RETHINKING RIVERFRONT COMMONS: A COMMUNITY- CULTURAL CENTER FOR RE-ESTABLISHING THE WATER-PEOPLE THRESHOLD IN NASHIK

Thesis submitted in partial fulfillment of the requirements for the award of the degree of

BACHELOR OF ARCHITECTURE

By

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DECLARATION

I, *Urjashi Bose*, Scholar No. *2020BARC017,* hereby declare that the thesis titled *"Rethinking Riverfront Commons: A Community-Cultural Center for re-establishing the Water-people Threshold in Nashik",* submitted by me in partial fulfillment of the requirements for the award of the degree of *Bachelor of Architecture at* ***School of Planning and Architecture, Bhopal,*** **India,** is a record of bona fide work and I take sole responsibility for its authenticity. The information and results embodied in this thesis have not been submitted to any other university or institute for the award of any degree or diploma.

Date: 19th May 2025

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STATEMENT OF ORIGINALITY

I, *Urjashi Bose*, Scholar No. *2020BARC017,* hereby declare that this thesis titled *"Rethinking Riverfront Commons: A Community-Cultural Center for Re-establishing the Water-People Threshold in Nashik"* contains literature survey and original research work done by me as part of my Architectural Thesis in the curriculum of the Bachelor of Architecture degree course of the School of Planning and Architecture, Bhopal.

All information in this report has been obtained and presented in accordance with existing academic rules and ethical conduct. I declare that, as required by these rules and conduct, I have fully cited and referenced all materials and results that are not original to this work.

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CERTIFICATE

This is to certify that the student *Ms. Urjashi Bose*, Scholar No. *2020BARC017* has worked under my guidance in preparing this thesis titled "*Rethinking Riverfront Commons: A Community-Cultural Center for Re-establishing the Water-People Threshold in Nashik*"**.**

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ABSTRACT

Water has played an important role in shaping Indian landscapes. India's relationship with water is a profound dialogue between humanity and the divine, where architecture, culture, and ecology converge, from the tranquil ghats to the vibrant riverfronts. This relationship has been taken for granted by the cities, thus looking at water as merely a resource and not as a sacred thread weaving together life, faith, and culture. Nashik, a cultural city, shaped by the sacred Godavari River and the dynamic character of the Kumbh Mela along the river, exists at the crossroads of tradition and modernity. The thesis aims to investigate this relationship of the city with the river by proposing a cultural community center along the stretch of the Godavari River. This not only fulfills the requirements of the community but also reduces the stress of the ghats during the Kumbh by accepting the spillover, creating an ephemeral character along the river. Rooted in the philosophy of re-establishing the connection between the city and its river, the design incorporates the historical wadas of Nashik into a comprehensive cultural trail. The project aims to revitalize the Godavari through careful restoration of the riverfront, giving due importance to the rejuvenation of the lost Kunds of the city due to concretization and an appreciation for local craftsmanship, all while safeguarding the essence of the city. This proposal aims to transform Nashik into more than just a destination; it seeks to present the city as a dynamic narrative, where architecture, heritage, and humanity intersect harmoniously with the ecology and making the river the lung of the city. The proposed community-cultural centre helps to inculcate the essence of Godavari in the everydayness of the community residing in the Wadas, in the old core city of Nashik. The wadas occupied by the artisans and residents of Nashik, serve as bridges to the Godavari, linking the people of the city to its soul, the river. Paths meandering through revitalized kunds, vibrant courtyards, and tranquil riverfronts establish a seamless connection between the natural and the cultural, the sacred and the mundane.

Keywords: Community-cultural centre, Riverfront development, Urban river revitalisation, Godavari Rejuvenation.

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Chapter 1: Introduction

1.1 Background

Urban river edges denote the regions next to rivers located inside metropolitan areas. These margins function as essential connectors between the natural and constructed ecosystems, impacting both ecological systems and metropolitan areas. Urban riverbanks are crucial for sustaining ecological equilibrium, offering habitats for diverse species and promoting biodiversity. They frequently encompass riparian zones that sustain vegetation and enhance water quality through pollution filtration. (Bais & Suneja, 2020) These places are essential for social interaction and enjoyment, providing urban residents with opportunities to connect with nature via parks, pathways, and leisure activities. Strategically designed urban riverbanks can improve the quality of life for urban inhabitants by facilitating access to green areas. The significance of urban rivers has always been acknowledged for their contributions to water resources, environmental protection, fisheries, and recreation, given their substantial impact on the landscape. Moreover, rivers possess distinct environmental, social, cultural, and economic significance. Humans utilize them for several purposes, including potable water, irrigation, industrial applications, energy generation, transportation, flood management, fishing, boating, swimming, and aesthetic appreciation. (Cengiz, 2013) Managing urban riverbanks is problematic owing to urbanization pressures, which frequently result in habitat degradation, pollution, and diminished ecological connectivity. Efficient governance and ecological methods are crucial to alleviate these challenges and foster sustainable development along riverbanks. (Bagherniya et al., 2021)

Throughout history, rivers have served as a crucial resource for human civilization, offering fertile lands, essential water supplies, and facilitating transportation across valleys (Vriddhi, 2017). Historically, the predominant mode of transportation along the riverbanks consisted of horses and carts. Nevertheless, the advent of the industrial revolution saw the establishment of factories and warehouses along the riverbeds, which resulted in the discharge of pollutants into the previously untainted waters (Chakrabortty, 2022; Slathia & Jamwal, 2022). With the expansion of road networks during this era, the demand for boats experienced a significant decline, leading to the relocation of associated factories to the central areas of urban environments.

Regrettably, as noted by Roy Cloutier, minimal efforts were undertaken to repurpose the antiquated warehouses, resulting in their subsequent disuse. Within the Indian context, the development of urban riverfronts has adhered to a comparable path, incorporating sociocultural and religious elements (Vimawala, 2015).

The historical trajectory of riverfronts in India can be systematically categorized into four distinct phases. The initial phase encompasses the formative period characterized by early civilizations, notably the Indus Valley civilization. Following this, the period dating back to approximately 3000 BC, facilitated the establishment of settlements by diverse groups, including the Mughals, Portuguese, Dutch, French, and British. The pre independence phase, spanning from the thirteenth century to the twentieth century, is marked by a notable expansion of industrial activities. Lastly, the post-independence phase, commencing in the twentieth century, is characterized by a discernible decline in the condition of riverfronts, as documented by Garg and Anand (2022) and Vimawala (2015). Throughout this development, rivers in India have been regarded with profound spiritual significance and revered as essential providers by numerous Indians, presenting a formidable challenge for planners to reconcile local and global viewpoints.

Beyond their roles as cultural and religious centers, rivers play a crucial role in the fabric of urban existence. The conceptualizations surrounding riverfronts have proven to be invaluable for the fields of architecture, urban settlements, and the development of public spaces. The Taj Mahal, an exemplary architectural achievement situated along the banks of the Yamuna River, continues to serve as a significant symbol of India's cultural identity. Consequently, rivers and their associated developments are instrumental in embodying essential representations of any urban environment. The influence of human activities has resulted in detrimental effects on riverfront regions, characterized by the unregulated disposal of untreated waste and sewage into these aquatic environments (Chen et al., 2022). Consequently, rivers have increasingly served as repositories for various undesirable activities, thereby presenting unprecedented environmental challenges. In recent years, considerable initiatives have been undertaken to rehabilitate these waterfront regions, effectively revitalizing their aesthetic appeal and restoring their former vibrancy (Zhang et al., 2022). The interdependent connection between a river and an urban environment involves multiple facets, encompassing economic, cultural, environmental, and social

dimensions. This complex interplay underscores the essential function of rivers in influencing the trajectory of human societies and their urban developments.

The interplay between a river and an urban environment is complex, significantly impacting and enhancing the dynamics of city life in various dimensions. Rivers play a crucial role in promoting economic prosperity and enriching cultural and social experiences, thereby contributing significantly to the overall vitality of urban environments. The sustainable management of natural resources, coupled with deliberate urban planning, is of paramount importance in maintaining the intricate relationship between rivers and urban environments. This approach is crucial for safeguarding the ability of rivers to nurture and inspire the cities they flow through for the benefit of future generations. The economic significance of rivers lies in their capacity to facilitate trade routes that link geographically distant regions, thereby contributing to the accumulation of wealth and the enhancement of diversity within urban centers. Their influence permeated various cultural domains, including art, literature, and religious practices, thereby establishing themselves as fundamental components of the urban identity. Rivers have historically played a crucial role in sustaining diverse ecosystems, which urban populations have depended upon for essential food sources and natural resources. From a sociocultural perspective, rivers served as vital recreational areas, significantly contributing to the overall quality of life experienced by urban residents.

A city functions as a dynamic entity, characterized by the presence of various stakeholders who contribute to its ongoing development and sustainability. The periphery of an urban area plays a crucial role within the broader ecological framework, functioning as a vital respiratory organ for the city. The overexploitation of these rivers in terms of resource utilization necessitates the establishment of a systematic approach aimed at revitalizing these essential ecological zones. Consequently, an examination of the interplay between a river and the urban environment facilitates the establishment of a compelling discourse that may ultimately illuminate the requisite characteristics of public spaces and riverfront development necessary to restore the connection between rivers and cities. The urban river edges refer to the zones that delineate the boundaries of rivers as they traverse through metropolitan environments. The significance of these spaces lies in their role as the intersection between the urban landscape and natural waterways, thereby fostering

distinctive interaction zones that facilitate the interplay between human activities and ecological processes.

Urban river edges represent essential natural resources within metropolitan environments, frequently acting as ecological "lungs" that bolster urban resilience, especially by alleviating climate-related hazards such as flooding, regulating stormwater, and promoting biodiversity (Kong et al., 2020; Thadani, 2019). These spaces, nonetheless, transcend mere functionality; they embody profound cultural significance, intricately shaped by centuries of interactions between rivers and the communities that inhabit their vicinity (Chattopadhyay, 2019). Historically, these spaces have served as venues for public assemblies, cultural ceremonies, and community interactions, thereby enhancing urban culture and fostering the emergence of distinctive, dynamic interfaces where urban life coexists with the natural environment.

The dual role of urban riverfronts, serving both as ecological stabilizers and as cultural spaces, necessitates a careful equilibrium in developmental initiatives. Although riverfront initiatives frequently emphasize the importance of ecological restoration and resilience, it is of paramount importance to also safeguard the socio-cultural vibrancy that arises from local practices and traditions. This integration guarantees that riverfronts serve not only to advance environmental objectives but also persist as venues that promote social unity, cultural preservation, and community involvement (Smith & Leatherman, 2021). Nevertheless, numerous urban riverfront developments globally exhibit a deficiency in a holistic framework capable of concurrently addressing these complex roles. In the absence of a comprehensive framework, initiatives may prove inadequate in harmonizing ecological well-being with socio-cultural sustainability.

1.2 Research problem formulation

This study aims to fill the existing gap by formulating a comprehensive framework that is applicable to riverfront development initiatives on a global scale. This framework would evaluate a comprehensive array of parameters within the overarching themes of ecological systems and socio-cultural dynamics. This study seeks to conduct a comprehensive review of existing riverfront projects in order to elucidate best

practices, challenges, and opportunities that may contribute to the formulation of a flexible and adaptable model for forthcoming urban riverfront developments.

- How has the relationship between people and the Godavari River changed over time in Nashik?
- What spatial strategies can revive the water–people connection along urban riverfronts?
- How can traditional spatial typologies like the *wada* or *ghat* be reinterpreted in contemporary civic architecture?
- What role can community-driven spaces play in activating underused riverfront edges?
- How can a riverfront common be designed to remain adaptable throughout the year, catering to both every day and festival use?
- How can architecture sensitize users to the ecological importance of riparian zones while integrating them into public use?

This research endeavours to tackle these inquiries, with the objective of offering an extensive framework for city planners, architects, and policymakers. The aim is to analyse the development of riverfronts that exhibit resilience while simultaneously fostering a profound connection to the cultural identity inherent in their respective cities.

1.3 Aim and Objectives

To design a community-cultural center along the Godavari riverfront in Nashik that re-establishes the historical and cultural relationship between people and the river, while addressing ecological sensitivity, seasonal transformations, and the spatial character of public life around water.

1. To examine the spatial and cultural transformations of the riverfront during events such as the Kumbh Mela and their effects on public and private areas.
2. To study the built-use patterns, building height distribution, and ecological vulnerabilities of the site to guide context-sensitive and flood-resilient design strategies.
3. To identify chances for rehabilitating underutilised or flood-prone river edges into multifunctional public places that can adjust to temporal urban dynamics.

4. To design an inclusive, multi-dimensional public space that enhances the connection between communities and the river through architecture, landscaping, and cultural initiatives.

1.4 Understanding the topic in brief

The thesis examines the pressing necessity to reconceptualize urban riverfronts as significant public commons, particularly in culturally rich towns such as Nashik. The interaction between individuals and the Godavari River has declined over time due to fast urbanization, inflexible infrastructural barriers, and the fading of cultural connections. The river, once integral to daily existence and ceremonial practices, is now perceived from a distance—physically, socially, and spiritually. Riverfront Commons denotes public, accessible areas adjacent to the river, intended for communal use rather than privatization or enclosure. These areas are conceived as vibrant cultural and natural environments, rather than merely enhanced pathways.

This concept proposes a Community-Cultural Centre located along the Godavari riverbank in Nashik, aimed at re-establish the threshold between water and the populace. The center functions not merely as a physical structure, but as a civic common—accommodating artisan workshops, skill-development spaces, transient lodging, galleries, and versatile gathering areas. It anchors three core verticals: cultural continuity, community engagement, and ecological consciousness.

The design reinterprets conventional typologies like the wada and the ghat, physically contextualizing them within a contemporary, modular framework. The landscape and constructed elements integrate to facilitate porosity, respite, and engagement, guaranteeing year-round activity and adaptability to various programs. Terraced areas, tiered kunds, and buoyant platforms promote both reflection and engagement with the river.

By including flexibility, cultural memory, and environmental care into its structure, the proposal seeks to rejuvenate the Godavari as a cherished and communal space—restoring its function as the spiritual and communal core of the city.

Chapter 2: Literature Study

2.1 Introduction

The river has proved to be an important lifeline for the city since times immemorable. This intricate relationship highlights the indispensable role of rivers in shaping the destiny of human civilizations and their cities. Rivers in India are considered sacred and the relationship between a river and a city is multifaceted, influencing and enriching urban life in numerous ways. From fostering economic prosperity to enhancing cultural and social experiences, rivers are integral to the vitality of cities.

The river Godavari, also called as Vridha Ganga (literally translating to elder sister to Ganga), is fondly called Amchi Godavari, meaning “our Godavari”, by the locals in Nashik. The Godavari has seen a decline in its health over the years due to over concretization of the river banks, removal of vegetation cover, encroachments in the river banks, etc causing the river to fade into decline. Questions by various newspaper articles and local organisations have made people ask the question, “Aapli Godavari meli ka?” which literally translates into, “Is our Godavari dead?” This proposal attempts to restore the faith of the community in its river by re-establishing a communal threshold that interacts with the city and the river, bringing in people to the river edge and celebrate Godavari as a river by creating a punctuation in the city’s daily life. The proposal will investigate the lost connections of the Godavari River to the city and present a social hub in the existing fabric of the city that will act as an interface in the heart of Nashik city.

Nashik being a pilgrim town, boasts a profound cultural heritage, recognized for its religious importance, historical landmarks, and vibrant festivals. The city also boasts an intricate network of wadas around the river which stitch together to form the historic tapestry of the city. Each wada, a timeless artifact of architecture and community, serves as a portal to the past, where the stories of artisans and locals echo through intricately carved facades and bustling courtyards. The wadas are occupied by generational artisans well know for their filigree and silverware (*Chandi che kaam*), metal ware (*Tambat kaam*) and metal embossing (*Uthavache kaam*). These wadas act as bridges connecting the city to the river, which additionally host the Kumbh mela

once in every 12 years. The river banks in Nashik also boast a rich cultural heritage and a historical timeline that have modified the interaction of the people with the river by adding ‘Kunds’ at the thresholds which served specific functions. Overtime, these kunds have been concretized to accommodate the influx of the crowds during the Kumbh melas of 2003 and 2015. This action has not only affected the tangible aspects such as the sudden flooding in the monsoons and droughts in the summers but has also affected on an intangible level as it has caused a rift in the connection of the river’s edge with the city. Thus, this leads to the dialogue on the local need of each day by the community living there versus the changes that are done to fulfill the global needs to Kumbh. Hence, this proposal aims to understand this dichotomy and proposes to create an interface between the two needs over time, establishing an ephemeral relationship of the city with the river. Kumbh is one of the few global level ephemeral mass gathering that engages the city in an spiritual yet transcendent space.

The thesis aims to investigate this relationship of the city with the river by proposing an urban water linkage through the redesign of the riverfront that not only fulfills the requirements of the community but also reduces the stress of the ghats during the Kumbh by accepting the spillover, creating an ephemeral character along the river. Rooted in the philosophy of reestablishing the connection between the city and its river, the design incorporates the historical wadas of Nashik- the remnants of its architectural legacy- into a comprehensive cultural trail. The wadas occupied by the artisans and residents of Nashik, serve as bridges to the Godavari, linking the people of the city to its soul, the river.

The objective of the thesis will be to renew the connection of the city with the river rethinking this threshold to make it the lung of the city through revitalized kunds, wadas, vibrant courtyards and community spaces establishing a seamless connection between the natural and the cultural, the sacred and the mundane. The design will aim to create a network of water linkages through the urban streets. These water linkages will connect the existing kunds and act as arteries to the final lung of the city, the river. Thus, a micro to macro connection is established through these urban water networks. This will be achieved by a thorough primary study of the site and engaging with the community and river to map the different requirements and elaborating the problems faced by both the river and the city. Literature studies will support the above findings. Case studies will provide a better understanding and insight to the strategies that can

be adopted to create a good design. Finally, a final design proposal outlining the strategies that can revitalize the selected precinct and in turn rejuvenate the river Godavari, creating a culture as well as ecologically sensitive proposal.

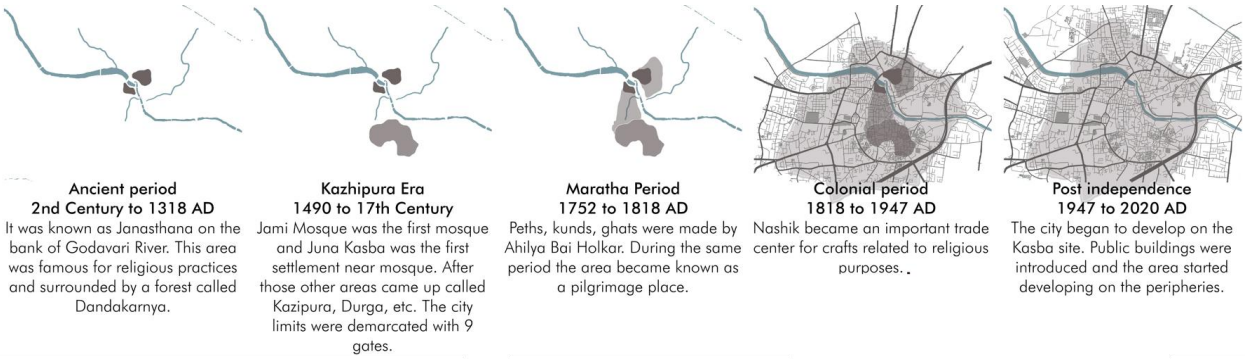


Figure 1 Timeline of Nashik

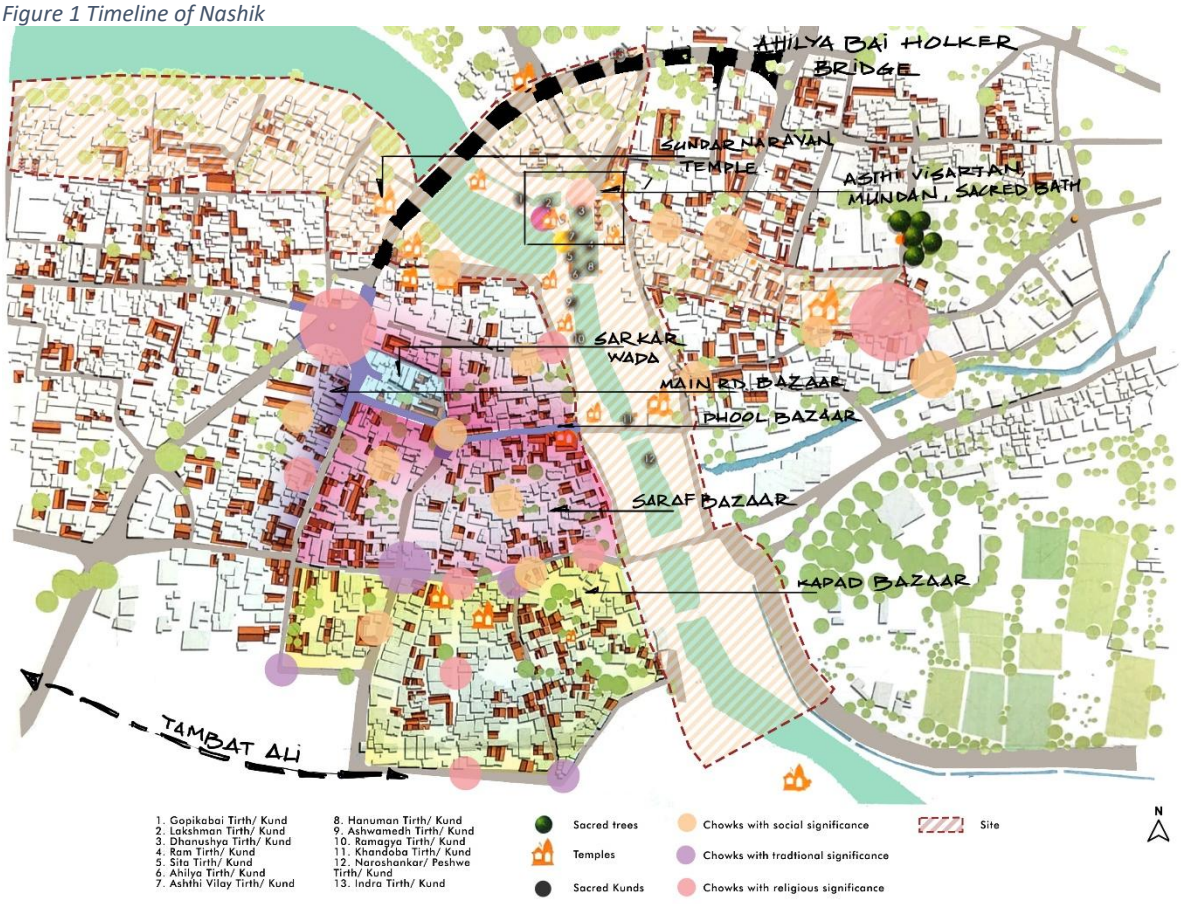


Figure 2 The sacred scape of Nashik

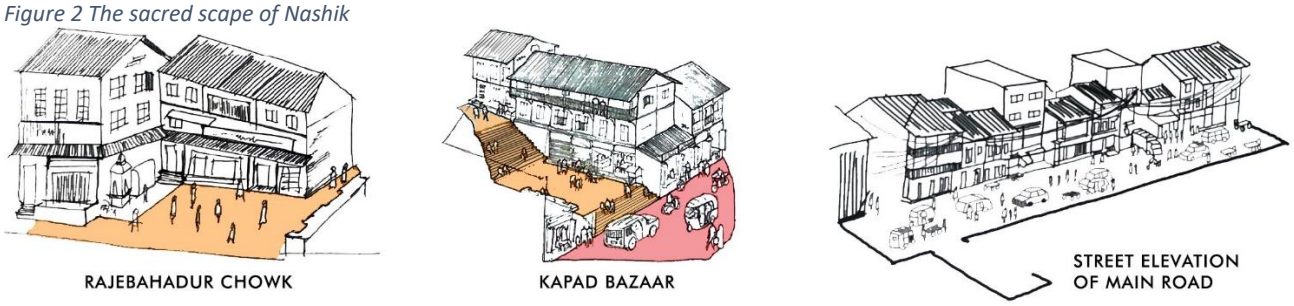


Figure 3 The architectural language of Nashik

The selected precinct is part of a strategic stretch identified by the Nashik Municipal Corporation for the proposed **redesign and revitalization of the Godavari riverfront**. This area holds immense potential as a focal point for ecological restoration, cultural rejuvenation, and community engagement, serving as a prototype for sustainable urban riverfront development. By addressing both environmental and social dimensions, the redesign aims to transform the riverfront into a vibrant public space that harmonizes Nashik's rich heritage with modern aspirations.

2.2 Reconnecting City and River: A Comprehensive Study of Urban-Riverine Relationships with Focus on Godavari in Nashik

The intricate relationship between rivers and cities has been foundational to human civilization's growth, with waterways serving as lifelines for urban development across millennia. This extended literature study explores the multifaceted dimensions of the Godavari River's relationship with Nashik city, examining both historical significance and contemporary challenges while proposing sustainable approaches for revitalizing this sacred bond.

2.2.1 Historical and Cultural Significance of Riverscapes in Urban Development

Rivers have historically been the cradle of human civilizations, particularly in India where urban centers like Benares, Patna, Ahmedabad, and Delhi emerged along riverbanks. These settlements developed in harmony with their respective rivers, creating communities that both relied on and contributed to the health of these waterways (Aditi Rakhe, et.al.,2022). The relationship between rivers and urban spaces transcends mere pragmatic utility, embedding itself into the cultural, religious, and social fabric of cities.

The Godavari River, affectionately known as "Amchi Godavari" (Our Godavari) by Nashik residents and reverently called "Vridha Ganga" (elder sister to Ganga), represents this profound connection. Originating at Brahmagiri hills in Tryambakeshwar of Nashik District in Maharashtra, the river flows through approximately 13 kilometers of Nashik city, creating a mesmerizing intersection of land and water (Bhamburdekar, 2025). This riverscape has shaped Nashik's identity as a sacred pilgrimage center, drawing thousands of devotees daily to its banks.

However, the contemporary reality reveals a disconnect between reverence and practice. As Dr. Kailas Kamod aptly observes, "Since the rivers are sacred for us, thus, there is a Ganga in our minds, and in reality, there is one another Ganga... Similarly, we celebrate the religiosity of Godavari symbolically... but we do not respect the materiality of the river... By elaborately emphasizing the religiosity of Godavari, we consider ourselves to be free to pollute the river in any way we want." (Botekar, 2025) This dichotomy between spiritual veneration and environmental degradation forms the central paradox in the river-city relationship.

2.2.2 The Sacred Geography and Cultural Landscape

Varanasi's example illustrates how cities develop unique identities through their relationship with rivers. The riverine planning strategy for this sacred city acknowledges it as a "blessed land" positioned above normal flood levels. The strategy incorporates soil management techniques to build "fingers" that enable water drainage during monsoons while supporting urban agriculture during the remainder of the year3. This approach demonstrates how traditional wisdom can inform modern urban planning solutions.

Similarly, Nashik's identity is inextricably linked to the Godavari. The city owes its recognition as an important religious center to this sacred river, which hosts the Kumbh Mela every twelve years. The riverbanks in Nashik feature a rich cultural heritage, including traditional structures like 'kunds' that served specific functions at the thresholds between city and river (Center, 2025). This cultural landscape forms a unique urban tapestry that merits preservation and revitalization.

2.2.3 Decline of Godavari: Anthropogenic Interventions & Environmental Consequences

The contemporary approach to river management in Indian cities marks a stark departure from historical practices. Urban development now follows a statist framework characterized by master plans and zoning regulations that impose strict controls on human activities in river floodplains1. While ostensibly aimed at environmental protection, these approaches often exclude traditional communities and disrupt established relationships with the river.

2.2.4 Concretization and Its Impacts

The Godavari in Nashik exemplifies the detrimental effects of inappropriate riverfront development. The 1992 Kumbh Mela marked a watershed moment when concretization began along Goda Ghat to address issues with the basalt bedrock. This process accelerated before the 2003 Kumbh Mela, with extensive re-concretization for beautification and safety purposes (A.D.Chavan, et.al.). These interventions destroyed riverine ecology and blocked 17 kunds with four natural springs, significantly reducing the river's width and altering its natural hydraulic flow (A.D. Chavan, et.al.).

The consequences of these actions became evident in 2008 when Nashik experienced one of its worst floods, attributed directly to the concretization of the riverbed (A.D. Chavan, et.al.). Subsequent droughts and floods, including notable events in 2016, further demonstrated the ecological damage caused by these interventions. Local experts identified the concretization of the riverbed and the confluence of major sewerage systems around Goda Ghat as primary factors in these environmental disasters (A.D. Chavan, et.al.).

2.2.5 Water Quality and Pollution

The deterioration of the Godavari extends beyond physical alterations to include severe water quality issues. The river faces pollution from untreated sewage, industrial waste, and general refuse entering the waterway daily (S.Chen, et.al., 2024). Despite significant investments in infrastructure—approximately Rs 400 crores for 300 kilometers of drainage under JNNURM and construction of sewerage treatment plants under AMRUT—these projects have failed to improve the river's condition (Dubey, 2024). These failures stem from fundamental planning oversights, including the lack of separated stormwater and sewerage drainage systems and disregard for the natural surface geomorphology of the city (Dubey, 2024). Consequently, sewerage infrastructure in Nashik's core discharges within 500 meters of the sacred Ram Kund, directly polluting this revered site (Dubey, 2024). Comprehensive water quality monitoring at four strategic locations along Nashik's Godavari stretch reveals critical contamination patterns:

1. **Gangapur Dam Downstream (Station 1):** Dissolved Oxygen (DO) levels plummet to 3.2 mg/L post-monsoon, against the CPCB standard of 6 mg/L for bathing waters (Dutta,et.al., 2021). This hypoxic condition correlates with algal

blooms from agricultural runoff containing NPK fertilizers (Nashik district uses 248 kg/ha of fertilizers annually)1.

2. **Someshwar Temple Segment (Station 2):** Biochemical Oxygen Demand (BOD) peaks at 28 mg/L during summer, exceeding the 3 mg/L permissible limit1. The contamination originates from 17 MLD of untreated sewage entering through the Nasardi nullah, carrying organic load from 45,000 households in dense urban ward (ET Hospitality, 2024).

3. **Ramkund Area (Station 3):** Fecal coliform counts reach 23,000 MPN/100mL during pilgrimage seasons (Dutta,et.al., 2021), directly linked to 22 ghats lacking proper sanitation facilities. The concrete-lined banks prevent natural filtration, creating pathogen reservoirs.

4. **Gangawadi Downstream (Station 4):** Total Dissolved Solids (TDS) escalate to 1,842 mg/L near industrial clusters (ET Hospitality, 2024), reflecting effluents from 127 registered SMEs discharging heavy metals (lead: 0.48 mg/L, chromium: 0.32 mg/L). This mineral loading increases water treatment costs by 40% for downstream users like the Nashik Thermal Power Station.

The pollution matrix demonstrates spatial-temporal variations: 68% of contamination loads occur during monsoon runoffs, while 55% of toxic pollutants manifest in low-flow summer months (Follmann 2014). This duality complicates remediation strategies, requiring seasonally adaptive treatment protocols.

2.2.6 Hydrological Transformations and Their Urban Implications

The Godavari River's hydrological regime has undergone significant transformations due to anthropogenic interventions, particularly in the Nasik region. The construction of Gangapur Dam in 1954, with an initial storage capacity of 204.07 million cubic meters (MCum), now holds only 159.42 MCum due to siltation – a 22% reduction in water-holding capacity(Gujral & Kaur, 2019). This sediment accumulation alters floodplain hydrology, reducing groundwater recharge rates critical for maintaining baseflows during dry seasons. The dam's operations prioritize urban water supply (reserving 136 MCum for Nashik Municipal Corporation and MIDC) (G.Initiative, 2025), creating a systemic bias toward urban needs over ecological flows.

Concurrently, Nashik's water distribution network spans 2,100 km of pipelines (M.R. Patel, et.al. 2020), yet faces 40-50% non-revenue water (NRW) losses from leakages and illegal connections (M.R. Patel, et.al. 2020). This inefficiency exacerbates demand pressures on the Godavari, forcing increased withdrawals that disrupt the river's natural discharge cycles. The city's water audit initiatives reveal that 12 ESR (Elevated Service Reservoir) zones exhibit NRW patterns mirroring the broader urban system, with flow measurements showing 35% physical losses in aging distribution infrastructure (M.R. Patel, et.al. 2020). Such systemic losses create a paradox: while the city struggles with water distribution efficiency, riverine ecosystems bear the burden of compensatory over-extraction.

2.2.7 Institutional Frameworks and Governance Challenges

The Godavari River Management Board (GRMB), established under the 2016 Godavari Water Disputes Tribunal, faces jurisdictional complexities in Nashik:

- **Multi-Agency Overlaps:** 14 agencies including MPCB, NMC, MIDC, and Irrigation Department share management responsibilities
- **Policy Conflicts:** JNNURM's focus on concrete infrastructure (₹60 crore for walkways) (PrcIndia, 2024) vs. NMC's 2017 River Policy emphasizing natural buffers
- **Data Silos:** Water quality data from MPCB, flow data from Irrigation Department, and urban usage stats from NMC remain unintegrated

The Godavari Initiative (TGI)'s 2024 Nashik Regional Consultation marked progress, bringing together 87 stakeholders from industries, NGOs, and academia (Ritika Rajput, 2022). Key outcomes included:

- Consensus on IoT-based water quality monitoring (12 sensors deployed)
- Corporate Social Responsibility (CSR) commitments of ₹18.7 crore for wetland restoration (Ritika Rajput, 2022)
- Farmer Producer Organizations (FPOs) adopting organic farming across 640 ha riverside lands (Ritika Rajput, 2022)

However, institutionalizing these partnerships remains challenging due to electoral cycles and shifting bureaucratic priorities.

2.3 Riverfront Development Models in India: Critical Perspectives

Riverfronts have emerged as focal points for urban development initiatives across India, with varying approaches and outcomes. These projects often aim to beautify cities and channel rivers for recreational purposes, particularly catering to middle-class aesthetics and leisure activities (S. Sadeghfam, 2025).

2.3.1 The Sabarmati Model and Its Limitations

The Sabarmati Riverfront Development Project in Ahmedabad, Gujarat has been widely touted as a successful model for river revitalization. However, critical examination reveals significant ecological and social shortcomings. The project has allegedly exacerbated drought-like conditions in the Sabarmati River and led to inadequate groundwater recharge (S. Sadeghfam, 2025). These cost-intensive riverfront development projects alter the natural course and ecosystem of rivers while raising questions about the misallocation of public investments (S. Sadeghfam, 2025).

Environmental activist Himanshu Thakkar from South Asia Networks on Dams, Rivers and People (SANDRP) has warned against prioritizing cosmetic beautification over genuine restoration and revitalization (S. Sadeghfam, 2025). The experience with the Sabarmati project demonstrates how development models that focus primarily on aesthetic and recreational considerations can undermine ecological sustainability.

The Sabarmati Riverfront Development (SRFDCL) in Ahmedabad diverted 28,000 million liters annually from the Narmada Canal to maintain a permanent 11.25 km channel9. While creating 185 ha of real estate worth ₹40,000 crore, it (L. Sarbu, 2021):

- Increased groundwater salinity by 35% due to reduced recharge
- Displaced 14,000 families to housing 9 km from original settlements
- Reduced riparian biodiversity from 127 to 39 avian species

These outcomes inform Nashik's planning – the proposed Godavari riverfront must balance hydraulic engineering with sediment transport dynamics. The river's natural slope of 0.72 m/km necessitates minimum environmental flows of 15-20% MAF (Mean Annual Flow) to prevent channel incision, unlike Sabarmati's static water approach.

2.3.2 Nanded Model: Integrated Ecological Zoning

The Godavari riverfront development in Nanded (Maharashtra) employs a five-zone spatial strategy across 5 km stretches (L. Sarbu, 2021):

- **Zone 1:** Heritage precinct with restored ghats and pedestrian promenades
- **Zone 2:** Eco-sensitive buffer with constructed wetlands
- **Zone 3:** Mixed-use development with controlled FSI (1.5)
- **Zone 4:** Riverine agriculture belt using treated wastewater
- **Zone 5:** Biodiversity park with native species plantation

This zoning reduced floodplain encroachment by 38% through strategic land acquisition and created 22 ha of new green buffers. However, the project displaced 1,240 informal settlers to peripheral locations, replicating Ahmedabad's Sabarmati model's social equity challenges(S. Simons, 2023).

2.3.2 The Godavari Riverfront Development Initiatives

In Nashik, the Godavari riverfront development was initially brought under the Jawaharlal Nehru National Urban Renewal Mission (JNNURM), with stormwater drainage as a key component of the city development plan. The Rs 60 crore first phase included construction of a 2.5-kilometer concrete walkway, following the Sabarmati model. However, the 2008 flooding highlighted the limitations of this approach.

Subsequent interventions continued despite these warning signs. In 2013, development was transferred to the Reliance India Foundation due to funding constraints, and the company began developing the Goda Park in 2014. Re-concretization occurred again before the 2015 Kumbh Mela, followed by droughts and floods in 2016 that exposed the concrete riverbed and demonstrated the harmful effects of these interventions(S. Simons, 2023).

The selection of Nashik under the Smart City Mission (SCM) brought renewed focus on riverfront infrastructure, with proposals for redeveloping the Godavari riverfront with promenades, boating facilities, and beautification of Goda Ghat to attract tourists. However, de-concretization efforts remained symbolic, with only four out of 17 kunds restored, while extensive concretization continued in other areas, prompting one resident to observe: "Call it smart or stupid, they are just concretising it." (Satsang Foundation, 2024).

2.4 Traditional Urban Forms and Their Relationship with Rivers

2.4.1 Wadas: Architectural Heritage of Maharashtra

Wadas represent a rich architectural tradition in Maharashtra, reflecting the pride, religion, culture, traditions, and history of the Maratha people. These traditional housing forms now serve as cultural and architectural heritage sites. The distinctive design elements of wadas—including their spatial planning, ornamentation, fenestrations, and religious influences—contribute to Maharashtra's unique architectural identity (S. Simons, 2023).

In Nashik, wadas create an intricate network around the Godavari, forming the historic tapestry of the city. Each wada functions as a timeless artifact of architecture and community, connecting residents to their heritage through intricately carved facades and communal courtyards. These structures house generational artisans known for their filigree, silverware, metalwork, and metal embossing, serving as cultural bridges between the city and the river.

2.4.2 Kunds and Ghats: Ritualistic Interfaces

The traditional kunds along the Godavari in Nashik served as vital thresholds between the city and the river, facilitating various community functions. Over time, many of these kunds have been concretized, particularly to accommodate the large crowds during Kumbh Melas in 2003 and 2015. This modification has disrupted both the tangible aspects of the river-city relationship (causing flooding during monsoons and droughts in summers) and the intangible connection between the riverbank and urban fabric.

The Godavari Initiative has worked to restore some of these traditional water structures. Their team has desilted six ancient kunds and one well, with several already showing signs of revival and providing water to human settlements and wildlife on Brahmagiri, the river's source (PrcIndia, 2024). These efforts demonstrate the potential for revitalizing traditional water systems as part of a comprehensive approach to river restoration.

2.5 The Dichotomy Between Daily Use and Periodic Events

2.5.1 Kumbh Mela and Its Impacts on Urban Planning

The Kumbh Mela in Nashik presents a unique planning challenge, requiring infrastructure that can accommodate millions of visitors during a brief period while remaining relevant for everyday use by local residents. This tension between local and global needs has driven many of the riverfront modifications, particularly the extensive concretization before the 2003 and 2015 events. The Kumbh Mela of 2015 demonstrated both positive and negative aspects of event-driven urban transformation. While the city achieved unprecedented cleanliness during the festival, the permanent modifications to accommodate the event have had lasting environmental consequences (Sahapedia, n.d.). This highlights the need for more flexible, adaptive approaches that can accommodate periodic mass gatherings without compromising everyday ecological functions.

2.5.2 Cultural Hydrology: Ritual Practices and Hydrological Impacts

Nashik's Kumbh Mela, hosting 30 million pilgrims over 49 days, imposes unique hydrological stresses (Botekar, 2025):

- **Water Withdrawals:** 45 MLD extra demand during peak days, drawing down reservoir levels by 1.2 m
- **Ritual Offerings:** 18 tonnes/day of organic matter (flowers, coconut husks) increasing BOD by 6 mg/L
- **Footfall Erosion:** 12 cm sediment displacement at major ghats per event, altering channel morphology

The 2015 Mela's "Clean Godavari Campaign" temporarily reduced pollution through 5,000 community volunteers and 22 mobile STPs, but post-event monitoring showed pollutant rebounds within 90 days. This illustrates the conflict between ephemeral event management and sustained river stewardship.

2.5.3 Daily Community Needs and River Health

The everyday relationship between Nashik's residents and the Godavari involves various activities including bathing, worship, and leisure. However, the decline in water quality and access has strained this relationship. The question posed by a young participant in a 2017 river walk—"Is our Godavari really dead?"—reflects growing community concern about the river's condition (Aditi Rakhe, et.al., 2022).

Addressing daily community needs requires attention to water quality, access, and the cultural significance of the river. The farmers of Bela Estate who once thrived along the Yamuna's banks but now face eviction due to riverfront development projects illustrate the human cost of interventions that prioritize aesthetics over traditional livelihoods. Similarly, in Nashik, urban development should consider the needs of communities who have long-standing relationships with the Godavari.

2.6 Towards Sustainable Riverfront Development: Integrated Approaches

2.6.1 Ecological Restoration and Nature-Based Solutions

Sustainable riverfront development must prioritize ecological restoration alongside recreational and aesthetic considerations. The Godavari Initiative (TGI) exemplifies this approach with its five-pronged strategy designed to protect and restore the river's health while empowering local communities and fostering sustainable practices.

Nature-based solutions offer promising alternatives to conventional engineering approaches. TGI promotes such solutions by sharing expertise and insights through their knowledge repository. These approaches work with ecosystems rather than against them, using natural processes to address water management challenges. Examples include planting trees along riverbanks to prevent erosion, restoring wetlands to filter pollutants, and recharging aquifers to ensure long-term water security (Aditi Rakhe, et.al., 2022).

2.6.2 Community Engagement and Collective Action

Successful river restoration requires active community involvement. TGI demonstrates this principle by bringing together corporates, government agencies, and civil society to address water challenges through collective action. Their Nashik Regional Consultation in September 2024 brought together diverse stakeholders including industrial bodies, government officials, and corporate representatives to tackle the ecological challenges facing the Godavari (Chen, et.al., 2024).

This collaborative approach recognizes that river health depends on the actions of multiple stakeholders across various sectors. As Navdeep Singh Mehram, Head of CSR & Sustainability at Diageo India, noted: "Initiatives like this consultation are critical because they bring together government, industries, nonprofits, academia, and communities—to collaborate on practical solutions."

2.6.3 Urban Water Linkages and Network-Based Approaches

The concept of urban water linkages offers a promising framework for reconnecting cities with their rivers. This approach views water systems as networks that can be integrated into urban fabric, creating connections between various water bodies and the main river. In Nashik, this could involve connecting the existing kunds through water channels that serve as arteries leading to the Godavari, establishing a micro-to-macro connection through urban water networks.

The Godavari riverfront development proposal for Nashik has included various components aimed at creating a unified waterfront, such as riverfront roads with parking and public amenities, promenades at the river edge, treatment of polluted drain channels, community spaces, sports centers, fair grounds, urban ghats, commercial development, and water transport options. However, these elements must be designed with ecological sensitivity and community input to avoid the pitfalls of previous interventions.(Diageo, n.d.)

2.7 Recent Initiatives and Future Directions

2.7.1 The Godavari Initiative: A Multi-Stakeholder Approach

The Godavari Initiative represents an innovative approach to river basin management through multi-stakeholder collaboration. Launched with Shri Mukesh Sinha, Chairman of the Godavari River Management Board, TGI aims to enhance the resilience of the Godavari Basin in Maharashtra through collective action, knowledge sharing, and sustainable water management practices (Aditi Rakhe, et.al., 2022).

TGI's vision aligns with global priorities for water stewardship, recognizing the Godavari as one of eight key river basins in India requiring focused attention. The initiative works within the framework of the UN Global Compact's CEO Water Mandate, driving sustainable solutions in river basin management while addressing critical water challenges and enhancing regional resilience.

2.7.2 Funding and Policy Support

Securing adequate funding and policy support remains crucial for comprehensive river restoration. Recent efforts by Nashik MP Rajabhau Waje illustrate this need. In March 2025, Waje met with Jalshakti minister C.R. Patil to request funds for a Godavari clean-

up program modeled after the Namami Gange project. The proposed Rs 2,700 crore package would fund sewage treatment plants, diversion of water from 27 nullahs to treatment facilities, common effluent treatment plants in industrial areas, and measures to prevent pollution in Trimbakeshwar town. Such funding could support comprehensive approaches including plantation efforts, riverfront development with entertainment spaces, and nature trails to prevent misuse of riverside spaces. These initiatives demonstrate growing recognition of the need for substantial investment in river restoration. (A. Dubey, 2024)

2.7.3 Educational and Community Initiatives

Educational initiatives play a vital role in fostering environmental awareness and community stewardship. The Aviral Godavari team has conducted My Tree workshops in 22 schools to enhance students' understanding of the importance of trees, distributing over 1,600 saplings for students to maintain for future greening projects on Brahmagiri. These efforts build environmental consciousness among younger generations while creating tangible resources for ecological restoration.

Community-led approaches have also emerged, as demonstrated by the Gram Panchayat Dari, a predominantly tribal community that developed an innovative system for wastewater management. Their solution combines five leach pits with plantings of Kardal (Canna indica) to naturally filter wastewater, simultaneously creating sustainable livelihoods for six tribal families who now cultivate and sell these flowers in local markets (Aditi Rakhe, et.al., 2022). This model shows how ecological restoration can be integrated with economic empowerment.

2.8 Reconnecting the City with its Lifeline

The relationship between Nashik and the Godavari exemplifies both the challenges and opportunities in urban-riverine interactions. Decades of inappropriate development have strained this relationship, leading to environmental degradation and community disconnection. However, emerging initiatives demonstrate the potential for restoration through holistic approaches that integrate ecological, social, and cultural considerations.

The proposed framework for urban water linkages, revitalization of traditional structures like wadas and kunds, and creation of community spaces along the

riverfront offers a promising path forward. By establishing a seamless connection between the natural and cultural, the sacred and mundane, Nashik can renew its bond with the Godavari, transforming the river once again into the lung of the city.

This approach recognizes rivers not merely as resources to be exploited or ornamental features to be beautified, but as living systems that sustain urban life in multiple dimensions. Through thoughtful design that respects ecological processes, honors cultural heritage, and engages communities, Nashik can create a model for sustainable urban-riverine relationships that serves both everyday needs and periodic celebrations like the Kumbh Mela.

The question posed by that young participant—"Is our Godavari really dead?"—need not be answered in the affirmative. With committed collective action, informed by traditional wisdom and contemporary science, the Godavari can once again flow vibrantly through Nashik, nourishing both the land and the cultural life of this historic city.

Chapter 3: Site Analysis

3.1 Introduction

Nashik, a cultural city, shaped by the sacred Godavari River and the dynamic character of the Kumbh Mela along the river, exists at the crossroads of tradition and modernity. The thesis aims to investigate this relationship of the city with the river by proposing a cultural community centre along the stretch of the Godavari River, that not only fulfills the requirements of the community but also reduces the stress of the ghats during the Kumbh by accepting the spillover, creating an ephemeral character along the river. Rooted in the philosophy of reestablishing the connection between the city and its river, the design incorporates the historical wadas of Nashik into a comprehensive cultural trail. The wadas occupied by the artisans and residents of Nashik, serve as bridges to the Godavari, linking the people of the city to its soul, the river.

Paths meandering through revitalized kunds, vibrant courtyards, and tranquil riverfronts establish a seamless connection between the natural and the cultural, the sacred and the mundane.

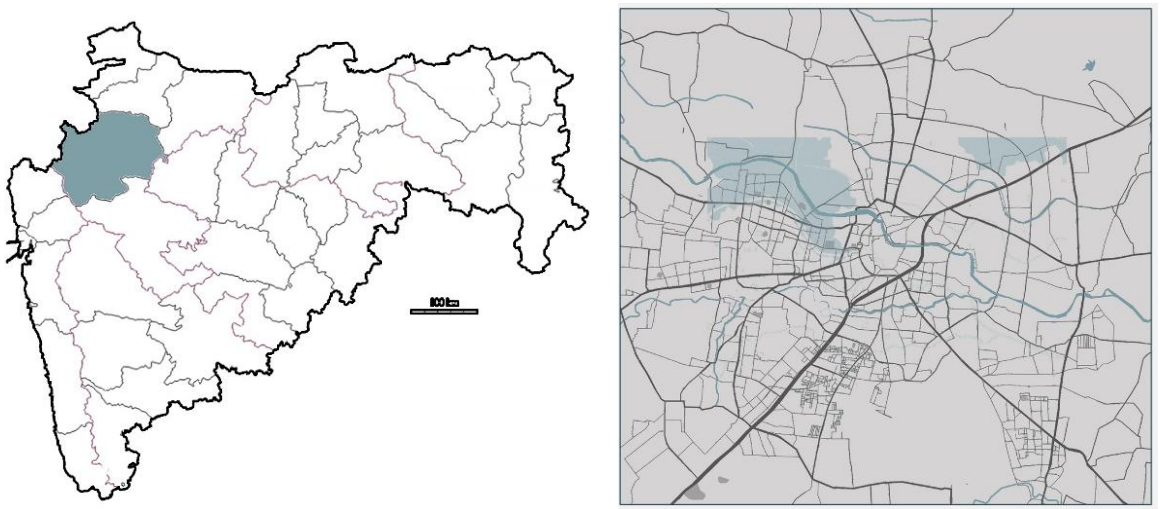


Figure 4 (a) Maharashtra and Nashik district (b) Nashik city

The project aims to revitalize the Godavari through careful restoration of the riverfront, giving due importance to the rejuvenation of the lost Kunds of the city due to concretization and an appreciation for local craftsmanship, all while safeguarding the essence of the city. This proposal aims to transform Nashik into more than just a destination; it seeks to present the city as a dynamic narrative, where architecture, heritage, and humanity intersect harmoniously with the ecology and making the river the lung of the city.

Figure 5 Infographic showing the culture and architecture of the Godavari precinct in Nashik

3.2 Precinct level analysis

3.2.1 Built use mapping

The built use mapping of Nashik shows the morphology of the precinct selected. The selected precinct is located in the old city core of Nashik city. The constructed environment along the Godavari River area in Nashik exhibits a dense and organically developed urban fabric, predominantly characterized by residential and mixed-use residential-commercial edifices. Residential areas are distributed over the precinct, whereas mixed-use structures border the principal streets and riverbanks, fostering dynamic street-level engagement. The region is economically and culturally vibrant, featuring dense concentrations of commercial enterprises like as garment stores, jewellery and metal workshops, dairy and confectionery shops, and small-scale businesses, especially along the eastern riverbank. This area contains a dense network of temples, underscoring its significance as the spiritual and ritualistic nucleus of the city, whereas mosques are more scattered throughout the residential landscape. Community centers are strategically situated near cultural districts, although their quantity is restricted. Institutional edifices, including public offices and educational facilities, are dispersed, providing fundamental civic assistance. Amenities such as hotels, restaurants, and hospitals are located along main thoroughfares and in proximity to significant religious sites, serving both locals and pilgrims. The map also delineates many clusters of wadas—traditional courtyard houses—recognized as

important heritage assets with potential for adaptive reuse. Nevertheless, there exist areas of derelict edifices and informal encampments, particularly adjacent to the river, indicating both prospects and obstacles in urban revitalisation. The existing design does not provide a continuous, accessible riverside, which corresponds with the thesis's objective to restore the people-water interface and enhance the connection among nature, culture, and society.

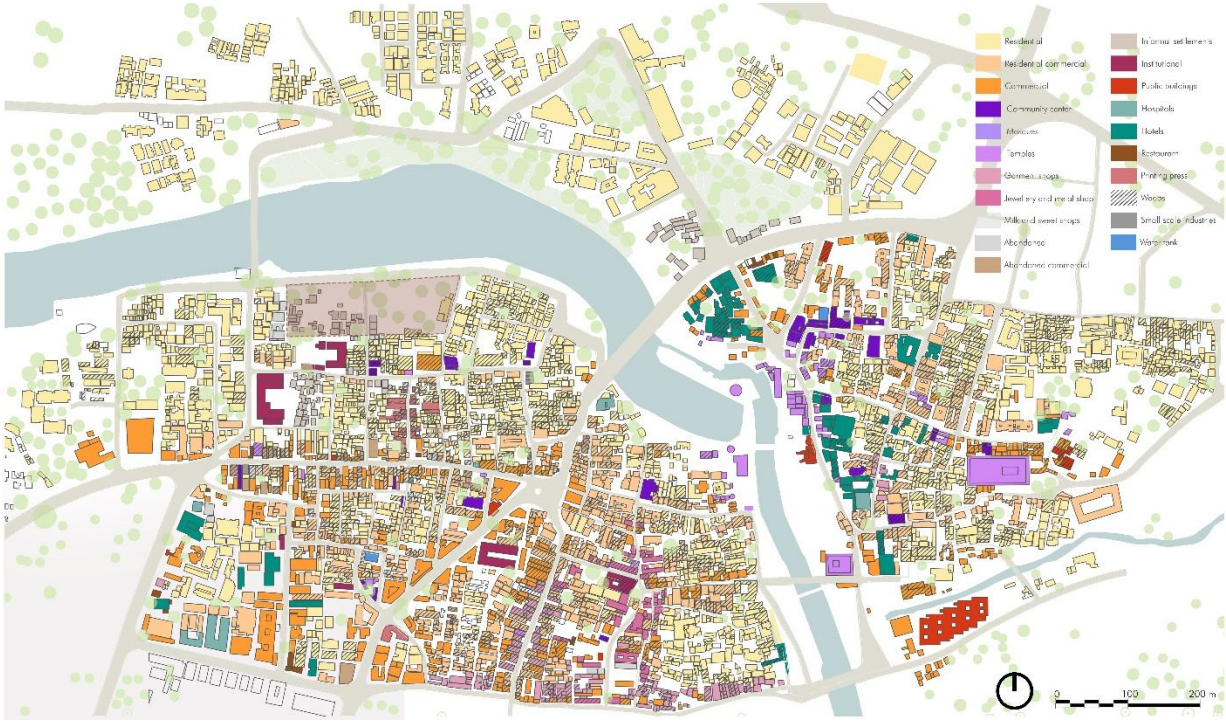


Figure 6 Built use mapping

3.2.2 Types of wadas in the area

This map depicts the spatial distribution and classification of wadas—traditional courtyard houses—in the Godavari River area of Nashik, organized according to their architectural design and courtyard presence. The typology comprises four primary categories: wadas with courtyard, wadas without courtyard, *neeche dukaan upar makan* (shop below, house above) with courtyard, and *neeche dukaan upar makan* without courtyard. The greatest density of traditional wadas, particularly those including courtyards, is found along the densely populated eastern riverbank and in areas near significant religious and commercial hubs, indicating their historical importance and prominence. Wadas featuring internal courtyards exemplify a traditional architectural adaptation to climate, privacy, and communal engagement, whereas those lacking courtyards may signify alterations, increased density, or less land area. The typology of ground-floor shops with upper-floor residences, particularly

those lacking courtyards, predominates along commercial corridors and street peripheries, reflecting a synthesis of economic activity and habitation—a crucial element of Nashik's mixed-use urban identity. The existence of these many wada forms indicates a morphologically complex and culturally nuanced community, presenting substantial opportunities for conservation and adaptive reuse in precinct-level revitalization methods.

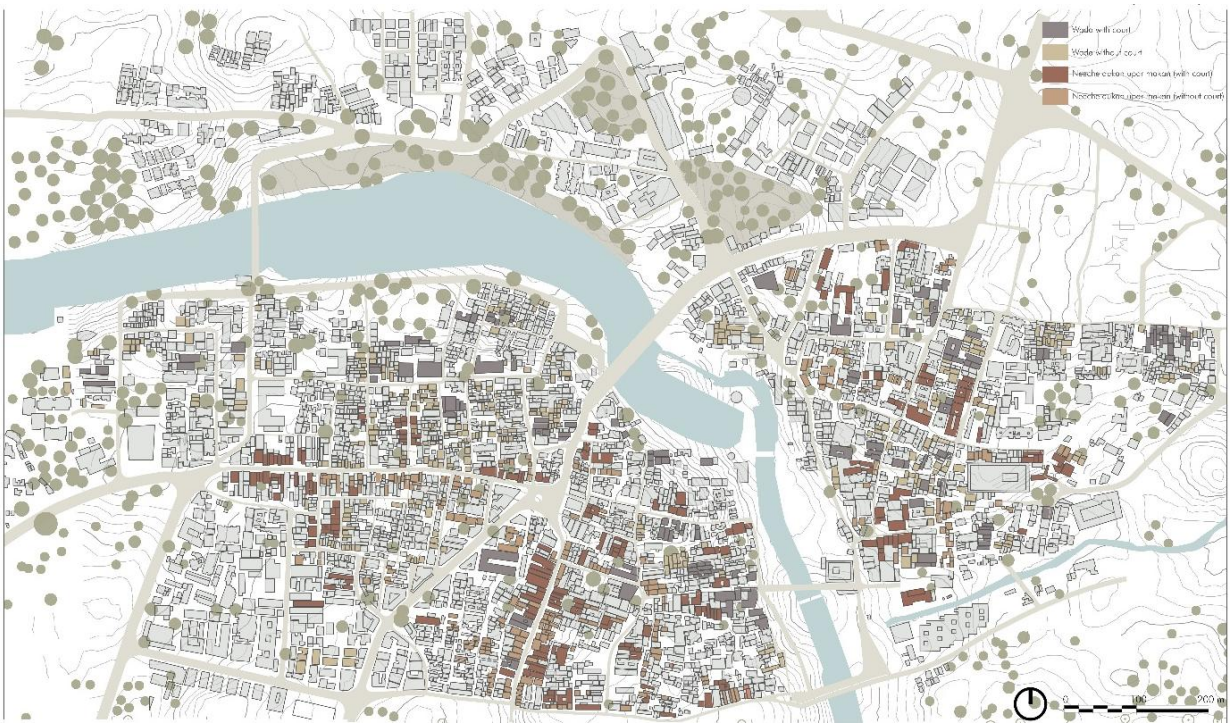


Figure 7 Types of Wadas in the precinct

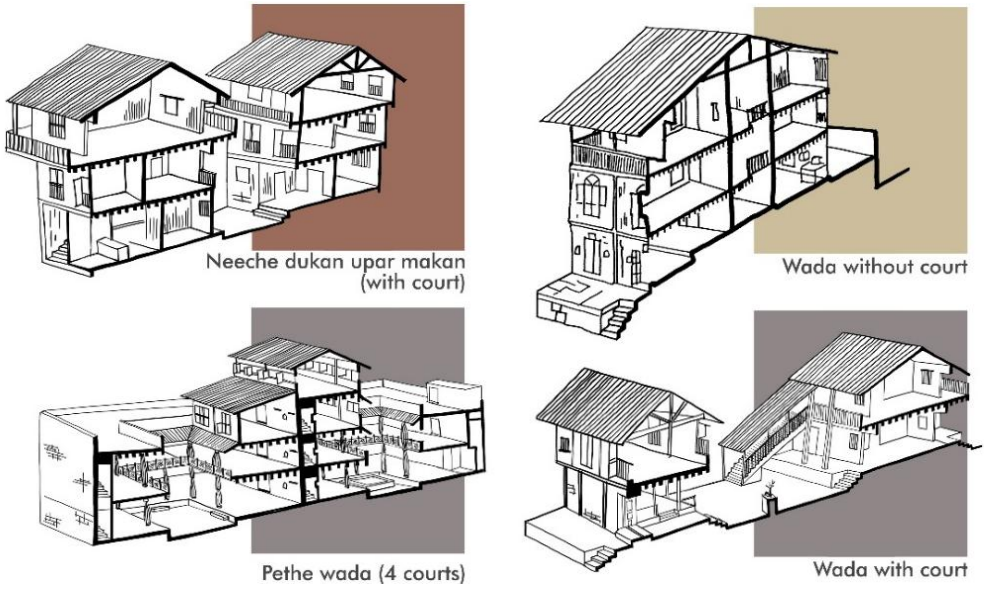
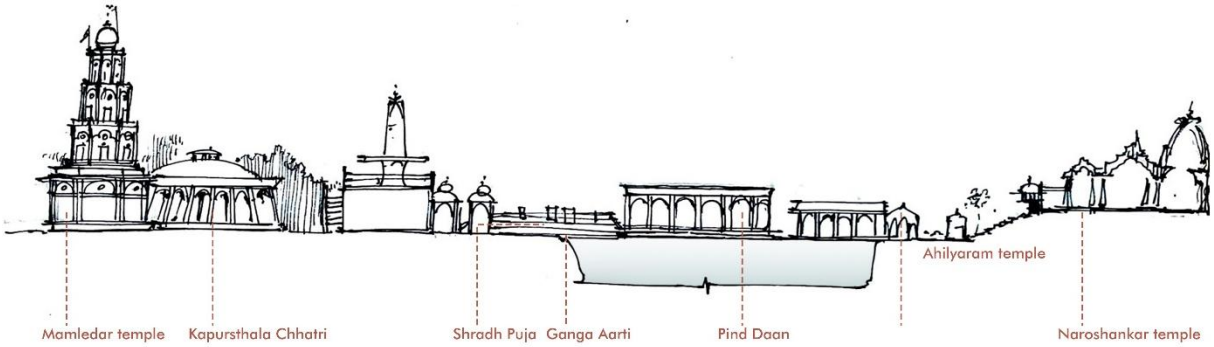
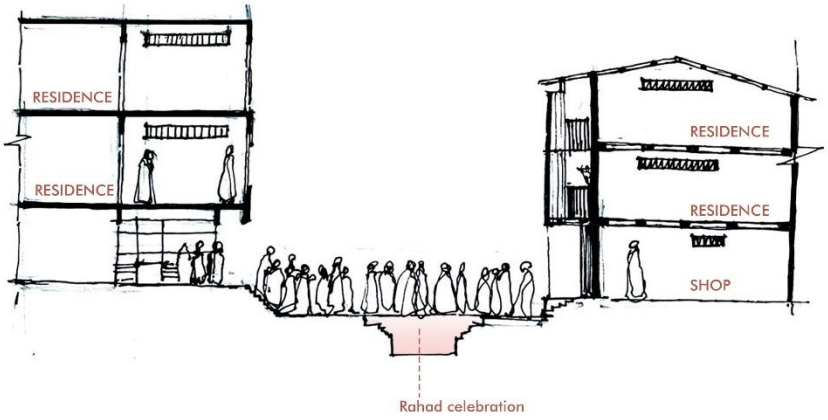


Figure 8 Illustration showing sections of the different types of wadas

Bhadrakali defined from Dahipul ro the river., from Somwar Peth and from Gadge Maharaj Pul named after Pandit Nehru. The fruit market area defines one road goes to Balaji Wada and other to Chitranghanta Tek. Known for Loksatta Chakhana belonging to the Kelkars.



The spirituality and the sacredness of the Godavari lure thousands of the devotees everyday along the banks of Godavari in Nashik. This ghat has significance importance in Hindu mythology as Lord Ram is aid to have taken bath in this ghat during his stay in Nashik (Panchavati). This ghat is the epicentre of every 12 years during Kumbh Mela. Historically, there used to be kunds near the river ehich had particular functions. Over the years, these have been concretised, making the river narrower.



Rahad means a stepped well filled with coloured water, it's constructed all over the core city. There were total 18 of them from which 4 still remain. Every year after Rangpanchami, the rahad is filled with mud, wooden planks and other stuff and packed. So before Randpanchami this is excavated once again and cleaned thoroughly.

Figure 9 Sections showing interaction between built, unbuilt spaces and the community

3.2.3 Activity mapping

The Godavari River, a lifeline and a cultural emblem, has become a space of paradoxical engagement. While the river holds immense cultural and historical significance, the activities along its edge reveal a growing disconnect between the river, the city, and its inhabitants.

Cultural activities, festivals, and rituals, which historically brought people closer to the river, are now overshadowed by urban functionality. The riverbank, instead of being a vibrant community space, has transformed into a parking zone, prioritizing vehicular convenience over human connection with nature. This shift has diluted the intrinsic relationship between the river and the city, creating a divide that hinders the flow of both cultural vitality and ecological balance.

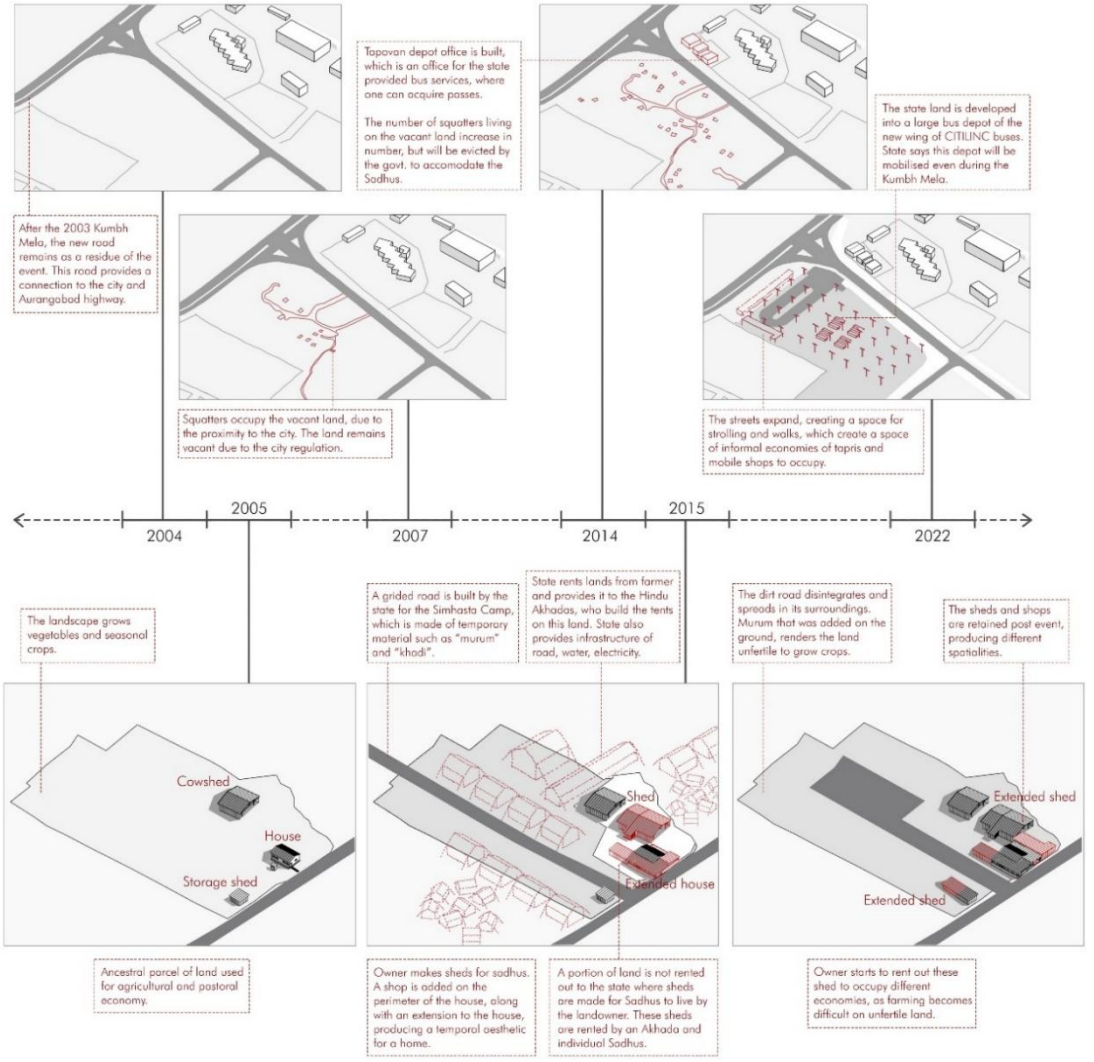
This activity mapping illustrates a vibrant yet disjointed socio-cultural environment along the Godavari River area in Nashik, highlighting the contrast between entrenched traditions and developing urban challenges. The map delineates three principal temporal zones of utilization—morning rituals, all-day activities, and evening congregations—that influence the riverfront's daily cadence.

Historically, the river functioned as a sacred and communal area where individuals congregated for praying, bathing, laundering, conducting rites, and participating in minor commerce. Nonetheless, this inherent cultural linkage has waned due to the growing use of vehicles and practical land utilisation, exemplified by parking lots that currently occupy excellent riverfront locations.

Markets like Kapad Bazaar, Rajebahadur Chowk, and Dashbhua Ganpati Chowk serve as vital community hubs but are hindered by overcrowding, encroachments, and insufficient pedestrian-friendly infrastructure. The illustrative mapping of activities such as street vending, meal preparation, religious events, and informal trade demonstrates a vibrant yet chaotic public sphere. Although the area preserves robust cultural traditions, the vibrancy of the riverside is compromised by disorganised urban developments, necessitating a reevaluation as a community-centric commons that restores equilibrium among water, inhabitants, and locale.

Figure 10 Activity mapping of the precinct

3.2.4 Kumbh character and built height mapping



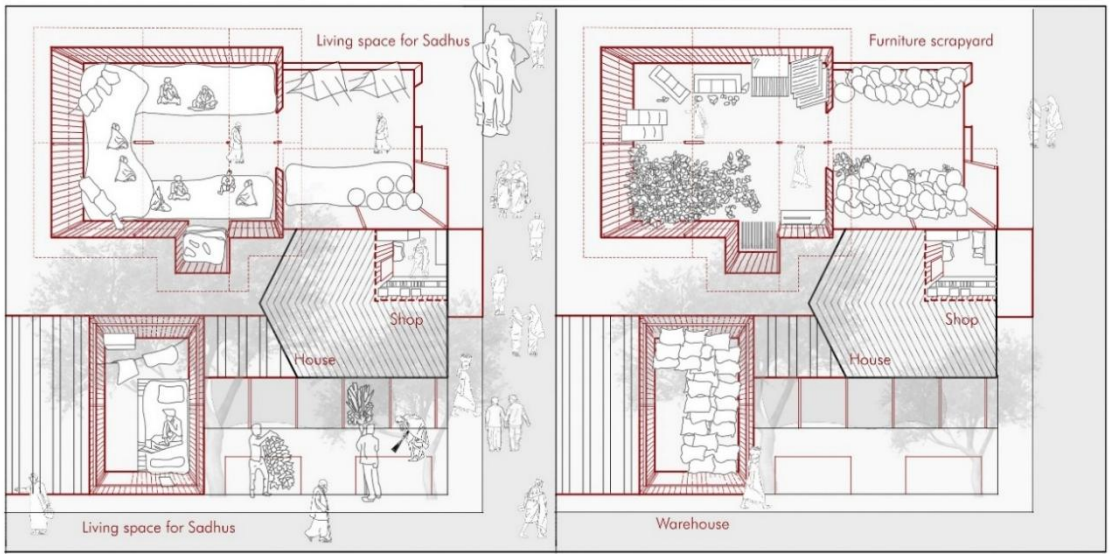


Figure 11 Timeline showing changes in street and house through the years
Figure 12 Spatiality of the house during and post event

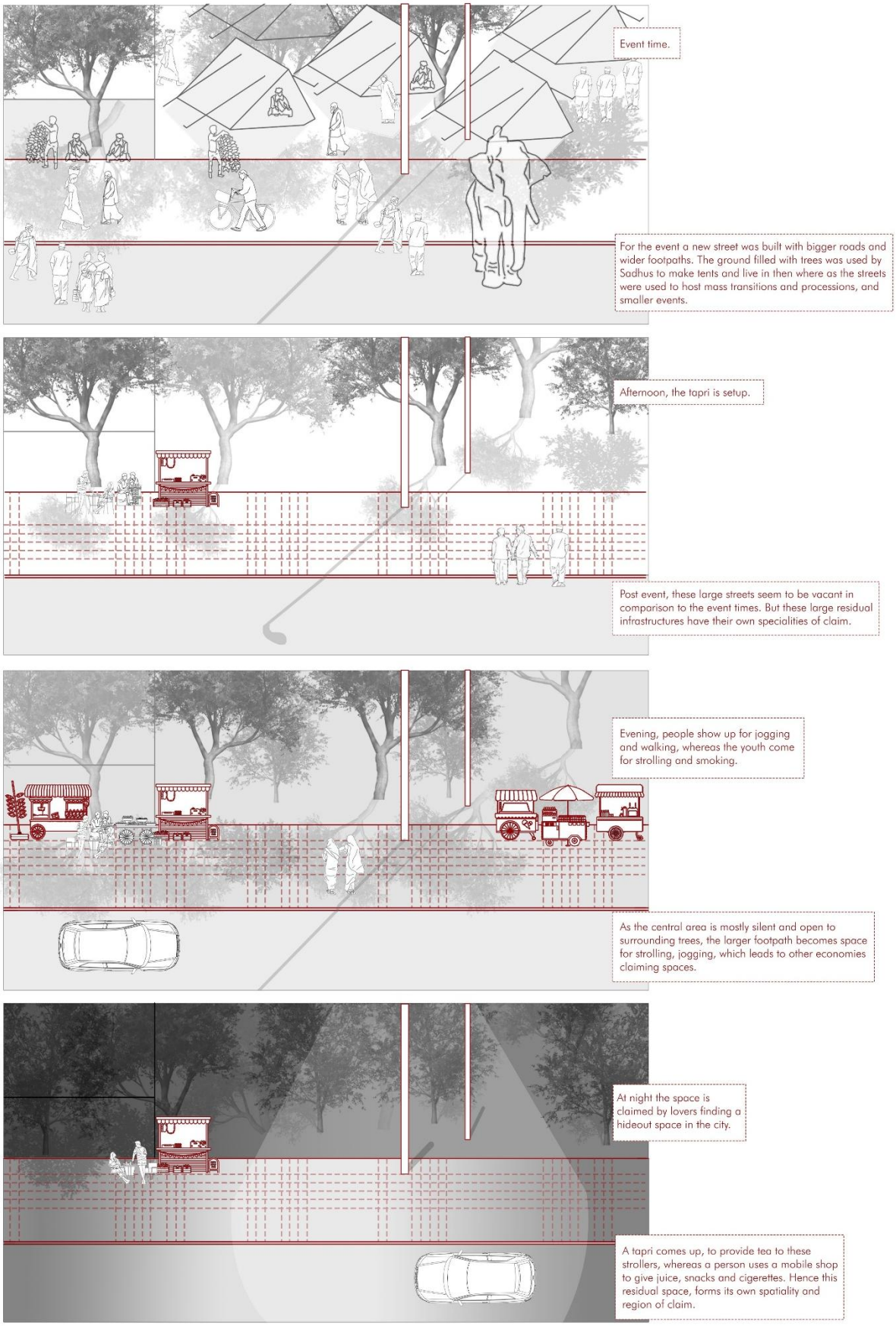


Figure 13 Spatiality of street during and post event

The Kumbh character depiction examines the spatial and temporal evolution of the riverfront region during and subsequent to the Kumbh Mela, one of the greatest religious assemblies globally. It emphasizes how streets and residences transform in function and structure to accommodate the substantial inflow of attendees at the event. The diagrams illustrate the transformation of once cozy, shaded lanes into vehicle-dominated corridors, substituting soft edges with paved surfaces throughout timelines and portions. Informal commerce flourishes during the event, blurring the boundaries between public and private spheres.

Residences transition from private sanctuaries to transient accommodations, with living rooms reallocated for Sadhus and pilgrims. The adaptability of the constructed environment is seen in the removal of furnishings and the conversion of house fronts into business interfaces. Street segments exhibit a lively stratification of activities during Kumbh; nevertheless, they also signify a post-event inertia as dynamic social engagement yields to static vehicular dominance. This temporality highlights the profound cultural importance of the event while simultaneously challenging the inadequate infrastructure to sustain its legacy throughout the year.

Simultaneously, the built height map provides an extensive overview of the area's vertical composition, categorizing edifices according to their height—from single-story to multi-story buildings. The spatial distribution indicates a dense center adjacent to the river, characterized by a predominance of 2- and 3-story edifices, exemplifying a conventional urban architecture that harmonizes accessibility with compactness. Taller edifices often congregate around significant religious or commercial areas, signifying nodes of elevated activity or economic relevance.

Concurrently, periphery regions exhibit greater dispersion, typically featuring single-story dwellings or smaller-scale buildings, indicating a gradient of urban intensity. This stratification of building height not only mirrors socio-economic disparities but also highlights vulnerabilities during events such as the Kumbh, where crowd accommodation and infrastructural stress are exacerbated in denser areas. The map and graphics advocate for a more adaptive, stratified urban strategy that respects cultural dynamics while promoting sustainable and inclusive urban development.

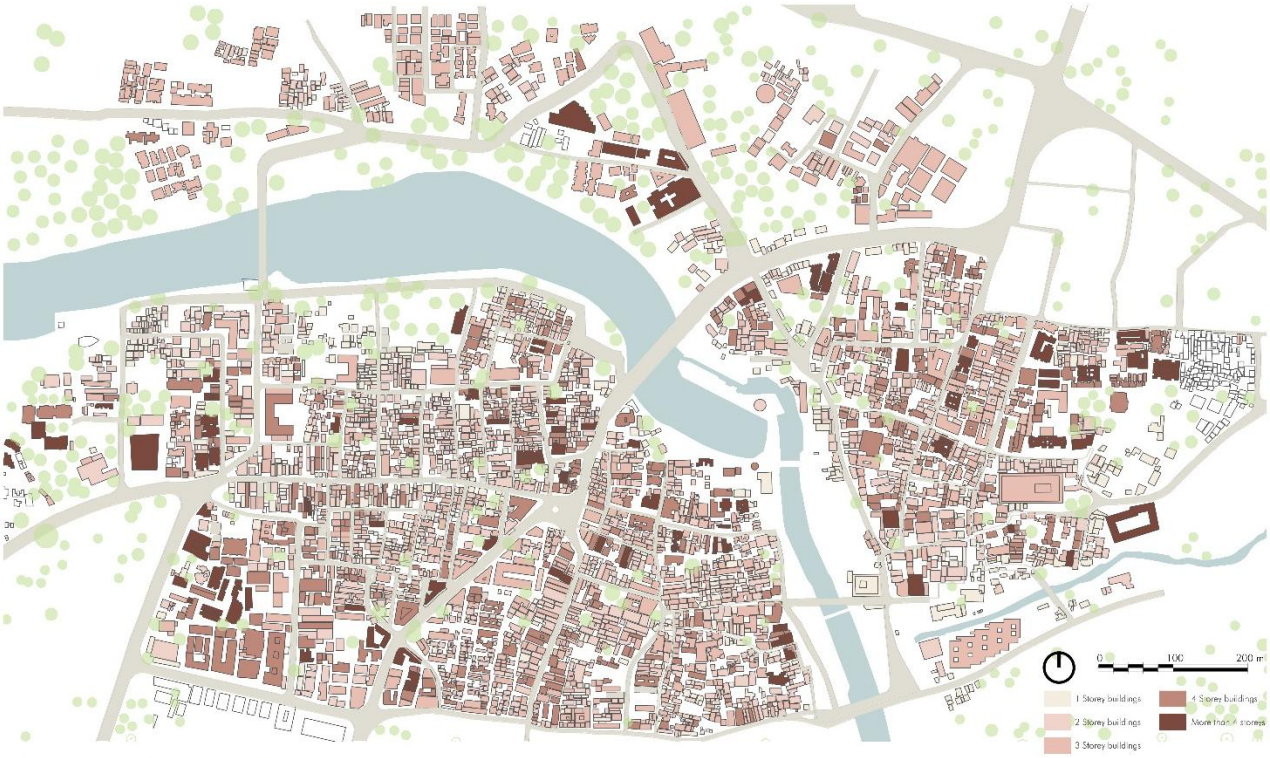


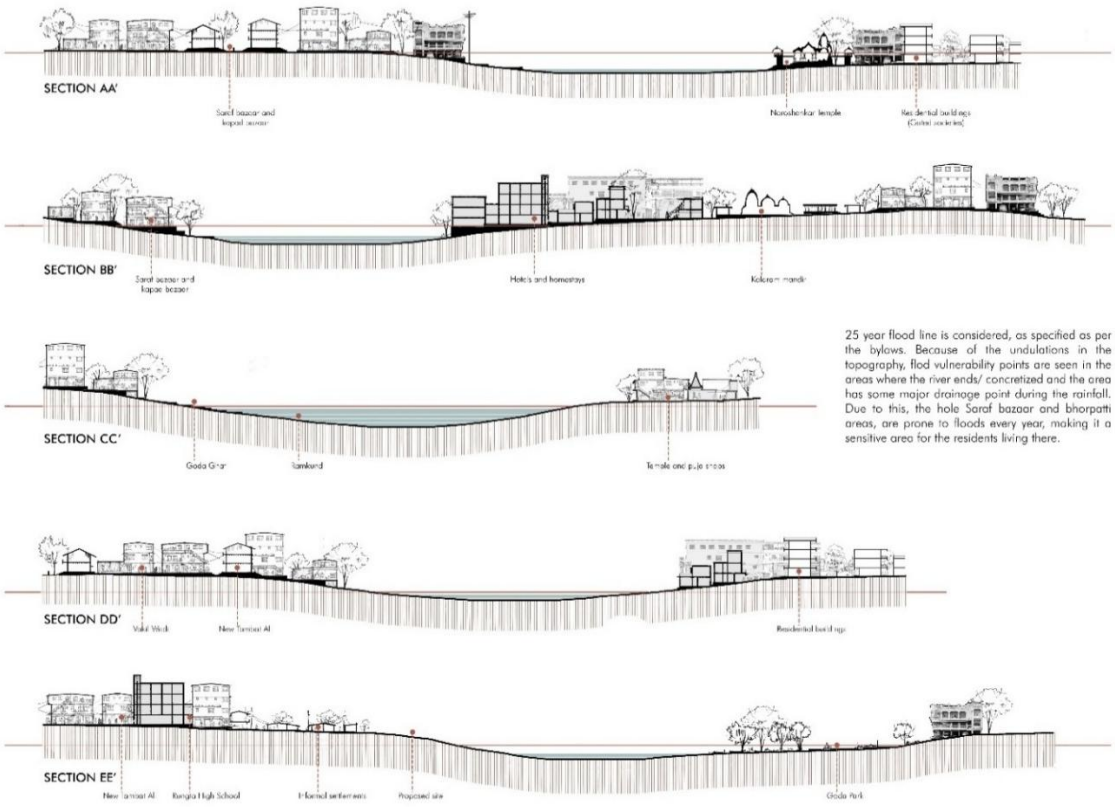
Figure 14 Built height mapping of the precinct

3.2.5 Ecological analysis

This section provides a thorough ecological and sectional examination of the Godavari Riverfront in Nashik, highlighting the topographical and hydrological issues of the region. The sectoral illustrations (AA', BB', CC', DD', EE') depict the topographical variations within the river basin, showcasing a multifaceted interaction among residential zones, religious edifices such as ghats and temples, commercial hubs including Saraf and Kapad bazaars, and contemporary institutional establishments. The sections highlight the differing ground elevations and constructed shapes, facilitating the identification of areas susceptible to water accumulation and flooding. Special emphasis is placed on the 25-year flood line, with notes indicating that encroachments and low-lying informal settlements adjacent to the banks are particularly susceptible to annual flooding.

The map below substantiates this analysis by indicating flood vulnerability locations, stormwater pathways, and drainage orientations. It superimposes the constructed environment and infrastructure with natural hydrological patterns, pinpointing regions commonly affected by flooding, particularly where the river constricts or where drainage is inadequate. The circles indicate areas susceptible to flooding that coincide with high population density and economic activity. The amalgamation of topography

and hydrodynamics provides critical insights into the ecological vulnerability of the area, emphasizing the pressing necessity for resilient planning that honours both natural water systems and urban infrastructure.



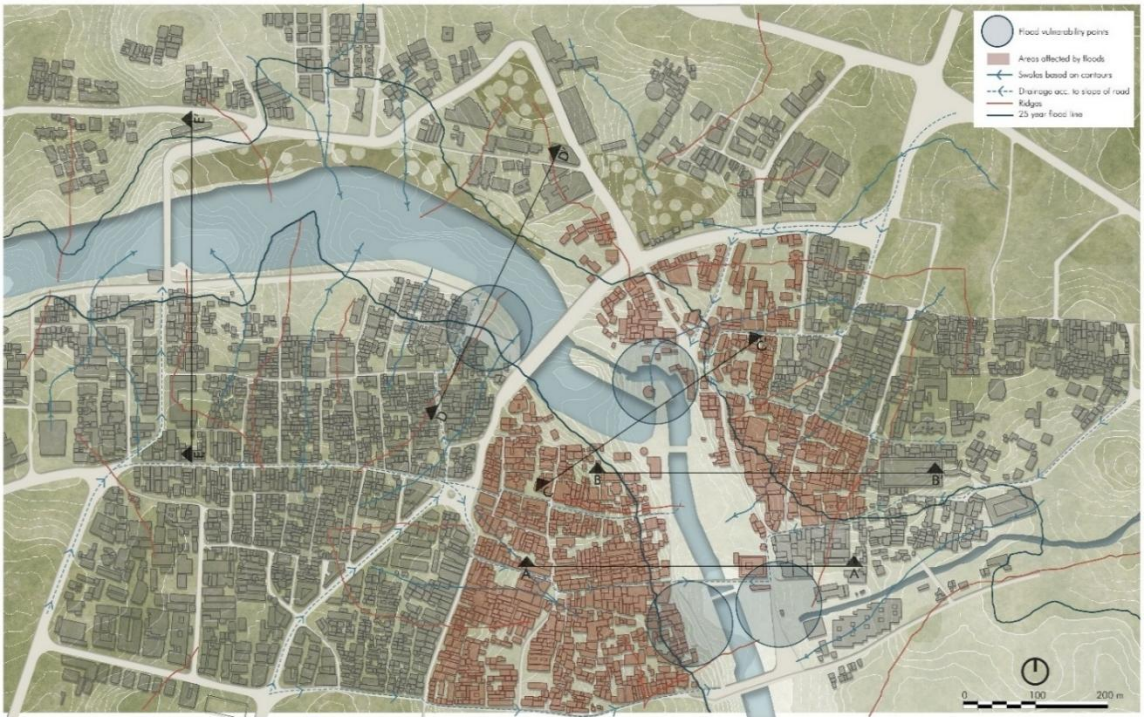


Figure 15 Ecological sections showing built and unbuilt interaction
Figure 16 Ecological mapping of the precinct

3.3 Site level analysis

3.3.1 Site context

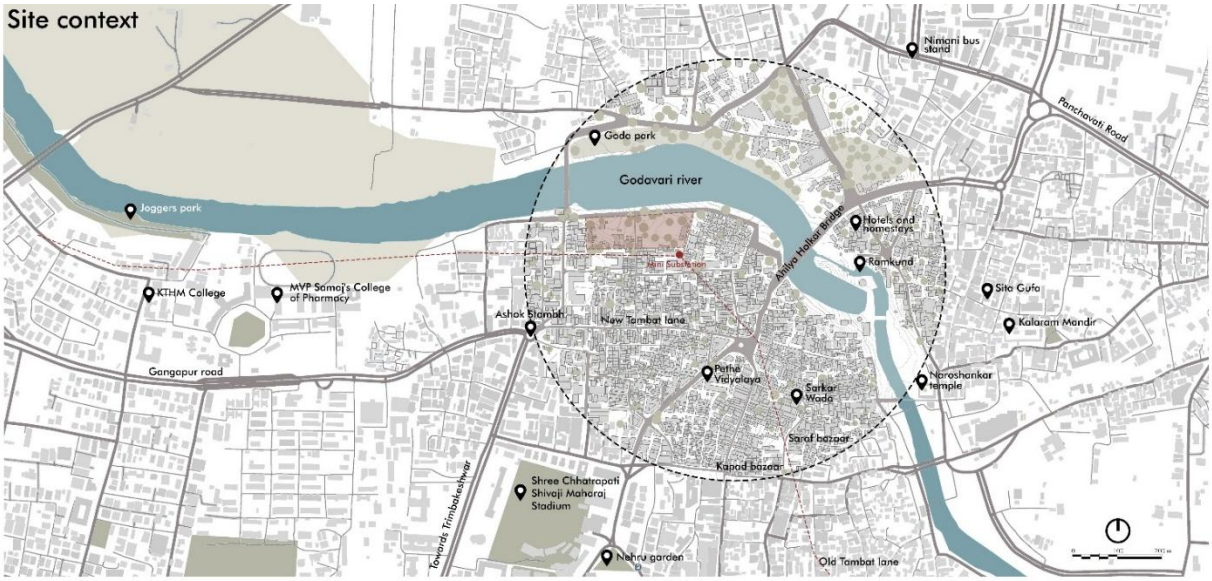


Figure 17 Site context mapping

The site context map depicts the centrality and interconnectedness of the proposed intervention zone along the Godavari River in Nashik. The property is situated in a densely constructed historic centre, bordered by significant roads and landmarks, and lies within a 1 km radius of many cultural, educational, and recreational facilities.

To the west, it is linked by Gangapur Road and bordered by notable institutions such KTHM College, MVP Samaj's College of Pharmacy, and leisure areas such as Joggers Park. To the north and northeast are Goda Park and Ninetini Bus Stand, improving the area's accessibility. The eastern and southern peripheries are culturally affluent, showcasing notable religious sites including Ramkund, Kalaram Mandir, and Naroshankar Temple, with lively marketplaces such as Saraf Bazaar, Kapad Bazaar, and Sarkar Wada. Other significant landmarks comprise Shree Chhatrapati Shivaji Maharaj Stadium, Nehru Garden, and Site Gufa, highlighting the blend of public utility and heritage.

This geographical setting establishes the site as a crucial nexus of religious, cultural, educational, and civic engagement, highlighting its significance as a prospective public common. The site's proximity to the river and historic districts renders it optimal for initiatives focused on restoring linkages between water and communities through inclusive and sustainable urban design.

3.3.2 Bye laws and calculations

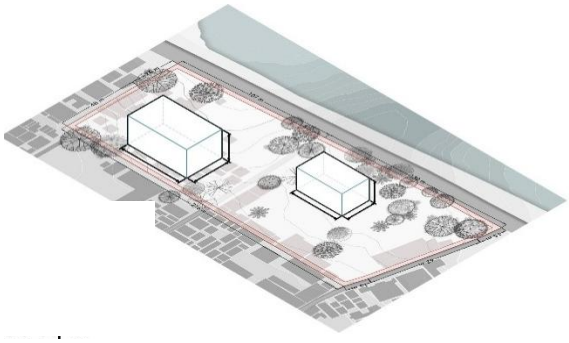


Figure 18 Bye laws representation illustration

Total site area- 18,500 sq m (4.5 Acres)

Ground coverage-

One third of the site area (33%)

FAR- 1.50

Parking- 1 Car per 100 sq. m. carpet area

Setbacks: Front: 6m Sides: 6m Rear: 6m

Footfall- Around 10,000 people per day

Height of building-

The maximum height of the building = 1.5 × Road Width + Front Marginal Open Space

Calculations

Site area- 18,500 sq. m

Ground cover- 5,550 sq. m

Buildable ground cover-

Ground Cover + Exceptions (10% -20%)

= 6,105 sq. m - 6,660 sq. m

Permissible built up- 27,750 sq. m

Parking to be provided- 280 nos estimated

Mandatory open space- 1,850 sq. m

Other requirements-

One single transformer sub-station of the size of 5m × 5m and height of not more than 5m. Pathway for access to internal building shall not be less than 3.6 m in width. 10% of the total area shall be reserved as recreational open space for sites above Ha. For sites above 0.8 Ha, the open space may be allowed to be left at different locations.

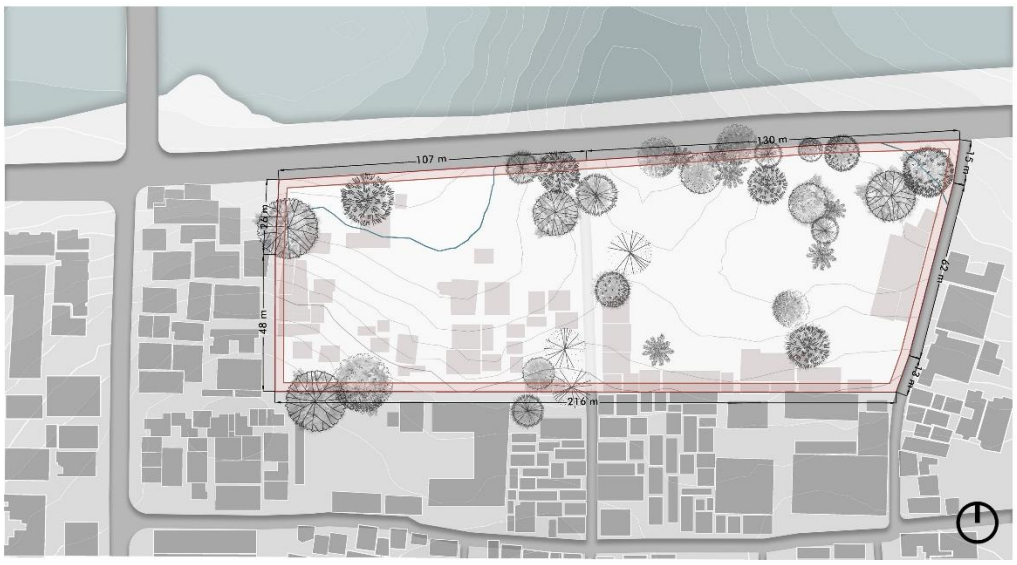


Figure 19 Plan showing dimensions of site

3.3.3 Connectivity of the site

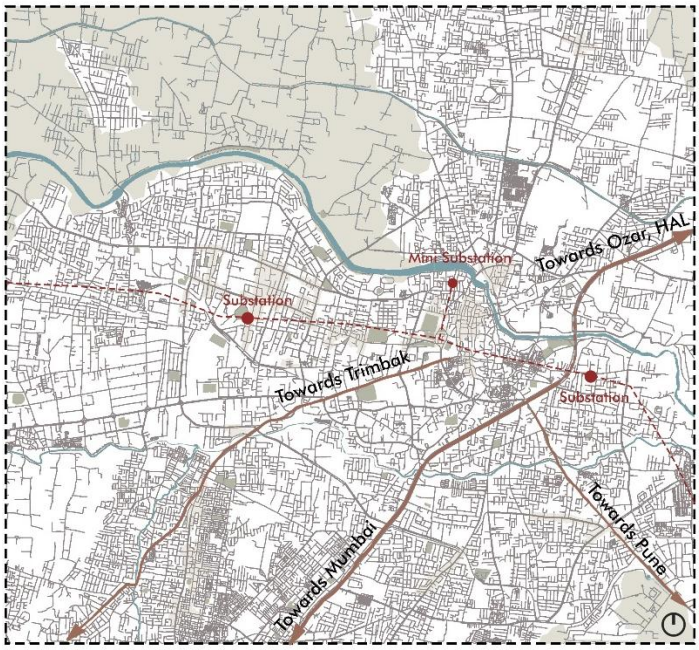


Figure 20 Site connectivity mapping

The site exhibits robust regional and intra-city connectivity. It is seamlessly connected to important arterial routes leading to Mumbai, Pune, Trimbak, and Ozar/HAL, essential for enabling local and regional transit. This renders the site readily accessible from diverse urban and suburban areas. The closeness to several electricity substations, including a nearby micro substation, signifies a robust infrastructure network, advantageous for further expansion. The Godavari River, seen meandering through the northern part of the map, offers a natural boundary while fostering ecological and cultural connections within the metropolis. This strategic location

positions the site as a central, well-connected hub ideal for community and cultural development initiatives.

3.3.4 About the site

The site along the riverbank presents a paradoxical narrative—it is both a space of vibrant cultural activity and a zone of neglect. The river's edge, once bustling with communal interactions, has been reduced in many places to a utilitarian parking zone, eroding the organic bond between the community and the river. This detachment has not only disrupted the river's ecological vitality but also diminished its potential as a vibrant public realm. For an architectural thesis centered on designing a Community Cultural Centre, this site is highly relevant. It embodies the intersection of opportunity and challenge—where cultural revival can meet urban rejuvenation. The proximity to the Godavari provides a platform to weave the river's sacred and communal essence into the built environment, fostering reconnection.

Figure 21 Illustration showing existing activities on site
Figure 22 Pictures showing site context

3.3.5 Depth to water level analysis

The depth-to-water-level maps of Nashik from 2011 to 2021 show a gradual drop in groundwater availability, with notable pre- and post-monsoon variances. Over-extraction for agriculture, urbanisation, and industry has lowered water levels from 10–15 meters in 2011 to 15–20 meters or deeper by 2021, according to pre-monsoon maps. Post-monsoon maps show partial recovery, although recharge has decreased over the decade, keeping water levels lower. Urbanisation, loss of natural recharge zones, and increasing surface runoff have slowed groundwater replenishment.

The pattern shows a widening gap between pre-monsoon depletion and post-monsoon recovery, stressing Nashik's groundwater resources. Although riverbed infiltration stabilises areas near the Godavari river, diminished upstream recharge and usage cause long-term stress. Climate variability and poor water-sensitive urban development have made things worse. These maps emphasise sustainable water management for a Godavari riverfront community cultural centre.

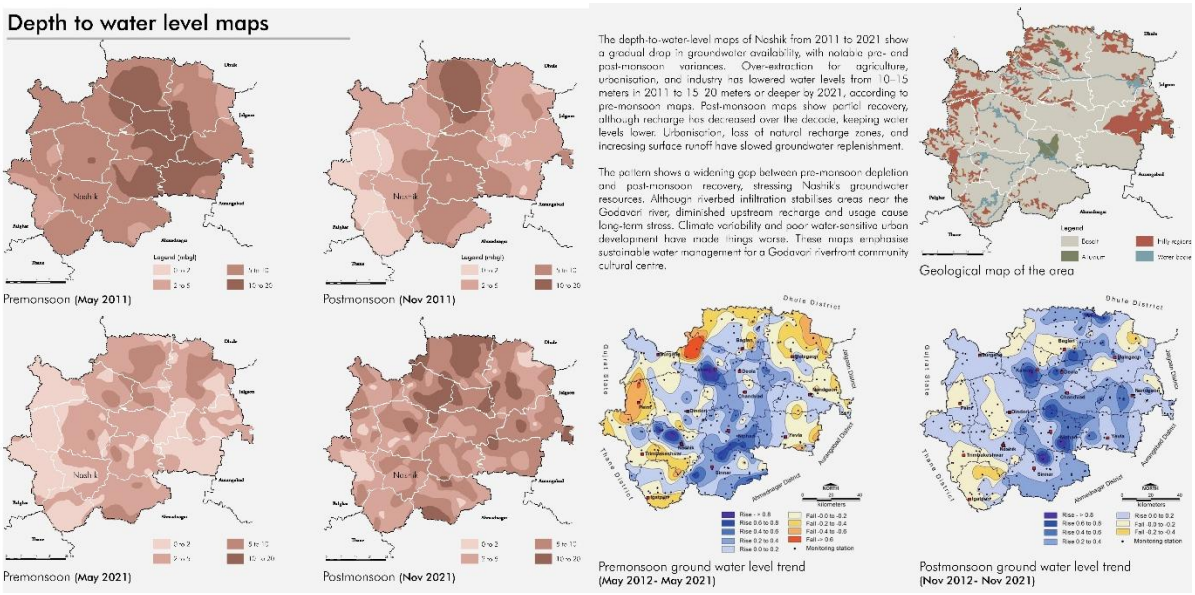


Figure 23 Depth to water level maps

3.3.6 Views to and from site

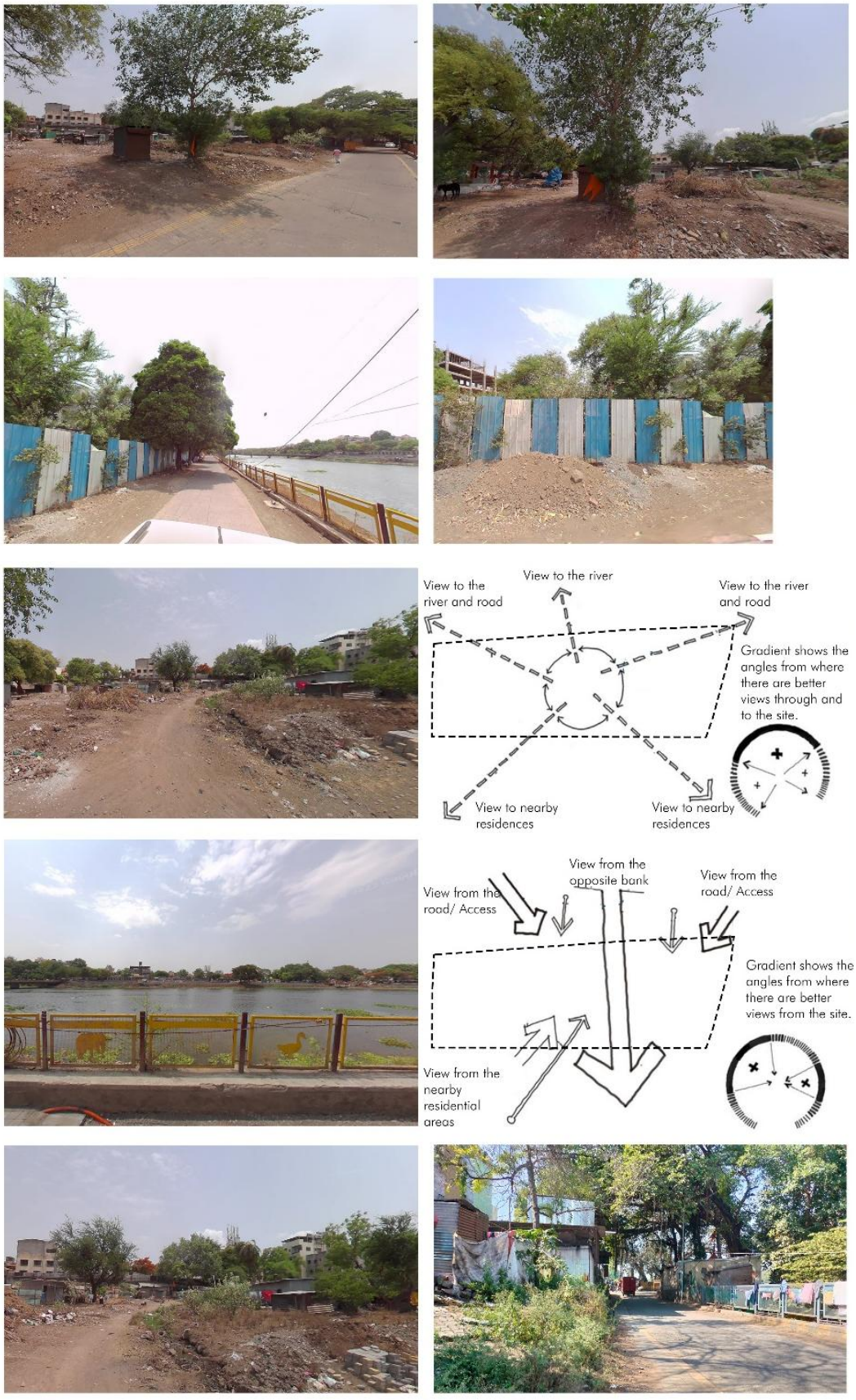


Figure 24 Figures and pictures showing views to and from site

3.3.7 Drainage pattern and slope analysis

Figure 25 Drainage pattern of site
Figure 26 Slope analysis of site

The site is fairly steep with almost more than half of the area lying in the 5 to 15 % slope range. While the site is not entirely non buildable, it still provides opportunities to build on stilts to respect what the site has to offer.

The slope of the site also allows better views into and from the site, creating noticeable visual impact in case of connecting the site to the river.

3.3.8 Climate analysis

Nashik's climate is characterized by distinct seasonal variations in temperature, rainfall, humidity, and wind patterns. The site's proximity to the Godavari River further influences local microclimatic conditions. Hot Season lasts approximately 2.5 months, from mid-March to May. During this period, the average daily high temperature reaches around 35°C, making it a challenging time for outdoor activities without proper shade or cooling mechanisms. Beyond the hot season, the temperatures tend to moderate, offering more comfortable conditions for outdoor and river-related activities. July experiences the heaviest rain with an average of 370 mm, necessitating effective drainage systems and resilient design to address flooding risks along the riverbank.

From June 5 to October 4, the chance of a wet day exceeds 34%, highlighting the need for weather-resistant materials and structures. Westward winds are predominant for 8.2 months, from February to October, with a peak frequency of 98% on August 3. This consistent wind flow can be harnessed for natural ventilation and cooling. Integrate permeable surfaces and rainwater harvesting systems to manage monsoon water effectively. Create flexible spaces that remain functional across varying weather conditions, particularly addressing the challenges of heavy rainfall and humidity. Orient structures and pathways to leverage prevailing winds for passive cooling.

The temperature is fairly comfortable through the year and the hot season peaks at 36 deg. C. But the weather is relatively dry and only June poses to be uncomfortable because of high humidity levels.

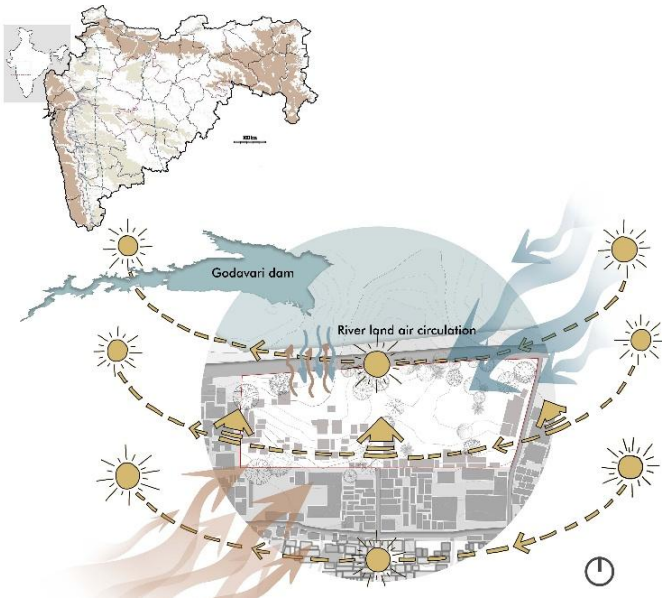
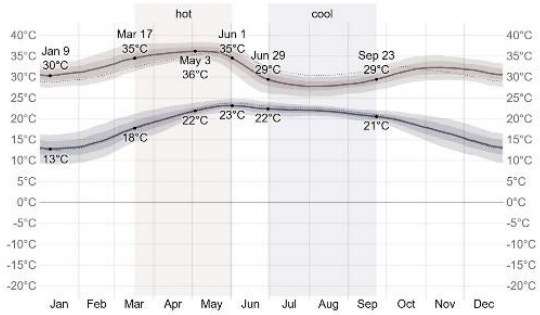
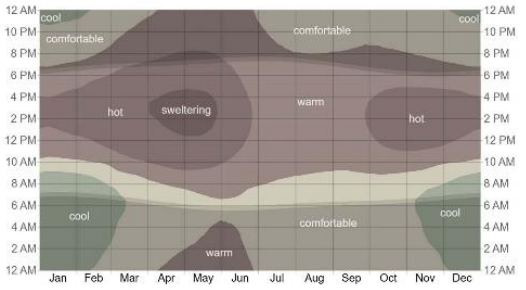


Figure 27 Climatic conditions of site



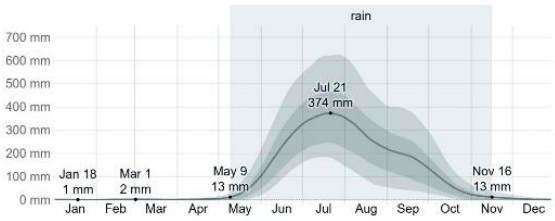
Average high and low temperature

The hot season lasts for roughly 2.5 months roughly from mid March to May with an average daily high temperature of 35°C.



Average hourly temperature

The horizontal axis is the day of the year, the vertical axis is the hour of the day, and the color is the average temperature for that hour and day.

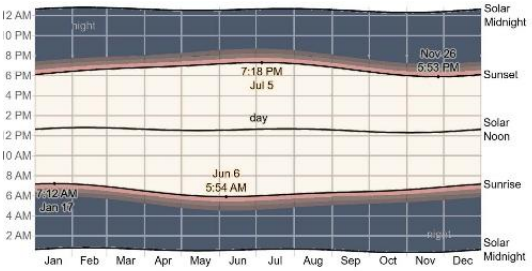


Average monthly rainfall

The rainy period of the year lasts for 6.2 months, from May to November. The month with the most rain is July, with an average rainfall of 370 mm.

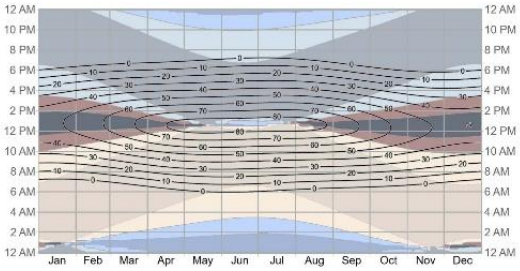
Humidity comfort levels

Nashik experiences extreme seasonal variation in the perceived humidity. The muggier period of the year lasts for 5.8 months.



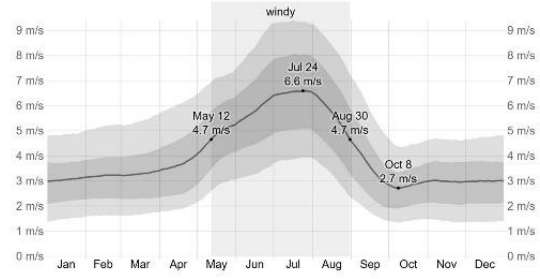
Sunrise and sunset with twilight

The number of hours during which the Sun is visible (black line). From bottom to top bands indicate the midnight, sunrise, noon, sunset.



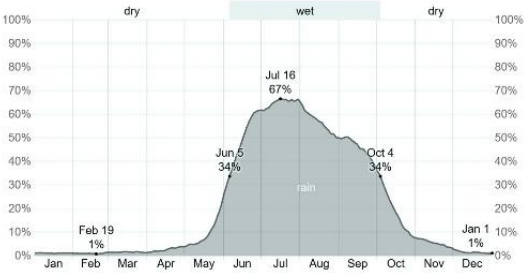
Solar elevation and azimuth

The figure presents a compact representation of the sun's elevation and azimuth for every hour of every day.



Average monthly rainfall

The wind is from west for 8.2 months, from Feb to Oct, with a peak percentage of 98% on Aug 3. The wind is from east for 3.8 months, from Oct to Feb, with a peak percentage of 45% on Jan 1.



Daily chance of precipitation

The wetter season lasts 4.0 months, from June 5 to October 4, with a greater than 34% chance of a given day being a wet day. The month with the most wet days in Nashik is July.

Figure 28 Climatic data for Nashik

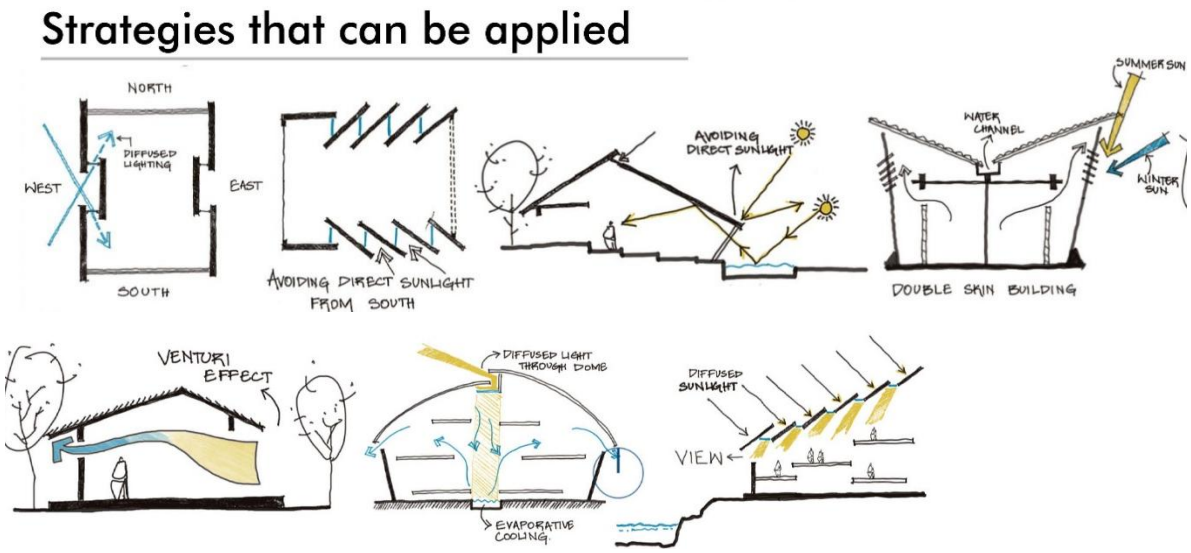


Figure 29 Strategies that can be applied

3.3.9 Flora and fauna

Nashik, though not a birdwatching city, hosts a variety of birds because of the presence of the Godavari River and Gangapur Dam. It is an important stopover point for migratory birds like flamingos for the last few years and they can be mostly seen in the Nandur Madhmeshwar bird sanctuary which is just near Nashik. Proximity of the site to the river and its secluded location allows the birds to nest in the trees of the site.

Brown-headed gull
Chroicocephalus brunnicephalus

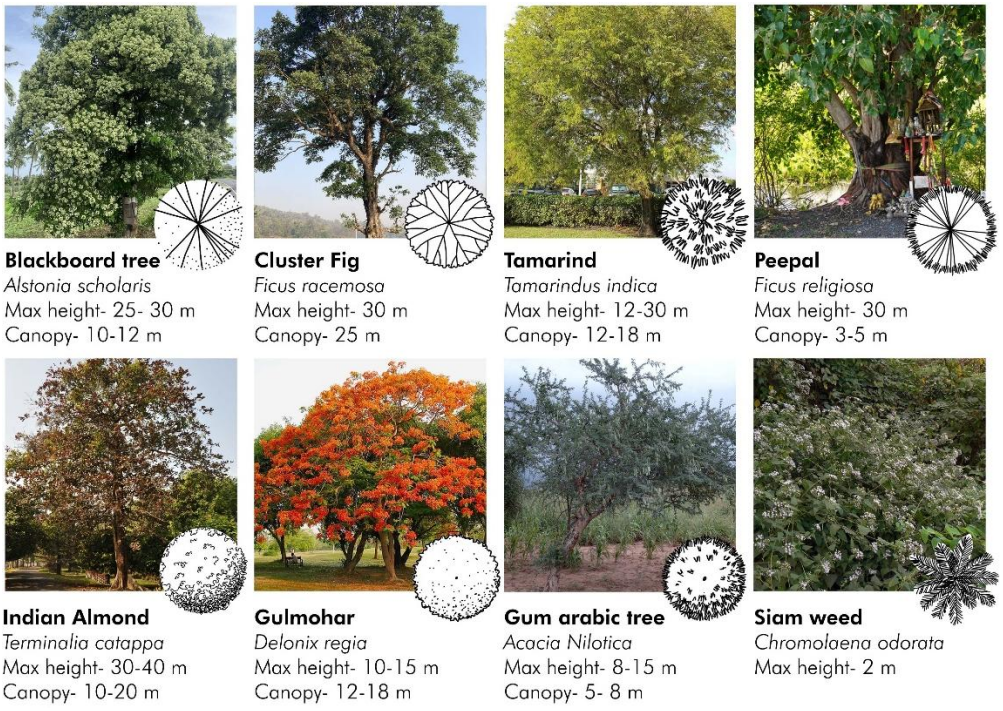
Western Reef-Heron
Egretta gularis

Indian Gray Hornbill
Ocyceros birostris

Rose-ringed Parakeet
Psittacula krameri

Figure 30 Birds sighted on site

The trees and flora along the Godavari riverfront in Nashik are integral to its ecosystem, featuring species like banyan and peepal, revered in Indian culture. These trees provide shade and sustain biodiversity, while aquatic plants enhance the river's health. The presence of sacred groves and rare medicinal plants enhances its ecological and cultural significance.



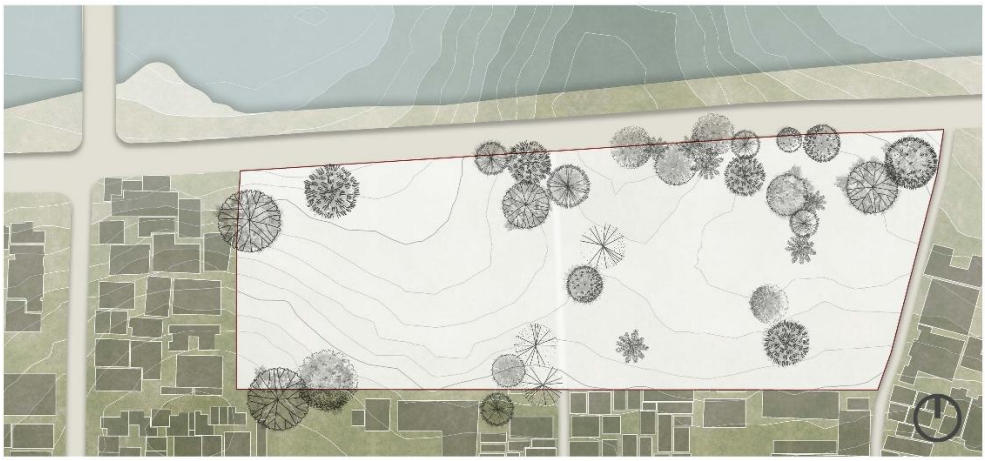


Figure 31 Types of trees and their positions on site

3.3.10 Conclusion

The compilation of maps and illustrations offers a sophisticated and detailed comprehension of the Godavari riverfront in Nashik, illustrating the complex interactions among built-use patterns, cultural dynamics, urban morphology, and ecological vulnerabilities. The investigation commences with built-use mapping, delineating the spatial arrangement of commercial, residential, religious, and public zones, thereby uncovering a dense, historically significant fabric that has developed around the river, yet currently experiences fragmented accessibility and functional disjunctions.

The activity mapping highlights this fragmentation by recording how ancient communal practices—rituals, religious assemblies, and marketplaces—have been progressively replaced or eclipsed by automobile infrastructure and parking requirements. This transition underscores the steady diminishment of the river's function as a public commons and cultural focal point, transforming lively social engagement into fragmented, utilitarian areas.

The Kumbh character section examines temporal variations in roadway utilisation and residential patterns, especially during and subsequent to the Kumbh Mela. It illustrates how ordinary spaces are altered by the demands of the mega-event, frequently leading to enduring spatial changes that prioritise transient configurations over sustainable community advantages. These modifications are illustrated in both street-level and house-level graphics, highlighting the conflict between tradition and modern urban requirements.

The constructed height map incorporates a vertical component to the spatial narrative, illustrating a dense accumulation along the riverbanks, particularly of 2-3 story edifices. This layout exacerbates microclimatic stresses, congestion, and restricts the permeability of the urban boundary to the river. Finally, the sectoral and ecological map offers essential insights into the physical landscape and environmental stresses. Sections and flood hazard mapping reveal that some low-lying regions, especially adjacent to Saraf Bazaar and informal settlements, are very susceptible to monsoon flooding. Inadequate drainage systems and unregulated development intensify this susceptibility, resulting in hazardous living conditions and environmental strain. In conclusion, these interrelated analyses expose a significant disparity between the cultural-historical importance of the Godavari riverbank and its present urban state. The riverbank, once a site of communal memory and ritual, today faces ecological threats and social erosion due to erratic planning, flood dangers, and automobile predominance. The results highlight the pressing necessity for a redefined riverside common that restores human-water connections via integrated design, ecological resilience, and community-focused planning.

Figure 32 Initial zoning based on the existing site conditions and analysis

Chapter 4: Case study

4.1 Case study: Kashi Vishwanath corridor

Figure 33 Arial view of the corridor

Live case study

Project name: Kashi Vishwanath corridor

Location: Varanasi

Client: Shri Kashi Vishwanath Special Area Development Board (SKVSADB)

Architect: Bimal Patel, HCP

Year of completion: 2018 to 2021

Site area: 4.8 Hectares

Built up area: 2.7 Hectares

Ground coverage: 30%

The project was conceptualized as a large-scale urban rejuvenation and religious tourism initiative, aimed at restoring the sanctity and accessibility of the Vishwanath temple complex and its connection to the Ganga River. Emphasis was placed on preserving heritage while catering to modern visitor needs.

4.1.1 Significance

The integration of heritage conservation with contemporary design can serve as a guiding principle for the cultural center. Considering the blend of spiritual and cultural themes, ensuring accessibility while respecting the sanctity of the site.

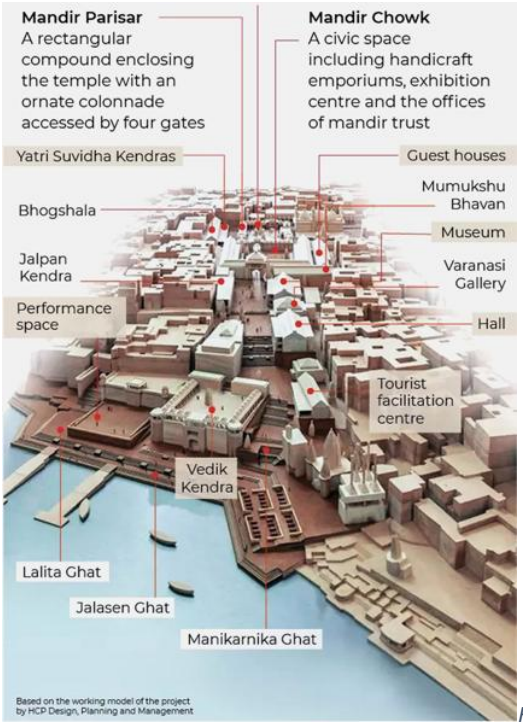


Figure 34 Massing of the corridor

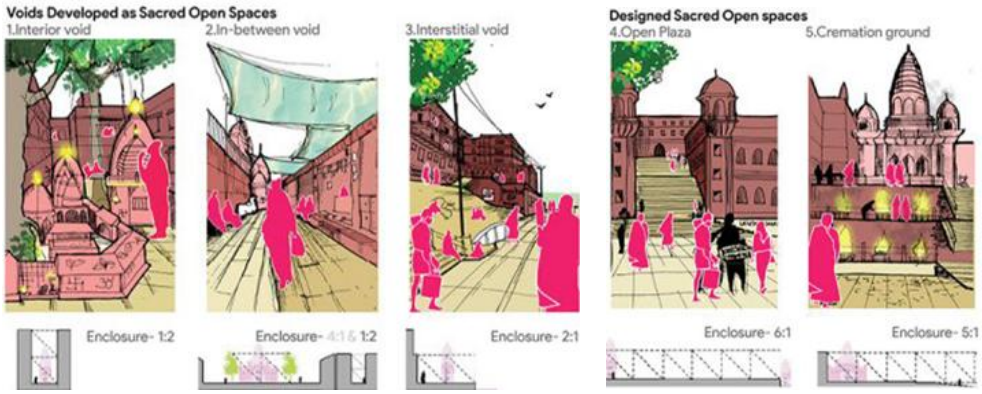


Figure 35 Illustration showing the scales and proportion on site

The redeveloped precinct establishes a connection between Kashi Vishwanath Mandir and the river. The Chowk, or outer court, descends on to the main path leading to the Ghats. This path is lined with institutions such as the City Museum, the Varanasi Gallery and the Multipurpose Hall. Public amenities include lockers, toilets, lodging and even hospice care. The precinct is made fully accessible to those with mobility restrictions, and also has provisions for unobtrusive security arrangements where required

The corridor is selected to expand and modernize spaces for large pilgrim gatherings. Integration of modern amenities with traditional architectural styles. Community involvement in design to maintain cultural authenticity.

Figure 36 Illustration showing built vs open spaces

Figure 37 Activity density

Figure 38 Maps showing satellite imagery of the site from 2018 to 2024

4.1.2 Relevance

The project redeveloped a highly congested and sacred area to improve access and create public spaces for pilgrims. Its emphasis on preserving cultural identity while enhancing infrastructure for large-scale events mirrors the needs of Nashik during the Kumbh Mela.

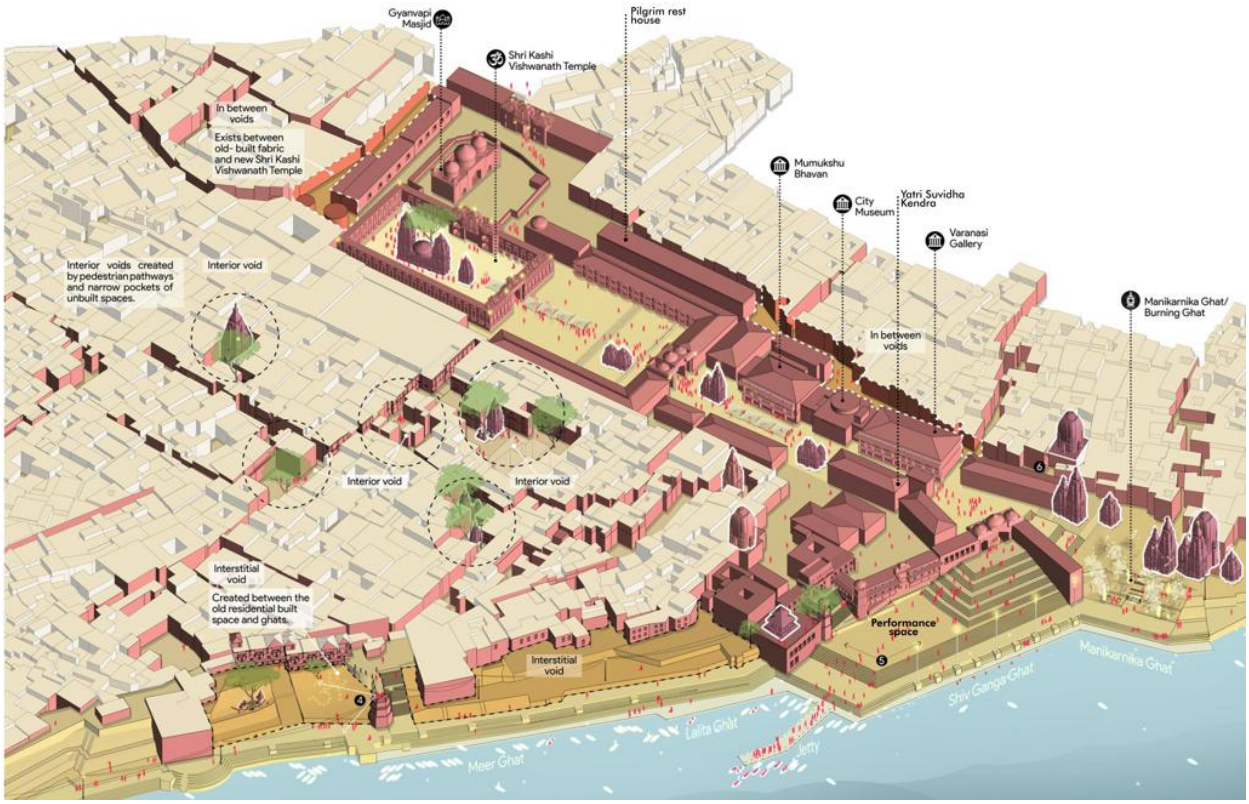


Figure 39 Illustration showing the site layout of the corridor

4.1.3 Architectural language

The architectural language is rooted in traditional Hindu temple architecture, with an emphasis on local craftsmanship, stone detailing, and symbolic motifs. The design reinforces the spiritual significance of the site through the use of symmetry, proportion, and axial alignments. Traditional techniques are integrated with subtle modern interventions to cater to contemporary needs. The materiality changes as we move from the corridor to the mandir parisar.

Developing an architectural language that blends Nashik's regional vernacular styles with modern functionality. Using motifs, materials, and design strategies that reflect Nashik’s spiritual and cultural ethos.

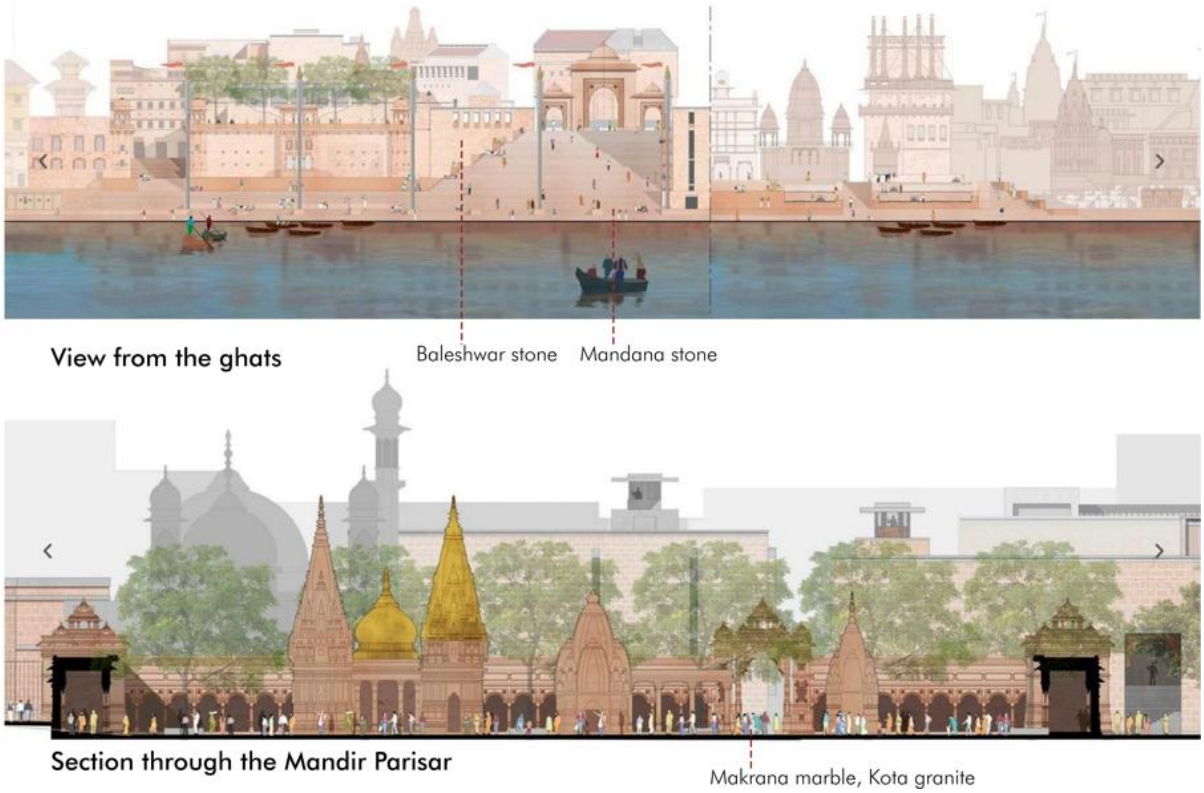


Figure 40 View from ghats and section through the Mandir

The presence of 4 entrances in this region increases its usage. The scarcity of shops and the impermeable nature of the boundary wall here has led to the appropriation of the street, primarily for parking and in places near the entrance for informal vending setups. The provision of 3 entrances along the main road may also reduce the number of people using the entrance through Vishwanath Street.

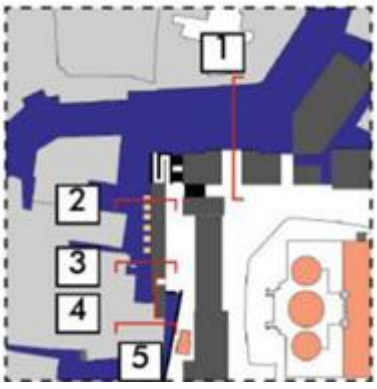


Figure 41 Figure showing analysis of the entrance

The proximity to an entrance has facilitated access through this region and benefits the shops here. Instances of appropriation for storage and shade are evident here. Parking is evident in their spots.

1. This region is very close to the ghat. There is evidence of a sizeable amount of parking and scattered waste which may be a result of the pilgrimage activities. There is no active frontage on either side of the street, and the ghat becomes the important node for activity here.

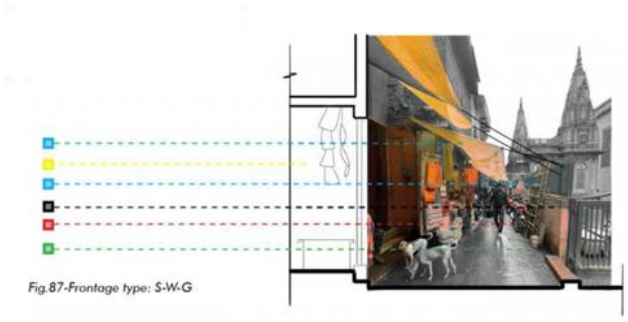
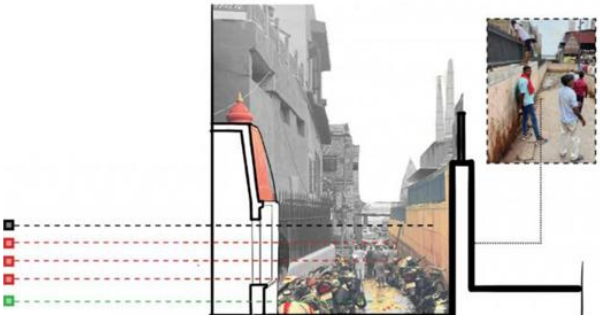
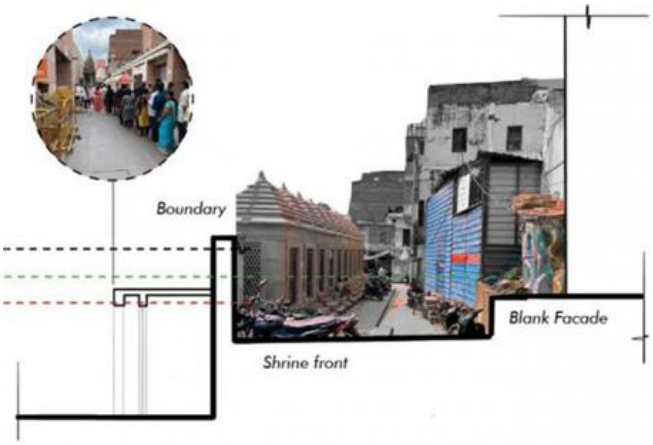


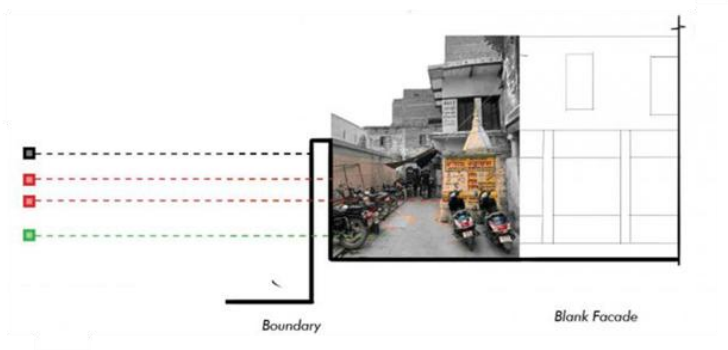
Fig.87-Frontage type: S-W-G



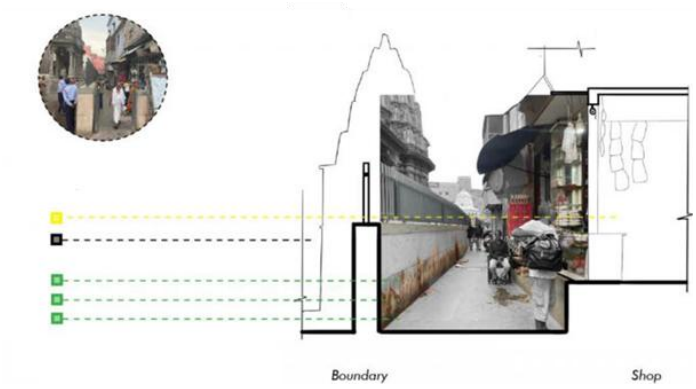
2. The temple fronts provide visual access but no physical access towards them, providing opportunities only for momentary pause along them.



3. The lack of physical access or activities on either end of the street facilities the movement of people over pause. Therefore, the resultant street is appropriated for parking.



4. Multiple evidences of spitting despite being proximal to an entrance. This region becomes a queueing area for pilgrims using this entrance.



5. An additional rail has been added around the boundary wall to prevent informal vendors from appropriating the space.

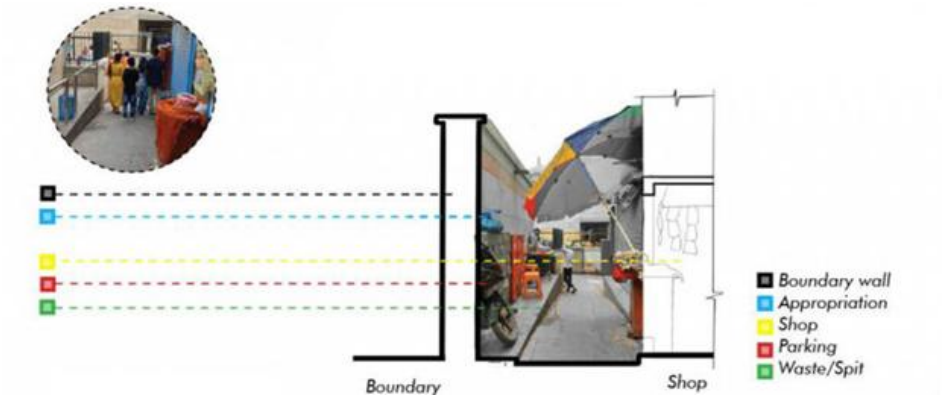


Figure 42 Sections showing different types of thresholds

4.1.4 Site layout

The site spans approximately 5 hectares and features a linear axis connecting the Vishwanath temple to the Ganga River via multiple ghats. The corridor is divided into zones for spiritual activities, pedestrian movement, and commercial functions.

Merits: Clear zoning that enhances functionality and ease of navigation.
Demerits: The large-scale intervention required significant demolition, which might not be feasible in Nashik.

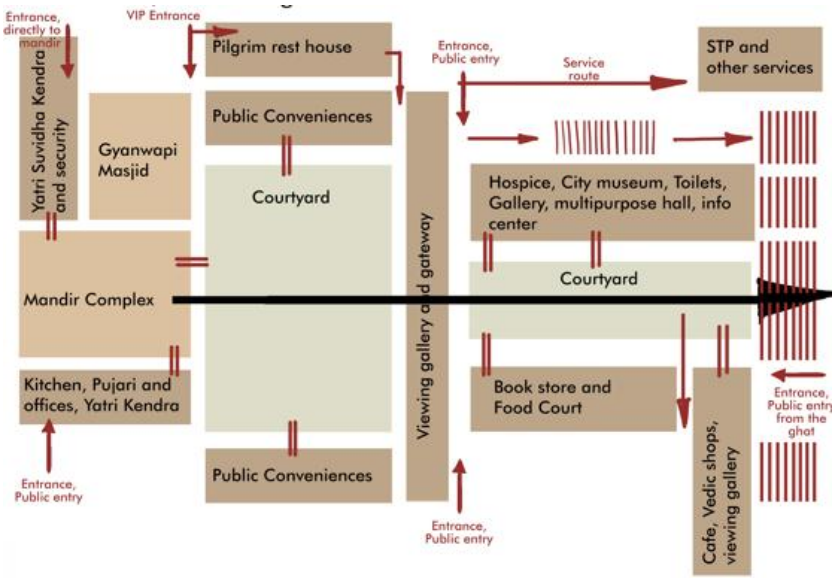


Figure 43 Zoning diagram showing the movement

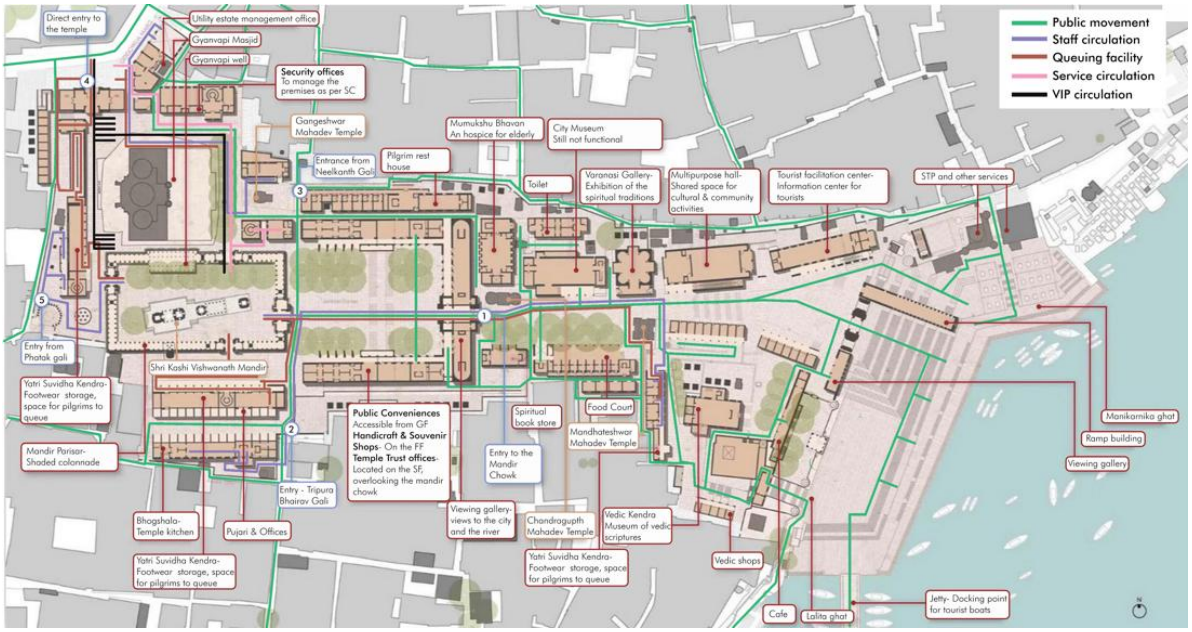


Figure 44 Plan of the corridor

4.1.5 Massing and Verticality

The massing emphasizes horizontal spread to retain the visual prominence of the Vishwanath temple and avoid overshadowing the ghats. Vertical elements are limited to temple spires and symbolic structures. Hence, the design features a pedestrian-first approach with wide pathways, multiple access points, and designated zones for vehicular traffic outside the temple complex. The corridor unravels in different levels allowing the visitor to get different view at each point.

Significance: Pedestrian-friendly zones can encourage community interaction and cultural activities. Planning seamless circulation between the riverfront, cultural center, and surrounding urban fabric.

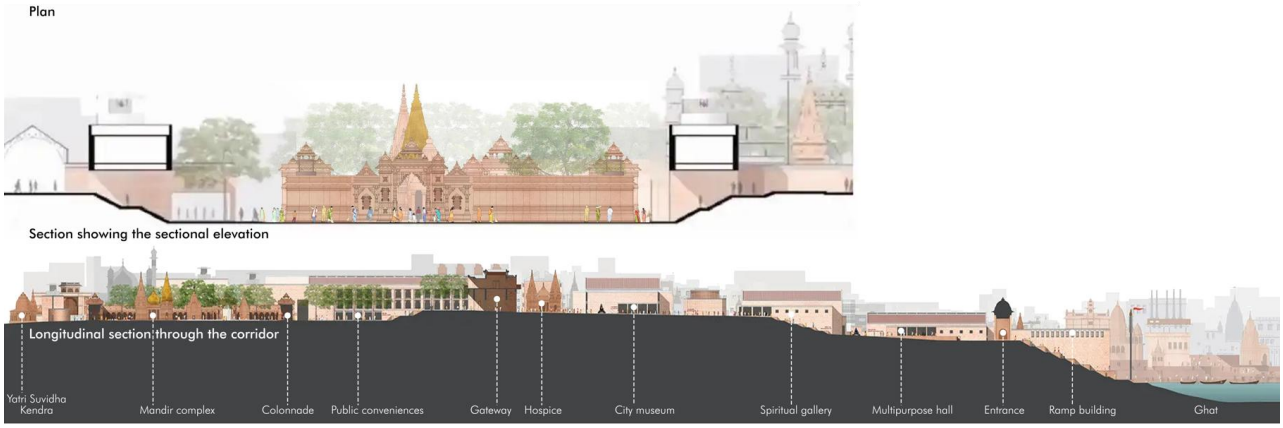


Figure 45 Site sections

4.1.6 Limitations

Potential for over-commercialization, diluting the sacred ambiance. Extensive demolition raised concerns about erasing local history. Large-scale interventions risk overshadowing smaller cultural elements.

4.1.7 Activities at the ghat

A variety of activities are seen at the ghats at different levels and scale. From people indulged in deep prayer to someone enjoying a joyride through the boat, the ghats have something to offer to everyone. Strolling through streets of Varanasi offers a distinct character with every lane. From winding alleys to expansive plazas, the experience is rich and diverse.

Fig.59-Activities in the context before.

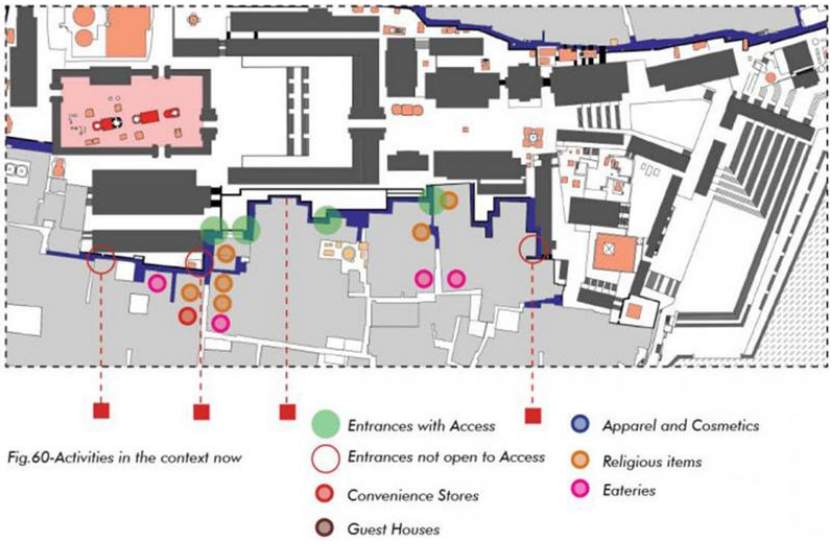


Fig.60-Activities in the context now

Figure 46 Activities in the context now

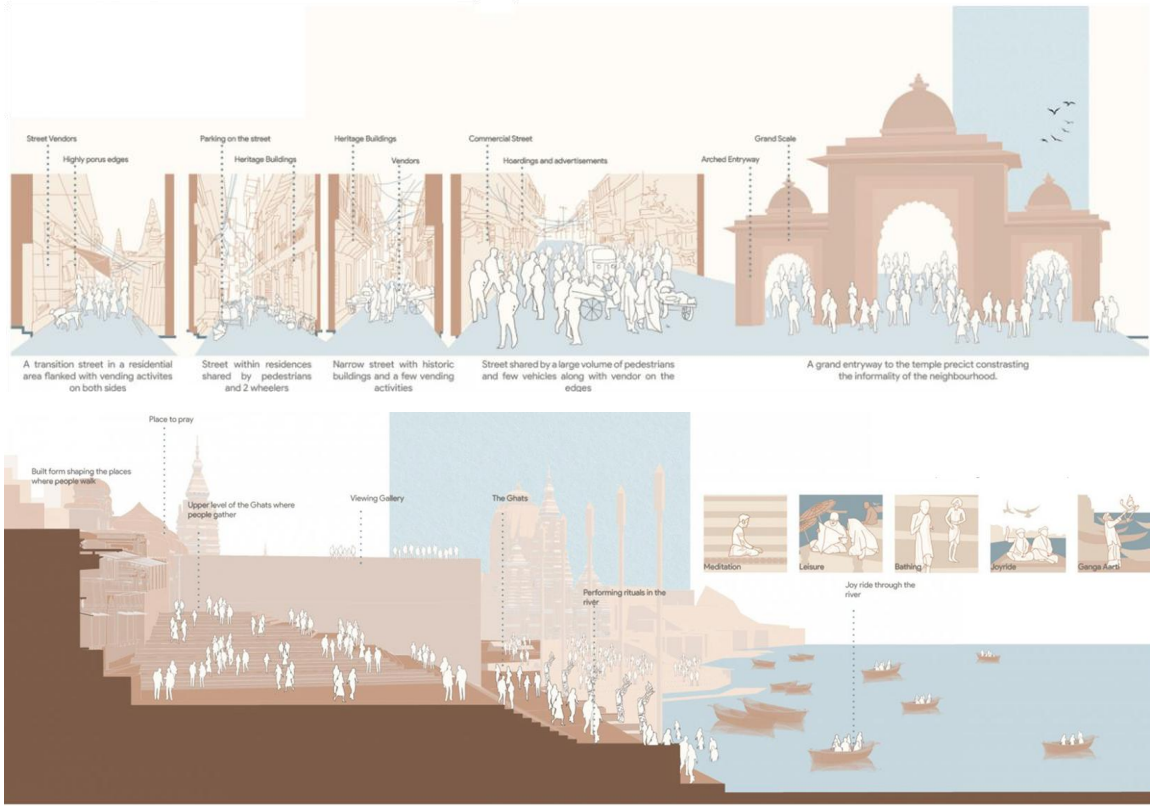


Figure 47 Sections showing community interaction with site

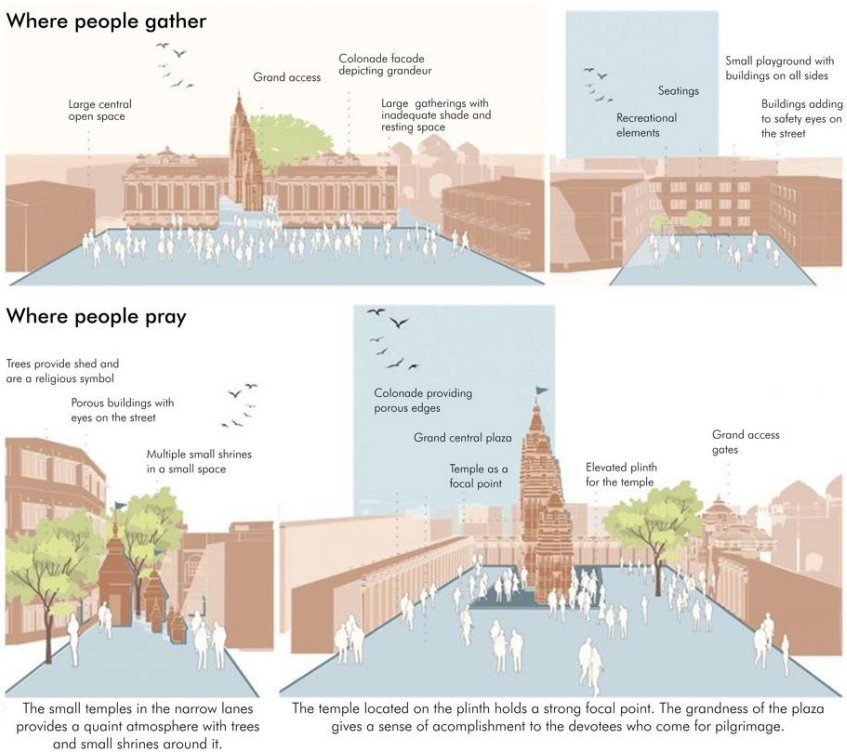


Figure 48 Activity illustrations

4.1.8 Contextual integration

The project carefully integrates the Ganga River into the design, emphasizing its centrality to the spiritual experience. The ghats act as transitional spaces between the natural and built environments. The surrounding dense urban fabric was restructured to highlight the temple as a focal point.

Significance: The integration of the Godavari River with the cultural center can draw inspiration from this project. Ghats and open plazas to act as shared spaces for worship, leisure, and cultural activities. Ensuring that the cultural center enhances the visibility and accessibility of the riverfront without overpowering its natural beauty.

4.2 Sharanam Center for Rural Development

Literature case study

Project name: Sharanam center for rural development

Location: Pondicherry

Client: Sri Aurobindo Society

Architect: Jateen Lad

Year of completion: 2007 to 2014

Site area: 5 Acres

Built up area: 20,000 sq ft

Ground coverage: 30%

Footfall: 500 people

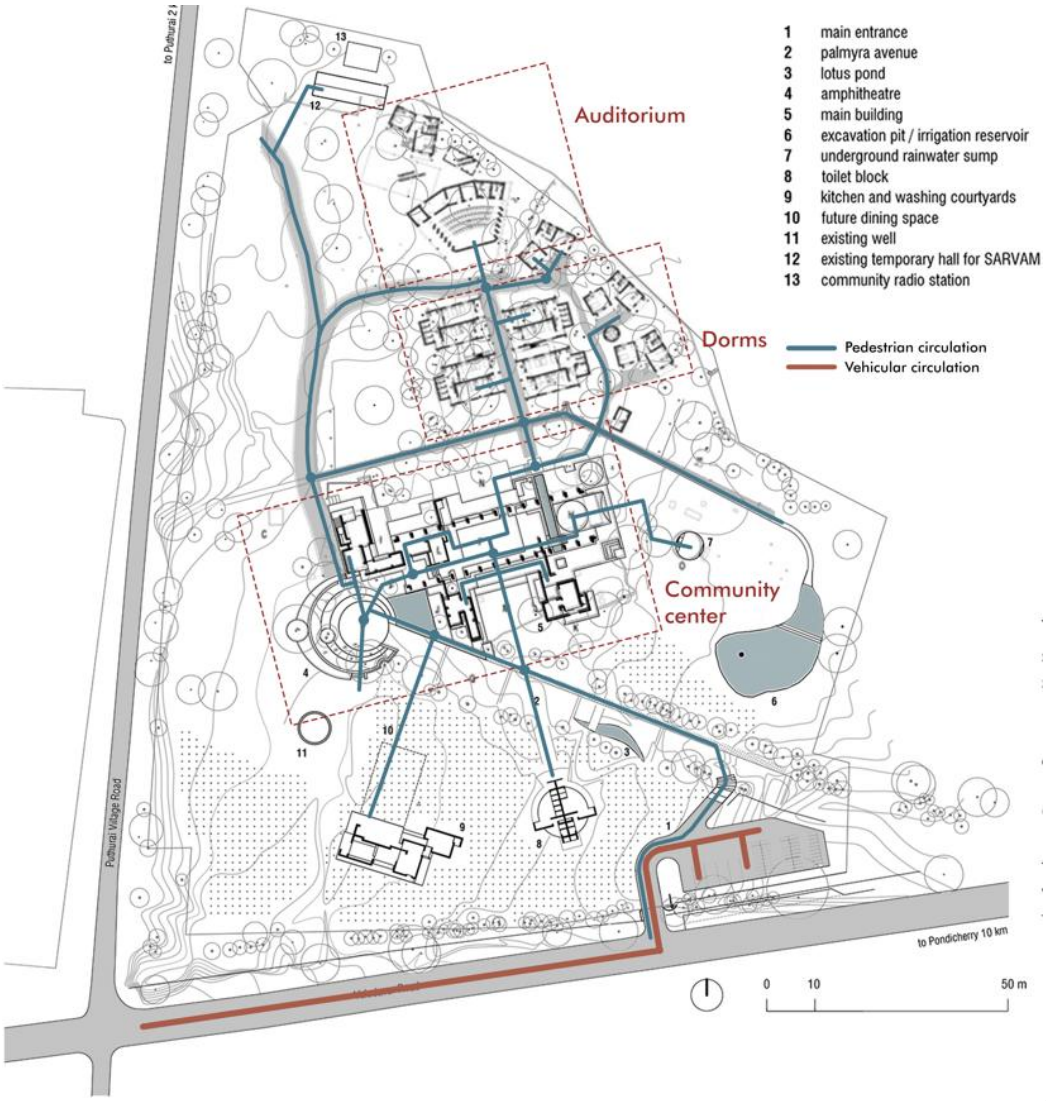


Figure 49 Plan

4.2.1 Significance

The Sharanam Centre for Rural Development is a project by architect Jateen Lad. Located in Pondicherry in south-eastern India, the center is constructed from manually pressed earth blocks made from the site's red soil. The project was conceived as a hub for rural empowerment, with a focus on self-sufficiency, sustainability, and creating a low-cost, eco-friendly structure. The design emphasizes contextual sensitivity, incorporating vernacular elements and traditional wisdom while addressing modern functionality.

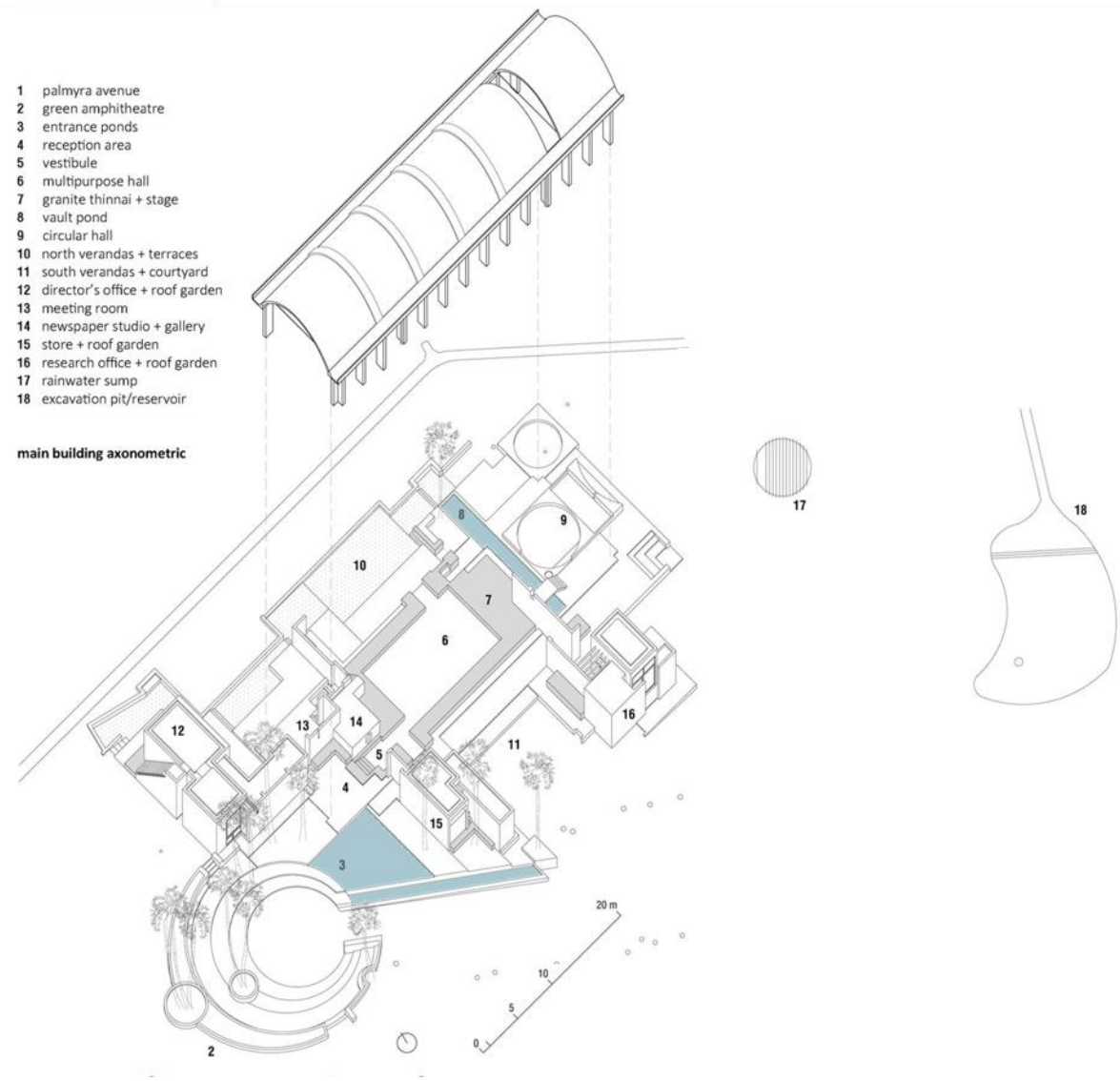


Figure 50 Exploded view showing the built space

The cultural center can draw inspiration from Sharanam's focus on community-centric spaces and sustainable practices. Emphasizing a design that fosters local involvement and showcases Nashik's unique cultural and spiritual identity. A cultural center on the

Godavari riverfront can act as a hub for community engagement, much like Sharanam. Incorporate spaces that support education, cultural exchange, and skill development, such as workshops, performance areas, and craft exhibitions.

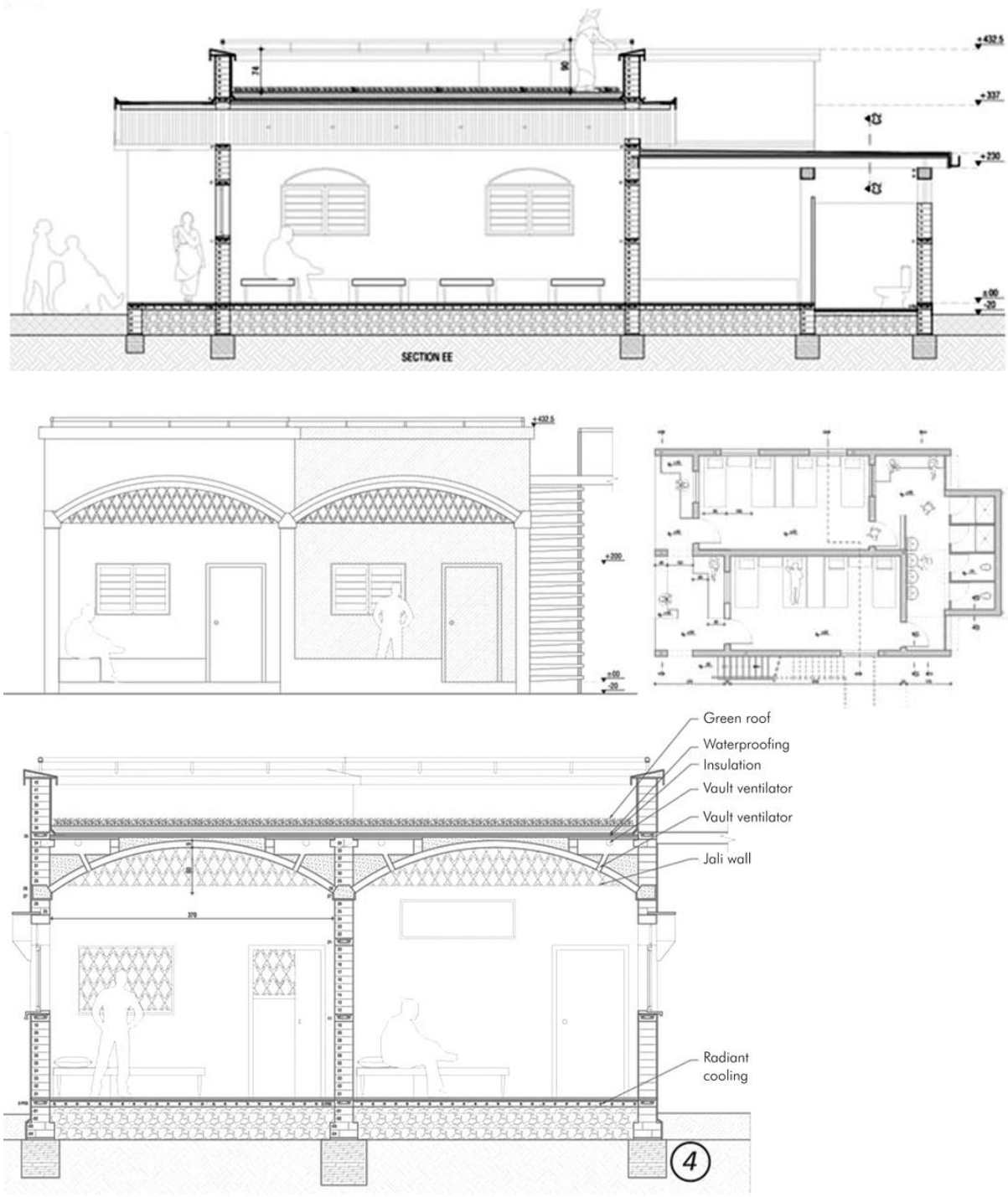


Figure 51 Dormitory plan and sections

Designed to empower rural communities, the center prioritizes inclusivity and provides spaces for learning, interaction, and skill-building. Multi-functional spaces cater to diverse community activities, reinforcing a sense of ownership and belonging.

Uses the natural landscape and vernacular elements effectively. Emphasis on eco-friendly materials and techniques. Prioritizes inclusivity and empowerment. Achieves high impact with low-cost solutions.

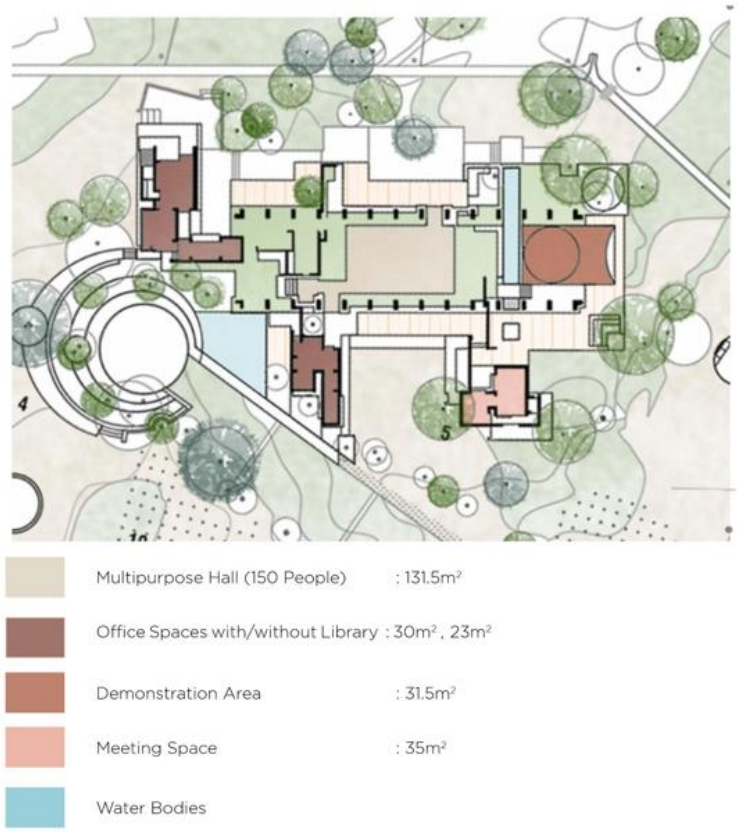


Figure 52 Built to open relation map

4.2.2 Dormitory

The 4 single-storey dormitory style residential units are a simple design intended to maximize communal space in building. These buildings are designed and built with load bearing CSEB masonry, CSEB composite elements, poured earth concrete foundations and CSEB vaulted roof system built with the freespanning technique.

4.2.3 Built open relationship

The project's high open-to-built ratio allows for courtyards and semi-open spaces that encourage interaction and foster a connection with nature. Designing the cultural center with a balanced built-to-open ratio, creating spaces where people can gather informally while maintaining a visual and physical connection to the Godavari River. Open spaces can host cultural events, festivals, and community interactions, while shaded areas or semi-open pavilions offer relief from Nashik's climate.

4.2.4 Sustainability

Incorporates sustainable construction techniques and eco-friendly systems like rainwater harvesting, passive cooling, and local materials to minimize environmental impact. As the Godavari riverfront is a sensitive ecological zone, the project can take inspiration from Sharanam's emphasis on sustainability. Implementing systems for rainwater harvesting, energy-efficient design, and waste management to ensure environmental harmony. Using local, renewable materials like basalt stone, terracotta, or timber to minimize the project's carbon footprint while reflecting the vernacular character of Nashik.

4.2.5 Architectural language

The architectural language is rooted in vernacular traditions, with forms and materials inspired by rural Indian architecture. Simple lines, sloping roofs, and courtyards define its aesthetic. The architectural language is simple, rooted in vernacular traditions, and emphasizes human-scale design. Incorporating Wada-style courtyards and ghat-inspired stepped forms to evoke Nashik's historic riverfront architecture. Using symbolic elements inspired by the Godavari River, reflecting its spiritual significance. Maintaining a human scale in the design, ensuring that the spaces feel welcoming and accessible to all.

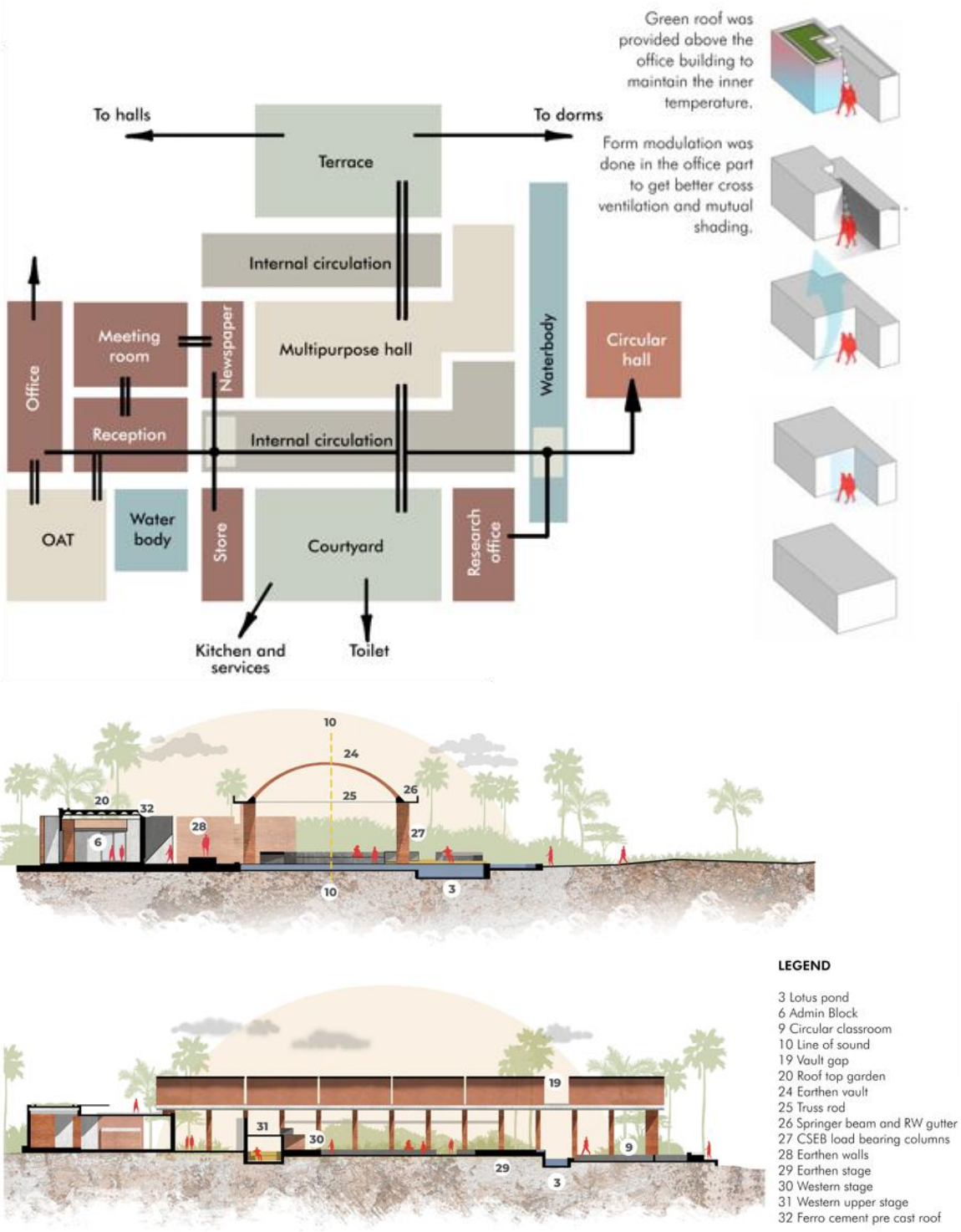


Figure 53 Zoning, movement and massing diagrams

Figure 54 Sections through the built

4.2.6 Massing

The project employs low-rise structures that are human-scaled and non-intrusive, with horizontal massing blending into the landscape. The forms are simple and rooted in vernacular architecture. Use horizontal massing to maintain harmony with the

Godavari riverfront's landscape and cultural landmarks. Avoid vertical elements that could overshadow the surrounding natural and built context.

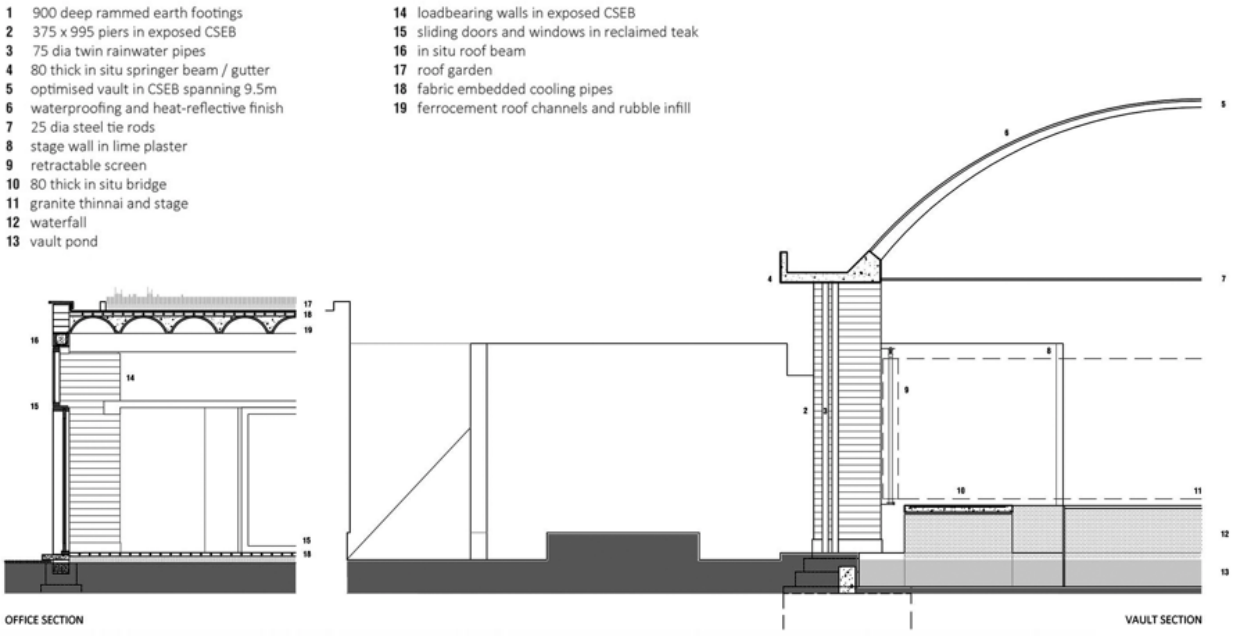


Figure 55 Construction details

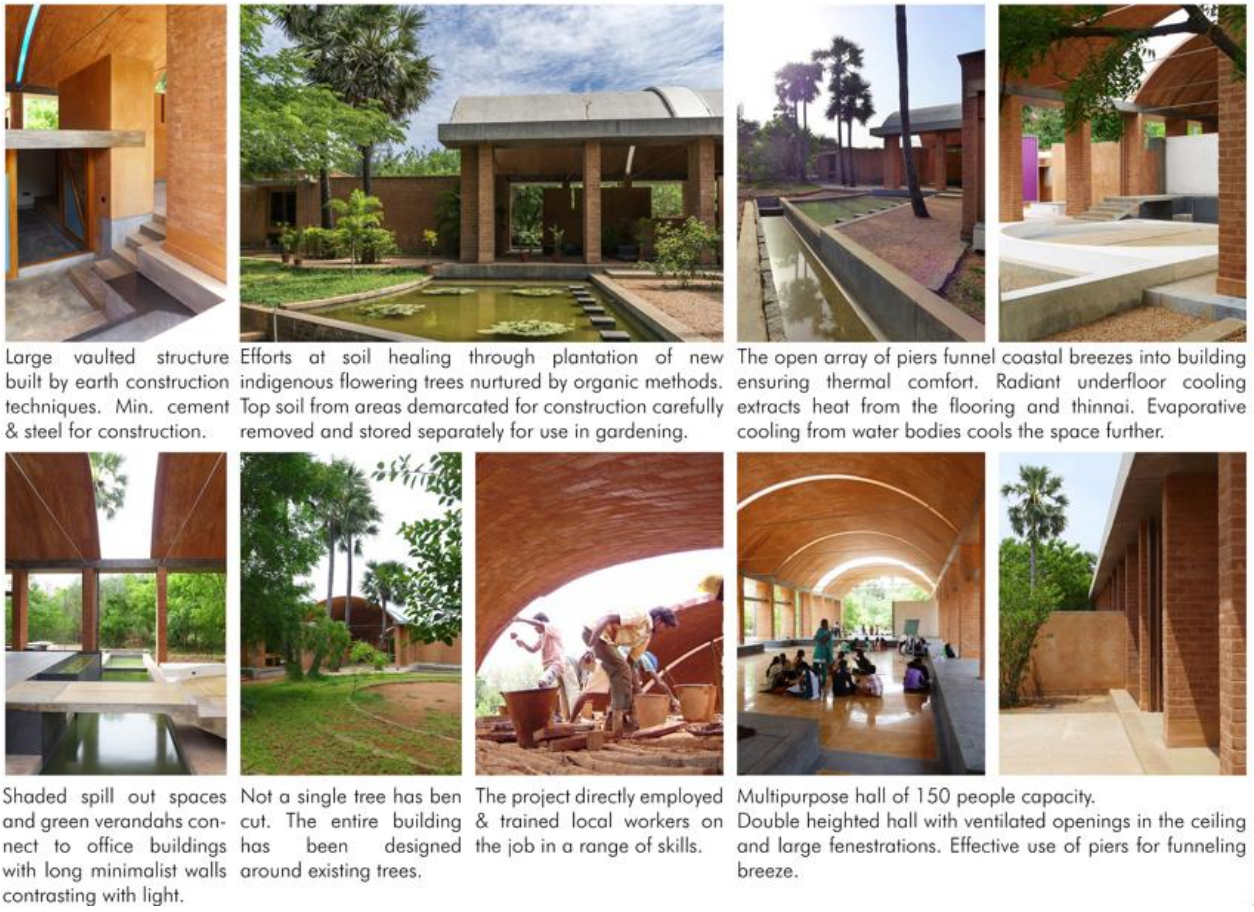


Figure 56 Pictures showing the different spaces

4.2.7 Multi-functional spaces

The project's spaces are designed to accommodate multiple activities, ensuring flexibility and adaptability. Flexibility is crucial for the cultural center, which must accommodate a range of activities, such as art exhibitions, workshops, performances, community events, and riverfront gatherings. Designing multi-functional spaces that can adapt to seasonal festivals and varying user needs, particularly during Nashik's famous Kumbh Mela or smaller cultural events.

4.2.8 Movement and circulation

The movement pattern is primarily pedestrian, with pathways interwoven into landscaped courtyards and open spaces, creating a seamless flow between indoor and outdoor areas. The pedestrian-friendly circulation in your cultural center can guide visitors through a curated journey, from public spaces near the riverfront to more intimate, cultural zones. Design pathways and plazas that integrate landscape elements while ensuring accessibility for all user groups. Plan for efficient movement during high-footfall events, such as festivals and community gatherings, while maintaining visual connectivity with the Godavari.

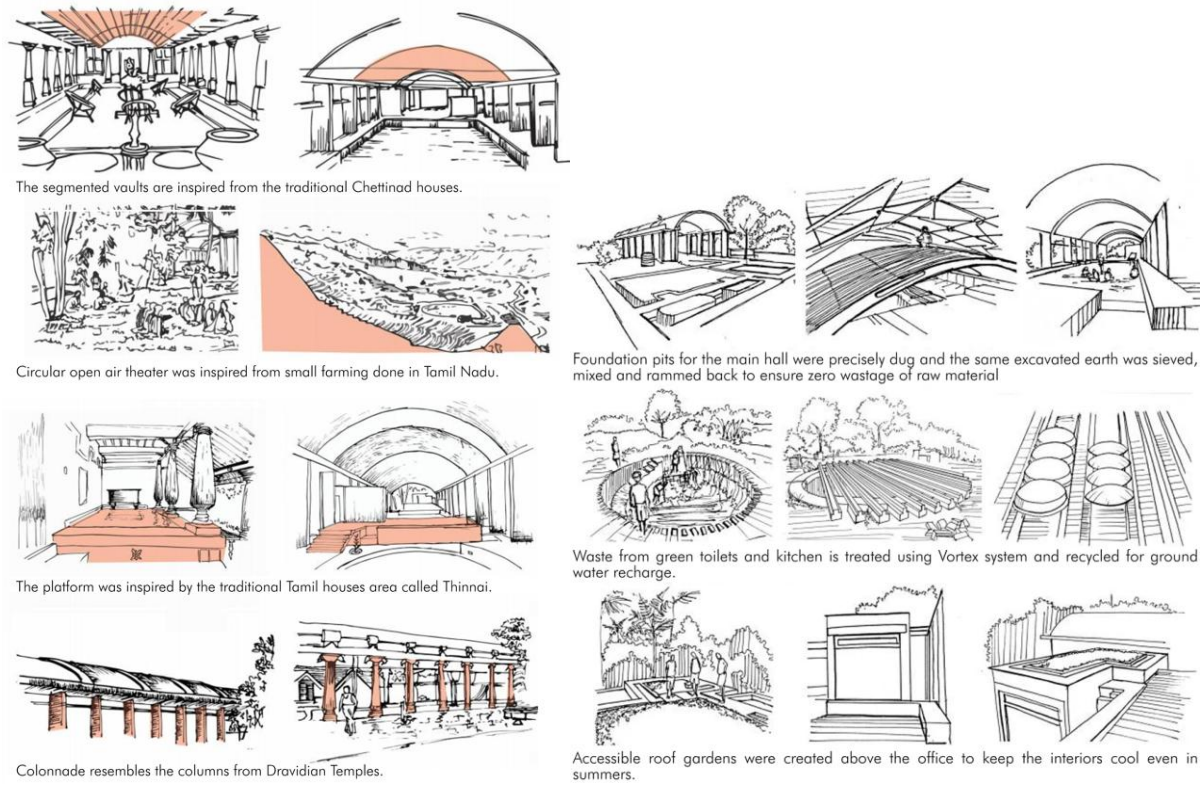


Figure 57 Sketches showing the different spaces

4.2.9 Services

The services emphasize low-energy solutions, such as rainwater harvesting, passive cooling, and wastewater recycling. The use of bio-digesters and other eco-friendly systems aligns with the project's sustainable goals. Focus on sustainable services, like water management systems that integrate with the Godavari River, renewable energy sources, and natural cooling strategies. Use eco-friendly waste management systems to maintain the cultural center's harmony with its environment. Helps in reducing operational costs and environmental impact.

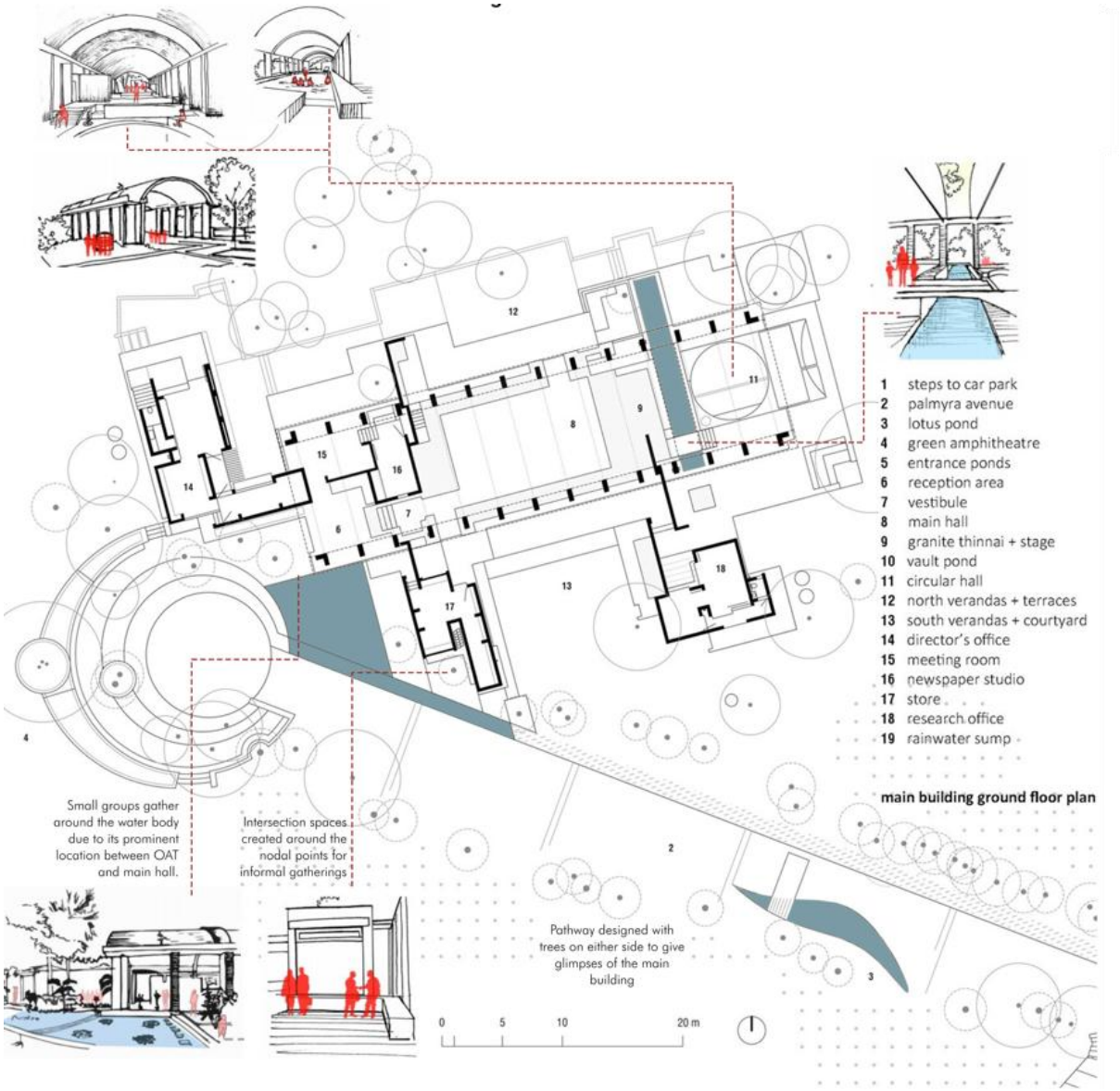


Figure 58 Plan and spatial qualities

4.3 Bharat Bhavan

Live case study

Project name: Bharat Bhawan
Location: Bhopal
Architect: Charles Correa
Year of completion: 1983
Site area: 2.46 Acres (9968 sq m)
Built up area: 7100 sq m
Ground coverage: 65%

4.3.1 Significance

Designed by Charles Correa in 1982, Bharat Bhawan celebrates the interplay between nature, built form, and culture. The project was envisioned as a cultural hub, integrating art, literature, music, and theatre under one roof. The design focuses on the contextual sensitivity to the site and user interaction. Reflecting Nashik's cultural and religious traditions through architecture. Respecting the site's topography and connection to water. Creating spaces that foster community interactions, performances, and celebrations. Using local materials and sustainable techniques to ensure resilience and harmony with the environment. Incorporating flexible spaces to adapt to diverse cultural activities. The project on the Godavari riverfront can adopt Bharat Bhawan's approach of creating a vibrant cultural space that integrates local traditions and riverine significance. The concept of "celebrating culture through architecture" is a guiding principle for both projects.

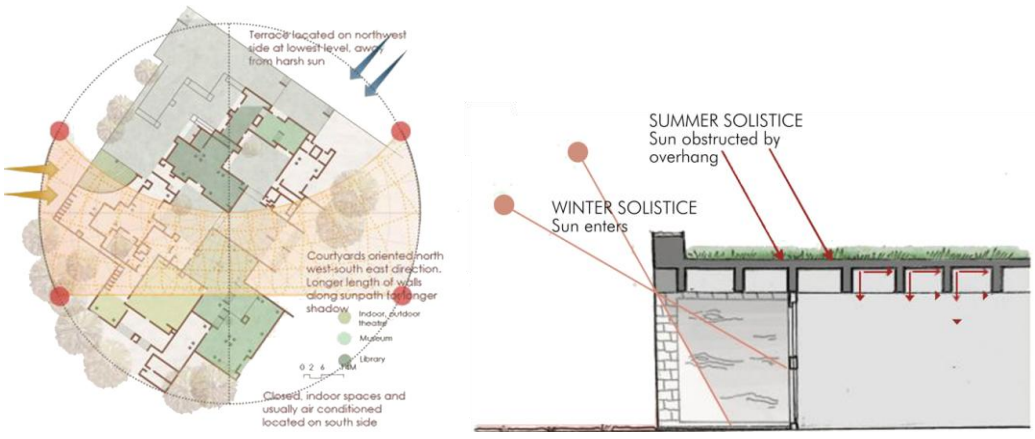


Figure 59 Climatic conditions and applied strategies

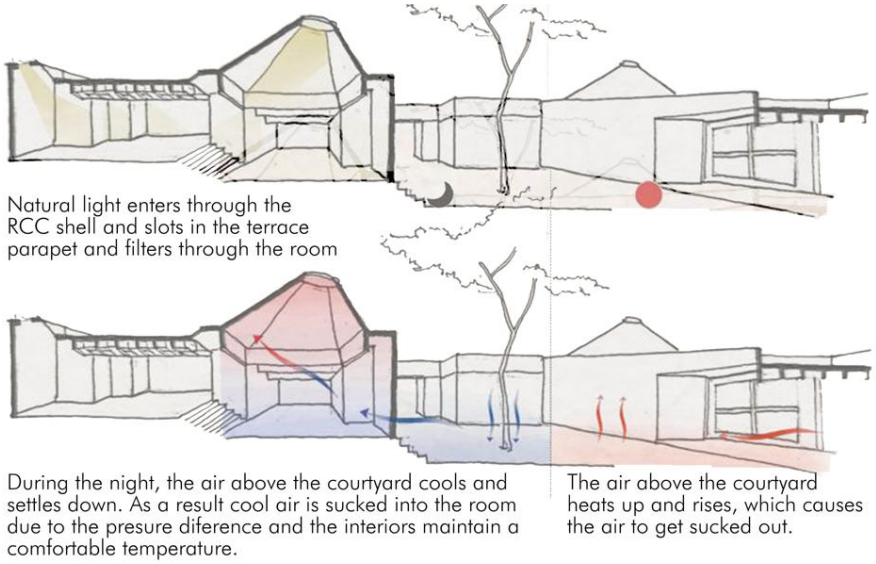


Figure 60 Bharat Bhavan in the day and night

4.3.2 Site layout

The site is located on the slopes of a hill overlooking the Upper Lake in Bhopal. The cascading layout allows the structures to blend seamlessly into the natural topography. The entire complex is arranged around a series of courtyards, with carefully designed levels to create continuity between indoor and outdoor spaces. On the riverfront, using a cascading design along the slopes of the Godavari could create visual and physical access to the river while respecting the natural contours. The layout of Bharat Bhawan offers lessons in integrating built spaces into natural settings without dominating the landscape.

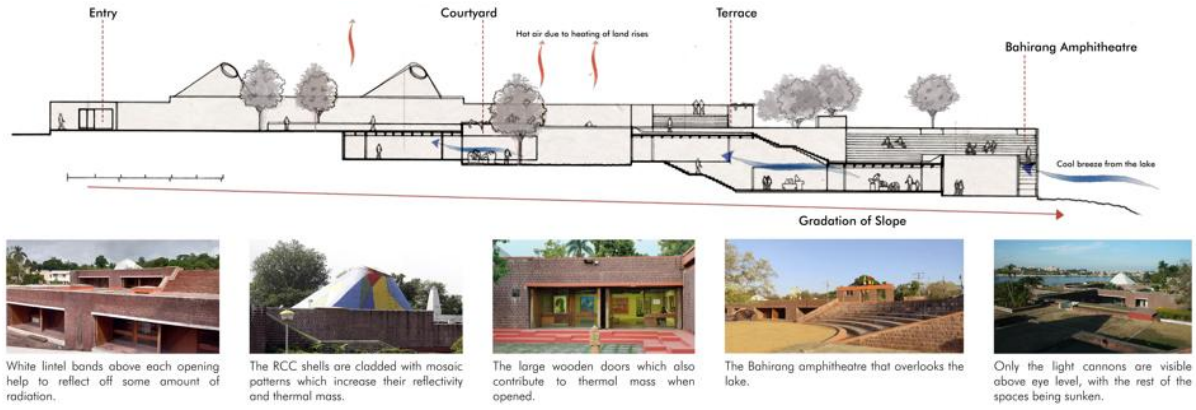


Figure 61 Site section

4.3.3 Massing and verticality

The massing is low-rise and horizontal, blending into the landscape. Correa used stepped forms to reduce the visual impact, with the structures appearing as though

they emerge from the ground. For a riverfront project, low-rise massing would preserve the openness of the site and ensure views of the river. Bharat Bhawan's sensitivity to verticality can inspire similar respect for the skyline and context in Nashik.

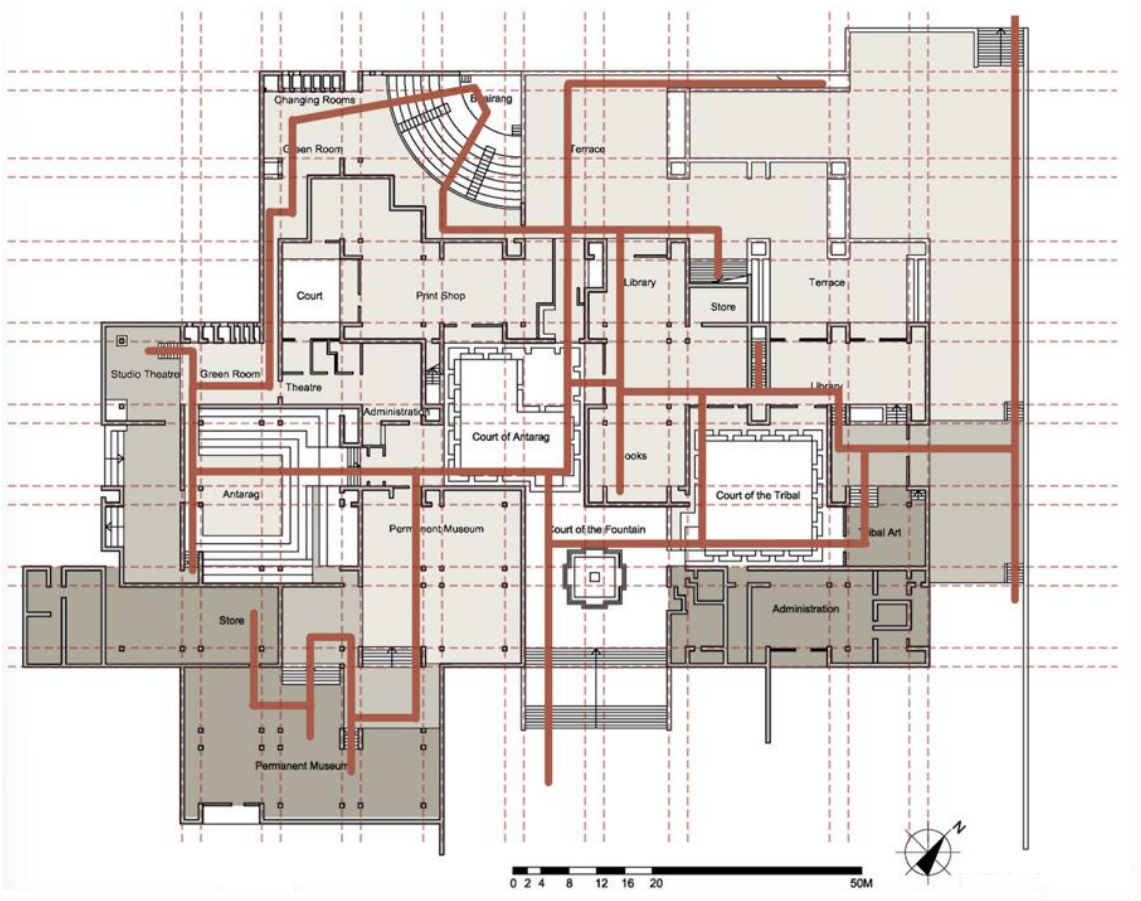


Figure 62 Plan of Bharat Bhavan

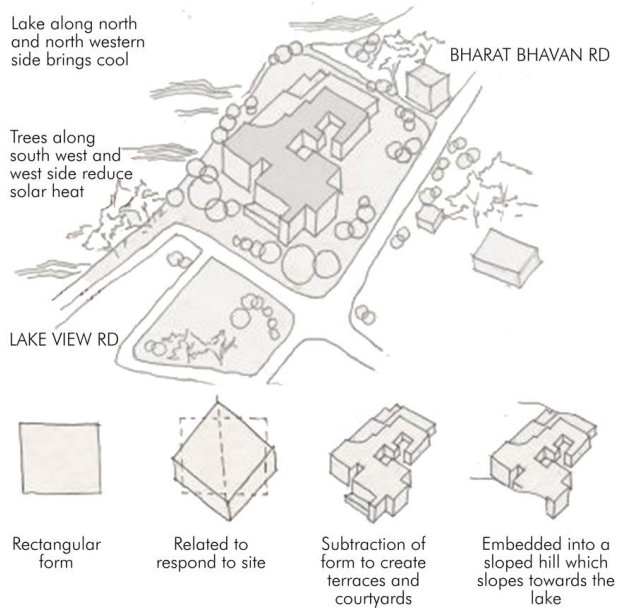


Figure 63 Massing

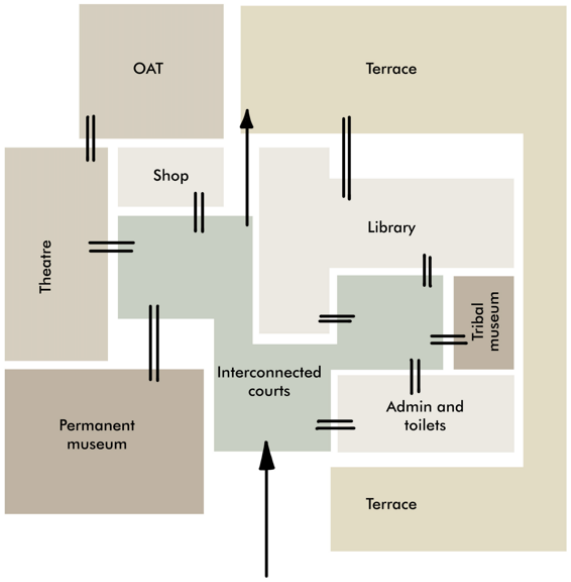


Figure 64 Zoning and circulation diagram

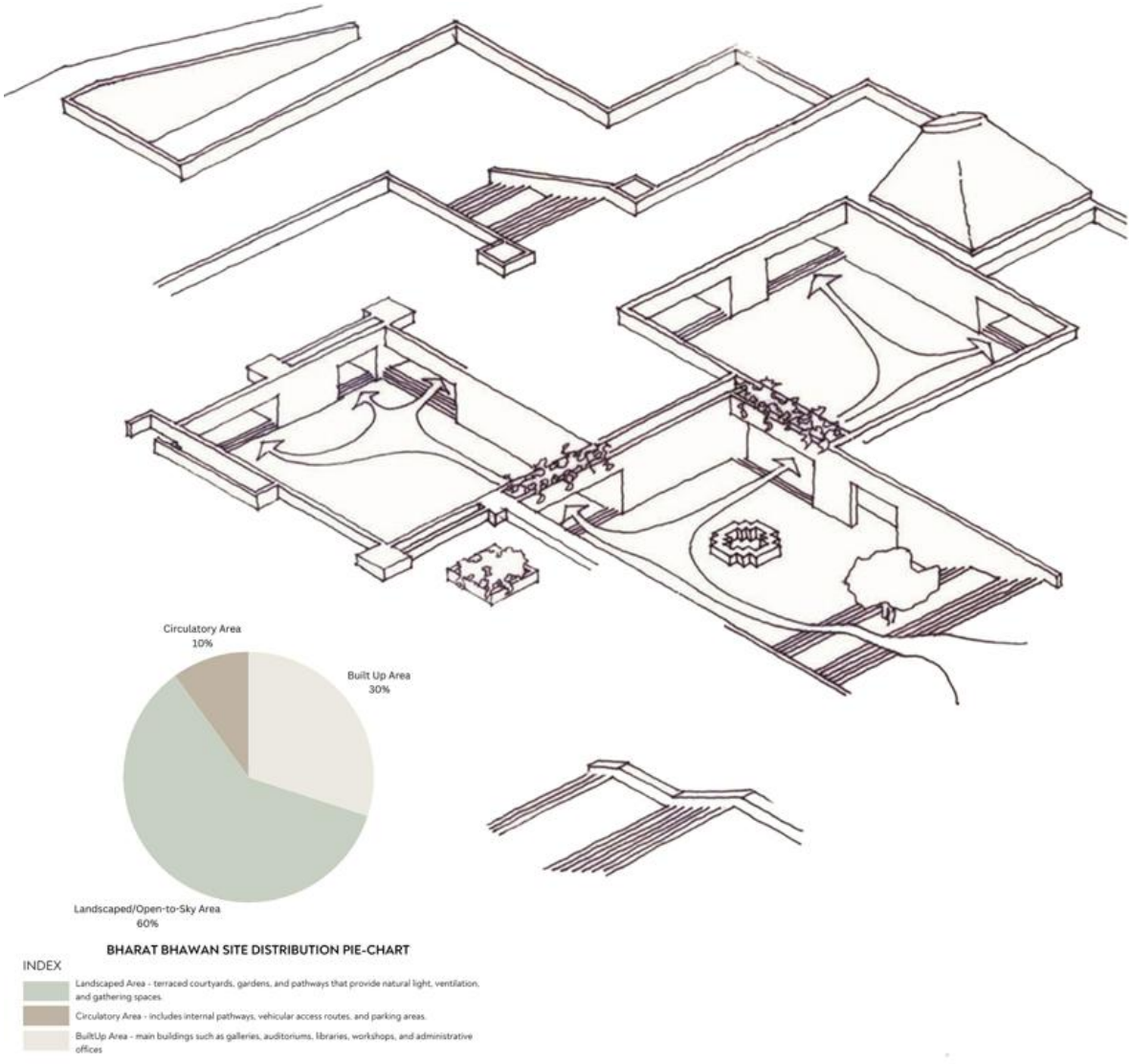


Figure 65 Built to open relation

4.4 Dilli Haat

Live case study

Project name: Dilli haat

Location: New Delhi

Client: Delhi Tourism & Municipal Corporation of Delhi

Architect: Design Associates

Year of completion: 1993

Site area: 6 Acres (24,280 sq m)

Built up area: 3,190 sq m

Ground coverage: 12 %

Target number of people: 500 people

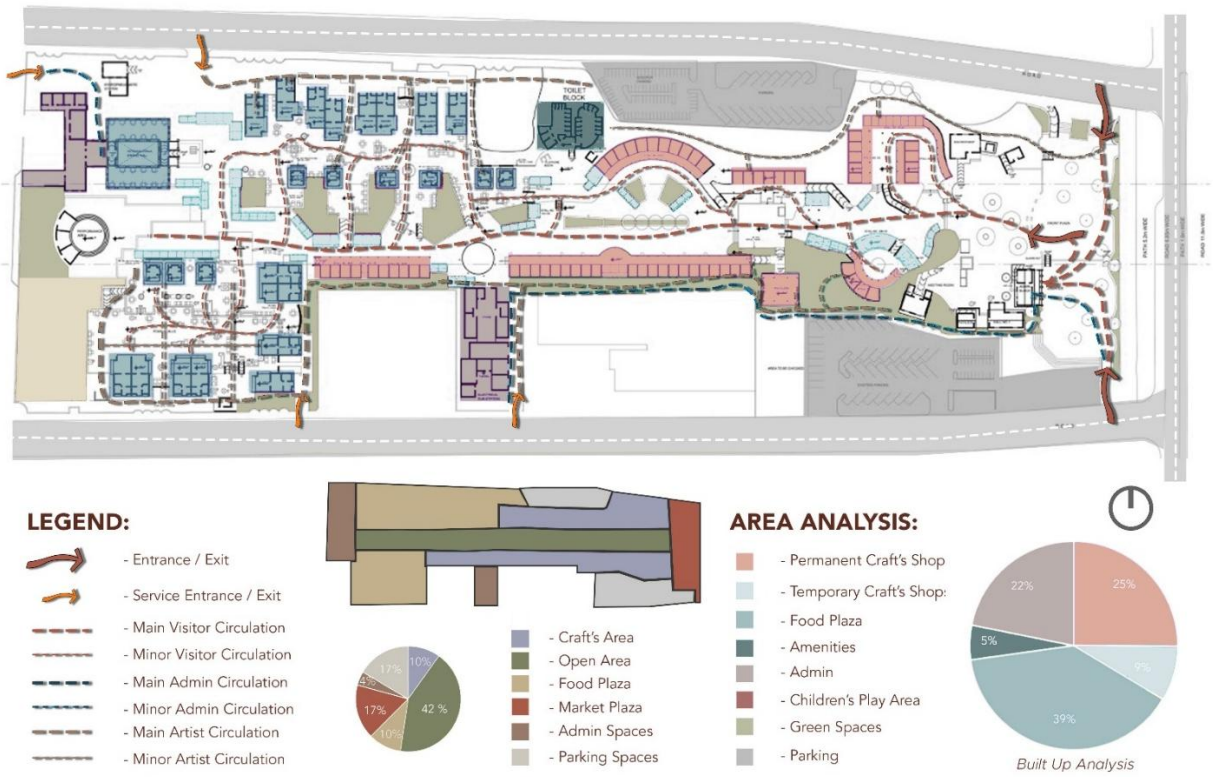


Figure 66 Plan, Zoning and Area analysis

4.4.1 Significance

Dilli Haat, designed by the Delhi Tourism and Transportation Development Corporation (DTTDC) and architect Pradeep Sachdeva, is a vibrant open-air market and cultural hub. The project integrates traditional Indian craft, food, and performance spaces into

an urban setting while fostering community interaction and economic opportunities for artisans. The design celebrates culture through built form and the informal vibrancy of open spaces. Celebrates Indian art, craft, and cuisine, creating a vibrant cultural hub. The modular design allows for multiple uses, from markets to performances. Incorporates passive cooling, local materials, and water management systems. The non-linear pathways and open courtyards create a dynamic user experience. The community cultural center on the Godavari riverfront can emulate this approach by offering a platform for local artisans, cultural performances, and food experiences. Integrating the heritage and religious significance of the Godavari can create a similar celebration of culture while adapting to Nashik's unique context.

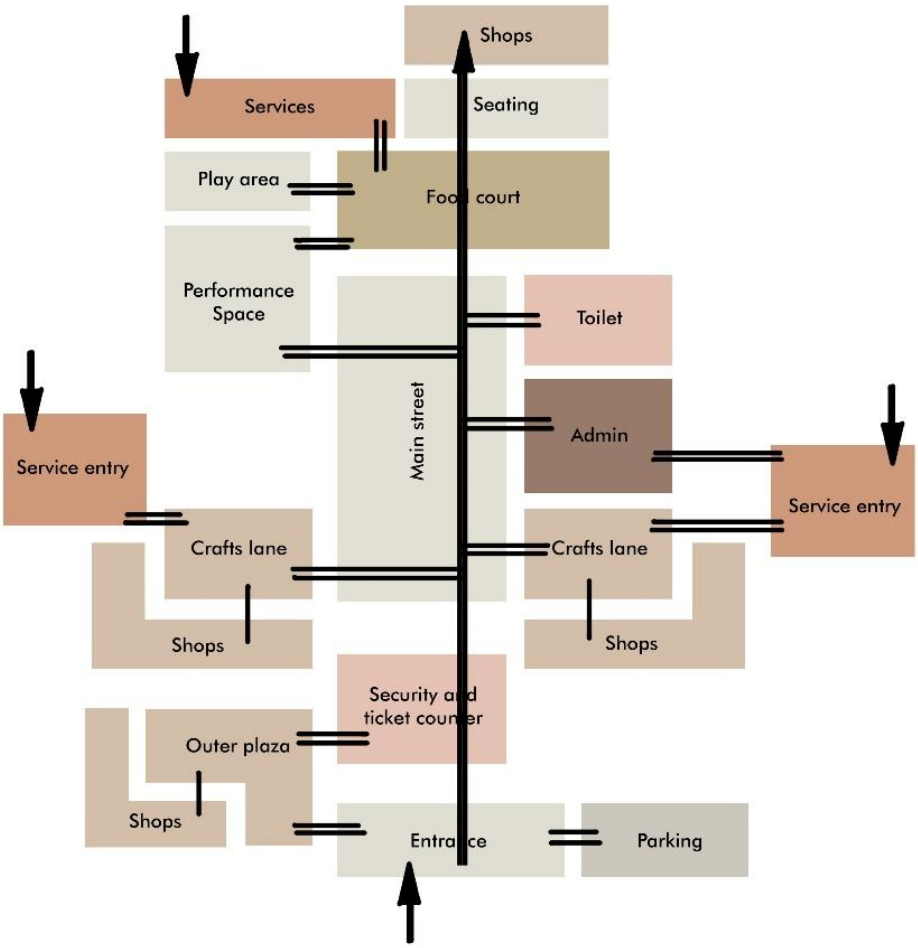


Figure 67 Zoning and movement diagram

4.4.2 Site layout

The layout is organized as a series of courtyards and pathways, allowing the built structures to feel open and interconnected. Stalls are arranged to maximize visibility

and accessibility while maintaining intimacy. Open spaces for performances and shaded areas for rest punctuate the site, creating a rhythmic balance between built and open areas. For the riverfront at Godavari, the layout can inspire creating modular stall arrangements or kiosks for vendors and craftspeople. Courtyards and shaded seating areas can serve as spaces for informal interactions, performances, and gathering zones, ensuring a lively yet cohesive experience along the Godavari.

Figure 68 Stall types in the haat

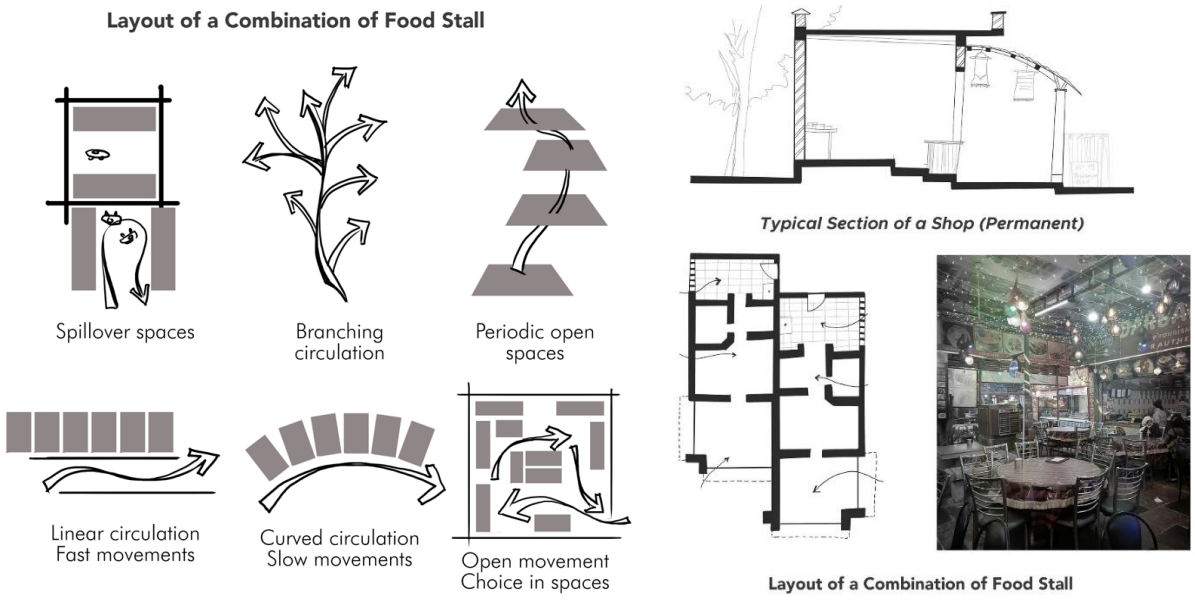


Figure 69 Site layout parti diagrams
Figure 70 Stall plan and section

4.4.3 Services

Services are well-integrated into the design, with water, drainage, and utilities concealed below ground or behind stalls. The project incorporates sustainable

features like rainwater harvesting and waste management to handle heavy visitor traffic.

Figure 71 Formal and open space distribution

Figure 72 Spatial qualities of different spaces

Dilli Haat incorporates sustainable features like shaded walkways and landscaping that reduce heat. For the project, sensitivity to the riverfront ecosystem is essential. Techniques like riparian planting, flood-resistant landscaping, and waste management systems will help ensure environmental harmony. Dilli Haat fosters community interaction by hosting festivals and cultural events. Similarly, the project can act as a platform for local artisans, traditional music, dance, and community rituals, tying the riverfront into the social fabric of Nashik.

4.5 Sarkar Wada

Live case study

Project name: Sarkar Wada
Location: Nashik
Built by: Nanasaheb Peshwa
Year of completion: 1750- 1760
Site area: 1582 sq m
Built up area: 1304 sq m
Ground coverage: 80%

4.5.1 Significance

The Sarkar Wada, a historic Maratha-style Wada in Nashik, is a significant architectural and cultural landmark. The adaptive reuse of Sarkar Wada transforms a historic residence into a functional, culturally significant space, balancing conservation and contemporary utility. The project focuses on preserving the heritage value while integrating modern facilities. Creating a master plan that connects Sarkar Wada and other Wadas in the precinct to the Godavari riverfront through walkways, plazas, and cultural trails. Incorporate elements that highlight the spiritual and cultural significance of the riverfront, making it a place of pilgrimage, leisure, and learning. Community involvement in design to maintain cultural authenticity. The proposed cultural center can highlight the historical narratives of the Wadas and the Godavari riverfront, using them as interpretive spaces for storytelling, exhibitions, and workshops. Using interactive design elements to educate visitors about Nashik’s Maratha heritage and its connection to the river.

4.5.2 Site layout

The original layout follows the traditional Wada typology, with a central courtyard surrounded by rooms on multiple levels. The adaptive reuse introduces functional zones while maintaining the courtyard as the core, ensuring natural ventilation and light. Using courtyard-centric layouts to create functional and interactive spaces for cultural activities. Maintaining the Wada's hierarchical spatial arrangement while

connecting the built spaces with the riverfront precinct and other Wadas through pathways and urban linkages.

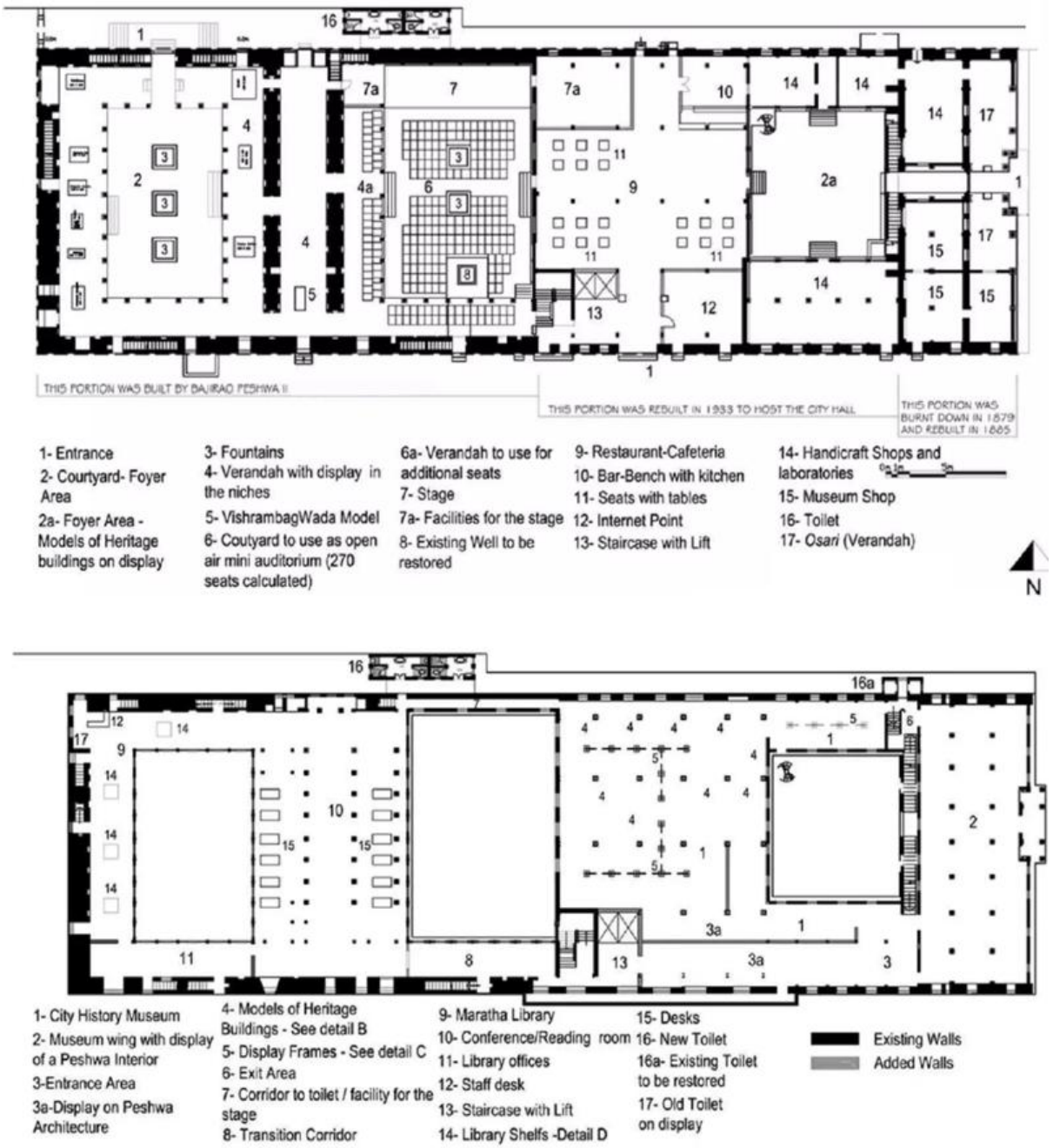


Figure 73 Plans

4.5.3 Construction techniques

Originally built using timber-framed construction, with basalt stone plinths, lime plaster walls, and terracotta tiled roofs. The adaptive reuse focuses on restoring these materials while using modern techniques for structural reinforcement. Preserve and

restore the traditional construction techniques of Wadas, such as using lime plaster and basalt stone, while integrating modern reinforcement methods for safety and longevity. For new construction within the cultural center, use a material palette inspired by traditional Wadas, creating harmony between old and new.

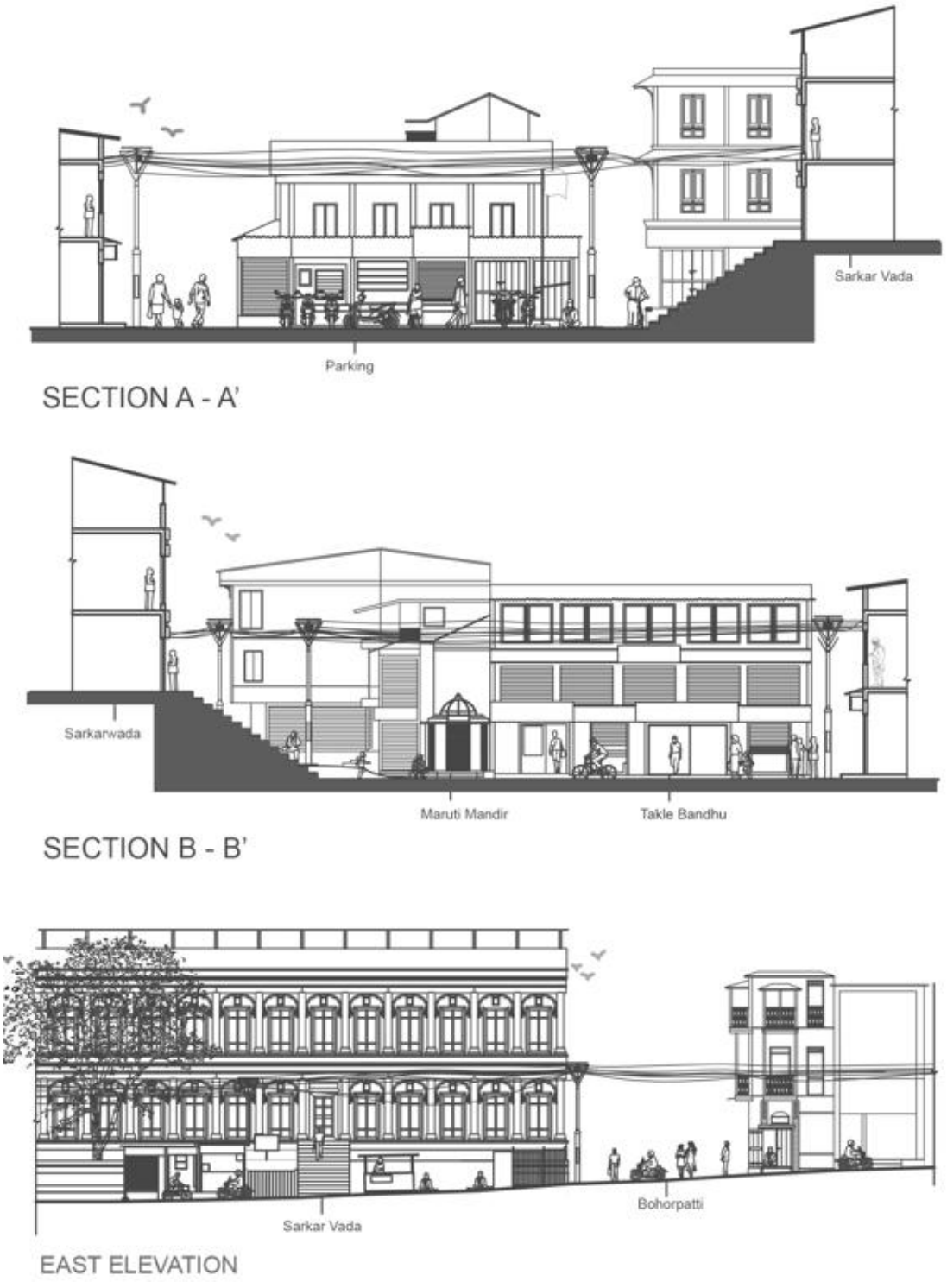


Figure 74 Sections and elevations of the Wada

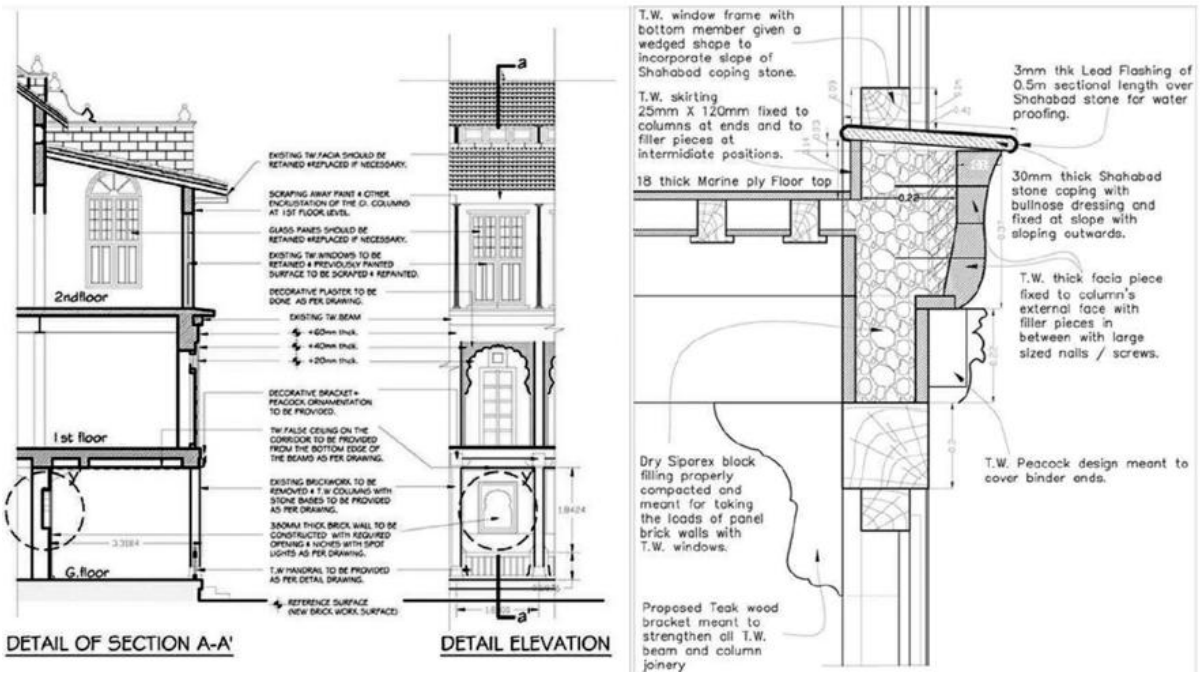


Figure 75 Construction details

The Wada exhibits classic Maratha architectural features, including wooden columns, intricately carved brackets, courtyards, and sloping tiled roofs.

Originally built using timber-framed construction, with basalt stone plinths, lime plaster walls, and terracotta tiled roofs.

The project repurposes historic spaces for contemporary functions, including galleries, workshops, and community events, while preserving key architectural features.

The Wada is reimagined as a cultural node within the urban fabric of Nashik, highlighting its relevance to the surrounding community.

Figure 76 Views of the wada

4.6 Cheonggyecheon restoration

Literature case study

Project name: Cheonggyecheon Restoration
Location: Seoul, South Korea
Architect: Mikyoung Kim Design
Funding: Seoul Metropolitan Government
Year of completion: 2005
Site area: 5.84 km stretch

Figure 77 Isometric illustration depicting the Cheonggyecheon restoration

The Cheonggyecheon project showcases how polluted urban waterways can be restored, a critical factor for the Godavari, which suffers from untreated sewage and pollution and concretisation which has led the river to lose its cultural characters.

Insights on integrating plazas, recreational nodes, and cultural spaces can be applied to Nashik, which is a major religious destination with opportunities to incorporate heritage-oriented design.

Figure 78 Sections showing the different strategies applied for the restoration

The Cheonggyecheon Restoration Project, conducted between 2003 and 2005, significantly transformed the urban landscape by revitalizing the 5.8 km stream located in central Seoul. The restoration project extended over a period of 27 months and involved the dismantling of elevated highways as well as the removal of decades-old concrete pavement. The stream and its tributaries further segmented the city into distinct towns; coursing from west to east, the stream delineated a boundary between the northern and southern regions of the city, where the aristocracy and the common populace resided, respectively. Due to its strategic positioning, the Cheonggyecheon served as a venue for communal gatherings and seasonal activities, such as kite flying. Of greater significance, it served as the city's drainage system. Domestic waste and sewage from individual households were discharged into the stream, ultimately contaminating the Han River. Beginning in the 14th century, the persistent threat of flooding and the stream's function as a sewer necessitated ongoing management and enhancement efforts, including embankment and dredging activities.

Figure 79 Views of the canal after restoration

The project involved the restoration of two historical bridges, incorporating traditional scenes depicted on tiles, the inclusion of traditional music, and the application of traditional designs. It featured fountains and illuminated the stream at night, while also reintroducing elements of nature to the heart of Seoul, all the while creating a space that is unique and unprecedented in its character. The stream has been enhanced

through a variety of events, such as an annual lantern festival, music concerts, and traditional performances.

Between 2000 and 2009, Seoul experienced an increase in green space, primarily due to Mayor Lee’s Green Seoul initiative, while the neighboring regions of Gyeonggi and Incheon saw a reduction in their green areas during the same timeframe. By 2010, nitrogen dioxide levels had decreased by 10 percent, while the adjacent area experienced a 16 percent increase. Additionally, there was a 15 percent reduction in particulate matter, contrasting with a 16 percent rise in the neighboring region. Consequently, the pollution trend in this area has exhibited a decline, in contrast to the upward trajectory observed in similar urban regions.

Numerous tributaries originating from the valleys and mountains encircling Seoul converged to create the Cheonggyecheon, an eleven-kilometer-long stream that traversed the central area of the city before merging with the Han River, a significant waterway in South Korea. Similar to numerous other waterways across the nation, the Cheonggyecheon functioned as an ephemeral stream, characterized by significant fluctuations in water levels throughout various seasons. During certain drier intervals, it may have experienced a complete absence of flowing water. The geographical characteristics of the region, coupled with Korea's rainfall pattern—wherein over 50 percent of annual precipitation occurs within a limited number of summer weeks—rendered the stream susceptible to flooding.

The fish population in the stream has shown a notable increase in both species’ richness and abundance, especially in the downstream areas, with a continuous upward trend in these factors over time. In contrast to numerous locations throughout the city, fish and various forms of wildlife are often observable during informal excursions to the stream. Satellite imaging of the restoration area indicates that the heat island effect was alleviated by the restoration, partly due to the reestablishment of a pathway for wind flow through the central city (Cho, 2010). This has enhanced the urban environment and moderated the area through the promotion of cleaner air circulation. The removal of the overpass and the restoration of the stream have resulted in notable improvements in air quality.

The exposed stream bed has adapted to increased precipitation intensity, indicating a resurgence of the stream's function in flood management (Anderson, 2010). Overall,

a reduction in suspended solids, chemical oxygen demand, and biological oxygen demand, coupled with a rise in dissolved oxygen levels, signifies an improvement in water quality. Concurrently, it indicates a decreasing trend in e-coli bacteria contamination.

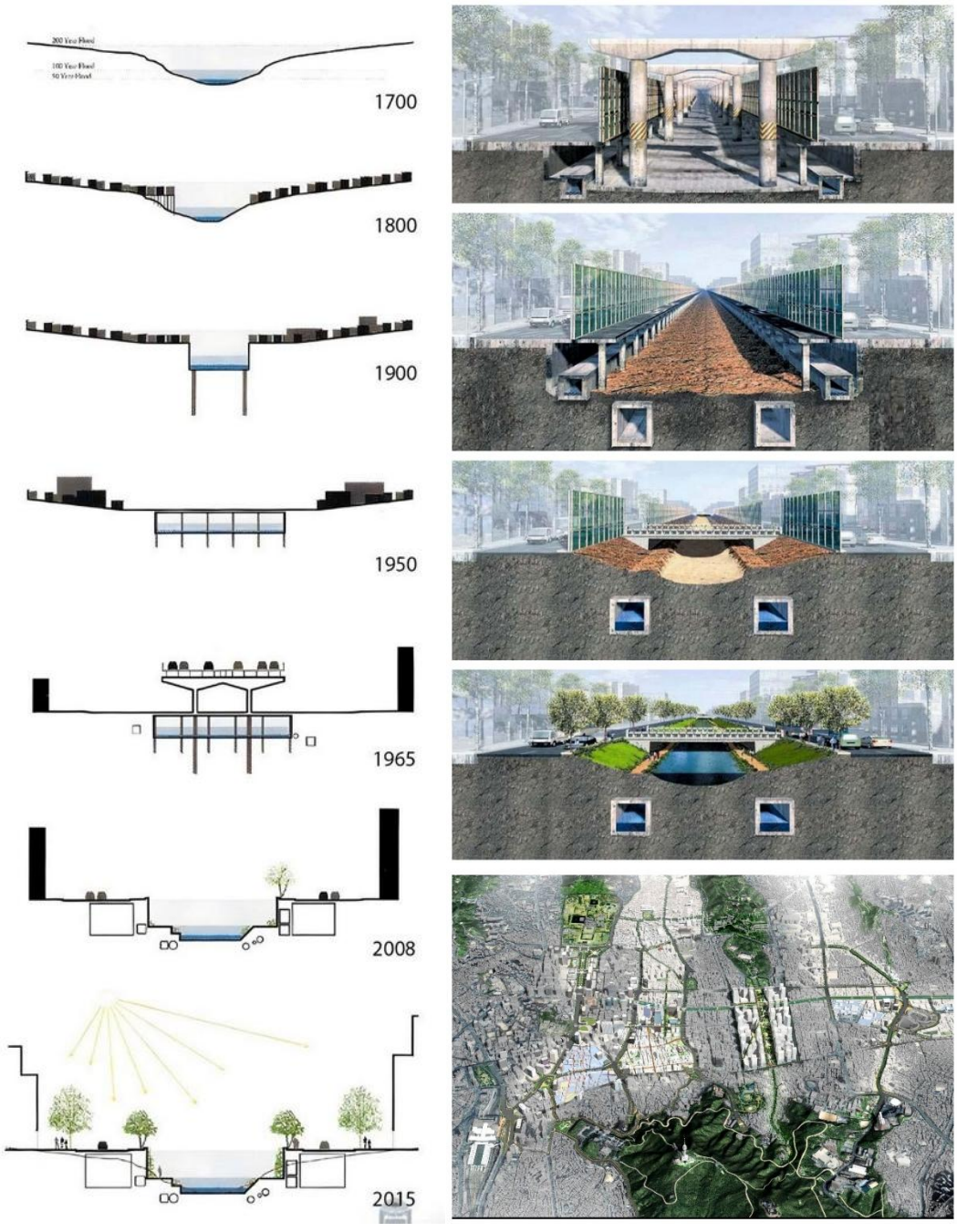


Figure 80 Transformations of the canal from 1700 to 2015

In anticipation of the restoration efforts, residents of Seoul were extended an invitation to explore the site and observe the environmental degradation firsthand. The project involved consultations with both international and Korean ecologists, as well as foreign

architects who possessed expertise in comparable projects. Mayor Lee endeavored to engage stakeholders by considering their interests and articulating the advantages of the project beforehand. An ecological interpretation program elucidates the diversity of flora and fauna inhabiting the stream and its surrounding areas.

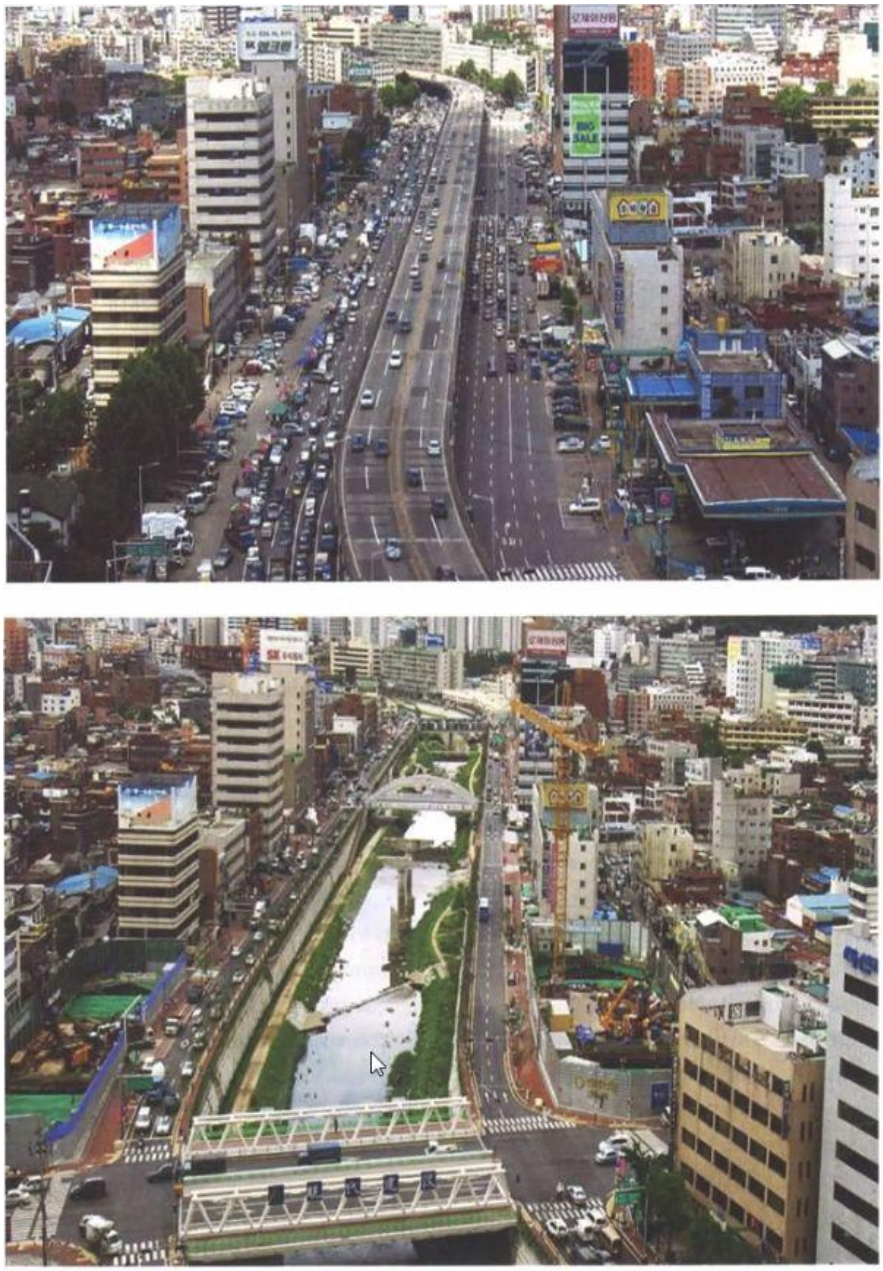


Figure 81 Before and after restoration

The most compelling evidence of gentrification, aside from the notable increase in land prices by 30–50 percent within a 50-meter radius of the project along the stream (“Cheonggyecheon Stream Restoration Project,” 2013), has been the evolving price dynamics in the vicinity. Historically, prices tended to rise as one approached highway exits; however, contemporary trends indicate that they now escalate as one nears the

open green areas and pedestrian zones surrounding the Cheonggyecheon (Cervero and Kang, 2011).

A variety of assessments have been conducted regarding the tourist experience in the region, highlighting an enhanced alignment with visitor preferences for leisure areas, fulfillment of visitor expectations, and a notable positive correlation between the expansion of leisure spaces and overall satisfaction with city tours. In a comparative analysis of tourists who visited the stream versus those who did not, it was observed that the former group expressed a more favorable and impactful impression of their experience in Seoul. The findings indicated that the project achieved success through significant correlations between the tourist experience and satisfaction regarding the cultural site (Anderson, 2010). There are designated benches available for pedestrians seeking a place to rest alongside the stream.

Conversely, the anticipated widespread obliteration of smaller vendors along the riverbank, which raised concerns regarding gentrification at the project's inception, has not materialized. Hardware and textile/fashion enterprises of various scales continue to thrive along the Cheonggyecheon, demonstrating resilience and stability even after seven years. The primary displacement involved smaller, more peripheral merchants who conducted their business in markets or even on the streets.

4.7 Changsha Liuyang Riverfront

Literature case study

Project name: Changsha Liuyang Riverfront

Location: China

Architect: SWA Group

Funding: Changsha FuRong Urban Construction Investment Company

Year of completion: 2013

Site area: 10 km stretch

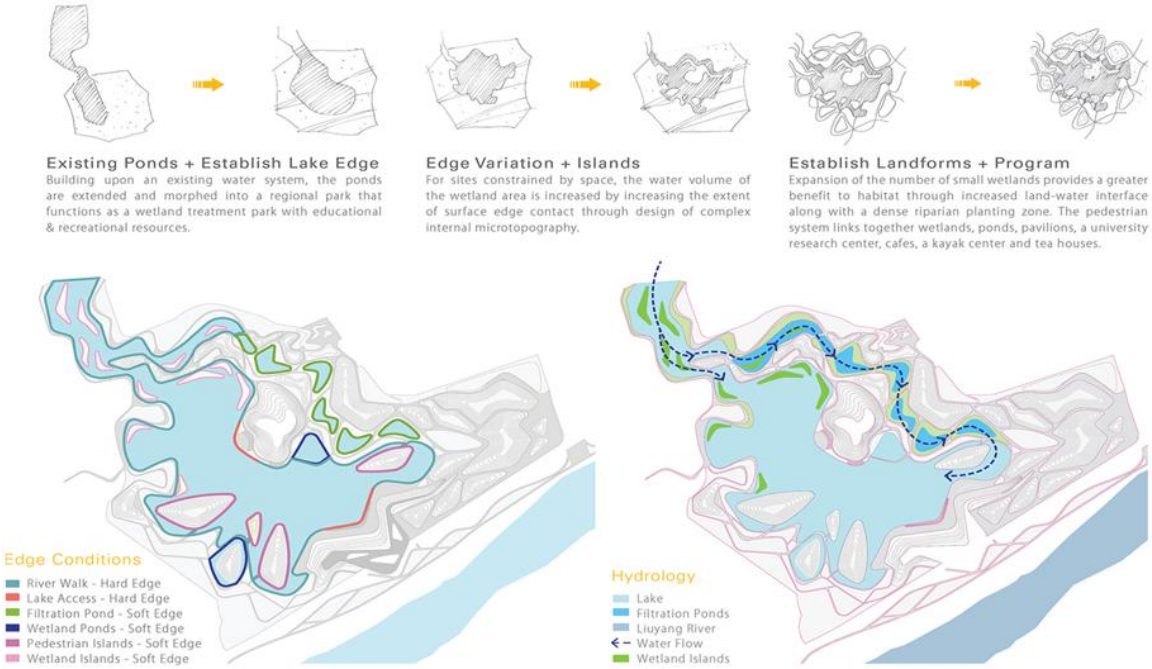


Figure 82 Conceptualisation diagrams

Provides strategies to tackle Nashik's monsoonal floods while creating public spaces that can remain functional year-round. Emphasizes incorporating wetlands and bioswales to manage stormwater and improve biodiversity along the Godavari's edges. Offers ideas on multifunctional riverfronts to host Nashik's diverse cultural, recreational, and religious activities. The Liuyang River serves as a tributary to the Xiangjiang River, traversing the eastern section of the city and constituting a significant aquatic area within Changsha. Liuyang River stands as the most significant tributary of Xiangjiang River, which has also been developed with various riverfront amenities and riverbank facilities in subsequent years. Both river systems are situated in regions that are witnessing significant population growth. Despite the potential for river

flooding, the Changsha region has historically been recognized as a society deeply intertwined with water, where daily life has consistently centered around the banks of rivers. The river served as a vital conduit for the exchange of transportation, sustenance, and social discourse. Families gathered and engaged in social interactions beneath the refreshing shade and inviting branches of the river willow trees. The fluctuations in seasonal river water levels established a profound connection between the community and the natural rhythms of their environment. However, the rise in flooding resulted in fatalities, prompting the implementation of a stringent separation between the city and the river through the construction of an extensive levee system, aimed at managing and regulating an increasingly unpredictable and harmful natural phenomenon. However, the division and disconnection of the city resulting from the established levee system has resulted in the loss of significantly more.

Figure 83 Plan and section of the riverfront

This wetland park serves multiple functions, encompassing ecological, climatic, and recreational aspects, and has emerged as a significant stopover for migratory birds. The wetland park plays a crucial role in regulating the microclimate, resulting in more comfortable temperature and humidity levels in its vicinity compared to other urban areas. The Wetland Park, developed from an existing lake, broadens the aquatic area

and edge conditions to augment its purification capabilities, improve wildlife habitats, and provide enhanced recreational resources. A multitude of islands and bays intricately weave together a landscape characterized by river grass, forests, and berms. Bird-watching platforms, Metasequoia islands, and perch pole zones offer suitable resting areas for both humans and avian species within the newly established wetlands.

The enhancement of water quality is achieved through a network of purification wetlands and ecological islands, which serve as a refuge for avian wildlife, support fish ponds, and function as a site for ongoing river research.

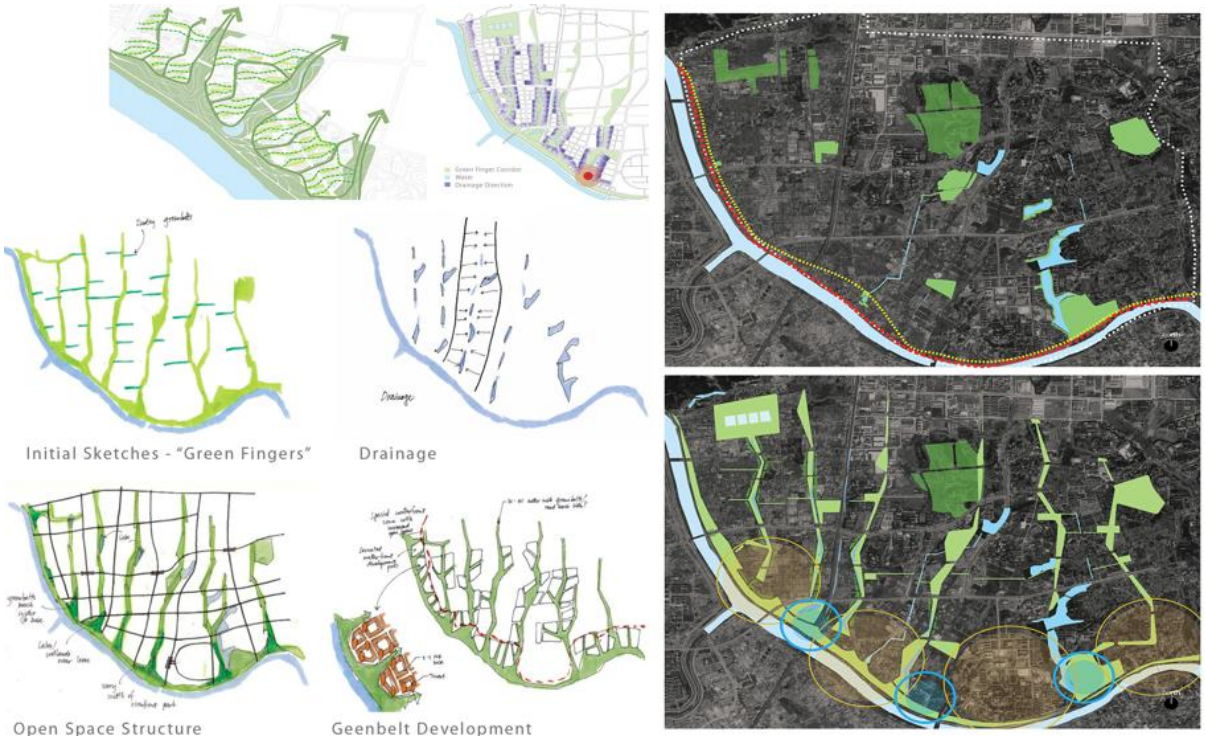


Figure 84 Conceptualization diagrams

Four strategies are employed; firstly, the levee is enlarged, incorporating additional terraces along the city edge and broadening its expanse, thereby facilitating a more gradual topographical transition to development. Furthermore, a network of 'Green Fingers' extends from the waterfront into the newly developed urban area, serving dual purposes as a drainage filter for runoff and a bicycle transportation system. Thirdly, adjacent development aims to integrate landscape and architecture, effectively enhancing the value of the park at the urban boundary. The design of curving forms is informed by the nine curves of the nearby Liuyang River, facilitating a multi-layered system of pedestrian pathways and green terraces, which are seamlessly integrated

with retail spaces and residential or office towers. Ultimately, new wetlands are created that function as collection sites for urban runoff, facilitate bio-filtration, contribute to ecological habitat development, and provide recreational opportunities.

developing an extensive series of 'Green Fingers' that integrate seamlessly with the existing urban framework. The greenbelts, varying in width from 50 to 200 meters, integrate into the urban landscape, facilitating drainage to the river, establishing a bicycle network, decreasing dependence on automobiles, enabling bio-filtration, and creating forested zones for carbon sequestration.

A broader levee facilitates the establishment of significant forestation. The forest encompasses a diverse range of recreational activities and 'hidden gardens' nestled within its meadows, while also serving as a significant carbon sequestration sink for an expanding metropolis. A sequence of terraces has been designed to gradually transition the levee to the urban environment, occasionally merging with architectural elements to create a hybrid of park and city. New wetlands are created to function as collection points for urban runoff, facilitate bio-filtration, foster ecological habitats, and provide recreational resources.

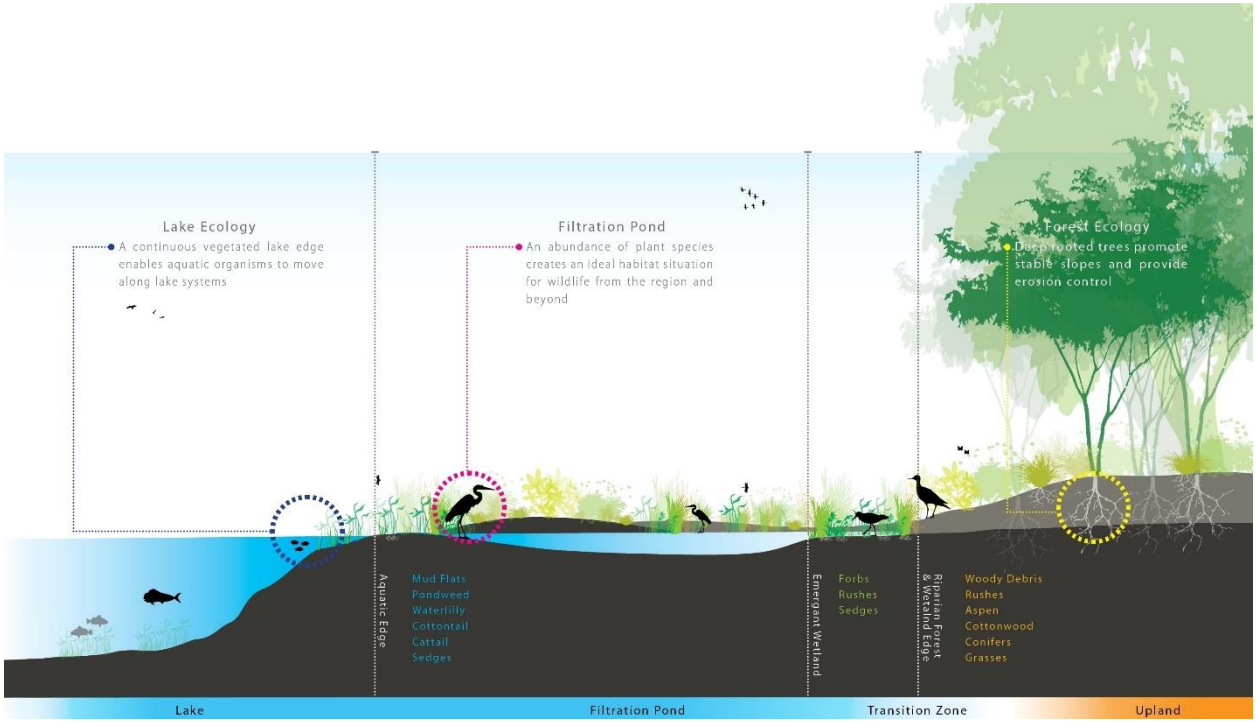


Figure 85 Changsha Liuyang river waterfront wetland section

Changsha Hunan Agriculture University has been instrumental in the development of the predominant rice variety cultivated in China today. In summary, Changsha has

nourished an entire nation. In recognition of this significant contribution, a collection of Rice gardens is situated beneath the urban forest. These modest yet intimate gardens offer visitors opportunities for education, leisure, and passive recreation, effectively blending cultural elements with the landscape. The rice garden, established by the trailblazers of rice research, is elegantly bordered by artistic panels, a fountain pathway, and a diverse forest landscape.

Commercial and retail activities are situated at a significant intersection of a vital green belt and river. The interplay between landscape and architecture is integrated and linked to an expansive park system. Schools and shopping areas are strategically positioned along its periphery, facilitating enhanced pedestrian and bicycle access to residential neighborhoods. The pedestrian network integrates wetlands, ponds, pavilions, a university research facility, cafes, a kayak center, and tea houses.

Between 2014 and 2019, the city experienced an average annual GDP growth rate of 10.4%, significantly surpassing the national average of 6.8%. The proximity effect of the Liuyang River was observed to have a substantial influence on house prices, with each additional kilometer of walking distance from the river corresponding to an approximate 2.36% decrease in house values.

An innovative approach to architecture is proposed that transcends conventional limits, featuring winding pedestrian 'canyons' within retail spaces and land bridges that link the primary park promenade to the adjacent district. A multi-tiered pedestrian and green terrace system, seamlessly integrated with ground-level retail and residential/office towers, flows akin to the river's current, navigating around the towers and enveloping internal courtyards.

The Retail Park is conceptualized as a multi-story garden that enhances the waterfront experience, with skywalks connecting city towers and landscaped terraces seamlessly. The pathways meander and curve, unveiling unexpected discoveries that lead to concealed courtyards or vast rooftop gardens. Land bridges interlink across boulevards, integrating residential areas, retail spaces, office buildings, universities, and the more urban 'green fingers' with the river park.

Chapter 5: Area Programming

S. No.	Space		Crafts museum			Sharanam Centre for Rural Development	Bharat bhavan		Kanoria center of arts	Standards (NBC)
			No. of units	Area (Sq m)	Design Capacity	Area (Sq m)	Area (Sq m)	Design Capacity	Area (Sq m)	Area (Sq m)
1	Entrance	Entrance lobby		100	40	75	50	20		The site selected for the proposed museum should have adequate and reliable water supply for tire fighting and also within easy accessibility from the nearest fire fighting station
		Reception	1	20		30	20			
		Back Office	1	12		30	100			
2	Administration	Staff Office	5	60	50	120	15	80	80	The desktop working area should be at least 120 x 80 cm (for specialist employees, at least 200 x 80 cm) For every approx. 50-100 workplaces, one -10 m2 kitchen. 2.5 m2 per seat. "A good ratio is one toilet unit per 50-80 workstations. Space requirement -0.6-0.8 m2 per workstation. "Museum staff, subcontractors, and specialists should be organized into teams in order to faciliate the successful implementation of the exhibition. These teams do not work independently tom one another, but each has its particular tasks that need to be completed. Several individuals may be on more than one team. The project manager coordinates all teams and facilitates communication among them. Responsible for policy and financial decisions regarding the exhibition.
		Director's office	1	20		100	50			
		Office	1	12		100	110			
		Meeting rooms	1	40		150	75		240	
		Staff rest room	1	40						
		Security monitoring room	1	20			50			
		Server room	1	20						
		Staff toilet	1	10		40	20			
		Store	1	40			10			
		Pantry	1	40						
3	Workshop	Workshop	1	400	300	450	345	300	1260	Painting and Drawing Studios: Recommend an area of 7.5 to 10 square meters per person. Sculpture Studios: Suggest an area of 10 to 12.5 square meters per person. Ceiling Height: A minimum of 3.5 meters is recommended for adequate ventilation and space. Lighting: Emphasizes the importance of north-facing windows to provide consistent, diffused natural light.
		Studios	1	400		450	660		840	
		Display	1	400		120	100		380	
		Store	3	120						
4	Exhibition spaces	Galleries	6	2000	500		650	300		As per requirement
5	Auditorium	Auditorium space	1	340	200	100	2560	500, 300		1 locker/four visitors 2 spectators/m2 Length of the rows of seats per aisle: 10 places 1% of the seats must be accessible for wheelchair userslocated on one side, opposite the technical side on several floors Dressing rooms: more than 2m/person. Foyer: 0.6-0.8 sqm/spectator
		Project room	1	20		20				
		Green room	1	40		40				
6	Amenities	Restaurant	1	200	50	150	1322	75, 50		As per requirement
		Shop	1	100	50		800	40		4.8
		Seminar hall	1	200		150	150		140	As per requirement
		Dorms	5	50		300				3.2 / person
		Toilet	5	125		100			30	
		Library				400	360			1.25 x 0.8 sq m (cubical)
7	Services	Maintainence	1	50	100	75				For male public: 1 Per 200 persons up to 400 persons and for over 400 persons add at the rate of 1 per 250 persons or part thereof For Female public: 1 Per 100 persons up to 200 persons and for over 200 persons add at the rate of 1 per 150 persons or part thereof
		Generator room	1	20		20				
		Store	5	100		200				
		Housekeeping center	1	20		100				
		Control room	1	200		100				
		HVAC room	1	200						
8	Parking	Visitor parking		300	60	100				3 sqm/ Wheelers
		VIP parking		100						25 sqm/ Car
		Staff parking		100						50 sqm/ Bus
9	Open spaces	Courtyard		400	400	1160				10 % of the site area
		Central amphitheater		1130						
		OAT		400		380				
10	Transition spaces (30% of total built up)			2370			2338			
	TOTAL AREA			10219		4605	9785		2970	

PROPOSED AREAS

Sr. No.	Major Spaces	Minor spaces	Final areas in sqm
	Public & Cultural Spaces		
1	Reception	Entrance foyer	500
		Ticket office	30
		Info desk	20
		Reception desk	30
		Luggage room	30
		Waiting lounge	80
		Deposit counter	20
		Booking counter	10
		Souvenir shop	100
		Toilet	100
		Janitor room	20
		Total	**940**
2	Exhibition spaces	Galleries	3000
		Storage	550
		LV room	66
		Electrical room	120
		AHU	50
		Toilet	180
		Total	**3966**
		Adding 30%	**1100**
3	Restaurant	Reception	20
		Waiting area	150
		Restaurant	450
		Coffee shop	50
		Bakery	50
		Total	**720**
		Adding 30%	**200**
	TOTAL		**6926**

Sr. No.	Major Spaces	Minor spaces	Final areas in sqm
	Learning & Research Facilities		
4	Workshop and skill development center	Entrance foyer and reception	100
		Studio Spaces	350
		Artisan workshops	1000
		Research areas	500
		Material storage	50
		Prototyping	100
		Toilets	80
		Tools store	50
		Art display & storage	100
		Accomodation for artisans	500
		Total	**2830**
		Adding 30%	**800**
	Market & Community Spaces		
5	Convention	Prefunction area	50
		Auditorium for 100 capacity	124
		Meeting room	150
		Admin and support staff	150
		Total	**474**
		Adding 30%	**120**
	Community market and haat	Shops	1080
	Multipurpose hall and OAT		1000
	Community Kitchen & Dining		500
	TOTAL		**5884**
	Short-Stay Facilities		
8		Guest Accommodation	1000
		Staff Housing	1000
		Total	**2000**
		Adding 30%	**600**
	TOTAL		**2600**

Sr. No.	Major Spaces	Minor spaces	Final areas in sqm
	Circulation & Utilities		
6	Admin	Entance foyer	155
		Information desk	256
		Canteen	95
		Kitchen	90
		Group ticketing, luggage	40
		Visitor services	30
		Facilities and operations	15
		Cloak room	16
		Training and interview	73
		Security	30
		Lift lobby	17
		IT Admin office	48
		Technical support	35
		Archive and preservation	74
		Server room	10
		LV room	10
		Cybersecurity	15
		Manager room	15
		Toilet	80
		Total	**1104**
7	Services	Electrical room	50
		AHU Room	60
		BMS Room	80
		LT Panel room	80
		Equipment room	80
		Service Access, Fire exit	45
		Toilets	480
		Transformer	50
		Total	**925**
		Adding 30%	**250**
	TOTAL		**2029**

Table 1 Comparison between case studies
Table 2 Table of the proposed areas

Chapter 6: Assessment of Ecological and Socio-Cultural River integration of urban Indian River edges

6.1 Background

Urban river edges denote the regions next to rivers located inside metropolitan areas. These margins function as essential connectors between the natural and constructed ecosystems, impacting both ecological systems and metropolitan areas. Urban riverbanks are crucial for sustaining ecological equilibrium, offering habitats for diverse species and promoting biodiversity. They frequently encompass riparian zones that sustain vegetation and enhance water quality through pollution filtration. (Bais & Suneja, 2020) These places are essential for social interaction and enjoyment, providing urban residents with opportunities to connect with nature via parks, pathways, and leisure activities. Strategically designed urban riverbanks can improve the quality of life for urban inhabitants by facilitating access to green areas. The significance of urban rivers has always been acknowledged for their contributions to water resources, environmental protection, fisheries, and recreation, given their substantial impact on the landscape. Moreover, rivers possess distinct environmental, social, cultural, and economic significance. Humans utilize them for several purposes, including potable water, irrigation, industrial applications, energy generation, transportation, flood management, fishing, boating, swimming, and aesthetic appreciation. (Cengiz, 2013) Managing urban riverbanks is problematic owing to urbanization pressures, which frequently result in habitat degradation, pollution, and diminished ecological connectivity. Efficient governance and ecological methods are crucial to alleviate these challenges and foster sustainable development along riverbanks. (Bagherniya et al., 2021)

Throughout history, rivers have served as a crucial resource for human civilization, offering fertile lands, essential water supplies, and facilitating transportation across valleys (Vriddhi, 2017). Historically, the predominant mode of transportation along the riverbanks consisted of horses and carts. Nevertheless, the advent of the industrial revolution saw the establishment of factories and warehouses along the riverbeds, which resulted in the discharge of pollutants into the previously untainted waters (Chakrabortty, 2022; Slathia & Jamwal, 2022). With the expansion of road networks

during this era, the demand for boats experienced a significant decline, leading to the relocation of associated factories to the central areas of urban environments. Regrettably, as noted by Roy Cloutier, minimal efforts were undertaken to repurpose the antiquated warehouses, resulting in their subsequent disuse. Within the Indian context, the development of urban riverfronts has adhered to a comparable path, incorporating sociocultural and religious elements (Vimawala, 2015).

The historical trajectory of riverfronts in India can be systematically categorized into four distinct phases. The initial phase encompasses the formative period characterized by early civilizations, notably the Indus Valley civilization. Following this, the period dating back to approximately 3000 BC, facilitated the establishment of settlements by diverse groups, including the Mughals, Portuguese, Dutch, French, and British. The pre independence phase, spanning from the thirteenth century to the twentieth century, is marked by a notable expansion of industrial activities. Lastly, the post-independence phase, commencing in the twentieth century, is characterized by a discernible decline in the condition of riverfronts, as documented by Garg and Anand (2022) and Vimawala (2015). Throughout this development, rivers in India have been regarded with profound spiritual significance and revered as essential providers by numerous Indians, presenting a formidable challenge for planners to reconcile local and global viewpoints. The dual role of urban riverfronts, serving both as ecological stabilizers and as cultural spaces, necessitates a careful equilibrium in developmental initiatives. Although riverfront initiatives frequently emphasize the importance of ecological restoration and resilience, it is of paramount importance to also safeguard the socio-cultural vibrancy that arises from local practices and traditions. This integration guarantees that riverfronts serve not only to advance environmental objectives but also persist as venues that promote social unity, cultural preservation, and community involvement (Smith & Leatherman, 2021). Nevertheless, numerous urban riverfront developments globally exhibit a deficiency in a holistic framework capable of concurrently addressing these complex roles. In the absence of a comprehensive framework, initiatives may prove inadequate in harmonizing ecological well-being with socio-cultural sustainability.

6.2 Exploration of research intent and formulation of questions

This study aims to fill the existing gap by formulating a comprehensive framework that is applicable to riverfront development initiatives on a global scale. This framework would evaluate a comprehensive array of parameters within the overarching themes of ecological systems and socio-cultural dynamics. This study seeks to conduct a comprehensive review of existing riverfront projects in order to elucidate best practices, challenges, and opportunities that may contribute to the formulation of a flexible and adaptable model for forthcoming urban riverfront developments.

The central research question guiding this study is: *What is the relationship of a river with the city?* An exploration of this relationship will contribute to a deeper understanding of the ways in which urban riverfronts can concurrently foster ecological resilience while also enhancing socio-cultural vitality. This investigation will subsequently decompose the primary inquiry into the ensuing sub-questions:

- What are the overarching ecological and socio-cultural challenges encountered by urban riverfronts?
- What methodologies can be employed to construct a versatile framework aimed at effectively tackling the myriad challenges present in varied urban settings?
- What are the most effective strategies for the integration of ecological sustainability with socio-cultural vitality in the context of riverfront development?
- In what ways can the proposed framework be modified to address the unique requirements of various urban environments?

This research endeavors to tackle these inquiries, with the objective of offering an extensive framework for city planners, architects, and policymakers. The aim is to analyze the development of riverfronts that exhibit resilience while simultaneously fostering a profound connection to the cultural identity inherent in their respective cities.

6.3 Aim

The primary aim of the research is to assess how different built and unbuilt public spaces on riverfronts can enhance ecological and social impacts.

6.4 Objectives

1. To understand the ecological and socio-cultural parameters within the scope of research on which a river supports the city.
2. Assessing the existing regulations for river edge developments that will help us to understand the present scenario.
3. Analyzing case studies in a comprehensive framework that can be applied to assess and enhance the ecological and socio-cultural relationship between urban river edges and cities.
4. Developing clear recommendations for future architectural work on riverfronts.

6.5 Understanding the topic in brief

In the context of urban riverfronts, ecological pertains to the natural systems and processes that preserve the health, variety, and sustainability of the river and its adjacent surroundings. This encompasses the interactions of living species (flora, fauna, microbes) and their physical environment (water, soil, air), together with wider environmental aspects such as climate and hydrology.

Socio-cultural pertains to the connection between the river and the people groups residing in proximity to and engaging with it. This includes the historical, cultural, social, and economic aspects of human interaction with the river. The text addresses the river's contribution to the identity and legacy of a city, its impact on social practices, customs, and cultural events, as well as its significance as a venue for public life, recreation, and social interaction.

River margins denote the transitional areas between the river and the urban landscape. This phrase includes the physical areas next to the riverbanks, comprising both natural and constructed habitats. These margins function as essential connectors between the natural and constructed ecosystems, impacting both ecological systems and metropolitan areas.

6.6 Methodological framework used

The methodology outlined for the study utilizes both qualitative and quantitative approaches to evaluate existing riverfronts and develop improved guidelines. In the initial step parameters are identified, and this entails anchoring the study in existing secondary sources and recognized river guidelines, so establishing a robust basis of

past information.(Cengiz, 2013) This step facilitates a thorough comprehension of previously assessed components and assists in pinpointing essential concerns pertinent to ecological and socio-cultural dynamics. Research from analogous studies highlights the significance of history and contextual information in urban ecological evaluations. (John et al., 2013)

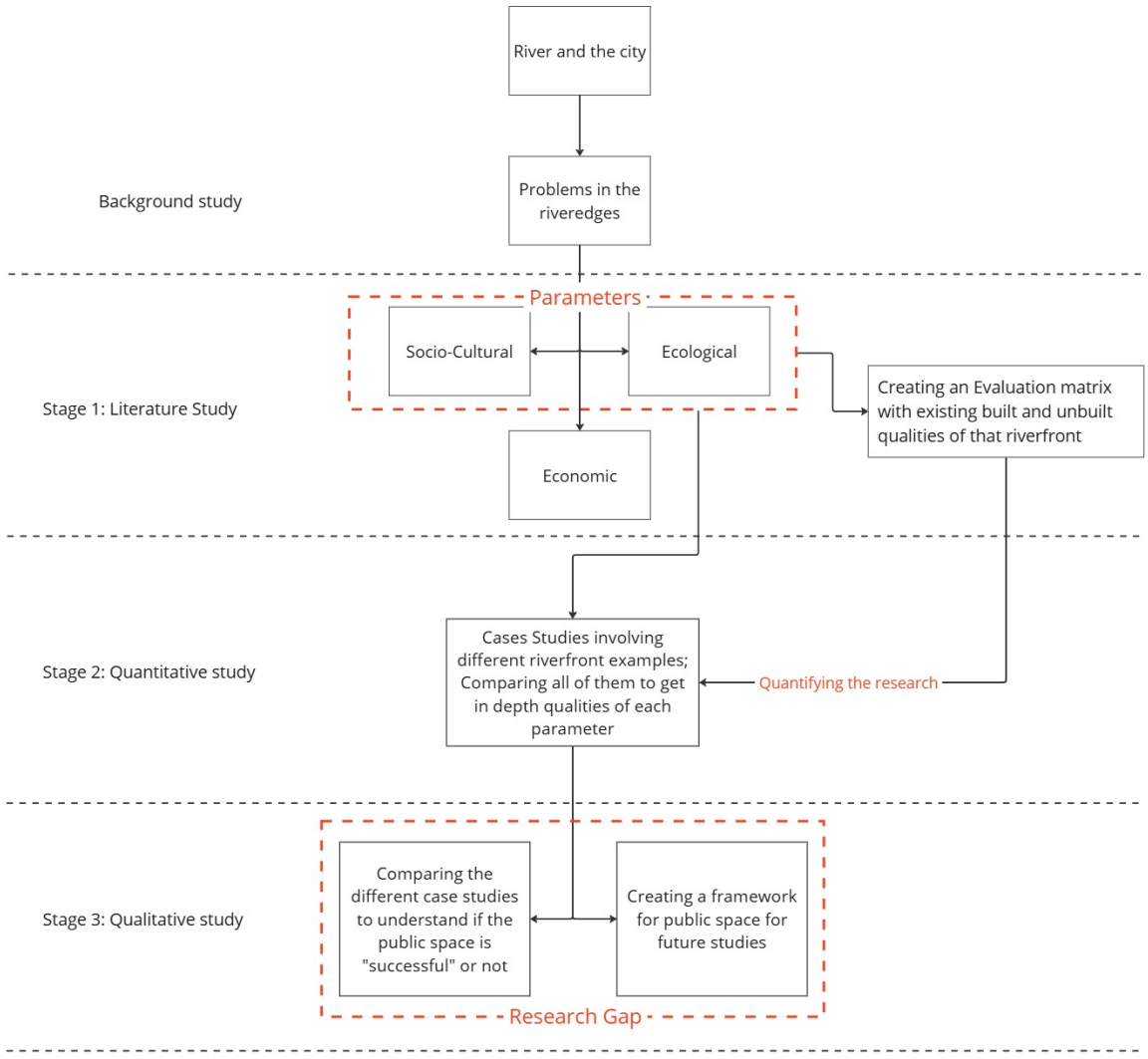


Figure 86 Research methodology flow chart

Then different riverfronts have been critically analyzed using the above parameter as a basis for the analysis, revealing detailed insights into their strengths and flaws across various scenarios. A comparative study uncovered the trends and anomalies that individual evaluations might have overlooked, emphasizing benefits or effective treatments that could be reproduced in future initiatives.

The third step was to critically analyze the existing frameworks, which provides a chance to evaluate the efficacy of current frameworks and pinpoint areas for improvement. This investigation is essential for generating actionable insights for

policymakers and urban planners, considering the fast urbanization and environmental deterioration of several Indian urban riverfronts. Previous research highlights the significance of flexible frameworks that cater to both ecological and social requirements in specific local situations.

The iterative process of assessing current models and proposing a new framework is particularly beneficial in developing a new framework. This method enables contributions to be customized to the specific difficulties of Indian riverfronts while using insights gained from previous programs. The new framework aims to guarantee inclusion and adaptation in various urban environments—attributes recognized as vital in urban ecological research.

6.7 Study on existing frameworks in India

6.7.1 Urban River management plan (URMP)

The primary aim of this publication was to assist river cities in the Ganga River Basin in attaining the condition depicted in Figure 87. The objective was to establish a comprehensive yet straightforward strategic framework known as the Urban River Management Plan (URMP), intended for adoption by river communities to oversee the rivers under their authority. (A Strategic Framework for Managing Urban River Stretches in the Ganga River Basin, 2020)

The URMP framework was founded on the three pillars of sustainable development: Environment, Economics, and Society. Consequently, the actions conducted under the URMP were intended to be:

- Environmentally responsible
- Economically beneficial
- Socially inclusive

Each city's Urban Resilience Management Plan shall include the following vision statements. This is illustrated in Table 3.

- *Vision Statement for the Environmental element*

The river has the potential to sustain a habitat conducive to the flourishing of riverine biodiversity, representing an optimal scenario from an environmental perspective. The rivers within the Ganga basin often fail to satisfy this condition in their urban segments.

The vision of the URMP aims to alter this trend by fostering healthy rivers that can create an environment conducive to the flourishing of diverse species of flora and fauna in their natural states.

- *Vision Statement for the Economic element*

The river presents avenues for economic advancement. Rivers play a crucial role in sustaining the livelihoods of numerous communities by offering a range of ecosystem services. The objective for this component of the URMP aims to improve this facet in a sustainable and environmentally considerate way.

- *Vision Statement for the Social element*

The river will be commemorated by the citizens. Throughout history, urban centers in India have emerged alongside the riverbanks. In these cities, the river consistently served as the central element for religious, social, and recreational activities. Nevertheless, throughout the years, the relationship between citizens and rivers has diminished, and in certain instances, has been entirely lost. This vision of the URMP for this element aims to foster an environment in which citizens appreciate the river and recognize it as a significant shared resource.

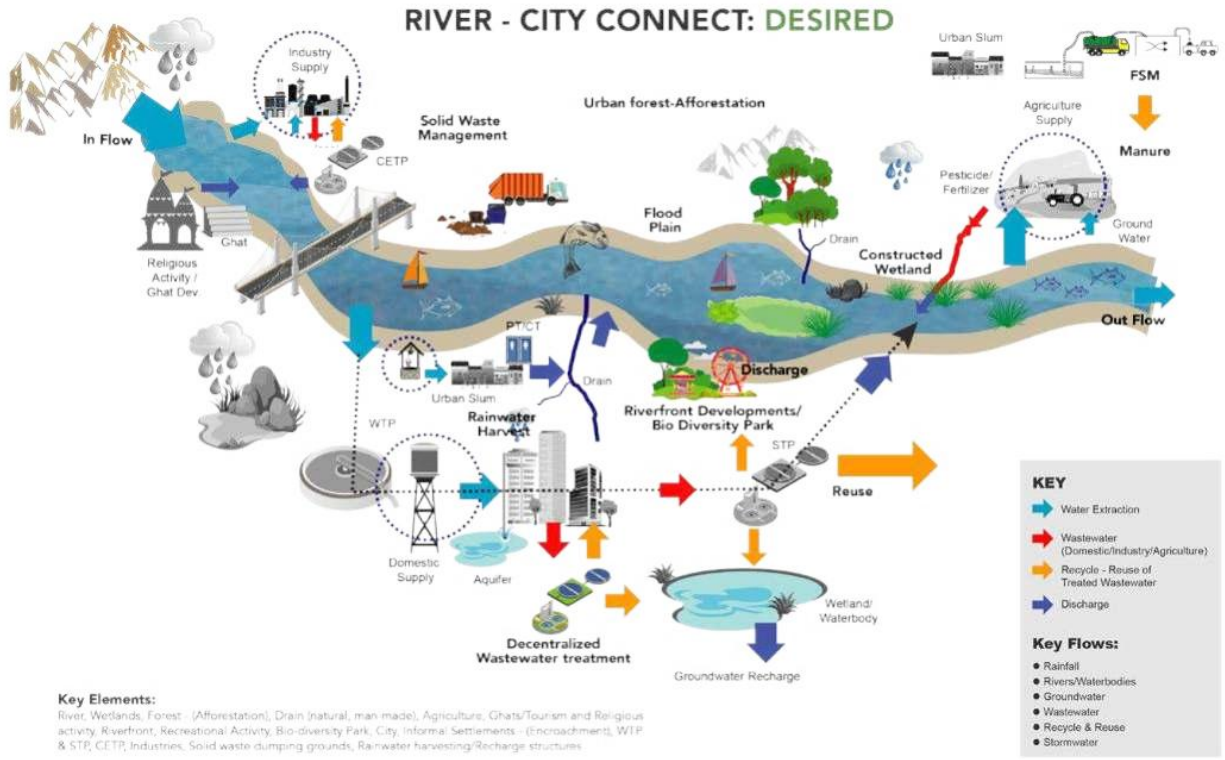


Figure 87 Desired connect of the river and city, URMP guidelines

6.7.2 URMP objectives

Ten objectives have been established to realize the visions of the URMP. The objectives encompass all elements of the URMP, namely environmental, economic, and social aspects. The objectives will be accomplished through a series of actions, activities, and interventions manifested in diverse projects. It is essential to recognize that these objectives are shared among all river cities within the Ganga River Basin. Therefore, the Urban Renewal Master Plan for each city will share identical objectives. Nonetheless, the interventions or projects designed to attain these objectives may differ based on the specific local context. (A Strategic Framework for Managing Urban River Stretches in the Ganga River Basin, 2020)

DESIGN PHILOSOPHY	Environmentally responsible	Economically beneficial	Socially inclusive
ELEMENT	**ENVIRONMENTAL**	**ECONOMIC**	**SOCIAL**
VISION	The river will be able to support a habitat for biodiversity to thrive	The river will provide opportunities for economic development	The river will be celebrated among the citizens
OBJECTIVES	1. To ensure effective regulation of activities in the floodplain 2. To keep the river free from pollution 3. To rejuvenate waterbodies and wetlands in the city 4. To enhance the riparian buffer along river banks 5. To adopt increased reuse of treated wastewater 6. To ensure maximum good quality return flow from the city into the river	7. To develop eco-friendly riverfront projects 8. To leverage on the economic potential of the river	9. To inculcate river-sensitive behaviour among citizens 10. To engage citizens in river management activities

Table 3 Aims and objectives of the URMP guidelines

Sr. No.	Topic	What is assessed?
C6.1.1 Indicator 1	Floodplain management score	Floodplains are assessed and scored on 11 different parameters. Refer Table 1
C6.1.2 Indicator 2	Net Dissolved Oxygen (DO) score	$\text{Net DO} = \frac{\text{DO outlet} - \text{DO inlet}}{\text{DO inlet}} \times 100$

C6.1.3 Indicator 3	water body revival score	Water body revival factor = $\frac{\text{Number of water bodies in acceptable condition}}{\text{Total number of water bodies}}$ x 100
C6.1.4 Indicator 4	Riparian buffer score	Riparian buffer factor = $\frac{\text{Total length of riparian buffer (within city limits)}}{\text{Total length of river edge in the city}}$ x 100
C6.1.5 Indicator 5	wastewater reuse score	Wastewater reuse factor = $\frac{\text{Wastewater reused annually}}{\text{Wastewater generated annually}}$ x 100
C6.1.6 Indicator 6	Return flow score	Return flow factor = $\frac{\text{Actual annual return flow – Committed annual return flow}}{\text{Committed annual return flow}}$ x 100
C6.1.7 Indicator 7	Eco-friendly riverfront score	Eco friendly riverfront includes 8 parameters ranging from economic, people's perception, and also some ecological factors which are scored. Refer Table 2
C6.1.8 Indicator 8	River economy score	If the river has 3 or more economic uses: river economy score = 5 If the river has 2 economic uses: river economy score = 4 If the river has 1 economic use: river economy score = 2 If the river has no economic use: river economy score = 1
C6.1.9 Indicator 9	Citizen sensitization score	Citizen sensitization scores are assessed and scored on 8 different parameters which are purely based on community engagements and awareness with the river front. Refer table 3
C6.1.10 Indicator 10	Citizen engagement score	If the city has >= 3 modalities of citizen engagement: citizen engagement score = 5 If the city has 2 modalities of citizen engagement: citizen engagement score = 4 If the city has 1 modality of citizen engagement: citizen engagement score = 2 If the city has no modalities of citizen engagement: citizen engagement score = 1

Table 4 Assessment of the various indicators in the URMP framework

6.8 Parameters identified for the research

ECOLOGICAL PARAMETERS	
Bio diversity and habitat quality	Flora and fauna
	Aquatic ecosystems
	Green connectivity
Water Quality and management	Pollution levels
	Stormwater managements
	Hydrology
Land use and vegetation	Riparian Buffer Zones
	Land Cover
	Soil health
Climate resilience	Climate adaptation
	Flood risk management

SOCIO-CULTURAL PARAMETERS	
Historical & cultural significance	Cultural heritage
	Historical evolution
	Local identity
Community engagement	Public Access
	Recreational opportunities
	Community participation
Economic Impact	Economic Vitality
	Equity and access
Urban design	Built spaces
	Unbuilt spaces
	People's perception
	Ownership

Table 5 Ecological and Socio-cultural parameters identified for the research

The ecological and socio-cultural characteristics offer a comprehensive framework for evaluating the health, sustainability, and community involvement of urban riverfronts. This is a comprehensive examination of each category and its respective sub-parameters:

1. Ecological Parameters
    a. Biodiversity and Habitat Quality

i. Flora and Fauna: Analyzes the diversity and prevalence of plant and animal species within the riverine ecosystem. Elevated species variety is crucial for a stable, robust ecosystem, sustaining all organisms from pollinators to apex predators.
ii. Aquatic Ecosystems: Evaluates the status of habitats in aquatic environments, such as riverbeds, marshes, and streams, that support fish, invertebrates, and microorganisms. Indicators comprise water quality, oxygen concentrations, and the existence of sensitive species.
iii. Green Connectivity: Examines the continuity and interconnection of green spaces along the waterfront, promoting species migration, genetic diversity, and natural corridors essential for a flourishing urban ecology.

b. Water Quality and Management
   i. Pollution Levels: Assesses the presence of contaminants, such as chemicals, heavy metals, and organic pollutants, that may infiltrate rivers through urban runoff, industrial discharges, and wastewater. Elevated pollution levels can alter aquatic ecosystems and impact human health.
   ii. Stormwater Management: Assesses techniques such as green infrastructure (rain gardens, bioswales) and retention basins that catch, filter, and attenuate stormwater runoff, therefore mitigating flood risks and pollutant loads.
   iii. Hydrology: Examines the natural and altered movement of surface and groundwater, impacting floods, drought resilience, and ecosystem vitality. Hydrological evaluations facilitate the strategic planning of sustainable water resource utilization.

c. Land Use and Vegetation
   i. Riparian Buffer Zones: Vegetated regions adjacent to riverbanks that filter contaminants, mitigate erosion, and offer habitat. Efficient buffers enhance water quality and decrease sedimentation in rivers.
   ii. Land Cover: Comprises both natural (vegetation) and manmade (pavement, structures) kinds of cover. Diverse land cover with more flora diminishes runoff, alleviates urban heat, and sustains animals.

iii. Soil Health: Evaluates soil parameters including nutrient levels, organic matter, and microbial presence. Nutritious soil fosters plant development and biodiversity, enhancing ecosystem resilience.

d. Climatic Resilience
    i. Climate Adaptation: Assesses measures for alleviating climatic effects, including the cultivation of indigenous flora, minimizing impermeable surfaces, and establishing shaded areas. Adaptation tactics are crucial for addressing elevated temperatures, drought conditions, and storms.
    ii. Flood Risk Management: Examines infrastructure such as levees, stormwater systems, and natural barriers that mitigate flood hazards. Efficient flood control safeguards property and lives, particularly in heavily populated metropolitan regions.

2. Socio-Cultural Parameters
    a. Historical & Cultural Significance
        i. Cultural Heritage: Recognizes historical sites, landmarks, and objects that embody the community's identity and cultural legacy. The preservation of these aspects augments the river's cultural and historical significance.
        ii. Historical Evolution: Chronicles the transformations in the river's function and its adjacent environment, encompassing industrial applications, urban development, or ecological restoration initiatives. Comprehending this past facilitates the planning of future advancements.
        iii. Local Identity: Investigates the river's role in shaping the community's feeling of place and pride. A river with a robust local identity typically engenders heightened public interest and engagement in its conservation.
    b. Community Engagement
        i. Public Access: Assesses the accessibility and quality of paths, seating places, and other public spaces that enhance the enjoyment of the river. Public access fosters physical exercise and facilitates a connection to nature.

ii. Recreational Opportunities: Examines activities accessible along the river, including parks, paths, and aquatic sports. Varied recreational opportunities appeal to a broad spectrum of individuals and promote mental and physical well-being.

iii. Community Engagement: Evaluates the extent of local citizens' involvement in planning and decision-making processes. Community participation is essential for cultivating a feeling of responsibility and ensuring initiatives correspond with people's needs.

c. Economic Impact

i. Economic Vitality: Evaluates the river's economic contributions to the local economy via tourism, employment generation, or commercial endeavors. Waterfront projects frequently enhance local enterprises and draw visitors.

ii. Equity and Access: Analyzes the accessibility of economic advantages derived from the riverfront for all community members, ensuring that marginalized groups may also engage with and profit from these resources.

d. Urban Design

i. Constructed Environments: Comprises parks, promenades, commercial establishments, and other infrastructure next to the shoreline. Considerate design of constructed environments improves functionality, accessibility, and visual attractiveness.

ii. Unbuilt Spaces: Highlights conserved natural areas essential for biodiversity, flood mitigation, and offering tranquil green spaces within urban environments.

iii. Public Perception: Assesses community opinion about the riverfront's design, cleanliness, and utility. Favourable perceptions frequently result in increased utilization rates and enhanced community attachment.

iv. Ownership: Denotes the sense of duty and stewardship inhabitants exhibit towards the shoreline. Individuals who have a sense of ownership are more inclined to engage in conservation initiatives and endorse sustainable behaviours.

6.9 Case studies

The rapid depletion of freshwater resources is significantly contributing to the escalating water crisis. The reduction and deterioration of river ecosystems represent a significant challenge that must be addressed at a national scale in order to achieve objectives pertaining to environmental conservation, climate change mitigation, and sustainable development practices. India constitutes 18 percent of the global population; however, it possesses merely 4 percent of the world's water resources, thereby rendering it one of the most water-stressed nations globally. The graph depicting population growth in India illustrates a notable upward trajectory, while the graph representing water availability demonstrates a concerning decline over time. Furthermore, the incidence of polluted rivers within the nation has escalated significantly, increasing from 121 in 2009 to 275 in 2019, out of a total of 445 rivers that are under monitoring. India is a nation characterized by an abundance of water resources, where rivers are revered and regarded as maternal figures. However, it is noteworthy that the country's fresh water quality index ranks 120th out of 122 nations, while its fresh water availability index stands at 133rd out of 180 countries. (Srivastava & Dutta, 2023) Through the aforementioned statistics, it becomes evident that India is progressing towards becoming a water-scarce nation if we do not manage our water resources with due diligence.

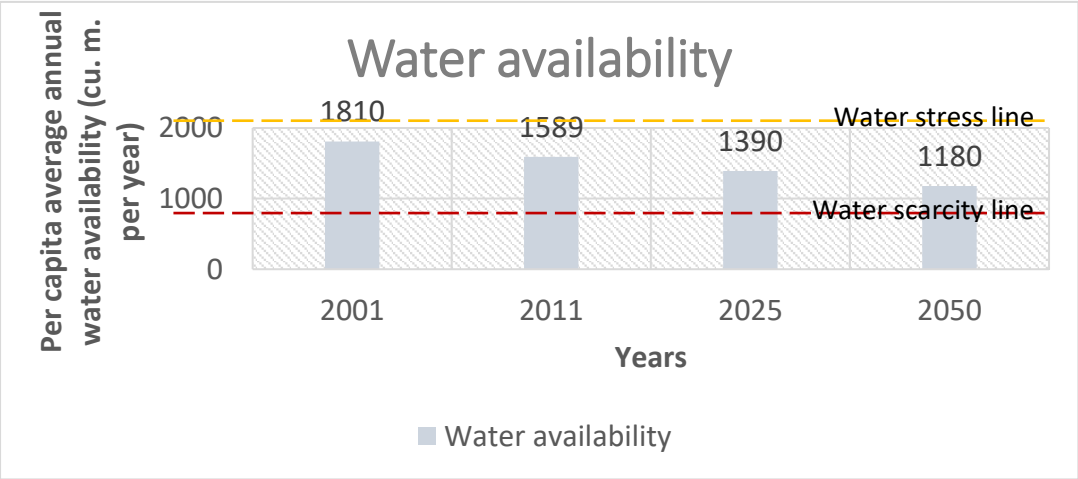


Figure 88 Graph showing the water availability in India through the years

Hence, urban riverfronts function as intricate interfaces where natural ecosystems and human settlements intersect, offering both difficulties and opportunity for sustainable development. As cities globally develop and expand, riverside regions have

progressively emerged as essential elements for urban revitalization, leisure activities, and community involvement. These areas are crucial for ecological services, including biodiversity support, stormwater management, and water quality enhancement, while also offering significant social and economic advantages, from cultural identity to economic viability. This study examines the change and sustainability of urban riverfronts via a comprehensive investigation of ecological, socio-cultural, and economic factors. Through the analysis of case studies under this framework, we get insights into how cities are tackling essential ecological indicators such as biodiversity, habitat quality, and climate resilience, alongside socio-cultural dimensions like historical importance, community engagement, and recreational accessibility. The economic effect and urban design of riverside regions are evaluated, since these factors demonstrate how waterfronts enhance local economies, provide equal access, and fulfill community needs via well designed built and natural environments. Each case study presents a distinct situation, illustrating several strategies for reconciling ecological integrity with urban expansion. This comprehensive approach will elucidate how urban riverfronts may be converted into sustainable, resilient, and community-focused settings, providing significant insights for urban planners, environmentalists, and legislators. This approach establishes a foundation for a comprehensive evaluation of each riverfront's tactics, results, and opportunities for enhancement within the intricate dynamics of urban ecosystems and social environments.

Case Study	Geographical & Hydrological Context	Ecological Relevance	Socio-Cultural Significance	Urban Planning & Development Approach	Comparative Learning Potential for Indian Riverfronts
Sabarmati Riverfront, India	Semi-arid river, artificially maintained water flow	High concrete embankments, limited natural ecology	Displacement of traditional users, tourism-centric	Commercialized, lacks strong ecological considerations	Example of rapid urban riverfront transformation but with ecological trade-offs
Gomti Riverfront, India	Perennial river with pollution concerns	Pollution, lack of effective riparian buffer zones	Limited public engagement, weak cultural preservation	Unplanned interventions, lack of community focus	Highlights challenges of unregulated urban riverfront development
Varanasi Ghats, India	Historic riverfront with cultural-religious significance	Natural hydrological patterns but high pollution	Deep-rooted spiritual and religious practices	Minimal modern intervention, relies on traditional systems	Represents a non-commercialized, culturally integrated riverfront
Cheonggyecheon Restoration, South Korea	Urban stream restoration in a highly developed city	Strong ecological restoration, riparian green spaces	Integrated with urban lifestyle, high public engagement	Model urban river restoration, minimal built intervention	A global benchmark for riverfront revitalization through ecological restoration
Cumberland Riverfront, USA	Large urban river with periodic flooding	Well-planned flood resilience, moderate ecology	Public spaces promote active engagement	rBalanced mix of development and green spaces	Example of urban flood adaptation and recreational planning
Belgrade Waterfront, Serbia	Major river, significant modifications for urban use	Limited ecological focus, commercial dominance	Exclusive spaces, low community participation	Real estate-driven, minimal integration of nature	Illustrates risks of over-commercialization in riverfronts
Chicago Riverwalk, USA	Managed riverfront with urban integration	Improved water quality, stormwater strategies	Public-friendly, accessible urban river edge	Balances development and accessibility	Represents adaptive reuse of an urban river for community benefit
Changsha Liuyang Riverfront, China	Hydrologically balanced urban riverfront	Strong ecological preservation, flood resilience	Strong cultural integration, accessible to all	Integrated green spaces, minimal built intrusion	Example of a balanced riverfront with strong ecological and cultural focus

Table 6 Case study selection

6.10 Observations

6.10.1 Observations

When examining different riverfronts, significant differences become apparent in their ecological and socio-cultural practices. For example, the Cheonggyecheon Restoration in Seoul is recognized for its successful integration of green spaces and promotion of biodiversity, which not only supports ecological health but also boosts community engagement by providing recreational opportunities. Conversely, the Varanasi Ghats encounter considerable difficulties due to pollution, which negatively impacts both their ecological health and the experience of visitors; notwithstanding their profound cultural heritage, these environmental challenges diminish their importance. In a similar vein, the Sabarmati Riverfront exemplifies progress in urban design; however, it faces challenges related to habitat degradation stemming from significant urbanization, underscoring the necessity of achieving equilibrium between development and environmental preservation. The Chicago Riverwalk exemplifies effective urban design by integrating ecological factors with lively public areas, positioning itself as a benchmark for other riverfront developments. Conversely, emerging initiatives such as the Belgrade Waterfront Project expose certain shortcomings, as the focus on development can occasionally eclipse the necessity for robust ecological management and active community participation. This comparison highlights the fundamental aspects of successful riverfront planning: sustainable practices that emphasize ecological health and community involvement are vital for creating dynamic, livable urban spaces, whereas neglecting these practices can result in environmental harm and a loss of cultural significance.

The Urban Riverfront Management Plan (URMP) framework created by the National Institute of Urban Affairs (NIUA) provides a systematic method for overseeing urban riverfronts, in accordance with diverse ecological and socio-cultural factors crucial for sustainable development. This framework warrants a critical evaluation through the examination of various riverfront case studies, including the Sabarmati Riverfront, Gomti Riverfront, and Cheonggyecheon Restoration, among others, to elucidate its strengths and limitations.

6.10.2 The advantages of the URMP Framework

The URMP framework encompasses various essential parameters that are pivotal for the efficient management of riverfronts, thereby enhancing its strengths:

The URMP framework advocates for an integrated perspective by concurrently addressing ecological, social, and economic dimensions. This comprehensive perspective promotes well-rounded growth, exemplified by the Cheonggyecheon Restoration project, which effectively integrated ecological restoration with urban design to establish a lively public space.

Emphasis on Community Engagement: The URMP framework highlights the importance of local participation in the planning and management processes. The Chicago Riverwalk serves as a prime illustration of how active public engagement influenced the design and amenities, resulting in a space that aligns with the needs of the community.

The frameworks offer structured guidelines aimed at improving biodiversity and managing water quality effectively. For example, the riverfronts stand to gain from targeted approaches aimed at enhancing the restoration of aquatic ecosystems and fostering improved green connectivity throughout the waterfront.

Adaptive Strategies for Climate Resilience: The URMP emphasizes the significance of climate resilience, advocating for measures that effectively mitigate flood risks and adapt to evolving environmental conditions.

6.10.3 The limitations of the URMP Framework

While the URMP framework possesses notable strengths, it also exhibits certain limitations that may influence its overall effectiveness:

Implementation Challenges: The extensive scope of the URMP may result in obstacles during execution, particularly in regions characterized by constrained resources or insufficient political commitment. The Belgrade Waterfront Project exemplifies this challenge, as its ambitious plans encountered critical examination regarding their effective implementation and the needs of the community.

The framework aims to harmonize urban development with ecological well-being; however, there exists a possibility of favoring economic advancement over environmental considerations. In the Gomti Riverfront, urban expansion has resulted

in considerable ecological degradation, prompting inquiries regarding the sufficiency of protective measures.

The adaptability of the guidelines to the distinct circumstances of various riverfronts may not always be effective. The varied cultural landscape of the Varanasi Ghats necessitates specific strategies that may not be adequately encompassed within a broad framework.

The effectiveness of the URMP framework is significantly contingent upon the accessibility of financial resources and specialized knowledge for its successful execution. Initiatives such as the Changsha Liuyang River Waterfront illustrate that constrained resources can impede the effective implementation of the URMP guidelines.

6.11 Comments and suggested improvements in the URMP guidelines

The following table comments on the indicators and the process to achieve the URMP index. The table also attempts to give some suggestive frameworks that will help to bridge the gap in the said guidelines. Finally, a checklist has been created that may be added to the existing guidelines to make it more comprehensive.

Sr. No.	**Topic**	**Comment**	**Suggestive changes**
C6.1.1 Indicator 1	Floodplain management score	Changes in scoring and inclusion of more parameters in the table	
C6.1.2 Indicator 2	Net Dissolved Oxygen (DO) score	One major problem with using the Net DO score is its sensitivity to environmental variability. Factors such as temperature, seasonal changes, and biological activities can significantly affect dissolved oxygen levels, independently of anthropogenic influences. As a result, fluctuating natural conditions may lead to misinterpretations of pollution levels if they are not adequately accounted for in the assessment. The reliance solely on dissolved oxygen as an indicator may not provide a comprehensive view of water quality. While DO is crucial for aquatic life, other parameters, such as nutrient levels, microbial populations, and pollutants, also play significant roles in determining ecological health.	Nutrient levels, particularly nitrogen and phosphorus, play a crucial role in aquatic ecosystems. Excess nutrients can lead to eutrophication, resulting in algal blooms that deplete oxygen levels and harm aquatic life. Other parameters such as pH levels, BOD, TSS and temperature should also be included in the assessment.
C6.1.3 Indicator 3	water body revival score	The indicator utilizes a qualitative assessment approach to determine whether a water body is in an acceptable condition. This subjectivity could result in inconsistencies and discrepancies in evaluations across different assessors or locations. The conditions for evaluating acceptable status do not consider broader contextual indicators, such as surrounding land use or community practices that could affect the water body.	Hydrological dynamics, such as water level fluctuations, flow rates, and seasonal variations, are essential for assessing the ecological integrity of freshwater systems. Changes in these parameters can affect habitat availability, spawning cycles, and the migration patterns of aquatic organisms. Therefore, incorporating hydrological indicators can contribute to a more holistic understanding of water body health

C6.1.4 Indicator 4	Riparian buffer score	While using satellite data for quantitative assessment is efficient, this approach can overlook important local nuances that affect riparian health. Satellite imagery may not capture critical features such as vegetation diversity, the presence of invasive species, or local land use impacting the riverbanks. Assessing the riparian buffer score only once a year may not be sufficient to capture seasonal variations and dynamic changes due to weather events, flooding, and other disturbances. The indicator restricts its analysis to riparian buffers that are wider than 7.5 meters. This arbitrary threshold may exclude many important riparian zones that are narrower but still play crucial ecological roles. Research has shown that even narrow buffers can provide significant benefits for water quality and habitat, making such a limitation potentially detrimental to holistic ecosystem management.	Evaluating the connectivity of the riparian buffers to surrounding habitats is vital for maintaining biodiversity and species movement. Metrics can include the degree of fragmentation, presence of corridors for wildlife movement, and proximity to other natural habitats. High connectivity facilitates species dispersal and reduces the impacts of habitat loss. Assessing the levels of bank erosion and sediment deposition within the riparian zone can provide significant insights into hydrological and ecological processes. Metrics such as the rate of lateral bank erosion and sediment composition can indicate the effectiveness of the riparian buffer in stabilizing banks and controlling sediment flows into waterways.
C6.1.5 Indicator 5	wastewater reuse score	The indicator primarily concentrates on measuring the amount of treated wastewater reused, without sufficiently addressing the quality of that wastewater. While conformity to the Central Pollution Control Board (CPCB) standards is obligatory, a solely quantitative measure may overlook significant qualitative aspects such as the type and degree of contaminants that could still pose risks to health and the environment. This oversight may lead to the application of problematic water quality in various uses.	BOD levels, COD levels, pH levels, E. Coli count, Sodium Absorption ratio (SAR), Salinity, may be included in the assessment along with the quantity. Key physical parameters include turbidity and total suspended solids (TSS), which provide insight into the clarity of the water and the presence of particulates. These metrics are crucial since high turbidity can inhibit light penetration and photosynthesis in aquatic environments, impacting overall ecosystem health
C6.1.6 Indicator 6	Return flow score		
C6.1.7 Indicator 7	Eco-friendly riverfront score		
C6.1.8 Indicator 8	River economy score	The scoring system, which assigns fixed points based on the number of identified economic uses, overlooks the qualitative aspects and relative importance of these uses. For example, the economic impact of navigation might be far greater than that of water sports, yet both would receive equal weight in the scoring system. This simplistic approach does not account for variations in economic impact or significance, potentially skewing the overall river economy score. The framework depends on number of economic activities provided on the river front. A riverfront may have a certain activity that may give more economic returns than 2-3 activities combined. Hence, a holistic viability is not attained.	Utilizing technology, such as remote sensing and GIS, coupled with data analytics, can improve the accuracy of scoring systems by providing real-time insights into river conditions and economic activities. Such systems can offer data-driven evaluations of river use, enabling adaptive management strategies that respond to changes rapidly and effectively. MCDA frameworks consider multiple criteria in decision-making scenarios, allowing for the assessment of various river uses beyond mere presence or absence. This approach can incorporate economic, environmental, social, and cultural factors to provide a balanced view of river activities. By weighing these factors according to local priorities, MCDA can yield a more tailored evaluation of river economic activities that aligns with community values and needs.
C6.1.9 Indicator 9	Citizen sensitization score		
C6.1.10 Indicator 10	Citizen engagement score		

Table 7 Comments and suggestive changes on the different indicators in the URMP guidelines

6.12 Suggested checklist for framework

Sr. No.	Areas of consideration	Targeted topics	Suggested frameworks
1	Floodplain Management and Geographic Considerations	Floodplain Limits	Establish distinct floodplain borders with historical data and hydrological evaluations.
		Buffer Zones	Implement a minimum buffer zone of no less than 30 meters from the riverbank for all constructed edifices to safeguard against floods and erosion.
		Hydrological Assessment	Integrate detailed hydrological studies for each riverside, examining water flow patterns, seasonal variations, and impact evaluations of upstream and downstream operations.
2	Regulatory Framework for Built Spaces	Building Regulations	Implement zoning restrictions to regulate the height, configuration, and materials of structures adjacent to the river to preserve ecological integrity and aesthetic appeal.
		Embarkment Design Alternatives	Permit both rigid (concrete) and flexible (vegetation) options for embankments, while imposing a stringent cap on the proportion of concrete utilized.
3	Ecological and Environmental Sustainability	Bioswales and Soft Scaping	Establish bioswales and uninterrupted green areas to purify runoff and facilitate natural infiltration, so improving the biological integrity of the riverside.
		Water Quality Metrics	Incorporate evaluations of essential water quality parameters like nitrogen and phosphorus concentrations, pH, Biochemical Oxygen Demand (BOD), Total Suspended Solids (TSS), and E. Coli numbers.
		Riparian Connectivity	Assess the efficacy of riparian buffers regarding their connection with adjacent ecosystems, including fragmentation, animal corridors, and sediment stabilization.
4	Community Engagement and Cultural Heritage	Public Access	Facilitate unimpeded access to the riverside for local people, promoting activities that enhance cultural involvement and regular utilization.
		Support for Traditional Economies	Designate a portion of development activities or funds to bolster local traditional economies, ensuring their sustainability and vitality.
		Cultural Heritage Scoring	Establish a score system to assess and encourage the integration of cultural heritage components into riverside projects, encompassing religious rituals and historical edifices.
5	Hydrological Dynamics and Ecosystem Health	Monitoring Hydrological Parameters	Consistently assess variations in water levels, flow rates, and seasonal alterations to comprehend the ecological consequences of growth.
		Sediment and Erosion Management	Evaluate bank erosion and sediment deposition rates, modifying buffer zones as needed to enhance ecological stability.
6	Technological Integration	Remote Sensing and GIS	Employ technology to precisely map river conditions and demographics, facilitating real-time monitoring and data-informed decision-making.
		Multi-Criteria Decision Analysis (MCDA)	Utilize MCDA frameworks to assess river operations, incorporating economic, environmental, social, and cultural variables in decision-making processes.

Table 8 Suggested checklist for the framework

6.13 Conclusion

This study offers an in-depth examination of diverse riverfront developments, highlighting the critical role of ecological sustainability and socio-cultural relevance in the context of urban planning. By conducting thorough comparisons of significant riverfront initiatives, such as the Sabarmati Riverfront, Gomti Riverfront, Varanasi Ghats, Cheonggyecheon Restoration, Cumberland Riverfront, Belgrade Waterfront Project, Chicago Riverwalk, and Changsha Liuyang River Waterfront, it underscores essential practices that promote environmental integrity and foster community involvement.

The analysis highlights the strengths found in successful case studies such as Cheonggyecheon and the Chicago Riverwalk, where notable integrated approaches to biodiversity, community participation, and climate resilience are evident. In contrast, challenges such as pollution, overdevelopment, and insufficient resource management are recognized as significant obstacles for various riverfronts, notably the Varanasi Ghats and Gomti Riverfront.

Moreover, the assessment of the Urban Riverfront Management Plan (URMP) framework by NIUA highlights its promise as a strategic instrument for sustainable riverfront management, while also revealing limitations associated with implementation difficulties and the potential tendency to prioritize development at the expense of ecological considerations.

In summary, these results highlight the necessity for more flexible, resource-conscious, and community-oriented approaches in riverfront development. The effective amalgamation of ecological, cultural, and community components will be crucial in developing dynamic and robust urban settings that respect both historical importance and natural ecosystems. This study highlights the significance of cooperative planning that integrates urban development with environmental care, guaranteeing that riverfronts can thrive as vibrant areas for future generations.

Chapter 7: Concept development

7.1 Concept note

Situated on the southern bank of the Godavari River in Nashik, this Community-Cultural Centre is conceived as a convergence of local traditions, community activities, and visitor interaction—a juncture where the cit y rekindles its severed bond with the river. The idea is designed as a new urban center, promoting an interactive link among land, water, and inhabitants. The site's natural swales and current arboreal coverage dictate the zoning plan, establishing a balance among open, semi-open, and secured areas. The design is revealed through three interrelated verticals:

The Cultural Centre - A venue for exhibitions and narratives, where visitors interact with Nashik’s abundant heritage, history, and modern cultural manifestations.

The Community Centre - A dynamic center for local artisans, marketplaces, food areas, and skill development, fostering grassroots economic and social engagement.

The Adaptive Event Space - A versatile space that evolves during significant events such as the Kumbh Mela, guaranteeing the location adjusts to seasonal and cultural patterns.

With these foundations established, the subsequent inquiry is: How can we integrate this into a cohesive concept? The core objective of this project is to "re-establish the water-people threshold." This notion is founded on three fundamental principles:

Commemorating Water Through Various Means: The site's lowest elevation is converted into a terraced water plaza, drawing inspiration from the traditional water structures of Nashik. Water serves not merely as a visual element, but as a conduit for interaction, facilitated by dynamic water features, bio-swales, and percolation areas.

Reassessing Wada Elements within a Contemporary Framework: Nashik's traditional Wada architecture, characterized by courtyards and semi-open areas, is reinterpreted in a modern context, resulting in engaging public meeting spaces.

Establishing an Adaptive and Inclusive Environment: The plan advocates for modularity rather than a fixed site, enabling areas to expand during festivals and contract for daily use. This creates a spatial and sensory continuity in which water, culture, and community interact effortlessly.

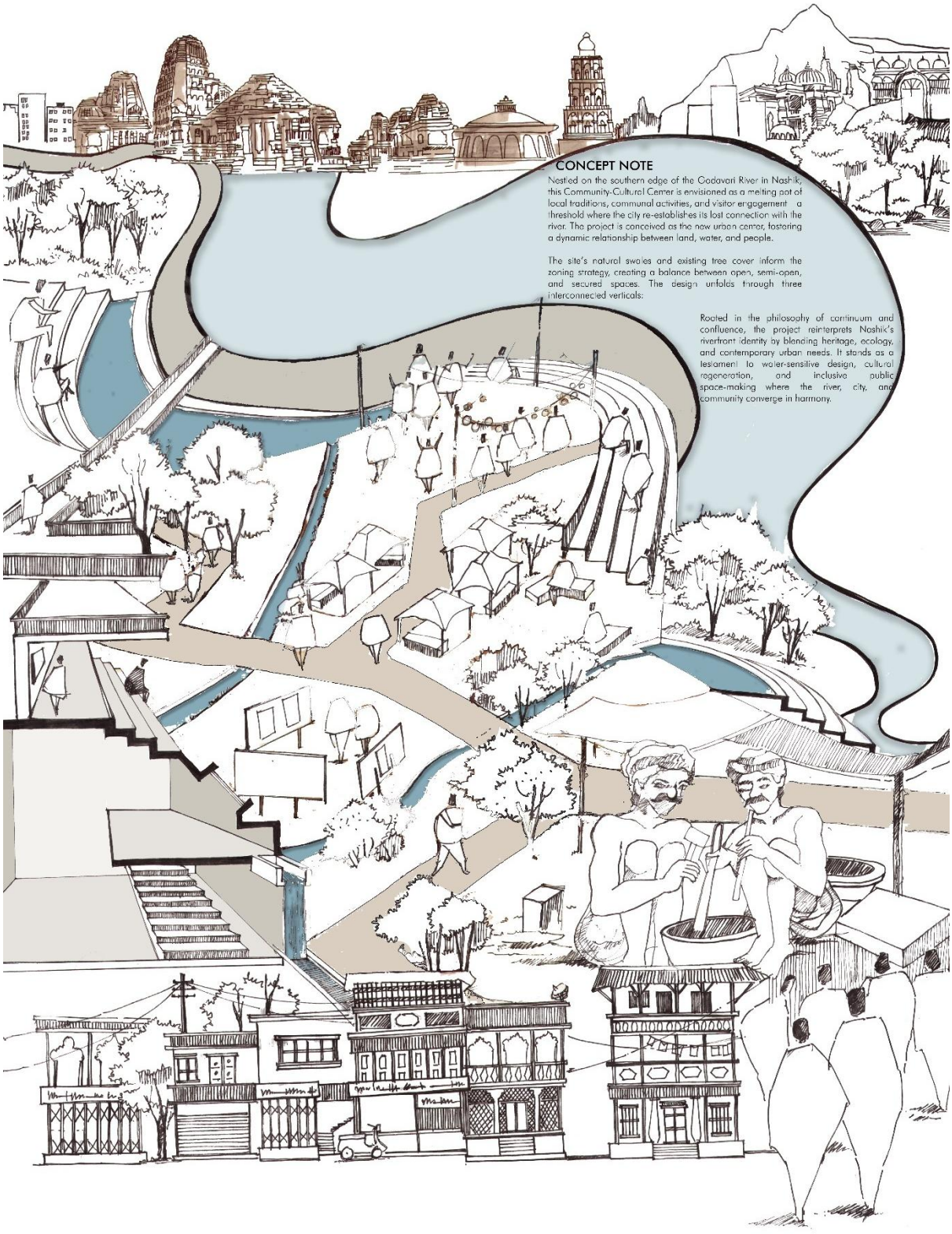


Figure 89 Concept sketch

A significant intervention near the northern perimeter is a tiered, kund-inspired water plaza, influenced by Nashik's native water systems. It functions as a communal assembly area and an environmental barrier, reinterpreting the water-human boundary. The plan incorporates elevated pedestrian pathways above the roadway,

landscape-oriented stormwater management, and interactive water features to enhance the site's relationship with the river. The project, grounded in the principles of continuum and confluence, redefines Nashik's riverfront character by integrating heritage, nature, and modern urban requirements. It exemplifies water-sensitive design, cultural revitalization, and the creation of inclusive public spaces—where the river, city, and community coexist harmoniously.

7.2 Conceptual development and initial sketches and sections

To actualize this notion, the sketches and parts depict the site's integration with water is achieved through tiered plazas and landscape transitions. Wada elements are reinterpreted as semi-open spaces, facilitating adaptable interactions. The stratification of constructed and unconstructed areas, guaranteeing ventilation and permeability in the architecture. This initiative not only revitalizes an architectural vernacular but also reinstates the experiential and cultural significance of Nashik's riverbank.

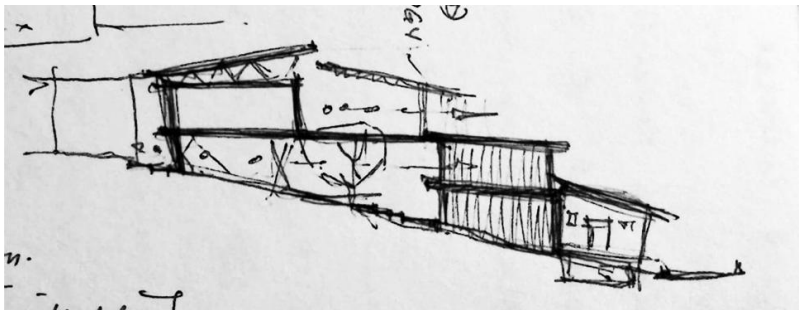


Figure 90 Conceptual section

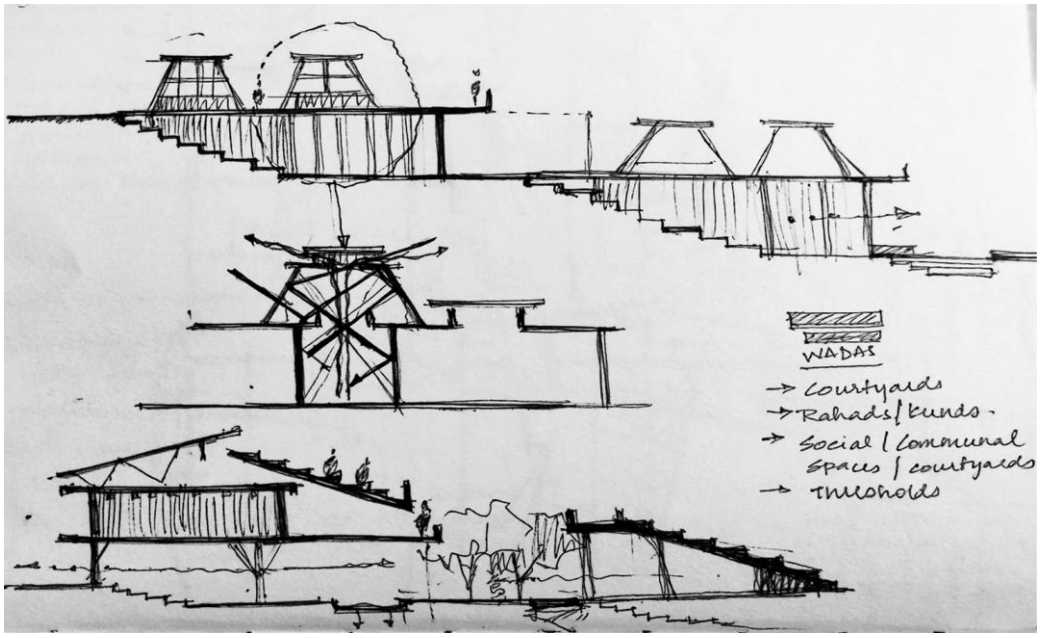


Figure 91 Conceptualising the site sections

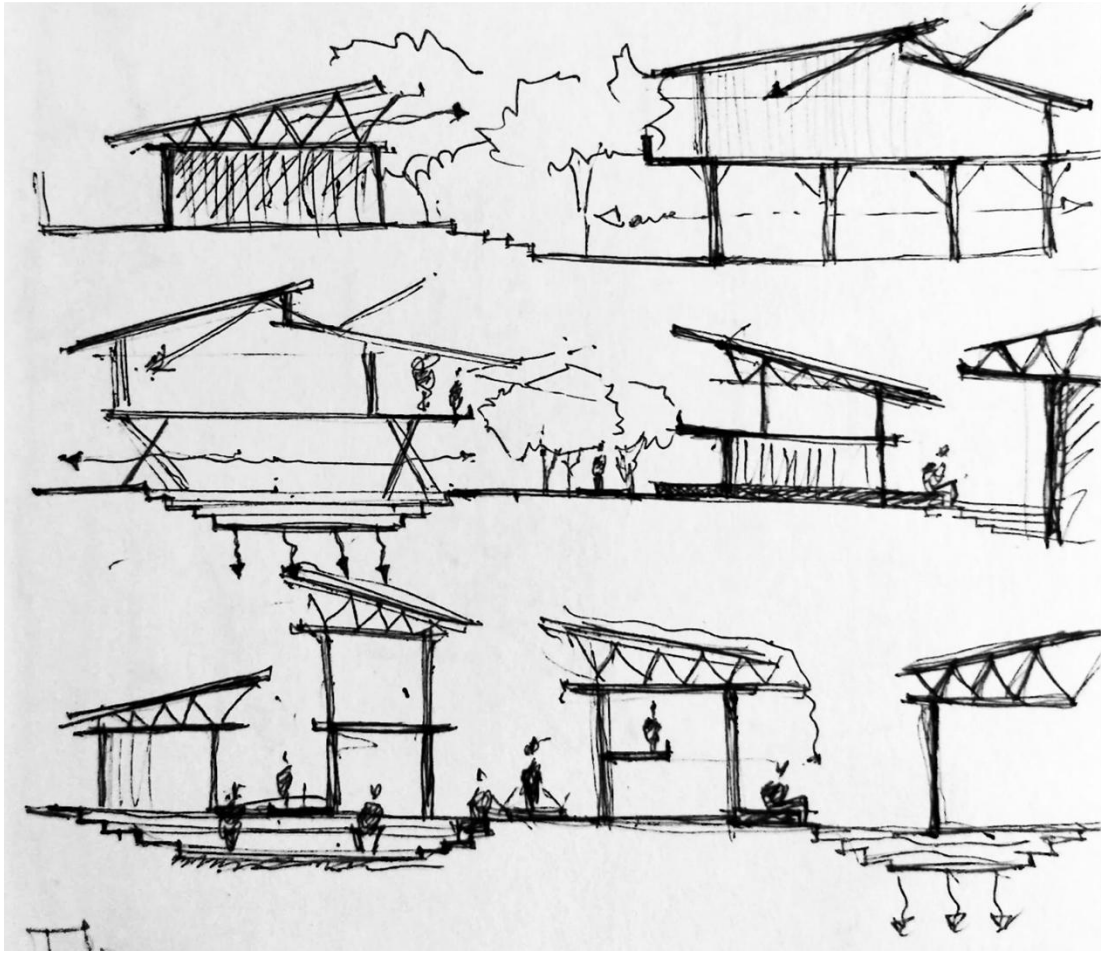


Figure 92 Conceptual site sections

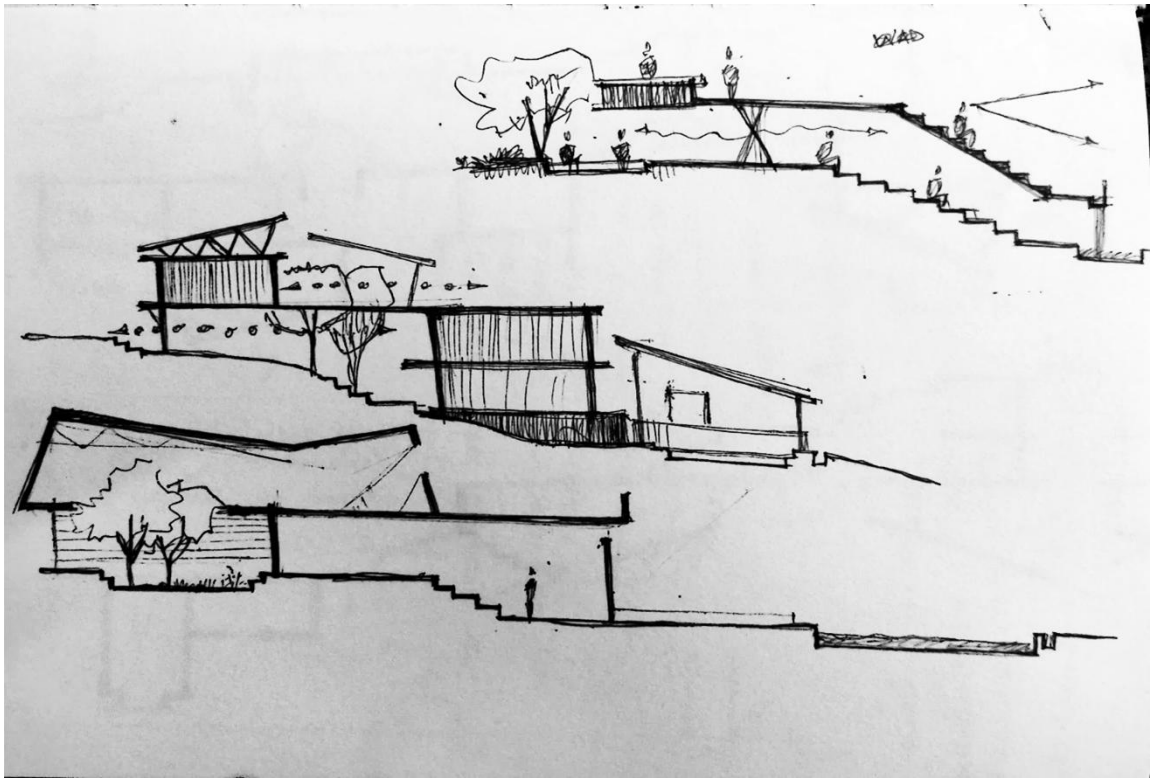


Figure 93 Conceptual site section

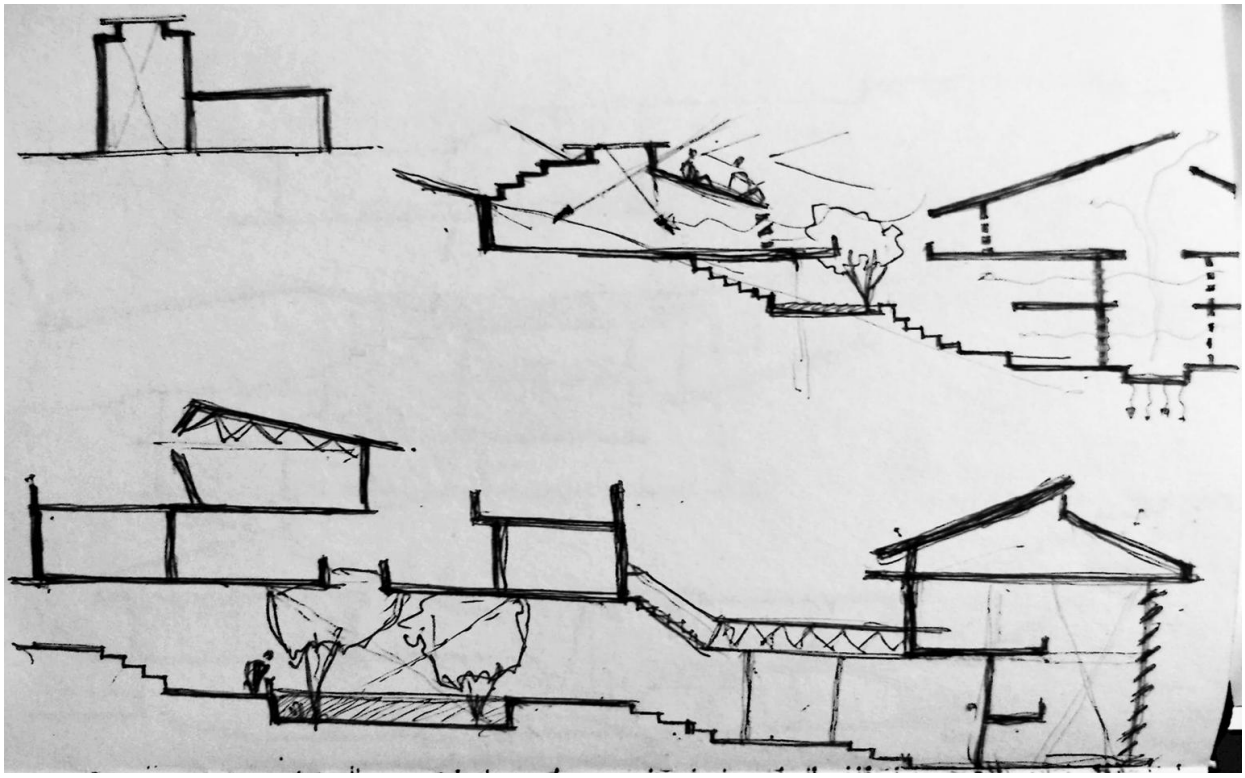


Figure 94 Conceptual site section

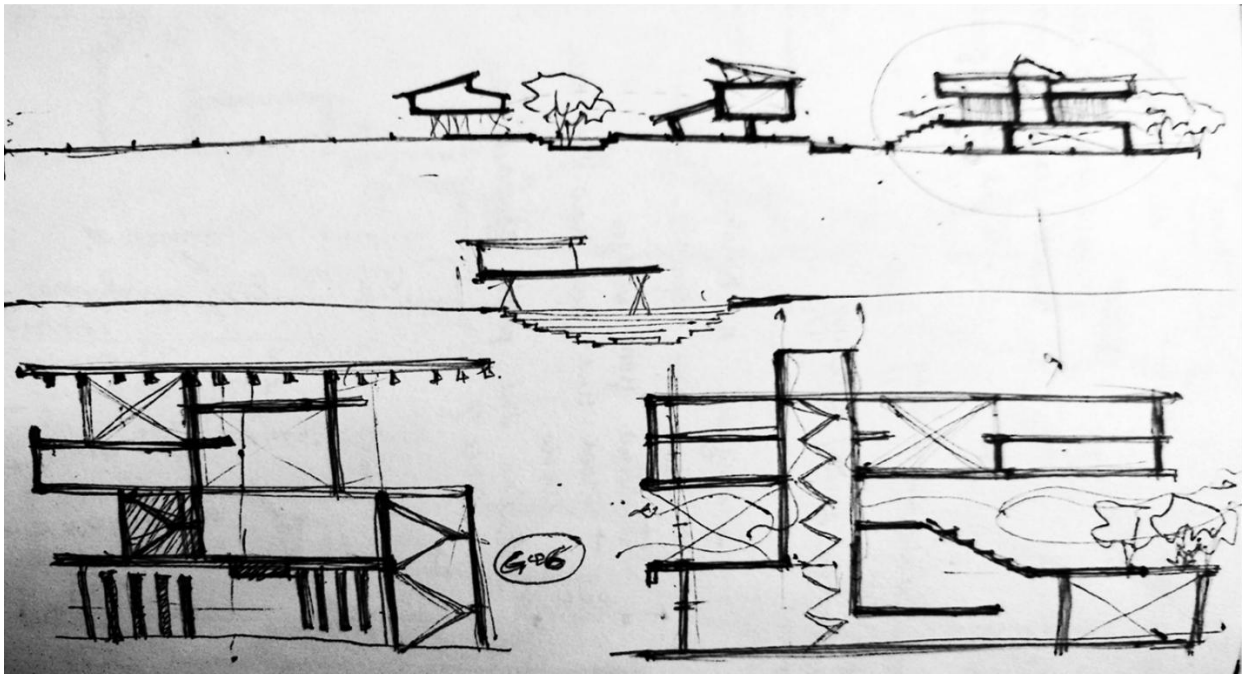


Figure 95 Conceptual part sections

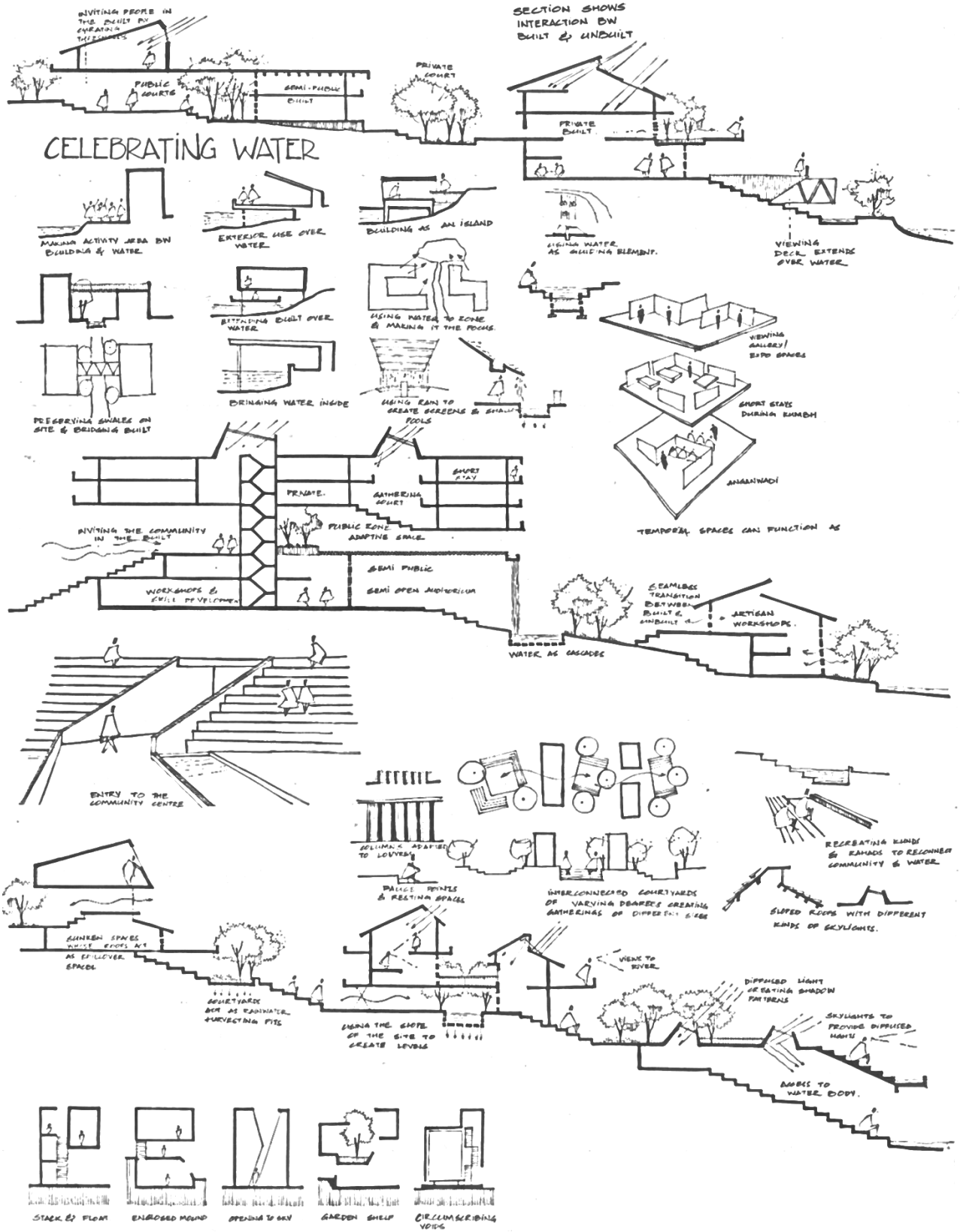


Figure 96 Concept development

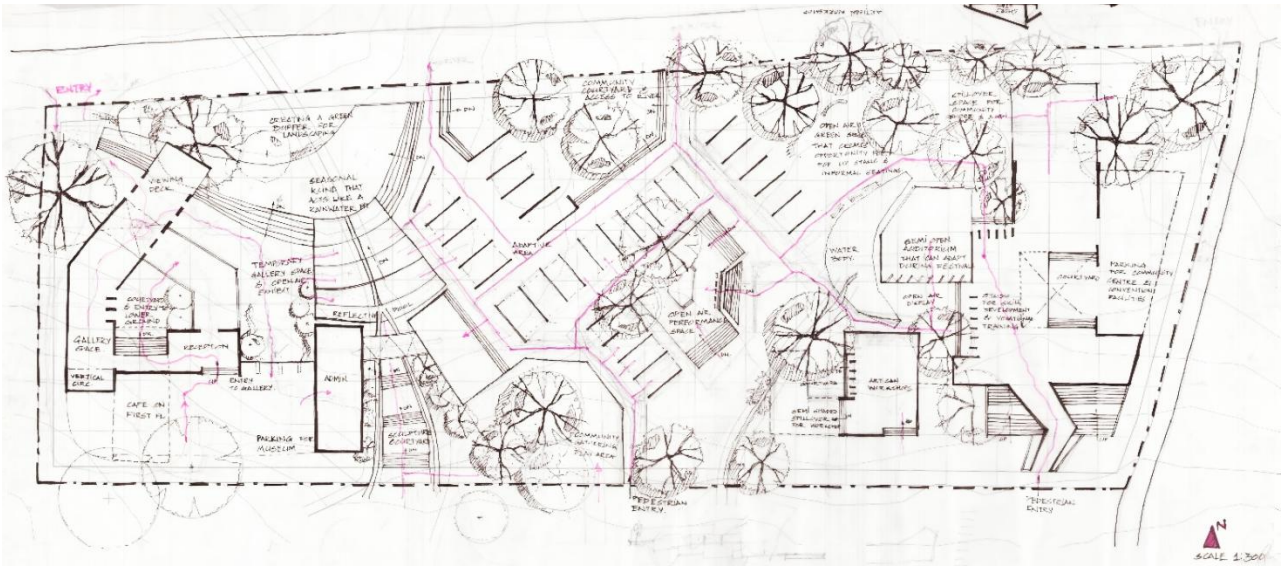


Figure 97 Initial plan conceptualization

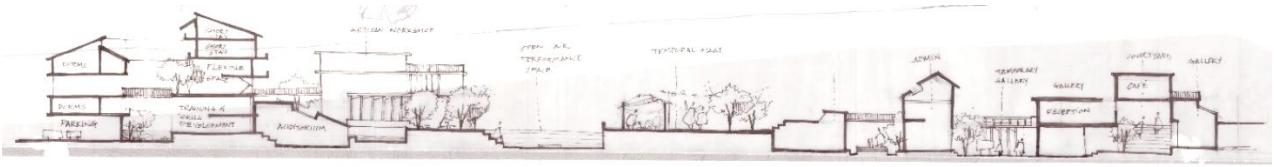


Figure 98 Conceptual section

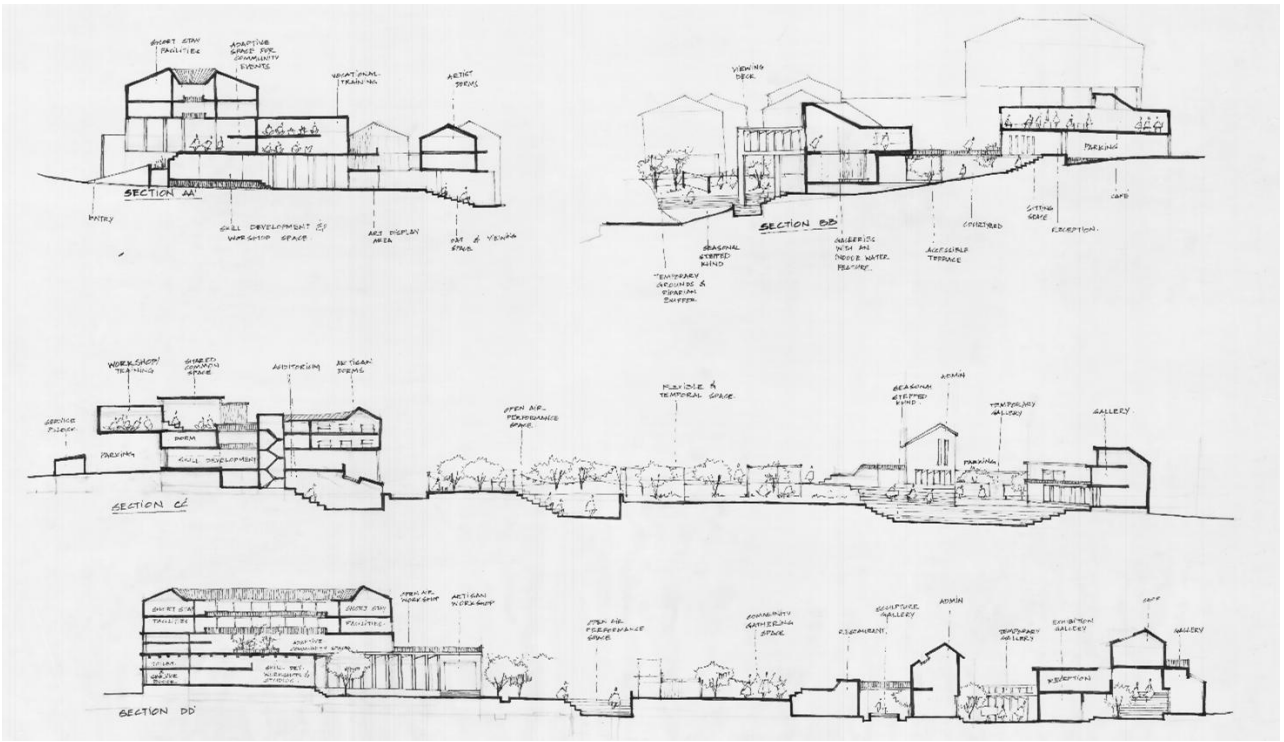


Figure 99 Sections

Chapter 8: Design proposal

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8.1 Conclusion and vision of the precinct

The proposed precinct design encapsulates a comprehensive concept that harmonizes environment, culture, and sustainable urban growth. The project reinstates a symbiotic relationship between water and landscape by maintaining the site's natural drainage pattern and implementing a decentralized water management system that includes kunds, bioswales, and bio-ponds. The design alleviates the issues of urban runoff and water scarcity while reconceptualizing public space as a vehicle for ecological restoration, community involvement, and sensory enhancement.

The stratification of indigenous flora across many types—ravine woodlands, food gardens, seasonal floral beds, and therapeutic landscapes—encourages biodiversity, improves microclimatic comfort, and cultivates a robust urban ecology. Every planting method is intentionally designed to enhance soil health, facilitate water absorption, provide shade, and promote community connection. This method transforms dormant green spaces into dynamic environmental infrastructure.

The overarching objective is to establish a dynamic precinct that exemplifies regenerative urbanization. This will serve as a precedent for how towns such as Nashik might integrate traditional wisdom and ecological systems thinking into modern urban design. The precinct becomes a dynamic classroom and restorative landscape—where water cycles are visible and celebrated, native ecology is nurtured, and communities reconnect with nature and each other.

By shifting from an extractive to a regenerative design approach, the project sets a new benchmark for sustainable urban living—where every drop of water is valued, every plant has a role, and every space contributes to the collective health of the ecosystem and the people within it.

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