

DRAFT URBAN RIVER MANAGEMENT PLAN HARIDWAR



**NAGAR NIGAM HARIDWAR
UTTARAKHAND
February, 2026**

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E. EXECUTIVE SUMMARY

A river and a city share an important relationship. The river supports the city by providing water, helping regulate the climate, and shaping the city's identity. In return, the city is responsible for protecting the river by conserving its catchment area, managing water flow, and preserving biodiversity. However, in recent years, this relationship has become unbalanced, with city relying on resources from rivers and disposing waste into them, which harms the river's health. The Urban River Management Plan (URMP) is a strategic framework that aims to restore this relationship by moving from exploitation of rivers to their protection and sustainable management.

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

The URMP proposes 14 tangible and practical actions along with several recommendations under a ten-point agenda (or objectives) to ensure the "Nirmal" (clean) and "Aviral" (continuous) nature of the rivers in the city. The level of detail for the interventions are presented is restricted to the concept idea level for general broad understanding, with Detailed Project Reports (DPRs) to be prepared subsequently. will be prepared for each intervention based on the concept ideas proposed in the document. The URMP document is a living document, evolving continuously to which will address emerging issues related to river management on continuous basis.

Approach adopted for preparing the URMP for Haridwar

To prepare the URMP, a Multistakeholder Working Group (MSWG) with the District Ganga Committee meeting was held. It comprises of 30 members from different organizations, chaired by the District Magistrate. It was set up to lead the development of the URMP for Haridwar. The team from NIUA and NMCG helped facilitate the MSWG meeting. This was followed by a rapid baseline assessment to understand river-related issues and challenges faced by the city and to identify opportunities for enhancing river-city interaction. The assessment was based on secondary data, published reports and ongoing projects. It covered planning provisions related to river, streams, drains etc.; status of river pollution and groundwater, encroachments in floodplain and ongoing projects in the city and waterbodies.

A second MSWG meeting was held under the chairpersonship of Municipal Commissioner, Haridwar to seek input from different actors for the development of the URMP. On the basis of the rapid baseline assessment and discussions with MSWG members, 14 projects/interventions were identified that will be taken up in Haridwar URMP.

Envisaged benefits of the URMP for Haridwar city

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

- ▶ It will improve climate resilience and environmental outlook of the city, making it more appealing to residents and visitors as well as help in providing ancillary benefits such as water pollution control, thriving biodiversity, flood mitigation and improved groundwater recharge.
- ▶ It will improve the connect between the residents and the river by creating avenues for recreation, social bonding and leisure thereby improving the quality of life of the residents.
- ▶ It will boost the city's river-related economy and provide livelihood for multiple stakeholders.

- The URMP will create a premise for shared governance with key stakeholders and citizens and enable them to take on a more active role in managing the city’s environmental assets and instilling a sense of ownership around actionable items.

Interventions proposed in URMP

The table below lists the key details of 14 interventions which includes the agencies responsible for implementation, estimated costs and the source of funding against each intervention.

Table E-0-1: List of Proposed Interventions

Sl. No.	URMP Objective	Intervention	Responsible Agency	Estimated Cost (Rupees in Lakhs)	Potential Financing Sources	Duration (in years)
1	To ensure effective regulation of activities in Floodplain	Intervention 1: Suggestions and recommendations on Draft Master Plan 2041 of Haridwar	TCPO and HRDA			
2	To keep river free from pollution	Intervention 2: Tapping and diversion of spring water at Loknath Nallah for reduction of used water volume at I&D structure	Jal Sansthan	95	Jal Jeevan Mission	0.8
		Intervention 3: Arrangement of removal of silt from nallahs	PeyJal Nigam	38	Namami Gange	0.8
		Intervention 4: Installation of Weir Gates for Flow and Silt Control at Selected Nallahs	PeyJal Nigam	60	Namami Gange	0.8
		Intervention 5: Construction of I&D Structures at Irrigation colony nallah	PeyJal Nigam	18	Namami Gange	0.8
		Intervention 6: Retrofitting of existing I&D Structures	PeyJal Nigam and HNN	10	Namami Gange and Municipal Budget	0.6
		Intervention 7: Hedge plantation and stone pitching along Lal Tarao nallah	HNN and Irrigation Department	60	State Urban Development Funds, SBM-Urban and Municipal Budget	1
		Intervention 8: Ecological Reinforcement and Structural Barriers at Subhash Nagar	HNN	7	SBM-Urban and Municipal Budget	0.6

Sl. No.	URMP Objective	Intervention	Responsible Agency	Estimated Cost (Rupees in Lakhs)	Potential Financing Sources	Duration (in years)
		Intervention 9: Installation of Riser-type trash trap system for solid waste at nallahs	PeyJal Nigam and HNN	250	Namami Gange and SBM-Urban	1
		Intervention 10: Implementation of Integrated Dung Waste Management for Bio-CNG Recovery in Haridwar	HNN	4,600	Municipal Budget, SATAT Scheme and MNRE Waste-to-Energy Programme	1-3
		Intervention 11: Installation of Sculptures/ Murals/ Signages/Art Work at Bridges and Identified Solid Waste Hotspot areas	HNN	70	Municipal Budget	1.5
4	Enhance riparian buffer	Intervention 12: Restoration of degraded riparian stretches	Forest Dept and Irrigation department	1,997	CAMPA and Namami Gange	0.5
7	Develop Eco-friendly riverfront projects	Intervention 13: Development of Lodhi ghat	State Tourism Board, NMCG, PWD (for steel bridge)	246	MOT Scheme, NMCG, CSR	0.9
		Intervention 14: Re-development of Aastha path	HRDA	13,515	MOT Scheme, NMCG, CSR	2
Total				20,966 (Approx.)		

The total investment requirement for the 14 interventions is estimated at ₹ 20,966 lakhs, with funding proposed from Namami Gange, SBM(U), AMRUT 2.0, municipal budgets, CSR contributions, tourism department, PWD, MOT PRASAD and other state/national schemes. The proposed interventions listed under Objective 2 and 7 have been identified as priority interventions required to be undertaken at the city and state level.

1 INTRODUCTION

The National Institute of Urban Affairs (NIUA) and the National Mission for Clean Ganga (NMCG) have collaborated to promote river-sensitive urban development across cities in the Ganga basin and other Indian river basins. This collaboration aims to harness the role of the cities to rejuvenate and restore river health. As part of this initiative, two major support systems have been developed: Urban River Management Plan (URMP) Framework and Guidelines for creating River-Sensitive Master Plans.

The framework was prepared to help cities improve and sustain river stretches within their boundaries through holistic, ecosystem-based interventions. It underscores that healthy river are essential for urban livability and productivity and its vision is organized around three elements environmental, economic and social, supported by ten objectives. These objectives are translated into city-specific projects, each tied to funding sources and institutional mechanisms for effective implementation.



Figure 1-1: Ten Objectives of the URMP

A total of sixty URMPs are planned in two phases with 25 in Phase I and 35 in Phase II, including six cities in Uttarakhand in the first phase. Funded by the World Bank under Namami Gange Mission II, this initiative is expected to guide Urban Local Bodies (ULBs) in addressing challenges such as drying rivers, poor waste management, loss of green cover, floodplain encroachment and industrial pollution through systematic, city-level planning. The three tiers of governance and monitoring committees at the center, state and city level is depicted in **Figure 1-2**.

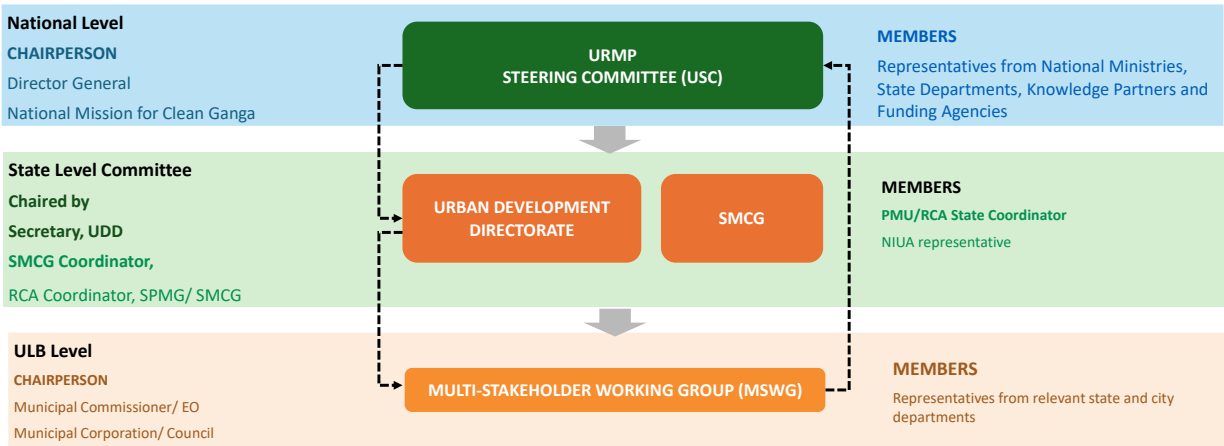


Figure 1-2: National, State & City Engagement for the URMP Preparation

1.1 PROCESS FOR PREPARATION OF THE URMP HARIDWAR

The preparation of an URMP follows a systematic approach as per NIUA’s URMP Components and Guidance Note 2020 and strategic guidelines for making River Sensitive Master Plans 2021 to ensure effective river conservation, sustainable management and stakeholder collaboration. The process involves multiple stages, each contributing to a comprehensive and actionable plan as depicted below.

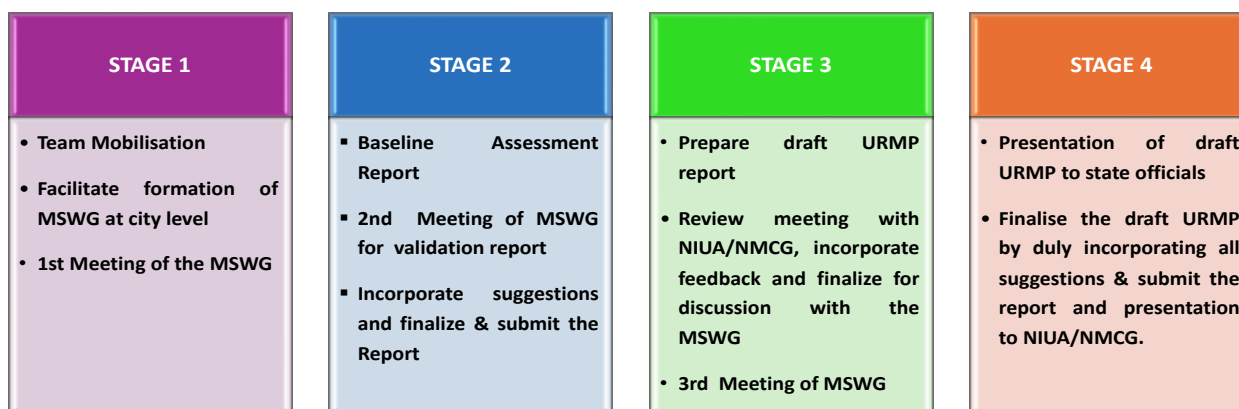


Figure 1-3: Process for preparation of URMP

In order to ensure that the plan is participatory and has involvement of concerned government agencies from the state to the city level, workshops and meetings have been carried out at all levels.

1.2 STATUS OF WORK AND CONTENTS OF THE PRESENT DELIVERABLE

Tasks one to three as listed in **Figure 1-3**, have been completed and findings are elaborated in the present deliverable of Draft URMP Report. The detailed content of the report includes the following:

- ▶ Key points discussed during URMP State level Steering Committee Meeting for Uttarakhand held on 6th February 2025 at Dehradun,
- ▶ Discussions during 1st Multistakeholder Working Group (MSWG) meeting at Haridwar on 28th March 2025,
- ▶ Discussions during 2nd Multistakeholder Working Group (MSWG) meeting at Haridwar on 19th December 2025,
- ▶ Analysis of the field visit, primary and secondary data available in the public domain and collected from various stakeholder departments post the MSWG meeting.

1.2.1 URMP State level Steering Committee

A State-level URMP Committee, chaired by the Secretary, Urban Development Department (UDD), Government of Uttarakhand has been constituted to oversee the URMP Process. The first State level Steering Committee meeting was held on 06 February 2025 in Dehradun, chaired by Director General, NMCG, with participation from Urban Development Department (UDD) Uttarakhand, State Mission for Clean Ganga (SMCG), Town and Country Planning Office (TCPO), Pey Jal Nigam, NIUA, World Bank, School of Planning and Architecture (SPA) and project consultants.

The meeting presented the guiding principles, objectives and work plan for preparing URMPs in five cities of the state. Commissioners, Executive Officers and senior officials shared the current status, challenges and future plans for river management in their cities.



Picture 1-1: Steering Committee Meeting for Uttarakhand on 6th February 2025

1.2.2 Multistakeholder Working Group

To guide the development of city URMP, a Multistakeholder Working Group (MSWG) with the District Ganga Committee meeting was held on 28th March 2025 under the chairmanship of the District Magistrate, to notify the MSWG for the city. It comprises of 30 representatives from Haridwar Nagar Nigam and key stakeholder agencies operating within the city (refer **Picture 1-2**).



Picture 1-2: MSWG held on 28th March 2025 at Haridwar

The second MSWG meeting for finalization of the baseline report was held on 19th December 2025 under the chairpersonship of Mr. Nalin Kumar (IAS), DDG, NMCG and attended by Mr. Nandan Kumar (IAS), Municipal Commissioner, Haridwar and other officials from Haridwar city (refer **Picture 1-3**)



Picture 1-3: 2nd MSWG held on 19th December 2025 at Haridwar

1.2.3 Draft URMP Report

The Draft URMP report includes tangible interventions for river conservation and management for each of the ten URMP objectives. Multiple meetings and consultations with concerned agencies along with site visits were conducted to assess the ground situation and identify opportunities for future interventions (refer **Picture 1-4**). Based on the gaps and prioritized issues identified in the Baseline Assessment Report,

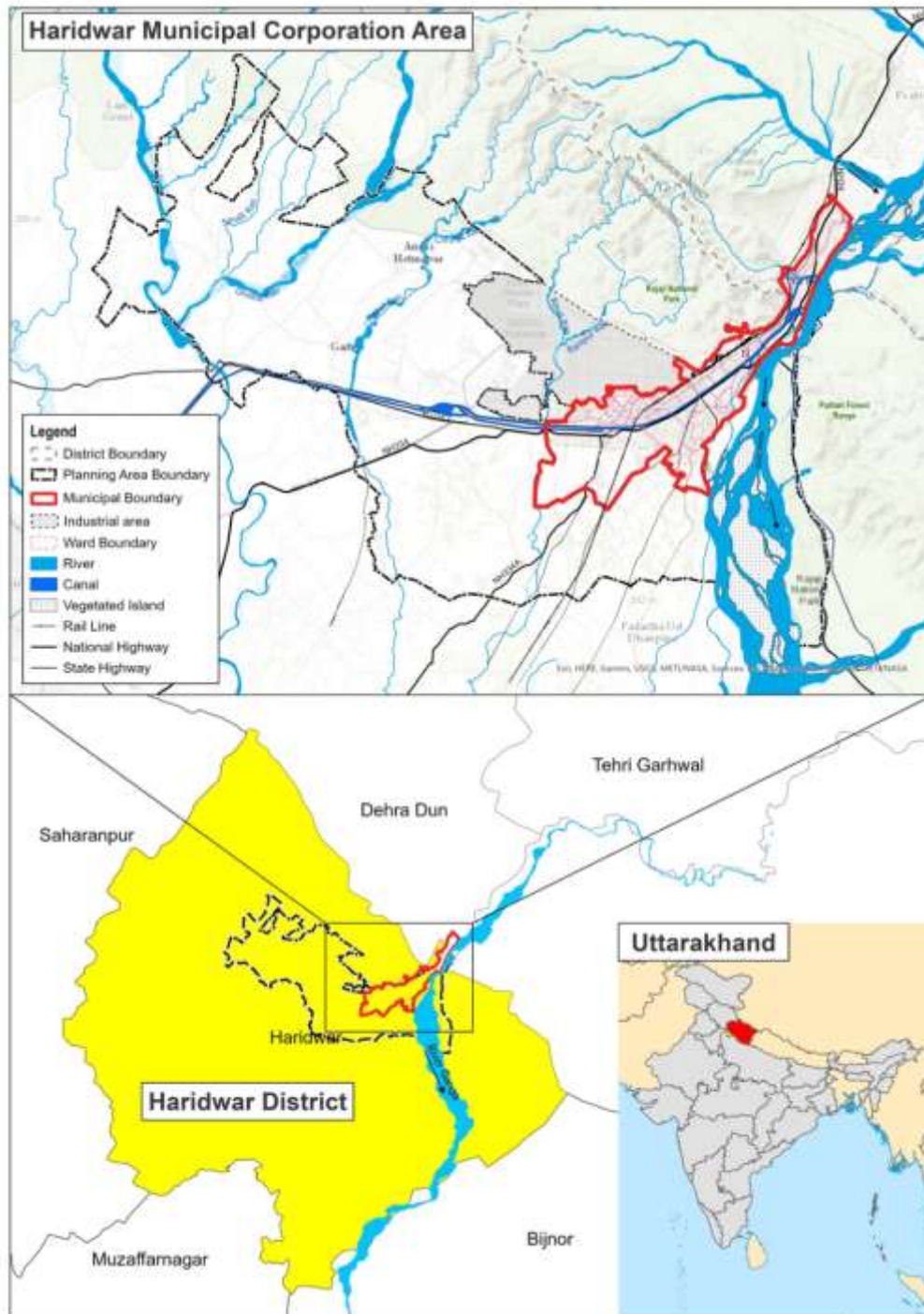
this document outlines interventions and recommended actions. Each intervention is elaborated in detail, including the project rationale, conceptual framework, key components, broad cost estimates and the designated implementing agency.



Picture 1-4: Consultations and Site Visits

2 CITY PROFILE

Haridwar city is located in the Haridwar District of Uttarakhand State. The city is known as the 'Gateway to the Chota Char Dham' and is the state's second most populous urban center of state. It is situated at the foothills of the Shivalik ranges on the western bank of the River Ganga. The city is connected to Delhi and Dehradun by National Highway 334, bolstered by a robust regional rail network. The city lies 225 km from Delhi and 52 km from Dehradun, with its economy further driven by the nearby industrial and tourism hubs of Roorkee and Rishikesh. It serves as a major pilgrimage destination for the Kumbh Mela and Kanwar Yatra. The nearest airport is Jolly Grant International, 37 km north of the city in Dehradun.



Map 2-1: Regional Context of Haridwar city

2.1 CITY ADMINISTRATIVE BOUNDARIES

As per the draft Master Plan of Haridwar, 2041, Haridwar Planning Area spans 239.66 sq. km, excluding BHEL, SIDCUL and UPSIDC. This expanded jurisdiction now covers the municipal limits, Shivalik Nagar Palika Parishad and 61 villages, compared to 172 sq. km in the earlier plan which encompassed 37 villages along with the municipal area and Shivalik Nagar Palika Parishad. Although the boundary has been extended to include 24 additional villages, the analysis has been undertaken only for the originally notified 172 sq. km. Further, Haripur Kalan, which was part of the northern boundary in the previous plan, has been excluded in the current delineation. The planning area is managed by Haridwar – Roorkee Development Authority. The authority is responsible for preparation of Master Plan, implementing urban planning policies, regulating land use and activities and overseeing infrastructure development.

Haridwar was accorded Nagar Nigam Haridwar (HNN) status on 21 July 2011¹. Initially comprising 30 wards over 12.5 sq. km, the jurisdiction expanded in 2018 to 60 wards covering 19.4 sq. km. The city, located within Haridwar tehsil of Haridwar district, is the second largest HNN in Uttarakhand after Dehradun. The HNN is responsible for managing civic services and infrastructure, including sanitation, water supply, street lighting and road maintenance.

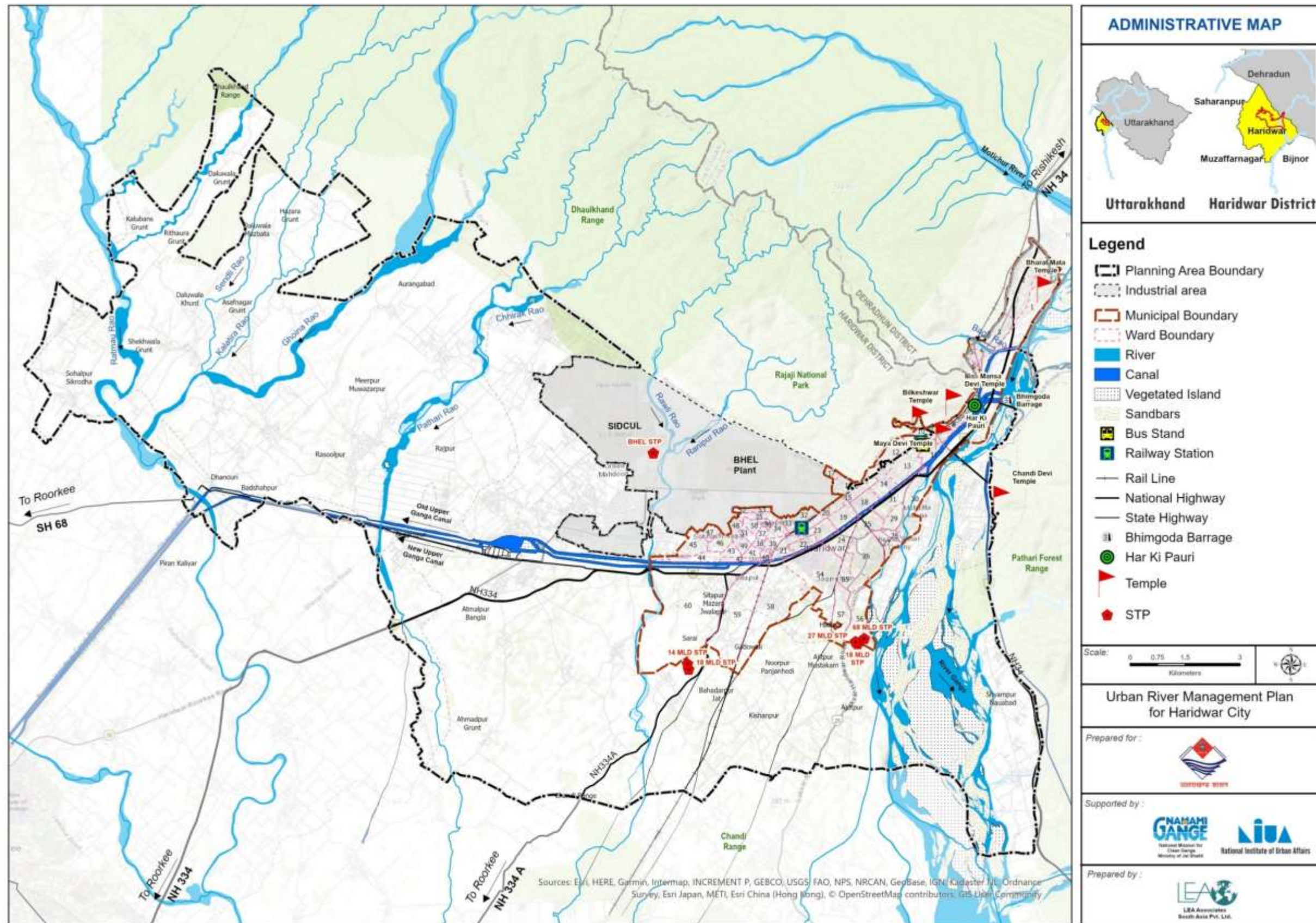
2.2 DEMOGRAPHY

As per the draft Haridwar Master plan, 2041, the projected population for the Haridwar Planning Area is estimated to be 9.4 lakhs in 2041. Considering a 10% floating population share for the year 2041. The total population of the Haridwar Nagar Nigam is 2,51,196 (Census 2011). Based on the current decadal growth trend, the population of the city is expected to grow up to 5.5 lakhs in 2051. The urban expansion is restricted in east and northwest due to the presence of Rajaji National Park.

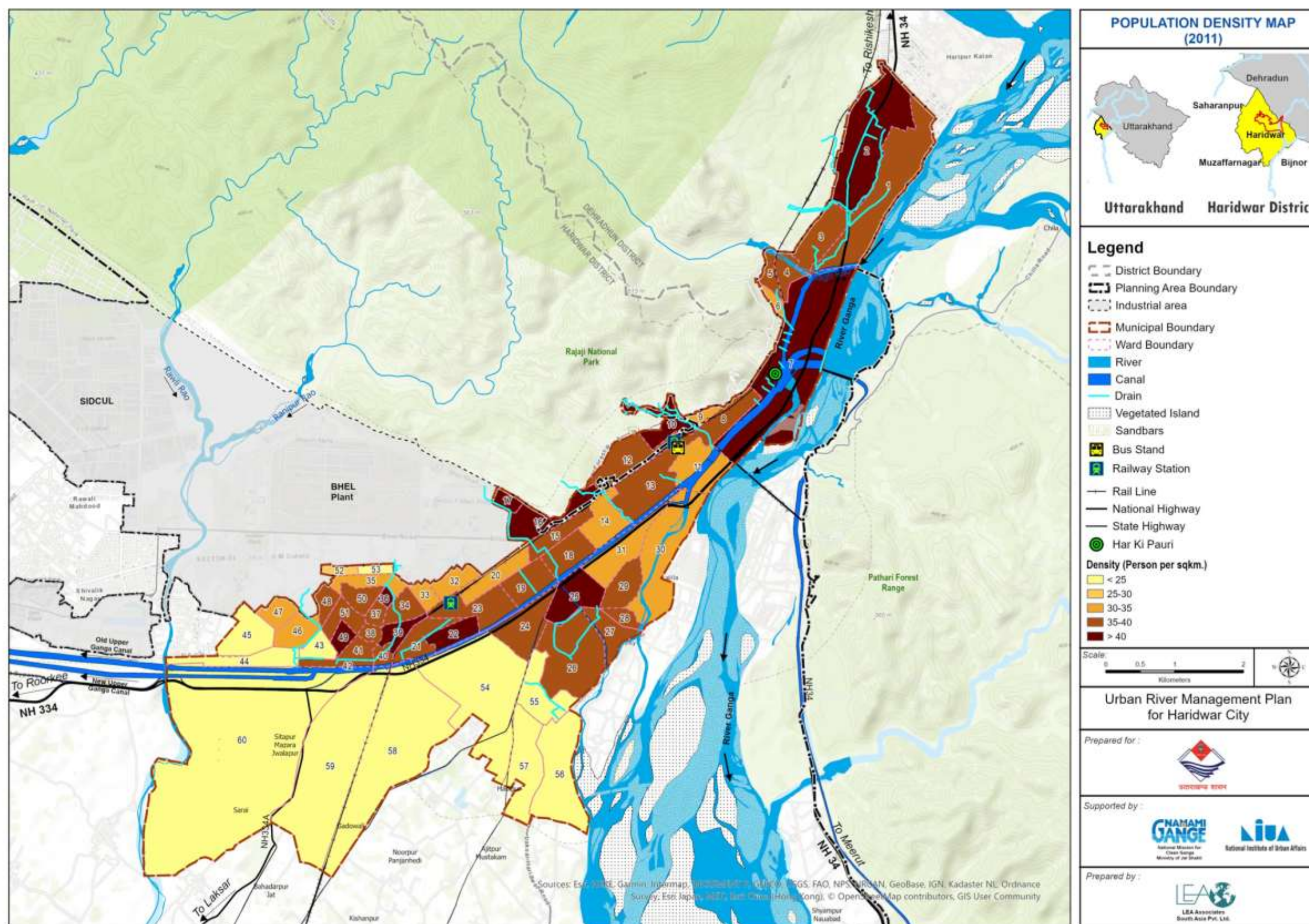
Area	Current Population (2011)	Projected population(2041)
District	18.9	-
Planning	-	9.4
Municipal	2.5	4.6

Source: A) District- Census of India, 2011; B) Planning- Draft Haridwar Master Plan, 2041; C) Municipal- Census of India, 2011 and Consultant Analysis

¹ Source- Nagar Nigam Haridwar



Map 2-2: Administrative map of Haridwar



2.3 PHYSIOGRAPHIC PROFILE

2.3.1 Topography

Haridwar lies at the transition zone between the Shivalik foothills in the north and the Indo-Gangetic plains in the south. The city is situated on the western bank of the River Ganga, with elevations ranging between 249 and 314 meters above sea level. The northern terrain is characterized by undulating, forested hills dominated by Sal and other deciduous species, while the southern plains exhibit flatter alluvial landscapes.

2.3.2 Geophysical Characteristic

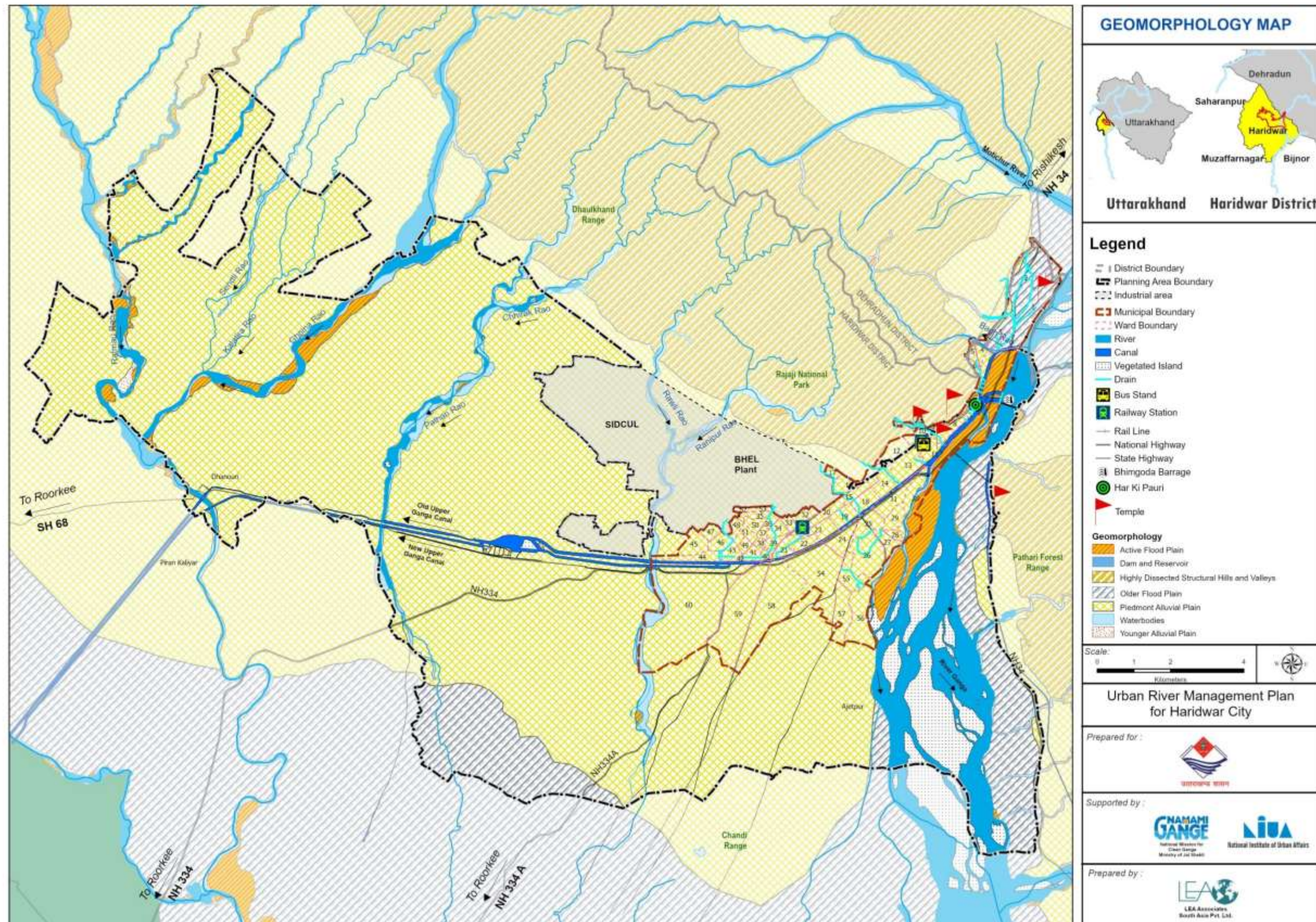
The Bhabhar zone in the north is composed of coarse, porous alluvial deposits (sand, gravel and pebbles), which enable rapid infiltration and substantial groundwater recharge. In contrast, southward, the terai zone consists of fertile clay-loam soil that retain moisture, supporting intensive agriculture and facilitating urban expansion.

The soil in the area ranges from sandy loam to loam, enriched with organic matter. Their structure strikes a balance between excellent drainage and superior moisture retention, making them suitable for diverse agriculture. major crops including sugarcane, wheat, rice, lentils and mustard.

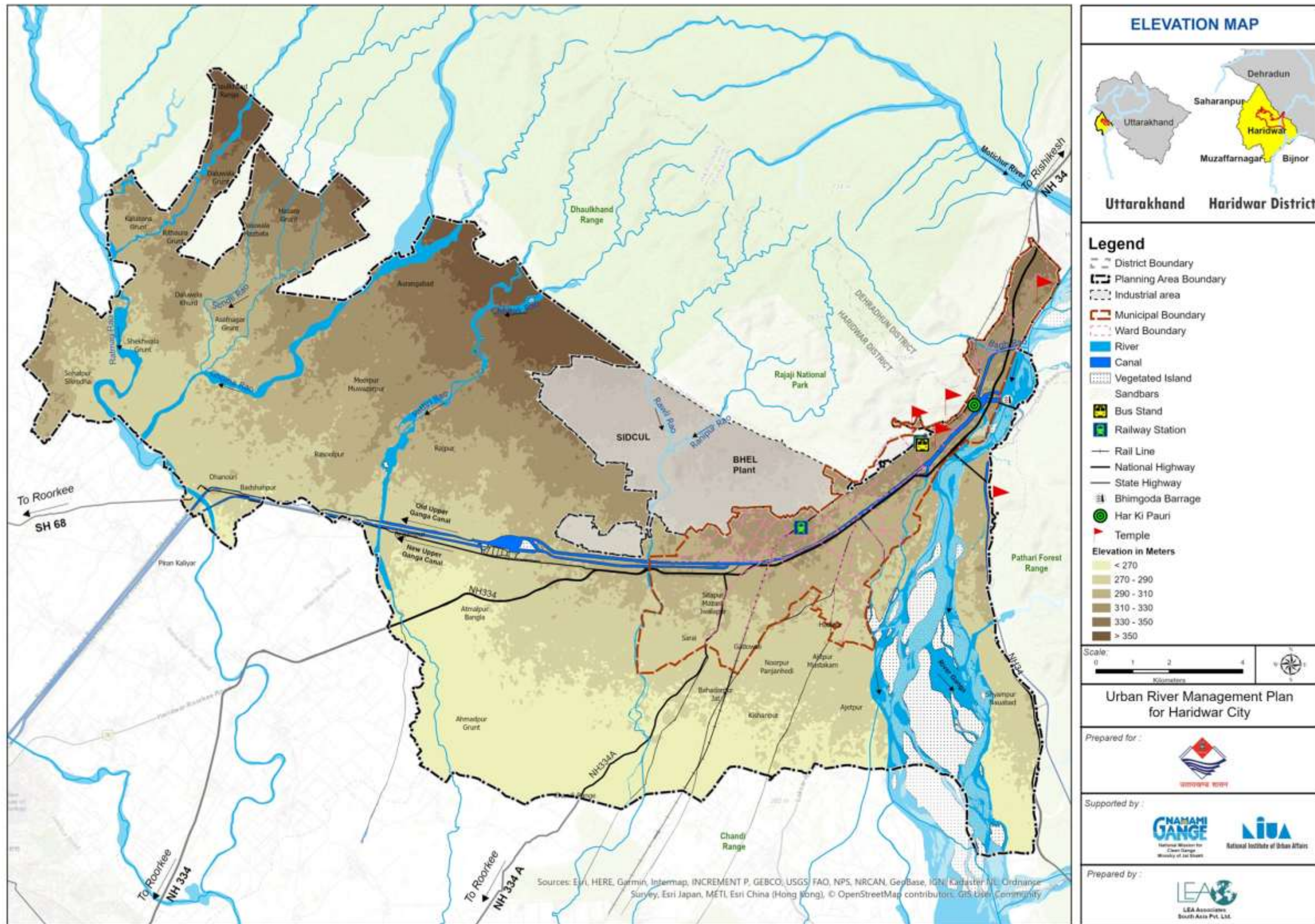
Groundwater occurs within thick alluvium deposits of the Bhabar-Tarai plain. This zone has high-permeable gravel and boulder beds facilitate recharge and high yield for both irrigation and drinking water. The River Ganga serves as a perennial source of replenishment, though seasonal floods present hydrological vulnerability.

2.4 URBAN SPRAWL

The spatial growth of Haridwar city during the last two decades can be understood in three broad phases. In the first phase, around 2000, urban expansion was largely concentrated within the municipality with compact development centered around the core pilgrimage and residential zones. Growth radiated outward along the railway line and major highways, but remained relatively contained. In the second phase, by 2010, the city began extending beyond its traditional municipal limits into the wider planning area. Built-up footprints expanded along the corridors leading to Roorkee and Rishikesh, with new residential and institutional clusters emerging near waterbodies and transport routes. This period marked the transition from compact growth to dispersed expansion. After 2010 and especially by 2020, Haridwar experienced multi-directional growth, with significant sprawl along NH-58, NH-74 and other arterial roads. The pattern of expansion became more fragmented, with scattered peri-urban developments merging into a continuous urban fabric. This dispersed expansion is characteristic of urban sprawl, driven by improved connectivity, rising land demand and the pressures of pilgrimage-related tourism and industrial activity.

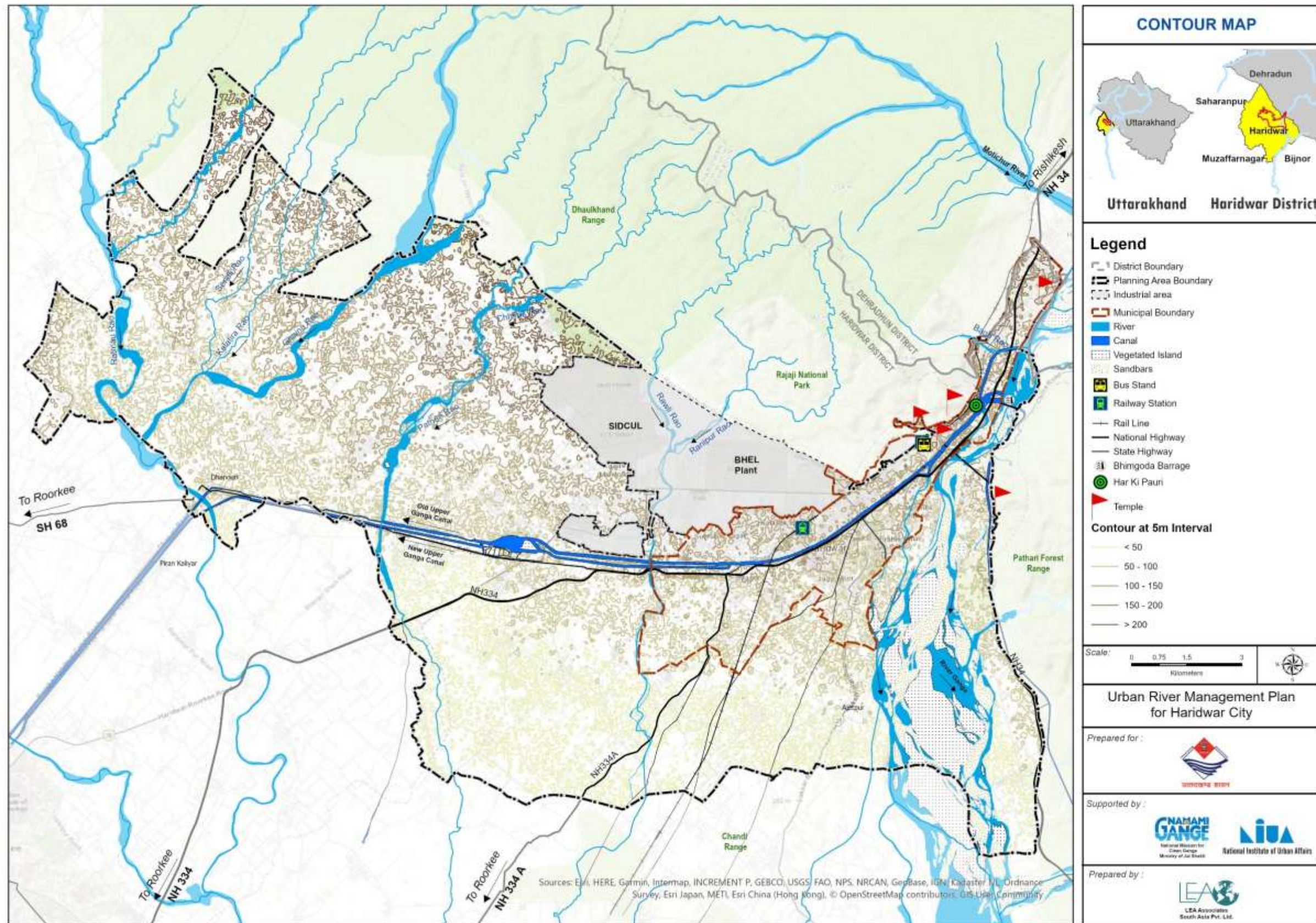


Map 2-4: Geomorphology of Haridwar city

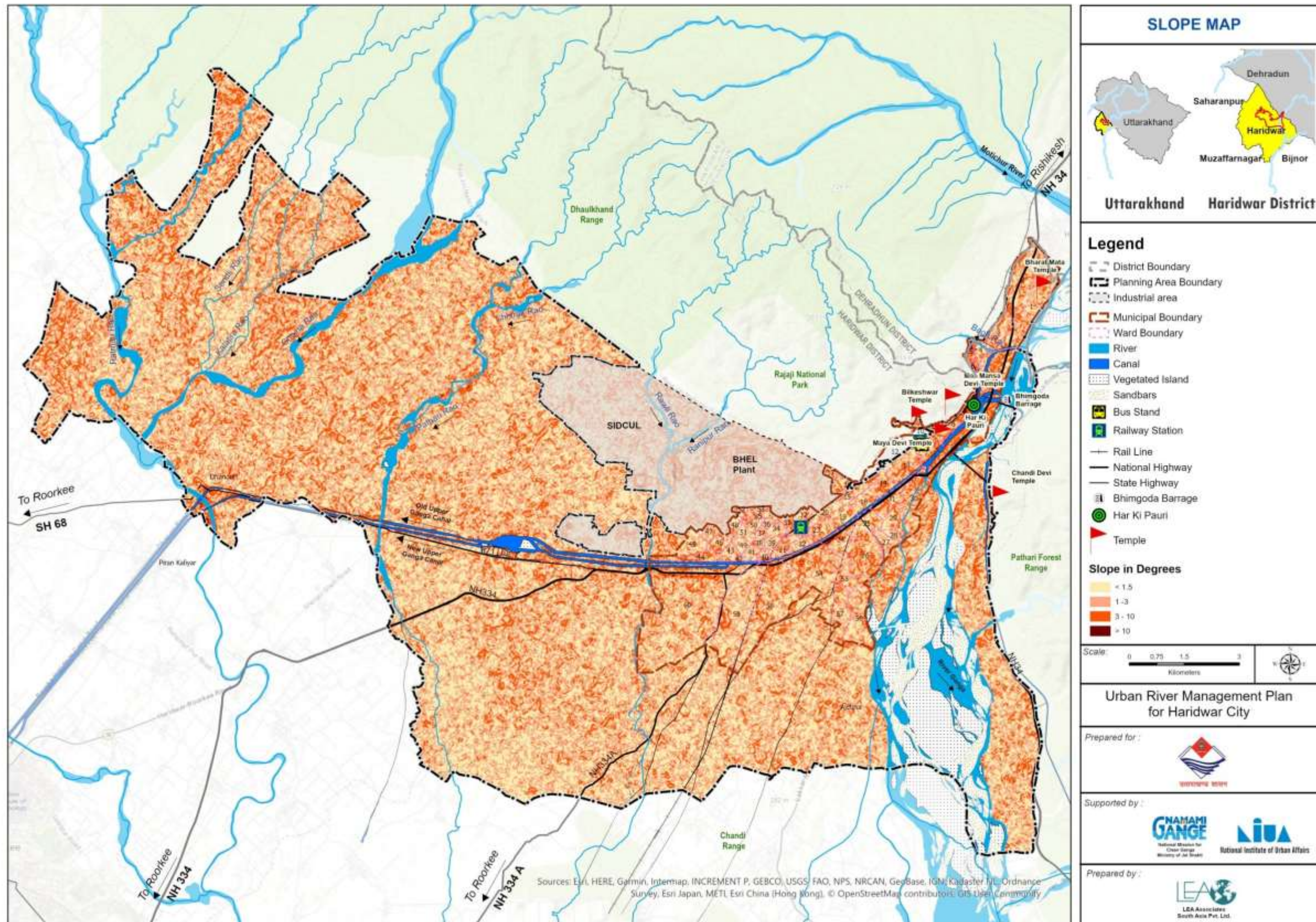


Source: Landsat 8/9 Imagery (for NDWI); SRTM DEM (Elevation); Open Street Map (Road Network), Consultant's Analysis

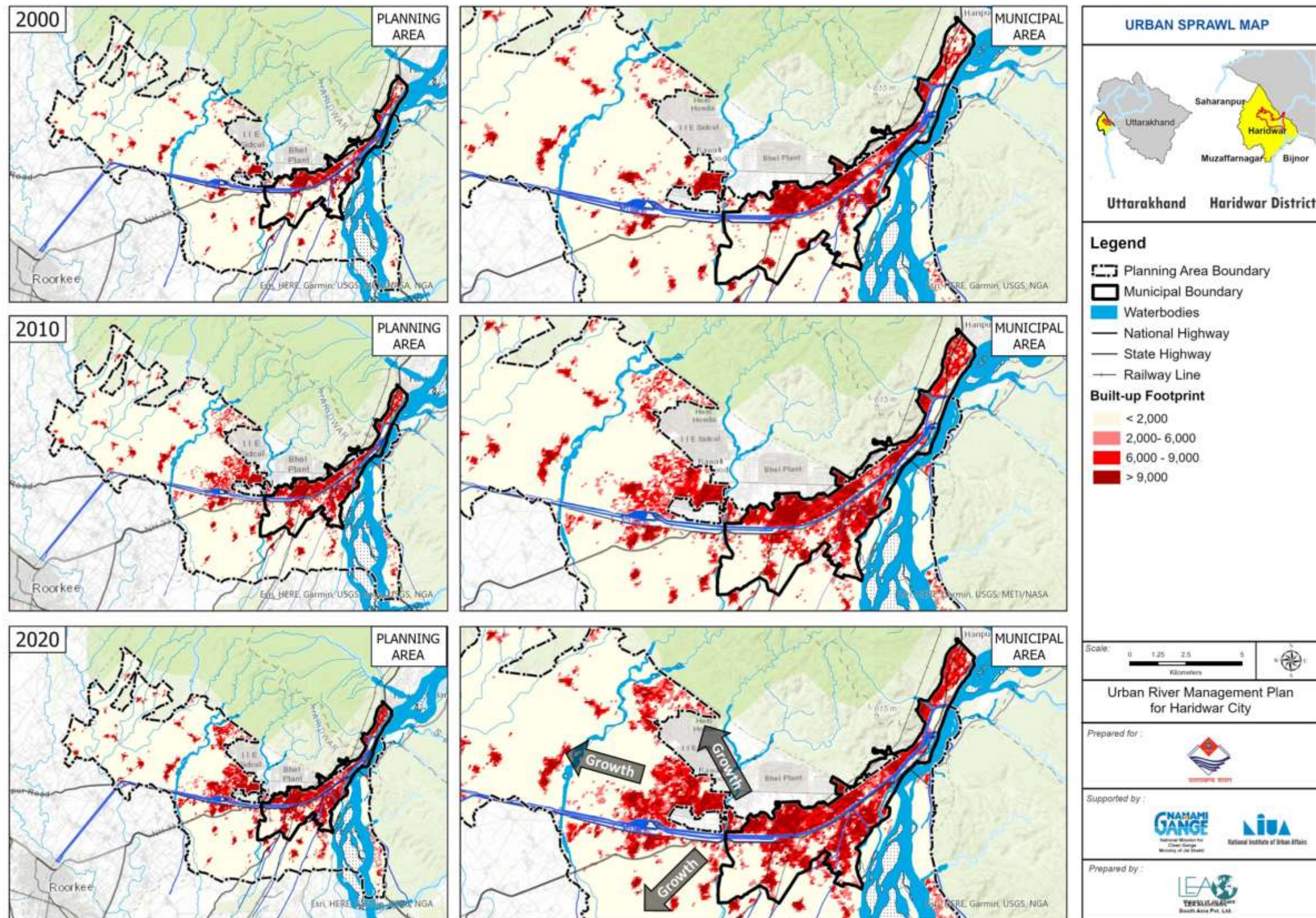
Map 2-5: Elevation map of Haridwar city



Map 2-6: Contour Map of Haridwar



Map 2-7: Slope Map of Haridwar



Map 2-8: Urban sprawl in Haridwar

2.5 HISTORY AND CULTURAL PROFILE

Haridwar is one of India's oldest cities and a major religious center having deep roots in Hindu mythology and history. The name, ‘Haridwar’ means ‘Gateway to Hari (Vishnu)’ and is also linked to ‘Har’ (Shiva). It is further known as Gangadwara, marking the descent of River Ganga. Over the years, the city has evolved as a religious city with temples and ashrams along with celebrating the festivals that uphold its spiritual heritage.

The construction of the Upper Ganga Canal in the mid-19th century supported irrigation and agriculture, guiding urban growth along its course. Post-independence, the city expanded as a significant religious and cultural hub. The industrial development began with Bharat Heavy Electricals Limited (BHEL) in 1964 followed by the establishment of State Industrial Development Corporation of Uttarakhand Ltd. (SIDCUL) in 2002, which attracted industries such as Patanjali and Hindustan Unilever. Further, Patanjali Yogpeeth promoted yoga and wellness tourism, boosting the local economy.

Table 2-1: Festivals and events in Haridwar

Festival/ Events	Month	Tourists (in lakhs)	Location	Cultural Significance
Kumbh Mela	Every 12 Years		Ghats of Haridwar	The world's largest religious gathering, held when Jupiter enters Aquarius and the Sun enters Aries.
Ardh Kumbh Mela	Every 6 Years		Ghats of Haridwar	The "Half Kumbh," held at the six-year interval between Purna Kumbh Melas to maintain spiritual continuity.
Makar Sankranti	January	3.5–4	Ghats of Haridwar	Marks sun's transition into Capricorn; ritual bathing in Ganga believed to cleanse sins.
Maha Shivratri	Feb–March	4	Ghats of Haridwar	Celebrates Lord Shiva; Haridwar temples become focal points for night-long prayers and offerings.
Ram Navmi	March–April	4–5	Ghats of Haridwar	Birth of Lord Rama; emphasizes dharmic values and draws family pilgrimages.
Ganga Saptami	April–May	4–6	Ghats of Haridwar	Commemorates descent of Ganga; bathing rituals reinforce Haridwar's identity as “Gateway to the Ganga.”
Ganga Dussehra	June	10–15	Ghats of Haridwar	Celebrates Ganga's earthly arrival; mass bathing and cultural programs highlight river's sanctity.
Somvati Amavasya	July	25–30	Ghats of Haridwar	Rare lunar event; bathing believed to grant longevity and prosperity.
Kanwar Mela	July–August	40–55	throughout Haridwar	Largest annual pilgrimage; devotees collect Ganga water for Shiva temples across North India.
Dev Deepawali	Oct–Nov	—	Ghats of Haridwar	Festival of lights on Ganga; ghats illuminated, symbolizing divine victory.
Kartik Poornima	November	8–10	Ghats of Haridwar	Marks Lord Shiva's triumph; bathing and lamp-lighting rituals strengthen Haridwar's spiritual aura.
Poornima/Amavasya	Year-round	3–4	Ghats of Haridwar	

Source: A) Draft Master Plan Haridwar, 2041, B) Tourism Department

2.6 TOURISM PROFILE

Haridwar is primarily known for its religious tourism, where the Ganga River and numerous temples form the central focus of pilgrimage activities. These sacred sites attract a continuous stream of visitors throughout the year. Har-Ki-Pauri (Brahmakund) is the most prominent site, hosting the Ganga Aarti and large gatherings. The Kumbh Mela, held every 12 years and the Ardh kumbh held every 6 years from January to April, features a series of festivals designated as major bathing days. These occasions draw exceptionally large congregations to the riverfront (refer **Figure 2-2**) Similarly and Kanwar Yatra, held annually during July and August lasting around 15 days. These special days place considerable pressure on local infrastructure, mobility and public amenities

The **Figure 2-1** shows a consistent upward trend, with sharp surges in the last two years reflecting intensified pilgrimage and tourism inflows.

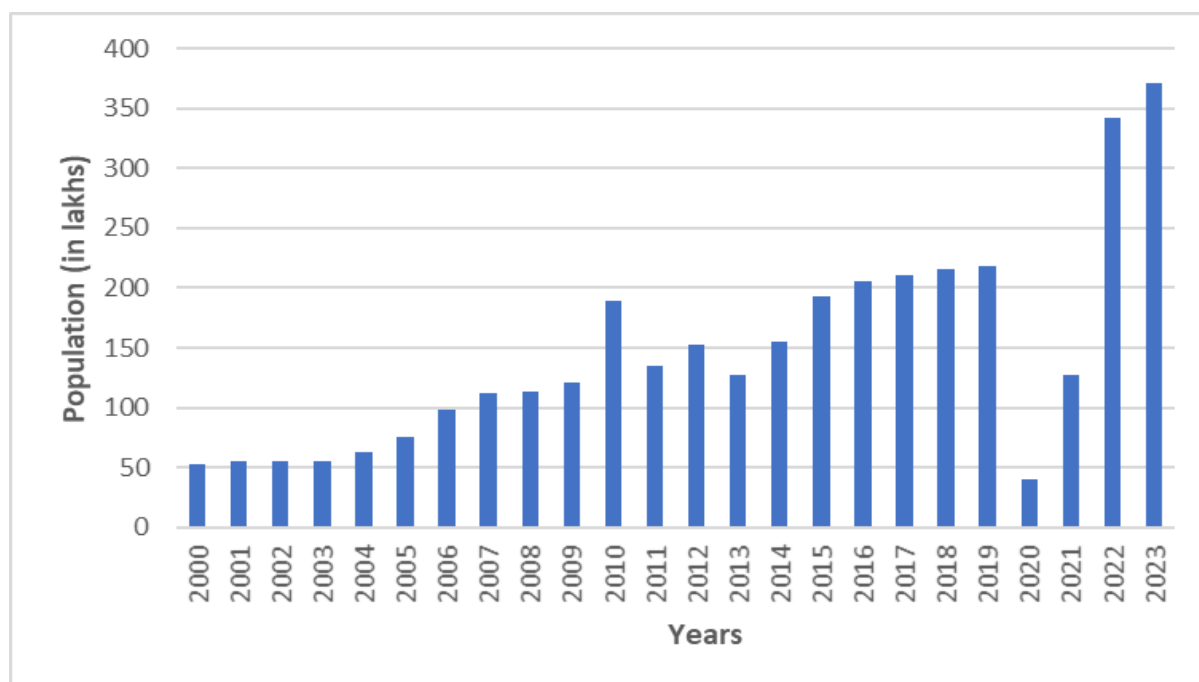


Figure 2-1: Tourist footfall in Haridwar

Source: (1) Haridwar Draft Master Plan, 2041 & (2) Tourism Department, 2025

The number devotees/visitors came during the bathing festivals in Kumbh Mela 2021. The **Figure 2-2** shows massive fluctuations, with peak crowds on Mahashivratri and Somvati Amavasya far surpassing other bathing days.

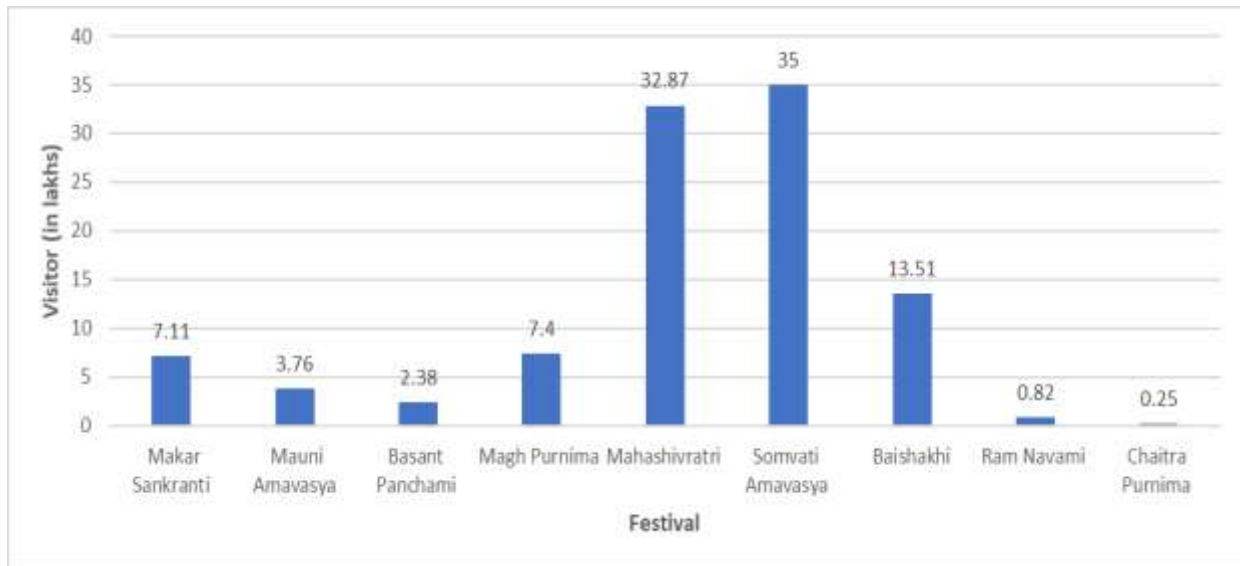


Figure 2-2: Number of visitors came during the bathing festivals in Kumbh Mela 2021.

Source: Tourism Department, 2025



Kumbh Mela at Har-Ki-Pauri



Kanwar Yatra



Mansa Devi



Chandi Devi

Picture 2-1: Religious tourism in Haridwar

2.7 SOCIO – ECONOMIC PROFILE

2.7.1 Economic Activities along the rivers

Haridwar's economy is shaped by a mix of pilgrimage-driven tourism, agriculture and a rapidly growing industrial estate in SIDCUL and BHEL. The River Ganga serves as the primary engine shaping the city's identity through religious activities, hospitality sector and commercial enterprises along River Ganga and Upper Ganga Canal. The various economic activities along the river and canal are:

- a. **Religious activities:** At Har-Ki-Pauri, local priests, known as pandas, provide religious services such as pujas, mundan and ancestral rituals (Shraddha and Pind Daan). These spiritual practices are central to the pilgrimage experience in Haridwar.
- b. **Commercial activities:** Vendors and shopkeepers along the Ganga River sell a variety of items such as Ganga Jal, prayer essentials, woollen garments and spiritual souvenirs, all closely tied to the religious and cultural reverence associated with the sacred river Ganga.
- c. **Hospitality along the Ganga:** The influx of pilgrims and visitors to the riverfront sustains Haridwar's tourism and hospitality sector, encompassing hotels, guest houses, dharmshalas and food vendors along the ghats. Peak Yatra seasons amplify this activity, generating substantial employment and livelihood opportunities for local communities



Hospitality Sector



Vending activities



Religious activities

Picture 2-2: Socio- economic activities along the Upper Ganga Canal

2.7.2 IEC and Social Engagement (Annual calendar, frequency, target audience)

Creating a river-sensitive society requires behavioral change, active participation and awareness across all sections of citizens. The focus is on integrating sustainable practices into daily life, ensuring that rivers are seen as community assets that need protection.

1. IEC Activities by National Mission for Clean Ganga (NMCG):

The NMCG has undertaken a wide range of IEC activities in Haridwar to build awareness, mobilize communities and integrate cultural identity with ecological stewardship. The **Table 2-2** presents the initiatives undertaken in Haridwar.

Table 2-2: Initiatives undertaken by NMCG in Haridwar city

Category	Initiatives
Community Cadres	Creation of Ganga Praharis (volunteer guardians) and Ganga Doots (youth ambassadors) who lead local cleaning drives, biodiversity monitoring and awareness door-to-door.
Youth Engagement	Bal Ganga Prahari: Specialized school-level programs including "Ganga Chaupals," skit competitions on themes like "Planet vs. Plastics," and painting/quiz contests at local colleges (e.g., Jwalapur Inter College).
Religious Outreach	Ganga Aarti Sensitization: Using the daily Aarti at Har-Ki-Pauri as a platform to broadcast cleanliness messages and distribute resource materials to pilgrims.
Visual Awareness	"Paint My City" Campaign: Large-scale mural art and wall paintings across ghats, flyovers and public buildings depicting the river's biodiversity and the importance of waste segregation.
Experiential Learning	Ganga Women Rafting Expedition: Flagging off expeditions from Haridwar to promote gender inclusion and ecological awareness along the river's course.
Livelihood Connect	Ghat Par Haat: Organizing local markets on the riverbanks to promote "Arth Ganga," where local products and handicrafts are sold to connect the river's health with economic prosperity.

2. IEC Activities by Ganga Mahasabha

The Shri Ganga Sabha, through its Information and Broadcast Centre and a network of volunteers, ensures the orderly conduct of major religious gatherings in Haridwar. During peak festivals, it manages crowd movement, disseminates real-time information and guides pilgrims to designated zones.



Picture 2-3: Ganga Arti at Har-Ki-Pauri

3. IEC Activities by Haridwar Nagar Nigam:

Under the "Paint My City" initiative, the HMC has transformed the walls of bridges, ghats etc. and the garbage vulnerable points into beautiful wall paintings depicting the heritage of the River Ganga and cleanliness messages to discourage open littering. Its includes mythological-themed graffiti and murals related to Ramayana, Shiva Purana and local Uttarakhand culture. They are further enhancing the visitor experience.

The HMC has also actively deploys hoardings, banners and public address systems particularly around Har-Ki-Pauri to reinforce messages of Ganga cleanliness and prohibition of plastic and solid waste. These measures are intensified during high-footfall religious events, ensuring effective regulation, awareness dissemination and compliance among pilgrims and visitor.

4. NGO involvements

In Haridwar, three NGOs—The Nature Foundation, Being Bhagirath and The Shiv Kala Foundation—work closely with the Nagar Nigam to promote river-centric activities. The Nature Foundation leads citizen awareness programs and has innovatively initiated incense stick production from floral waste at the ghats, creating livelihoods through SHGs. Being Bhagirath focuses on Ganga rejuvenation through cleanliness drives, waste management, beautification projects like Kalpvriksha Vatika and creative student engagement. The Shiv Kala Foundation emphasizes water resource management and rural development, advancing sustainable practices for community well-being. Together, these organizations embed ecological responsibility into Haridwar’s development narrative while strengthening its socio-cultural fabric.

2.8 INSTITUTIONAL MECHANISM

The list of existing agencies responsible for planning, development and service delivery within the Haridwar Planning area.

Table 2-3: Role and responsibility of key government agencies for Haridwar City

Sl. No.	Department	Key role and responsibilities	Nodal Officer	Applicable for URMP Objectives
A. Regional/ State level				
1.	State Mission for Clean Ganga, Uttarakhand	- Execute centrally funded projects for sewage treatment, river rejuvenation, drainage management and ghat development - Ensure timely completion of STPs (Sewage Treatment Plants), I&D (Interception & Diversion) works and faecal sludge management projects - Oversee construction and beautification of ghats, crematoria and riverfront amenities to enhance religious and tourism experiences while maintaining sanitation. - Run awareness campaigns, school programs and public outreach to encourage citizen participation in river conservation.	M&E Officer	Objective 1, 5, 9 and 10
2.	Uttarakhand Tourism Development Board	- Formulate state tourism policies and long-term development strategies - Develop eco-tourism zones and nature trails with Forest Department coordination - Monitor environmental and social impact of tourism projects - Implement safety protocols and eco-friendly practices	Tourism Development Officer, Haridwar	Objective 7 and 8
3.	Uttarakhand Urban Sector Development Agency	- Plan and execute projects related to water supply, sewerage, sanitation, solid waste management and drainage systems. - Prepare city development plans (CDPs), master plans and detailed project reports (DPRs) - Monitor progress and ensure timely execution of projects using digital tools and MIS systems - Mobilize and manage funds from multilateral agencies (e.g., ADB, World Bank) and government grants - Provide technical and managerial support to Urban Local Bodies (ULBs).	Project Manager	Objective 1, 2, 7 and 8
4	Forest Department	- Protect wildlife habitat in nearby forest areas comprising Haridwar Forest and buffer zones of Rajaji National Park. - Conserve water catchment areas, especially the River Ganga (vital for the region's water supply).	Divisional Forest Officer	Objective 4, 9 and 10
5.	Uttarakhand Irrigation Department	- Construct and maintain embankments, spurs, check dams and anti-erosion works along rivers - Develop watershed projects to conserve soil and water in hilly terrain. - Plan, design and construct canals, dams, barrages, lift irrigation schemes and tube wells to support agriculture - Identify and mark the maximum flood level recorded or estimated during a major flood.	Executive Engineer	Objective 1 and 2

Sl. No.	Department	Key role and responsibilities	Nodal Officer	Applicable for URMP Objectives
6.	UP Irrigation	- Controls the Bhimgoda Barrage, which regulates water into the Upper Ganga Canal and River Ganga - Maintenance of canal networks, including cleaning, silt removal and strengthening canal banks - Manages canal-associated land, including ghats on both the banks, as well as the land extending up to national highway		
7.	Uttarakhand Pollution Control Board	- Enforce key environmental acts including: Water (Prevention & Control of Pollution) Act, 1974, Air (Prevention & Control of Pollution) Act, 1981, Environment Protection Act, 1986, Plastic Waste Management Rules, 2016, Biomedical Waste Rules, E-Waste Rules, Solid Waste Rules, etc. - Regularly monitor water quality of the rivers, - Actively support the Namami Gange program through monitoring and enforcement, - Ensure no untreated sewage or industrial waste is discharged into rivers, - Conduct regular inspections of industrial units, hotels, stone crushers, mining sites, etc.	Regional Officer	Objective 1,2, 3 and 5
8.	District Ganga Committee (DGC)	Ensures convergence of local development with river conservation goals.	District Magistrate	Objective 1,9 and 10
B. Local level				
1	Haridwar Nagar Nigam	- City governance and civic administration - Urban services and infrastructure – solid waste management, maintenance of road & drainage, management of water supply & sewerage - Environment and public welfare activities - Development and planning - Public interface and emergency services	Municipal Commissioner	Objective 1,2,7,8,9 and 10
2	Uttarakhand Pey Jal Nigam	- Plan, design and construct drinking water supply, - Implement rural water schemes such as Jal Jeevan Mission, - Install chlorination units, UV treatment, or filtration systems in contamination-prone zones, - Prepare Detailed Project Reports (DPRs) and execute works for sewer networks, sewage treatment plants (STPs) and drainage systems in coordination with Urban Development Department or Smart City Projects.	Executive Engineer	Objective 2 and 5
3.	Uttarakhand Jal Sansthan	Responsible for day-to-day operation and maintenance of urban and rural water supply systems.	Executive Engineer	Objective 2 and 5
4.	Uttarakhand PWD	Plan, construct and maintain state highways, district roads, rural roads and bridges.	Executive Engineer	Objective 2
5.	Town and Country Planning Department	- Prepare Master Plans, Zonal Development Plans and Land Use Maps for cities, towns and notified areas, - Prevent unauthorized constructions and encroachments, - Conduct public consultations, hearings and surveys before finalizing plans.	Executive Engineer	Objective 1 and 2

Sl. No .	Department	Key role and responsibilities	Nodal Officer	Applicable for URMP Objectives
6.	Local NGO/ Civil Society Member	- Educate local communities on river health, waste management and conservation practices. - Organize awareness drives, clean-up campaigns and public meetings. - Promote citizen participation in river protection initiatives.	Represent ative	Objective 9 and 10

3 ECOLOGICAL PROFILE OF THE CITY

3.1 RIVER ECOSYSTEM

As stated in the Section 2.7, the Haridwar planning area is defined by a river, canal and streams, i.e., River Ganga, Upper ganga canal, Bagh rao and 6 seasonal streams.

- i. **River Ganga-** The river enters Haridwar planning area near Raiwala and flows approximately 18 km. within the planning area and 14 km within the municipal area. The river serves as the spiritual lifeline of the city, with its waters revered at sacred ghats such as Har-Ki-Pauri, where thousands gather for ritual baths and ceremonies. Downstream, near Bhimgoda Barrage, the river begins to widen and its flow decreases.



Picture 3-1: River Ganga flowing at Swaminarayan ghat

- ii. **Bagh Rao:** It is locally referred as Sukhi River, originates from the Rajaji National Park and enters Haridwar planning area from near Bhoopatwala and Kharkhari. The total length of the river within the planning area and municipal area is 1 km. This is a seasonal and rainfed river that usually remains dry most of the year. Due to its intermittent flow, the riverbed is often used informally as open ground or temporary parking space. However, during episodes of intense rainfall, the river can swell rapidly, leading to sudden flooding.
- iii. **Seasonal streams(Rao):** There are 6 raos' within Haridwar planning area. A rao refers to a seasonal rivulet or small stream that originates in the Shivalik foothills and flows down into the plains. These rainfed channels are active during monsoon but often remain dry in summer months. The raos originate in Rajaji National Park and enter the planning area from the north, flowing in north-south direction along the western bank of the Upper Ganga Canal.

The channel pattern of River Ganga at Haridwar is braided, as the river splits into multiple smaller channels downstream of the Bhimgoda Barrage due to reduced water volume. This branching leads

to the formation of riverine islands downstream of the river, near south of Kumbh Mela ground extending up to Shyampur.

To illustrate the interaction between River Ganga and the city, three stretches of the river have been analysed, each highlighting distinct features of the river–city interface.

Upstream of the Bhimgoda Barrage (refer **Figure 3-1**), the river spans approximately 175 meters in width, with a difference of about 4 meters between the riverbed and the banks. The western bank is safeguarded by a flood protection embankment that shields the low-lying areas of Sangampuri, while the eastern bank slopes gently into the river, consisting of sand and gravel bars followed by riparian vegetation belonging to Rajaji National Park.



Picture 3-2: Flood embankment along western bank



Picture 3-3: Sand and gravel bars on eastern bank

Downstream of the Bhimgoda Barrage, south of Chandi Ghat (refer **Figure 3-2**), The river widens to nearly 560 meters, of which 180 meters are occupied by sand bars. Here, the elevation difference between the riverbed and banks ranges from 3 to 4 meters. The Upper Ganga Canal flows about 200 meters west of the river and the intervening stretch is designated as a no-construction zone. Due to variations in the riverbed, this section is further divided into three parts—HRS-2(A), HRS-2(B) and HRS-2(C) shows the river and canal connect with Haridwar. HRS-2(A) providing a detailed overview of the riverbed. The sand bars extended over roughly 400 meters of the riverbed, while the vegetated island spans about 120 meters within the river bed.

At the southern end of Haridwar Nagar Nigam, near Ajeetpur (refer **Figure 3-3**) the river reaches a considerable width of approximately 2,931 meters. This includes 505 meters of river channels, 700 meters occupied by a vegetated island and 680 meters covered by sand bars. Owing to its vast width, this stretch is also divided into three segments—HRS-2(A), HRS-2(B) and HRS-2(C)—for detailed analysis of sand bar and vegetated island features. These sections show the span of River Ganga in the planning area. The eastern bank of this stretch is characterized by human settlements and agricultural fields, while the western bank is primarily agricultural. Embankment structures on both sides of the river (refer **Figure 3-3**) highlight the flood protection and riverbank stabilization measures implemented to safeguard the city and its surroundings.

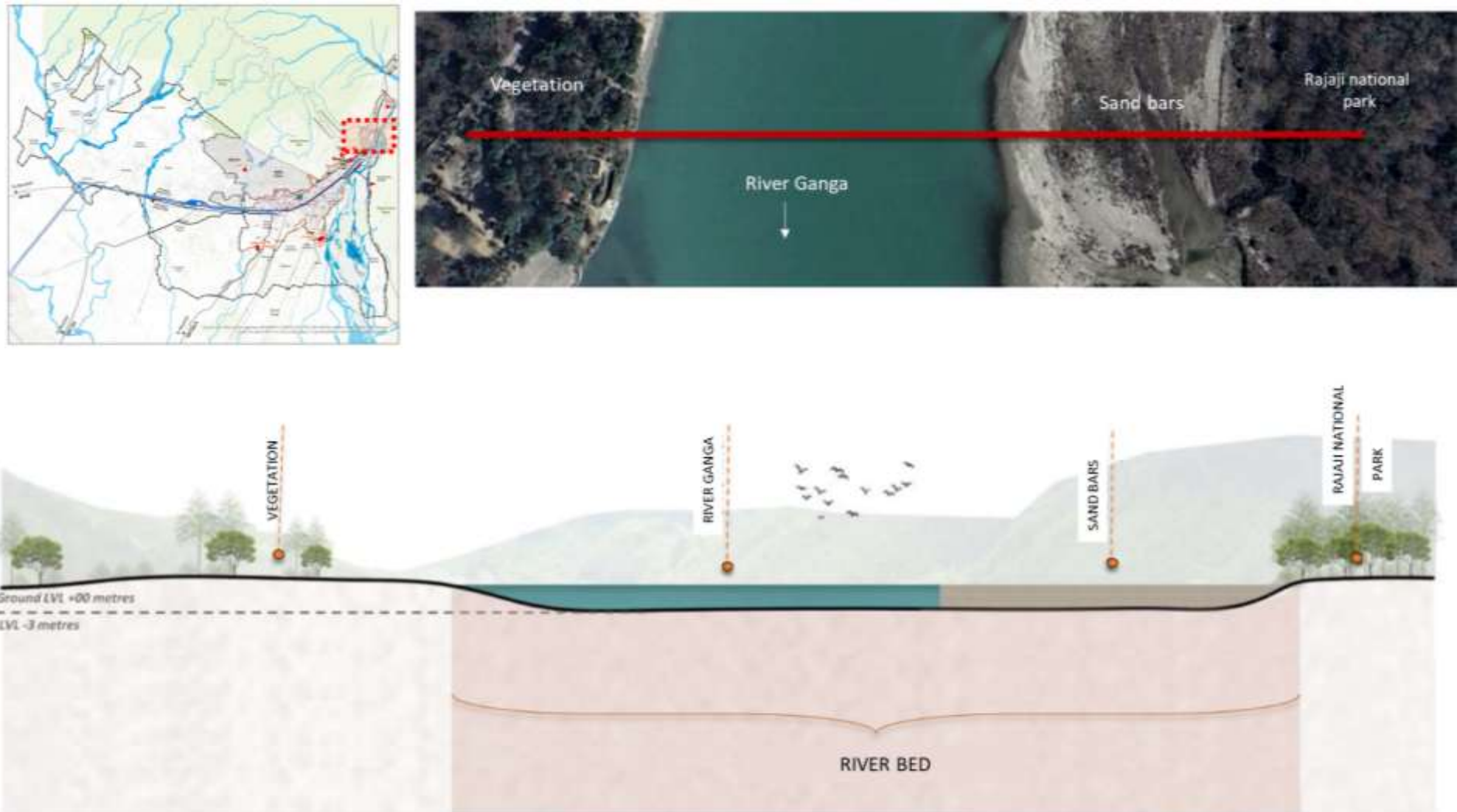


Figure 3-1: Upstream Cross section of River Ganga

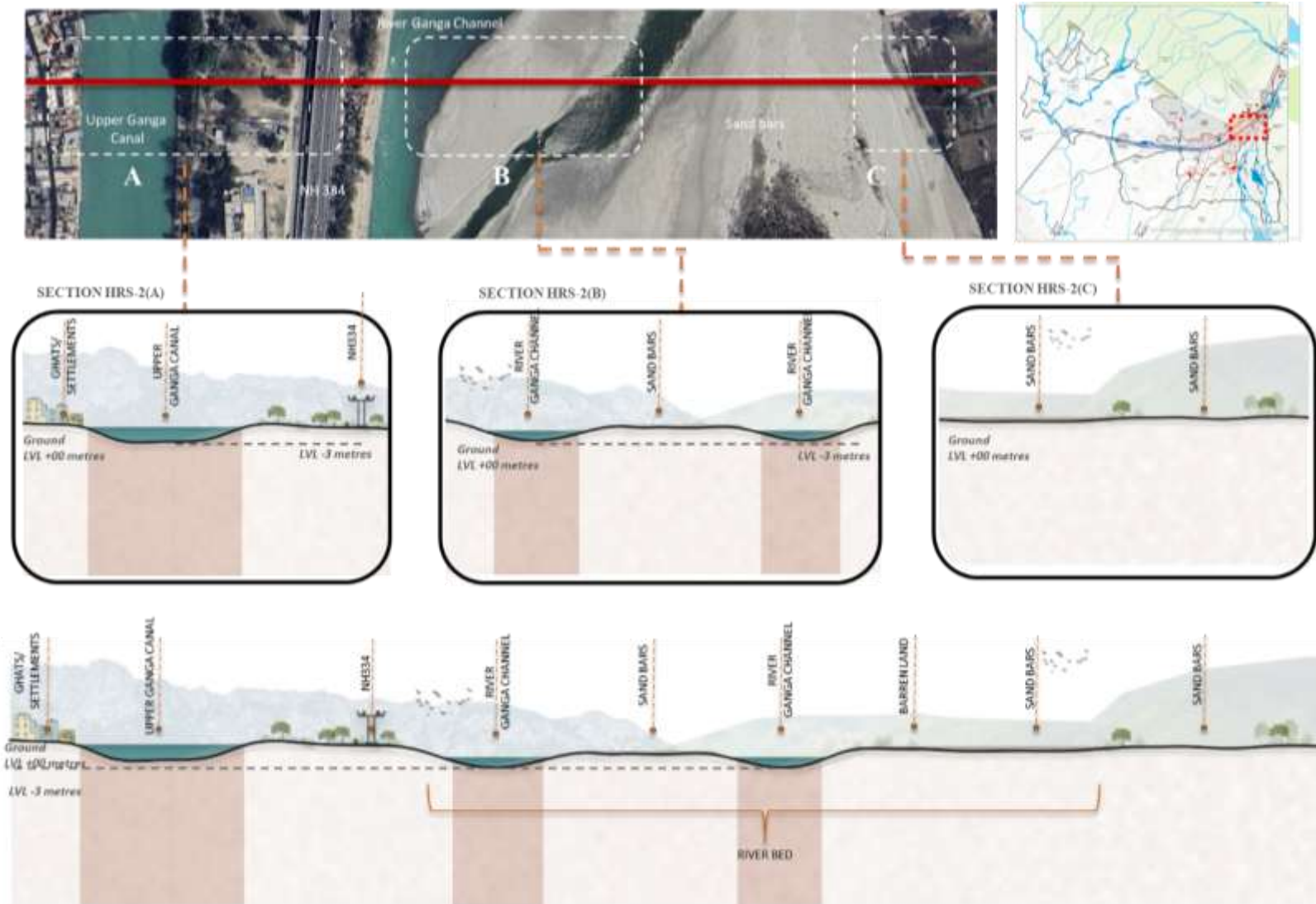


Figure 3-2: Cross section of River Ganga near Bhimgoda Barrage

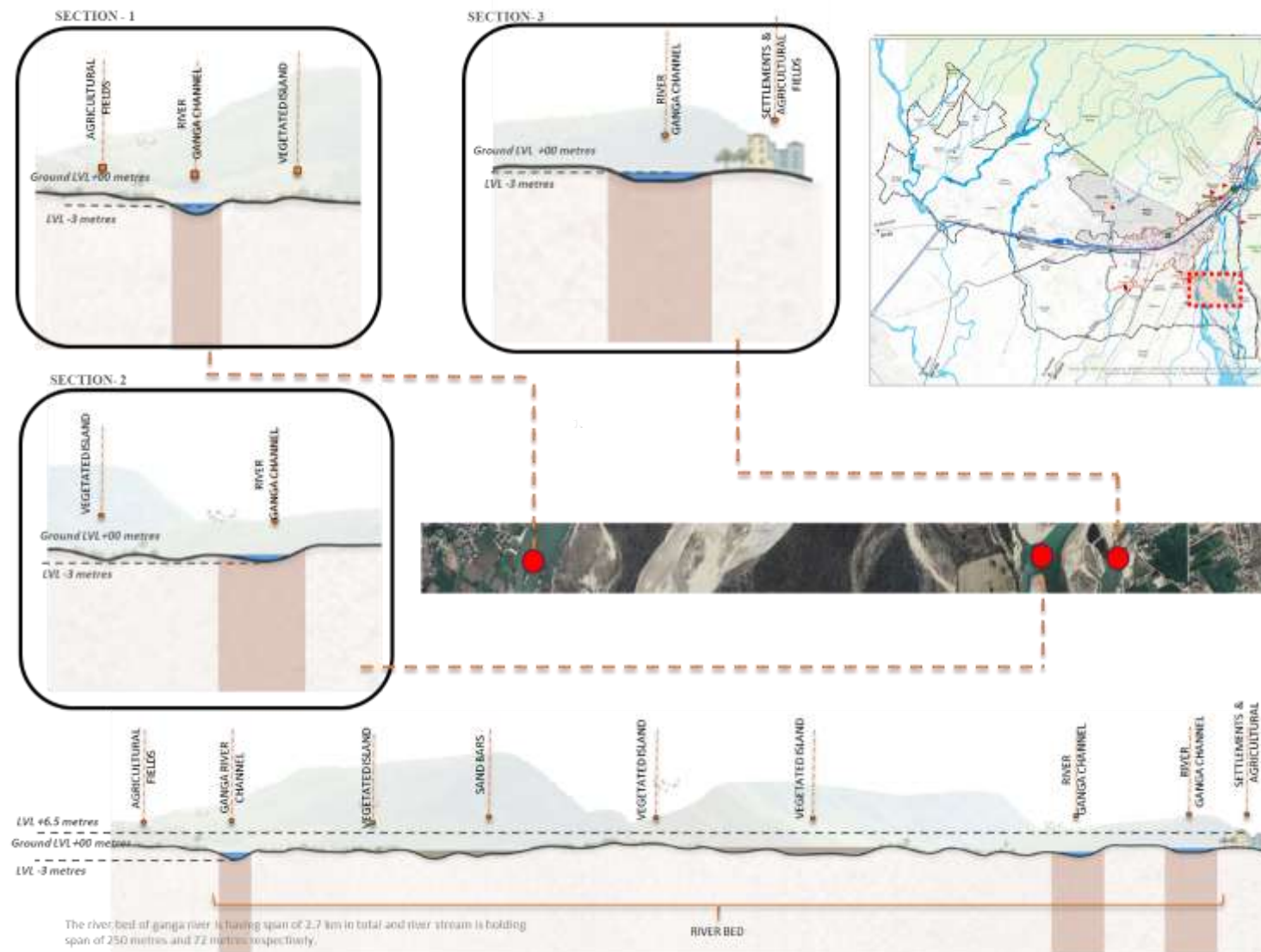


Figure 3-3: Downstream Cross section of channelized River Ganga

3.2 BLUE-GREEN RESOURCES IN THE CITY

3.2.1 Blue Resources

Haridwar’s planning area does not contain independent waterbodies such as lakes or ponds. Instead, the city’s hydrological character is defined by the River Ganga, the Upper Ganga Canal and seasonal streams (Rao’s). The **Upper Ganga Canal** serves as a critical blue resource for Haridwar, shaping both its hydrological and socio-cultural landscape. It is a major man-made canal system, constructed in 1854 to supply water for irrigation to the doab region situated between Ganga and Yamuna rivers i.e., Western Uttar Pradesh. The canal originates from Bhimgoda Barrage near Har-Ki-Pauri. The length of the canal in Planning area is 25 kms, of which within the city is 12 kms. Along its banks, there are 68 ghats, including prominent ones such as Har-Ki-Pauri, Gau Ghat and Subhash Ghat, which serve as important religious, cultural and social spaces. As per the stakeholder consultation, UP Irrigation regulate water in the Canal, maintains canal networks, cleaning, silt removal and strengthening of banks and manages land associated to canal.



Picture 3-4: Upper Ganga Canal near Rishikul Bridge

3.2.2 Green Resources

- ▶ **Flora:** Haridwar Planning Area is surrounded by the Rajaji National Park, which forms an ecological buffer and enriches the city’s natural landscape. The regional flora, comprises 227 species in total- 127 tree species, 66 shrubs, 11 creepers, 3 parasitic plants and 20 grasses.
- ▶ **Fauna:** The Rajaji national park is a home to a to a total of 186 fauna which gives shelter to 32 mammals such as Bengal tiger, leopard, Himalayan black bear, sloth bear, striped hyena, sambar deer, barking deer, goral (mountain goat), wild boar, Asian elephant, langurs etc. Further, there are 121 bird species within the park, including the great hornbill, peafowl, woodpeckers and various

migratory birds during winter months. The park's diverse habitats, ranging from dense deciduous forests to grasslands, support this extensive biodiversity.

- ▶ **Aquatic species:** The aquatic ecosystems of this region are home to various species. Among the aquatic species found here are- the smooth-coated otter (*Lutrogale perspicillata*), a social and agile mammal that thrives in rivers and wetlands; the Eurasian otter (*Lutra lutra*), a solitary species whose presence indicates high water quality; the mugger crocodile (*Crocodylus palustris*), a keystone reptilian predator of the Indian subcontinent that regulates aquatic populations; and the golden mahaseer (*Tor putitora*), a large migratory fish revered as the “tiger of the river” and valued both ecologically and culturally.
- ▶ **Urban green belt/ parks:** According to the Draft Haridwar Master Plan 2041, 1.9% (197 ha) of planning area is under parks.
- ▶ **Agriculture:** As per the draft Haridwar master plan 36.8% (90 sq km) of the total planning area is under agriculture. It is located in the north-eastern, north-western and northern outskirts of the planning area. The fertile land is used for cultivation of crops such as wheat, paddy etc.

3.2.3 Riparian Buffer

The riparian buffer in Haridwar shows a distinct two layers of riparian buffer. It features a canopy layer of medium to tall native trees such as Peepal (*Ficus religiosa*), Banyan (*Ficus benghalensis*) and Neem (*Azadirachta indica*), which form the upper storey. Beneath this, a second layer of shrubs, grasses and young saplings including species like Lantana, Clerodendrum and Saccharum is present, providing essential ground cover and supporting local biodiversity.



Picture 3-5: Two-distinct layers within the riparian buffer

Riparian buffer along the riverbanks indicates the domination of built up and embankments in the Haridwar Planning area. Out of the total stretch of 45.1 kms, degraded vegetation occupies the largest share (14.1 km) followed by built-up (10.3kms) leaving limited scope for dense vegetation or sandbar ecosystems. It highlights a strong urban pressure with constrained ecological and recreational potential. The Upper Ganga canal stretch is dominated by dense vegetation (38.7 kms), with notable presence of built-up areas and embankments which includes the ghats, temples and ashrams. In contrast, Pathri Rao’s buffer is dominated by agriculture (23.5 km), while Ghoina Rao is marked by extensive sandbars (19.8 km). The Sukhi River and Ranipur Rao depicts built-up dominance within their 30 m riparian zones. The detailed analysis is given in **Annexure 1**.

Further detailing of the riparian buffer observed on both the banks of River Ganga and upper ganga Canal are given in **Table 3-1**.

Table 3-1: Calculation of Existing Riparian Buffer in Haridwar

Riparian	Western bank (in kms)	Eastern bank (in kms)
River Ganga		
Agriculture	-	6.6
Built-up	7.6	2.9
Degraded Vegetation	10.9	3.4
Dense Vegetation	9.7	-
Sandbars	4.7	-
Total	32.9	12.9
Upper Ganga Canal		
Built-up	-	0.6
Degraded Vegetation	-	-
Dense Vegetation	-	-
Embankment	22.5	20.6
Total	22.5	21.2

Source: Consultant’s analysis from site observation & satellite imagery

3.2.4 Biodiversity

As mentioned in section 3.2.3 The riverine landscape of Haridwar, shaped by the Ganga supports a rich diversity of native flora and fauna that sustain ecological balance and cultural heritage. The vegetation includes species such as Sal (*Shorea robusta*), Sheesham (*Dalbergia sissoo*), Neem (*Azadirachta indica*) and Bel which play a vital role in stabilizing riverbanks, filtering runoff and maintaining soil fertility. In some parts the invasive species are also found which includes-

The common flora species has been listed as under:

Table 3-2: List of Flora and Fauna Along the River Ganga

Parameter	River Ganga (Haridwar stretch)
Riparian Vegetation Composition	Mosaic of native and planted vegetation. Common trees include Peepal (<i>Ficus religiosa</i>), Neem (<i>Azadirachta indica</i>), Shisham (<i>Dalbergia sissoo</i>), Banyan (<i>Ficus benghalensis</i>) and Bel (<i>Aegle marmelos</i>). Shrubs and herbs such as Tulsi (<i>Ocimum sanctum</i>), Ipomoea carnea and Saccharum spontaneum dominate floodplains. Temple ghats often have ornamental and religious plantings, enhancing cultural value.
Buffer Width and Condition	Buffer zones vary between 20–80 m. Wider buffers exist near semi-natural stretches upstream, while urbanized ghats and settlements show narrowing, fragmentation and encroachment. Sandbars and floodplain areas are often colonized by invasive species like Lantana camara and Parthenium hysterophorus.
Faunal Presence	Rich aquatic and avian diversity. Key species include Mugger Crocodile, Indian Flapshell Turtle and migratory birds such as Bar-headed Goose, Northern Pintail and Black-bellied Tern. Fish diversity includes Rohu, Katla, Mahseer and other carp species. Urban pressures and pollution have led to localized decline in sensitive fauna.



Neem



Bel



Sal



Peepal

Picture 3-6: Native species along the River Ganga

In Haridwar, several invasive species have been reported all over the planning area. They disrupt the ecological balance of the Ganga riverfront, floodplains, natural drains and forest (refer **Table 3-3**). These species spread aggressively, often outcompeting local flora and affecting biodiversity.

Table 3-3: List of invasive species in Haridwar

Species	Type	Impact
Lantana camara	Shrub	Forms dense thickets, suppresses native vegetation, reduces grazing land and hinders forest regeneration.
Prosopis juliflora (Vilayati Babool)	Tree	Alters soil chemistry, depletes groundwater and displaces native grasses crucial for livestock.
Parthenium hysterophorus (Congress grass)	Herb	Causes health issues (allergies, dermatitis), reduces crop yields and dominates open lands.
Eichhornia crassipes (Water hyacinth)	Aquatic plant	Chokes water bodies, reduces oxygen levels, hampers fish populations and obstructs river navigation.
Saccharum spontaneum (Wild sugarcane)	Grass	Spreads rapidly along floodplains, altering riverbank vegetation and competing with native grasses.

**Lantana
Camara**



**Prosopis
Juliflora**



**Parthenium
hysterophorus**



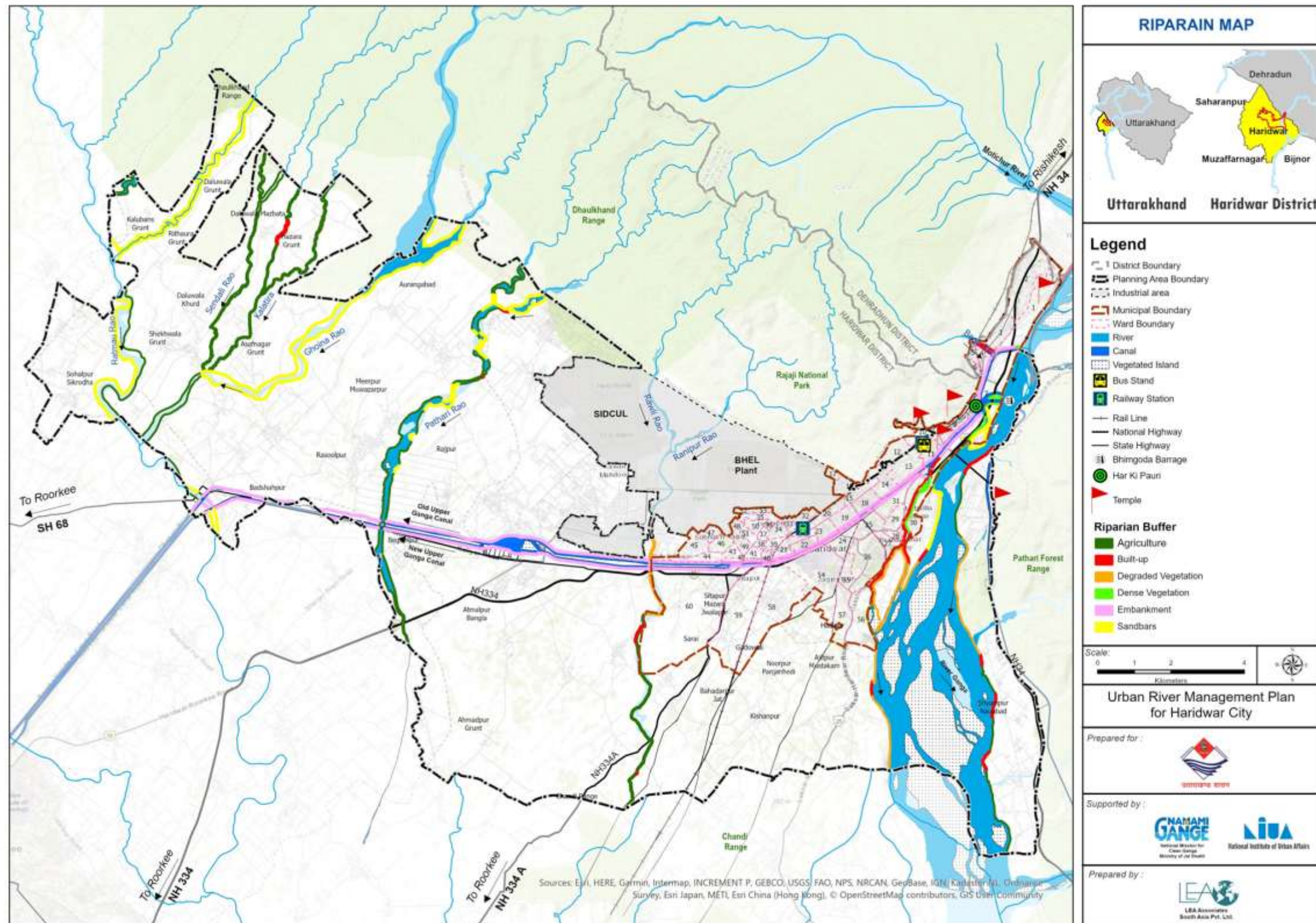
**Saccharum
spontaneum**



Water hyacinth



Picture 3-7: Invasive plant species along River Ganga in Haridwar



Source: Draft Master Plan 2041 ;Survey of India (Administrative Boundaries); Open Street Map (Road Network), Consultant's Analysis

Map 3-1: Riparian Buffer in Haridwar

3.3 ACTIVITY MAPPING ALONG THE RIVER

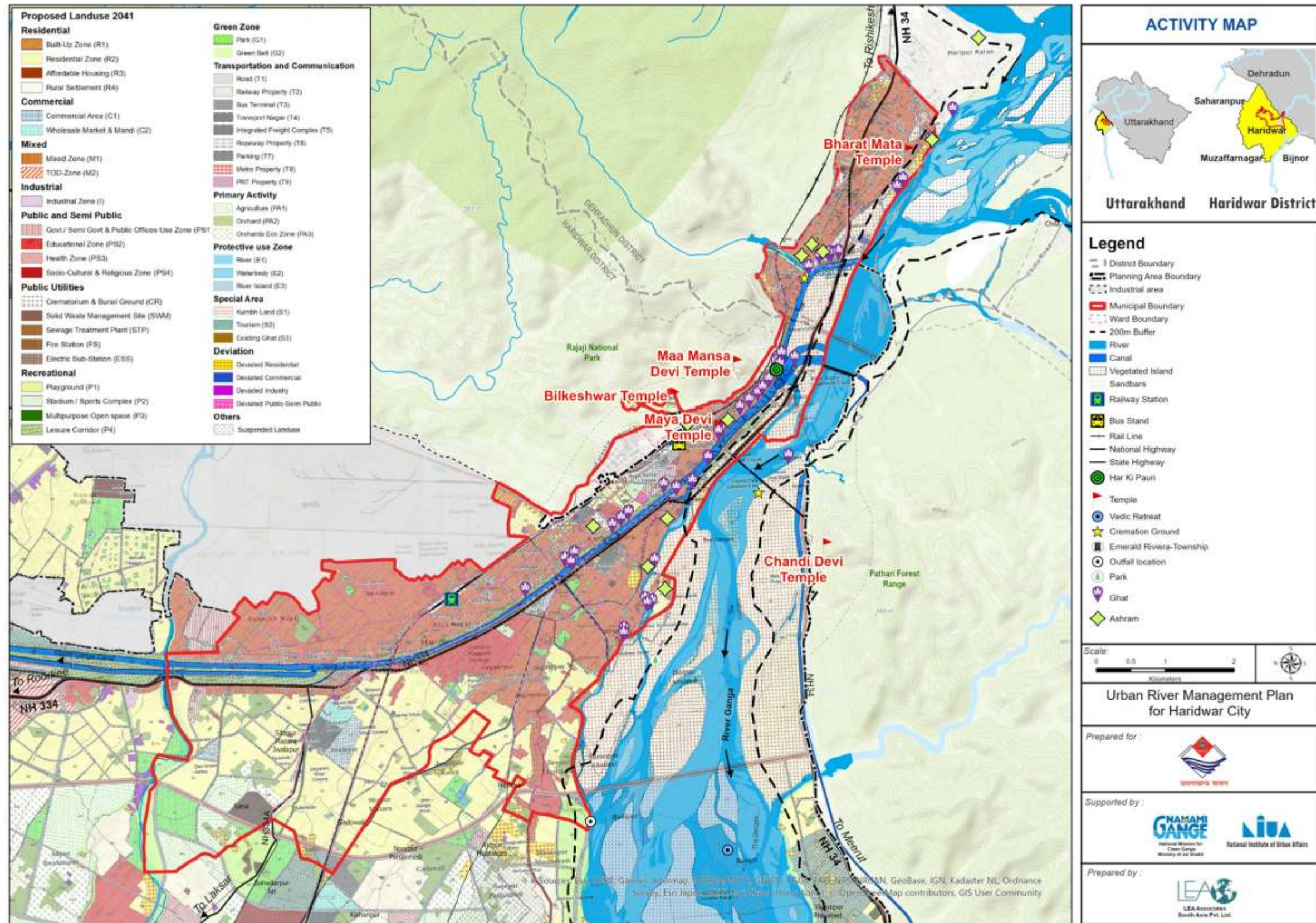
The major activities observed along the banks of the river and canal are as under (refer Map 3.3). No major activities were observed along the banks of River Ganga as the majority of the ghats, ashrams, hotels, commercial activities are observed along the Upper Ganga Canal in the field survey and satellite imagery. There are minimal activities along the river as the riverbed of Ganga is dry and only during the cleaning of the Har-Ki-Pauri the water diverted here, making such activities unfeasible.

1. Activities along the River Ganga

- ▶ Ghat- Chandi ghat is the prominent ghat among all and it is located on the eastern bank of the river. It serves as a vital city river interaction point for rituals, bathing and devotion, i.e., Ganga aarti.
- ▶ Agriculture- In the downstream stretch of the western bank of the River Ganga, south of the Mela Ground, fertile alluvial soils provide a rich agricultural base. These nutrient-laden floodplains support the cultivation of key crops such as wheat, rice, sugarcane and pulses, forming the backbone of local agriculture and sustaining rural livelihoods in Haridwar.
- ▶ Cremation activities- The crematorium is located adjacent to the Chandi ghat along the bank of River Ganga.
- ▶ Unauthorized establishments: Downstream of the eastern bank of river Ganga, a residential settlement has developed within the.

2. Activities along the Upper Ganga Canal

- ▶ Ghat – Har-Ki-Pauri is the most prominent and revered ghat in Haridwar, serving as the vital point of interaction with the River Ganga. It is the sacred site for rituals, aarti and ceremonial bathing,
- ▶ Commercial establishments- At the ghats in small kiosks, vendors and shopkeepers sell variety of items -Ganga Jal containers, prayer essentials, eatables and spiritual souvenirs catering to the needs of pilgrims and visitors.
- ▶ Hospitality sector- In Haridwar, the majority of dharmshalas, hotels and ashrams are concentrated along the canal, forming a continuous stretch of hospitality and pilgrimage infrastructure. During peak seasons, this clustering becomes the city’s primary interface as visitors and pilgrims stay close to the sacred Har-Ki-Pauri ghat. The proximity reflects Haridwar’s deep spiritual character with the Har-ki-Pauri.
- ▶ Parking- Parking facilities are available along the ghats in Haridwar, with a particular concentration on the eastern bank of the canal, especially in the Rodi Belwala area.



Map 3-2: Activity mapping along the River Ganga

3.4 FLOODING

Haridwar is highly vulnerable to both fluvial and pluvial flooding. Fluvial flooding, driven by the swelling of the Ganga and its tributaries during the monsoon season whereas pluvial flooding is caused by intense local rainfall overwhelming urban drainage systems.

1. Fluvial Flooding:

Haridwar experiences significant flood vulnerability due to its location along the River Ganga. The floodplain zone assessment has identified that the entire Mela Ground falls within a high-risk area, where the 25-year, 50-year and 100-year flood lines converge. In compliance with NGT directives and the Uttarakhand Flood Plain Zoning Act, 2012, the Irrigation Department has delineated the flood lines, marking the Red Line (100-year return period) and Blue Line (25-year return period) for the Ganga. Villages such as Missarpur Ahatmal, Jiya Pota, Ajitpur Ahatmal, Sirsali, Ajitpur Mustkam, Shayampur, Jagjeetpur, Kankhal and Devpura have been identified as among the most vulnerable to flooding. refer **Map 3-8**. These zones have been officially notified, underscoring the need for strict regulation of land use and preparedness measures in flood-prone areas.

According to the Uttarakhand Flood Zone Notification, specific cadastral numbers of villages located between Chandi Pul and Laksar have been officially designated as part of the flood risk area. This notification clearly defines the activities that are permitted and prohibited within the designated floodplain zones.

Development within the flood lines-

- ▶ **Developments within Blue Line:** In the downstream stream of the River Ganga there are ghats and a Kumbh mela ground.
- ▶ **Developments within Red Line:** Developments such as ghats, embankments and settlements have been observed within the red line area of Haridwar. In the downstream of River Ganga along the eastern bank, there are residential settlements and townships, constructed on the edge of the river. In contrast in the upstream western bank, ghats and embankments are constructed like Sapt Rishi Ghat to protect the riverbank.

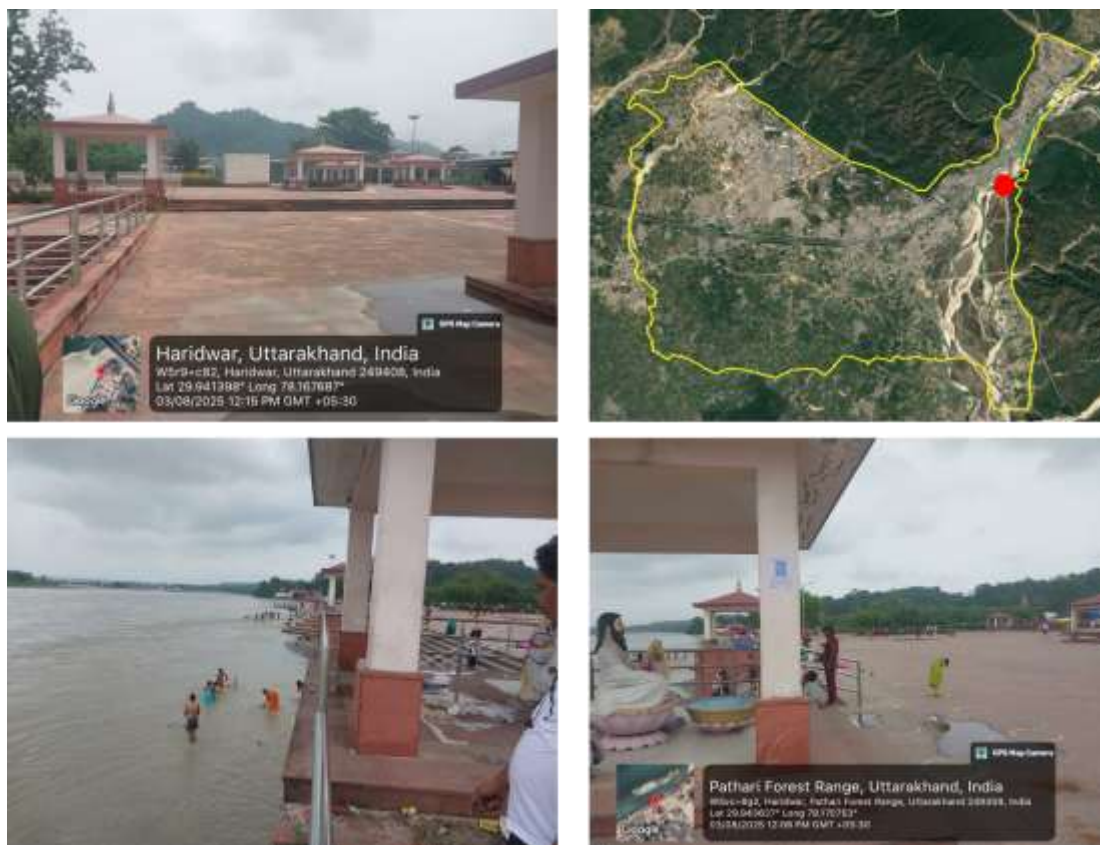


Map 3-3: Developments in the Blue Line in Haridwar Planning Area

▶ Floodplain activities:

- i. **Chandi Ghat-** The ghat is built on the eastern bank of River Ganga. It was constructed in a flood-prone zone as part of the Namami Gange Project as per the notification, Ministry of Water Resources, River Development and Ganga Rejuvenation, 2016. This development is

among the activities permitted within the River Ganga floodplain under the guidelines. The development of ghats is permitted within floodplain zones.



Picture 3-8: Chandi Ghat in Flood Plain Area

Source: Site visit

- ii. **Illegal construction-** The encroachment by permanent structures, specifically the 'Vedic Retreat' development, have been established on the ecologically sensitive riverine islands of River Ganga. This construction directly violates the National Green Tribunal (NGT) mandates regarding 'No-Construction Zones' on active floodplains.



Map 3-4: Vedic Retreat Island

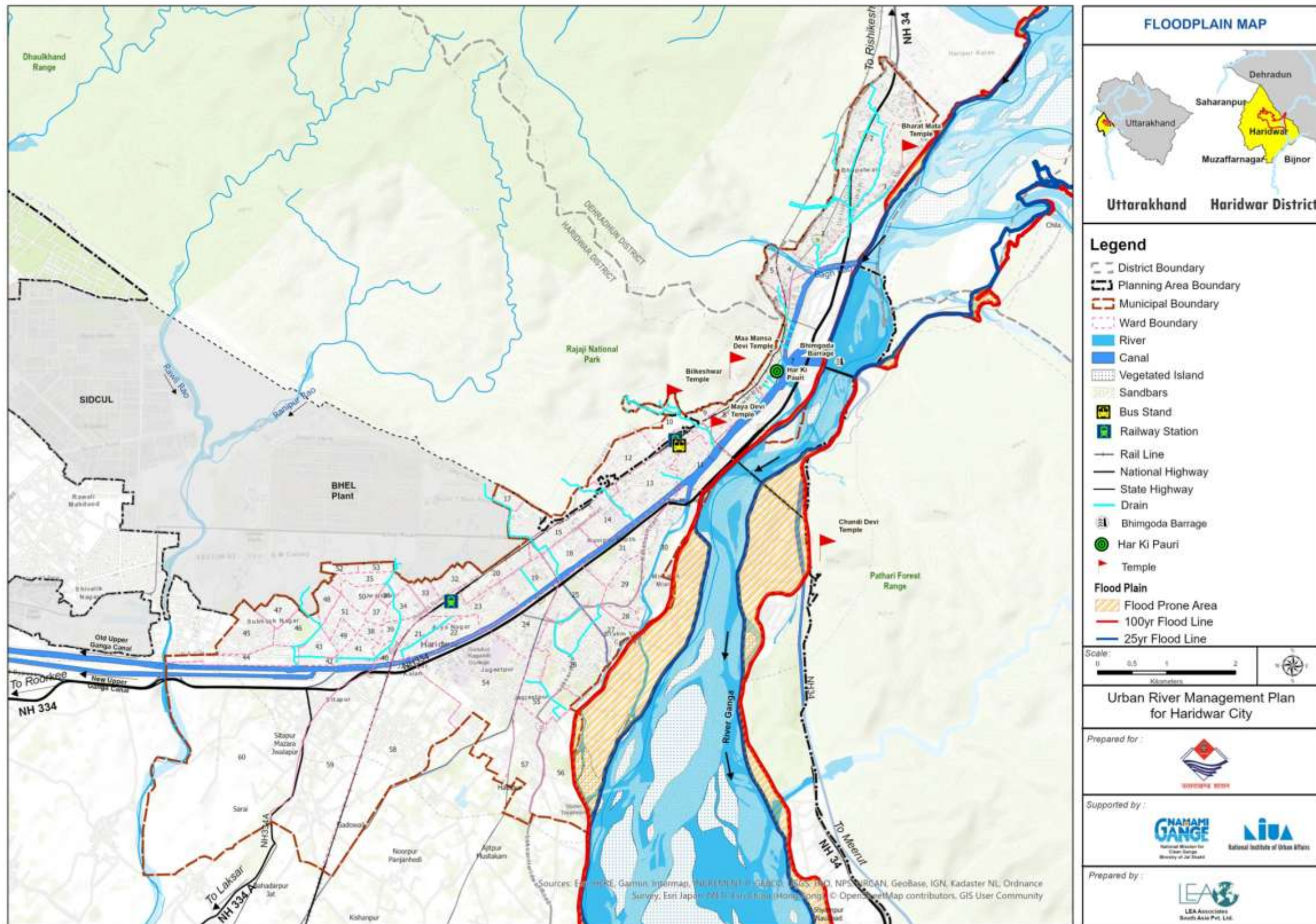
2. Pluvial Flooding:

As per draft master plan Haridwar 2041, Haridwar is prone to pluvial flooding. **Table 3-4** highlights the areas where flooding incidents have been reported during the monsoon season.

Table 3-4: Areas of pluvial flooding incidents

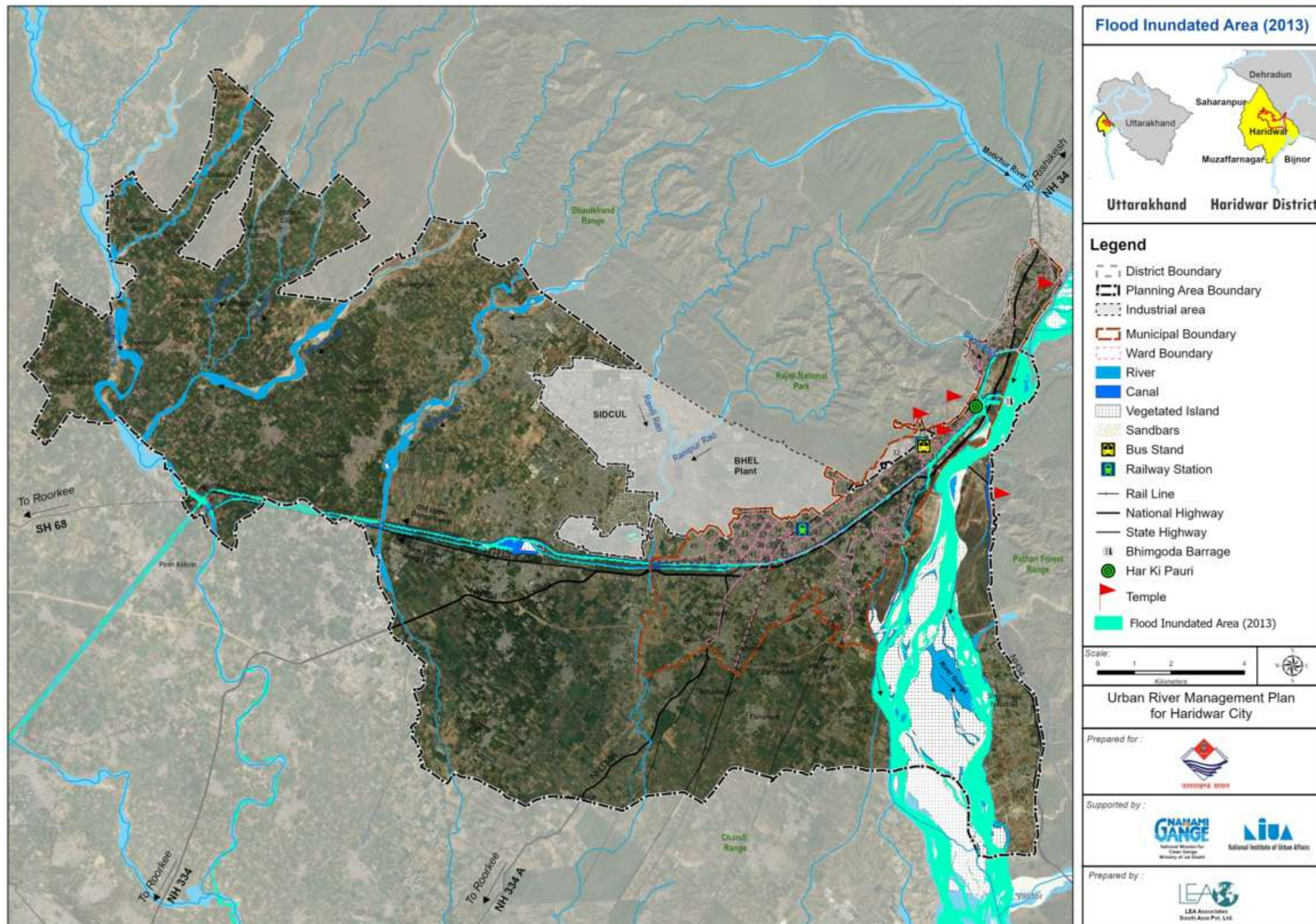
S. No.	Area Name	Category / Land Use
1	Govindpuri	Residential/Commercial
2	Tibdi	Residential
3	Durganagar	PSP + Ashrams
4	Krishna Nagar	PSP + Residential
5	Sri Gangadhar Mahadev Nagar	Ashram
6	Raj Ghat	PSP + Ashrams
7	Sandesh Nagar	Residential
8	Saptrishi	Ashram
9	Aarya Nagar	Residential / Commercial
10	Sharda Nagar	Residential
11	Bhimgoda	PSP + Commercial
12	Laatonwaali	Residential
13	Mayapur	Residential + Ashrams
14	Shiv Lok	Residential
15	Raman Nagar	Residential
16	Bhopatwaala	Ashrams + Commercial
17	Naathan Nagar	Residential
18	Shravannath Nagar	Residential/Commercial
19	Nirmala Chawni	Farm house Agriculture/Residential

Source: Draft Master plan Haridwar, 2041



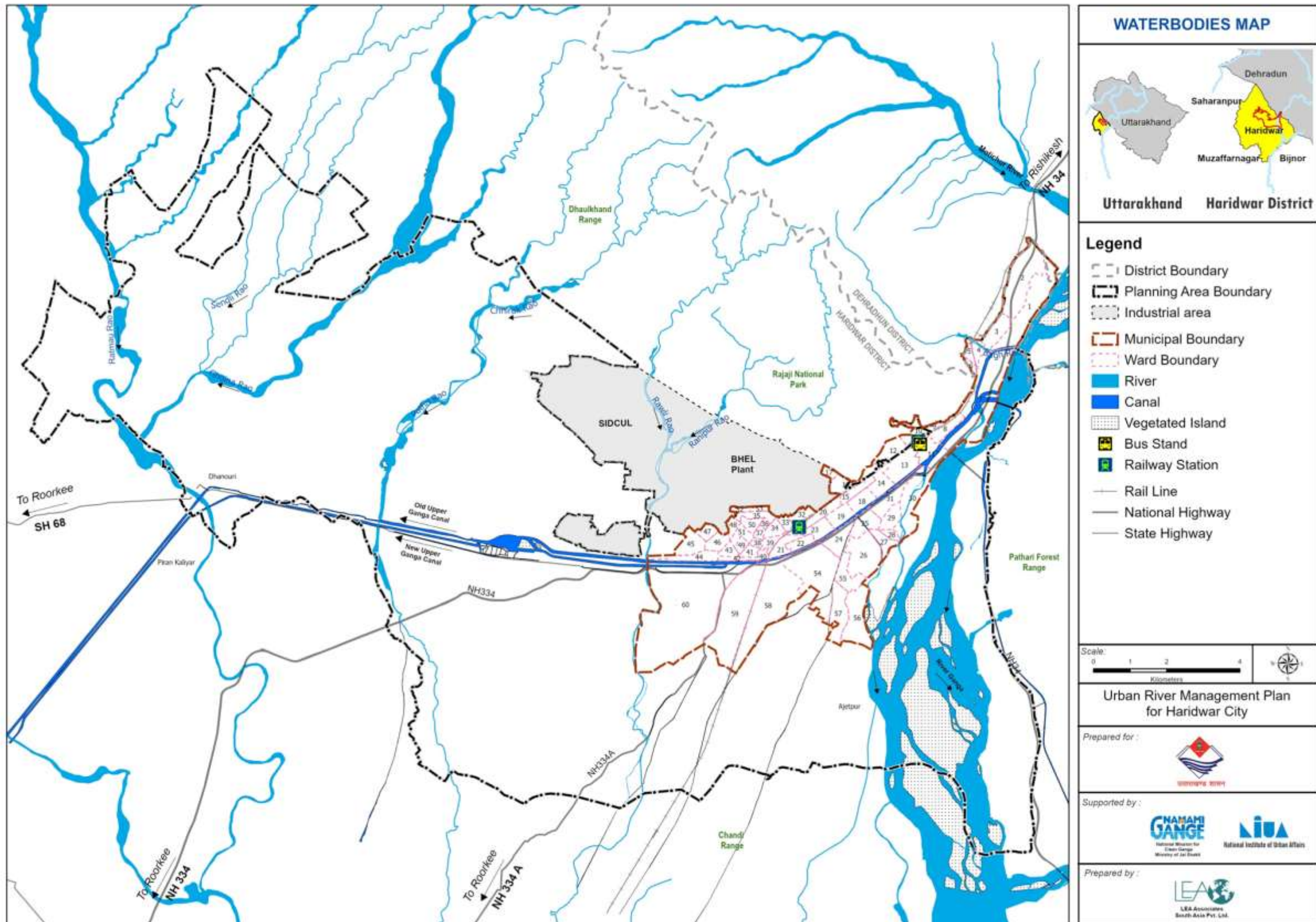
Source: Survey of India (Administrative Boundaries); Open Street Map (Road Network), Consultant's Analysis

Map 3-5: Floodplain map of Haridwar city



Source: Draft Master Plan 2041 ;Survey of India (Administrative Boundaries); Open Street Map (Road Network), Consultant's Analysis

Map 3-6: Flood inundation Map of Haridwar



Source: Draft Master Plan 2041 ;Survey of India (Administrative Boundaries); Open Street Map (Road Network), Consultant's Analysis

Map 3-7: Waterbodies in Haridwar



3.5 EXISTING/ UPCOMING/ PROPOSED PROJECTS

Currently, in villages Sajjanpur Pilli, Kangri, Shyampur, Shyampur Gajjiwali and the adjoining areas between these settlements and the Ganga River, a flood protection embankment has been proposed. Given the tourism potential of this stretch, it is recommended that a green buffer be developed along the embankment, both to enhance ecological resilience and to create spaces that can be utilized for tourism-related activities.

3.6 INSTITUTIONAL MECHANISM

The Irrigation Department is responsible for bank protection and embankment works, while the Forest Department oversees ecological planning, plantation and conservation initiatives. The Municipal Council manages public amenities and ensures urban integration along the riverfront.

Table 3-5: Roles and responsibilities of government agencies in ecological management for Haridwar City

Departments	Role
Irrigation Department	Lead agency for river bank protection, embankment construction and flood mitigation
Forest Department	Custodian of forested riparian zones and biodiversity conservation

4 PHYSICAL INFRASTRUCTURE

4.1 WATER SUPPLY

As mentioned in section 3.2.1 above, Haridwar city is dependent on groundwater to meet domestic and commercial water requirements.

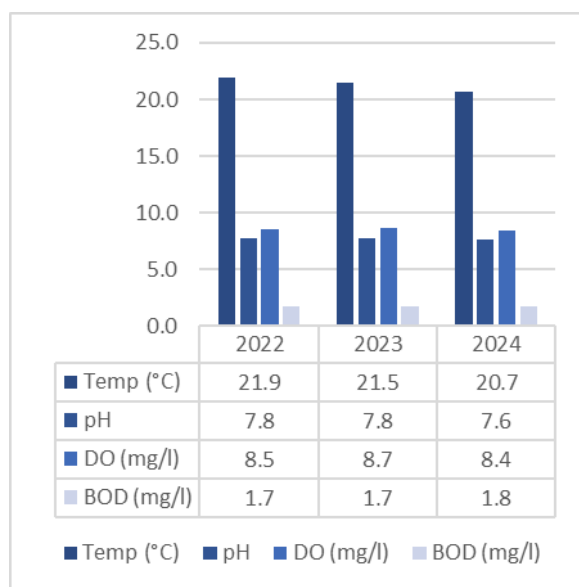
4.1.1 Water Demand and Supply

Haridwar's water supply system is entirely dependent on groundwater and supplied through pipeline system. The water demand of the city is 100 MLD, while the city extracts about 132 MLD, indicating a marginal surplus. In Haridwar, the borewells are also used to extract the water. They ensure water supply in ashrams, commercial areas and municipality. To sustain this spiritual rhythm alongside the city's domestic requirements, borewells ensure a steady flow of water.

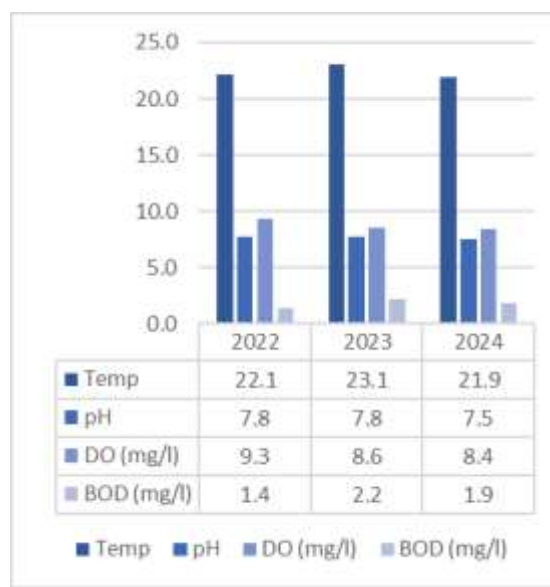
4.1.2 Water Quality

Water quality plays a crucial role in the health of a river ecosystem. At present the manual testing in 3 monitoring points is conducted at i.e., (i) River Ganga at Bindughat Dudhiyaban (Upstream), (ii) River Ganga at Balkumari Mandir, Ajeetpur (Downstream) and (iii) Upper Ganga Canal at Bindughat Dudhiyaban (upstream), Balkumari Mandir, Ajeetpur and Har-ki-Pauri, Rishikul Bridge (downstream). As per the NMCG-NEERI, water quality in Haridwar has been classified as Category B i.e., water suitable for outdoor bathing. The water quality at the three monitoring stations is presented in **Figure 4-1** and **Figure 4-2** below. Results show that all the three stations consistently comply with the CPCB standards.

- **Water Quality of upstream and downstream of River Ganga:** As shown in **Figure 4-1** the water quality at both the monitoring stations has remained within permissible limits over the past three years. The BOD levels have increased since 2023, they continue to fall within the permissible range.



River Ganga U/S at Bindughat Dudhiyaban



River Ganga D/S at Balkumari Mandir, Ajeetpur

Figure 4-1: Water Quality in the Upstream and Downstream of River Ganga

Source: Water Quality, Uttarakhand, 2022-24²

² https://ukpcb.uk.gov.in/home/url?id=19&menu_type=submain

- **Water Quality of upstream and downstream of Upper Ganga Canal:** As shown in **Figure 4-2** the water quality in the monitoring stations has remained within permissible limits over the past three years.

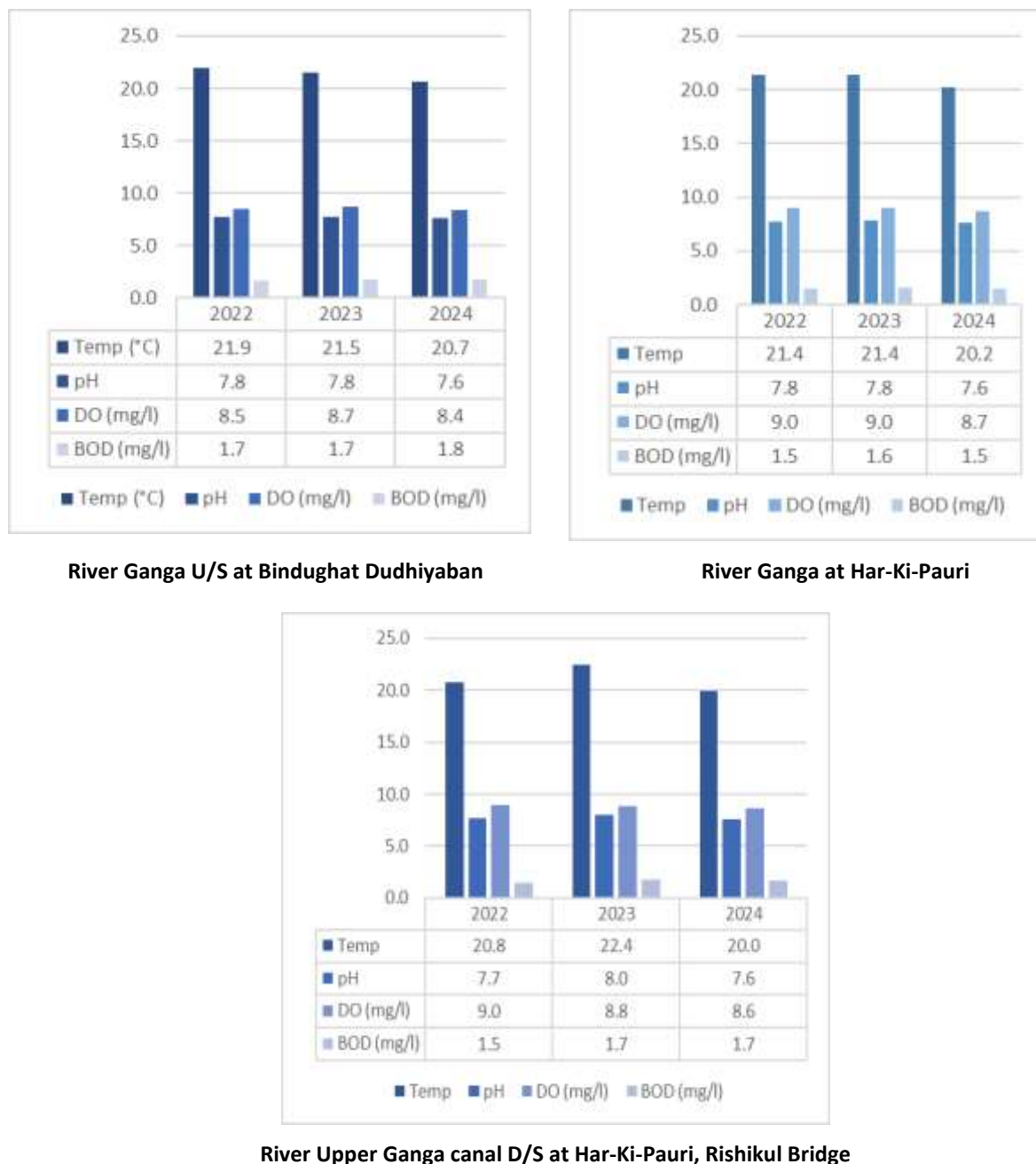


Figure 4-2: Water Quality in the Upstream and Downstream of Upper Ganga Canal

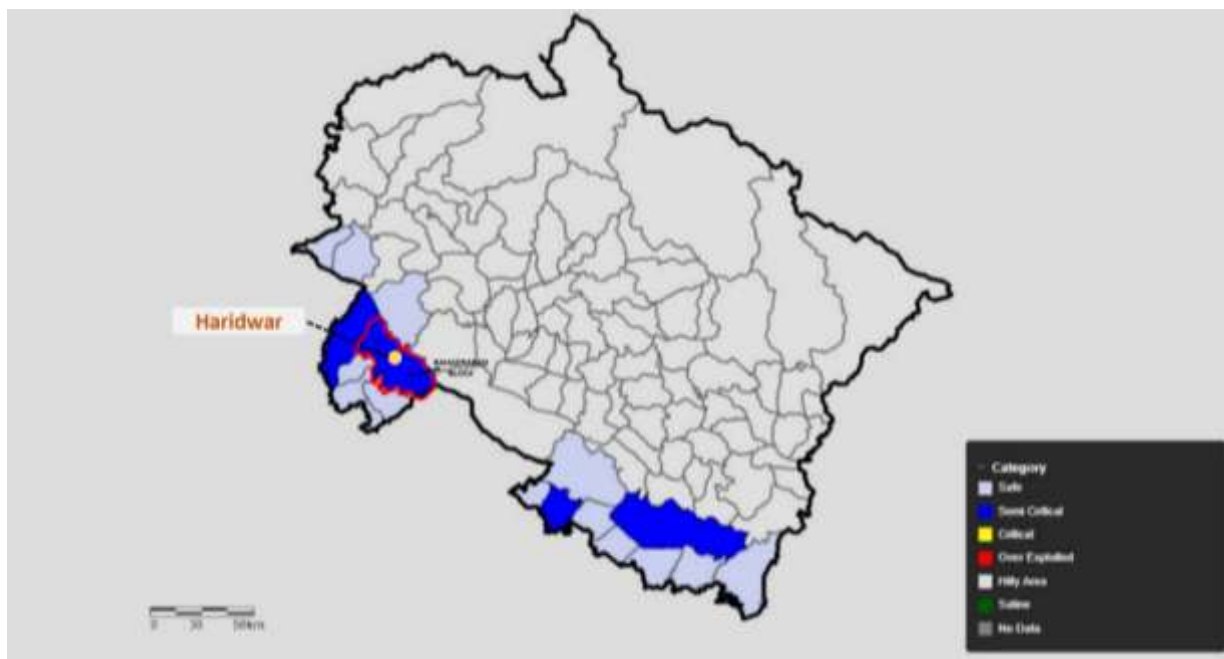
Source: Water Quality, Uttarakhand, 2022-24³

4.1.3 Groundwater

Groundwater in the city is extracted through a network of 80 tube. At present, approximately 132 MLD is pumped over 16 hours each day to meet an urban demand of 100 MLD. The extracted water is treated through chlorination before being supplied via 22 overhead tanks and reservoirs. However, this complete dependence on groundwater has raised serious sustainability concerns, as the water table continues to decline due to over-extraction. According to the Central Ground Water Board (CGWB), the water table has

³ https://ukpcb.uk.gov.in/home/url?id=19&menu_type=submain

been declining at an average rate of 0.36 meters per year, amounting to a cumulative decline of 4–5 meters over the past decade. The major factors behind this depletion include rapid urban expansion, population growth, intensive agriculture in the Ganga plains, widespread dependence on shallow tube wells, industrial development and inadequate recharge practices. As a result, Haridwar has been categorized as a semi-critical zone, particularly within the unconfined aquifers of the Ganga basin.

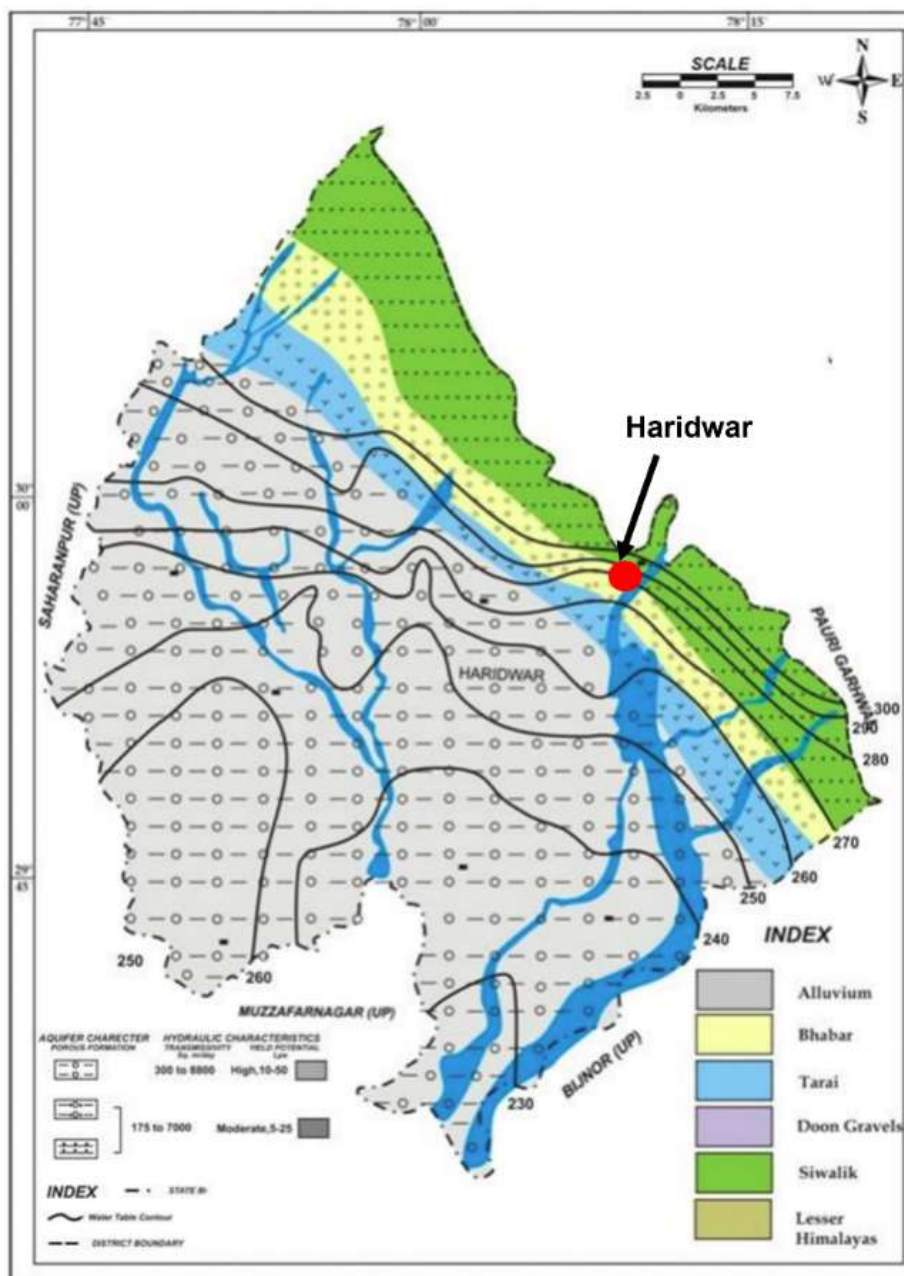


Map 4-1: Categorization of Haridwar city in ground water development

Source: Dynamic Ground Water Resources, 2023, CGWB

Haridwar planning area falls within Bahadrabad block, which, as per the District Ganga Plan (2025), the block records the highest groundwater consumption in the Haridwar district. The block emerges as the major extraction zone, with irrigation as the dominant use, alongside significant domestic and industrial demand. Its total annual groundwater draft of 7,228.84-hectare meters is substantially higher than other blocks of the district, reflecting both intensive agriculture and growing urban-industrial pressures. Since Haridwar lies in this block, it faces the same situation of high groundwater dependence and declining sustainability

There is potential for recharge of ground water as the northern part of Haridwar falls in the Shivalik belt and the southern part falls in the Bhabar zone. **Map 4-2** indicating the aquifers in the region.



Map 4-2: Haridwar lies in Bhabar belt of aquifers

Source: Aquifer Mapping and Ground Water Management Plan Haridwar District, Uttarakhand, 2016

4.1.4 Institutional Mechanism

Agency/Department	Roles and Responsibilities
Haridwar Jal Sansthan	Primary agency responsible for operation, maintenance and management of water supply and treatment infrastructure in the city
Uttarakhand Pey Jal Nigam	State-level agency tasked with planning, design and execution of water supply projects
Haridwar Nagar Nigam	Supports Haridwar Jal Sansthan in administrative coordination and ensures alignment of water supply services with overall city management
Central Ground Water Board (CGWB)	Provides technical assistance for groundwater assessment and sustainable resource management in Haridwar

4.2 SEWERAGE SYSTEM

4.2.1 Sewage Generation and Coverage

Haridwar city generates an estimated 155 MLD⁴ of sewage. The city has a sewerage network of 219.8 km, of which 186.7 is functional, while the remaining stretch require replacement. As per the Draft Haridwar Master plan 2041, about 89% households are connected to the sewerage network. The network is divided into six operational zones (A-F). Zones A to E are linked to the Jagjeetpur STP, while Zone F is connected to Sarai STP.

The BHEL township operates an independent sewerage system managed by BHEL, with sewage treated at a 7 MLD STP through oxidation pond near Shivalik Nagar. Within the BHEL premises, a new STP is under construction in Sector 3, supported by pumping stations in the township.

In SIDCUL, industrial wastewater is managed through a 9 MLD CETP, which discharges treated effluent into the Ranirao.

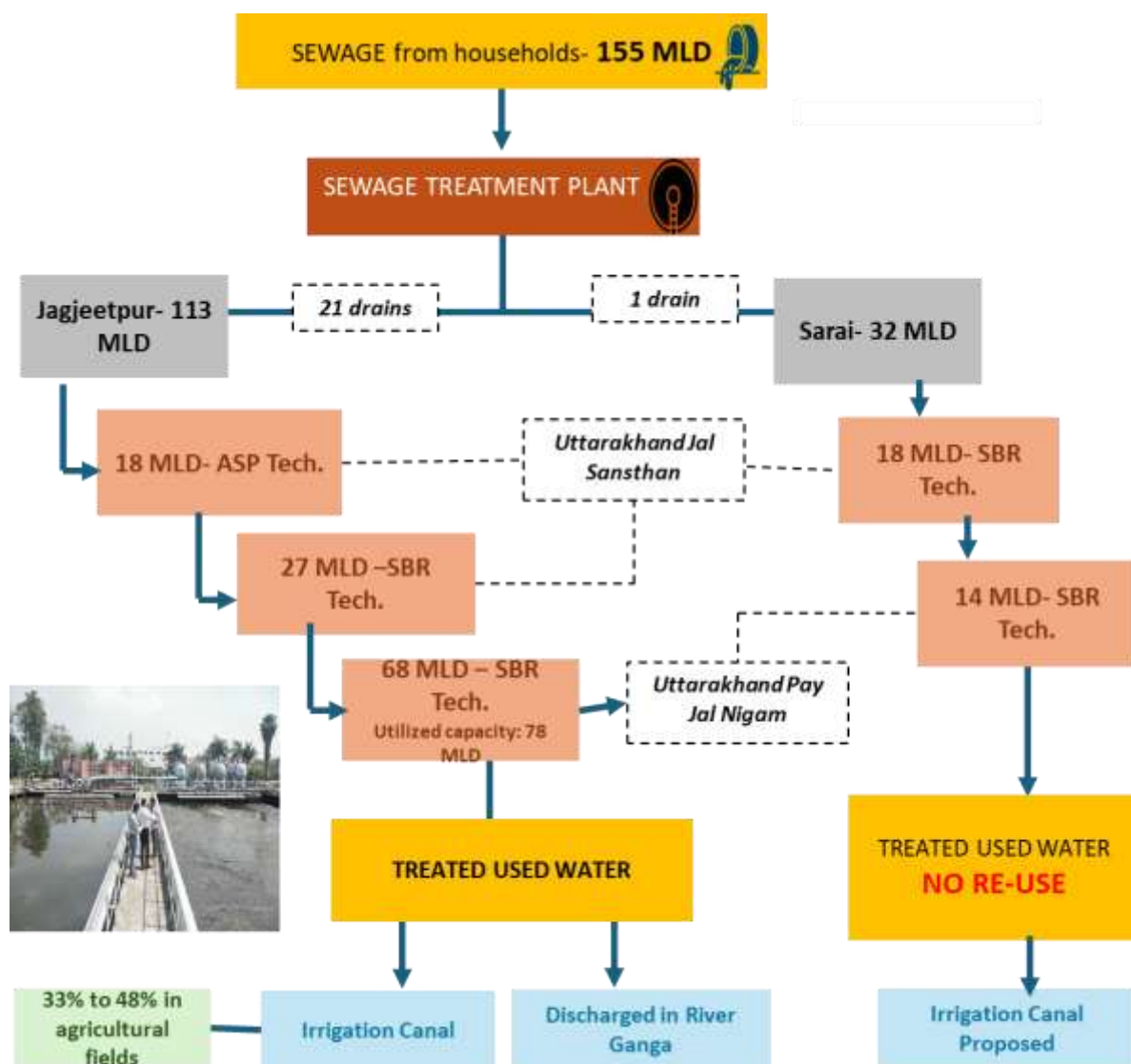


Figure 4-3: Flow chart of liquid waste in Haridwar city

⁴ Source: Consultant Analysis

4.2.2 Existing Sewage infrastructure

The Haridwar planning area is served by five STPs with a combined capacity of 145 MLD. Out of these 5 STPs, 3 are in Jagjeetpur and 2 in Sarai. The 3 STPs in Jagjeetpur has a total capacity of 113 MLD and receives sewage from 21 nallah. It operates through two technologies i.e., Activated Sludge Process (ASP) with a capacity of 18 MLD and Sequencing Batch Reactor (SBR) with 95 MLD. The Sarai STP, with a capacity of 32 MLD, receives sewage from a single drain and is entirely based on SBR technology. To support the functioning of these treatment plants, 23 Sewage Pumping Stations (SPS) are operational across the city ensuring effective conveyance and management of liquid waste. The sewage sludge generated from the STP of ASP technology unit at Jagjeetpur is to be utilized by Anerobic Energy Private Limited for its biogas-to-bio CNG plant. The inflow & outflow and the outfall locations of the STPs are listed in Table 4-1.

Table 4-1: Inflow and Outflow capacity of STPs of Haridwar

Sl.No	STP & its Location	STP Capacity (in MLD)	Technology	Inflow (in MLD)	Outflow (in MLD)	Outfall Location	Distance (In Km)
1	STP in Jagjeetpur	18	ASP	18	17.8	Agricultural fields and Irrigation canal	0.1
2		SBR	27	26.7			
3			68	78	77.2		
Total (A)			113	123	121.7		
4	STP in Sarai	18		18	17.8	Ranipur Rao	4.9
5		14		14	13.8		
Total (B)		32		32	31.6		
Grand Total (A+B)		145		145	153.3		

Source: Uttarakhand Pay Jal Nigam and Uttarakhand Jal Sansthan

According to Uttarakhand Pay Jal and Jal Sansthan, 40% of treated water from the Jagjeetpur STP (27 MLD and 18 MLD) is utilized for agriculture. The treated water is supplied through an irrigation canal in 11 km, while the remaining water is discharged into the river; the sludge generated is provided free of cost to the local farmers.



Picture 4-1: STP at Jagjeetpur and Sarai in Haridwar



Picture 4-2: Irrigation canal of Jagjeetpur STP

The detailed sewerage structure of Haridwar city is shown in the flow chart (refer **Figure 4-3**).

Onsite sanitation: In Haridwar, about 11% of households are not connected to the sewer network, relying on septic tanks and soak pits that generate nearly 9.86 KLD of faecal sludge. As per the discussion with stakeholders 5-6 desludging vehicles having capacity of 5000-6000 litres operates in the HNN typically charge around ₹2000 per tank, but often discharge directly into manholes, reducing the efficiency of sewage treatment plants (STPs).

To manage faecal sludge, two co-treatment facilities are operational- a 50 KLD plant at Sarai and a 100 KLD plant at Jagjeetpur while another 50 KLD facility at Bahadradabad is under construction by NMCG. The Sarai plant remains underutilized as no registered desludging vehicles are linked to it. Notably, these co-treatment facilities serve not only households within the municipal boundary but also the wider planning area outside it, extending their impact on regional sanitation.

4.2.3 Ongoing and Proposed Projects

- The city is expanding its treatment capacity with proposed Sewage Treatment Plants (STP), including a 40 MLD plant at Jagjeetpur and 15 MLD plant at Sarai and an irrigation canal is proposed for the sarai STP.
- The list of ongoing projects to manage the liquid waste in Haridwar city funded by KfW is as under:

Table 4-2: Proposed/ Ongoing work under the KfW funded sewage scheme

PKG no.	Phase	Zones	Approved Cost / Estimated Cost (In Cr.)	Proposed Works	Status
1	Phase - I	A+B+C	251.97	- Sewer Network – 75.70 Km - Sewage Pumping Station – 2 Nos - House Service Connections – 6298 Nos	Sanctioned
2	Phase - I	D+E	270.46	- Sewer Network – 90.34 Km - Sewage Pumping Station – 1 No - House Service Connections – 3816 Nos	
3	Phase - II	F	186.13	- Sewer Network – 76.72 Km	

PKG no.	Phase	Zones	Approved Cost / Estimated Cost (In Cr.)	Proposed Works	Status
				- Sewage Pumping Station – 3 Nos - House Service Connections – 7214 Nos	
4	Phase - II	G	154.41	- Sewer Network – 78.24 Km - Sewage Pumping Station – 2 Nos - House Service Connections – 3746 Nos	
9 (B)	STP – Zone G	—	30.47	- Sewage Treatment Plant – 8 MLD	

Source: Uttarakhand Peyjal Nigam

- The list of on- going projects undertaken by NMCG is as follows-

Table 4-3: List of Ongoing projects in Haridwar by NMCG

Location	Capacity	Implementing Agency	Status
Construction of Co- treatment Plant in Jagjeetpur	100 KLD (0.10 MLD)	Uttarakhand PeyJal Nigam	Sanctioned
Construction of FSTP in Bahadarabad	50 KLD (0.05 MLD)		

Source: Uttarakhand Peyjal Nigam

4.2.4 Institutional Mechanism

Stage	Responsible Agency/Department	Role
Planning & Design	Uttarakhand Pey Jal Nigam / ULB / MoUD	Project design, planning and preparation of sewerage schemes
Construction / Implementation	Uttarakhand Pey Jal Nigam	Execution of sewerage projects, including construction and commissioning
Operation & Maintenance (O&M)	Uttarakhand Jal Sansthan	Nodal agency for O&M of sewerage system, supported by sweepers and supervisors; equipped with five truck-mounted sewer jetting machines and necessary tools for upkeep

4.3 STORM WATER MANAGEMENT

As per the stakeholder consultation with Pey Jal Nigam and Jal Sansthan, Haridwar planning area has a total of 22 stormwater, all of which are tapped. Of these, 21 nallah are connected to the Jagjeetpur STP and maintained by the Jal Sansthan, while one drain i.e., Kasawaan nallah is managed by Peyjal Nigam and linked to the Sarai STP (refer **Table 4-4**) Overall, the drainage network provides coverage to approximately 70% of the city.

Table 4-4: Details of Nallahs of Haridwar

River/Canal	Total no of Nallah	Maintenance of Tapped Nallah	
		Jal Sansthan	Peyjal Nigam
River Ganga	15	14	1
Upper Ganga Canal	7	7	
Total	22 Nallah	22 Nallah	

Source: Uttarakhand Peyjal Nigam, 2020

As per the stakeholder consultation, the stormwater drainage network in Haridwar is facing multiple critical challenges. These includes-

- Siltation** – Many nallahs carry large amounts of silt from monsoon runoff, which accumulates in pumping stations and drains. Mechanical screens often get damaged and manual desilting becomes the only option. Ex- Bhimgoda nallah, PWD nallah, Kasawaan nallah etc.

2. **Solid waste-** the solid waste dumped by Surrounding houses and roadside areas clogged the nallahs, restrict the flow and causing overflow. ex- Lal Tarao nallah, Pandaywala nallah etc.
3. **Spring-fed contamination-** Pure streams like **Loknath Nallah** become polluted by domestic wastewater, increasing avoidable hydraulic load on STPs
4. **Seasonal overload-** During monsoon, stormwater mixes with sewage and greywater, overwhelming pumping stations
5. **Cow dung disposal-** Cow dung is directly discharged into the nallah, adding to waste load. Ex- Matarsadan nallah

The detailed issues are given in **Annexure 2**.



Silt removed from Bhimgoda SPS



Solid waste dumping in Kasawaan nallah



Spring Water in Loknath Nallah behind Shyamlok Colony



Manual cleaning of Kasawaan SPS

Picture 4-3: Issues of Storm water drains

4.3.1 Cleaning Mechanism

Each year, Haridwar undertakes pre-monsoon desilting and cleaning of nallahs to reduce blockages and improve flow capacity but the cleaning mechanism itself faces several persistent issues. These are:

1. **Access constraints-** At sites like **Awass Vikas and PWD SPS**, poor access prevents deployment of suction-cum-jetting machines, forcing manual removal of silt.
2. **Infrastructure damage-** Broken or ineffective screens at **Jagjeetpur and Kasawaan SPS** allow waste to bypass interception structures.

4.3.2 Ongoing/Proposed Projects

As per the draft Haridwar Master plan 2041,

Table 4-5 provides the lengths of the drainage systems being laid under AMRUT scheme.

Table 4-5: Stormwater drainage laid under AMRUT

Sl. No.	Name of The Drain	Length (km.)	Status
1	Ghaas Mandi, Bangali mod & Rajghat	800	sanctioned
2	Bhopatwaala, Vikas colony & Singh Dwar	1,300	
3	Laatonwaali, Kankhal	1,473	
4	Chandracharya chowk & Avdhoot Mandal	1,940	
Total		5,513	

Source: PIU AMRUT, Peyjal Nigam Roorkee

4.3.3 Institutional Mechanism

Department	Roles and Responsibilities
Haridwar Nagar Nigam	Primary agency responsible for the design, construction, maintenance and cleaning of stormwater drains within the city to ensure functional urban drainage.
Uttarakhand Pey Jal Nigam (UPJN)	Responsible for project design, planning and implementation of sewerage projects; also handles state-level planning, funding and upgrading of stormwater systems.
Uttarakhand Jal Sansthan	Handles the operation and maintenance of sewerage projects once they are transferred from Pey Jal Nigam.
Collaborating Agencies (PWD, Irrigation Dept, SPCB)	Coordinate with HMC to ensure all drainage work complies with engineering standards and environmental regulations.

4.4 SOLID WASTE MANAGEMENT

4.4.1 Residential Waste

According to Haridwar Nagar Nigam, the city generates about 260 metric tonnes per day (MTPD) of solid waste. Of this, 51% is wet waste, 25% dry waste, 20% inert material and 4% construction debris. As per the Draft Haridwar Master Plan 2041, the actual production is estimated at 300MTPD, which also accounts for silt and sludge collected from drains.

Solid waste management practices include door-to-door collection in 50 out of 60 wards, carried out by 2 contracted firms. The municipal fleet comprises 640 personal and 114 vehicles/ equipment, including 43 CNG tippers, 58 e-rickshaws, 4 JCBs and 4 Tractor Trolleys among others.

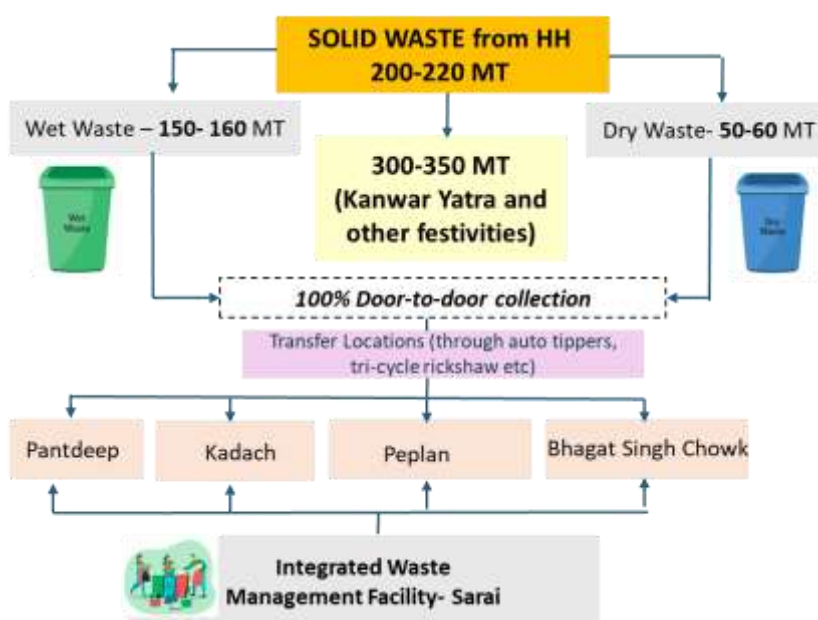


Figure 4-4: Flow chart of solid waste in Haridwar city

Despite these measures, waste dumping along nallahs, particularly in residential areas and roadside stretches, has emerged as a serious challenge. Site observations reveal that Lal Tarao nallah frequently receives waste from surrounding households and roadside activities, exacerbating local sanitation concerns.



Picture 4-4: Solid waste dumping along the Lal Tarao nallah

4.4.2 Waste Processing Facilities

Solid waste is collected at 4 transfer stations (refer **Map 4-3** before being transported to the 20-hectare sanitary landfill site at Sarai, located within the planning boundary about 4.6 km from the river. The facility is equipped with 3 trammel systems of 2.5 TPD capacity each for waste recycling.

On average, the city processes approximately 120–160 tons of waste daily, producing 180–240 tonnes of compost fertilizer per month. However, operations at the landfill are disrupted due to weather-related challenges.

Large religious establishments, termed as Bulk waste generators⁵ also contribute to localised waste processing. Shanti Kunj Ashram generates about 5–6 tonnes of waste per day, which is composted on-site, while Dudhadhari Ashram processes around 2–3 tonnes of waste daily.



Picture 4-5: Landfill site at Sarai

⁵ Bulk waste Generators- A unit is considered a bulk waste generator if it produces more than 100 kilograms of waste per day or has 200 or more families.

4.4.3 Religious waste

Major religious gatherings such as the Kanwar Yatra, Kumbh Mela and Ardh Kumbh Mela, significantly increases waste volumes, with generation rising to nearly 300–350 MT during the Kanwar Yatra alone. Since 2016, agencies like Sulabh International and Spars Ganga have been engaged to manage large-scale sanitation and solid waste operations during these events. At the ghats, particularly Har-ki-Pauri, the Ganga Mahasabha plays a central role in managing pilgrim-related waste.

Additionally, a Nature based Foundation is working on recycling used flowers collected from the ghats into incense sticks.

4.4.4 Waste from Dairies

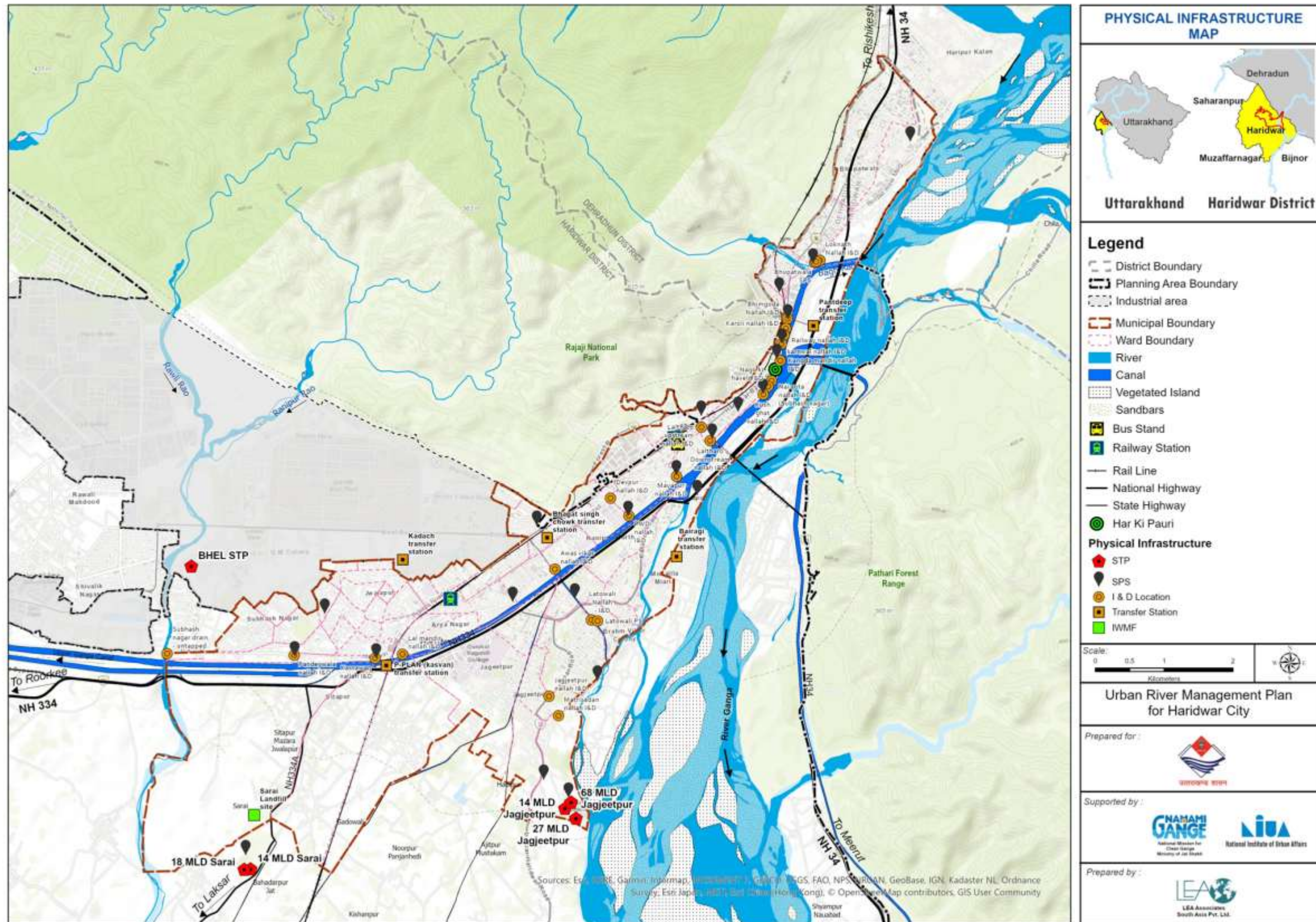
Haridwar city generates nearly 105 TPD of dung waste from around 7,000 bovines based on CPCB guidelines. Currently, the dung is collected from only 4 wards by the HNN and transported to Sarai (previously a MRF site) using six trolleys carrying 7-8 tonnes per trip. Field visit indicate that, due to the absence of a structured collection and transport system, dung is often washed into nallah. Although the city has a Bio-CNG plant with a capacity of 1,500 kg/day, mentioned in section 4.2.2, it has adequate capacity to cater to the cow dung



Picture 4-6: Bio-CNG Plant inside Jagjeetpur STP

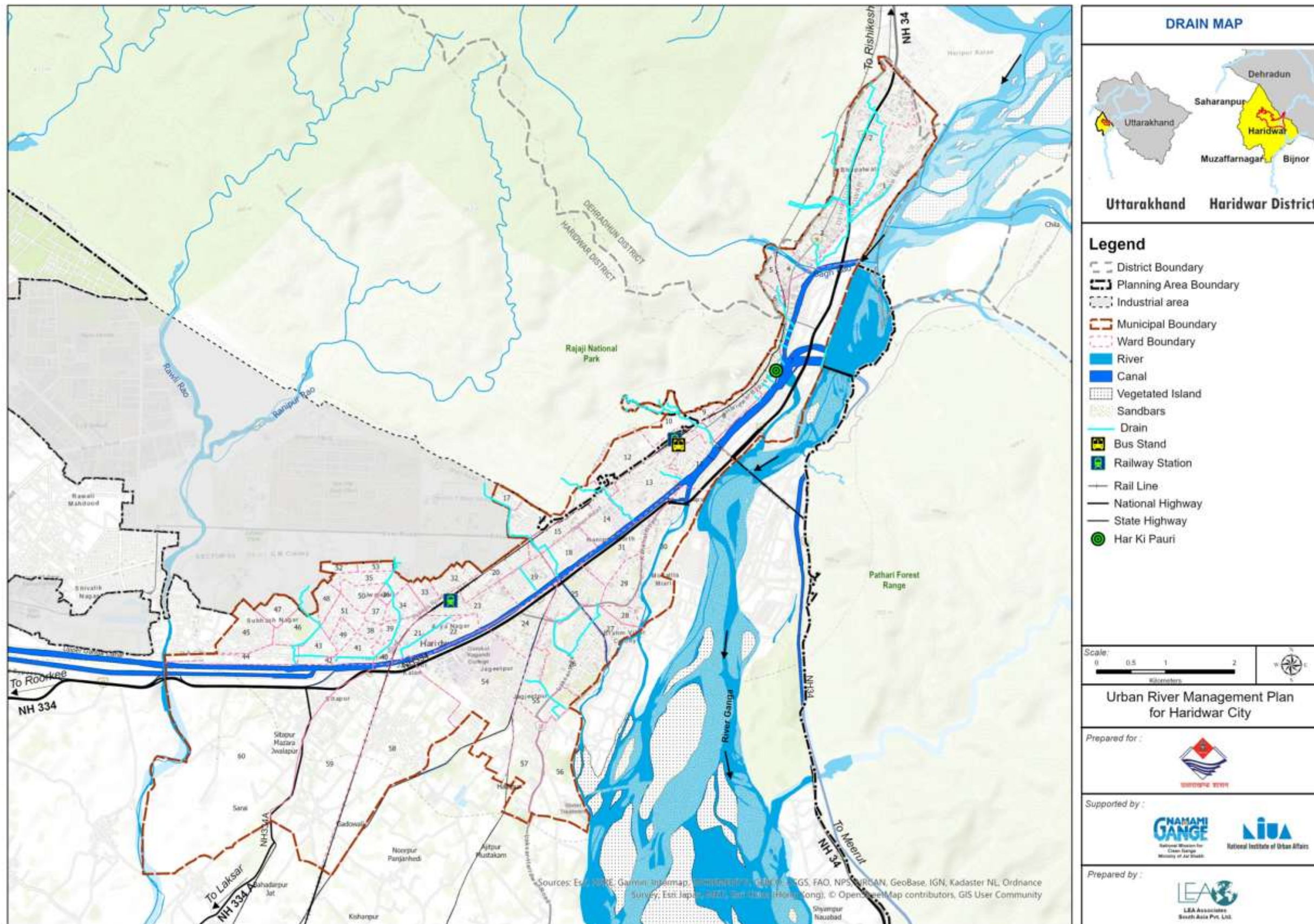
4.4.5 Institutional Mechanism

Departments	Role
HNN	Key functions such as door-to-door waste collection, transportation and processing



Map 4-3: Physical Infrastructure Map of Haridwar





Map 4-5: Drainage map of Haridwar city



5 SWOC ANALYSIS AND URM INDEXING OF THE CITY

5.1 SWOC ANALYSIS

Based on the baseline assessment of Haridwar city, various issues and gaps have been identified. Based on this, a SWOC analysis has been done and presented below:

Objectives	Focus Area	Strength	Weakness	Opportunities	Challenges
Ensure effective regulation of activities in Floodplain	Floodplains	Presence of notified 25-year and 100-year flood lines along the River Ganga	Settlements observed in the no construction zone	Suggestions and recommendations on Draft Master Plan 2041	Mitigating risks during extreme weather events
Keep the river free from pollution	Water Supply	Heavy reliance on groundwater	Supply is more than the demand	Implement water metering	
	Sewerage	Sewer network coverage extends to 85% of the population	Sewage generation exceeds treatment capacity; outdated sewer lines with limited holding capacity	Expanding sewer connectivity in partially covered wards.	Manage increased sewage loads during festivals
	Storm water drains	All the drains are tapped	Solid waste dumping, stormwater inflow and siltation issue	Improve desilting and enforce waste management practices	Preventing blockages and maintaining flow during monsoon
	Solid waste	Solid waste is transferred to IWMF Sarai	Minimal onsite segregation, solid waste dumping in drains; no initiative for religious waste	Religious waste repurposed into incense sticks	Managing surges in waste during festivals
Rejuvenate Waterbodies and Wetlands	Waterbodies	No waterbody			
Enhance the riparian buffer along river banks	Riparian buffer		Encroachment by built-up areas	Conserve and restore riparian buffers	
Adopt increased reuse of treated used water	Reuse of treated water	Treated water is used in agriculture and manure sold to farmers			Ensuring quality standards for diverse applications
Ensure maximum good quality return flow from the city into the river	Return flow	Approximately 12,510 MLD of treated used water is discharged into the River Ganga			

Objectives	Focus Area	Strength	Weakness	Opportunities	Challenges
Develop eco-friendly riverfront projects	Eco-friendly riverfront	Presence of 34 ghats along Ganga	Limited riverfront coverage i.e., Chandi ghat	Expand riverfront development to lesser-known ghats and river stretches with eco-sensitive design	Balancing tourism growth with ecological integrity
Leverage on the economic potential of the river	Economic potential	River supports religious & cultural tourism; supports livelihood of farmers	Unregulated vending and encroachments near ghats	Structured market expansion with heritage-sensitive planning	Market-driven expansion could overshadow cultural heritage
Inculcate river-sensitive behavior among citizens & to engage citizens in river management activities	River-sensitive behavior	3 NGOs actively engaged with Nagar Nigam Haridwar	Behavioral impact limited to symbolic events; Dependence on symbolic events only	Build official river management websites and active social media channels for campaigns and events.	Sustaining long-term behavioral change beyond festivals

5.2 URM INDEXING OF THE CITY

The URMP framework provides a clear indexing/ scoring mechanism to monitor progress of project implementation recommended under URMP vis-à-vis its objectives. The implementation of the URMP is monitored through 10 indicators, one for each objective of the URMP framework. The URM_{Index} is measured on a scale of one to five and is useful to paint a snapshot of the situation, which can be used to monitor the implementation of the URMP and develop overall strategies and policies for enhancement.

In order to understand the present status of water resources in the city, an assessment has been made using the URM_{Index}. With a score of 2.4, Haridwar is at intermediate level of urban river management. This score shall improve upon implementation of proposed interventions against each objective. The figure below shows the current status of the city against each of the objectives of urban river management.

Table 5-1: Prioritization Matrix

S.N.	URMP Objective	Current status	Priority in URMP	Remarks
1	Regulation of activities in floodplain	★★	Very High	Flood lines as per NGT guidelines are notified 25-year and 100-year flood lines along the River Ganga.
2	Pollution free River	⚠	Low	The city faces groundwater dependence, outdated sewerage, clogged storm drains and poor solid waste segregation, all of which intensify during festivals
3	Rejuvenate Water bodies and wetlands			Absence of major waterbody in the city
4	Enhance Riparian buffer	⚠	High	Riparian buffer along the River Ganga is largely dominated by degraded vegetation, built-up zones, whereas Upper Ganga Canal is dominated by vegetation and built up which includes ghats, ashrams etc.
5	Increased use of treated wastewater	★★★	Very High	The city is using treated used water into the agricultural fields from Jajeetpur STP and a new irrigation canal is proposed for the same.
6	Max. good quality return flow			-
7	Eco friendly Riverfront projects	★★	Very High	Chandi ghat is the only riverfront project in the city. The riverfront are not made up of natural materials.
8	Leveraging on economic potential of the river	★★	Very High	The river sustains tourism and farming livelihoods, but unregulated vending and encroachments near ghats cause congestion, while market-driven growth risks overshadowing cultural heritage
9	River Sensitive behaviour among citizens	★★	Low	NMCG, Municipal Corporation and Ganga Mahasabha are actively promoting the river sensitive behaviour in citizens through awareness drives, campaigns, wall paintings etc.
10	Engage citizens in River Management Activities	★★	Low	3 NGOs are working with Nagar Nigam Haridwar

★★★ Excellent
 ★★ Acceptable
 ⚠ Needs Improvement
 Very High
 High
 Low

6 URMP VISION FOR THE CITY AND ZONING

6.1 URMP VISION FOR HARIDWAR

The Urban River Management Plan (URMP) envisions “**Haridwar: Living Heritage of the Ganga - Harmony with the River**”. The vision emphasizes harmony with the river through decentralized sanitation and ecological rejuvenation, ensuring the restoration of clean water, biodiversity and cultural identity.

Riverfront Zoning – Haridwar Nagar Nigam

The River Ganga shapes Haridwar’s spiritual identity and ecological resilience. Its ghats serve as cultural and religious anchors, hosting millions of pilgrims each year, while its floodplains function as vital ecological buffers that regulate floods and sustain biodiversity. Alongside, the Upper Ganga Canal operates as a civic and infrastructural spine, channeling water through the city core but also facing challenges of pollution and encroachment. Together, these three elements- the ghats, floodplains and canal, demand differentiated and context-specific planning approaches to safeguard Haridwar’s living heritage, strengthen ecological health and ensure harmony between urban growth and the river system

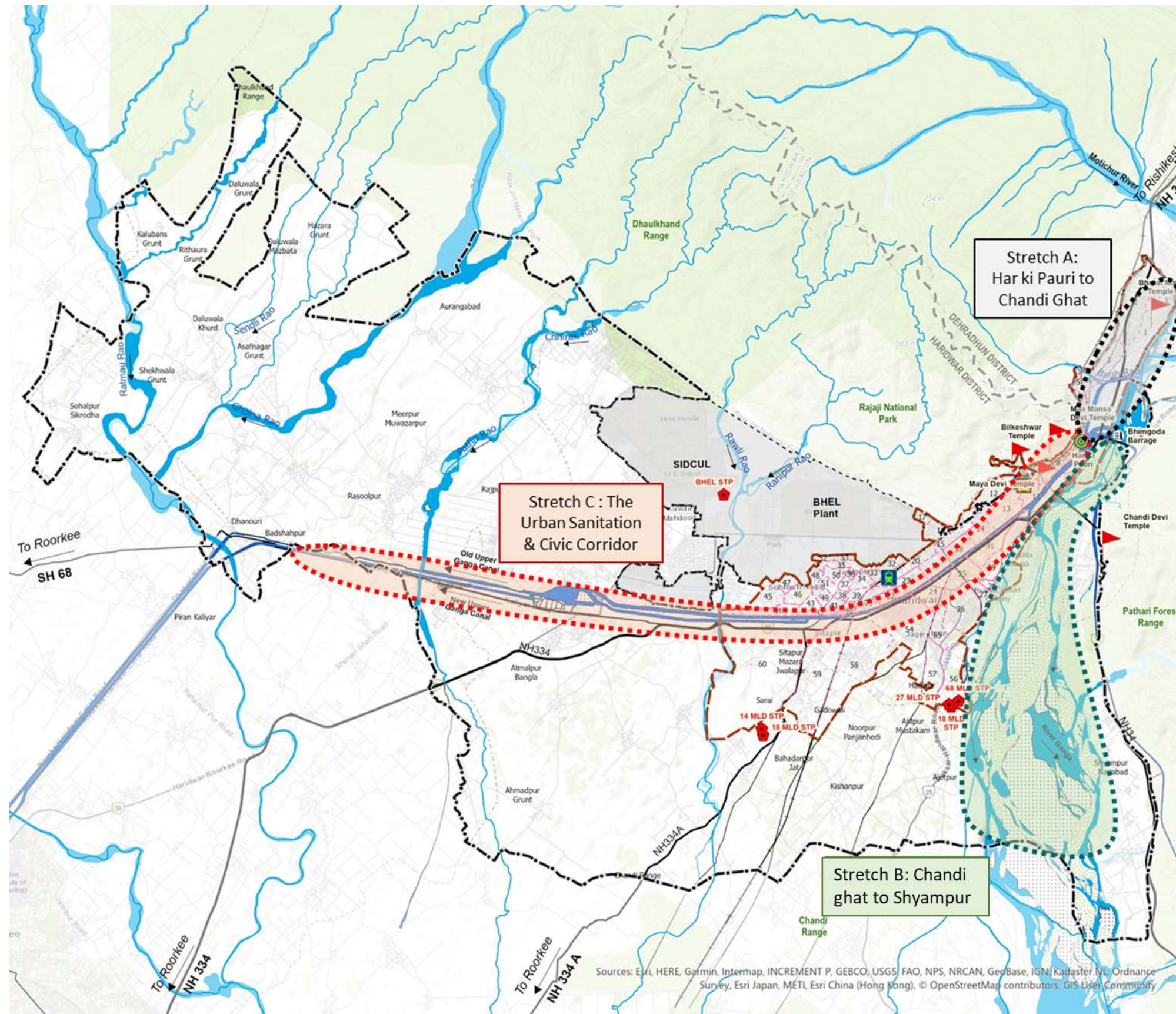
Based on the river’s characteristics and the nature of river–city interaction, the entire stretch of the River Ganga in the planning area and the Upper Ganga Canal has been divided into three stretches-

- ▶ **Stretch A (Upstream Ganga):** Har-ki-Pauri to Chandi Ghat
- ▶ **Stretch B (Downstream Ganga):** Chandi Ghat to Shyampur
- ▶ **Stretch C (Upper Ganga Canal):** Canal corridor through the city core

Details of the two stretches are presented in the following table and **Map 6-1**.

Stretch A (Upstream Ganga): Har-ki-Pauri to Chandi Ghat	
Location	: Har-ki-Pauri to Chandi Ghat
Theme	: Living Heritage & Eco-Sensitive Pilgrimage
Description	: This stretch is the spiritual heart of Haridwar, attracting millions of pilgrims annually. The vision is to preserve sanctity while embedding ecological safeguards and sustainable infrastructure.
Key Strategies	: • Regulation of ritual and tourism activities with municipal oversight • Awareness campaigns for eco-friendly practices during pilgrimages and festivals • Eco-sensitive upgrades: solar lighting, plastic-free zones, permeable paving • Youth engagement in eco-guiding, waste management and heritage interpretation • Integration with biodiversity corridors along the Ganga • Development of cultural circuits linking rituals, ghats and ecological education
Stretch B (Downstream Ganga): Chandi Ghat to Shyampur	
Location	: Chandi Ghat to Shyampur (Approx. 10 km)
Theme	: Flood Resilience, Sanitation & Ecological Rejuvenation
Description	: This downstream stretch transitions into wider floodplains and urban edges. It faces flood vulnerability but offers opportunities for ecological restoration and recreation.
Key Strategies	: • Ecological buffers along the River Ganga • Integration of green belts into city planning, • Development of inclusive recreation spaces and water quality monitoring

	Community stewardship programs with schools, NGOs and local residents.
Stretch C (Upper Ganga Canal): The Urban Sanitation & Civic Corridor	
Location	: Canal corridor traversing Haridwar’s urban core
Theme	: Sanitation, Civic Life & Ecological Integration
Description	: The Upper Ganga Canal is both a functional waterway and a civic spine. Currently burdened with greywater inflows and encroachments, it holds potential for ecological rejuvenation, sanitation improvement and community engagement.
Key Strategies	: - Interception and treatment of canal inflows to reduce pollution - Canal-side green belts and pedestrian promenades integrated into city planning - Development of inclusive recreation spaces along canal edges - Awareness campaigns on canal heritage and ecological importance - Community stewardship programs with schools, NGOs and local residents - Integration of canal rejuvenation with decentralized sanitation and pond-based treatment system



Map 6-1: Spatial Division of River Ganga and Upper Ganga Canal

7 URMP INTERVENTION

7.1 OBJECTIVE 1: ENSURE EFFECTIVE REGULATION OF ACTIVITIES IN FLOODPLAIN

Interventions under Objective 1 are designed to strengthen the Draft Master Plan 2041 if Haridwar by embedding flood resilience, ecological restoration and sustainable water management into core planning framework of the town. Measures such as validated flood lines, encroachment free flood plains, river and stream buffer conservation, naturalized bank protection, ground water recharge will enhance resilience, reduce disaster risks, safeguard communities and protect critical infrastructure. Aligned with national floodplain zoning and climate adaptation guidelines, these planning interventions will ensure balanced urban growth with long term sustainability.

7.1.1 Intervention 1: Suggestions and recommendations on Draft Master Plan 2041 of Haridwar

The Draft Master Plan 2041 of Haridwar represents a comprehensive and forward-looking framework that integrates multiple dimensions of urban growth and environmental stewardship. It goes beyond conventional land-use planning by embedding strategies for river management, ecological restoration, infrastructure development and heritage conservation into a unified vision. The plan emphasizes safeguarding the Ganga and its floodplains through zoning regulations, ecological buffers and sustainable interventions, while simultaneously addressing Haridwar's growing needs for housing, mobility and public amenities. However, there is no separate section for the waterbodies, notified flood-lines are not incorporated etc. into the Draft Master Plan. The recommendations and suggestion on the draft Haridwar Master Plan, 2041 is presented in **Table 7-1**. The detailed recommendations are in Annexure 3.

Table 7-1: Recommendations for draft Haridwar's Master Plan, 2041

Sl. No.	Aspects	Section Name & Reference in Master Plan	Current Vision	Recommendation	Rationale / Justification
1	River Background	Sec. 11.1.1	Base map does not explicitly delineate tributaries, floodplains, catchments, or associated water bodies	Explicitly map tributaries, floodplains, catchments, lakes, reservoirs, tanks and islands	Provides clarity for zoning, supports informed planning and minimizes human-induced impacts on river ecosystems
2	Floodplain Demarcation	Sec. 2.8.1.5; NGT directives (2013, 2017)	Flood-prone zones acknowledged; ESZ provisions included but without clear GIS demarcation	- Mark 1-in-25 and 1-in-100-year flood lines - Designate active floodplains as 'No Development Zones'	Aligns with Ganga Notification; ensures flood safety and ecological protection
3	River Ecology & Corridors	Sec. 3.9.1; 3.9.2	200m green buffer proposed; wildlife corridors noted but not mapped	- Map ecological corridors - Prohibit land-use change	Maintains ecological continuity, supports

Sl. No.	Aspects	Section Name & Reference in Master Plan	Current Vision	Recommendation	Rationale / Justification
				List native flora for buffer restoration	biodiversity and integrates conservation into zoning
4	Water Bodies & Wetlands	Sec. 11.1.1.2	Protective Zone (2448 ha) designated; 50m buffer around water bodies	- Classify wetlands separately from water bodies - Provide restoration guidelines	Wetlands need distinct treatment; ensures stormwater functions and biodiversity protection
5	Drainage & Stormwater	Sec. 11.1 (Figure 11-1)	No separate provisions for drains; buffers missing	- Mandate GIS-based monitoring 10m green buffer along nallah - Integrate with green corridors	Prevents pollution, reduces flood vulnerability and creates connected green-blue networks
6	Pollution Abatement – Liquid Waste	Sec. 6.3.3; 7.3; 11.2.4	Sewerage network expanded; cremation ash disposal into Ganga; industrial CETP gaps	- Introduce dual pipeline system - Ecologically responsible cremation - Strict effluent audits	Reduces contamination, aligns with NGT discharge norms and promotes sustainable practices
7	Pollution Abatement – Solid Waste	Sec. 7.4; NGT orders	270 TPD waste generated; 81% collected; PPP model in place	- Decentralized waste processing - Religious waste bins - Special plans for Kumbh/ Kanwar Yatra	Ensures resilient waste management, prevents river pollution and supports cultural practices
8	Groundwater Management	(General Provisions)	Aquifer mapping and recharge zones not detailed	- Map aquifers - Regulate extraction - Promote artificial recharge	Addresses demand-supply gap, safeguards long-term water security
9	Implementation & Monitoring		Roles not clearly defined; monitoring limited	- Define lead agency - Inter-departmental roles	Strengthens accountability, ensures convergence with national/state schemes

Sl. No.	Aspects	Section Name & Reference in Master Plan	Current Vision	Recommendation	Rationale / Justification
				GIS-based monitoring stations	
10	Stakeholder Engagement		Limited mention of community role	Institutionalize citizen science, NGO partnerships, relocation plans for flood-vulnerable communities	Builds participatory stewardship, enhances compliance and supports livelihood restoration

7.2 OBJECTIVE 2: KEEP THE RIVER FREE FROM POLLUTION

Objective 2 interventions aim to prevent liquid and solid waste pollution in River Ganga, Upper Ganga Canal (UGC), its tributaries and nallahs. In Haridwar the untreated sewage discharged through minor nallah into the Ganga Canal, is the main source of liquid waste, while indiscriminate dumping of municipal solid waste into streams, nallah and canal banks is the major source of solid waste pollution. These practices degrade water quality and river ecology, thus requiring intervention measures such as sewage nallah water interception, treatment and improved solid waste management practices.

7.2.1 Intervention 2: Tapping and diversion of spring water at Loknath Nallah for reduction of used water volume at I&D structure

As mentioned in Section 4.2, Loknath Nallah is a spring-fed stream originating from Rajaji National Park, carrying about 3–4 MLD of pure spring water. However, once it enters Shyamlok Colony, the stream becomes contaminated due to domestic wastewater discharge from nearby houses. Although the contamination is diluted by the continuous spring flow, when the nallah reaches the Loknath I&D structure near Bhupatwala Pumping Station, the contaminated water adds an excess hydraulic load of 3–4 MLD to the STP. This results in unnecessary treatment of otherwise usable spring water. Thus, the key issues are:

- Contamination of pure spring water by domestic used water at Shyamlok Colony and downstream.
- Additional 3–4 MLD of water unnecessarily diverted to STP, increasing hydraulic load.
- Lack of localized treatment and supply system for Shyamlok and nearby colonies.
- Underutilization of a reliable spring-fed source that could directly serve the community.

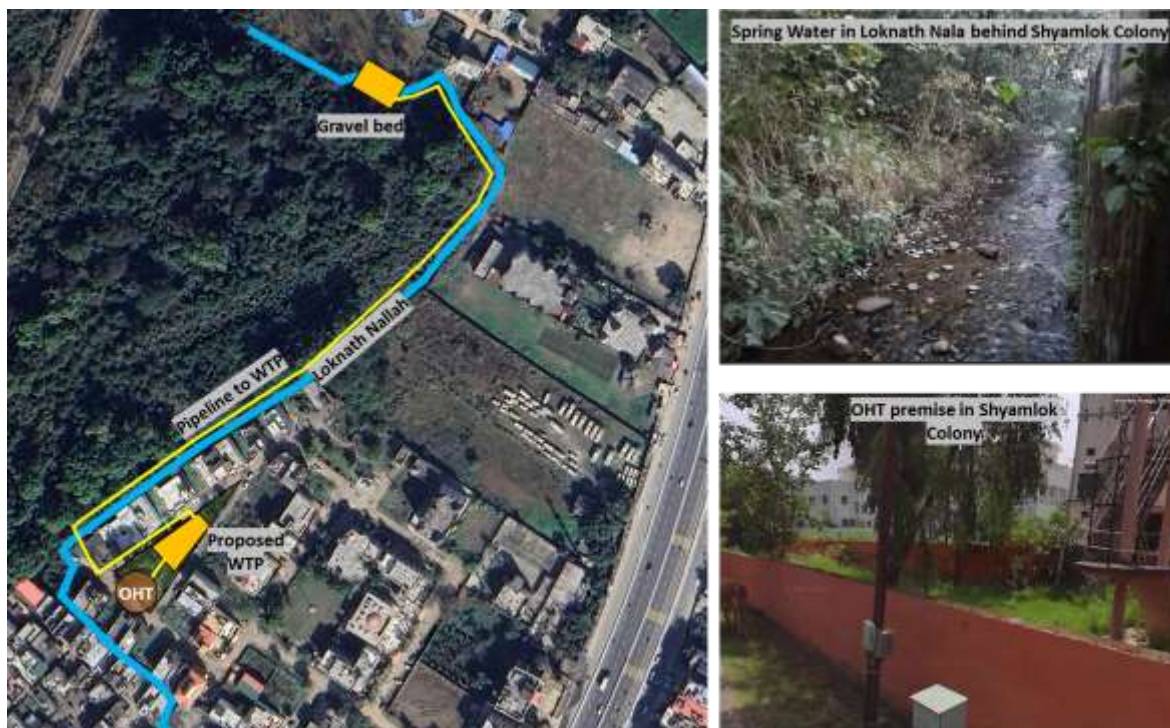
a. Proposed Intervention

The intervention proposes tapping Loknath Nallah at its source before contamination, constructing a 3–4 MLD Water Treatment Plant (WTP) within the Overhead Tank (OHT) premises of Shyamlok Colony (900 sqm area) and supplying treated water to Shyamlok and nearby colonies. The treatment process will include sedimentation and chlorination, ensuring safe potable water distribution.

b. Detailed Intervention

- **Source Tapping:** Loknath Nallah will be tapped upstream, ensuring that only pure spring water enters the treatment system.
- **Gravel Bed Filtration (Primary Treatment):** A gravel bed (approx. 100 sqm) to be constructed at the identified site to remove suspended solids and silt, designed as a layered bed (coarse - medium - fine gravel) to maximize particle removal. A 470-meter pipeline network will be laid along the nallah to convey treated flow from the gravel bed filtration unit to the secondary treatment facility shown in **Picture 7-2**.
- **Pressure Sand Filter (Secondary treatment):** A pressure sand filter (approx. 3m dia, one working and one standby) to be installed for filtration, ensuring compliance with BIS 10500:2012 drinking water standards.
- **Chlorination Unit:** After filtration, water will undergo chlorination within the OHT premises, following CPCB and BIS drinking water quality guidelines, to ensure disinfection and safe supply. If required, the chlorination/pump/electrical room can be shifted below the OHT.
- **Pump House:** A pump house (approx. 50 - 100 sqm) to be constructed for pumping treated water into the OHT.
- **Overhead Tank Utilization:** Treated water to be pumped into the existing OHT located in Shyamlok Colony, which will act as a distribution hub for Shyamlok and nearby colonies.

- **Distribution Network:** From the OHT, water will be supplied through the colony's distribution pipelines, ensuring equitable access and reducing dependency on groundwater.



Picture 7-1: Proposed Loknath nallah treatment facilities at Shyamlok colony

A technical survey to be undertaken along the 500 m stretch of Loknath Nallah from tapping point to secondary treatment, where few flats and vacant plots are located adjacent to the stream. The survey will identify and document any existing or potential household used water discharge points. If detected, interception and diversion infrastructure to be incorporated into the intervention design to prevent contamination of the nallah. This preventive measure should be finalized during the Detailed Project Report (DPR) stage, ensuring compliance with NMCG protocols for source protection.

All technical measurements, including tank sizing, pumping capacity and chlorination dosage, should be finalized during the DPR stage, ensuring compliance with MoHUA service level benchmarks. Since a detailed investigation and design is required for its implementation, only pre-feasibility and broad components are provided in the URMP at this stage.

This intervention will reduce avoidable hydraulic load on the STP, utilize a sustainable spring-fed source and provide safe, treated water directly to Shyamlok and nearby colonies. By integrating sedimentation, filtration and chlorination within the OHT premises and conducting a survey of upstream flats and vacant plots, the system will align with national water supply and treatment guidelines, ensuring resilience, efficiency and long-term sustainability in Haridwar's urban water management.

Implementation Framework:

Sl. No	Components	Unit Rate (SOR Approx.)	Quantity	Total Cost (INR)	Responsible & Supporting Agency	Duration (Months)	Funding Sources
1	Source Tapping & Intake Works – RCC intake chamber, sluice arrangement	12,000–15,000 per cum (RCC works, CPWD SOR)	Approx. 25 cum	3–3.75 lakh	Jal Sansthan	3–4	Jal Jeevan Mission
2	Gravel Bed Filtration Unit – layered gravel bed (100 sqm)	6,000–7,000 per sqm (PWD SOR for filtration beds)	100 sqm	6–7 lakh		4–6	
3	Pipeline Network (470 m, 200 mm dia HDPE/RCC) – excavation, laying, jointing	6,000–7,000 per running meter	470 m	28–33 lakh		6–8	
4	Pressure Sand Filter (Secondary Treatment) – 3 m dia, 2 units (1 working + 1 standby)	8–10 lakh per unit	2	16–20 lakh		4–6	
5	Chlorination Unit – dosing system, pump, electrical room (within existing OHT premises)	-	Lump sum	10 - 12lakh		2–3	
6	Pump House Construction – RCC structure (50–100 sqm)	6,000–7,000 per sqm	Approx. 75 sqm	4.5–5.25 lakh		4–6	
7	OHT Integration Works – connection to existing OHT, valves, fittings	-	Lump sum	3–4 lakh		2–3	
8	Upstream Survey & Interception Works – survey of 500 m stretches, minor tapping/diversion	-	Lump sum	6-9 lakh		2–3	
9	Source Tapping & Intake Works – RCC intake chamber, sluice arrangement	12,000–15,000 per cum (RCC works, CPWD SOR)	Approx. 25 cum	3–3.75 lakh		3–4	
	Total		Approx. 95 lakhs				

* Above costing is prepared using CPWD/PWD Schedule of Rates for civil and mechanical works, with quantities derived from intake chamber sizing, filtration bed area, pipeline length and treatment unit capacity. Since an OHT already exists, only integration works are included.

Overall Implementation framework

Responsible agencies:	Estimated budget
Jal Sansthan	95 Lakhs
Timeline	Funding sources
Short Term (8-10 months)	Jal Jeevan Mission

7.2.2 Intervention 3: Arrangement of removal of silt from nallahs

As highlighted in Section 4.2, Haridwar city has 22 nallah, several of which face persistent operational challenges due to heavy silt deposition and solid waste accumulation. Intense runoff from the Himalayan foothills during monsoon season overloads the nallah with silt, sand, soil and debris, resulting in severe siltation at multiple sewage pumping stations (SPS). This condition adversely affects pumping efficiency and increases stress on downstream STPs. The major issues identified include:

- Heavy silt load with limited space preventing use of suction-cum-jetting machines at Bhimgoda SPS.
- Significant silt deposits damaging mechanical screens and causing blockage at both Kasawaan and Pandaywala Nallahs.
- Heavy silt inflow requiring manual diversion due to access constraints, preventing mechanized desilting at PWD SPS.

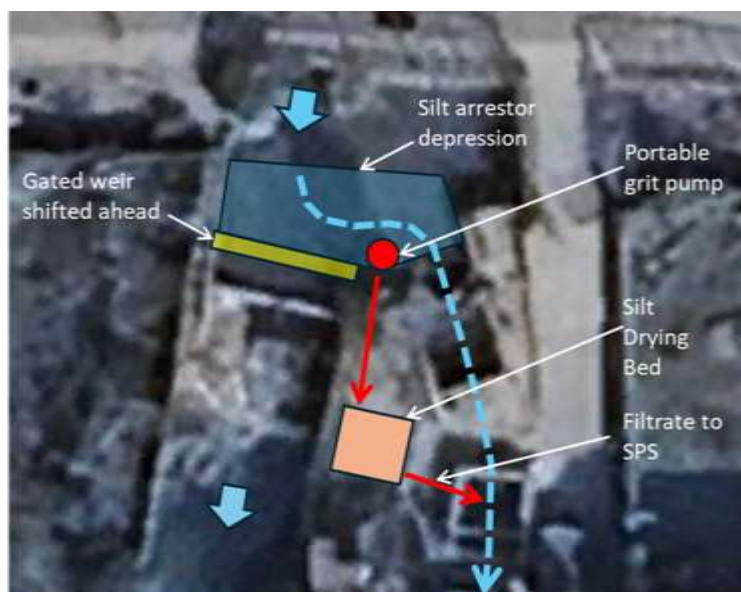
These recurring problems reduce hydraulic efficiency, increase wear and tear on equipment and necessitate frequent manual intervention, thereby compromising reliability of SPS operations.



Picture 7-2: Silt accumulated at Bhimgoda SPS and Pandaywala Nallah I&D Structure

a. Proposed Intervention

The proposed intervention adopts a comprehensive and integrated sediment management strategy for the four major nallahs in Bhimgoda, Kasawaan, Pandaywala and PWD, where siltation problems are most severe. The approach involves building pits to trap silt and sumps to manage water flow while holding sediment. Together, these measures intercept silt before it enters the pumping stations, enable mechanized removal through slurry pumps and ensure systematic handling of sediment loads. This arrangement minimizes the need for manual intervention, safeguards mechanical infrastructure and enhances hydraulic efficiency during both dry weather and monsoon flows.



Picture 7-3: Proposed layout and silt pump

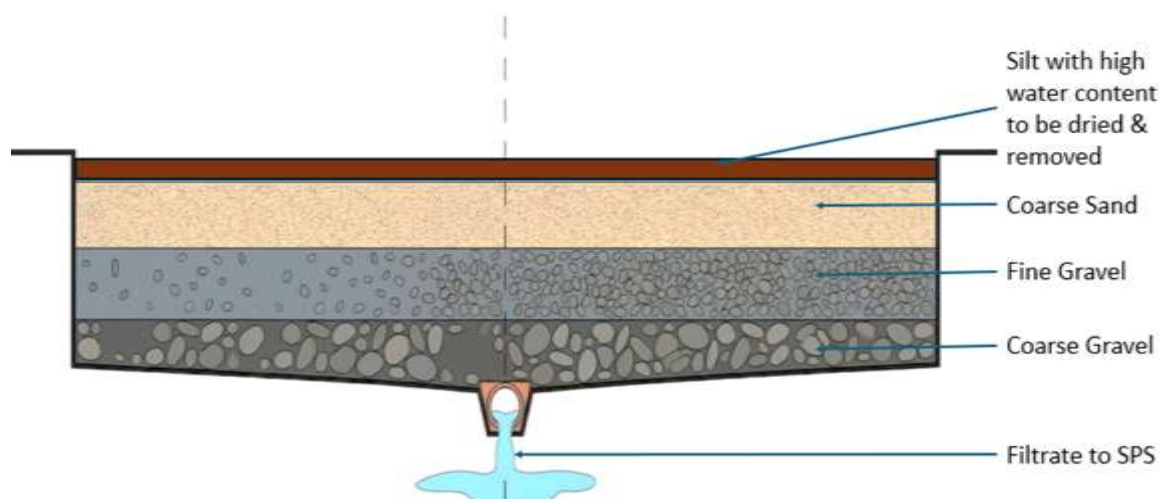
b. Detailed Proposals

1. Depression Pits:

- Construct depression pits upstream or within SPS premises before the tapping points. Each pit will be approximately 3 m in length, 3 m in width and 0.45 m in depth, with side slopes provided to maintain stability under varying hydraulic conditions. It will be finalized in the DPR stage based on hydraulic design, site conditions and standards compliance. These pits act as localized silt traps, concentrating sediment deposition in a confined zone.
- Within the depression pits, submersible slurry/silt pumps shall be equipped with built-in agitators which will be deployed directly into the silt hopper. These pumps are designed to break up compacted silt and sand, enabling efficient pumping and removal of settled material. The use of portable slurry pumps minimizes manual desilting requirements, reduces downtime and ensures continuous operation during peak rainfall events also. This arrangement ensures that silt is intercepted and managed before it progresses downstream.

2. Silt Removal Bed:

- Install silt collection sumps at available locations inside SPS premises. The detailed dimensions shall be finalised during the DPR stage based on space availability. Each sump to be designed with stratified layers to facilitate filtration and dewatering. The base layer shall consist of coarse gravel, followed by fine gravel, coarse sand and another layer of fine gravel. On top, a sludge layer with high water content is applied, which will dewater as water percolates downward through the stratified layer.
- The liquid filtrate will drain from the sump bottom into the SPS, while the retained silt layer dries and is removed periodically. Sand and gravel layers are cleaned or replaced as required to maintain sump efficiency. This arrangement provides a sustainable mechanism for sediment retention and water separation.



Picture 7-4: Proposed cross section of silt collection sump

3. Operational Protocol

- The operational framework mandates that silt deposited in depression pits is pumped into silt removal bed using slurry pumps. Scheduled removal cycles are to be carried out on a monthly to quarterly basis, with particular emphasis after high inflow events such as monsoon rains. Mechanized desilting reduces reliance on manual labour, prevents choking of mechanical screens and ensures uninterrupted hydraulic flow through the system. Maintenance activities include periodic cleaning of sump layers and removal of dried silt deposits, thereby sustaining long-term operational efficiency.

Implementation Framework:

Sl. No	Components	Unit Rate (SOR Approx.)	Quantity	Total Cost (INR)	Responsible & Supporting Agency	Duration (Months)	Funding Sources
1	Depression Pits (Silt Traps) – RCC pits (3 m × 3 m × 0.45 m) with side slopes	12,000–15,000 per cum (RCC works, CPWD SOR)	15 cum per pit × 4 sites	7.2–9 lakh	Peyjal Nigam and Jal Sansthan	04-Mar	Namami Gange
2	Submersible Slurry/Silt Pumps with Agitators – portable pumps for mechanized desilting	3.5–4 lakh per pump	4 (one per site)	14–16 lakh		2–3	
3	Silt Removal Beds (Filtration Sumps) – stratified gravel/sand layers with RCC base	6,000–7,000 per sqm (PWD SOR for sump construction)	Approx. 25 sqm per site × 4 sites	6–7 lakh		4–6	
4	Ancillary Works – excavation, backfilling, chamber	Lump sum 1–1.5 lakh per site	4 sites	4–6 lakh		2–3	

Sl. No	Components	Unit Rate (SOR Approx.)	Quantity	Total Cost (INR)	Responsible & Supporting Agency	Duration (Months)	Funding Sources
	finishing, access covers						
5	Total Cost			Approx. 38 Lakhs			

** Above costing is prepared using CPWD/PWD Schedule of Rates for civil and mechanical works, with quantities derived from pit dimensions, sump sizing and pump requirements as per drainage management guidelines.*

Overall Implementation framework

Responsible agencies:	Estimated budget
PeyJal Nigam	38 Lakhs
Timeline	Funding sources
Short Term (6-8 months)	Namami Gange

7.2.3 Intervention 4: Installation of Weir Gates for Flow and Silt Control at Selected Nallahs

As mentioned in Section 4.3, the existing weir systems across major nallahs are constructed with fully concretized bases and brick masonry walls at the top portion. These structures serve as hydraulic barriers to regulate water levels and maintain flow continuity. However, during the monsoon and flood seasons, the incoming water carries significant quantities of silt, soil and debris. These materials tend to accumulate at the weir crest and downstream bed, leading to sediment deposition and clogging. Over time, this deposition creates operational challenges, particularly at tapping points where used water is diverted for SPS. The lack of dynamic control in the current fixed weir design restricts effective flushing of sediments and compromises hydraulic efficiency.

Proposed Intervention

To address these limitations, the installation of weir gates is proposed at four nallahs (Bhimgoda, Kasawaan, Pandaywala and PWD). The intervention aims to introduce a controlled flow mechanism that allows operators to regulate water discharge under varying hydrological conditions. By integrating gates into the existing weir structure, the system will enable:

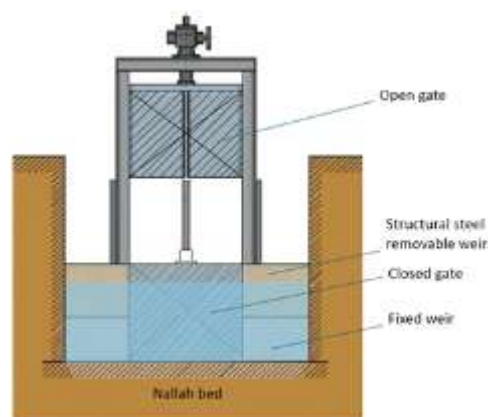
- Full closure during normal conditions to maintain water levels and ensure tapping reliability.
- Partial or full opening during storm floods to facilitate sediment flushing and prevent excessive deposition.
- Continuous flow through designated portions even in closed conditions, ensuring ecological balance and downstream connectivity.

This proposal directly responds to the operational inefficiencies of fixed weirs and enhances adaptability to seasonal variations.

Detailed Intervention

The intervention involves retrofitting the existing concretized weir structures with vertically operable sluice gates at strategic points. The design, as illustrated in the, **Picture 7-5** incorporates the following elements:

1. **Structural Integration:** The base remains fully concretized to withstand hydraulic pressure. The top portion continues in brick masonry, reinforced to accommodate gate installation.
2. **Gate Mechanism:** Removable and fixed weirs are retained for structural stability. A gate system is embedded within the central portion, operable to achieve three states - fully closed for normal ponding/tapping; fully open for monsoon flood/silt passage; partially open for controlled discharge and ecological flow.
3. **Hydraulic Functionality:** The gate facilitates sediment flushing by creating higher velocity flows during flood events. It reduces deposition at tapping points, thereby improving long term operational efficiency. The nallah bed alignment and crest level (CL) are preserved to avoid structural imbalance.



Picture 7-5: Replacement of fixed weirs at nallahs with Weir Gates

This intervention will significantly improve sediment management, reduce operational disruptions and enhance water availability for downstream use

Implementation Framework:

Sl. No	Components	Unit Rate (SOR Approx.)	Quantity	Total Cost (INR)	Responsible & Supporting Agency	Duration (Months)	Funding Sources
1	Gate Fabrication & Installation – Mild steel/structural steel sluice gate with spindle mechanism	6–7 lakh per gate (fabrication + installation, CPWD SOR for steel works)	4 (one per nallah)	24–28 lakh	Peyjal Nigam and Jal Sansthan	06-Apr	Namami Gange
2	Structural Integration Works – RCC reinforcement of weir crest, brick masonry strengthening	12,000–15,000 per cum (RCC works)	Approx. 40 cum	4.8–6 lakh	Peyjal Nigam and Jal Sansthan	3–4	Namami Gange
3	Anchoring & Bed Protection – GI/SS anchoring,	Lump sum 3–4 lakh per site	4 sites	12–16 lakh	Peyjal Nigam and Jal Sansthan	3–4	Namami Gange

Sl. No	Components	Unit Rate (SOR Approx.)	Quantity	Total Cost (INR)	Responsible & Supporting Agency	Duration (Months)	Funding Sources
	nallah bed concreting						
4	Access & Safety Provisions – RCC slab, removable covers, inspection platforms	6,000–7,000 per sqm	Approx. 50 sqm	3–3.5 lakh	Peyjal Nigam and Jal Sansthan	2–3	Namami Gange
5	Site Preparation & Minor Civil Works – excavation, finishing, debris clearance	Lump sum 1–1.5 lakh per site	4 sites	4–6 lakh	Peyjal Nigam and Jal Sansthan	2–3	Namami Gange
6	Total Cost			Approx. 60 Lakhs			

* Above costing is prepared using CPWD/PWD Schedule of Rates for civil and mechanical works, with quantities derived from site dimensions (cum, sqm, units) and IS code specifications for sluice gates, RCC reinforcement and anchoring systems.

Overall Implementation framework

Responsible agencies:	Estimated budget
Peyjal Nigam	60 Lakhs
Timeline	Funding sources
Short Term (6-8 months)	Namami Gange

7.2.4 Intervention 5: Construction of I&D Structures at Irrigation colony nallah

As outlined in section 4.2, The Irrigation Colony nallah presently carries approximately 0.012 MLD of greywater generated from around 20 households. This flow runs through the minor drain of the colony and ultimately discharges into the Upper Ganga Canal. Although a long-term sewerage system exists in the area, these households are not yet connected to it. In the interim, Interception and Diversion (I&D) measures are proposed to prevent untreated discharge into the canal and redirect the flow toward existing treatment infrastructure.

Proposed Intervention

It is proposed to construct a single Interception and Diversion (I&D) structure of approx. 0.012 MLD capacity (to be measured and designed as required during DPR Stage) beside the road, just before the minor drain crosses into the Upper Ganga Canal. This structure will intercept the greywater flow from the colony and divert it into a newly laid sewer line of approx. 153 meters length. The sewer line will connect directly to the Singhdwar Sewage Pumping Station (SPS), thereby ensuring that the used water is conveyed to treatment facilities before discharge into the canal.

The I&D structure can be constructed on the road right-of-way and its outlet shall be connected directly to the sewer line leading to the Singhdwar SPS. This arrangement will ensure that untreated greywater from the colony is prevented from entering the Upper Ganga Canal and is instead integrated into the existing sewerage system for treatment.

The flow arrangement is presented in **Figure 7-1** and the conceptual arrangement of the I&D components is presented in **Map 7-1**.



Figure 7-1: Flow arrangement of proposed I & D Structure



Map 7-1: Showing discharge and proposed I&D location of Irrigation colony nallah

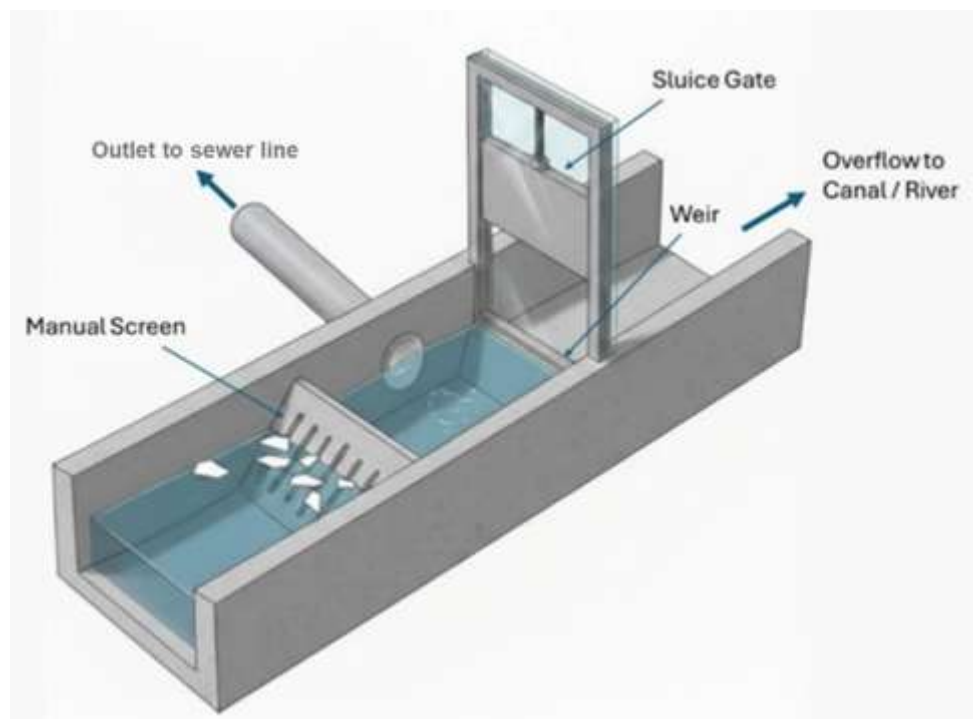


Figure 7-2: Proposed I & D Structure

Implementation Framework

Sl. No	Components	Unit Rate (SOR Approx.)	Quantity	Total Cost (INR)	Responsible & Supporting Agency	Duration (Months)	Funding Sources
1	I&D Chamber Construction – RCC chamber with sluice arrangement (capacity approx. 0.012 MLD)	12,000–15,000 per cum (RCC works, CPWD SOR)	Approx. 20 cum	5 lakh	Peyjal Nigam and Jal Sansthan	3–4	Namami Gange
2	Sewer Line (153 m length, 200 mm dia RCC/HDPE pipe) – excavation, bedding, laying, jointing	6,000–7,000 per running meter (PWD SOR for sewer works)	153 m	9.2–10.7 lakh		4–6	
3	Site Preparation & Ancillary Works – excavation, backfilling, finishing	Lump sum 1–1.5 lakh	Lump sum	1–1.5 lakh		2	
	Total Cost			Approx. 18 Lakhs			

* Above costing is prepared using CPWD/PWD Schedule of Rates for civil and sewerage works, with quantities derived from site requirements (cum, running meters, units) and standard IS code specifications for RCC chambers, sewer lines and manholes.

Overall Implementation framework

Responsible agencies:	Estimated budget
PeyJal Nigam	18 Lakhs
Timeline	Funding sources
Short Term (6-8 months)	Namami Gange

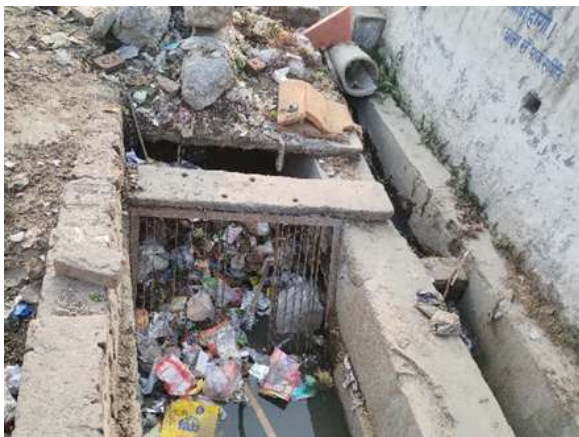
7.2.5 Intervention 6: Retrofitting of existing I&D Structures

As highlighted in the Section 4.2, the Mayapur, Awas Vikas and Jagjeetpur nallah face operational challenges in their Interception & Diversion (I&D) structures, compromising stormwater management, solid waste handling and sewage pumping efficiency. Mayapur Nallah remains dry most of the year with flow only during monsoons, where stream water enters manholes alongside grey water, overloading the Mayapur SPS and increasing STP pressure. Awas Vikas Nallah lacks proper access to its I&D structure, hindering solid waste removal from screens. At Jagjeetpur Nallah, the damaged manual screen allows solid waste to choke flow, bypassing interception and leading to incomplete tapping at the subsequent Matrasadan I&D structure. These issues reduce overall drainage efficiency and elevate operational risks amid urban growth. The concerns identified are listed below:

- Mayapur Nallah SPS receives sewage and grey water via manholes, but monsoon stream water causes overloading and excess STP inflow.
- Awas Vikas Nallah I&D lacks proper access, creating difficulty in removing screened solid waste.

- Jagjeetpur Nallah I&D has a damaged manual screen, allowing solid waste to choke flow and bypass interception.

Overall, retrofitting is essential to prevent stormwater ingress, improve maintenance access and restore screening for resilient urban drainage.



Picture 7-6: Damaged screen at Jagjeetpur and no access for Awas vikas Nallah I&D Structures

Proposed Interventions

The retrofitting of existing I&D structures has been planned to address critical operational issues at Mayapur, Awas Vikas and Jagjeetpur nallahs. Each location presents unique challenges and the interventions have been designed to strengthen the system and ensure smooth diversion of sewage to the SPS and STP.

A. Mayapur Nallah – Installation of Manual Gate at Manhole

A manually operated sluice gate to be installed directly at the manhole opening where used water enters from the bottom. The gate to be fabricated in mild steel with a spindle mechanism for manual operation, allowing closure during monsoon periods. By blocking stormwater inflow while permitting controlled grey water entry, this measure will reduce hydraulic overloading of the Mayapur SPS.

The intervention will minimize operational stress on the STP and improve treatment efficiency by maintaining stable inflow conditions.



Picture 7-7: Proposed sluice gate at the manhole at Mayapur nallah

B. Awas Vikas Nallah – Construction of RCC Slab for Access

A reinforced concrete slab to be constructed over the I&D chamber to provide safe and stable access for inspection and solid waste clearance. The slab will cover an area of approximately 35 Sq.m., designed with M25 grade concrete as per IS:456–2000 and reinforced with Fe500 grade steel conforming to IS:1786.

Adequate load-bearing capacity will be ensured for inspection personnel, with an access opening fitted with a removable cover for waste clearance.

This intervention will facilitate regular inspection and ensure efficient removal of accumulated solid waste. As a result, uninterrupted interception and diversion of sewage will be maintained, strengthening operational reliability of the I&D structure.



Picture 7-8: Illustration of proposed RCC Slab to access the Awas vikas nallah I&D structure

C. Jagjeetpur Nallah – Repair/Replacement of Manual Screen

The damaged manual screen at the I&D chamber to be repaired or replaced to restore interception efficiency. The drain section measures approximately 1 m in width and 1 to 1.5 m in depth, requiring a screen designed to fit securely across the chamber.

The screen to be fabricated using Galvanized Iron (GI) or Stainless-Steel conforming to IS:2062/IS:6911, with bar spacing of 20–30 mm to trap floating debris and solid waste. Anchoring will be provided on both sides of the drain walls, with provision for manual raking and clearance.

Restoring the screen will prevent untreated drain water from bypassing the I&D structure, improve diversion upstream of Matrasadan nallah I&D and ensure smoother flow management.

The measurements of above interventions to be finalized during the DPR stage based on hydraulic design requirements, site conditions and compliance with standards and IS codes. Collectively, it will prevent stormwater-induced overloading at Mayapur SPS, provide standardized access at Awas Vikas I&D and restore interception capacity at Jagjeetpur I&D, thereby strengthening the sewage diversion framework and reducing operational risks.



Picture 7-9: Illustration of galvanized Iron Screen at Jagjeetpur I&D Structure

Implementation Framework:

Sl. No	Components	Unit Rate (SOR Approx.)	Quantity	Total Cost (INR)	Responsible & supporting Agency	Duration (Months)	Funding Sources
1	Mayapur Nallah – Manual Sluice Gate at Manhole (MS fabricated, spindle mechanism)	2.5–3 lakh per gate (fabrication and installation)	1	2.5–3 lakh	Peyjal Nigam and Jal Sansthan	2–3	Namami Gange
2	Awes Vikas Nallah – RCC Slab for Access (M25 concrete, Fe500 steel, 35 sqm)	6,000–7,000 per sqm (CPWD SOR for RCC works)	35 sqm	2–2.5 lakh	HNN	3–4	Municipal budget
3	Jagjeetpur Nallah – Repair/Replacement of Manual Screen (GI/SS bars, 1 m width × 1–1.5 m depth)	1-2 lakh per screen (fabrication and anchoring)	1	1-2 lakh	Peyjal Nigam and Jal Sansthan	2–3	Namami Gange
4	Site Preparation & Minor Civil Works (chamber cleaning, anchoring, finishing)	Lump sum 1–1.5 lakh	Lump sum	1–1.5 lakh	HNN	2	Namami Gange
	Total Cost			Approx. 10 Lakhs			

**Above costing is prepared using CPWD/PWD Schedule of Rates for civil and mechanical works, with quantities derived from site dimensions (sqm, units) and IS code specifications for sluice gates, RCC slabs and screening structures.*

Overall Implementation framework

Responsible agencies:	Estimated budget
PeyJal Nigam, HNN	10 Lakhs
Timeline	Funding sources
Short Term (4-6 months)	Namami Gange and Municipal Budget

7.2.6 Intervention 7: Hedge plantation and stone pitching along Lal Tarao nallah (280 m both sides)

As outlined in Section 4.3, The Lal Tarao nallah, a natural stream that primarily carries water during the monsoon season, extends for approximately 280 meters from the downstream section up to Bhagwan

Valmiki Chowk. Currently, the nallah faces environmental challenges due to the activities of commercial vendors residing along its banks. Solid waste is being dumped directly into the nallah, which poses significant risks:

- Waste accumulation along the banks reduces the aesthetic value of the area.
- Dumped solid waste is carried into the Upper Ganga Canal during monsoon, leading to water pollution.
- Soil erosion along the banks weakens structural stability and increases vulnerability during heavy rains.
- Lack of natural barriers allows unrestricted access for further waste disposal



Picture 7-10: Solid waste dumped along the Lal Tarao nallah

Proposed Intervention:

To address the challenges along the Lal Tarao nallah, a targeted intervention plan has been implemented across its 280-meter stretch on both sides, combining engineered stabilization with ecological reinforcement. The measures follow Indian standards such as IRC:89 for river training works and CPHEEO guidelines for stormwater drains, ensuring hydraulic stability, compliance and resilience.

Stone pitching (revetment protection): Hand-placed, graded quarry stones of 225–300 mm thickness are laid dry over a geotextile-filtered granular bedding. Slopes are designed at 1.5H:1V to 2H:1V, with a launchable toe apron extending 1.5 times the pitching thickness below bed level to resist scour. This interlocking stone matrix dissipates flow energy, prevents bank undercutting, stabilizes slopes against monsoon velocities and forms a durable barrier that reduces direct solid waste ingress into the stream.

Hedge plantation (bio-engineering reinforcement): Using dense bougainvillea rows planted at 0.5–1 m spacing along the crest. These fast-growing, thorny climbers provide root reinforcement, increase soil cohesion through evapotranspiration and act as a living fence to restrict waste dumping. The vegetation enhances riparian biodiversity, filters runoff through phytoremediation and integrates with the stone pitching to form a hybrid green infrastructure system.

Pathway: A 1.8 m wide pedestrian pathway along with 0.9m high rail is proposed along the drain to improve accessibility and create a continuous movement corridor along the edge. The pathway will also create opportunities for people to engage with the waterfront while improving the overall visual and functional character of the edge.

Together, these measures stabilize the banks, reduce erosion and downstream pollution, improve aesthetics and strengthen ecological sustainability, ensuring long-term protection and community value for the Lal Tarao nallah.



Map 7-2: Proposed Stone pitching, Pathway and Hedge planation along the Lal Tarao Nallah

Implementation framework:

Sl. No	Components	Unit Rate (SOR Approx.)	Quantity	Total Cost (INR)	Responsible & Supporting Agency	Duration (Months)	Funding Sources
1	Stone Pitching (revetment protection) – hand-placed quarry stones 225–300 mm, geotextile bedding, slope 1.5H:1V	Rs.6,500–7,500 per running meter (including stone, bedding, labour)	560 m	36.4–42 lakh	Irrigation Dept./ HNN	6–8	State Urban Development Funds, Municipal Budget
2	Hedge Plantation (bougainvillea rows) – spacing 0.5–1 m, including pit digging, planting, watering	Rs.400–500 per meter (including plants, soil work, labour)	560 m	2.2–2.8 lakh	HNN	3–4	Municipal Budget
3	Site Preparation & Waste Removal – debris clearance, leveling, disposal	Rs.800–1,000 per meter	560 m	4.5–5.6 lakh	HNN	2–3	Swachh Bharat Mission
4	Permeable Pathway	Rs. 2100- 2300 per sq. mt.	380 sq. mt.	8.0–8.8 lakh	HNN	0.5 - 1	State Urban Development Funds, Municipal Budget

Sl. No	Components	Unit Rate (SOR Approx.)	Quantity	Total Cost (INR)	Responsible & Supporting Agency	Duration (Months)	Funding Sources
	Total Cost			Approx. 60 Lakhs			

*Above costing is based on CPWD/PWD SOR-based per running meter.

Overall Implementation framework

Responsible agencies:	Estimated budget
HNN and Irrigation Dept.	60 Lakhs
Timeline	Funding sources
Short Term (1 years)	State Urban Development Funds, SBM Urban and Municipal Budget

7.2.7 Intervention 8: Ecological Reinforcement and Structural Barriers at Subhash Nagar

As outlined in Section 4.3, at Subhash Nagar, a solid waste hotspot exists at the edge of the river and nearby settlements and waste dumping along the banks has led to environmental degradation and pollution risks.

- Waste accumulation along the banks reduces the aesthetic value of the area.
- Dumped solid waste is carried into the Ranipur Rao during monsoon, leading to water pollution.
- Lack of natural barriers allows unrestricted access for further waste disposal.

Proposed Intervention:

To address the challenges along the Subhash Nagar nallah, a targeted intervention plan has been designed across a 100 meter stretch on the southern side of the road and a 50 meter stretch along the Ranipur Rao, both banks. In addition, iron fencing has been installed on both sides of the bridge, covering 35 m on the northern side and 65 m on the southern side of the Ranipur Rao, as shown in Picture 7-11 as per the Indian standards.

Hedge plantation (bio-engineering reinforcement): Dense bougainvillea rows planted at 0.5–1 m spacing along the crest. These fast-growing, thorny climbers provide root reinforcement, increase soil cohesion through evapotranspiration and act as a living fence to restrict waste dumping. The vegetation enhances riparian biodiversity, filters runoff through phytoremediation and integrates with fencing to form a hybrid green infrastructure system.

Iron fencing (structural barrier): Decorative iron fencing installed on both sides of the bridge (35 m north, 65 m south of Ranipur Rao). The fencing prevents direct access to the banks, restricts waste disposal and improves aesthetics. It complements hedge plantation by providing immediate physical protection while vegetation matures, ensuring long-term resilience and community safety.

During the DPR stage, the exact lengths of hedge plantation, fencing and associated civil works will be finalized based on detailed site surveys and design standards. The preliminary figures provided here (100 m along the road, 50 m along Ranipur Rao and iron fencing of 35 m north and 65 m south at the bridge) are indicative and subject to adjustment as per DPR findings.



Picture 7-11: Proposed Hedge planation and Iron Fence at subhash nagar

Implementation framework:

Sl. No	Components	Unit Rate (SOR Approx.)	Quantity	Total Cost (INR)	Responsible & Supporting Agency	Duration (Months)	Funding Sources
1	Hedge Plantation (bio-engineering reinforcement) – bougainvillea rows at 0.5–1 m spacing	250–300 per plant (including pit preparation, planting, maintenance)	300 plants	0.8–1 lakh	HNN	3–4	Municipal budget, Swachh Bharat Mission
2	Iron Fencing (structural barrier) – decorative iron fencing on both sides of the bridge (35 m north + 65 m south)	3,500–4,000 per running meter (PWD SOR for fencing works)	100 m	3.5–4 lakh	HNN	3–4	Municipal budget, Swachh Bharat Mission
3	Site Preparation & Ancillary Works – debris clearance, soil dressing, minor civil works	Lump sum 1–1.5 lakh	Lump sum	1–1.5 lakh	HNN	2–3	Municipal budget
4	Total Cost			Approx. 7 Lakhs			

**Above costing is based on CPWD/PWD SOR-based per running meter.*

Overall Implementation framework

Responsible agencies:	Estimated budget
HNN	7 Lakhs
Timeline	Funding sources
Short Term (4-6 months)	SBM Urban and Municipal Budget

7.2.8 Intervention 9: Installation of Riser-type trash trap system for solid waste at nallahs

As highlighted in Section 4.3, Kasawaan and Pandaywala nallahs that primarily carries used water are burdened with heavy inflows of solid waste. This waste obstructs water flow, creates unhygienic conditions and requires daily removal of 1–2 trolleys of solid waste. Manual cleaning is inefficient and unsafe, highlighting the need for mechanized interventions.

Issues:

- High volume of floating solid waste entering nallahs.
- Daily removal of 1–2 trolleys of waste indicate persistent inflow.
- Manual removal is labor-intensive and exposes workers to health risks.



Picture 7-12: Solid waste accumulated at Pandeywala and Kasawaan Nalla I&D Structure

Case study of Hussain Sagar Lake, Hyderabad

The floating trash barrier system at the mouth of Picket Nallah is designed to intercept plastics, thermocol and other debris before they enter Hussain Sagar Lake. The barrier guides waste into collection cages, which are periodically lifted and transferred to GHMC facilities for proper disposal. To ensure compliance, CCTV monitoring and challan enforcement are integrated into the system. Technically, the intervention uses HDPE floating booms with anchoring, supported by crane-based debris removal cages in a modular, easy-maintenance design that adheres to CPCB standards for urban waterbodies. This setup significantly reduces floating waste inflow, enhances the lake’s aesthetics and water quality and lowers the desilting load and cleaning requirements, thereby contributing to sustainable urban water management.



Picture 7-13: Floating barrier before entering to Hussain Sagar Lake

Source: Floating Barriers: River Boom and Biobarriers

Proposed Intervention

To address these challenges, Riser-type Trash Trap systems will be installed at both Kasawaan Nallah and Pandaywala. Each system integrates a Floating Boom Barrier, Mechanical Screen and Belt Conveyor to intercept, trap and transport solid waste out of the nallahs.

In Kasawaan nallah, a floating boom barrier installed directly across the nallah intercepts floating debris, which a mechanical screen guides to a conveyor belt transferring it to a raised platform for collection. For Pandaywala nallah, floating boom barrier positioned before the I&D structure captures waste early, directing it to a mechanical screen and conveyor belt that lifts it to beside area for collection.

In both nallahs, waste collected on the platforms is loaded into trolleys and transported to designated Solid Waste Processing Units or disposal facilities. This setup prevents accumulation and choking, reduces manual removal or intervention and ensures continuous mechanized transfer with smooth wastewater flow. This mechanized approach ensures continuous removal of debris, reduces manual handling and improves sanitation. The specifications of the components are mentioned below;

- **Floating Boom Barrier**
 - Positioned across the nallah to intercept floating waste.
 - Built with HDPE floats, anchored to withstand flow velocity.
 - Guides waste toward the mechanical screen.
- **Mechanical Screen**
 - Installed downstream of the boom barrier.
 - Vertical stainless-steel bars trap solid waste while allowing water to pass.
 - Inclined design reduces clogging and ensures efficient capture.
- **Belt Conveyor System**

- Positioned behind the screen.
- Motorized conveyor lifts trapped waste and transfers it to collection trolleys.
- Designed for 2–3 tons/day capacity, matching observed waste inflow.



Picture 7-14: Proposed Riser-type Trash Trap systems (floating boom barrier, mechanical screen and belt conveyor)

Implementation Framework:

Sl. No	Components	Unit Rate	Quantity	Total Cost (INR)	Responsible & Supporting Agency	Duration (Months)	Funding Sources
1	Floating Boom Barrier – HDPE floats, anchored, imported design	35-40 lakh per barrier	2	70-80 lakh	PeyJal Nigam	3–4	Namami Gange
2	Mechanical Screen – stainless steel, inclined, anti-clog design	30-35 lakh per unit	2	60-70 lakh	PeyJal Nigam	4–5	Namami Gange
3	Belt Conveyor System – motorized, 2–3 tons/day	45-50 lakh per unit	2	90-100 lakh	PeyJal Nigam	5–6	Namami Gange
4	Platform & Collection System – raised platform, trolley loading	20-25 lakh per site	2	40-50 lakh	HNN	2–3	Municipal Budget
5	Total Cost			Approx. 250 Lakhs			

**Above costing is based on EnviRo-Care (Complete Marine Debris Management Solutions) which provides the equipment's.*

Overall Implementation framework:

Responsible agencies:	Estimated budget
PeyJal Nigam and HNN	250 lakhs
Timeline	Funding sources
Short Term (1 years)	Namami Gange, SBM Urban and CSR

7.2.9 Intervention 10: Implementation of Integrated Dung Waste Management for Bio-CNG Recovery in Haridwar

As highlighted in Section 4.4.3, dung waste in Haridwar is one of the sources for pollution affecting urban sanitation and drainage systems. With approximately 7,000 bovines (cows and buffaloes), unmanaged disposal of dung contributes significantly to solid waste loads. At present, dung is largely washed into nallahs, reducing sewage treatment efficiency and creating environmental hazards. Only 4–5 wards have partial collection using trolleys and the waste is ultimately dumped untreated at the Sarai solid waste management site (approx. 7 hectares). This unmanaged system leaves considerable potential for resource recovery untapped.

Proposed Intervention:

To establish a municipal-scale waste-to-energy initiative that converts cattle dung into Bio-CNG, integrated with existing infrastructure and new facility development. By combining anaerobic digestion, gas upgrading and compression technologies, the project will reduce methane emissions, generate clean fuel and improve sanitation. The initiative will be designed under a DBFO (Design–Build–Finance–Operate) concession model with government and private sector collaboration.

1. **Dung generation:** Based on the stakeholder’s consultation, Haridwar has approx. 7000 bovines (cows and buffaloes), as per CPCB (Guidelines for Environmental Management of Dairy Farms and Gaushalas) each animal produces approximately 15 kg dung/day and the total dung generated approximately 105 tons per day. Currently, only a fraction is collected and none is treated.
2. **Collection System:** Dung collection will follow a door-to-door strategy across all wards.
 - Core wards will use handcarts, e-rickshaws and bins for narrow, dense areas.
 - Peri-urban wards will use mini-tractors and motorized trolleys for mixed-density zones.
 - Outer wards will use bulk tractors with hydraulic trailers for large cattle cluster
 - Covered community bins of 500–1000 litres will be placed at junctions and farms, emptied twice daily. Partnerships with gaushalas and cattle owners will provide on-site tanks, compost return and farmer incentives. GPS tracking, mobile app logging and ward-level dashboards will ensure accountability and efficiency.

Case Study: Indore’s GOBARDhan Bio-CNG project demonstrated how organized dung collection improved sanitation and ensured steady feedstock supply. (Ministry of Jal Shakti, 2024)

3. **Transfer station:** The collected dung will be aggregated at transfer stations before treatment. The area requirement is estimated at 30 square meters per ton per day, which means that for 105 TPD, approximately 3,150 square meters will be required.
 - This can be achieved through the three recommended station types mentioned below:
 - **Small (3–5 TPD): 400–600 sqm**
 - **Medium (10–20 TPD): 1000–2000 sqm**
 - **Large (>50 TPD): 1–2 hectares**

Case Study: Pune’s integrated biogas facility used decentralized transfer stations to streamline logistics and reduce transport costs. (CSE Report, 2025)

4. **Treatment Facility:** In Haridwar, there is already an existing biogas plant and a new bio gas plant is established.

- Jagjeetpur Bio-CNG Plant Optimization: Utilize 50 TPD dung waste as additional feedstock alongside sewage sludge.
- New Sarai Bio-CNG Plant: Establish a 50 TPD facility at the Sarai SWM site with anaerobic digestion (CSTR) technology, gas upgradation via pressure swing adsorption, compression and bottling at 200–250 bar (PESO norms) and Land requirement of approx. 10-12 hectares for facilities.

Case Study: Ghaziabad’s decentralized dung-based biogas units successfully converted waste into clean fuel, reducing landfill loads. (IJIRT Case Study, 2025)

5. Resource Recovery & Revenue:

- Existing Revenue Model: Jagjeetpur Bio-CNG plant already operates a CNG Bag Station, selling Bio-CNG at 100/kg, generating direct income for plant management.
- Projected Recovery: Bio-CNG: 3,500–6,000 kg/day, annual revenue approx. 20–30 crore (at 50-55 per kg under SATAT scheme; higher if sold at 100 per kg locally).
- Compost: approx. 60–70 TPD digestate, 2–3 crore annually.
- Carbon Credits: Approx. 10–15 lakh annually.

Case Study: Nagpur’s integrated waste-to-energy model demonstrated how combining dung and municipal waste streams created a circular economy with strong revenue potential. (Ministry of Jal Shakti, 2024)

6. Project framework:

- Model: DBFO concession with government support through schemes/programmes.
- Private Partner Role: Build, operate and maintain the plant, manage logistics and earn revenue from Bio-CNG and compost sales.
- Government Role: Provide land, policy support and integration with national waste-to-wealth initiatives.

Implementation Framework:

Sl. No	Components	Unit Rate	Quantity	Total Cost (INR lakhs)	Responsible & Supporting Agency	Duration (Months)	Funding Sources
1	Dung Collection System – handcarts, e-rickshaws, mini-tractors, hydraulic trailers, bins	25,000–30,000 per cart/e-ricks haw; ₹4–5 lakh per tractor/trolley	Approx. 150 units (mixed fleet)	600–800	HNN	6–8	Municipal sanitation budget, Swachh Bharat Mission
2	Transfer Stations – decentralized aggregation (small, medium, large)	12,000–15,000 per sqm (PWD civil works)	Approx. 3,150 sqm	380–470	HNN	8–10	State Urban Development Funds, CSR and PPP investment
3	New Sarai Bio-CNG Plant – 50 TPD CSTR digester, PSA upgrading,	40-45 lakh per TPD (new facility, land, machinery)	50 TPD	2000-2250	HNN and Private Partner	18–24	Advisory on CBG Plants Based on Municipal Solid Waste

Sl. No	Components	Unit Rate	Quantity	Total Cost (INR lakhs)	Responsible & Supporting Agency	Duration (Months)	Funding Sources
	compression, bottling						
4	Resource Recovery Systems – bottling station, compost packaging, carbon credit certification	5–6 crore lump sum	Lump sum	500–600	Private Partner (DBFO concession)	6–8	Revenue from Bio-CNG & compost sales
	Total Cost			Approx. 4600			

*Above costing is prepared using CPWD/PWD Schedule of Rates for civil works, CPCB dung waste management guidelines and benchmarked case studies of Bio-CNG projects. Quantities (units, sqm, TPD) are derived from dung generation norms and facility sizing standards.

Overall Implementation framework

Responsible agencies:	Estimated budget
HNN	4600 lakhs
Timeline	Funding sources
Medium Term (1-3 years)	Municipal Budget, SATAT Scheme and MNRE Waste-to-Energy Programme

7.2.10 Intervention 11: Installation of Sculptures/ Murals/ Signages/Art Work at Bridges and Identified Solid Waste Hotspot areas

Haridwar city witnesses heavy footfall during festivals and daily rituals. Bridges across the river serve not only as transit infrastructure but also as highly visible public spaces. Leveraging these structures for awareness installations can transform them into platforms for environmental messaging, discouraging littering and promoting river-sensitive behavior.

Despite ongoing campaigns such as posters and rallies, they have a limited reach. So, the challenge of persistent pollution remains, with solid waste, religious offerings and plastic continuing to enter the river.

Proposed Interventions:

- Art installations: Large-scale lettering (e.g., “THINK”, “RESPECT THE RIVER”) made from recycled waste materials fixed on bridge railings.
- Vertical gardens: Bottle-based greenery installations to symbolize reuse and ecological balance.

Seasonal exhibits: Temporary sculptures during festivals (e.g., “Best out of Waste” campaigns) to coincide with high pilgrim activity. Interpretive signage: Boards explaining the ecological importance of the Ganga and consequences of pollution

Case Study on bridge-based art installations in Dharamshala

In Dharamshala, bridge-based art installations were introduced under the theme “Best out of Waste.” Local artists and citizens collaborated to create large lettering and sculptures from discarded plastic and other waste materials. These installations were displayed prominently on bridges, turning them into public awareness platforms. The initiative not only discouraged littering but also engaged the community in creative reuse, fostering a sense of collective responsibility towards keeping the environment clean. The visibility of these installations during high tourist activity amplified their impact, making Dharamshala a successful example of how bridge-based interventions can drive behavioral change



Picture 7-15: Sculpture/ Art work/Signage at bridges

Responsible agencies	Timeline
Responsible agencies: HNN, Irrigation department, Ganga Mahasabha; Supporting Agencies: SHGs, Temple Committees, katha Vachak, NGOs	Medium term 2-3 year

Implementation Framework:

Sl. No	Components	Unit Rate	Size	Total Cost (INR)	Responsible & Supporting Agency	Duration (Months)	Funding Sources
1	Sculpture/ art Work	6.0 – 8.0 lakh per piece	36" (H) x 40" (L) x 20" (W)	60.0 – 80.0 lakh (Total approx. 10 locations)	HNN	3–5	Municipal budget
	Total Cost			Approx. 70.0 lakh			

*Above costing is prepared using CPWD/PWD Schedule of Rates for civil works, CPCB dung waste management guidelines and benchmarked case studies of Bio-CNG projects. Quantities (units, sqm, TPD) are derived from dung generation norms and facility sizing standards.

Overall Implementation framework

Responsible agencies:	Estimated budget
HNN	70.0 lakh
Timeline	Funding sources
Medium Term (1.-1.5 years)	Municipal Budget

7.2.11 Recommendation 1: Strategic Sewer Alignment for Access-Constrained Areas

As outlined in Section 4.3, the identified problematic stretch measures approximately 2.215 km along the Ganga Canal, within this corridor, two distinct encroachment stretches have been observed, a 215 m stretch at Devpura and a 2 km stretch from Arya Nagar to Jatawala Bridge. Currently, this canal section faces severe environmental and infrastructural challenges due to unauthorized households constructed along canal. These settlements discharge untreated liquid waste directly into the canal, as sewer connectivity is absent. The situation poses multiple risks:

- Unauthorized housing has extended onto canal slopes, compromising structural safety and restricting access.
- As these households are unauthorized, they are excluded from Zone-E and Zone-F sewerage projects.
- Direct discharge of used water flows into the canal due to absence of sewer connectivity.
- Continuous inflow of untreated sewage degrades canal water quality.
- Current sewerage schemes do not include these households.
- Irrigation department land requires coordinated planning and approvals.

Proposed Interventions

To address the challenges along the 2.215 km. stretch, two alternative intervention strategies are proposed, combining engineered infrastructure with administrative safeguards. Both measures follow CPHEEO guidelines for sewerage works, BIS Standards and IRC standards for canal protection, ensuring hydraulic stability, compliance and resilience.

Option 1 – Sewer Alignment with Walkway (Preferred Engineering Solution):

A continuous walkway is recommended to be constructed along the canal edge, covering both the Devpura patch (215 m) and the Arya Nagar–Jatawala Bridge stretch (2 km). The walkway will serve as an access corridor for maintenance and as a protective buffer against further encroachment. In certain locations, demolition of one row of unauthorized houses built directly on canal slopes may be required to establish the alignment.

A sewer line to be laid along the walkway to intercept untreated wastewater currently discharged into the canal. The line will be hydraulically designed to connect minor drains and household used water discharge pipelines, conveying flow into the downstream trunk sewer network. This system will prevent direct inflow into the canal, thereby improving water quality and reducing environmental hazards.

A comprehensive survey to be undertaken to map encroachments, identify discharge points and assess household connectivity requirements. GIS-based mapping of canal slopes and hydraulic assessment of sewer line capacity will be carried out to establish technical feasibility and optimize design parameter.

The irrigation department will act as the primary stakeholder, given its jurisdiction over canal land and slope protection. PeyJal Nigam and Jal Sansthan will be responsible for sewerage integration, while joint administrative planning will be essential to secure approvals and ensure long-term sustainability of the intervention.



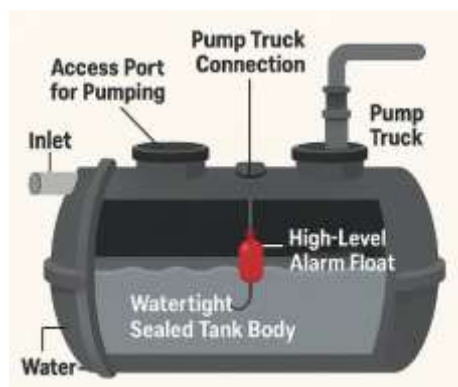
Map 7-3: Proposed Arya Nagar–Jatwala Bridge stretch (2 km)



Map 7-4: Proposed Devpura stretch (215 m)

Option 2 – Sealed Holding Tanks (Pump-and-Haul, Temporary Measure):

For highly constrained buildings where no piping or on-site treatment is feasible, completely sealed, watertight holding tanks to be installed. These tanks to be regularly emptied by vacuum trucks (pump-and-haul system). This prevents direct discharge into the canal but requires vehicular access and involves high ongoing operational costs. It is considered a temporary or last-resort measure, to be phased out once permanent sewer connectivity becomes feasible.



Picture 7-16: Proposed sealed holding tanks

7.2.12 Recommendation 2: Regular Half-Yearly Cleaning of Solid Waste & Silt Removal at all I&D Structures and Pumping stations

Haridwar’s nallah system faces recurring operational challenges primarily due to solid waste dumping and silt accumulation. These issues compromise the efficiency of Interception & Diversion (I&D) structures and Sewage Pumping Stations (SPS), leading to untreated wastewater and waste bypassing into the Ganga River.

Implementation Measures:

- **Daily Solid Waste Removal:** Manual cleaning of solid waste at hotspots such as Jagjeetpur, Matrasadan, Kasawaan, Pandaywala and Lal Tarao upstream nallahs to prevent choking of I&D structures.
- **Weekly Screening Maintenance:** Inspection and repair of mechanical/manual screens at all I&D structures to ensure interception efficiency and prevent bypass of untreated waste.
- **Monthly Silt Removal:** Desilting operations at major SPS (Bhimgoda, Lal Tarao, PWD, Kasawaan, Pandaywala) using silt pumps, suction-cum-jetting machines where feasible and manual diversion methods to be standardized where access is constrained.
- **Quarterly Preventive Desilting:** Comprehensive desilting of large drains to maintain hydraulic capacity and reduce operational stress on SPS.
- **Annual Pre-Monsoon Cleaning (May–June):** Large-scale desilting across all nallahs before the onset of monsoon to minimize overloading risks and ensure uninterrupted flow management.

Alignment with Guidelines:

- **CPCB Solid Waste Management Rules, 2016:** Mandate prevention of open dumping and regular removal of waste from urban drains.
- **National Mission for Clean Ganga (NMCG) Protocols:** Require functional I&D structures with preventive maintenance and silt removal before monsoon.
- **Urban Drainage Guidelines:** Recommend quarterly desilting of stormwater drains to maintain flow efficiency and prevent flooding.

This structured intervention - daily solid waste removal, weekly screening checks, monthly silt removal, quarterly preventive desilting and annual pre-monsoon cleaning will strengthen Haridwar’s drainage system, reduce untreated discharges into the Ganga and ensure compliance with national environmental standards.

7.2.13 Recommendation 3: Implementation of Water Metering for all City Connections

As mentioned in section 4.1, Haridwar's current per capita water supply stands at 250 litres per capita per day (LPCD), which exceeds the standard service level benchmark of 135 LPCD. This higher figure is largely due to the floating population of pilgrims, tourists, hotels and dharmshalas that consume water without regulated limits. The city's primary source of water is groundwater, which has already been classified as semi-critical by the Central Ground Water Department. Without regulation, excessive extraction and unmetered consumption will further stress this fragile resource base.

Implementation Measures:

- **Universal Metering of Connections:** All residential, commercial, institutional and hospitality connections including hotels and dharmshalas will be fitted with calibrated water meters, in line with CPCB service level benchmarks, to monitor consumption and reduce wastage.
- **Tiered Tariff System:** A slab-based tariff structure will be introduced as per CGWB recommendations, ensuring affordability for basic domestic needs while discouraging excessive consumption by high-demand use
- **Centralized Monitoring:** Metering data will be integrated into a centralized monitoring platform following Urban Water Supply Guidelines, enabling daily tracking of consumption patterns, detection of leakages and identification of high-demand cluster
- **Half-Yearly Audits:** Comprehensive audits of water consumption will be conducted twice a year (June and December) in accordance with CPCB and NMCG protocols, ensuring compliance and allowing tariff adjustments where necessary.
- **Awareness and Enforcement:** Public campaigns will be undertaken to sensitize residents and businesses about responsible water use, while strict enforcement will be applied to prevent illegal borewell extraction and unmetered usage, consistent with CPCB and NMCG guidelines.

Case Study of Nagpur Water Metering

Nagpur HNN implemented a 24x7 water supply project under a Public-Private Partnership (PPP), where 15,000 connections in the Dharampeth zone were metered. This initiative successfully reduced wastage, ensured equitable distribution and improved revenue collection. The project demonstrated that metering, combined with continuous supply, can balance demand and sustainability in urban contexts, offering a replicable model for Haridwar.

By implementing universal water metering, Haridwar can regulate excessive consumption from hotels and dharmshalas, safeguard semi-critical groundwater resources and align with national benchmarks for sustainable urban water management. Half-yearly audits, tiered tariffs and centralized monitoring will ensure accountability, efficiency and resilience in the city's water supply system.

Document Reference -

http://164.100.161.224/upload/uploadfiles/files/Nagpur_water_PPP_Final_case.pdf?utm_source=copilot.com

Case Study of Dehradun Water Metering

Dehradun HNN initiated a water distribution improvement program using GIS-based mapping, hydraulic modeling and smart metering. Engineered pits and grit sumps were integrated to manage silt deposition, regulate water drainage and retain sediment. Smart meters were introduced to monitor consumption more accurately, reduce losses and improve billing efficiency. This initiative enhanced supply-demand planning, reduced leakage and ensured more reliable distribution across the city.

By adopting universal water metering, Dehradun can further minimize non-revenue water, balance consumption across households and commercial establishments and strengthen accountability in its water supply system. Regular audits, tiered tariffs and centralized monitoring will help safeguard groundwater resources, improve efficiency and align with national benchmarks for sustainable urban water management.

Document Reference - <https://link.springer.com/article/10.1007/s43832-024-00107-8>

7.3 OBJECTIVE 4: INTERVENTIONS TO ENHANCE RIPARIAN BUFFER ALONG RIVER BANK

Riparian stretches comprising vegetated strips alongside rivers and natural drains are essential 'living infrastructure' in cities, as they help in ecological and hydrological functions that concrete embankments cannot replicate. These functions include:

- **Flood Control:** Riparian stretches absorb excess rainwater and slow down runoff, preventing downstream flooding.
- **Water Purification:** The soil and roots filter out toxic urban pollutants and sediments before they reach the river.
- **Climate Regulation:** They cool the surrounding area thereby combating "Urban Heat Island" effect.
- **Biodiversity and Recreation:** They serve as the primary corridors for wildlife movement and provide valuable green space for human mental health and recreation.

The riparian stretch on both banks of River Ganga was analysed and differentiated between degraded and healthy stretches. Interventions have been proposed for restoration of degraded stretches whereas conservation and preservation recommendations have been proposed for the relatively healthy stretches in the following paragraphs.



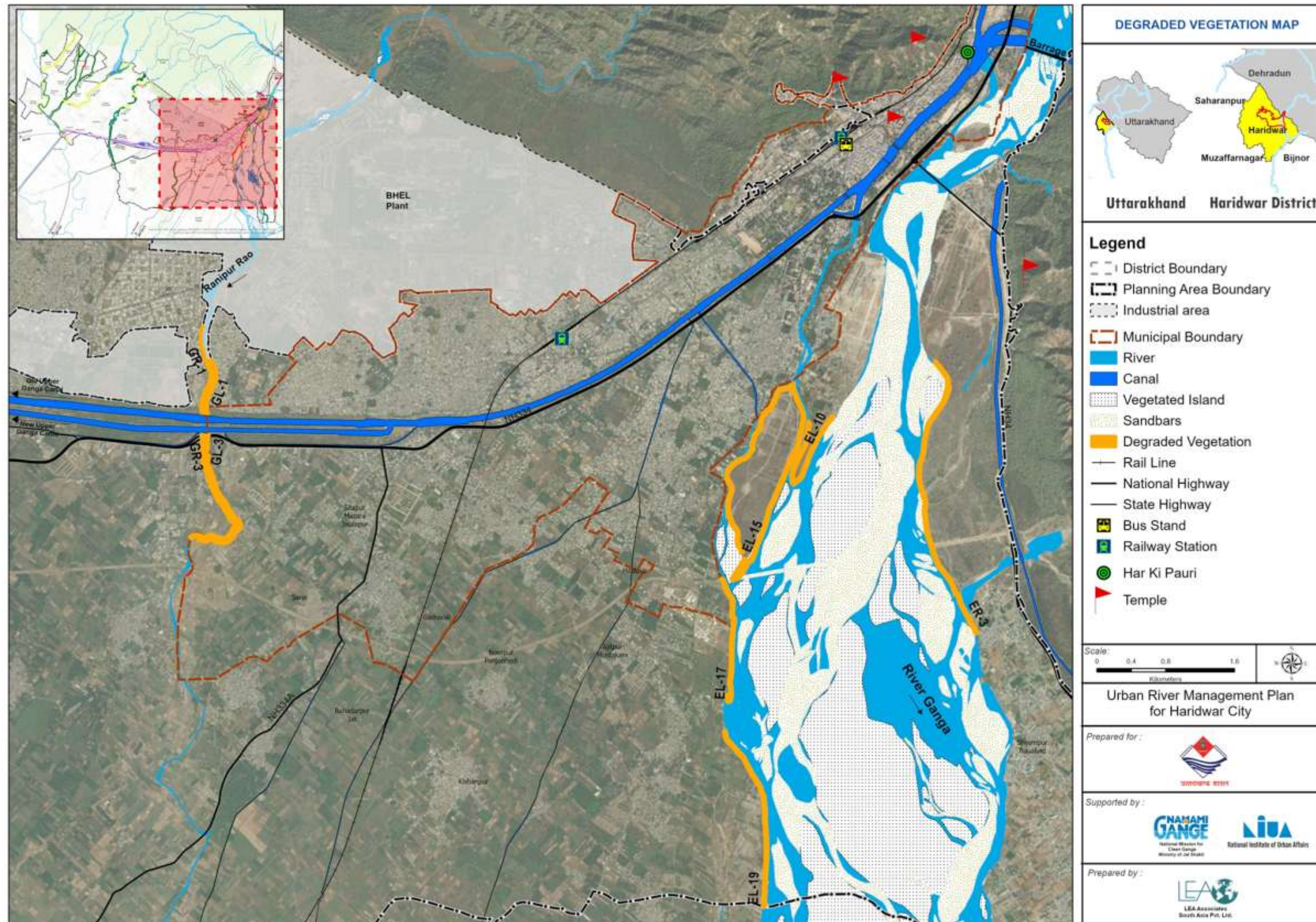
Picture 7-17: Dense Riparian stretches along River Ganga



Picture 7-18: Degraded Riparian stretches near Shyampur

7.3.1 Intervention 12: Restoration of degraded riparian stretches

As mentioned in section 3.2.3, the degraded vegetation in Haridwar is concentrated along River Ganga, Upper Ganga Canal and seasonal streams. Field observations indicate localized degradation, bank erosion from monsoon flooding and declining stability in downstream stretches (refer **Map 7-5**) Seasonal floods erode river banks, uprooting native vegetation, while the absence of systematic plantation and maintenance has facilitated the spread of invasive species and barren patches, thereby weakening ecological resilience. To address these issues, a **Three-Zone Riparian Buffer Restoration Strategy** is proposed along the degraded stretches on both banks. This approach will restore the vegetation in layers based on proximity to the river channel, strengthening both ecological and hydraulic functions.



Source: Draft Master Plan 2041 ;Survey of India (Administrative Boundaries); Open Street Map (Road Network), Consultant's Analysis

Map 7-5: Degraded stretches in Haridwar planning Area

Proposed key actions

The restoration strategy focuses on establishing a multi-zone riparian buffer and enhancing native vegetation to improve flood resilience and ecological integrity. The key measures are as under. Wherever feasible, hard engineering solutions shall be avoided, by preferring nature-based interventions, that strengthen ecological resilience.

- Plantation of vetiver, native grasses and sedges for soil binding and erosion control.
- Establishment of bamboo clumps and live staking techniques to stabilize eroding banks.
- Development of nature trail along Ranipur Rao.

Table 7-2: Key actions for the restoration of the riparian buffer

Components	Key Actions/ Species	Expected Outcome
1. Stabilize Eroding Riverbanks (Bio-engineering)	Vetiver, kans grass, bamboo clumps, live staking; avoid concrete where not required	• Reduced erosion, bank stability, safer flood margins
2. Establish Three-Zone Riparian Buffer	Zone-1 grasses & sedges, Zone-2 shrubs/small trees, Zone-3 native trees	• Flood energy dissipation • Biodiversity enhancement, long-term riparian stability
3. Riparian Plantation & Habitat Restoration	Native species clusters (Arjun, Jamun, Peepal, Siris, Bamboo), avoid monoculture	Biodiversity enhancement, long-term riparian stability
4. Pollution Source Management (Agro)	Vegetated filter strips, compost pits, controlled fertilizer use awareness	Reduced nutrient & pesticide loading
5. Replacement of invasive species by Native Species Integration	Recommended native species (site-suitable): • Aduša • Chirchita Implementation notes: • Gradual removal of invasive plants to avoid exposed bare soil • Sequential planting during pre-monsoon/monsoon • Periodic weed control and survival monitoring	• Restoration of native riparian habitat and biodiversity. • Gradual suppression of invasive species through healthy native cover. • Lower maintenance requirement over time due to self-sustaining native vegetation.

Multi-zonal approach for riparian stretches design

A 30-meter wide riparian buffer zone is proposed along the identified river stretches, extending from the river's edge to provide ecological stabilization and flood mitigation benefits.

1. Zone 1 (closest to river channel):
 - Grasses and sedges for erosion control and nutrient filtration
 - Stabilize the bank, reduce scouring and filter runoff
2. Zone 2 (intermediate zone):
 - Shrubs for flood energy dissipation and habitat connectivity
 - Intercept pollutants, break flood velocity and shield inner vegetation
3. Zone 3 (outer zone):
 - Native tree species for long-term stabilization, biodiversity enhancement and microclimate regulation

- Improve infiltration and support soil structure

The three zones of buffer are shown in **Figure 7-3**.



Figure 7-3: Section of the Proposed riparian stretch along eastern and western bank of the river and canal

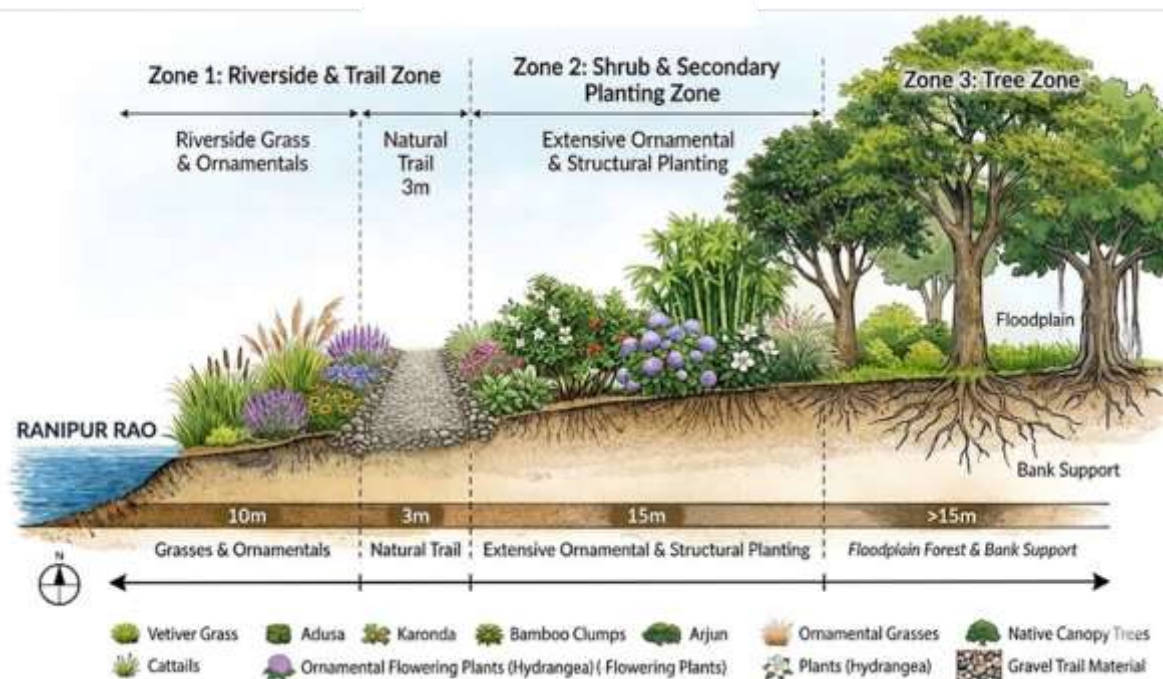


Figure 7-4: Section of proposed riparian stretch with the nature trail

Zone wise proposed species and its ecological benefits

Species selection is based on hydrological tolerance, rooting depth and ecological performance to optimize bank stabilization, nutrient retention and habitat functioning. The native plant species recommended for each riparian zone are summarized in the table below

Table 7-3: Native plant species recommended for each riparian zone

Zone	Width	Species name	Relevance to River Ganga Context	Pollution Control Function	Flood Control Function
Zone 1 – Grasses & Sedges (Immediate Stream Edge)	0-10 m	<i>Vetiveria zizanioides</i> (Vetiver / Khus)	Performs well on loose alluvial soils	High nitrate/phosphate uptake, pesticide adsorption	Deep roots anchor toe of bank, reduces scouring
		<i>Cynodon dactylon</i> (Doob grass)	Survives grazing & seasonal waterlogging	Filters runoff, strong nitrogen uptake	Forms dense mats, holds soil during flood recession
		<i>Saccharum spontaneum</i> (Kans grass)	Common on floodplains, easy to establish	Captures sediments carrying fertilizers	Flexible stems dissipate flood velocity
Zone 2 – Shrubs & Small Trees (Pollution Interception Zone)	10-15 m	<i>Vitex negundo</i> (Nirgundi)	Tolerates seasonal flooding & drought	Absorbs pesticides, hardy & low maintenance	Breaks flood velocity, shields inner vegetation
		<i>Clerodendrum inerme</i> (Glory bower)	Suitable for embankment slopes	Nutrient interception, supports soil microbes	Prevents gully formation during monsoon flows
		<i>Cassia fistula</i> (Amaltas)	Suitable near settlements and river edges	Enhances microbial pesticide breakdown	Canopy reduces storm runoff concentration
		<i>Jatropha curcas</i> (Jatropha)	Tolerant to poor soils near fields	Uptake of heavy metals & pesticides	Reinforces bunds and embankments
Zone 3 – Native Trees (Outer Buffer / Upland Zone)	15-30 m	<i>Terminalia arjuna</i> (Arjun)	Traditionally used along riverbanks	Strong nitrate uptake, stabilizes banks	Buttressed roots resist major flood events
		<i>Syzygium cumini</i> (Jamun)	Suitable for moist alluvial terraces	Reduces nutrient leaching to groundwater	Enhances infiltration, moderates peak runoff
		<i>Ficus religiosa</i> (Peepal)	Long-lived native species	Supports nutrient cycling & soil microbes	Improves soil structure and moisture holding
		Bamboo spp. (Bamboo)	Grows well on floodplain margins	Excellent nutrient sink, rapid biomass	Dense clumps act as natural flood barriers

Expected outcome

Implementation of the proposed riparian buffer will transform degraded stretches of river and canal into a continuous and dense green corridor. Grasses, shrubs and native trees will work together to:

- Stabilize the riverbanks and reduce flood impacts.
- Improve water quality through natural filtration.
- Enhance biodiversity and habitat connectivity along the river corridor.

The before and after intervention conditions are illustrated in the figures below.



Picture 7-19: Illustration of proposed riparian stretch on River Ganga



Picture 7-20: Illustration of existing riparian stretch along Ranipur Rao



Picture 7-21: Illustration of proposed riparian stretch with natural trail along Ranipur Rao

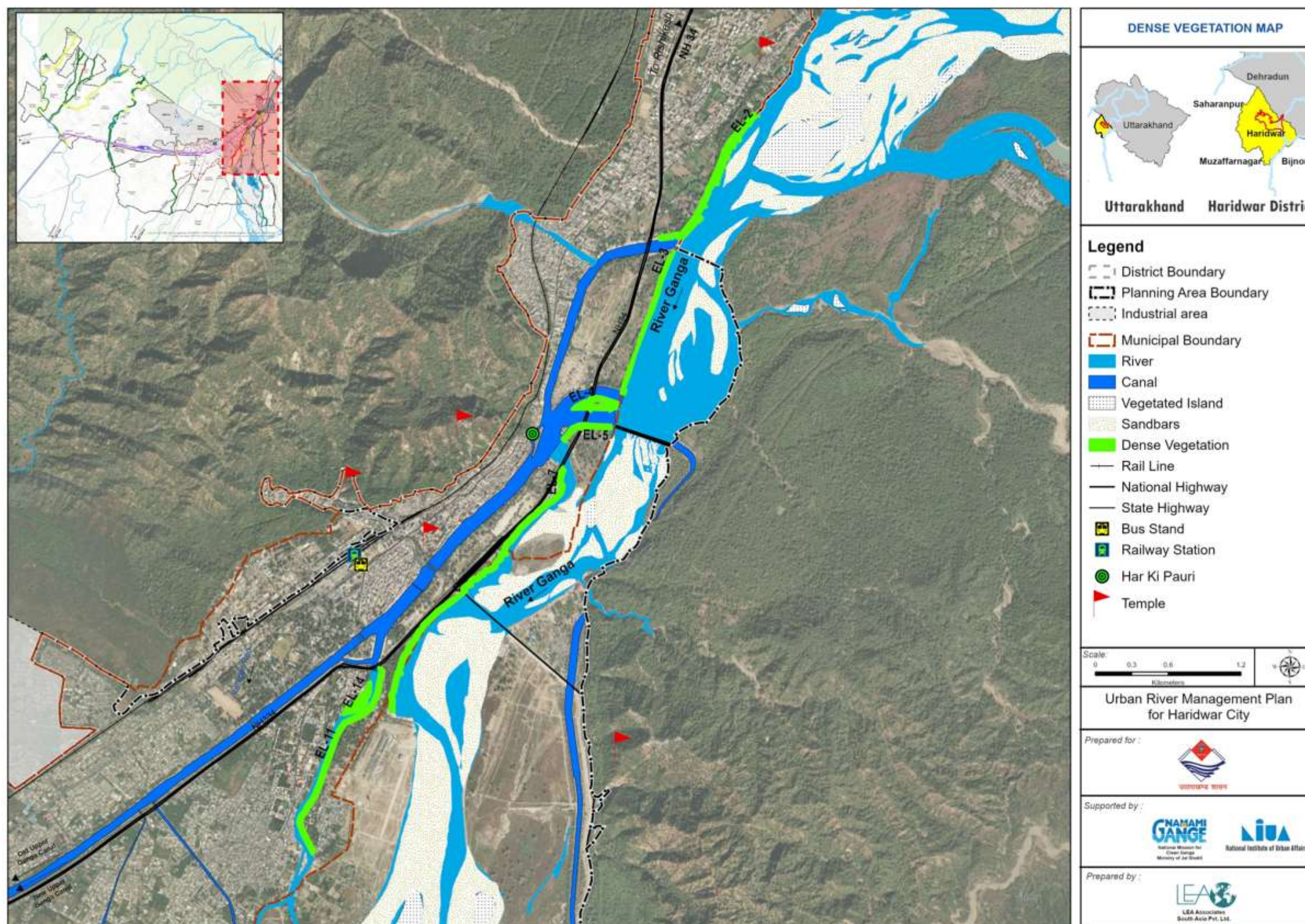
Implementation Framework:

Sl. No	Components	Unit Rate (in lakhs)	Quantity (in ha)	Total Cost (in lakhs)	Responsible & Supporting Agency	Duration (in Months)	Funding Sources
1	Zone 1 – Grass & hedge plantation (0–10 m)	20	15	300	Forest Dept and Irrigation dept	6	CAMPa and Namami Gange
2	Zone 2 – Shrubs & Small Trees (10–15 m)	40	12	480		6	
3	Zone 3 – Native Trees (15–30 m)	50	16.35	817.5		6	
4	Natural Trail	120	1.53	183.6		6	
4	Monitoring & Evaluation (@ 2% of total cost)	0.8	44.88	35.9		12	
5	Operation and Maintenance (5 year @ 10% of total cost)	4	44.88	179.5		60	
	Total			1996.5			

* Above costing is prepared by using DSR, Schedule of Rates (SOR) issued by each State Forest Department and by central norms under MoEFCC (Ministry of Environment, Forest and Climate Change). Uttarakhand specifically uses its Forest Department SOR and PWD SOR for DPR preparation, which prescribe per-hectare plantation costs, fencing, and maintenance norms.

7.3.2 Recommendation 4: Conservation and preservation of riparian buffer

Strict conservation measures are recommended for the ecologically intact stretches of the River Ganga, Upper Ganga Canal and associated streams in Haridwar, particularly where riparian vegetation remains relatively undisturbed in the downstream reaches. These riparian buffers serve as critical reference conditions or “benchmark sites” against which restoration outcomes in degraded areas can be evaluated.



Source: Draft Master Plan 2041; Survey of India (Administrative Boundaries); Open Street Map (Road Network), Consultant's Analysis

Map 7-6: Dense vegetation in Haridwar planning area

Collectively, these conservation zones must be safeguarded from unnecessary disturbance to ensure hydrological stability, biodiversity refuge and the integrity of Haridwar’s cultural landscape.

the key management actions proposed for the existing riparian buffer along the River Ganga, Upper Ganga Canal and the other streams is presented below. These actions will help prioritize conservation of healthy stretches, restoration of degraded banks and targeted interventions to maintain ecological stability and long-term river resilience.

Recommendation for existing riparian stretch conservation and preservation

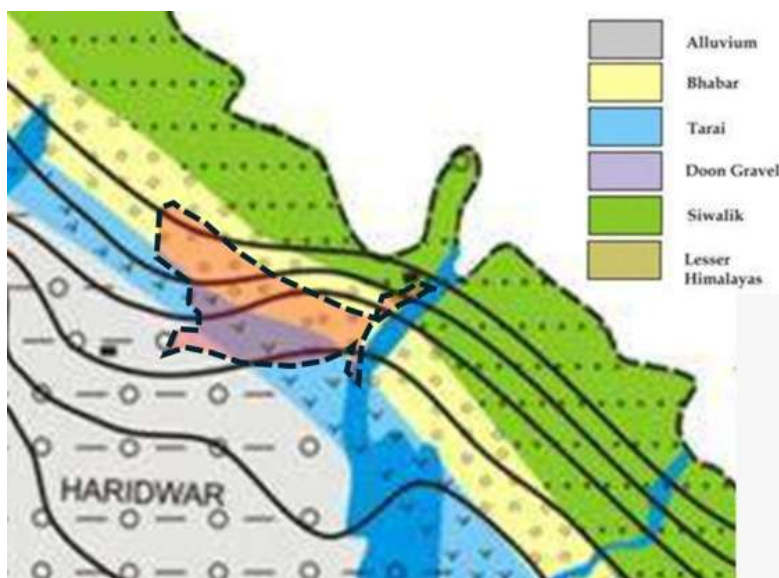
Well-developed, ecologically functional riparian vegetation that must be preserved in its current state.

The key recommended actions are given below:

- Integration of buffer width into flood plain zoning regulations.
- Prohibited Permanent construction mining, dumping and river bank encroachment.
- Gradual removal of invasive plants to avoid exposed bare soil
- Control grazing and fencing in sensitive stretches.
- GIS based demarcation and geo fencing of buffer stretches.
- Periodic drone and satellite monitoring.
- Formation of Community level protection committee.
- Penalty, restoration liability and compensatory plantation for violation.

7.4 OBJECTIVE 6: ENSURE ADEQUATE GOOD QUALITY RETURNS FLOW FROM THE CITY IN THE RIVER

The Bhabar belt of Haridwar Municipality acts as a crucial, highly porous transition zone at the foot of the Siwalik Himalayas. Characterized by thick boulder beds, coarse gravel, and un-consolidated sediments, this region possesses an exceptionally high natural water infiltration rate. However, rapid urban development and increasing concrete surfaces in Haridwar have disrupted this natural system. Heavy monsoons cause intense surface runoff leading to waterlogged public spaces and missed opportunities for deep aquifer recharge.



Map 7-7: Geological and Hydrogeological Zone map of Haridwar region

7.4.1 Recommendation 5: Transforming Public Parks within Bhabar belt of Haridwar into Sponge Parks

It is proposed to convert the existing municipal parks into Sponge Parks in a manner that it restores the Bhabar belt's natural hydrological capacity to absorb peak storm loads without affecting the parks' daily community use significantly. The parks will integrate sub-surface and natural nature-based features in a manner that seamlessly blends into the active park landscape as follows:

- **Dry Weather / Daily Use:** The open green fields function as active playgrounds (e.g., cricket pitches, football lawns), yoga zones, and community gathering spots. Covered seating, walkways, and play zones remain completely functional.
- **Wet Weather / Monsoon Use:** The same open spaces act as temporary, controlled retention basins. Runoff from surrounding urban roads is actively directed into the park, where engineered sub-surface layers quickly clean and filter the water down into the Bhabar aquifer, preventing waterlogging on adjacent streets.

The key technical interventions for conversion of public parks into sponge parks are as follows (refer --):

- **Sunken Multi-Use Grassy Areas (Retention Basins):** Grassy fields are excavated slightly (0.3 to 0.6 meters) to form a gentle basin. During heavy downpours, these temporarily hold excess water, protecting surrounding infrastructure.
- **Bioretention Cells & Rain Gardens:** Strategically placed along park boundaries and low points. These feature dedicated layers of native vegetation, organic mulch, and engineered soil matrices to naturally filter heavy metals and pollutants from road runoff before deep infiltration.

- **Infiltration Trenches & Bioswales:** Linear, gravel-filled channels cutting along or alongside park footpaths. They slow down rushing storm water and maximize contact with the highly permeable Bhabar gravel layers beneath.
- **Permeable Pathways:** Upgrading existing cracked asphalt or concrete walking tracks with permeable interlocking concrete pavers (PICP) or porous gravel-stabilized pathways, keeping walking routes puddle-free.
- **Step Pools & Sedimentation Stew Pools:** Small, terraced rock basins at major stormwater entry inlets to slow down rushing water and catch heavy silt and trash, keeping the main park areas clean and easy to maintain.



Picture 7-22: Reference Image of conversion of a Public Park into Sponge Park



BEFORE



AFTER

Picture 7-23: Conversion of Shravan Nath Park into a Sponge Park

7.5 OBJECTIVE 7: TO DEVELOP ECO-FRIENDLY RIVERFRONT PROJECTS

The water bodies in Haridwar comprising the engineered Upper Ganga Canal and the natural main river channel (Neel Dhara) are under-leveraged as economic engines of the city. The focus has been solely on managing pilgrim footfall rather than capturing the economic value of the waterfront. Hence, the proposed strategy is to transform Haridwar from a 3-hour transit stop into a multi-day destination by shifting focus from purely religious tourism to experiential, ecological and leisure tourism.

It is observed that riverfront assets such as ghat infrastructure on either bank of Ganga River such as the Aastha Path and Chandi Ghat are sparsely visited during off peak season since these are located away from the city.



Picture 7-24: Aastha path on western bank of Ganga River



Picture 7-25: Chandi ghat on eastern bank of Ganga River

Further south, ghats along the Mayapur Escape channel such as Bairagi ghat, Lodhi ghat, Sati ghat as well as the adjacent old city of Kankhal with its numerous temples, ashrams and heritage buildings also holds good tourism potential (refer **Picture 7-27**).



Picture 7-26: Bairagi camp ghat



Picture 7-27: Shri Yantra Mandir near Bairagi camp ghat

The Kankhal heritage walk is emerging as a highly valued attraction within Haridwar's tourism landscape. It is increasingly popular with boutique tour operators offering guided walking trails and eco-rickshaw circuits that focus on "the everyday Haridwar" and its architectural history. It is popular with history enthusiasts, culture-focused travellers and pilgrims seeking a quieter, more authentic spiritual experience.

The guided walking or e-rickshaw tours in Kankhal focus on the Daksheshwara Mahadev Temple, Sati Kund, Anandamoyi Ma Ashram and the area's traditional havelis and historic akhadas (refer **Picture 7-29**).



Picture 7-28: Daksh Mahadev Temple, Kankhal

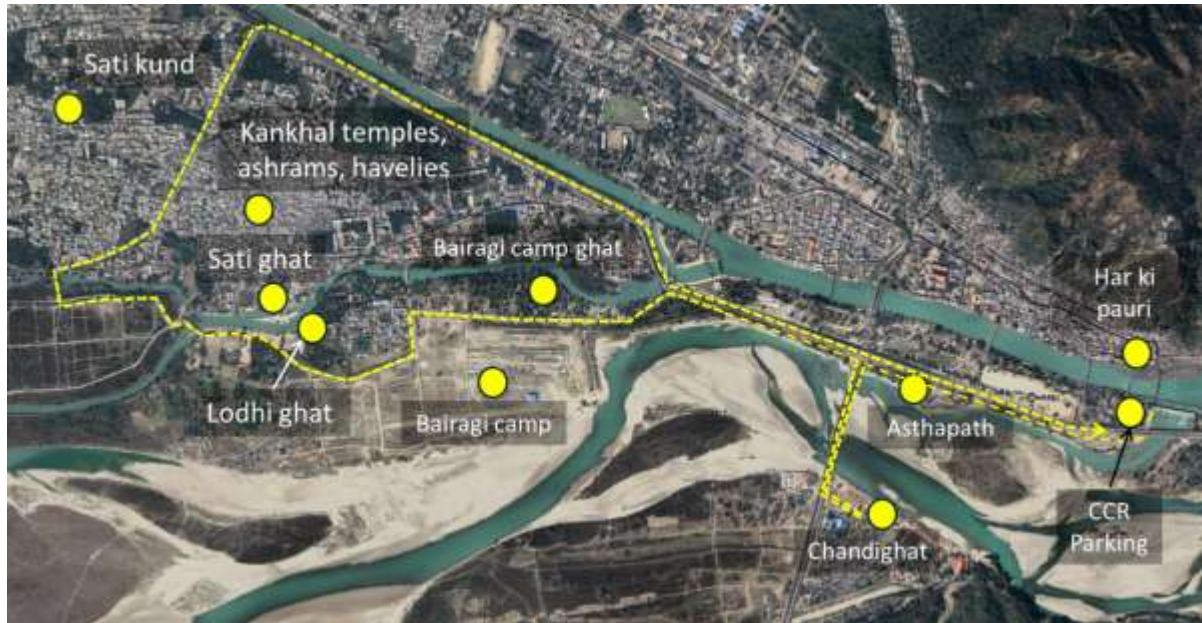


Picture 7-29: Haveli, Kankhal

7.5.1 Recommendation 6: Proposed Eco-Heritage Circuit

To connect the river front assets along the Ganga River an Eco-Heritage Circuit is proposed wherein a public transport corridor along less congested riverfront roads takes the visitor through ecological floodplains of Ganga River and the historic and religious fabric of Kankhal.

Since, most visitors visit Har-Ki-Pauri first, the start point of the tour is proposed from the parking area adjacent to the Control and Command Centre (CCR). The route passes along the banks of Ganga River parallel to the Aastha Path and links to Chandi Ghat across the river enroute to the Bairagi Camp area. After the Bairagi ghats on Mayapur Escape Channel the route connects to the Lodhi ghat located on the opposite bank of Sati ghat. Lodhi ghat is proposed as the assembly point of Kankhal Heritage Walk. Tourists after completion of the Kankhal Heritage walk return to Lodhi Ghat and take public transport back to Har-Ki-Pauri along the NH 334 (refer **Picture 7-30**).



Picture 7-30: Proposed Eco-Heritage Circuit

Three locations have been identified within the Eco-Heritage Circuit as key tourist attraction points. Recommendations and interventions for the following locations are presented below in section 7.5.2, section 7.5.3 and section 7.5.4.

7.5.2 Intervention 13: Development of Lodhi ghat

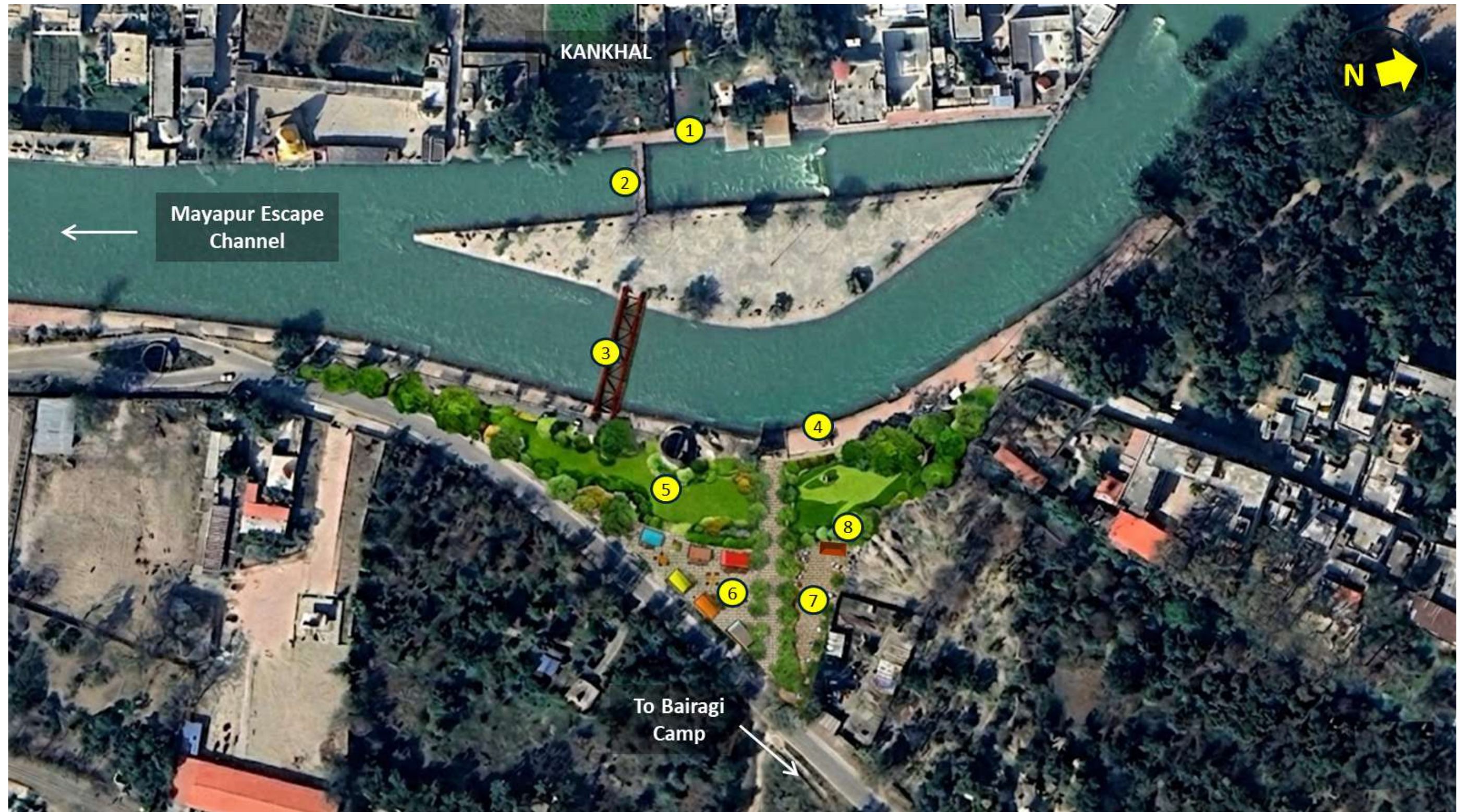
The Lodhi Ghat is proposed as the assembly point for the Kankhal Heritage Walk. Visitors after taking a brief rest at this location shall proceed for Kankhal Heritage Walk through the Sati Ghat. To enable tourists to cross over from Lodhi Ghat to Sati Ghat, an additional steel bridge across the Mayapur Escape Channel is proposed (Refer Picture 7-31).



Picture 7-31: Connecting Lodhi ghat to Sati ghat with new steel bridge across Mayapur Escape Channel

Lodhi ghat is conceptualised as a temporary halt point on the Eco-Heritage Circuit and hence the following infrastructure upgradation measures are proposed here (refer **Figure 7-5**).

1. Parking for small buses, cars, two wheelers and bicycles
2. Steel bridge for crossing over to Sati Ghat
3. Food court and Restrooms
4. Landscaped areas with gazebos for relaxation



- | | |
|--|---------------------------------------|
| 1. Existing Sati Ghat | 5. Proposed landscaping of Lodhi Ghat |
| 2. Existing steel bridge to island on Mayapur Escape channel | 6. Proposed Food Court |
| 3. Proposed steel bridge from island to Lodhi Ghat | 7. Proposed Parking |
| 4. Existing Lodhi Ghat | 8. Proposed Toilet Block |

Figure 7-5: Proposed Infrastructure at Mayapur Escape channel

Implementation framework:

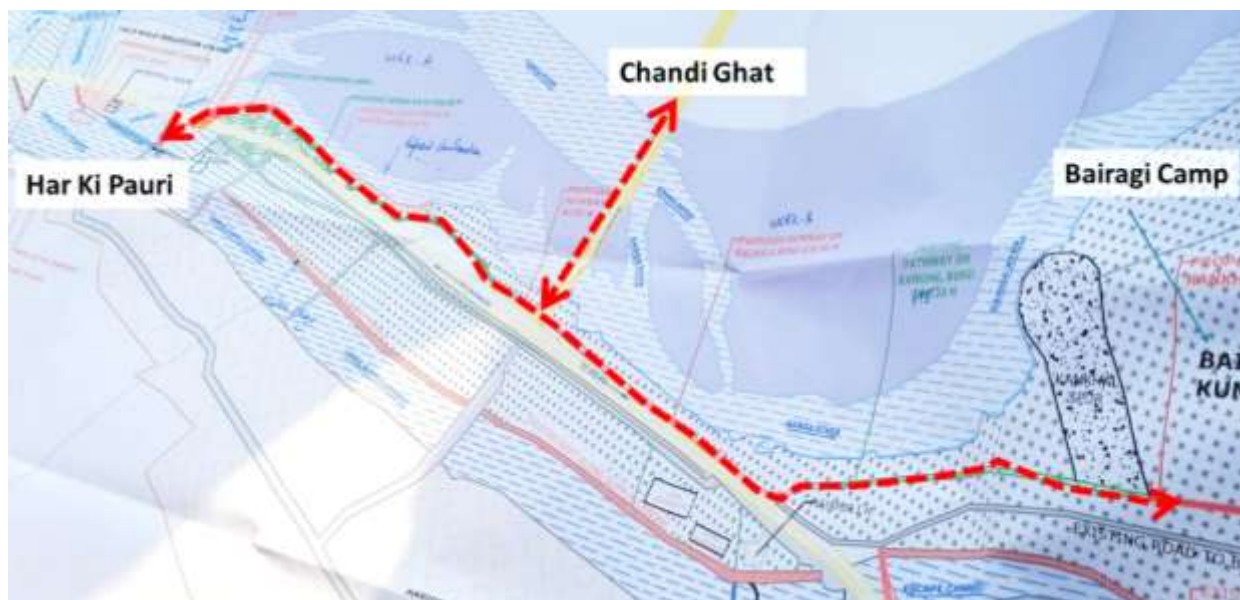
Component wise cost is presented below. The proposed intervention requires approvals from Irrigation Departments of UP and Uttarakhand.

Sl. No.	Component	Unit Rate (₹/sqm)	Area (sqm)	Total Cost (INR lakhs)	Responsible and Supporting Agency	Duration (in years)	Funding Sources
1	Parking with permeable pavers	1,200	1,400	16.80	State Tourism Board, NMCG, PWD (for steel bridge)	< 1 year	MOT Scheme, NMCG, CSR
2	Food court with kiosks and permeable pavers	3,500	1,900	66.50			
3	Soft landscaping with gazebos	2,500	5,200	130			
4	Steel pedestrian bridge	30,000	110	33			
	Total			246.3			

After construction and completion of defect liability period of the private contractor, the HNN may take over the asset for daily upkeep, sanitation and basic maintenance of the landscaped areas or specific volunteer trusts and Ganga management committees. HNN may outsource the Food Court and Parking Operations to private bidders.

7.5.3 Intervention 14: Re-development of Aastha path

The city authority is planning a continuous pedestrian link from Har-Ki-Pauri to Bairagi camp by extending the existing Aastha Path along the western bank of Ganga River, to facilitate movement of devotees during Kavar yatra and Kumbh mela (refer **Picture 7-32**).



Picture 7-32: Proposed pedestrian path linking Har-Ki-Pauri to Bairagi Camp

Currently, located adjacent to the DDU parking, the Chandi Ghat consists of steps leading to Ganga River, Pathways, Rubble Masonry Embankment, Toilets, Benches and landscape areas.



Picture 7-33: Existing components at Aastha Path



Picture 7-34: View showing existing steps, walkways and embankment at Aastha Path

In view of above, considering Aastha Path acting as a major interacting as well as a crowd evacuation place, especially during major religious events such as Kumbh and Kanwar, the place also needs to be redeveloped to attract the tourists and pilgrims to further appreciate the river and sensitive them towards the river. The plan below represents the concept of Redevelopment of Aastha Path.



Picture 7-35: Conceptual Proposed Plan of Redevelopment of Aastha Path

The following interventions may be considered in the redevelopment project:

- **Yoga Zone with Stepped Vegetative Gabion Walls and Tensile Canopies for shaded area-** A dedicated yoga zone is proposed to promote wellness, recreation, and a stronger connection with the natural environment and the Ganga River. Designed as a calm and open space, the zone will provide opportunities for yoga, meditation, and other wellness activities for people of all age groups.



Picture 7-36: Yoga Zone proposed at Aastha Path with Vegetative Gabion Walls and Shaded Canopies.

- **Open air Theatre-** Open air Theatre (Cultural activities for all age group people) of approximately 1000 seating capacity. Open air Theatre can be used as to perform various culutural activities around the year, as well as conduct events such as open art exhibition, etc. The steps of Open-Air Theatre will lead to the river inviting people to feel the river water non-monsoon season as well as the course of river bed during the dry season.

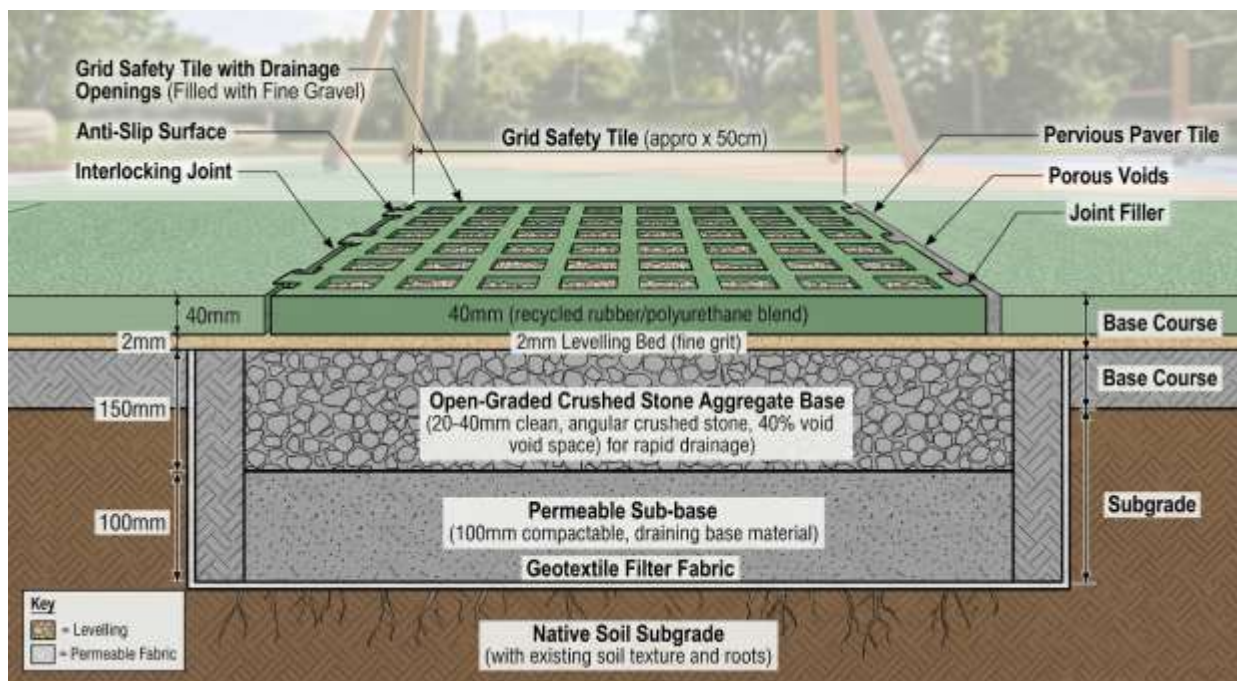


Picture 7-37: Open air Theatre proposed at Aastha Path with Red Sandstone Flooring for Socio- Cultural activities

- Craft Bazaar (All Day activity for all age group people)- Craft bazaar is proposed as a vibrant public space to promote local art, traditional crafts and small-scale livelihoods. The space will provide opportunities for artisans and local vendors to showcase and sell handmade products while creating an engaging experience for visitors. The craft bazaar will also contribute to the cultural identity of the riverfront and support regular community activities, seasonal markets and cultural events throughout the year.
- The flooring of Craft Bazaar will be 40 mm thick HDPE grid safety tile over permeable base.



Picture 7-38: View of proposed Craft Bazaar at Aastha Path



Picture 7-39: Conceptual Section of proposed 40 mm thick interlocking HDPE grid safety tile over permeable base.

- Children Play Area (Children Activity Zone)- A dedicated children's play area with sand flooring is proposed to create a safe, comfortable, and engaging recreational space for children. The sand surface provides a natural play environment while improving safety and comfort. The play area will encourage outdoor activities, social interaction, and active play, while adding a family-friendly recreational space along the riverfront.



Picture 7-40: View of Children's Play Area proposed at Aastha Path along with Walking Promenade and kiosks for vendors

- Other proposed components include the walking promenade, architectural lighting, kiosks for vendors and toilets & drinking facilities.

Implementation framework:

Sl. No	Components	Unit	Quantity	Unit rate	Total Cost (INR lakhs)	Responsible & Supporting Agency	Duration (in years)	Funding Sources
Play Area						HRDA	2	MOT Scheme, NMCG, CSR
1	Children’s play area with equipment (swing, slide, multi play equipment, challenger play equipment etc.)	No.	1	50,000,000	500.00			
2	200mm thk. Sand Flooring	Cum	850	6,000	51.00			
3	40mm thk. Grid safety Tile Flooring (open crushed stone aggregate base, Permeable Sub-base, geotextile filter fabric)	Sqm	2750	2,500	68.75			
Vending Zone								
4	Kiosks	Sqm	2000	6,000	120.00			
5	40mm thk. Sand stone flooring with sub base	Sqm	2000	5,000	100.00			
Art and Craft Zone								
6	Kiosks	Sqm	4000	6,000	240.00			
7	40mm thk. Grid safety Tile Flooring (open crushed stone aggregate base, Permeable Sub-base, geotextile filter fabric)	Sqm	4000	2,500	100.00			
8	40mm thk. Sand stone flooring with sub base	Sqm	4000	5,000	200.00			
Open Air Theatre								
9	Construction of stage and Amphi Wall along Red sand stone flooring, sub base and levelling as required	Sqm	12000	15,000	1,800.00			
Yoga Zone								
10	Tensile structures	Sqm	5000	11,741	587.05			
11	40mm thk. Grid safety Tile Flooring (open crushed stone aggregate base, Permeable Sub-base, geotextile filter fabric)	Sqm	5000	2,500	125.00			
12	40mm thk. Sand stone flooring with sub base	Sqm	5000	5,000	250.00			
13	Grass	Sqm	5000	400	20.00			
Other components								
14	Dismantling of all existing structures	Sqm	49000	4,000	1,960.00			
15	Architectural Lighting	Sqm	49000	9,000	4,410.00			
16	Landscape furniture (Benckhes, signage, dustbin, railing etc.)	Sqm	49000	1,200	588.00			

Sl. No	Components	Unit	Quantity	Unit rate	Total Cost (INR lakhs)	Responsible & Supporting Agency	Duration (in years)	Funding Sources
17	Bank Protection with Gabion	Cum	6600	4,500	297.00			
18	Toilet block (2 blocks of 150 sq. mt. each)	Sqm	300	35,000	105.00			
	Total (A)				11,521.80			
	Consultancy cost (@ 2% of Total)				230.44			
	Block cost (B)				11,752.24			
	Contingency (@ 15% of Total) (C)				1,762.84			
	Grand Total (B+C)				13,515.07			

7.5.4 Recommendation 7: Recommendations for Chandi ghat

The Chandi ghat was designed primarily to handle the peak surge of the Kumbh Mela. To convert it into a multi-functional urban destination the following activities may be introduced here:

1. Parallel evening aarti
2. Yoga and retreat pavallions
3. Seasonal river festivals

The first two activities have been elaborated in Section 7.6, as they are primarily intended for revenue generation purposes

- **Seasonal River Festivals:** The high carrying capacity of the ghat makes it the ideal venue for medium-to-large-scale civic events. Hosting zero-waste, ecologically themed river festivals, classical dance recitals or local food melas can utilize the large ghat space without overwhelming the city's central infrastructure.

7.6 OBJECTIVE 8: TO LEVERAGE THE ECONOMIC POTENTIAL OF RIVER

River Ganga stands as a powerful economic engine, shaping both cultural identity and economic growth of Haridwar while offering extensive opportunities to expand the city’s tourism, wellness and livelihood sectors. Beyond its spiritual significance, the river’s tranquil stretches particularly at Chandi Ghat and Lohi Ghat, providing ideal setting for yoga retreats, Ayurveda kiosks, food plazas and recreational spaces that can be developed into sustainable economic ecosystems.

7.6.1 Recommendation 8: Yoga and Retreat Pavilions at Chandi Ghat

Currently, Chandi Ghat remains an open and unstructured area, lacking defined infrastructure such as shaded pavilions, seating arrangements and designated space for wellness activities. The absence of infrastructure has led to underutilization of its natural tranquility, which distinguishes it from the dense and ritual-centric Har-Ki-Pauri. These gaps highlight the need for structured interventions to transform Chandi Ghat into a vibrant wellness and livelihood hub.

Chandi Ghat can offer the serenity required for wellness tourism. By partnering with local ashrams; sunrise yoga, meditation sessions and holistic wellness pop-ups can be hosted under shaded pavilions, establishing morning economy. The components and its details are as under:

- ▶ **Yoga & Retreat Pavilions:** Dedicated pavilions will provide shaded, comfortable spaces for sunrise yoga, meditation and satsang sessions. Revenue will flow from participation fees, while resorts and guesthouses can bundle these activities into wellness packages, ensuring steady tourist spending. Occasional retreats or workshops can be priced at premium rates, creating higher-value income streams and positioning Chandi Ghat as a wellness destination.
- ▶ **Ayurveda & Wellness Kiosks:** At least 10-15 kiosks will be setup to offer Ayurveda consultations, sell herbal teas, oils and naturopathy remedies. These micro-enterprises will generate daily sales and support local practitioners. Seasonal demand during festivals and tourist peaks boosts turnover. Operated by self-help groups (SHGs) and local healers, these kiosks will promote traditional knowledge while ensuring inclusive livelihood opportunities for the local community.
- ▶ **Food Stalls:** around 15-20 stalls will sell herbal drinks, sattvic snacks and eco-souvenirs. With high footfall during mornings and evenings, these stalls will create consistent cash flow and expand the local food economy. Vendors will source ingredients locally, supporting agriculture and handicrafts while offering tourists authentic, healthy refreshments. This will provide livelihood opportunities for the local community.

The Livelihood and governance model for this recommendation is as under:

- Developing **yoga pavilions** and **kiosks/stalls** at Chandi Ghat can be structured as a sustainable wellness economy, generating direct income from participation fees, retreats, Ayurveda consultations, herbal teas, naturopathy remedies and healthy refreshments, while indirect income arises from extended tourist stays, resort tie-ups and demand for local products.
- **SHGs** can operate kiosks and stalls, ensuring women and marginalized groups benefit through sales, profit-sharing and skill development.
- The **local community**, especially youth and practitioners, can be engaged as instructors, facilitators and guides, creating employment and reinforcing cultural authenticity. The
- **HNN** will provide infrastructure, regulates vending, manages branding and IEC campaigns and collects license fees or rentals, adding civic revenue. Together, these

elements establish a **morning and evening wellness economy** that strengthens livelihoods, boosts local businesses, supports agriculture and handicrafts and contributes to Haridwar’s municipal finances while preserving cultural and ecological integrity.

7.6.2 Recommendation 9: Riverfront Tourism at Lodhi ghat

Lohi Ghat remains underdeveloped and lacks structured infrastructure necessary to support tourism-oriented activities. Despite its strategic location along the riverfront, the ghat fails to attract local community and tourists due to the absence of organized food plazas, eco-friendly vending systems and cultural amenities. To unlock this opportunity and transform Lohi Ghat into a vibrant tourism hub, targeted interventions are required that build upon its riverfront setting and cultural identity. The proposed components and their details are outlined as follows:

- ▶ **Riverside Food Plazas (units):** The development of 8- 10 riverside food plazas to create a culinary hub showcasing Uttarakhandi vegetarian cuisine such as mandua roti, bhatt ki dal and singodi. The vendors will generate income through daily sales, while rentals and license fees will be collected by the HNN. Premium pricing can be applied for curated “heritage meals” bundled with cultural storytelling. These kiosks can charge slightly higher rates for the “experience” component, generating consistent tourist spending to strengthen the local food economy.
- ▶ **Eco-Packaging & Utensil System:** An eco-friendly packaging and utensil system will be introduced to minimize waste and promote sustainability. Revenue will flow through partnerships with eco brands, while vendors can include a small surcharge for biodegradable packaging to sustain the system financially. This intervention reduces waste management costs, aligns with ecological values and enhances the branding of Lodhi Ghat as a responsible tourism destination.

The kiosks and stalls to be operated by SHGs. This would ensure women and marginalized groups benefit through profit-sharing and skill development. The local community, especially youth, can be engaged as cooks, servers, storytellers and guides, creating employment and reinforcing cultural authenticity. The HNN will provide infrastructure, sanitation facilities and regulatory oversight. It will also manage branding and awareness campaigns while collecting rentals and license fees, thereby generating civic revenue.

7.6.3 Recommendation 10: Recreational activities at riverfront and canal front on ghats

The riverfront and canal front ghats in Haridwar have limited infrastructure to support recreational and cultural activities. Despite their strategic location and potential to attract both pilgrims and tourists, the absence of organized performance spaces, handicraft kiosks and viewing platforms has led to underutilization of these areas. The proposed components are as follows:

- ▶ **Cultural Performance Spaces:** Dedicated performance spaces will be developed to host devotional music, classical dance and folk storytelling. Revenue will be generated through ticketed entry, voluntary donations and sponsorships from cultural organizations or tourism boards. Seasonal festivals and curated performances can be priced at premium rates, attracting both pilgrims and tourists.
- ▶ **Handicraft & Ritual Kit Kiosks:** Around 8–10 kiosks will be operated by SHGs and local artisans. These kiosks generate direct income through the sale of sustainable handicrafts, ritual kits and herbal products. Profit-sharing model will ensure women and marginalized groups benefit economically. Storytelling panels and QR codes can be integrated to add cultural value, encouraging higher tourist spending and enhancing visitor engagement.

- ▶ **Elevated Viewing Platforms:** Three to four elevated viewing platforms will be constructed to provide panoramic views of the riverfront and canal front. These platforms can charge nominal entry fees or be bundled into guided tour packages. Professional photography services and souvenir sales linked to the viewing experience will create additional revenue streams.

Self-Help Groups (SHGs) act as grassroots enterprises by operating kiosks and stalls, generating daily income through handicraft sales, ritual kits and food stalls. Profit-sharing models will empower women and marginalized groups, while youth can be engaged as performers, storytellers, guides and service providers. This ensures inclusive participation and strengthens cultural authenticity. The HNN will provide enabling infrastructure such as pavilions, kiosks, sanitation facilities, performance spaces and viewing platforms. It will regulate vending, licensing and rentals, while managing branding and awareness campaigns. In return, the Corporation will collect rentals and license fees, generating civic revenue and ensuring long-term sustainability.

7.7 OBJECTIVE 9: INTERVENTION TO INCULCATE RIVER-SENSITIVE BEHAVIOR AMONG CITIZENS

The interventions under Objective 9 are designed to embed ecological awareness and cultural pride into everyday practices, ensuring citizens adopt river-sensitive behavior. From awareness campaigns and eco-clubs to storytelling corners, smart signages and annual river festivals, these measures collectively strengthen emotional, cultural and behavioral ties with River Ganga. The detailed interventions are listed in the sections below.



Figure 7-6: River-sensitive practices and cultural awareness

7.7.1 Recommendation 11: Installation of interpretive signages and boards

The Haridwar Nagar Nigam is actively conducting several IEC (Information, Education and Communication) campaigns; however, there is a critical gap in interpretive infrastructure. While the city manages millions of pilgrims, it lacks a cohesive visual and digital narrative that connects visitors to the ecological sanctity and cultural heritage of River Ganga and the Upper Ganga Canal.

The absence of interpretive signage at major "snan" (bathing) zones limits environmental awareness, while the lack of QR-linked storytelling prevents a deeper behavioral shift from "ritualistic use" to "ecological guardianship". The baseline assessment highlights the following key concerns:

1. Absence of river-centric signage at high-footfall landmarks such as Har-Ki-Pauri, Chandi Ghat, etc.
2. Current IEC activities are often restricted to peak festival periods
3. Inadequate integration of voices of local priests and ashrams
4. Absence of digital storytelling platforms reduces long-term citizen and tourist engagement.

Proposed Interventions:

1. **Installation of signages and digital Boards:** A total of 106 multilingual interpretive awareness boards shall be installed i.e., in 104 ghats and one each in bus stand and railway station. Each board will feature culturally sensitive messaging and intuitive visuals discouraging waste disposal and ritual offerings into the river.

Table 7-4: Total number of boards to be installed in Haridwar

Location	Ghat (104)	Bus Stand	Railway Station	Total
Number of Boards	104	1	1	106

Source: Consultant Analysis

- Visual Storytelling:** These boards will visually showcase a storytelling to highlight Haridwar's river heritage, local biodiversity and sacred folklore. The QR codes in these signages and boards shall be linked to 'Swachh Ganga' digital content, featuring conservation pledges, eco-tips and curated stories from the city's spiritual and ecological legacy.
- Eco-Dakshina:** "Green commitments" such as eliminating plastic and soap use shall be framed as acts of spiritual merit during the offering process, reinforcing cultural resonance with ecological responsibility.
- Tourist Integration:** Resorts, hotels and ashrams shall display QR codes in lobbies, encouraging visitors to engage with river stories and conservation pledges.
- Targeted Messaging:** Customized signages shall be developed for commuters and market users with practical, context-specific call of action.
- Crowdsourced Content:** A digital portal to be developed which will allow pilgrims and local residents to upload "Clean Ganga" pledges or share local folklore, fostering community-driven engagement.
- Real-time Data:** Digital boards will display current water quality indicators (i.e., BOD/DO levels), building citizen trust through transparency and awareness

Frequency: The signages and boards to be installed as a one-time intervention with quarterly maintenance and review to ensure their effectiveness and condition.



Picture 7-41: A concept design of Behavioural Science Design and River ecology Awareness board

Implementation Framework:

Responsible agencies	Timeline
Responsible agencies: HMC, Religious Boards; Supporting Agencies: SHGs, Temple Committees	Short term < 1 year

7.7.2 Recommendation 12: Eco-Ritual Starter Kits at Ghats, temples ashrams & Tourist Resorts

Religious ritual practices at temples and ghats continue to generate significant waste. Currently, there is no structured mechanism to encourage eco-sensitive rituals or to empower self-help groups (SHGs) and temple committees in distributing sustainable kits. The baseline assessment highlights the following key concerns:

1. Ritual waste at Haridwar’s ghats and temples remains a major contributor to plastic accumulation along the riverbanks.
2. Self-Help Groups (SHGs) are underutilized, lacking structured training and defined roles in preparing and distributing eco-friendly ritual kits.
3. Priests and temple committees are not mobilized to advocate sustainable practices.
4. Tourist resorts and pilgrimage facilities are not effectively integrated into eco-ritual outreach strategies.

Proposed Intervention:

1. **Kit Preparation:** SHGs shall be trained to prepare biodegradable kits comprising of seed idols, Organic hawan cups and incense sticks in compostable containers.
2. **Distribution Channels:** Kits sold at temple kiosks, SHG stalls, cremation area, mela grounds, resorts, ghats and marketplaces.
3. **Priest Advocacy:** Temple committees and priests promote eco-kits during rituals, encouraging devotees and tourists to adopt sustainable practices.
4. **Tourist Outreach:** Resorts shall include kits in welcome packages, linking religious practice with eco-tourism.
5. **IEC Messaging:** Slogans such as “Offer devotion, not pollution” shall be displayed at kiosks, temples, resort lobbies and stalls.
6. **Monitoring:** Municipal staff and Waste Warriors shall be responsible to track kit usage during festivals to assess reduction in plastic waste, with feedback loops on demand and adoption.

Implementation Framework:

Responsible agencies	Timeline
Responsible agencies: HMC, Religious Boards; Supporting Agencies: SHGs, Temple Committees, katha Vachak	Medium term 1-3 year

7.7.3 Recommendation 13: Designated Cloth disposal Zones in Kunds “Arpan Kunds” on ghats

Arpan kund will serve as safe, designated cloth disposal points at key ghats in Haridwar, particularly Har-ki-Pauri and Chandi Ghat. Supported by infrastructure, recycling partnerships, priest advocacy, IEC messaging and monitoring, these Kund will provide a culturally sensitive solutions to manage ritual waste.

Cloth disposal is especially vital in Haridwar as large volumes of clothes are left on ghats after bathing in river Ganga daily during aartis, pilgrimages and festivals. Without proper management, these materials often enter the Ganga, contributing to pollution and obstructing its flow. By channelling cloth waste into Arpan Kunds, the intervention will reduce contamination, empower SHGs through

collection and recycling and reinforces eco-sensitive practices that safeguard both the river’s sanctity and the city’s heritage.

Proposed Interventions

1. **Dedicated Arpan Kunds:** Construct or retrofit urn-shaped kunds (Kalash) at 104 Ghat for cloth disposal with proper lining to prevent seepage into the river.
2. **Segregation & Collection System:** Provide separate urn with compartments for cloth offerings and biodegradable ritual waste. Daily collection by municipal staff or contracted NGOs will prevent overflow.
3. **Recycling & Repurposing Pathways:** Partner with SHGs and textile recyclers to convert collected cloth into reusable products such as bags, mats and rags. Composting shall be explored for natural fibers and ensuring safe disposal of synthetic materials.
4. **Awareness & IEC Messaging:** Install clear signage at ghat entry points stating, ‘Dispose ritual cloth in Arpan Kunds – Protect Holy Ganga’ and engage priests and temple committees to guide devotees during rituals.
5. **Monitoring & Reporting:** Municipal staff and NGOs shall daily monitor cloth disposal volumes during peak festivals and periodically during other days. A bi-monthly reporting should be done to assess reductions in waste entering the river.
6. **Tourist & Resort Outreach:** Resorts and wellness centres should include information on Arpan Kunds in visitor guides to encourage tourists to participate in eco-sensitive rituals by using designated disposal zones.



Picture 7-42: Arpan Kunds at Ghat

Implementation Framework:

Responsible agencies	Timeline
Responsible agencies: HMC, Religious Boards; Supporting Agencies: SHGs, Temple Committees, katha Vachak	Medium term 2-3 year

7.8 OBJECTIVE 10: INTERVENTION TO ENGAGE CITIZENS IN RIVER MANAGEMENT ACTIVITIES

Objective 10 focuses on active citizen participation and structured stewardship of the rivers in Haridwar. Through River Sabha Committees, creative competitions, street plays and clean-up drives, these interventions institutionalize community involvement, empower residents and youth and strengthen accountability in river governance. Together, they transform citizens into custodians of river health and resilience. The detailed interventions are outlined in the following sections.



Picture 7-43: Citizen participation in river management

7.8.1 Recommendation 14: Establishment of River Sabha Committees at the city level to promote participatory river governance

Community participation in river governance in Haridwar is currently absent, with no institutional platforms for collective decision-making. While the city has ongoing commitments to urban cleanliness through municipal drives and temple waste collection, these efforts remain fragmented. The present environmental strategy underscores the importance of eco-sensitive rituals and citizen engagement; however, it also reveals the urgent need for structured mechanisms that empower SHGs, temple committee and local communities. Addressing this gap is critical, as moving from basic waste management to a holistic 'ridge-to-river' approach will actively safeguard the Ganga and its associated waterbodies in Haridwar. The baseline assessment highlights the following concerns:

1. Absence of a formalized citizen-led body to coordinate river stewardship and provide consistent environmental monitoring.
2. Inconsistent Youth engagement in river-related activities.

Proposed Intervention:

1. **Establishment of Multi-Tier Governance:** Establish River Sabha Committees at both city and ward levels, ensuring each tier has clearly defined roles, responsibilities and operational mandates.
2. **Inclusive Stakeholder Representation:** Ensure a diverse composition within each committee by integrating representatives from Self-Help Groups (SHGs), youth leaders, Resident Welfare Associations (RWAs) and ward officials.
3. **Enhance Digital Accountability:** Formalize transparency by integrating committee reporting and monitoring data into the Swachh Bharat Mission (SBM) and Urban River Management Plan (URMP) dashboards.
4. **Capacity Building for "River Ganga Guardians":** Train a dedicated volunteer force of "River Ganga Guardians" to spearhead community awareness initiatives, monitor environmental violations and report illegal dumping.
5. **Structured Youth Engagement:** Mobilize NSS and NCC units to conduct monthly riverbank clean-up campaigns, providing a consistent framework for youth-led environmental action.

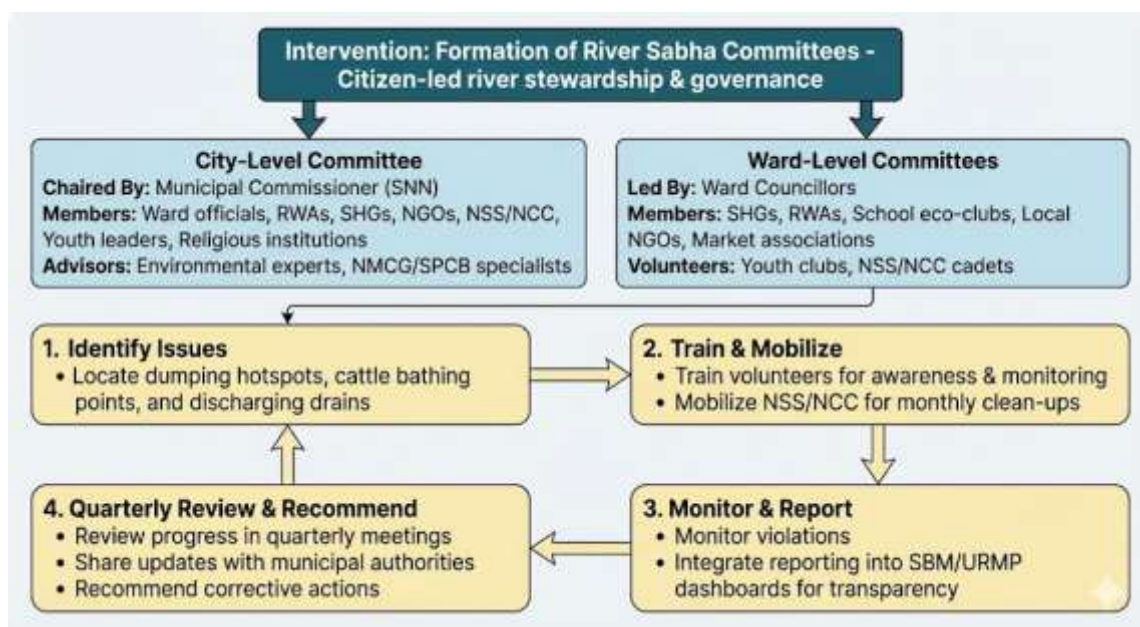


Figure 7-7: Composition of Committee and working model

Implementation Framework:

Responsible agencies	Timeline
Responsible agencies: HMC	Medium term 1-2 year

7.8.2 Recommendation 15: Riverbank Adoption by Schools, RWAs & Resorts

Clean-up drives are sporadic and lack continuity due to the absence of institutional ownership. Schools, RWAs and resorts are not assigned responsibility for specific river stretches, leading to inconsistent maintenance and visibility. The baseline assessment highlights the following key concerns:

1. No formal adoption model exists for riverbank stewardship.
2. Citizen and tourist contributions fade post-campaign due to lack of continuity.

3. Resorts are not integrated into long-term clean-up frameworks.
4. Absence of signage and recognition reduces public accountability.

Proposed Intervention:

1. **Adoption Model:** Schools, RWAs and resorts adopt 2 – 3 km stretches of River Ganga riverbank and the Upper Ganga Canal
2. **Monthly Clean-Ups:** Organized by students, residents and resort staff, supported by municipal staff.
3. **Signage:** Boards installed stating “Adopted by [School/RWA/Resort].”
4. **Recognition:** Annual “Best Adopted Stretch” award during River Day.

Implementation Framework:

Responsible agencies	Timeline
Responsible agencies: HMC Supporting Agencies: Schools, Colleges, RWAs, NGOs, SHGs	Medium term 1-3 year

7.8.3 Recommendation 16: Street Plays in Market, Temple & Tourist Places

IEC campaigns rely on static mediums that fail to culturally resonate with diverse audiences. There is no structured program to train youth and SHGs in creative formats like street theatre, limiting emotional impact and reach. The baseline assessment highlights the following key concerns:

1. IEC messaging lacks cultural depth and creative delivery formats.
2. Youth clubs and SHGs are not trained in performance-based outreach.
3. Tourist zones and markets are underutilized for thematic storytelling.
4. No recognition framework exists for impactful performers or groups.

Proposed Interventions:

1. Training: SHGs and youth clubs trained to perform monthly Nukkad Nataks.
2. Performance Venues: Bada bazaar, mela days and resort courtyards during peak season.
3. Themes: Scripts dramatize plastic pollution, segregation, eco-spiritual values.
4. Rotation: Plays rotated across wards and tourist hubs for wider reach.
5. Recognition: Annual awards for impactful performers during River Day

Implementation Framework:

Responsible agencies	Timeline
Responsible agencies: HMC, theatre groups Supporting Agencies: Schools, Colleges, RWAs, NGOs, SHGs	Medium term 1-4 year

7.8.4 Recommendation 17: Organizing community-led solid waste clean-up campaigns along nallahs and riverbanks

Refer section 4.4 on solid waste management. It was observed that large amounts of waste including plastics, construction debris and organic material are dumped directly into the nallahs. No clean-up drives are being undertaken, resulting in limited opportunity for community involvement. The baseline assessment highlights the following key concerns:

1. Weak integration with municipal reporting and monitoring systems
2. Limited acknowledgment and visibility of citizen-led contributions

Proposed Intervention:

1. Conduct monthly clean-up drives led by River Sabha Committees, SHG and youth clubs.
2. Deploy ward-level monitoring teams to prevent dumping on floodplains and riverbanks.
3. Establish designated waste collection points near dense settlements to reduce direct dumping.
4. Mandate contractors to dispose of debris at authorized sites with penalties for violations.
5. Engage Swachh Sarthi Clubs to adopt nallah in their localities, reporting blockages and illegal dumping.

Implementation Framework:

Responsible agencies	Timeline
Responsible agencies: HMC, River Sabha Committees Supporting Agencies: SHGs, Youth Clubs	Medium term 1-2 year

7.8.5 Recommendation 18: “Swachhta Challan” (Cleanliness Fine) for Haridwar

The Swachhta Challan initiative in Haridwar is a dedicated enforcement drive designed to preserve the sanctity of the holy city. This has been proposed to enforce cleanliness along ghats, temples and riverbanks by penalizing littering, plastic use and improper ritual waste disposal. It empowers HNN to levy fines on pilgrims, vendors, tourists and resorts, ensuring accountability and compliance with solid waste management rules. Implementation involves on-the-spot challans through digital systems, visible signage and monitoring by municipal staff, SHGs and youth volunteers.

Proposed Intervention:

1. **Regulatory Enforcement:** Impose fines for littering, plastic use and open disposal of ritual waste along ghats and riverbanks, with penalties for resorts, shops and eateries that violate solid waste management norms.
2. **Temple & Ghat Monitoring:** Deploy municipal staff and volunteers at 104 Ghats and temples to monitor ritual waste and On-the-spot challans for devotees using non-biodegradable offerings.
3. **Tourist & Resort Accountability:** Resorts and wellness centers fined for improper disposal of tourist-generated waste. Mandatory segregation of biodegradable and non-biodegradable waste at source.
4. **Plastic Ban Enforcement:** Strict challans for vendors selling single-use plastics near ghats, temples and mela grounds. Confiscation of banned items during festivals and tourist seasons.
5. **Digital Monitoring & Transparency:** QR-code based challan system for transparency and tracking. Monthly reporting of challan collections and reinvestment into cleanliness drives.

Implementation Framework:

7.8.6 Recommendation 19: Citizen & Tourist Monitoring Dashboard

Despite frequent IEC activities, there is no integrated system to monitor participation, waste collection or CSR contributions. Lack of public access to data reduces transparency and limits civic feedback. The baseline assessment highlights the following key concerns:

1. No centralized dashboard exists to track river-related citizen and tourist activities.
2. Resorts and Adventure Tour operators are not mandated to report visitor involvement.
3. IEC and clean-up data are not publicly visible or regularly updated.
4. Absence of feedback limits transparency and adaptive planning.

Proposed Intervention:

1. Dashboard Creation: Develop online dashboard (municipal portal) to track clean-ups, IEC and CSR activities investments and tourist participation.
2. IEC Cell: Create IEC cell within the RMC which will look after the monthly training, IEC calendars and ensuring that the dashboard updated.
3. Data Entry: Updated monthly by HMC IEC cell.
4. Tourist Inputs: Resorts and adventure tour operators report visitor involvement in clean-ups.
5. Public Access: Dashboard displayed at HNN office and shared via “Swachh Ganga” platform.
6. Transparency: Ensures visibility of citizen and tourist contributions.

Implementation Framework:

Responsible agencies	Timeline
Responsible agencies: HMC, River Sabha Committees Supporting Agencies: SHGs, NGOs, Youth Clubs	Medium term 1-2year

ANNEXURES

Annexure 1: Riparian buffer along the streams in Haridwar

Riparian	Western bank (in kms)	Eastern bank (in kms)
Pathri Rao		
Agriculture	12.5	10.7
Built-up	-	1.6
Sandbars	1.6	6.3
Total	14.1	18.6
Ghoina Rao		
Agriculture	2.5	2.5
Sandbars	7.8	10.2
Total	10.3	12.7
Bagh Rao/ Sukhi River		
Built-up	0.7	0.7
Total	0.7	0.7
Ratmau Rao		
Agriculture	1.5	7.7
Sandbars	13.4	8.2
Embankment	0.2	0.2
Total	15.1	16.1
Ranipur Rao		
Built-up	0.5	1.1
Degraded Vegetation	2.3	2.8
Embankment	0.1	0.1
Agriculture	5.5	5.5
Total	8.4	9.5
Kalatira		
Agriculture	12.1	8.4
Built-up	-	1.3
Total	12.1	9.7
Sendali Rao		
Agriculture	5.9	8.7
Total	5.9	8.7

Annexure 2: Storm water Issues of Haridwar

S no.	Name of Nallah	Salient Features and Issues
1	Loknath Nallah	- A spring-fed stream from Rajaji National Park, carries about 3-4MLD of spring water which is pure until it enters into Shyamlok Colony. Further this stream is contaminated by domestic wastewater discharged from nearby houses, however the contamination is diluted due spring water flow in Nallah. - Since the Nallah is contaminated spring water when it reaches the Loknath I&D structure near Bhupatwala Pumping Station, an additional 3-4MLD spring water needs to be pumped to STP hence increasing its avoidable Hydraulic Load
2	Pawan dham (Durga Nagar Nallah)	- The nallah remains dry for most of the year. - It mainly carries flow only during the monsoon season.
3	Bhimgoda Nallah	- The nallah carries significant silt, which creates operational challenges at the Bhimgoda Sewage Pumping Station (SPS) located beside the Interception & Diversion (I&D) structure. - Due to lack of space, suction-cum-jetting machines cannot be deployed to remove the accumulated silt at the SPS.
4	Karoli Nallah	- All these are very minor drains / street nallah located on the main ghats along Upper Ganga Canal and all are fully tapped - Nallahs do not face significant operational challenges. - Silt is removed once annually as part of regular upkeep.
5	Railway Nallah	
6	Karnwal Nallah	
7	Kangra Mandir Nallah	
8	Nai sota (Subhash ghat) Nallah	
9	Nago ki haveli Nallah	
10	Kusha ghat Nallah	
11	Lal Tarao upstream Nallah	- Surrounding houses and roadside areas contribute to the dumping of solid waste around the nallah - Since Nallah does not run full during non rainy period, stopping the solid waste by boom barrier is not feasible
12	Lal Tarao downstream Nallah	- The nallah carries silt, which creates difficulties at the Lal Tarao Sewage Pumping Station (SPS) located beside the Interception & Diversion (I&D) structure. - Although silt is present, it is managed and removed using vehicles equipped with suction-cum-jetting machines.
13	Mayapur Nallah	- The nallah remains dry for most of the year, with water flowing only during the monsoon season. - Mayapur SPS receives sewage from the sewer network, while little grey water from minor drains is tapped through manholes on the nallah. - During the monsoon, stream water flows into the opening in the manhole along with grey water, leading to overloading of the SPS. - The increased inflow during monsoon raises the volume of used water reaching the Sewage Treatment Plant (STP), adding operational pressure.
14	Devpura nallah	- The nallah was previously tapped, but during the consultation with the locals and Jal Sansthan this tapping has now been removed - The same flow is finally tapped at the Public Works Department (PWD) Nallah tapping.

S no.	Name of Nallah	Salient Features and Issues
15	Awass Vikas Nallah	- There is a lack of proper access to the Interception & Diversion (I&D) structure. - This creates difficulty in removing solid waste at screened at the I&D
16	Latowali Nallah	The nallah is tapped and diverted to Jagjeetpur Nallah
17	Jagjeetpur Nallah	- Nallah faces problems of silt accumulation and solid waste choking the flow. - At the I&D structure, the manual screen is damaged, causing solid waste to choke the flow and preventing interception. - As a result, the drain flow bypasses the I&D structure and continues downstream. - This nallah is further tapped at Matrasadan I&D structure, however, incomplete tapping at.
18	Kasawaan Nallah	- Both nallah's faces heavy silt deposits where the presence of silt in the flow has damaged the mechanical screen at the Sewage Pumping Station (SPS), creating additional operational challenges - Very high solid waste is screened and removed from Nallah. 1–2 trolleys of solid waste are removed from the nallah.
19	Pandaywala Nallah	
20	PWD Nallah	- The PWD nallah carries heavy silt in its flow enters the PWD SPS having two compartments - Silt is removed manually by diverting the flow to compartment. This diversion allows the other pumping station to be emptied so that accumulated silt can be cleared. - The SPS has access issues and the suction machine can't be deployed for removal of silt from the wet well of SPS
21	Lal Mandir Nallah	- The Lal Mandir nallah is functioning properly. - There are no reported problems related to silt, solid waste, or infrastructure.
22	Matrasadan Nallah (Jagjeetpur downstream)	- The nallah faces siltation and solid waste problems, with solid waste is being removed manually. In addition to this, cow dung is discharged directly into the nallah, further adding to the waste load. - The accumulation of solid waste often chokes the nallah, restricting the flow and causing overflow into open spaces downstream. Eventually, this untreated overflow finds its way into the Ganga River, creating environmental and operational challenges.

Annexure 3: Incorporation of River Considerations in the Draft Haridwar Master Plan 2041

Recommendations from the National Institute of Urban Affairs:

Based on research conducted by the National Institute of Urban Affairs (NIUA) in September 2020, it was observed that most city Master Plans and Development Plans within the Ganga River Basin could benefit from a stronger river-sensitive approach. In many cases, the river and its floodplains are not distinctly delineated as a separate land use zone, nor are they integrated as a living ecological system within the statutory and regulatory planning framework. Additionally, Development Control Regulations (DCRs) and Building Bylaws often do not include explicit river-sensitive development norms in alignment with the Ganga Notification and related government guidelines.

In contrast, the Draft Master Plan of Haridwar 2041 is overall a comprehensive and forward-looking document that captures multiple dimensions of river management, urban development, infrastructure and the associated ecosystem. Importantly, the Plan demonstrates a conscious shift towards river-sensitive master planning, reflected in its recognition of the ecological and cultural significance of the River Ganga and its efforts to integrate river-related aspects within the city’s planning framework.

A few recommendations and additions have been identified to further strengthen the Draft Plan’s river-centric perspective, ensuring that the river ecosystem becomes an integral component of Haridwar’s long-term vision and growth trajectory. The review has been divided into the broader river ecosystem-related aspects and provisions that can be incorporated into the Master Plan:

- **River Background:** Basin context, river reach, catchment, tributaries, historical course, hydrology, flood history, cultural significance
- **River Zone delineation:** Floodplain demarcation and permissible activities within the Plan and the Land Use Plan
- **River Ecology, Ecosystem:** Riparian and buffer zones
- **Nallah and Water Bodies:** Natural drains, stormwater drains, canals, tanks, lakes, whether treated as a separate land-use zone, provision for buffer uses
- **Pollution Abatement:** Sewerage coverage, STP capacity, untreated discharge points, solid waste hotspots, sludge management, stormwater control, litter prevention
- **River Water Extraction for City Use:** surface water dependence, demand-supply gap, strategies to manage freshwater demand
- **Groundwater Management:** Aquifer mapping, recharge zones, groundwater extraction regulation, groundwater monitoring, provisions for artificial recharge
- **Norms for discharge:** Effluent standards, discharge locations, monitoring, penalties, compliance reporting and enforcement mechanisms
- **Reuse of treated used water:** Reuse avenues mapping (parks, industry, irrigation), quality standards, dual plumbing, incentives, cost recovery, reuse targets attached to land use
- **Special Projects:** Riverfront development, navigation, tourism zones, recreation nodes, low-impact designs for public access, environmental safeguards, pilgrim management during peak seasons
- **River-related vulnerability assessment:** Urban flooding, flood vulnerable spots, sedimentation and bank erosion in the river zone, landslides, minimizing risks to settlements/infrastructure
- **River-related economic uses:** permissible and non-permissible uses in the river zone, near water bodies and nallah
- **Implementation and Regulatory Frameworks for Plan implementation:** Lead agency, inter-

departmental roles, legal instruments, convergence with national/state schemes, phasing roadmap

- **River-related monitoring and evaluation:** monitoring stations, GIS / remote sensing, encroachment regulation
- **Stakeholder and community engagement:** Institutional stakeholders, local communities, NGOs, citizen science, awareness programs, livelihood restoration, relocation plan for flood-vulnerable communities

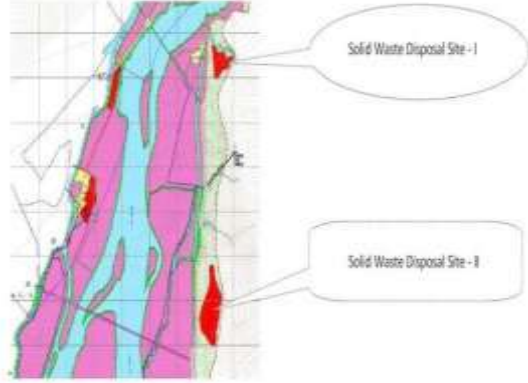
The following table provides a comprehensive section-by-section review of the draft master plan provisions and how they can be modified to embed river-thinking into the city’s development agenda:

Theme / Section (with original section numbers)	Baseline Data & Issues (quoted)	Master Plan Provisions in Draft Master Plan for Haridwar	Observations	Recommendations as well as Guiding case studies and documents
River Background: Basin context, river reach, catchment, tributaries, historical course, flood history Section 11.1.1	The city is bound by River Ganga on the west and Rajaji National Park on the east. Key Water Bodies: • Ganges River: Central to the city's culture, religion and water supply. • Kali River: A tributary from the Shivaliks, supporting local ecology. • Bhimgoda Barrage: Regulates Ganga flow for irrigation and water management. • Mansa Devi & Chandi Devi Lakes: Sacred lakes near major temples. • Rajaji Park Streams: Rivers like the Song support regional biodiversity. Major Issues: Over past two decades' natural drainage patterns have been altered Rivers have notably shrunk in volume, especially south of Ganga Canal. Degradation largely due to rapid urbanization, SIDCUL development built directly over natural stream network causing encroachment and disruption of natural water flow.		The base map currently does not explicitly delineate the river tributaries, floodplains, catchment areas, or associated water bodies such as lakes, reservoirs, tanks and islands. A more detailed base map would support informed planning and facilitate measures for minimizing human-induced impacts.	The Base Map should explicitly indicate the river tributaries and their floodplains, the catchment areas, all the water bodies and the buffer areas, any special features like islands, lakes, reservoirs and tanks etc. The base map shall also indicate any potential threats, issues in the catchment areas that can possibly impact these aspects of the river ecosystem. Integrate river health indicators into zoning: Environmental Flow analysis through satellite imagery & GIS may be considered for identifying natural flow and zoning considerations. Promote integration of Nature-Based Solutions (NBS) for flood management (e.g., afforestation, wetlands restoration) Integration of Regional basin/ watershed level Ecologically Sensitive Zones, conservation areas with the Master Plan. This can help in assessing any anthropogenic activities that can be regulated to achieve minimal impact on the river and also the proposed activities aim to embed ecological intelligence into urban planning by aligning zoning and flood management strategies with river health and watershed dynamics. Linking ecologically sensitive zones and conservation areas at the basin and watershed level with the Master Plan fosters a systems-oriented approach to sustainable urban development, safeguarding biodiversity and long-term environmental stability.
River Zone delineation: River & Buffer Zone / Floodplains Demarcation Section 2.8.1.5; NGT directives (2013, 2017)	According to recent surveys, approximately 11% of the total planning area population is directly affected by flood events. Major Issues: The entire Mela Ground falls within a flood-prone zone, where the 25, 50 and 100-year flood lines converge, indicating a high flood risk. Table 2.6 indicates Flood Prone Areas Most of the slum settlements are currently located in the riverbed/ floodplains. Large tracts of land along the River Ganga, primarily floodplains designated as Kumbh land and under the ownership of the Irrigation Department, have been subject to increasing encroachments. These	Provisions for floodplains coming under ESZ (while the extent is being notified): No new construction of hotels or resorts shall be permitted within 1 km of the boundary of the National Park/Tiger Reserve, or up to the extent of the Eco- Sensitive Zone (ESZ), whichever is nearer. NGT orders: prohibition on construction within 200m of riverbank (2013); <i>ban on construction within 100m in 2017 (subject to demarcation)</i>	NGT buffer rules, floodplain demarcation and the draft plan provisions have been incorporated in the Plan, but the draft lacks a clear mapped demarcation (GIS layer) showing 100m/200m/500m floodplain zones and where existing uses (hotels, mela structures, dumpsites) encroach. No operational relocation plan for the informal settlements and vending/ economic activities not authorized within the floodplains. <i>(For e.g. if Mela Ground is used for temporary activities, during flood times strict regulation, relocation strategy and warning systems must be in place)</i>	Regulatory Provisions 1in 25 year and 1 in 100-year Flood lines as per Ganga Notification shall be marked over the proposed land use plan to demarcate river zone and active floodplains. The Active flood plain and River zone then shall be demarcated as no development zone. In this regard, recent TECHNICAL GUIDELINES ON FLOOD PLAIN ZONING by Central Water Commission, Ministry of Jal Shakti were published in July 2025. Refer: chrome-extension://efaidnbmninnbpcjpcglclefindmkaj/https://nmcg.nic.in/writereaddata/fileupload/56_Tech%20Guidelines_Full.pdf Water accumulation map/low lying area maps may need to be incorporated in the master plan for flood readiness in the urban/city zone. Housing density as per buffer zoning can be considered.
	encroachments are not only illegal but also threaten the ecological integrity of the floodplain and its long-established use for large-scale religious congregations like the Kumbh Mela.			Facilitatory Provisions The list of permissible/ proposed activities is quite elaborate for the special zone, green buffer etc. EIA shall be mandated for any project within the floodplains/ buffers with significant built up. Refer: Section 3.2.3 Special initiative for rejuvenation of Yamuna and its floodplains (Pg. 19-20) Refer: chrome-extension://efaidnbmninnbpcjpcglclefindmkaj/https://dda.gov.in/sites/default/files/inline-files/Draft%20MPD%202041%20%28English%2909062021_compressed_0.pdf Phased Relocation plan for informal settlements as well as river-dependent informal and non-compatible economic activities that do not fall under the permissible

Theme / Section (with original section numbers)	Baseline Data & Issues (quoted)	Master Plan Provisions in Draft Master Plan for Haridwar	Observations	Recommendations as well as Guiding case studies and documents																					
				category. Pune Relocation from floodplains case study: Refer: https://tinyurl.com/5n97xe8y																					
River Ecology, Ecosystem: Riparian Corridors & Wildlife — Sections 3.9.1; 3.9.2	200 m Green buffer has been proposed for Riparian Stretches along the river. “Wildlife movement corridors exist between Rajaji ranges; small green patch near Jolly Grant Airport acts as key corridor. Wildlife passages along canals (Soni Sot Rao and Dugadda Rao) exist but canal design (steep, smooth slopes) restricts animal access to water. Bridge over Song River (Raiwala) allows passage but animals required to descend; Motichur flyover is positive example.”	<table border="1"><thead><tr><th>Type of Land/Feature</th><th>Green Buffer (in M)</th><th>Source</th></tr></thead><tbody><tr><td>River</td><td>200</td><td>CPCB/NGT/CBE</td></tr><tr><td>Ganga River regulated zone</td><td>From 200 to 500</td><td>NGT guidelines</td></tr><tr><td>Other River</td><td>30</td><td>Byelaws</td></tr><tr><td>Flood Plain</td><td>500</td><td>NGT/CPCB</td></tr><tr><td>Reservoir</td><td>10</td><td>Byelaws</td></tr><tr><td>Natural reservoir and Water resources</td><td>15</td><td>Byelaws</td></tr></tbody></table> “Recommendations: preserve green patches (no development), modify canal embankments to replace smooth linings with rough-textured surfaces and gentler slopes; create wildlife passages, raised flyovers where required; preserve animal movement corridors in land use planning; set up monitoring and strict compliance with NGT.”	Type of Land/Feature	Green Buffer (in M)	Source	River	200	CPCB/NGT/CBE	Ganga River regulated zone	From 200 to 500	NGT guidelines	Other River	30	Byelaws	Flood Plain	500	NGT/CPCB	Reservoir	10	Byelaws	Natural reservoir and Water resources	15	Byelaws	The Plan follows NGT guidelines for the main spine of the river, but not for the tributaries. Good recognition of corridors; however, spatially corridor have not been mapped and integrated into the land-use plan. Institutional responsibility for corridor protection is unclear.	Regulatory Provisions The Master Plan shall indicate the river, floodplains and buffers for all the tributaries of the River Ganga flowing through the planning area. The development shall be regulated by the Development Controls for all these rivers and their buffer zones/ floodplain zones. The Plan in consultation with the Forest Department shall also provide a list of Native Flora (as Annex) in the area to be planted to restore designated buffer zones for all the rivers in the planning area. The Master Plan shall identify and map ecological corridors connecting forests, wetlands and river systems, integrating them into the zoning and development control framework. Change of land use in identified corridors shall be prohibited to maintain the ecological continuity.
Type of Land/Feature	Green Buffer (in M)	Source																							
River	200	CPCB/NGT/CBE																							
Ganga River regulated zone	From 200 to 500	NGT guidelines																							
Other River	30	Byelaws																							
Flood Plain	500	NGT/CPCB																							
Reservoir	10	Byelaws																							
Natural reservoir and Water resources	15	Byelaws																							
Drains and Water Bodies: Water bodies	Mansa Devi & Chandi Devi Lakes: Sacred lakes near major temples. Section 11.1.1.2 In Haridwar district, the most notable wetland is Jhilmil Tal, located near Bhogpur village, approximately 19 km from Haridwar city. Other significant wetlands in the district include Tehri Dam and Banganga Wetland. These wetlands not only support	“Protective Zone (4.2.3): 2448.43 hectares designated as Protective Zone (code ‘E’). All revenue water bodies identified to be brought under this classification. A 50 meters green buffer to be maintained around all water bodies. A 30-meter buffer around forests. Protective classification proposed to prevent encroachment and preserve stormwater functions.”	Water Bodies being covered under a separate Land use is a progressive step to regulate development and encroachments around them. A further classification can help prioritize their conservation and protection.	Some background on the significance and current status of water bodies must also be included in the Master Plan Baseline. Dedicated Drainage/Storm water network map of the planning area to be included. Storm water attenuation structures and NBS solutions can be recommended for flood prone/high risk areas. Mapping the drainage network enables targeted interventions, while recommending storm water attenuation structures and Nature-Based Solutions (NBS) in high-risk areas supports sustainable water management, reduces flood vulnerability and promotes ecological co-benefits.																					
	biodiversity but also contribute to the ecological and cultural fabric of the region. Figure 11-2 shows that Rivers/Streams makes up to 95.02%, while other types like Lakes/Ponds (2.74%) and Reservoirs/Barrages (1.37%) form a small share of the total wetland distribution			Any classification of water bodies in terms of natural and man-made, water bodies or wetlands , having space for buffers or not, based on the function etc. can be detailed out in the Zonal/ Local Area Plans going further. Regulatory Provisions A robust monitoring framework for tracking environmental parameters may be set up by State Pollution Control Committee. Facilitatory Provisions If the water bodies are not in Ecologically Sensitive Zones, public access and activities can be introduced recreational sites shall be permitted without threatening the natural environment. These water bodies can then be identified as ‘interactive nature zones. For restoration of wetlands, specific guidelines have to be provided in the master plan treating them differently from water bodies. For example, The Chennai Master Plan incorporates wetland conservation norms																					

Theme / Section (with original section numbers)	Baseline Data & Issues (quoted)	Master Plan Provisions in Draft Master Plan for Haridwar	Observations	Recommendations as well as Guiding case studies and documents																					
				primarily through the application of the Wetlands (Conservation and Management) Rules, 2017, which prohibit activities like conversion for non- wetland uses, industrial expansion and solid waste dumping. (refer Chennai Master Plan)																					
Drains and Water Bodies: Drainage and Stormwater Drains — Section 11.1 (Figure 11-1)	Frequent Blockages: Open drains are often clogged due to garbage dumping, especially plastic waste, reducing the effective water-carrying capacity of main drainage channels. - Inflow from Shivalik Hills: Haridwar’s location at the base of the Shivalik Hills leads to heavy siltation and waterlogging, especially in Middle Haridwar, Jwalapur, Kankhal, Bhopatwala and Mayapur. - Encroachments: Unauthorized construction along drains, by both low-income groups and others, has narrowed waterways and hindered maintenance access, worsening flooding and drainage inefficiencies. Infrastructure Needs: New drains: 70,270 meters o Repair and desilting of existing drains: 20,556 meters Construction of culverts: 21 Nos. Silt catchers: 4 Nos.	There are no separate provisions for drains within the Master Plan. They are not considered in the Environmentally Protected Zones also. The buffers table also doesn’t mandate any green buffers for the stormwater drains. <table><tr><th>Type of Land/Feature</th><th>Green Buffer (In Mt)</th><th>Source</th></tr><tr><td>River</td><td>200</td><td>CPCB’s</td></tr><tr><td>Ganga River regulated zone</td><td>From 200 to 500</td><td>NGT go</td></tr><tr><td>Other River</td><td>30</td><td>Byelaw</td></tr><tr><td>Flood Plain</td><td>500</td><td>NGT/C</td></tr><tr><td>Streams</td><td>10</td><td>Byelaw</td></tr><tr><td>Natural reservoir and Water resources</td><td>15</td><td>Byelaw</td></tr></table>	Type of Land/Feature	Green Buffer (In Mt)	Source	River	200	CPCB’s	Ganga River regulated zone	From 200 to 500	NGT go	Other River	30	Byelaw	Flood Plain	500	NGT/C	Streams	10	Byelaw	Natural reservoir and Water resources	15	Byelaw	No map-based inventory of drains and provisions of mandatory buffer zones. No discharge norms for the water being disposed off in the drains. Provisions for Pollution monitoring and regulation of discharge in drains is currently missing in the Master Plan.	Regulatory/ Facilitatory Provisions The Master Plan shall mandate prevention of pollution in drains by establishing a GIS-based monitoring and management system for: Identifying and checking the outflow of untreated wastewater into the drainage network. (quality monitoring) Preventing dumping of solid waste in open drains and water channels. Mapping and tracking encroachments, flooding hotspots and choke points. Enabling real-time performance evaluation of drainage infrastructure during peak monsoon periods. All authorities concerning drains shall be able to access the GIS-based platform and database of the entire drainage network, integrated with the storm water management system, land use data and pollution monitoring infrastructure. The Haridwar Master Plan can propose green buffers around drains: A minimum 10-metre-wide green buffer shall be maintained along all major drains, nallahs and water bodies, in both redevelopment and new development areas. Vacant lands along drains shall be identified and designated as natural green buffers forming part of city-level green corridors. These green corridors shall be developed as green mobility routes, integrating pedestrian and cycling pathways, ecological trails and heritage walks, thereby creating a connected city-wide green-blue network.
Type of Land/Feature	Green Buffer (In Mt)	Source																							
River	200	CPCB’s																							
Ganga River regulated zone	From 200 to 500	NGT go																							
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Flood Plain	500	NGT/C																							
Streams	10	Byelaw																							
Natural reservoir and Water resources	15	Byelaw																							
	o Desilting of check dams: 2 Nos.			Where feasible, wider buffer areas may be designed for active public use (parks, yoga and sports spaces without formal seating, open-air exhibitions, community gardens, etc.), ensuring ecological sensitivity and sustainability. The Plan may also suggest in-situ treatment mechanisms: such as bioremediation, constructed wetlands and decentralized wastewater treatment systems (DEWATS), to be adopted for improving water quality within the drain network. The Plan may also incorporate provisions for nature-based flood management measures, including afforestation of catchment slopes, contour trenches, vegetative buffers, etc. As also mandated by Draft Master Plan of Delhi 2041, Section 3.3.2 Green buffers along drains as city-level Green Corridors, Refer: https://tinyurl.com/2mp7yadn (Pg. 21, 95 (for discharge norms etc.))																					
Pollution Abatement: Liquid Waste Management 6.3.3; 7.3; 11.2.4	In Haridwar HNN, the sanitation infrastructure is relatively well- developed, with 93.28% of households having toilets within their premises. A small fraction (0.44%) still disposes of night soil in open drains. The sewerage network has expanded to 219 km, now serving 62% of households in the planning area. One of the most critical infrastructural gaps is the absence of a dual-line system for drainage, meaning that stormwater and sewerage often get mixed and are directed to the sewage treatment plants (STPs). Cremation activities: An estimated 1,200 to 1,500 cremations occur monthly, generating	Ecologically Responsible Cremation: Inspired by initiatives such as those taken by Parmarth Niketan in Rishikesh, Haridwar shall introduce “Ecologically Responsible Cremation” facilities at ghats. This includes the installation of specially designed “pyre ovens” that consume significantly less wood yet produce enough heat for effective cremation. ODF Status Monitoring: Villages located along the river, especially near Ajeetpur and flood-prone areas, must be routinely assessed for Open Defecation Free (ODF) status. Robust monitoring and community	The Plan has a number of interventions on pollution abatement. Industrial growth planned in SIDCUL conflicts with enforcement gaps: CETP non-compliance, lagoon contamination and evidence of red- category polluting units.	Regulatory Provisions Master Plan needs to mandate a strict industrial effluent audit, CETP compliance for approvals and linkage with reuse (treated effluent for industrial use internally) Facilitatory Provisions Moreover, provisions like more green industries and practices such as groundwater recharge, reuse of treated wastewater for non-potable purposes, permeable surfaces and mandatory green areas within the industrial complex design can be highlighted by the Master Plan. Incentivizing less polluting and promoting green industrial activities can be explored within the Master Plan. Liquid waste Management and Pollution Abatement During Large Gatherings The Master Plan of Haridwar must explicitly mention about liquid waste management provisions during large gatherings. Decentralized solutions like toilets with																					

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	several tonnes of ash and carbon dioxide, most of which are disposed of directly into the Ganga, adversely affecting water quality and contributing to particulate pollution. Industrial Pollution: As per the State Pollution Control Board (SPCB), there are 135 polluting industries in the industrial areas	engagement programs should be put in place to ensure compliance and sustained sanitation behaviour. Implementation of Dual Line System: To prevent the mixing of stormwater and sewage, a dual pipeline system should be planned and executed. This will ensure that only sewage reaches the treatment plants while stormwater can be diverted directly into designated drainage channels, reducing overload on existing STPs and contamination of natural streams.		biodigesters, decentralized STPs, shall be mandated. Since Haridwar is a center of such large gatherings, Master Plan must look at robust systems for managing both liquid and solid waste management and water quality monitoring downstream. The Jal Sansthan and State Pollution Control Board shall ensure continuous compliance through online flow and quality monitoring systems connected to the Command-and-Control Centre. For this refer: SOP for River-Sensitive Gatherings Along Riverbanks Link: chrome extension://efaidnbmnnnibpcajpcglclefindmkaj/https://nmcg.nic.in/writereaddata/fileupload/3_SOP%20for%20River%20Sensitive%20Gatherings%20Along%20Riverbanks.pdf
	of Haridwar. These include large-scale red-category industries such as electrical and automotive parts manufacturing, metal product units, packaging and printing industries.	Directions issued by NGT: CETP to be ZLD; BHEL directed to install 11 MLD STP by Jan 2016; regular monitoring by SPCB; no polluting industries allowed within ESZ. NGT Guidelines: All ongoing and future STPs must meet discharge standards (Fecal Coliform, BOD/TSS <10 mg/l). STPs should aim for Zero Liquid Discharge (ZLD), with treated water reused for agriculture/horticulture/plantations. Hotels, dharmshalas and ashrams must maintain individual STPs and are prohibited from discharging any wastewater into the Ganga; bio-digester-based public toilets recommended.		
Pollution Abatement: Solid Waste Management (MSW) & Landfill Siting — Sections 7.4; NGT orders	There is a gap between the generated waste and collected: waste generated per day is 270 tons whereas, waste collected is 81 % of total generation. - Management of bulk solid waste generated by tourism. According to HMC (2019), solid waste in Haridwar is composed of 51% biodegradable, 25% recyclables, 20% inert material and 4% construction waste. - The extent of segregation of solid waste needs to be improved by 20% to reach 100% benchmark by URDPFI. Insufficient waste treatment method. Daily waste generation at ward level reported as 260 tonnes per day (TPD) (filtered) and actual estimated ~300 TPD including silt and sludge from drains. During rainy season the scientific landfill becomes non-functional; temporary dumping in Plot No. 4 (not designed). Chandi Ghat MSW dumping site prohibited by NGT (within floodplain) but draft Zonal Plan	In Haridwar, solid waste management is undertaken through a Public-Private Partnership (PPP) model, with KRL as the designated private partner responsible for operations within the city. The management of bio-medical waste is handled by the Medical Pollution Control Committee (MPCC). The collected bio- medical waste is transported to the MPCC's authorized disposal facility, located near Mandawar, Bhagwanpur, along Roorkee–Chhutumal Road (Coordinates: 30°00'15"N, 77°46'05"E), approximately 45 kilometers from Haridwar. NGT siting criteria: landfills must be at least 100m from rivers, 200m from ponds/highways/habitations/parks/wells and 20 km from airports; temporary dumping sites must be at least 500m away from floodplain. Any facility >5 TPD must maintain a buffer of no development. For hospitals found disposing of bio- medical waste on land, into water bodies, or in any other unauthorized locations, a fine of ₹20,000 per violation	The plan must include a long-term, decentralized waste processing strategy (source segregation enforcement, formalized bulk waste generator contracts, resilient landfill design. The Master Plan also points out to a weather resilient waste management infrastructure and facility for the city.	In the SWM Action Plan for Rejuvenation of River Ganga, in addition to the points already covered, following points may be considered: Install religious waste bins (for flowers, diyas, ashes) at ghats and tie up with composting or vermicomposting units or organizations for recycling into useful products/ organic manure. Develop a special waste management plan for Kanwar Yatra, Makar Sankranti and Kumbh seasons, including temporary waste collection centers, rapid response clean-up teams and mobile waste monitoring units. All bulk waste generators particularly nest to the river (institutions, hotels, markets) shall be required to have a waste monitoring system and a larger strategy for waste management. Land shall be earmarked for scientifically designed sanitary landfills with leachate control and post-closure management plans. The Plan shall promote resource recovery centers in each municipal zone with real-time tracking of segregated waste inflow and recycling output. For weather resilient waste management infrastructure All the critical waste management infrastructure like landfills, Material Recovery Centers to be proposed in flood-safe locations. robust peripheral bunds; improved storm water diversion; bio-covers; and modular cell approach, dual leachate barriers (case studies like Brahmapuram Integrated Waste Management Facility, Kochi can be referred to) The Master Plan must declare Ghats "litter-free zones" with strict reinforcement regime for solid waste management on ghats. This may include incorporating both regulatory reforms such as "polluters pay" and

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	proposes a sanitary landfill at Chandi Ghat again. Additionally, solid waste dumping activities are reportedly taking place near the Chandi Devi Ropeway station. This practice is in direct violation of National Green Tribunal (NGT) regulations, which strictly prohibit any kind of dumping or landfill activity, permanent or temporary, within 500 meters of the edge of the River Ganga or its tributaries. Such violations pose significant risks to the river's health, surrounding soil and groundwater quality and undermine efforts toward sustainable riverfront management. <i>Figure 11-13: SWM sites</i> 	is imposed. Additionally, in cases where hotels, dharmshalas, or ashrams discharge untreated wastewater directly into the River Ganga, a penalty of ₹5,000 per day is levied. These enforcement measures aim to curb the degradation of the environment and ensure stricter compliance with pollution control regulations. under the Namami Gange Programme, a 72 Ghat Cleaning initiative has been launched, covering a total area of 0.125 square kilometers to ensure cleanliness along the riverbanks and prevent waste from entering the Ganga.		facilitatory reforms like incentivizing ghat vendors for waste management or transition to eco-friendly disposable products.
River Water Extraction for City Use: Water Supply (Domestic) Groundwater and Surface water Section 7.2.2	100% groundwater is used as the source of water for the planning area which is exploiting the groundwater. Haridwar, benefits from both surface and groundwater sources. Infiltration galleries and large-diameter wells near the river supply water to nearby areas. However, in zones farther from the river, where infiltration is less effective due to wider soil media, groundwater becomes the more viable source. The primary source of drinking water in Haridwar is groundwater, extracted through a network of 80 tube wells. These tube wells collectively have a total supply capacity of 112.55 million litres per day (MLD), based on 16 hours of daily pumping. During peak pilgrimage days when the city hosts an estimated 1.5 to 2 crore visitors per day water pumping operations extend to 22 hours daily.	Haridwar must adopt integrated water management strategies, including: Promotion of Rainwater Harvesting at household, institutional and industrial levels to augment water resources. Wastewater Recycling, particularly from industrial units, to reduce freshwater demand. Water Recharge Zone Protection: Identified water recharge areas must be protected by enforcing restrictions on impermeable surface materials, regulating groundwater extraction and mandating rainwater harvesting. Additionally, an environmental impact fee shall be levied on industries that utilize groundwater." Industrial zones require special focus, with industries encouraged to implement rooftop harvesting and sewage treatment to prevent contamination. Government strategies include artificial recharge, regulated extraction,	The city relies heavily on tube wells and short-term pumping for bulk users like industries and tourism peaks, which is unsustainable. Good recognition of groundwater stress and recharge zones, plus rainwater harvesting. Missing: enforceable extraction limits, permitted groundwater pumping schedules, annual monitoring framework, mapped aquifer vulnerability layers and concrete budget/timelines for implementation. No explicit regulation or fee schedule is provided in the draft; 'environmental impact fee' is proposed but details absent.	Given the city's major dependence on subsurface sources, the master may mandate adoption of a conjunctive water-use framework to optimize source mix between surface and groundwater, ensure reliability during high-demand events and sustain groundwater levels. Learning from Varanasi's dual-source model, which integrates Ganga River intakes, riverbank filtration and tubewell systems, Haridwar shall transition towards a balanced and resilient water supply. Applicable regulations of National Water Policy (2012) & Model Groundwater Bill (2016) may be incorporated. The Draft Master Plan has already indicated identifying and marking Recharge Protection Zones (RPZs). These may be made more robust by restricting high-density or high concretized developments and ensuring that at least 30% of each plot remains open and permeable to allow rainwater to soak into the ground, prohibiting deep borewell installation in critical or over-exploited areas. The plan may also indicate strategies for demand management, policy on source augmentation (reuse of treated used water) and pilgrim-centric water provisioning plans (e.g., potable water kiosk) that reduce freshwater stress.

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	Most of the planning area has groundwater levels ranging from 30 to 80 meters. In areas like SIDCUL and BHEL, groundwater levels drop below 80 meters. As per the Central Ground Water Board (CGWB), the water table has been dropping by about 0.36 meters annually, with a total decline of 4–5 meters over the past decade and over 10 meters in some areas.	and incentives for conservation technologies to ensure long-term groundwater sustainability and safe drinking water. Proposes scaled-up supply planning for peak pilgrimage events; additional temporary tube wells were proposed during large congregations in 2021 (20 small borewells and 8 tube wells). Encourages rainwater harvesting and treated used water recycling to reduce demand.		Refer Draft Master plan of Delhi 2041, Chapter Reference 13.2.2 Water supply rationalization to address water scarcity (link attached) Refer: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://dda.gov.in/sites/default/files/inline-files/Draft%20MPD%202041%20%28English%2909062021_compressed_0.pdf
Reuse of treated usedwater	In 2019, the estimated sewage generation in urban Haridwar was 110 MLD. The Jagjeetpur STP is currently handling a load of 80–85 MLD, which includes stormwater infiltration and the Sarai STP manages around 14–15 MLD.	Implementation of Dual Line System: To prevent the mixing of stormwater and sewage, a dual pipeline system should be planned and executed. This will ensure that only sewage reaches the treatment plants while stormwater can be diverted directly into designated drainage channels, reducing overload on existing STPs and contamination of natural streams. Expansion of STP capacity to at least 146 MLD and improved treatment efficiency (aim 90%). Implementation of dual pipeline system (separate stormwater and sewage) and comprehensive sewer connectivity is recommended." All ongoing and future Sewage Treatment Plants (STPs) must meet discharge standards, including treating Fecal Coliform and maintaining BOD and TSS levels below 10 mg/litre. STPs should aim for Zero Liquid Discharge (ZLD), with treated water reused for agriculture, horticulture, or plantations.	The Plan Promotes reuse for irrigation, sale of byproducts (manure) and pricing of treated water for irrigation users.	The Master Plan may promote the preparation of a phased reuse strategy, with clear targets for incremental adoption. The concerned agencies (Uttarakhand Jal Sansthan, Jal Nigam, SIDCUL and Urban Development Department) may jointly prepare an implementation roadmap, supported by investment and capacity-building plans. The Master Plan may direct the concerned agencies to develop financially viable reuse models, including sale of treated wastewater to industries at competitive tariffs. In addition to implementation of a dual pipeline system, the Master Plan shall recommend a third line conveying treated wastewater (e.g. Purple Line by World Bank in Aurangabad, Maharashtra) to supply treated water to industrial units within SIDCUL, nearby institutional clusters and peri-urban agricultural zones. The Master Plan may emphasize awareness and capacity building among industries, farmers and institutional users on the safe and beneficial use of treated wastewater. Periodic workshops and demonstration projects may be undertaken in coordination with NMCG, CGWB and SIDCUL to build confidence and promote uptake. For this section, refer National Framework on safe reuse of treated wastewater, November 2022 by NMCG. Refer: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://nmcg.nic.in/writereaddata/fileupload/32_SRTW%20Framework_Final_23_11_2021%20(1).pdf
River-related vulnerability assessment:	Soil erosion trigger landslides and flash floods, particularly in hilly terrain, posing serious threats to infrastructure, property and human life.	Promotion of green belts and the enforcement of regulations to control indiscriminate construction activities are also critical in curbing erosion.	Measures listed are engineering-heavy (embankments, walls). Nature-based solutions (afforestation, contour trenches, slope drains), to be incorporated.	The Master Plan may ensure that soil erosion, sedimentation and landslide risks are managed through an integrated mix of structural and nature-based measures. In addition to constructing embankments, check dams and retaining walls along vulnerable slopes and riverbanks, the Plan may promote afforestation, contour trenches, vegetative barriers and slope drains to stabilize soil and reduce run-off.
Soil Erosion, Sedimentation & Landslides — Section 2.9	"Soil Erosion leading to sedimentation, landslides, reduced water holding capacity, impact on life, infrastructure and livelihood, flash floods etc."	Provisions in the Master Plan: These include constructing embankments along rivers, building retaining walls on vulnerable slopes and relocating communities from high-risk zones.		Green belts and riparian buffers have already been incorporated in the draft plan for erosion-prone areas to act as natural barriers. The Master Plan may also mandate Low-Impact Development (LID) techniques and permeable surface norms in all large developments to control surface run-off and improve infiltration. The Master Plan may provide for community relocation and protection in highly vulnerable zones prone to recurrent landslides or flash floods. The Plan may identify and map High-Risk Settlements (HRS) based on slope stability and erosion susceptibility. Resettlement areas shall be identified within safe zones of the planning area, ensuring access to basic services and livelihoods. Risk-informed land-use zoning shall be introduced to prevent future habitation in such zones. Use of remote sensing and GIS-based slope hazard mapping may be institutionalized for ongoing evaluation.

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				TDR maybe considered for river sensitive land use zoning specially to promote low density housing along the river basin.
Eco-friendly Riverfronts 10.2.1.5 Ghats	There is a total of 72 ghats in Haridwar, each with a defined area. Among these, four ghats hold particular religious and cultural significance. Gau Ghat is rooted in mythology where the cow is revered as "Kamdhenu" - a divine being believed to fulfill all desires. People visit this ghat to seek forgiveness for the sin of cow slaughter. Asthi Parvath Ghat is another significant site where people immerse the ashes of deceased loved ones into the holy waters of the Ganga. Rituals involving prayers and final rites are performed here before ashes are released. This ghat is located to the south of the Ganga River. Subhash Ghat, situated near Har-Ki-Pauri, is notable not only for its proximity but also for the voluntary Sewa Samiti, which offers medical aid and other assistance to pilgrims. Most of these ghats are concentrated along the Ganga Canal near Har-Ki-Pauri and the Kankhal area.	Of the 72, 48 ghats are privately owned by ashrams, though they remain open to the public. Given the high concentration of ghats in this limited stretch, it is recommended to create additional ritual nodes at different locations across the city. This would help in decongesting the central areas and distributing the ritual activities more evenly, especially during peak pilgrimage periods	Most of the ghats are fully concretized. Draft Master Plan doesn't have any provision to re-imagine ghats as an intermix of green and embankments.	Wherever feasible, the Plan may promote partial de-concretization and re-grading of ghat edges to enable natural soil exposure, vegetative cover. Bio-engineering techniques (coir mats, vetiver grass, willow or indigenous shrubs) may be used to stabilize the slopes naturally. The Master Plan may identify and protect all existing green stretches and vegetated embankments along the Ganga and its tributaries. Construction, paving, or commercial activities may be restricted within these green zones to maintain natural filtration and biodiversity functions. The Plan may guide retrofitting of existing ghats with green interventions such as shade-providing native trees, rain gardens, vertical planters and grass pavers on approach roads and resting areas. Pervious pathways and landscaped buffers may be integrated without altering the functional or ritual character of the ghats. The Master Plan may prohibit any new concretization, structural expansion, or modification of river edges without environmental clearance. All these must also be extended to the tributaries of Ganga flowing through the Planning Area.
River-related economic uses: Mining & Riverbed Extraction — Section 11.4.2	"Illegal sand mining along the banks of the River Ganga in Haridwar has emerged as a critical environmental concern. Riverbed mining significantly alters physical characteristics of the river and bed, disrupting ecological balance. Continuous extraction of sand leads to loss of natural aquifers and weakens filtration capacity; excessive groundwater pumping for mining exacerbates depletion."	"Directions: Riverbed mining must be highly regulated; mechanized equipment including JCBs prohibited in riverbed; mechanical extraction methods (suction pumps) not permitted; mining must follow regulated seasonal schedule; mining prohibited in ecologically sensitive and animal movement corridors."	Plan does not propose an integrated mining surveillance & compliance mechanism, may have a plan for riverbed restoration and monitoring groundwater recovery.	The Master Plan may ensure that all riverbed and floodplain sand mining activities within the Haridwar Planning Area are carried out strictly in accordance with the Sustainable Sand Mining Guidelines, 2016 and Enforcement & Monitoring Guidelines for Sand Mining, 2020 issued by MoEFCC. Riverbed mining shall be treated as a regulated activity requiring prior environmental clearance, approved mining plan and strict monitoring by the District and State authorities Post-mining site restoration shall be made mandatory, including re- grading, slope stabilization and revegetation of disturbed areas. The Master Plan shall demarcate Sustainable Mining Zones and prohibit extraction in ecologically sensitive stretches and recharge zones. Having these marked on the landuse plan can facilitate the implementation agency to monitor and regulate mining activities.
River-related economic uses: Tourism, Orchards & Agriculture — Sections 4.* (Tourism zoning & TDR)	"Religious tourism drives demand: Nagar Nigam has 531 registered hotels (bed capacity 19,666). Emphasis on rejuvenation of old mango orchards; orchard lands designated as TDR sending zones. Agro-tourism potential and wellness tourism through Patanjali Yogpeeth.	Proposes Special Zoning for Tourism Land Use (to regulate activities within 5 km of protected areas); Orchard Conservation: designate orchard lands and allow TDR sending to preserve orchards and protect private landowner rights.	Positive policy signals but lacks zoning maps that overlay protected areas with tourism receiving zones; can have guidelines for sustainable tourism especially around the rivers. The Master Plan may look at	Tourism zones shall be spatially overlaid with environmental sensitive zones to regulate density and carrying capacity. Special Zoning for Tourism Land Use must be accompanied by ecotourism guidelines, carrying capacity studies and strict waste management norms. Carrying capacity assessments to be undertaken for tourism sites including pilgrimage sites, recreational areas and natural landscapes.

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	Major Economic Sectors having bearing on the river ecosystem: Agriculture: Predominantly found in rural areas, with major crops including wheat, rice, sugarcane and vegetables. It remains a key livelihood source. Tourism: Haridwar is one of India’s most visited pilgrimage destinations. Key attractions like Har-Ki-Pauri, Kumbh Mela and numerous temples and ghats support a large hospitality and retail economy. Small-Scale Industries: Industries in Haridwar produce Ayurvedic medicines, handicrafts, wooden toys, textiles and herbal products. Clusters are concentrated in areas such as SIDCUL, BHEL Township, Bahadrabad and Jwalapur. Informal Sector: Widespread near ghats, highways, bus terminals and rail stations. Activities include vending religious articles, food, toys and flower offerings. Weekly haats and street vendors contribute significantly to the local economy.	Dedicated vending zones: concentrated in high tourism footfall areas including Birla Ghat to Chandi Ghat <table><tr><th>Zone/Area</th><th>Dominant Economic Activity</th></tr><tr><td>Har - Ki - Pauri - Bhimgola</td><td>Religious tourism, shops, dharmashalas, informal vending</td></tr><tr><td>Shyampur, Kankhal</td><td></td></tr><tr><td>BHEL Township & Raxa</td><td>Organised industrial sector, weekly informal markets</td></tr><tr><td>SIDCUL</td><td>Large-scale industries, administrative offices, medical centres</td></tr><tr><td>Deotapa</td><td>Mixed-use commercial zone, small industries, dense informal and key roads</td></tr><tr><td>Bahadrabad & Deotapa Corridor</td><td>Industrial units like Hindustan Unilever Ltd., emerging centres</td></tr><tr><td>Anaj Mandi & Transport Nagar</td><td>Wholesale grain/vegetable markets, milling units, logistics hub</td></tr><tr><td>Kankhal Road, Lakshmi Road</td><td>Religious tourism, informal retail near heritage sites like Shri K</td></tr><tr><td>Kangri, Gajawali, Shyampur</td><td>Scattered small industries, mixed-use developments, low activity</td></tr><tr><td>Kumbh Mela Grounds</td><td>Temporary economic surge during Kumbh, high informal trade goods</td></tr></table>	Zone/Area	Dominant Economic Activity	Har - Ki - Pauri - Bhimgola	Religious tourism, shops, dharmashalas, informal vending	Shyampur, Kankhal		BHEL Township & Raxa	Organised industrial sector, weekly informal markets	SIDCUL	Large-scale industries, administrative offices, medical centres	Deotapa	Mixed-use commercial zone, small industries, dense informal and key roads	Bahadrabad & Deotapa Corridor	Industrial units like Hindustan Unilever Ltd., emerging centres	Anaj Mandi & Transport Nagar	Wholesale grain/vegetable markets, milling units, logistics hub	Kankhal Road, Lakshmi Road	Religious tourism, informal retail near heritage sites like Shri K	Kangri, Gajawali, Shyampur	Scattered small industries, mixed-use developments, low activity	Kumbh Mela Grounds	Temporary economic surge during Kumbh, high informal trade goods	minimizing the trade-offs of these economic activities on the river To be incorporated in the riverfront design and planning	The Master Plan may promote river-based tourism circuits connecting key ghats (e.g., Har-Ki-Pauri, Subhash Ghat and Kankhal) with adjoining cultural and ecological nodes through walkways, green trails and low-impact transport (electric ferries, bicycles). The Plan may promote agro-tourism and wellness-based economic activities around orchard clusters, farmstays and organic cultivation belts, particularly along the Haridwar–Roorkee corridor. These zones may be integrated with eco-tourism circuits, supporting community-based livelihoods, traditional farming. The Master Plan may ensure that vending zones are thoughtfully integrated into the riverfront design. Designated vending areas near ghats, walkways and public plazas may be planned using sustainable and locally available materials, such as bamboo, wood composites, or recycled metal frames, ensuring minimal visual and environmental impact. The Plan may also promote eco-friendly vending practices, including the use of biodegradable packaging, prohibition of single-use plastics and provision of shared waste-collection points linked to the city’s solid waste management network
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her River- related provisions in the Master Plan			Introduction of River-related monitoring and evaluation in the Master Plan including monitoring stations, GIS / remote sensing, encroachment regulation Incorporation of Stakeholder and community engagement models in the Master Plan involving Institutional stakeholders, local communities, NGOs, citizen science, awareness programs, livelihood restoration, relocation plan for flood- vulnerable communities	The Master Plan may ensure the establishment of a comprehensive river monitoring and evaluation system to track the health, use and spatial dynamics of the Ganga and its tributaries within the Haridwar Planning Area. This framework shall include continuous assessment of water quality, sediment load, flow regime and encroachment patterns in coordination with the Uttarakhand Pollution Control Board (UKPCB), Jal Sansthan and District Administration. A River Monitoring and Management Cell (RMMC) may be constituted within the Development Authority/ HNN to coordinate with NMCG, UKPCB and CGWB for data collection, analysis and enforcement. The Cell shall oversee GIS-based tracking, permit monitoring and field inspections to ensure compliance with Master Plan provisions. This cell must also look at convergence of efforts under different programs like AMRUT, SBM, State Interventions, Mela Authority Interventions etc. Recognizing Haridwar’s strong socio-religious context, the Master Plan may promote active participation of local religious trusts, temple committees, ghat management groups and sewa samitis in maintaining cleanliness, waste segregation and eco-friendly practices along ghats. Regular orientation and awareness drives may be conducted to sensitize pilgrims, vendors and residents about sustainable riverfront practices and waste reduction. Implement citizen science platforms for water quality monitoring through Wetland Mitra networks, Ganga Praharis etc. Integrate green-blue corridors for mobility and biodiversity (Delhi MPD 2041 reference).																						

