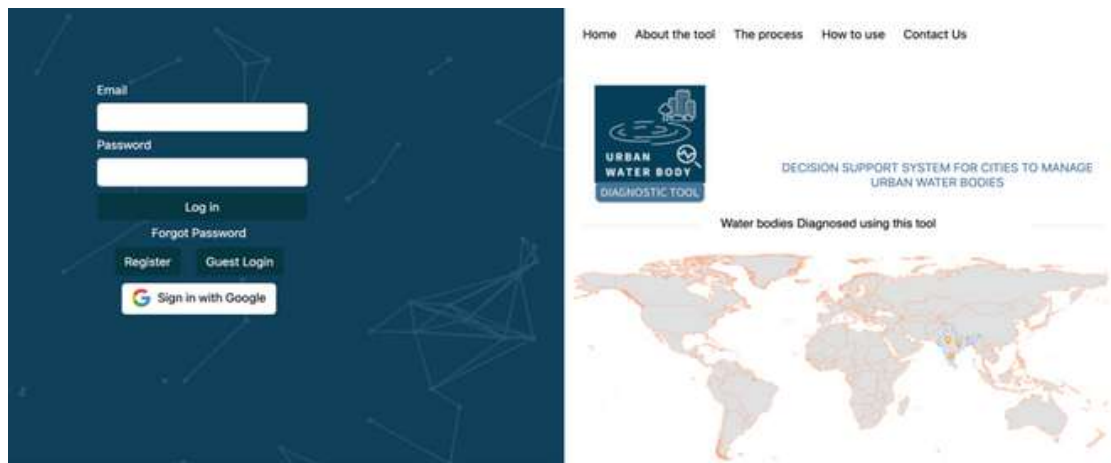
S.No	Aspect	Information
1.	General	<ul style="list-style-type: none"> Name Location Ownership Land use / Use zone as per the master plan Neighbouring land use category as per the master plan Existing neighbouring land use Classification (natural/artificial) Types of recreational activities (if any) Revenue generation (if any) Livelihood dependency (if any)
2.	Physical	<ul style="list-style-type: none"> Boundary Average depth Water sources Water use (if any) Elevation above mean sea level Presence of solid waste (Yes / No) Width of buffer (if existing)
3.	Chemical	<ul style="list-style-type: none"> Dissolved oxygen pH Temperature Faecal coliform
4.	Ecological	<ul style="list-style-type: none"> Types of trees and plants surrounding water body Presence of algal bloom (Yes/No) Type of aquatic species present

Ayodhya Development Authority can outsource the activity of creation of the database related to chemical and ecological parameters by engaging an external agency. Alternatively local university students can also be engaged after appropriate training to document the waterbodies and prepare the extensive database of waterbodies in Ayodhya city.

3.2.2 Diagnosis of health of waterbodies in Ayodhya City

NIUA along with UNESCO, New Delhi has developed a waterbody diagnostic tool aimed at rapid assessment of health of the waterbodies in the city. This user friendly tool (**Image 25**) assesses the health of a waterbody based on 10 indicators while helping a city to prioritise the action plan for betterment of the waterbodies.

Each of the parameters are scored out of 5 marks and the final cumulative marking including all the scores (which is called the UMD value in the tool) diagnose the current situation of the waterbody.



Physical Dimension

To evaluate characteristics that can be determined by senses of touch, sight, smell, and taste.

Water Quality Dimension

To evaluate chemical and biological properties that have a bearing on the health of water bodies

Water Quantity Dimension

To evaluate the change in water availability within the body

Management Dimension

To evaluate the practices followed for management of water bodies

Indicator 1
Visible surface algal bloom

Indicator 2
Odour

Indicator 3
Solid waste in the water body

Indicator 4
Solid waste in the buffer

Indicator 5
Dissolved oxygen

Indicator 6:
pH value

Indicator 7:
Change in surface area of the water body

Indicator 8:
Extent of built-up in the buffer

Indicator 9:
Vegetation in the buffer

Indicator 10:
Management protocols

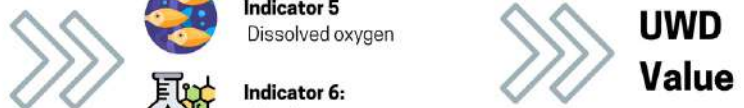


Image 25: UWDT interface and the assessment parameters

The usage of tool is demonstrated through diagnosis of two waterbodies viz Fatehganj pond and Vidya kund as a reference for the city.

Fatehganj pond (**Image 26**) is located Shakti Vihar Colony, Faizabad, Uttar Pradesh around a residential area. This pond has become a solid waste dumping site for the residences around. We diagnosed the score for this pond and the results were as follows:



Indicator	Score	Weighted Score
Physical Dimension		
Indicator 1 Visible surface algal bloom	0.00	0.00
Indicator 2 Odour	0.00	0.00
Indicator 5 Dissolved oxygen	4.00	0.64
Indicator 6: pH value	5.00	0.45
Indicator 7: Change in surface area of the water body	1.00	0.30
Water Quality Dimension		
Indicator 3 Solid waste in the water body	3.00	0.45
Indicator 4 Solid waste in the buffer	0.00	0.45
Indicator 8: Extent of built-up in the buffer	3.00	0.08
Indicator 9: Vegetation in the buffer	1.00	0.04
Indicator 10: Management protocols	1.00	0.12
Water Quantity Dimension		
Management Dimension		

$$\text{Urban Water Body Diagnostic Value (UWDvalue)} = 2.53$$

Image 26: Fatehganj Pond data base

The score for the Fatehganj Pond is **2.53** which falls under **Poor category**.

Vidya Kund (**Image 27**) is located in Kami Ganj, Ayodhya, Uttar Pradesh next to a temple. The temple committee is looking after this kund and have maintained this pond for years. We diagnosed this kund and the the results were as follows :

The score for the Vidya Kund is **4.01** which falls under **Good category**.

For diagnosing the health of all the waterbodies, the activity can be outsourced to external agencies or engage with university students.

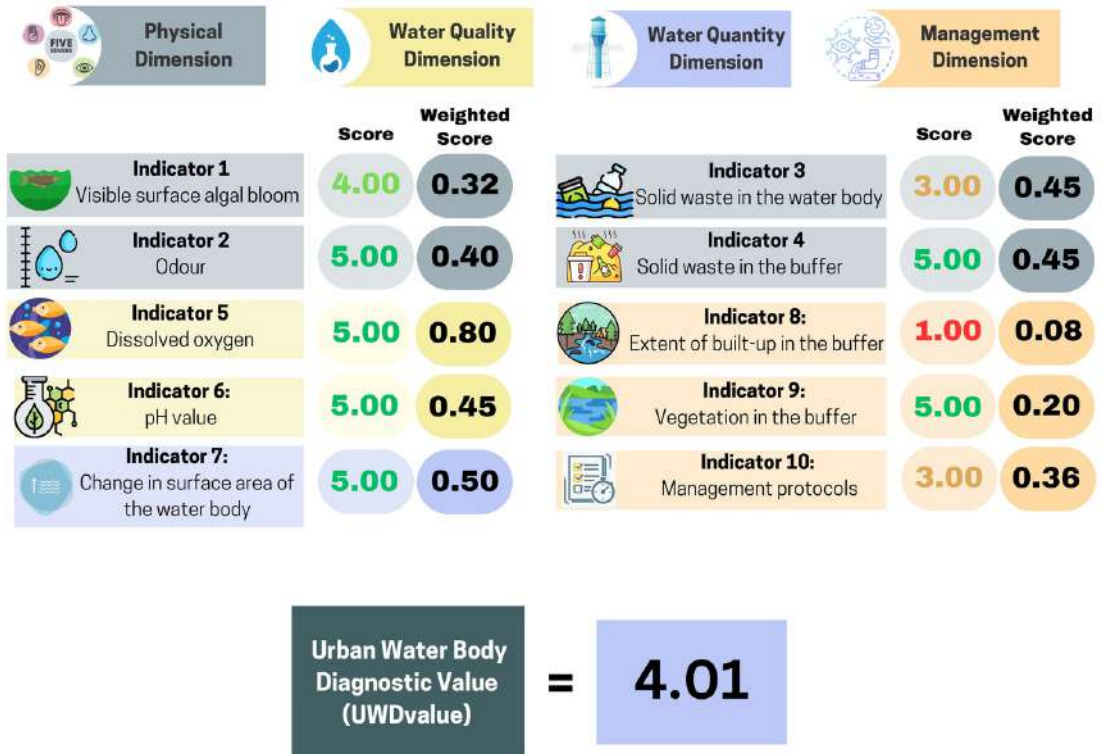


Image 27: Vidya Kund data base

3.2.3 Provision of buffer for protection of waterbodies

The health of a waterbody is dependent on its surroundings. After careful diagnosis of all 108 waterbodies, we will have a dataset of all the waterbodies which have a scope of maintaining a 6 meters buffer from the edge of the waterbody (Image 28). Once the diagnosis of all the water bodies is done, the city will have a database of all the water bodies in good, bad or acceptable conditions. The water bodies in acceptable conditions need to be protected from encroachment, and pollution and can be used as recreational spaces for local citizens. As per the Master Plan under preparation, these waterbodies should be demarcated with a 6 mt buffer and protected by providing a fence. The water body can be developed by providing a riparian buffer, a path for walking using sustainable materials, small shops and a play area for children. The water bodies in dilapidated condition need to be rejuvenated on a similar line as ADA and AMC is rejuvenating the 11 water bodies in the city.



Jogging track



Kids play Area



Plaza around a waterbody



Seating Area

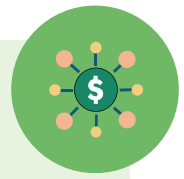
Image 28: Profile of 6m buffer around waterbody



Summary of the intervention



Responsible Agency
Ayodhya Municipal Corporation & Ayodhya Development Authority



Estimated Budget

- Rs.10-13 lakhs for creating the database
- Fencing - Barbed wire with concrete pole - Rs.1.20 lakh/acre
- Riparian buffer - Rs. 50,00/hac



Timeline
Short Term (6-9 months)

Potential Funding Sources

NMCG, Smart City Fund, AMRUT 2.0

Synergies with Missions

AMRUT 2.0, Smart City Mission, Namami Gange



Riparian buffer reduced to a thin stretch due to riverfront development





3.4 Interventions to enhance riparian buffer along the river bank

3.4.1 Defining the riparian edge along Saryu River

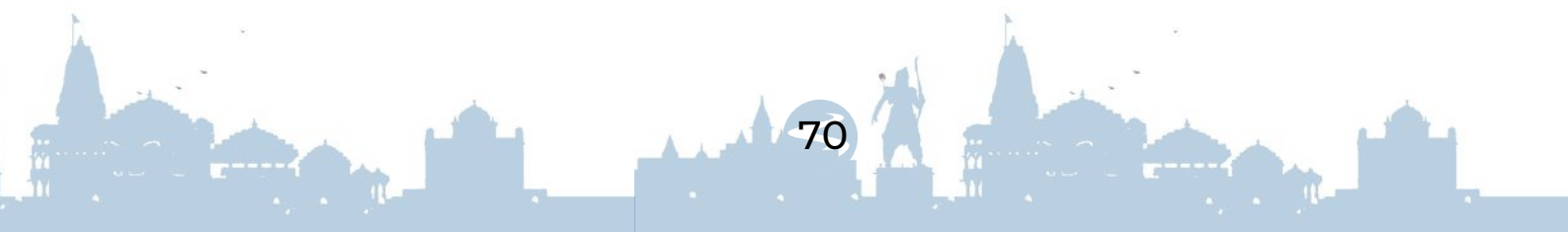
United States Department of Agriculture (USDA) Forest Service defines riparian buffer as a stretch of area along water bodies or wetlands comprising trees, shrubs, grasses and other perennials which together demand a different style of management all together due to the plethora of benefits provided. In an ideal scenario, a sufficiently wide riparian buffer with a healthy vegetative composition along both the sides of rivers or along all sides of lakes can help in plant nutrient retention, natural phytoremediation of fine sediments and toxic runoff, shade, organic material humus, natural wildlife habitats for numerous species, soil stabilisation and offer scope for monetisation of species naturally grown within the buffer.. Recent studies reveal that it is the continuity and length of the riparian buffer that determines its overall efficiency than its width i.e. a longer and continuous buffer with a lesser width can be highly efficient than a wider and fragmented buffer stretch.

The present extent of Ayodhya has limited riparian buffer pockets along 3.42 km out of the river front length of 27.8 km. A major portion of the riparian stretch has been lost to anthropogenic interventions and activities and there are limited areas that can be conserved, protected or reconstructed. Although the Ayodhya draft master plan 2031 discusses the importance of having a green buffer along urban water bodies, there is no clear mention of the dimensions, character or about a provision for having a riparian buffer along Sarayu River.

It is proposed to conserve and enrich the existing riparian stretches (**Map 8**) using function specific native species. Similarly potential stretches have been identified for establishing a riparian zone as well.

A sample profile section of a natural riparian buffer along Sarayu river is given in (**Image 29**). A planting palette for the same can be observed in **Table 19**.

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, State Forest Department, ADA, ANN and Irrigation Department can either independently or jointly develop land for the proposed plantation. Sources of funding include ANN, ADA, CAMPA, CSR and NMCG.



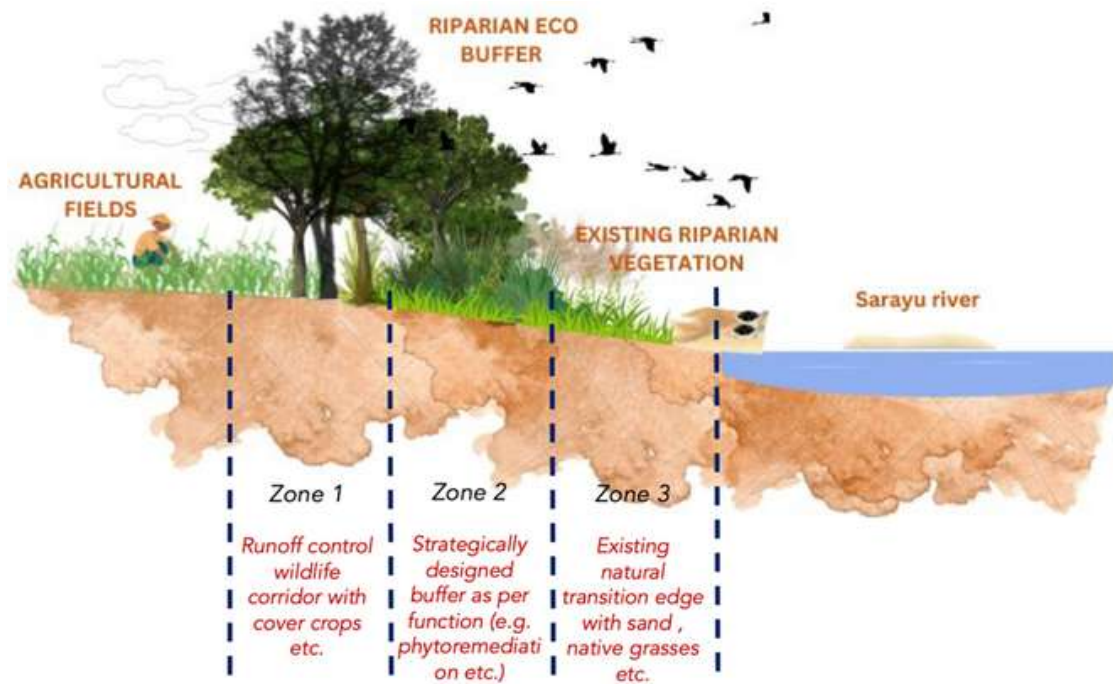


Image 29: Sample profile section for a riparian buffer along River Sarayu

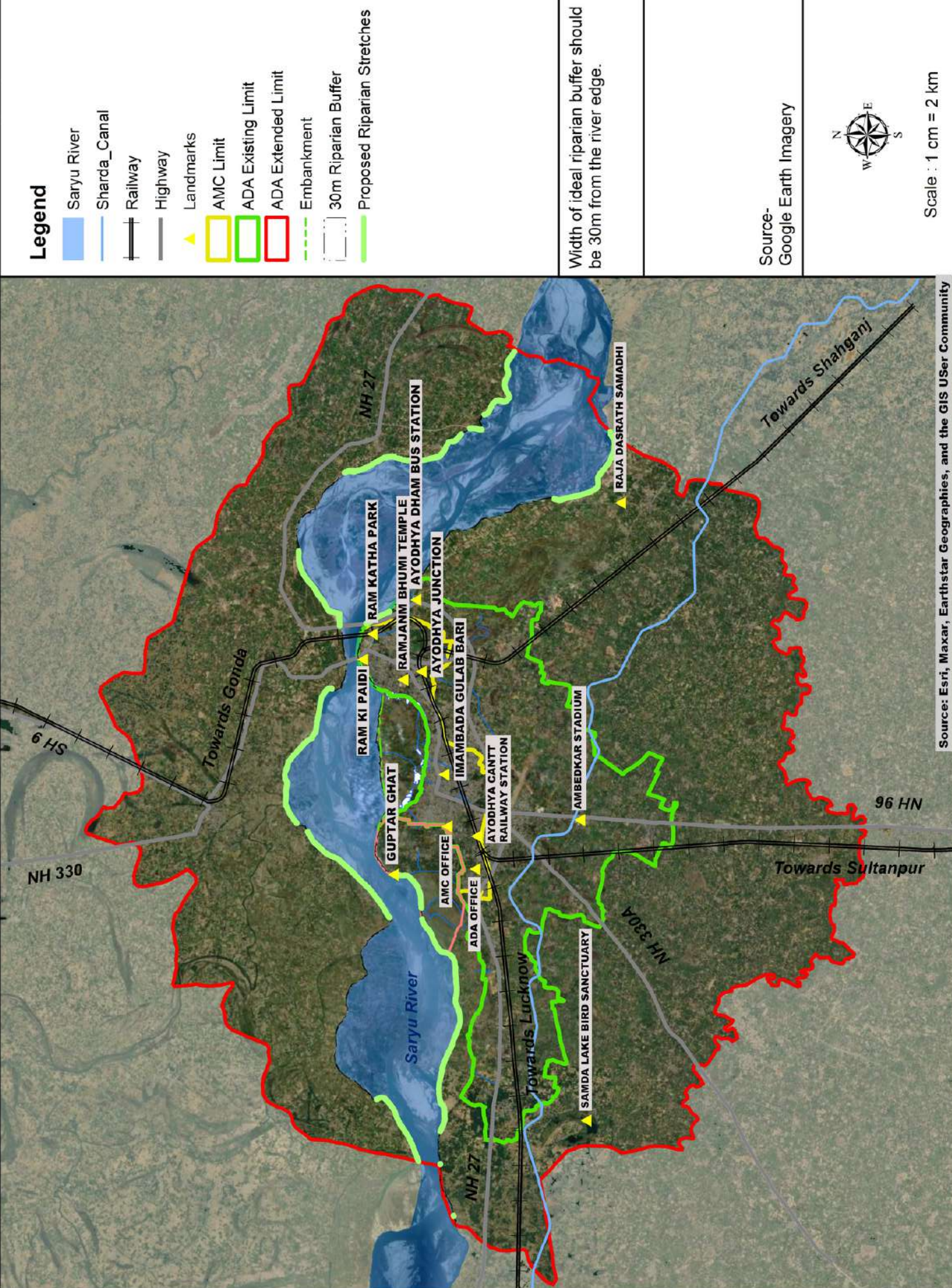
At present there is a dearth of proper repository of plant species suitable for the riparian buffer along Sarayu. A committee comprising a cohort of specialists such as botanists, ecologists, landscape architects, environmental planners along with state forest department officials and locals need to be brought in as part of building a repository of native riparian plant species.

Key activities towards planning and implementation of this intervention are mentioned below

- Identification of remnant pockets of riparian lands to be conserved
- Conducting an inventorial study of the plant species to prepare a database of native and invasive species
- Plantation of flood resistant species in tree planters or in voids in the zones where impermeable hardscapes are present. Soil stabilising grasses, shrubs or trees may be grown over the rubble embankments when enhancing the embankments to function as vegetative rip - rap or gabion walls with planting over the wire mesh

In the stretches where new construction is proposed or yet to be proposed, a minimum buffer of 3m and ideal scenario 5m need to be allotted for riparian vegetation specifically. Within this buffer, it is recommended to avoid hardscape elements to the extent possible, and wherever necessity, permeable hardscape materials such as gravel, stone, permeable concrete pavers, porous pavers etc. may be used. Likewise embankments that are already constructed or in process of construction may be naturalised (**Image 29**) to enhance the embankments to function as a combination of riparian buffers and soil stabilisers such as vegetative rip - rap, gabion walls with planting over the wire mesh etc.

URMP Ayodhya: Proposed Riparian Buffer



Map 8: Map showing existing & proposed riparian stretches within ADA limit



Image 30: Sample montage of naturalised embankment along River Sarayu.

The Master Plan of Ayodhya City is a vital instrument that can drive the mandate of provision of a minimum riparian buffer width range of 3m – 5m that runs continuously along River Sarayu in the long term. As a short term initiative, it is recommended that the draft master plan 2031 include a mandate width of 1m continuous riparian buffer/natural river edge in the zones where embankment or any physical infrastructure is already present along the river and a width of 3m – 5m in the remaining greenfield areas of the riverfront.

Pilot demonstration site for riparian buffer

The proposed site for implementation (**Image 31**) is subject to minimal anthropogenic encroachment and runs parallel to the proposed embankment road. Being a part of the floodplain and river bed, it is subject to flooding as well. Keeping in mind the sensitivity of the site, this can be utilised as a pilot demonstration site for adopting the riparian profile as shown in (**Image 32**). The site is envisioned as a nature experience trail that would connect Guptar Ghat to Naya Ghat, spanning approximately 4 kilometres. During the dry season, when there is minimal rainfall, the trail would function as a nature trail, offering visitors the opportunity to explore and enjoy the diverse flora and fauna in the area. However, during the rainy season when the water levels rise, the site will serve the purpose of a floodplain. Given the sensitivity of the area and the need to protect its natural ecosystem, controlling tourism activities becomes crucial. To achieve this, the responsible authority can propose the implementation of a ticketing system. This system would regulate the number of visitors allowed into the site at any given time, ensuring that the natural environment is not overwhelmed. Furthermore, to preserve the site's ecological integrity, the authority can declare it a no-plastic zone area. This designation would prohibit the use and disposal of plastic items within the site, encouraging visitors to adopt environmentally friendly practices.

Potential floral wetland resilient species such as *Brassica juncea* (Indian mustard), and *Pennisetum setaceum rubra* (red fountain grass), based on the palette discussed under Intervention 3.4.1 may be used here. The city administration can also leverage on this extent as a nursery and the benefits of the proposed species for monetary benefits as well by entering into agreements with like-minded organisations.

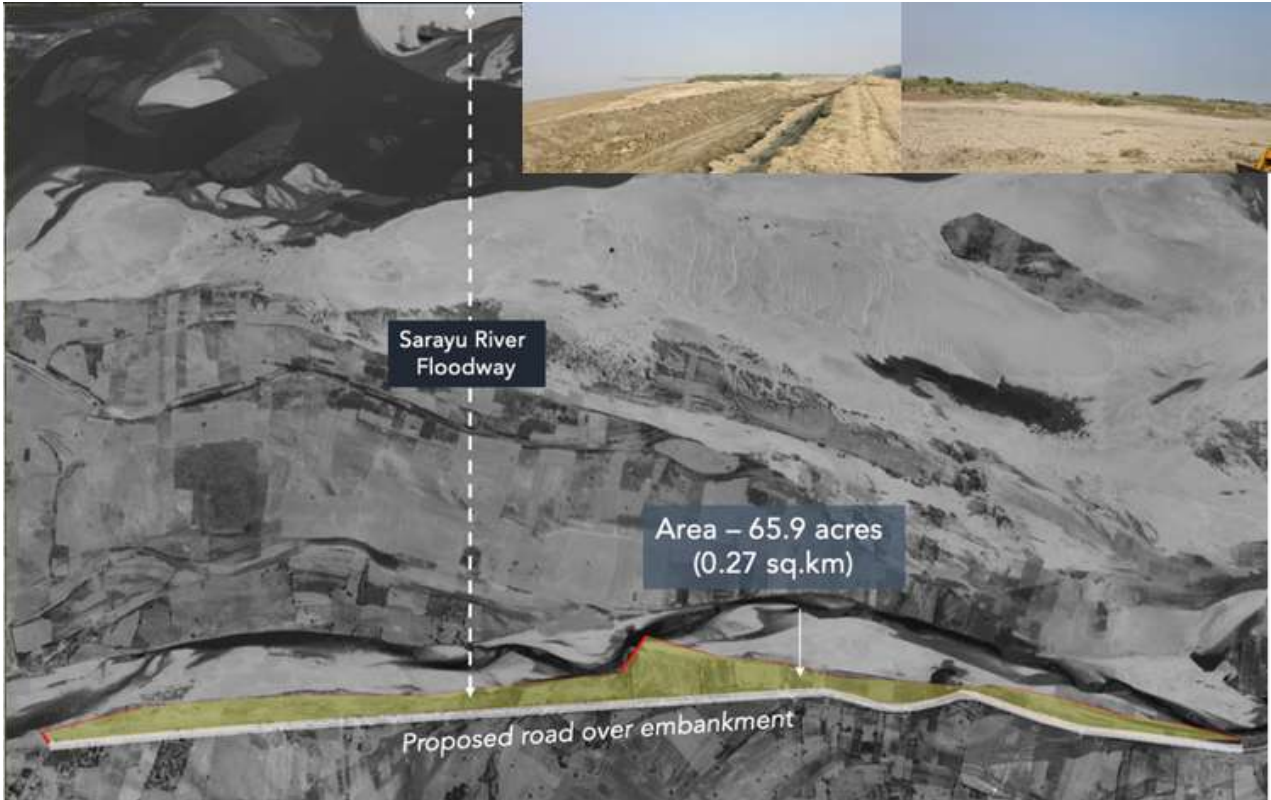


Image 31: The proposed site location (a mix of sand and deposition)

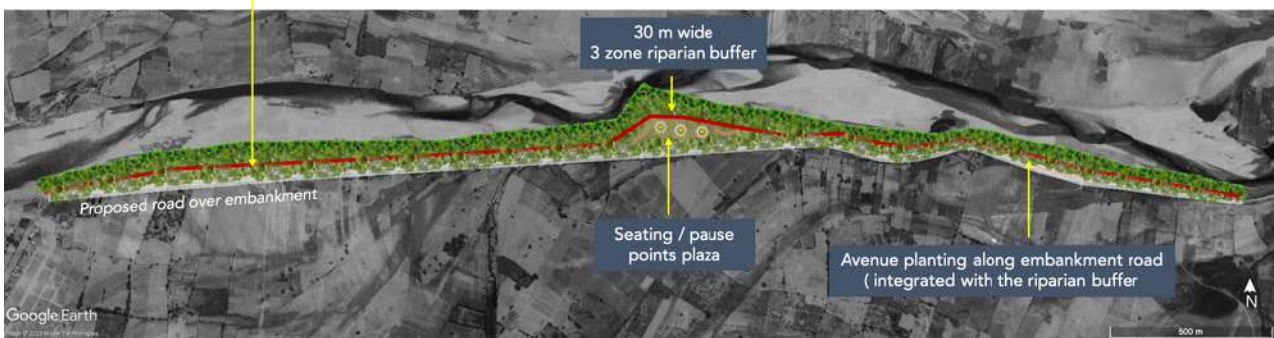


Image 32: Schematic showing the design element that can be integrated in the proposed site

The Master Plan of Ayodhya City is a vital instrument that can drive the mandate of provision of a minimum riparian buffer width range of 3m – 5m that runs continuously along River Sarayu in the long term. As a short term initiative, it is recommended that the draft master plan 2031 include a mandate width of 1m continuous riparian buffer/natural river edge in the zones where embankment or any physical infrastructure is already present along the river and a width of 3m – 5m in the remaining greenfield areas of the riverfront.

3.4.2 Defining the riparian on the opposite edge along Saryu River

The opposite edge of Saryu River has not yet been impacted by anthropogenic activities and therefore provides an opportunity to provide for a continuous yet functional riparian buffer across the opposite edge of Saryu River within the jurisdictions of Ayodhya Development Authority.

The width of riparian buffer strips depends on the soil and relief conditions of the adjacent landscape and normally lies between 5 and 50 m. It is recommended that a buffer of 10 –15 m be provided so that there is scope for integrating ecological benefits without compromising on the riparian rights of locals or tourists visiting Sarayu. As part of urban flood control, a combination of hybrid green – grey bioengineering solutions such as earth berm levees, grasscrete embankments, earthen embankments, vegetated gabion box walls etc maybe utilised. Together combined with the riparian buffer and the floodplain this can help mitigate the impact of floods immensely in a practical and sustainable fashion.

Compensatory Afforestation fund Management and Planing Authority (CAMPA) funds can help carry out activities related to strengthening of the riparian buffer along the river banks. Viability Gap Funding (VGF) and Centre/State Finance Commission Grants are also potential avenues of finance for implementation of green – grey integrated riparian solutions as well. 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, State Forest Department, ADA, ANN and Irrigation Department can either independently or jointly develop land for the proposed plantation.

Ayodhya master plan can drive a mandate for a minimum riparian buffer width range of 3m – 5m that runs continuously along River Sarayu in the long term. Considering the pristine nature of the riparian edge on this part of Sarayu, this is a golden opportunity for the city to develop and implement a unique riparian buffer strategy that shall be one-of-its-kind not just within Ayodhya but India as well.

(Map 8) identifies the potential stretches along the opposite edge of River Sarayu within extended ADA limit that need to be conserved.

Following (Table 14) is a template palette for how this may be achieved.

Table 18: Riparian modifications along Sarayu river edge

S.No	Profile section of riparian buffer	Function / benefits
1.	<p><i>Natural</i></p>	<p>Phytoremediation Soil stabilisation Run off capture and groundwater recharge Supports urban biodiversity</p>
2.	<p><i>Ghat integrated with riparian buffer</i></p>	<p>Economic Phytoremediation Soil stabilisation Run off capture and groundwater recharge Supports urban biodiversity</p>
3.	<p>A. Planting concrete revetment</p> <p>① Porous green concrete precast block ② Ballast ③ Non-woven fabrics</p> <p>D. Ecological stone cage revetment</p> <p>④ Stone cage wall ⑤ Reinforced concrete floor ⑥ Plain concrete foundation</p> <p><i>Riparian with nature based embankments</i></p>	<p>Flood control Economic Phytoremediation Soil stabilisation Run off capture and groundwater recharge Supports urban biodiversity</p>

3.4.3 Defining a functional riparian and riverfront planting palette for River Sarayu

The strength of riparian buffer is majorly dependent on the presence of plant species which is even better if it is native. A healthy riparian buffer along Sarayu signifies a healthy Sarayu river. Selection of species for riparian buffer need to be done on the basis of function to be achieved and the kind of issue to address. A riparian buffer does not merely constitute a green vegetative cover but also includes the natural scrubland and sand bars / spits along the river planform as well (**Image 33**). Further the health of riparian buffer is also dependent on the kind of plants used as part of riverfront development as well. At present there is a dearth of proper repository of plant species suitable for the riparian buffer and riverfront development along Sarayu.



Image 33: Example of a natural river edge with riparian buffer and sand spits/sand bars etc.

Table 16 comprises some ideal plant species matched against their functions in the context of River Sarayu :-

Table 19: *Permissible planting palletete for riparian buffer and riverfront

S.No	Plant species	Type	Function
1.	<i>Saccharum spontaneum</i> (Kans), <i>Chrysopogon zizanioides</i> (Vetiver), <i>Bambusa arundinacea</i> (Giant Thorny Bamboo), <i>Imperata cylindrica</i> (Cogon)	Grasses	Soil stabilisation - riparian buffer
	<i>Melia azedarach</i> (Indian lilac), <i>Senegalia catechu</i> (Kher), <i>Butea monosperma</i> (Palash), <i>Pandanus odoratissimus</i> (Keora /Screwpine)	Shrubs / Short trees	
	<i>Bombax ceiba</i> (Silk cotton), <i>Dalbergia sissoo</i> (Indian Rosewood), <i>Terminalia arjuna</i> (Arjun), <i>Pongamia pinnata</i> (Karanja) <i>Syzygium cuminii</i> (Black Plum)	Trees	
2.	<i>Acorus calamus</i> (Sweet flag, HM) <i>Brassica juncea</i> (Indian mustard, HM)	Grasses	Phytoremediation - riparian buffer (HM - Heavy metals, As - Arsenic)
	<i>Nerium oleander</i> (Nerium, HM), <i>Ocimum sanctum</i> (Tulsi, HM), <i>Canna indica</i> (Canna, HM)	Shrubs / Short trees	
	<i>Dalbergia sissoo</i> (Indian Rosewood, HM) <i>Terminalia arjuna</i> (Arjuna, As), <i>Nauclea orientalis</i> (Nichul, HM),	Trees	
3.	<i>Imperata cylindrica</i> (Cogon), <i>Moringa olifera</i> (Drumsticks)	Grasses/ Shrubs /trees	Scrublands and vegetated sand spits
4.	<i>Borassus flabellifer</i> (Asian Palymra), <i>Butea monosperma</i> (Palash), <i>Saraca asoca</i> (Ashoka)	Shrubs / trees	Focal planting - river front and floodplain

**The list is not exhaustive and may be modified depending on further knowledge*

Likewise, it is also important to have a clear understanding of the plant species that need to be avoided in the context of riparian buffer or riverfront development so as to prevent the attraction of larger wildlife such as monkeys, wild pigs etc. or invasive species that can turn into a health hazard for humans as well. Ayodhya just like many of urban cities specifically temple cities too experience a huge monkey menace. The antics of monkeys are a case of urban wildlife syndrome of which one mode of control is via avoiding planting those species that monkeys prefer within the city.

Following (Table 20) are a list of some species that need to be avoided in the urban context. This list is not exhaustive and require constant upgradation of research to be in loop regarding invasives.

Table 20: *Permissible planting pallette for riparian buffer and riverfront

S.No	Plant species	Type	Potential substitutes
1.	<i>Lantana camara</i> (West Lantana)	Shrubs	<i>Nerium oleander</i> (Nerium), <i>Ixora sp.</i> , <i>Tabernaemontana divaricate</i> (crepe jasmine)
2.	<i>Sphagneticola trilobata</i> (Wedelia) <i>Parthenium hysterophorus</i> (Carrot grass), <i>Alternanthera philoxeroides</i> (Aligator weed)	Grasses	<i>Brassica juncea</i> (Indian mustard), <i>pennisetum setaceum</i> (fountain grass)
3.	<i>Leucaena leucocephala</i> (River Tamarind)	Trees	<i>Tamarindus indica</i> (Indian Tamarind)
4.	<i>Pontederia crassipes</i> (Water hyacinth) <i>Pistia stratiotes</i> (Water lettuce),	Aquatic plants	<i>Nelumbo nucifera</i> (lotus), <i>Nymphaea nouchali</i> (blue lotus),

**The list is not exhaustive and may be modified depending on further knowledge*

The overall budget for this intervention is dependent largely on the source of the saplings. Transplantation of focal trees of importance from one area to another would require more funds depending on the sensitivity involved. The actual costs will vary when DPRs or detailed activities are developed. The primary mode of finances for this intervention would be leveraging funds from national missions. This intervention is under the jurisdiction of multiple agencies from the land ownership perspective. The agency owning the land parcel

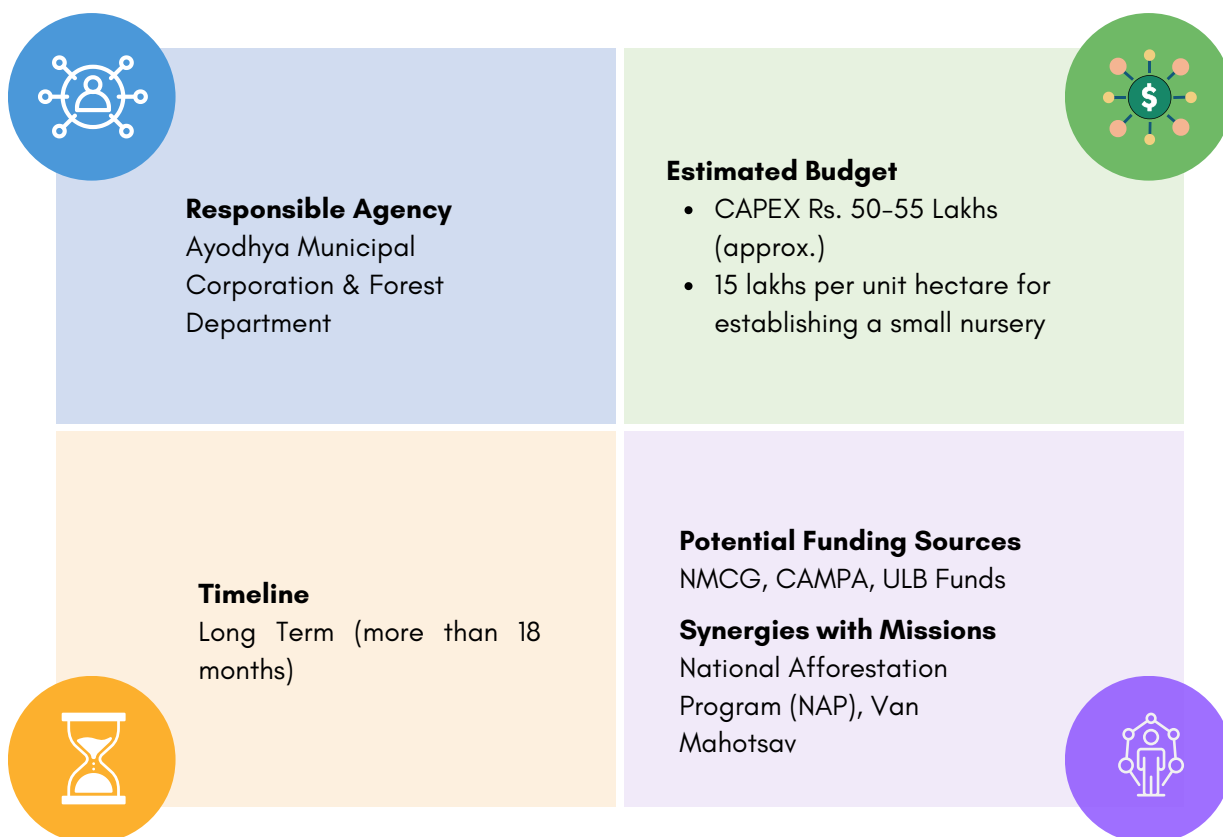
would have to propose riparian zone development and bear the expenditure. Considering this, State Forest Department, ADA, ANN and Irrigation Department can either independently or jointly develop land for the proposed plantation.

Sources of funding include CAMPA, State Forest Department, CSR, VGF, Centre/State Finance Commission Grants

This intervention majorly falls under the Forest Department however universities, local NGOs and specialists too can contribute towards building a growing compendium comprising a list of permissible and non-permissible planting palletete. The state forest department along with Ayodhya Nagar Nigam and Irrigation department need to be actively involved in ensuring that the palletete is followed and implemented in the on-going and future projects as well. Equal efforts need to be undertaken to enhance the existing plant nurseries in Ayodhya in support of the palletete.

At present Ayodhya draft master plan 2031 does not include any planting palletete comprising its native species or invasive ones. Therefore it is recommended that a detailed palletete upon due explorationis developed and made part of the Ayodhya master plan in order to regulate the planting across Sarayu riverfront and subsequently the city.

Summary of the intervention







3.5 Intervention strategy for reuse of treated wastewater

Ayodhya Nagar Nigam is currently failing to reuse treated wastewater generated from its existing 12 MLD STP due to two major reasons :-

- Poor quality of treated wastewater at the outlet due to improper functioning of the STP (the BOD is far more than the prescribed limit of the STP outlet)
- No strategy for the reuse of treated wastewater

As the city is moving towards 100 percent coverage of the sewer network in the corporation area, more than 100 MLD treated wastewater will be generated once all the households are connected to the sewer line. The city has huge potential to reuse this treated wastewater by doing the following (**Image 34**)

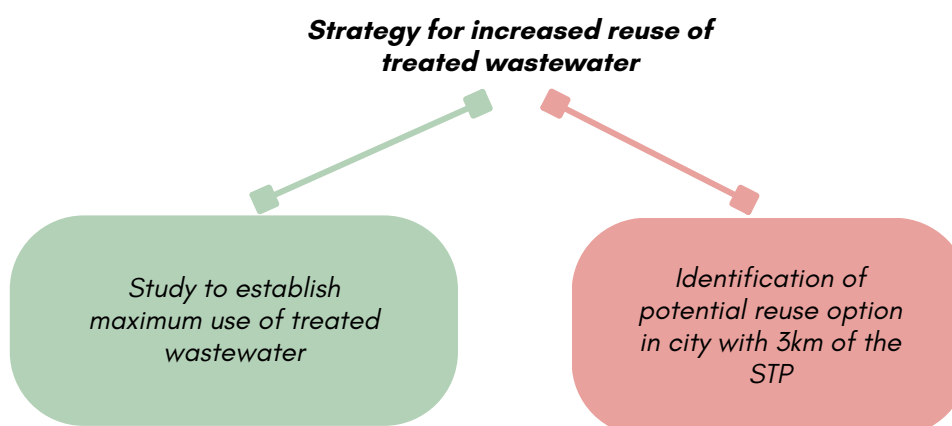
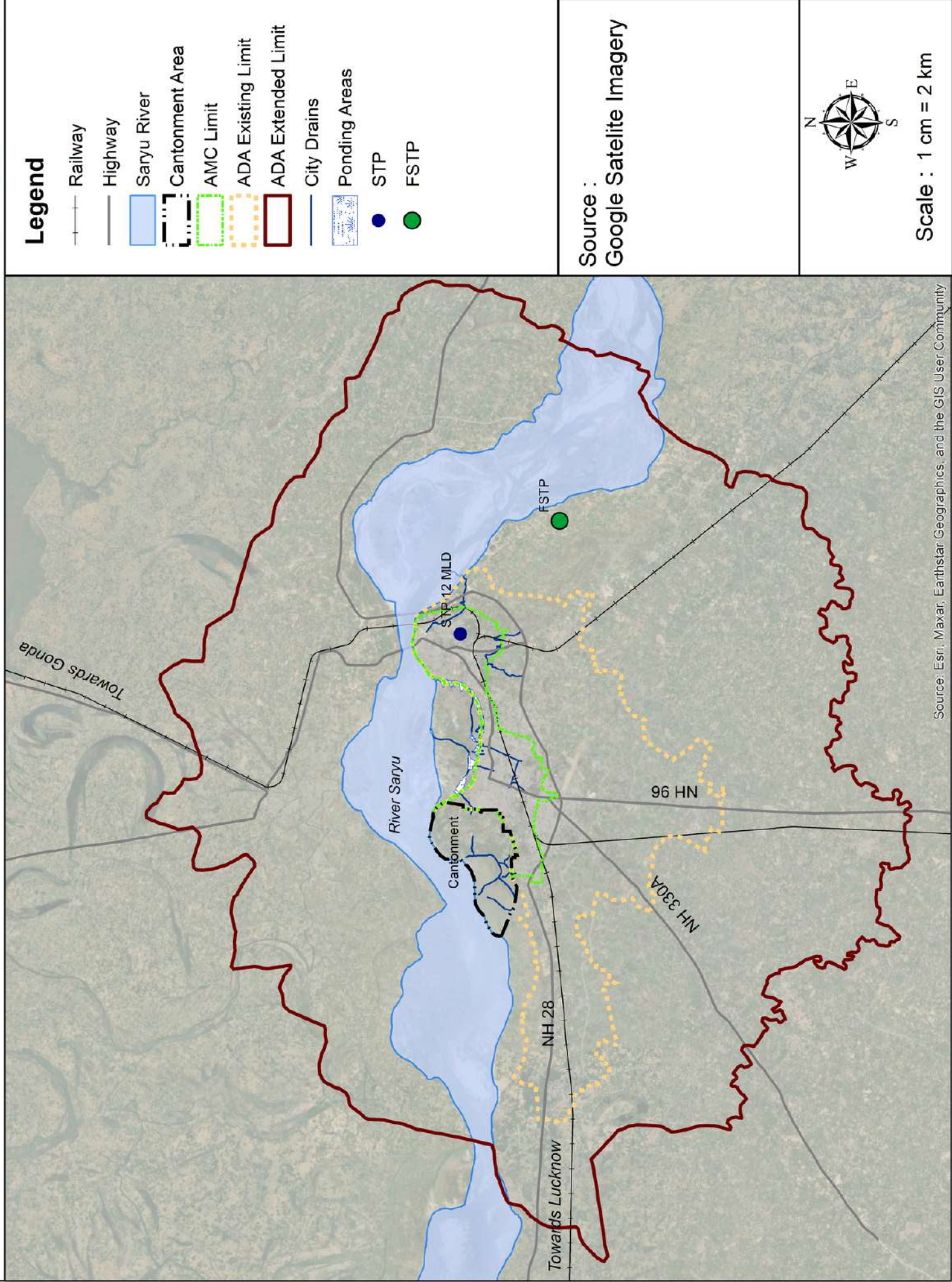


Image 34: Treated wastewater reuse strategy in Ayodhya

Currently, the city is generating and treating around 12 MLD of wastewater, of which 10 MLD of treated wastewater is being generated. The city needs to :-

- Upgrade the existing 12 MLD STP (**Map 9**) so that it complies with the CPCB standard for STP outlet water quality parameters.
- Determine the potential of reusing this treated wastewater for diverse purposes such as horticulture, irrigation, road cleaning, bus washing, Railway station use, satisfying industrial water demand, reviving water bodies, and developing artificial water bodies, among others.
- Mechanism for reuse of treated wastewater for the intended purposes and will address infrastructure requirements for conveying and storing wastewater, cost-benefit analysis, operation and maintenance, and so on.

URMP Ayodhya: Liquid Waste Management



Map 9: Map showing FSTP and STP locations in Ayodhya city

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

URMP Ayodhya: Treated Wastewater Reuse



Legend

- Saryu River
- Railway
- Highway
- Landmarks
- AMC Limit
- ADA Existing Limit
- STP**
- Existing 12 MLD
- Under Construction 6 MLD
- STP_Buffer3km
- Railway Station
- Park
- Open Space

Treated wastewater can be reused in parks and railway stations within 3km radius of STP

Source-
Uttar Pradesh Jal Nigam
Ayodhya Development Authority



Scale : 1 cm = 0.3 km

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Map 10: Map showing 3km buffer

Table 21 presents the details of all the parks, water bodies, Railway stations, Bus stands, and Cricket stadiums within 3km of 12 MLD STP, while **Map 10** has their spatial representation. The total water requirement of a railway station is around 4 MLD, all parks and sports stadium within 3 km of the STPs is 4.6 MLD. Thus, there is enough treated wastewater available to meet the horticulture, irrigation and other demands in the vicinity. Under AMRUT 2.0 mission, the city needs to fulfil its large amount of water demand by reusing treated wastewater. This initiative will help Ayodhya in achieving this goal. The funding source for this initiative can be Namami Gange mission, Central Finance Commission, AMRUT 2.0 etc.

Table 21: Potential reuse areas and their water requirements within 3km buffer

S.No.	Locations	Water Requirement
1	Bus Stand 2 Bus Stand under 3km vicinity of 12 MLD STP Total Water required = No. of buses x 100L	100L/day/bus
2	Railway Station 1 Railway Junction under the vicinity	Around 4 MLD
3	Parks and Sports stadium 7 parks and 1 sports stadium under the vicinity Total area - 92.9 Hac.	4.6 MLD (@25,000L/Hac)
4	Reviving Waterbodies <i>One time use of treated wastewater</i> 17 waterbodies with area 48 Hac.	Remaining Water

Summary of the intervention



Monkeys feeding on prasad offered by devotees along Naya Ghat, Ayodhya







3.6 Interventions to develop eco-friendly riverfront projects

3.6.1 Re-envisioning Sarayu riverfront to make it eco-friendly

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 while not compromising on the ecological sensitivity of the ecosystem. However the environmental aspects tend to get lost in the process of beautifying and monetising the riverfront.

In the case of Ayodhya , the stretch of Sarayu River within the administrative limits is around 25 kms and there are around 18 - 20 major ghats located on its banks. Most of these are frequented by citizens and tourists for religious purposes. Out of these ghats, Guptar Ghat ([Image 35](#)) is used for recreational activities as well while maximum footfall is received by Guptar Ghat and Naya Ghat/Ram Ki Paidi specifically during religious festivities like Ram Navami and Diwali.



Image 35: View of Guptar Ghat along Sarayu

Despite having long river frontage, the avenue for people to connect with the river is mostly in the form of ghats. Many of the ghats are not even frequented by people. Stretches of riverfront beyond Naya ghat and Guptar ghat is within cantonment limits, part of the stretch is dhobi ghat (for cloth washing) and rest of the stretch lies pristine with moderate or no hardscape interventions ([Image 36](#)). Discussions are underway for preparation of proposals for parks and Ashok Vatika (a theme park based on Ramayan) along the riverfront however as such nothing has materialised on ground. Significant afforestation and plantation works

along the stretches of the Sarayu River banks by the ADA, ANN and Forest Department office have been carried out ; mostly in Guptar ghat area. Likewise a major portion of the riverfront near Guptar ghat has been converted into a parking lot for the visitors which has yet again contributed to increased hardscape near the river.



Image 36: View of river edge along Sarayu in the cantonment area

The present character is majorly more hardscape down south and more natural up north. This therefore creates the need for some form of riverfront development along Sarayu River comprising diverse kinds of riverfront projects (apart from Ghats) to add more variety and liveliness to the river in a eco-friendly manner.

Following are some practices that may be adopted across both existing and proposed ghats to make them more eco-friendly and sustainable in the long run :-

Segregation of waste into organic, plastic, others

Separate waste bins can be positioned across the ghats as part of recycling and sustainability strategy. The number of bins is decided on the basis of quantity of waste expected and the size of bin being proposed. Using monkey proof waste bins (**Image 37**) to segregate waste can help ensure the success of this practice.



Image 37: Monkey proof waste bin sample models that can be used along Sarayu ghats.

Similarly reverse vending machines may be positioned across the ghats wherein waste goods made of plastic, metal etc. may be exchanged in return for cash back, material goods etc (**Image 38**).

along the stretches of the Sarayu River banks by the ADA, ANN and Forest Department office have been carried out ; mostly in Guptar ghat area. Likewise a major portion of the riverfront near Guptar ghat has been converted into a parking lot for the visitors which has yet again contributed to increased hardscape near the river.



Image 38: Reverse vending machine sample models that can be used along Sarayu ghats.

Rain garden patches

Rain gardens or bioretention systems may be incorporated across the ghats in Sarayu as small patches to soften the overall hardscape while simultaneously increasing the stormwater runoff reabsorption by the soil (**Image 39**). Additional benefits include reduction in urban heat island effect, increased urban biodiversity, groundwater recharge and a source of ponding areas for temporary storage of surface water prior to evaporation, infiltration or plant uptake.



Image 39: A photomontage showing rain garden patch incorporated in Guptar Ghat along River Sarayu.

Green embankments

As an eco - friendly measure, the prevailing embankments may be turned into green embankments by enhancing the existent green cover using native grasses and other similar plant species. This will not only soften the overall embankment hardscape but also provides added provision of stormwater runoff reabsorption by the soil, reduce urban heat island effect, increased urban biodiversity, etc. (Image 40). Likewise embankments if proposed along the riverfront may be made eco - friendly through strategies as suggested in **intervention 3.4.1**.



Image 40: A photomontage showing how an embankment along Sarayu will appear post greening

Seating integrated planting for wildlife habitat enhancement

Installations integrating seating with planting when proposed across the ghats along Sarayu can help to soften the overall hardscape while simultaneously increasing the stormwater runoff reabsorption by the soil (Image 41).



Image 41: Examples of green integrated urban furniture for use along riverfronts

This intervention majorly falls under the Ayodhya Development Authority, Ayodhya Nagar Nigam, State Forest Department, Irrigation and Water Resource Departments. These agencies need to actively take initiative to coordinate with concerned NGOs or organisations to arrange for the above discussed infrastructure. At present a lot of initiatives are being undertaken along lines of sustainability but these are mostly limited to Guptar Ghat, Ram Ki Paidi and Naya Ghat. Therefore if these practices are integrated along with the existing ongoing initiatives, it can help strengthen the river – city sensitivity.

At present Ayodhya draft master plan 2031 does not include any palette comprising eco-friendly hardscape materials to be used along the riverfront. Therefore it is recommended that a detailed list upon due exploration is developed and made part of the Ayodhya master plan in order to regulate the aspect of environmental sensitivity and sustainability across Sarayu riverfront and subsequently the city.

3.6.2 Landscaping design for Ram Van Marg park along Guptar Ghat

Guptar ghat is one of the prominent ghats along Sarayu which therefore makes it an important stretch for a lot of riverfront development to take place. At present one such extent of Guptar Ghat near Maharana Pratap Statue has been selected to develop Ram Van Marg Park. The present proposal will indeed add both aesthetic and economic value to the river however it holds immense potential for further enhancement to as part of citizen – Sarayu along with other regular benefits while not compromising on the ecological sensitivity of the ecosystem. This can be achieved by banking on the historic and cultural aspects of Ayodhya.

This intervention falls under Phase 3 of Guptar Ghat Riverfront Beautification project (**Image 42**) Phase 1 and 2 comprise parking majorly which is already close to completion. At present the proposed site for Ram Van Marg park is acting as an afforestation initiative site of the Forest Department until the actual design proposal is implemented. Further it is also noted that a fencing done along the river facing edge of the site prevents any probable river – citizen connect by blocking the visual connect with Sarayu.

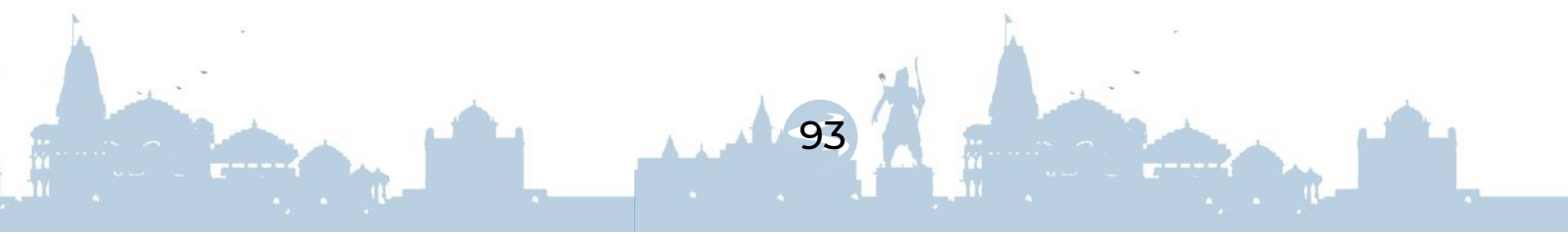
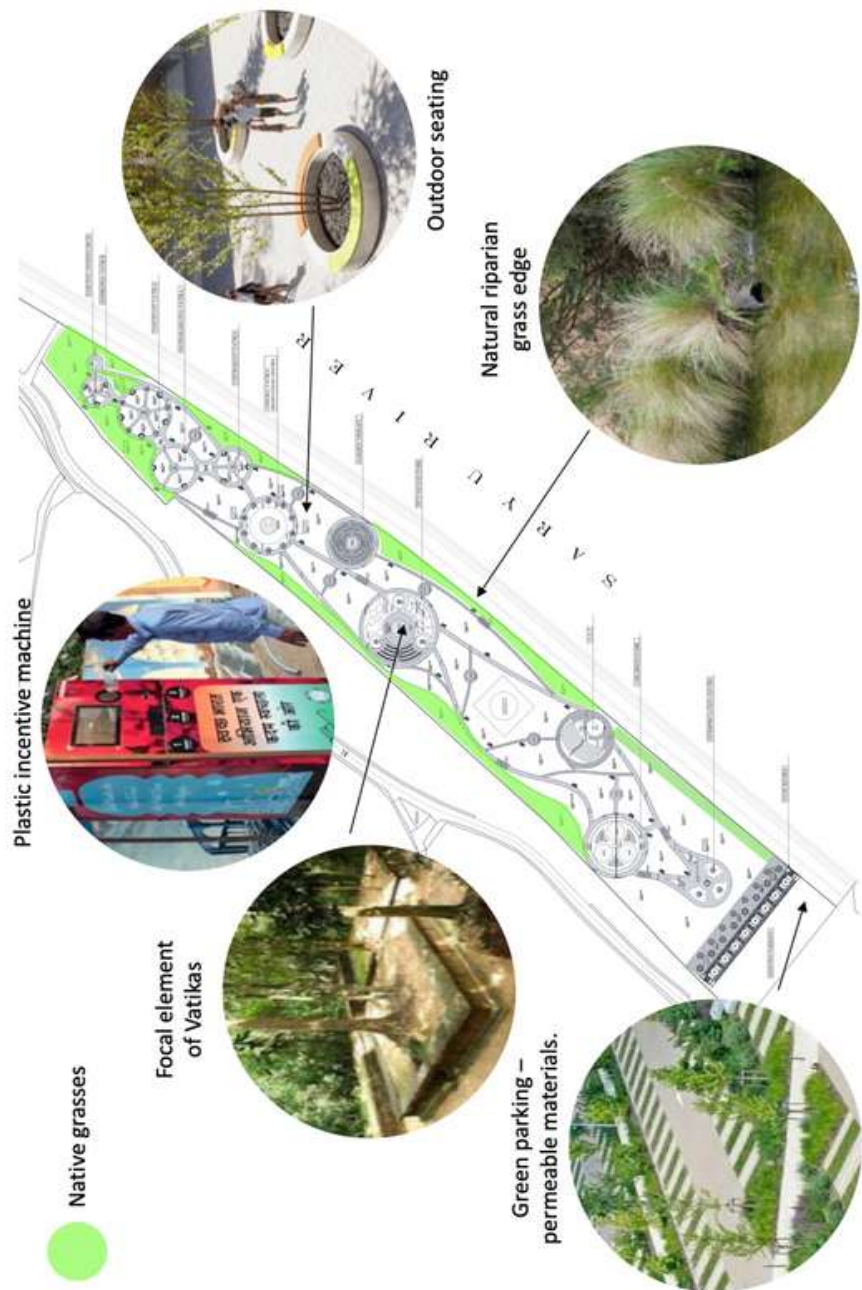
With a site area of 36749.05 sq.m, the present project proposal conceptual design plan as developed by Ayodhya Development Authority may be revamped with key highlights and unique features (**Image 43**) in lines with the 10 point framework agenda of URMP.

This intervention majorly falls under the ADA, ANN, State Forest Department, Irrigation and Water Resource Departments. These agencies need to actively take initiative to coordinate with concerned NGOs or organisations to arrange for the above discussed infrastructure. This proposal shall be successful in the long run if integrated with interventions under **objective 4**. Strict monitoring on parts of ADA, ANN and Forest Department is relevant to ensure that design is implemented as per the DPR.



Image 42: Gupta Riverfront Beautification project by ADA

Image 43: Conceptual landscape design proposal for Ram Van Marg Park



3.6.3 Re-envisioning Sarayu riverfront of Ayodhya to make it inclusive

Riverfronts are an important public element that not only shape urban social life but also equally contribute towards equity and inclusivity in the cities. While dialogue between rivers and built infrastructure have always been enforced, aspects of inclusivity have been left behind. A riverfront is said to be truly inclusive when it has embodied all the three facets of inclusivity namely social, spatial and economic; therefore satisfying all individuals in a society.

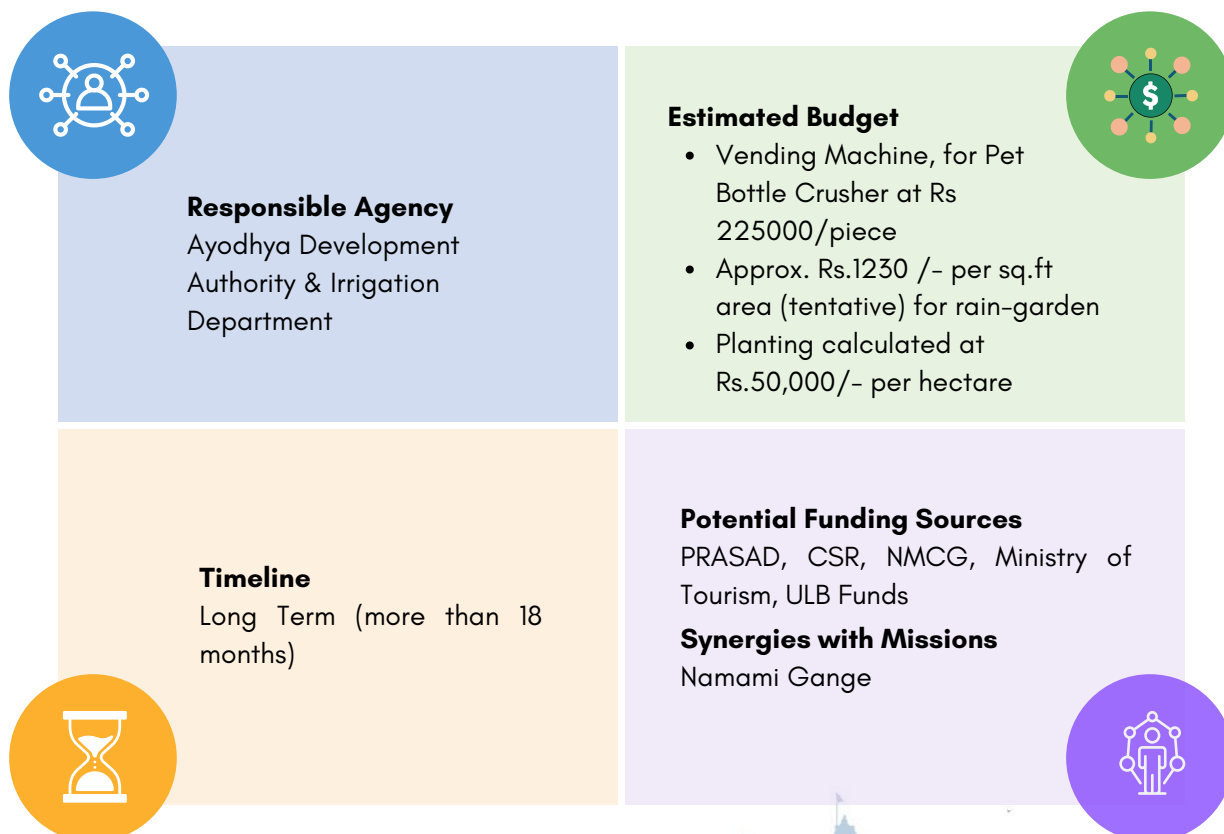
In the case of Ayodhya , major public elements along Sarayu River in Ayodhya are non - inclusive although works are on route for making the riverfronts more inclusive.

Some practices that may be incorporated as part of making Sarayu inclusive are can be observed in (Image 44).



Image 44: Suggestive practices for achieving wholistic inclusivity across Sarayu Riverfronts

Summary of the intervention



A provision stall along Naya Ghat





3.7 Interventions to leverage economic potential of the river

3.7.1 River linked recreational activities to boost tourism in Ayodhya.

The historical importance of Ayodhya city and Saryu is known to all. Rivers have a tremendous economic value through the ecosystem it provides and the livelihood it supports. The following interventions are proposed to be undertaken by the city to boost the local tourism potential and enhance its economy by keeping the health of river and its surrounding environment at the core.

The Ayodhya Development Authority and Ayodhya Nagar Nigam are working progressively towards enhancing river linked economy by undertaking activities like religious activities at ghats, activities around showcasing the local culture and recreation for visitors coming to the city in the form of boating excursions. This is reflected in the URMindex score of 4 as scored by Ayodhya under **Objective 8** of the URMP framework. However there are various other avenues that can be explored by the city to leverage the economic potential of Saryu River.

Water sports at Guptar Ghat.

Kayaking (**Image 45**) is gaining a lot of attraction in the recent times. This sport activity is for adventure enthusiasts seeking adrenalin rush as well as to relax and feel closeness to the nature.. The expanse of Saryu River around Gupta Ghat and its braided nature, is ideal for the activity and presence of river islands further adds excitement to this water sport. The water depth of more than 2m, ideally required for kayaking is always available near the ghat thereby making this sport available to the tourists round the year.



Image 45: Kayaking

The city can invite expressions from potential vendors to provide services for implementation of the proposed sport at Guptar Ghat. The potential vendor to provide the kayaks as well as operate the same. A revenue sharing mechanism to be worked out to sustain the activity considering the O&M requirements and safety measures while operating the kayaks.



Image 46: Proposed location for kayaking on Sarayu River

3.7.2 Replacing fuel powered boats with E-boats for boating activity at Guptar Ghat and Ram ki Paidi

The regular diesel/fossil fuel powered boats are detrimental to the riverine biodiversity considering the noise pollution and vibrations it generates when in operation.

Recently, Hon'ble PM Sh. Narendra Modi launched India's first solar powered boats (**Image 47**) that produces much less noise and is also environmental friendly. With city expected to witness upward trend in number of tourists coming to city post completion of Ram Temple, replacing motor powered boats with e-boats will go long way in protecting the fragile riverine ecosystem. The Ayodhya Development Authority along with the tourism department shall educate the boat operators on harmful effects of motorboats and motivate to shift to e-boats by providing financial assistance in the form of subsidies.



Image 47: Hon'ble Prime Minister enjoying the ride on e-boat in Varanasi

3.7.3 Dolphin Point at Guptar Ghat

The dolphins are rare to sight and often evokes a sense of excitement amongst people watching them. Dolphin sighting at Cantonment and Guptar Ghat have often been reported. It is proposed to install a watch tower (Dolphin Point) for nature lovers to see this amazing animal. The dolphin point (**Image 48**) can act as a selfie point for visitors. The key objective here is to revive the river-citizen connect. To. The dolphin point shall be constructed using friendly construction material so as not to harm the riverine health.



Image 48: A representative image of Dolphin Point

3.7.3 Designating Sarayu River stretch within ADA limit as river sanctuary

The Wildlife Protection Act, 1972 states that the State Government may, by notification, declare its intention to constitute any area other than an area comprised within any reserve forest or the territorial waters as a sanctuary if it considers that such area is of adequate ecological, faunal, floral, geomorphological, natural or zoological significance, for the purpose of protecting, propagating or developing wild life or its environment. In accordance with the same, measures may be undertaken towards establishing the extent of Sarayu flowing through Ayodhya as a river sanctuary. River sanctuaries are narrow linear eco-reserves that span a certain extent while supporting a rich biodiversity. This is yet another one-of-a-kind intervention as there are very few recognised river sanctuaries in India and the world.

The extent of River Sarayu and its river islands within the extended ADA limit are home to gharials, Gangetic dolphins, freshwater turtles (Image 49) and even the rare Gangetic Shark. Introducing selective activities can help foster a river-people connection on an ecological front while also boosting environment-based tourism in addition to providing a safe haven for the flora and faunal biodiversity.



Image 49: View of freshwater turtles along the river island edge in Sarayu River

This initiative to be undertaken by agencies like ADA, State Forest dept, Irrigation and Water Resources dept, Tourism Dept. These agencies need to actively take initiative to coordinate and prepare detailed plan. The proposed activities (Image 50) can be implemented in a controlled and regulated manner in line with environmental considerations. In the case of river islands in particular, designated zones for human congregation and activities (Image 51) need to be allotted. The entire arrangement can be a ticket-based system. Strict measures such as recognising the sanctuary as a plastic and waste-free zone need to be executed as well. In the case of this intervention, higher weightage and priority needs to be provided towards the wildlife over touristic activities for public leisure.



Image 50: Potential activities that can generate economy as part of the river sanctuary

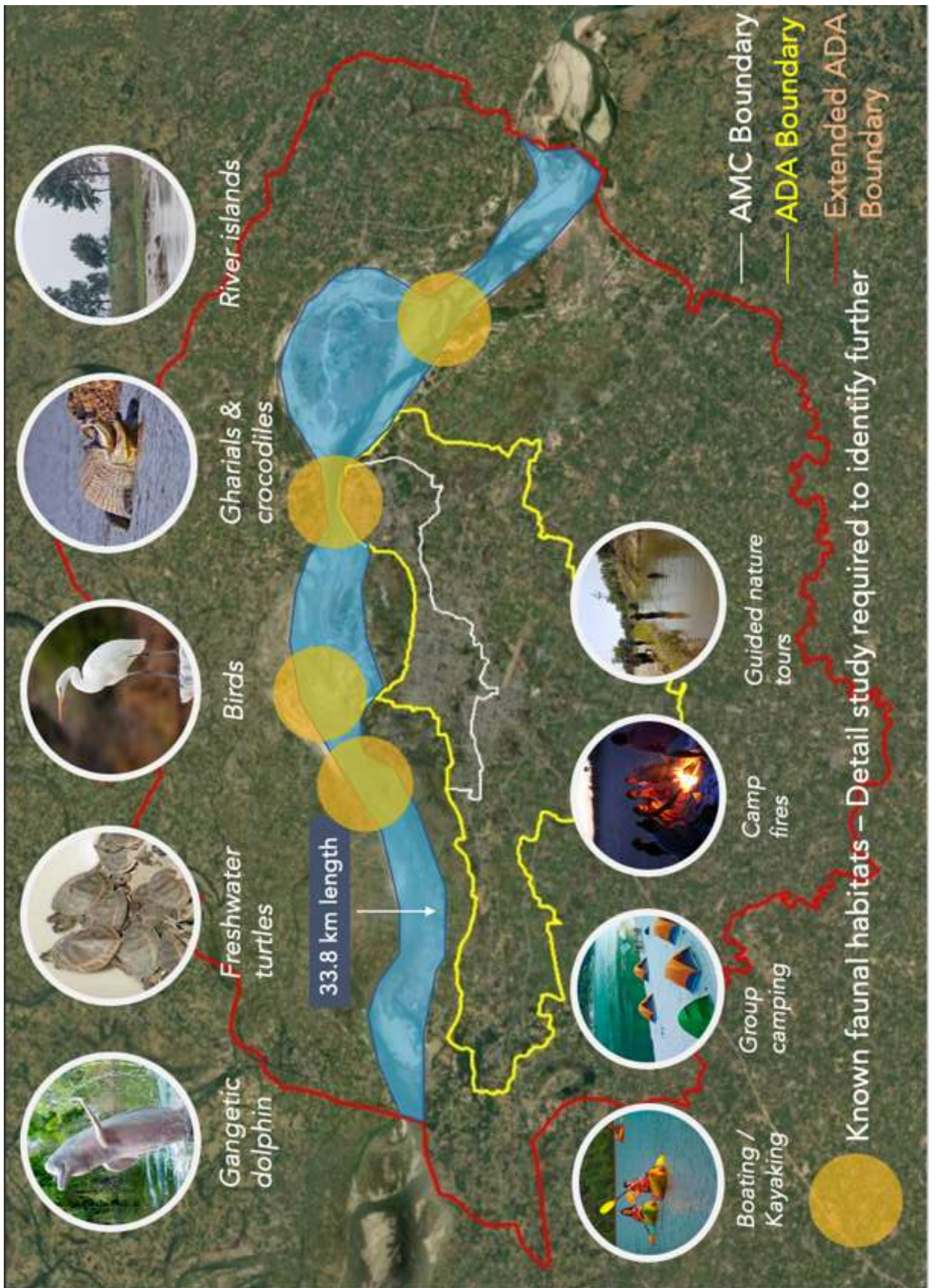


Image 51: Proposed extent of river sanctuary and the diversity supported

3.7.3 Promoting community based organic farming through agritourism

River islands and river floodplains are critical eco - sensitive areas that are often used by humans for agriculture (Image 52) due to the abundance of soil fertility and water availability. But this usually comes at an expense of nature as the practices and crops grown are usually detrimental for the riverine biodiversity. In view of the same, this intervention has been conceptualised.



Image 52: Informal agriculture site on riverine island of Sarayu River

India is predominantly an agrarian nation and therefore the concept of river centric agro based tourism can be introduced in Ayodhya as part of connecting people to the relevance of farming in today's times. This intervention (Image 53, 54) when viewed in harmony with the sanctuary shall foster the ecological sensitivity among the general public of Ayodhya without compromising on economic inclusivity of the society.





Image 53: The concept of agri-tourism and how the existing activities can be used for leveraging economy in Ayodhya



Image 54: Benefits of agri-tourism for the associated stakeholders

This intervention to be jointly undertaken by the Ayodhya Development Authority, Ayodhya Nagar Nigam, Irrigation and Water Resource Departments, Tourism and Agriculture Department. Agrarian river centric regulations supported by the upcoming riverine island policy as discussed in **Objective 1** shall spearhead this intervention. Native conventional and unconventional crop species that are not only beacons for wildlife but with economic benefits such as Brassica juncea (Indian mustard), millets, Camel Grass (Vetiver), oilseed cultivation etc. need be adopted. The capacities of farmers towards organic farming and the use of native riverine biodiversity friendly crops need to be built with support of agricultural universities. A committee comprising a cohort of specialists such as local farmers, botanists, ecologists, landscape architects, environmental planners along with state forest and agriculture department officials need to be brought in as part of building a repository of native riverine biodiversity friendly crop species.

Summary of the intervention

 <p>Responsible Agency Ayodhya Development Authority, Forest, Irrigation & Tourism Department</p>	 <p>Estimated Budget</p> <ul style="list-style-type: none"> Rs. 35,000/Kayak Rs. 2 Lakh/E-Boat Rs. 8-10 lakh/Watchtower Rs. 40 lakhs (4 room stay & 5 acres organic farming) Approx. 3-4 crores for river sanctuary
 <p>Timeline Long Term (more than 18 months)</p>	<p>Potential Funding Sources CAMP, NMCG, CSR, Ministry of Tourism, ULB Funds</p> <p>Synergies with Missions National Biodiversity Mission, NDTM, National Mission for Sustainable Agriculture, Namami Gange</p> 





9



River-sensitive Behaviour among Citizens



10



Engage Citizens in River Management Activities



3.8 Interventions to inculcate river-sensitive behaviour & citizen engagement

There is a limited number of activities being done by Ayodhya Nagar Nigam for sensitizing people to the River. Although these initiatives have made some impact but the city needs to adopt new initiatives to bring change in people's behaviour towards the river. There is a need for a dedicated river-based sensitization program, where a set of interventions needs to be adopted to connect youth and local people to the Sarayu River. A list of interventions under the river-based sensitized program has been provided below in **(Table 18)**

The proposed activities can be leveraged on existing structures of National Cadet Corps (NCC), Nehru Yuva Kendra Sangathan (NYKS), Ganga Praharis, National Service Scheme (NSS) etc.

3.8.1 Connect youth to Sarayu River

It is crucial to connect youth to the river and involve them in river conservation and rejuvenation activities. To achieve this, city should map all the schools and colleges in Ayodhya and earmark a dedicated space along the River stretch for schools and colleges to organize classes for students. This will give youth space and the occasion to know more about the Sarayu river and inculcate sensitivity towards it.

3.8.2 Sensitize youth for river conservation

The youth being the future of tomorrow can be roped into the aspect of river conservation under a variety of activities **(Image 55)** such as organizing thematic painting competitions along ghats (on important international days like International River Day etc.), marathons, essay competitions, poetry competitions etc. with theme of river conservation.



Image 55: Youth taking active involvement in conservation

3.8.3 Sarayu Nadi Utsav to celebrate Sarayu

"I will urge people in to observe 'Nadi Utsav (river festivals)' once a year, and a day may be fixed for it. It will help spread awareness among people regarding the proper utilisation of water,"

Hon'ble Prime Minister Sh. Narendra Modi

Celebrate sarayu utsav (**Image 56**) in line with the Nadi Utsav once a year by organizing different activities like cleanliness drive, Ghat pe yoga, cultural programs on Guptar and Naya Ghat etc. Sarayu utsav can also be integrated with Ganga Utsav celebrated every year in the first week of November



Image 56: Some activities that can be carried out during Sarayu Utsav

3.8.4 Celebrate Sarayu Sandhya

Every month, one evening would be designated as Saryu Sandhya. Local artists and Ayodhya's intangible legacy (nukkad natak, Ramkatha, music shows, sitar shows, dance shows, etc.) can be promoted through the events. The city has already identified some of the intangible heritage of the Ayodhya region, and the same data can be utilized to organize the Sarayu Sandhya.

This would allow the citizens of Ayodhya an opportunity to connect with the local culture and also to the Sarayu river. These programs could be centred on the significance of conserving and protecting the Sarayu River.



Image 57: Some activities that can be carried out during Sarayu Sandhya

3.8.5 Create a Sarayu Connect Application

An application called 'Sarayu Connect' can be created to connect people to the Sarayu while also raising awareness among citizens. The application may provide information about various events and activities taking place in Guptar Ghat and Naya Ghat, as well as assist benefits such as booking boat excursions, kayaking, and Dolphin Point, heritage walks, Ram Mandir Darshan, and so on.

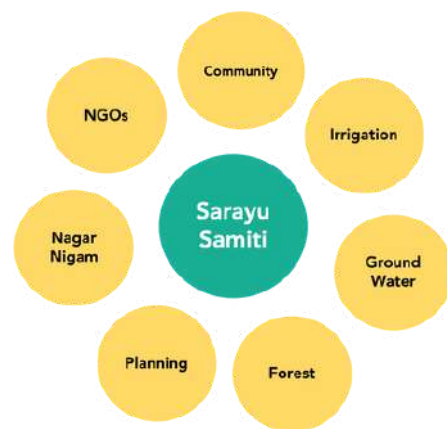


Some of the possible features of the Applications

3.8.6 Create a Sarayu Samiti

Sarayu Samiti can be created constituting the different departments concerning to river system and communities. The Samiti will be chaired by Commissioner (AMC)/ VC (ADA) and nodal officer to be nominated from each department.

One month one campaign needs to be run to generate awareness on different aspects related to river system like groundwater management, afforestation, agriculture etc.



Summary of the intervention

 <p>Responsible Agency Ayodhya Development Authority, Ayodhya Municipal Corporation, Tourism, Irrigation, Groundwater, Forest Department</p>	 <p>Estimated Budget</p> <ul style="list-style-type: none"> Rs. 2 Crore
 <p>Timeline Long Term (more than 18 months)</p>	<p>Potential Funding Sources CSR, NMCG, Ministry of Tourism, National Digital Tourism Mission, SBM, ULB Funds</p> <p>Synergies with Missions amami Gange, SBM, National Digital Tourism Mission (NDTM)</p> 

04



Locals near a waterbody in Ayodhya

M&E PLAN



4. URMP Ayodhya Monitoring & Evaluation 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 Ayodhya, 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 River Sarayu.

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 NIUA.

Table 18 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 organised chaired by the Commissioner to take stock of the progress made under the URMP, and examine the trend of the indicators.

Table 22 - URMP progress monitoring indicators

S.No	Name of indicator	Estimation measure (Details of calculations to be followed are in the guidance note for 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 waterbodies 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 riverbanks 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 an eco -friendly manner	Annual
9.	Citizen sensitisation score	Based on the modalities used for citizen sensitisation	Annual
10.	Citizen engagement score	Based on the modalities used for engaging citizens in river management activities	Annual

PROPOSED INTERVENTIONS

TABLE 1

S.NO	URMP Objective	Interventions (or projects)
1	To ensure effective regulation of activities in floodplain	1. Recommendations for River Centric Master Plan
2	To keep rivers free from pollution	2. City FSSM Plan
3	To rejuvenate waterbodies and wetlands in city	3. Waterbodies Database
		4. Waterbodies diagnosis using urbanwaterbody diagnostic tool.
		5. Protection of waterbodies by providing a 9 m buffer
4	To enhance the riparian buffer along river banks	6. Riparian Buffer
		7. Riparian Buffer on opposite edge of Sarayu
		8. Planting pallet for riparian buffer
5	To adopt increased reuse of treated wastewater	9. Reuse strategy for Ayodhya
6	To develop eco-friendly riverine projects	10. Eco-friendly strategy for existing river front - Ram ki Paidi - Naya Ghat
		11. Ram Van Marg Park Landscape Design
7	To leverage on the economic potential of river	12. Designating Sarayu River stretch within ADA limit as river sanctuary
		13. River linked recreational activities to boost tourism in Ayodhya City. 13.1 Water sports at Guptar Ghat. 13.2 Replacing fuel-powered boats with E-boats for boating activity at Guptar Ghat and Ram ki Paidi
		13.3 Dolphin Point at Guptar Ghat
		15. Promoting Organic farming through Agritourism
8	To inculcate river sensitive behaviour among citizens To engage citizens in river management activities	16. Connecting youth with Sarayu
		17. Sensitize youth for river conservation
		18. Sarayu Nadi Utsav to celebrate Sarayu
		19. Celebrate Sarayu Sandhya
		20. Create a Sarayu Connect Application
		21. Create a Sarayu Samiti
22. Dedicated River Day as Sarayu Diwas		

Timeline	Responsible agency	Synergy with national missions	Estimated Budget
Same as preparation of Master Plan	ADA	Namami Gange	NA
Short Term (6-9 months)	ADA	SBM, AMRUT	Rs. 35 lakh
Short Term (6-9 months)	AMC & ADA	AMRUT 2.0 Smart City Mission, Namami Gange	<ul style="list-style-type: none"> Rs.10-13 lakhs for database, Fencing – Barbed wire with concrete pole – Rs.1.20 lakh/acre, Riparian buffer – Rs. 50,00/hac
Short Term (6-9 months)	AMC & ADA	AMRUT 2.0 Smart City Mission,	
Medium Term (12-18 months)	AMC & ADA	AMRUT 2.0 Smart City Mission,	
Long Term (more than 18 months)	ADA, Forest Department	National Afforestation Program (NAP), Van Mahotsav	<ul style="list-style-type: none"> CAPEX Rs. 50-55 Lakhs (approx.) 15 lakhs per unit hectare for establishing a small nursery
Medium Term (12-18 months)	AMC	Swachh Bharat Mission, Jal Jeevan Mission, Namami Gange	One-time cost – Rs 10 lakh (2 tanker @6 cubic metres) Yearly o&m cost – Rs. 7.55 lakh
Long Term (more than 18 months)	ADA, Irrigation Department	Namami Gange	<ul style="list-style-type: none"> Vending Machine, for Pet Bottle Crusher at Rs 2.5 lakh/piece Approx. Rs.1230 /- per sq.ft area (tentative) for rain-garden Planting calculated at Rs.50,000/- per hectare
Long Term (more than 18 months)	Forest Department, Irrigation Department, ADA	National Biodiversity Mission under (PM-STIAC)	<ul style="list-style-type: none"> Rs. 35,000/Kayak Rs. 2 Lakh/E-Boat Rs. 8-10 lakh/Watchtower Rs. 40 lakhs (4 room stay & 5 acres organic farming) Approx. 3-4 crores for river sanctuary
	ADA, Tourism Department	National Digital Tourism Mission	
	Agriculture Department, ADA	National Mission for Sustainable Agriculture, Namami Gange	
Long Term (more than 18 months)	ADA, AMC	National Digital Tourism Mission	Rs. 2 Crore
		Namami Gange, SBM	
	ADA, AMC and Tourism Department	National Digital Tourism Mission	
	ADA, AMC, Tourism Department, Irrigation Department, Ground water Department, Forest Department	Namami Gange, SBM	
	ADA, AMC		

TOTAL

Rs. 8 - 10 Crore

Flood warning sign marked on Naya Ghat floodplain









NATIONAL MISSION FOR CLEAN GANGA

Ministry of Jal Shakti (Department of Water Resources, River Development & Ganga Rejuvenation) Government of India, 1st Floor, Major Dhyan Chand National Stadium India Gate, New Delhi - 110002

Telephone: +91-011-23072900-901
admin.nmcgenic.in; www.nmcg.nic.in



Nagar Nigam Ayodhya

Q4HP+GCF, Lajpat Nagar, Faizabad, Uttar Pradesh 224001

Telephone: 05278 223 164
<http://www.nagarnigamayodhya.in/>



National Institute of Urban Affairs (NIUA)

Ministry of Housing and Urban Affairs, Government of India, Core 4B, 1st Floor, India Habitat Centre (IHC), Lodhi Road, New Delhi - 110003

Telephone: 011 2461 7517 (ext. 214)
urvers@niua.org, <https://niua.in/waterandenvironment/>