Original Article
ISSN (Online): 2582-7472

ShodhKosh: Journal of Visual and Performing Arts
International Conference on Multidisciplinary Aspects of Built Environment
June 2024 5(ICoMABE), 181–194

# REJUVENATING THE PLACEMAKING POTENTIAL OF BLUE-GREEN INFRASTRUCTURE: LOHIA CANAL GREATER NOIDA

Kamini Singh [1], Bipasha Kumar [2], Kanika Verma [3]

[1] PhD Research Scholar, Department of Urban Design, School of Planning and Architecture, New Delhi, India
[2] Professor, Apeejay Institute of Technology, School of Architecture and Planning, Greater Noida
[3] Associate professor, Apeejay Institute of Technology, School of Architecture and Planning, Greater Noida

## ABSTRACT

The blue-green network plays a vital role in conserving the urban ecosystem by acting as a sponge and absorbing climate extremes. In cities 70% of the precipitation is lost due to inefficient drainage systems. The network of urban water bodies plays a crucial role to retain this water, encourage groundwater recharge and to prevent flooding. However, the urban design and planning processes often neglect the diverse potential of the blue-green infrastructure and the adjoining buffer spaces along the drains, canals, and rivers. The research identifies the Lohia canal in Greater Noida as a potential pedestrian and cycle network, a social space, and an eco-sensitive zone for conservation of existing biodiversity and develops an applied research framework. The research methods are primary field studies, interviews, mapping, and photography along the 8 kms stretch of canal to identify issues associated with the negligence of the canal in urban settings. This study is utilized to develop an integrated vision for revitalization of three layers of canal that are – 1. the climatic resilience, 2. the urban ecology and 3. the social spaces. The scheme thus proposes intervention at the seven locations for placemaking and ecological restoration through a series of connected and integrated design interventions.

**Keywords:** Blue-Green Network, Urban Waterbody, Placemaking, Urban Ecosystem, Walkability

**Corresponding Author**

Kamini Singh,
Kaminisingh015@gmail.com

**DOI** 10.29121/shodhkosh.v5.i ICoMABE.2024.2257

**Funding:** This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.



## 1. INTRODUCTION

Having 4% of fresh water in comparison to total global freshwater resources, India is on the brink of failure to fulfil the quench of Indian population which is 17.5% of total global population. As per WRI's Aqueduct 2019, India stands 13th in the list of 17 "extremely water stressed" countries in the world. NITI Aayog in 2018 highlighted India's critical state in their first Composite Water Management Index which says that India's water demand will grow double keeping the existing pattern of water requirements and eventually will have economic losses up to 6% from the water crisis by the end of 2050.

Indian cities were known for their water management systems and infrastructures, integration of structures like Baolis, Kund, Wells, Talabs, Tobas etc have made them self-sustaining and self- reviving.

Integrated water harvesting systems like Taankas, Guls, Kuls and Khadins are observed as one of the exemplary practices to collect water in extreme climates and terrains. But this is no longer the case, nowadays India has been observed to be a water stressed country with metropolitan cities going water rich to critically poor. Almost every water body that existed naturally is under threat and on the rim of annihilation.

The utilization of rivers and other urban water bodies has been an integral part of city development since the very inception of our cities, with a history that dates back to their earliest times. The urban Blue-green network proves to be crucial for sustenance of urban ecosystems by providing a habitat for native flora and fauna in the urban setting, providing a source of bio-diversity and increasing the habitability for humans. The Blue-green network has the most important role in maintaining the urban air-quality. It also provides porous surfaces to absorb the storm-water and reduce the chances of flooding during monsoon. In the extreme conditions of India summer these systems ensure the cooling of urban areas by breaking the stretches of hard-paved surfaces thereby preventing the Heat Island Effect in cities.

The Role of Urban Blue-green networks spreads beyond the ecology into the social dimension of urban life. The green-blue networks are often developed as places for people, to connect with people, to interact, communicate with each other and most importantly to connect with themselves as individuals by providing public spaces for pause surrounded with nature.

This research studies the Lohia canal at Greater Noida that is fed by several drains and connects several land-use zones of the city. The system of canals in the city transitions into a large drain when it passes through the city due to constant discharge of wastewater. The key cause identified for this degeneration and negligence is because they are hidden from the popular physical and visual movement network. The buffer zone along the canal is publicly accessible and dotted with public parks. Lack of through connection to cross the canal further disconnects it from the existing and preferred movement network. The disconnected cycle network also moves along the canal and shows a huge potential to be developed on the lines of national and international best practices on rejuvenating the urban green blue network. The research proposes to bring the spaces along the open drainage of the canal to the mainstream by introducing everyday activities as a public space. It is hypothesized that when a space is socially active and visible to the community it is safer, cleaner and active. Hence, the proposed intervention in this research contributes to the discourse on sustainable urban development by presenting a holistic approach to canal revitalization, addressing climatic, ecological, and social dimensions. It provides a blueprint for cities to embrace the multi functionality of blue-green infrastructure, fostering resilience and enhancing the overall urban experience.

## 2. IMPORTANCE OF BLUE GREEN INFRASTRUCTURE THROUGH CASE STUDIES

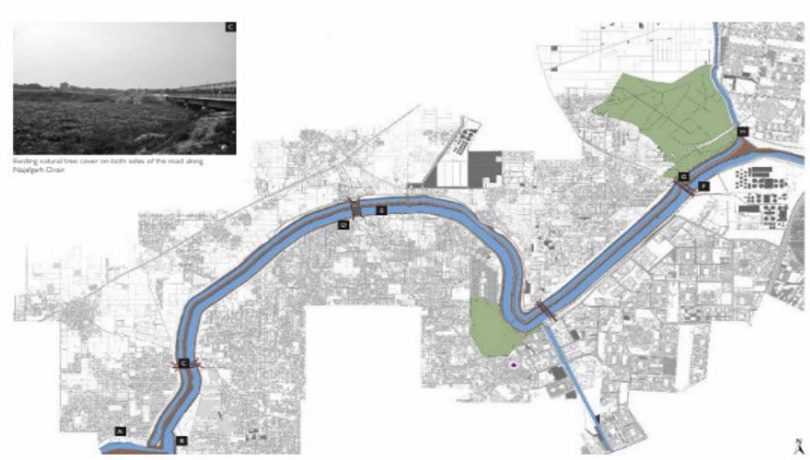


Figure 1 Map showing existing natural drainage drop points and low lines to the Najafgarh Waterway

There are various studies which illustrate methods to effectively manage urban water and signify importance of urban blue green infrastructure. The value of water systems as a social and economic requirement of society has been forgotten and people are no longer contingent on nearby water bodies.

Such as the case of Najafgarh Jheel, a transboundary water body that flows between Delhi and Gurugram, serving as the region's second-largest water body, surpassed only by the Yamuna. Originally spanning 220 square kilometers, Najafgarh Jheel has drastically shrunk to just 7 square kilometers due to human activities and anthropogenic pressures. When this tributary to river Yamuna enters Delhi, it is erroneously called as “Najafgarh Nullah (drain)” due to direct inflow of untreated sewage from surrounding populated areas. This was also identified as 13 most polluted wetlands for assessing the water quality of wetlands in wildlife habitats.

The proposal made by DUAC for rejuvenation of Najafgarh Waterway aims to create a seamless and connected pedestrian and cycling path along the waterway, harmoniously integrating with the existing environment and offering a diverse range of activities and amenities that enhance and complement the facilities already available in the surrounding communities. The proposal envisions a vibrant and diverse development, featuring a monumental park surrounding the historic Hast Minar, a bustling Dilli Haat shopping hub, dynamic festival and sports grounds, innovative urban farms, and lively weekly markets. Notably, the project adopts a forward-thinking approach, embracing the natural flood cycles of the Najafgarh Waterways, particularly in its central section.

The design incorporates ecological education spaces and promotes effective water management strategies, harmoniously integrating nature and urbanization.

The presence of water bodies and wetlands in urban areas has many positive aspects which are beyond the obvious water-based requirements of its habitants. They regulate ecosystems, support biodiversity of the region, perform as carbon sink, recharge groundwater aquifers, cleanse polluted waters, and act as sponge to mitigate floods, help to achieve thermal regulation which further control of UHI and micro climate. National Capital Regions like Gurugram and similar areas have shown the effect of Urban Heat Island, water scarcity in summers and flooding during monsoons, which is expected to amplify in near future with climate change.

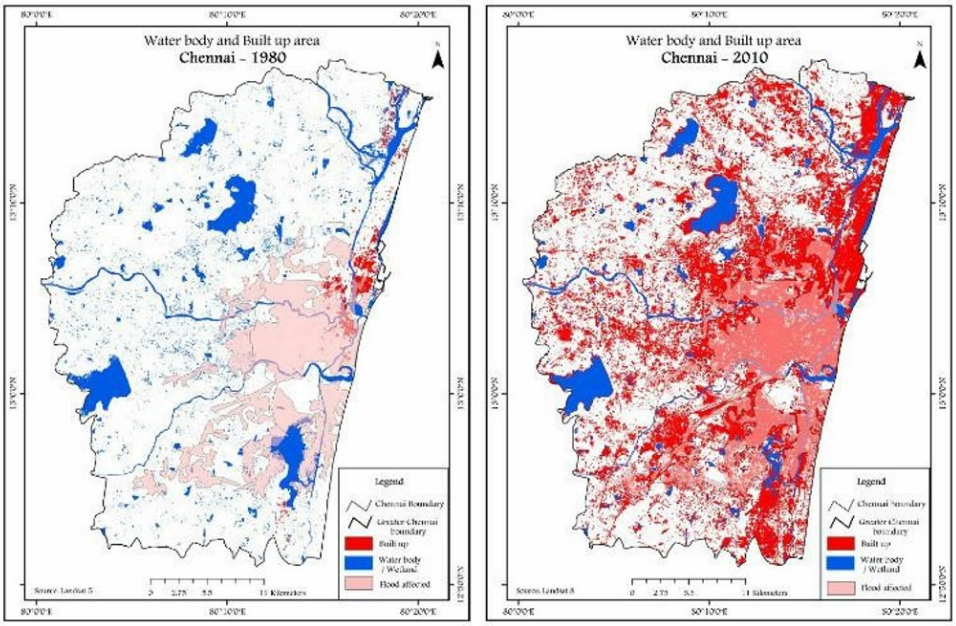



Figure 2 Water body and built-up area in Chennai, 1880 versus 2010,
Source (TNM, 2016)

Another epic example of this disastrous urban growth was Chennai’s 2015 floods, where several rain gauges in and around the city broke records with 500 mm of rain in a 24-hour period which was way higher than annual average of at least 31 countries (Hemalatha, 2018). With clogged drains and encroached water

bodies, the water had nowhere to go and flooded the cities and inhabitants' homes. Some 400 persons died, and 1.8 million people were displaced. The metropolis faced an economic loss of USD 7 billion. The cause of this flood was that 'The water bodies in the city versus percentage of built-up areas have gradually reduced from 80 percent in 1980s, 51 percent in 1990s, 32 percent in 2000 and just 15 percent in 2010' (Singh & Singh, Consequences of Climate Change on Urban Living Environment of Asian Cities, 2017). Restoring lakes was considered as a way to make Chennai resilient towards climate change, recharge groundwater resources and ensure the flora and fauna of the city are given space to flourish. Later, Importance of local hydrology and water bodies was recognized as crucial for any city to mitigate floods and regulate water cycles. Similar growth patterns have been observed in regions like Noida and Greater Noida which are soon going to reach a point of no return. The existing water body and greens around are way beyond repair and sooner going to extinction keeping the rate of exploitation.


**Figure 3** Lake Restoration at Coimbatore,
**Source** (Inc., 2024)

The Revival of these dying water bodies require an approach that integrates people and community. One such project of reviving Periyakulam, Valankulam, Kurichi, Selavampathy and Muthanankulam lakes in the city of Coimbatore, by strengthening their bunds, landscaping work, setting up walking tracks and providing common facilities under the Coimbatore smart city mission (coimbatoresmartcity.org, 2024)


Figure 4 Benefit of Great Places,
Source: PPS, 2024

According to an article by Financial Express (FE Online, 2023), the restoration has brought about a surge in active lifestyles, with thousands of people now flocking to the lakefronts for daily activities like walking, jogging, cycling, yoga, and sports. The lakefronts have been transformed into community hubs, offering a range of amenities such as boating facilities, delicious food courts, and elevated bird-watching towers, making them perfect spots for relaxation, recreation, and socializing. (Figure 1). The project is a milestone

in achieving environmental resilience through urban design. The first step to Sustainable Urban Drainage System (SUDS) is to good housekeeping and site design to prevent the run-off of rainwater and preventing pollution of water bodies for this reducing paved surfaces is essential (Singh & Singh, Integrating Traditional Wisdom of Water Resilience in Architecture and Urban Design, 2020).

Creation of Public spaces along water bodies is a Traditional Indian Placemaking practice as these spaces fulfil all the needs for a good public space. In order to create good public spaces, the four broad principles of placemaking as elaborated by Project for Public Spaces (PPS) include – 1. Spaces that are accessible and well connected, 2. They are comfortable and project a good image, 3. They attract people to participate in activities there. 4. They are sociable environments in which people want to gather and visit again and again. The benefits of great places are elaborated in the Figure 1 Benefit of Great Places, Source: PPS, 2024.

Another case study form Wuhan, China signifies the impact of water bodies on urban thermal environment. Study which investigated three scenarios in which water bodies was regarded as individual samples, water network system and landscape category of urban ecosystem amplifies the relevance of urban blue infrastructure system for climate adaptation. Their results concluded that urban water bodies help gain on water cooling island effect and effective to cool urban environment. All detected water bodies showed WCI effect with the mean WCI intensity of 5.5°C and range of 1.1°C to 13.3°C. Water area and shape index of individuals alone could explain 62.29 and 45.23% of the WCI variation, respectively (Qijiao Xie *, Lu Ren and Chenzhe Yang ,2023). The cooling effect of water bodies on the thermal environment is significantly influenced by their characteristics and spatial relationships. An urban water body system with a larger water area, regular boundaries, and simpler surroundings can more effectively cool the urban environment. Moreover, creating an urban BGI (Blue-Green Infrastructure) system by connecting fragmented water bodies and breaking up contiguous construction land in rapidly urbanizing areas offers a practical strategy for mitigating the Urban Heat Island (UHI) effect and adapting to climate change.Methodology

The Research paper is built on a concern of negligence of urban blue-green network and finds a solution through applied research method. The key objective was to understand the phenomenon, issue, best practices and case studies on managing urban water bodies and then applying the contextual understanding and learning to the studied site of Lohia Canal. The Research tools for documentation of the context include primary survey, mapping, photography and personal interviews. The Design solutions were developed through an intensive 16 weeks long urban Design Studio, with several rounds of expert review. The final design solutions were further submitted to the local development authority for implementation. The Research Process have been explained in the Figure 5 Research methodology.

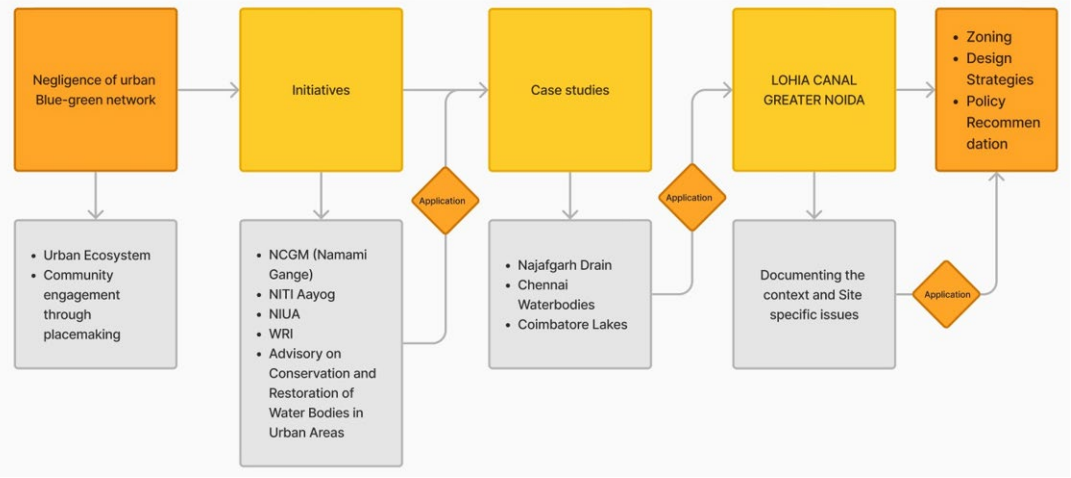
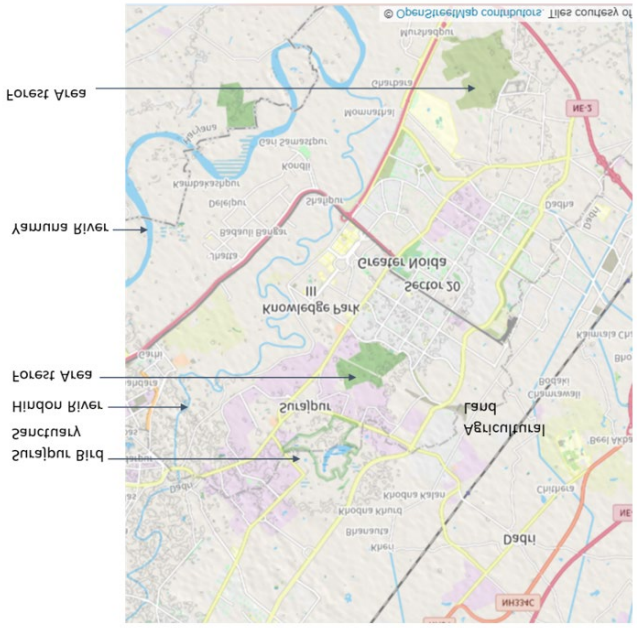



Figure 5 Research methodology

## 3. CASE STUDY OF LOHIA CANAL, GREATER NOIDA

### 3.1. GREENS OF GREATER NOIDA



The Greater Noida City setup in 1991 has been built by amalgamating 293 villages. The Surajpur Bird Sanctuary and Hindon river are the two eco-sensitive zones. The planning of urban greens is done at 3 levels, level 1 has urban forests, large recreational and institutional plots, and green buffer zones along the water bodies. The level 2 has city level parks and green belts along major roads. The third level greens are sector level green belts, parks, open spaces in group housing and large plots.

**Table 1 Distribution of Open Spaces in Greater Noida City**

| | Category of Green Space | Percentage of Area allocated |
|---|---|---|
| **1** | Institutional | 32 % |
| **2** | Green Belt | 26 % |
| **3** | Vacant land | 21% |
| **4** | Road Median | 11 % |
| **5** | Sector Park | 7% |
| **6** | Public Park | 3% |

Table 1 Distribution of Open Spaces in Greater Noida City shows that the area allocated to the greens have reduced at an exponential rate to only 18.5% of the land designated for recreational green areas in the Draft master plan of 2041, down from 22.36% in 2021 and 27 % in 2001. About 32% of recreational green spaces is allotted to the institutions which are completely private in nature. Only 10% of green space is accessible for public Use and lack maintenance. The city level recreational greens such as Jaypee Greens and Samrat Mihir Bhoj City Park are gated and ticketed thus are not part of the everyday life of residents. The lack of urban green spaces also restricts the social cohesion between the residents as most recreational activities occurs at the private realm of residential or institutional zones. The Existing condition of green spaces have been shown in photographs below (Figure 6)


Figure 6 Image Showing green spaces in the city of Greater Noida

## 3.2. RATIONALE FOR SITE SELECTION

For the purpose of this research Lohia Canal for Identified for further analysis and implementation strategies. The rationale for selecting area adjoining Lohia Canal was -

1) **Eco-Sensitive Zone:** Habitat for diverse species of flora and fauna. Act as a sponge to absorb and retain the rainwater runoff and prevent floods. Merges with the Hindon River which is a tributary to River Yamuna.
2) **Underutilized Existing Infrastructure:** Poor connectivity, safety concern, and lack of maintenance cycle-track or parks. The area needs interventions in order to attract attention of the community.
3) **Pedestrian and Cycle Connectivity:** Intense traffic on Surajpur - Kasna Road which is a main-arterial road. Obstruction for movement and crossing of cyclist and pedestrians.

The continuous stretch of canals provides an opportunity to be developed as an alternate safe route for pedestrians and cyclists in the city (Figure 8).

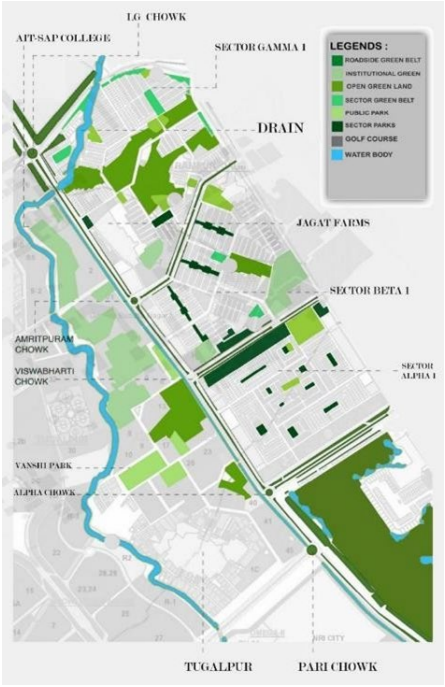



Figure 7 Map Showing The Path Of Lohia Canal And Adjoining Green-Blue Spaces

## 3.3. DOCUMENTATION OF EXISTING CONDITIONS

The Lohia Canal begins at the Surajpur Bird Sanctuary and passes through Industrial Area, Institutional area, and Residential Area before merging into the Hindon River, diagonally bisecting the city and creating a short route alongside. The Hindon River serves as a contributory river to the Yamuna River. The Water channel loses its biodiversity that was present at Surajpur bird Sanctuary and gets polluted in its journey through the city. The 8 kilometer stretch of Lohia Canal was documented in detail using personal interviews, mapping, photography and videography. The seven key issues identified were -

1) Invisible entry-exit zone for the path along the canal
2) Loss of biodiversity
3) Pollution due to drains
4) Disconnected cycle track
5) Garbage dump along the parks
6) Parks with high boundary wall are in accessible
7) Long walking distances

## 3.4. PROPOSED FRAMEWORK

The proposal is based on a holistic vision for the Canal that is “To create a new image for urban greens in Greater Noida”. The three objectives of the proposal were -

1) To improve the stormwater systems by reducing the pollution and reviving the canal from drain to a living waterbody.

2) To increase the biodiversity and provide a safe habitat with a mixed landscape and retention of water within the city by relinking the parks to the larger urban green blue network.

3) Provide a green public open space that is accessible to all and part of the everyday network with shaded walkways, street furniture and connected cycling tracks.

The Table 2 below, explains how the issues have been addressed through implementation strategies.

**Table 2 Issues, Solution and Implementation strategies**

| | Issue | Solution | Strategies |
|---|---|---|---|
| 1 | Blocked drainage system.<br>Rapid Runoff and low stormwater retention. | Reducing the pollution and reviving the canal from drain to a living waterbody. | Proposal for STPs<br>Connecting institutional water discharge with the canal instead of drains |
| 2 | Reduced native wildlife and bird population. | Provide a safe habitat with a mixed landscape and retention of water within the city by relinking the parks to the larger urban green blue network. | Proposing diverse vegetation in the parks and along the canal<br>Use of bio swale along the canal Rain gardens and solar panels |
| 3 | Lack of accessible and inclusive urban spaces. | Provide a green public open space that is accessible to all | Visual Magnets to be added at the entry points of canal pathway. |
| | Low Sociability High Crime rate. | and part of the everyday network with shaded walkways, street furniture and connected cycling tracks. | Removing or reducing the Hight of boundary walls<br>Designing a linked path along the blue green network<br>• Sidewalks<br>• cycle track<br>• space for vendors<br>• lighting<br>• public art<br>• plantation<br>• shaded seating areas<br>• landscape buffer<br>• Shelters and Visual Focal points |

## 3.5. DESIGN INTERVENTIONS

The key characteristics, issues and potentials of the site were identified by making use of personal interviews with the users. Based on these characteristics, surrounding land-use and issues the 8 km stretch is further divided into the seven zones of proposed interventions as illustrated in Figure 8 Key characteristics of spaces along the Canal. The entire site was divided into character zones and interventions were developed based on the area specific issues and needs of surrounding context.

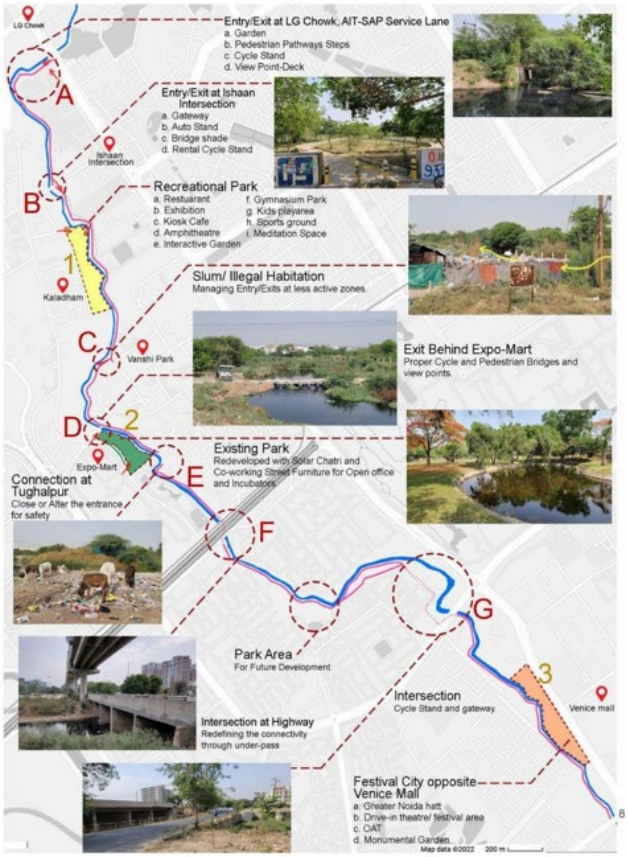



Figure 8 Key characteristics of spaces along the Canal

## 3.5.1. ZONE 1 – LG CHOWK

Zone 1 has been identified as the starting point for the canal trail from the arteria SK road.T o mark the entrance a visual magnet of vertical green sculpture is to be placed and is to be connected with the existing cycle lane at the service road. The Zone provides a rental bike zone for long distance travelers, a recreational plaza and a vending zone is created along with a bridge. The total length of the cycle track is 12.5 Kilometres. A central focus of this design strategy is to create a distinct sense of place to initiate community engagement through placemaking.


Figure 9 Placemaking and Entrance landmark at Zone 1

### 3.5.2. ZONE 2 – ISHAN INTERSECTION

The second entry point to the site is connected to the most crowded intersection of Ishan Chowk and Knowledge Park, at the secondary road ensuring high activity levels and provides an alternate route for pedestrians and cyclists particularly for students commuting between the residential and institutional zones daily. The provision of a much-needed auto stand further facilitates accessibility for longer distances. Open spaces are designated for temporary vendors, to add vibrancy and provide a space for pause. The tabletop crossing on Ishan Chowk Road allows slow and safe pedestrian movement. The visual elements are the entrance gateway, graffiti wall, play zone, and a bridge structure.


Figure 10 Mobility interchange for Cyclist and Pedestrians - Decongestion of the chowk

### 3.5.3. ZONE 3 – VANSHI PARK

The current state of the area presents challenges due to illegal occupation by homeless families, raising concerns about potential slum development. Additionally, the area has been utilized as a junkyard, with significant accumulations of plastic waste observed adjacent to the canal. The area is proposed to be cleaned out and tactical urbanism methods are introduced. The proposed strategy entails a thorough cleanup initiative coupled with the visual integration of this hidden space with the surroundings and Regulated Entry/Exit points.

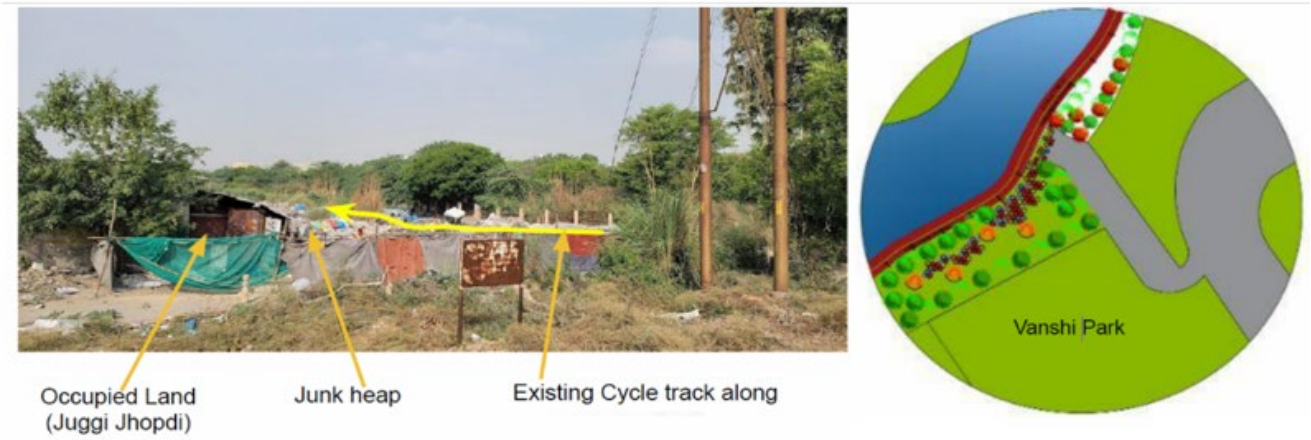



Figure 11 Sanitizing the greens

## 3.5.4. ZONE 4 – EXPO MART

The current connectivity of the cycle track to the back-road of the Expo-Mart presents safety hazards and lacks functionality, highlighting a pressing need for improvement. The planned accessibility to the proposed Site Tech-Park is ingeniously achieved through a bridge traversing the canal. A dedicated cycle stand with rental options is integrated into this scheme, promoting sustainable transportation choices.

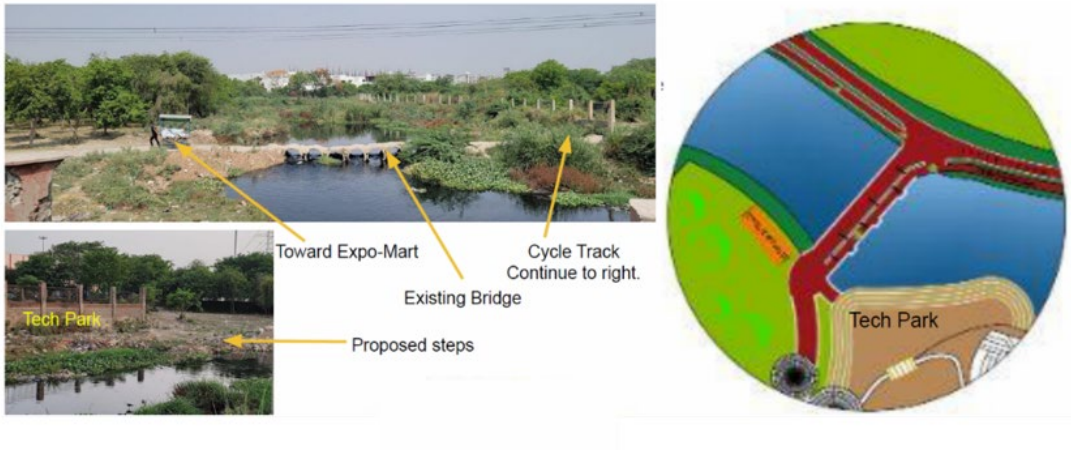



Figure 12 Connecting the extremes

## 3.5.5. ZONE 5 – DISCONNECTED CYCLE TRACK AT TUGALPUR VILLAGE

Tughalpur village stands as a historic, organically developed settlement. However, the village's proximity to a direct road connecting the track poses safety concerns due to its high population density and resultant traffic issues. This situation has contributed to the ineffective functioning of the track, as safety risks remain unaddressed. The proposal involves closing off this specific exit, which currently disrupts the continuity of the cycle track and compromises safety standards. By extending and securing the track, we aim to mitigate safety hazards and prevent further exploitation of the area due to unsafe conditions.

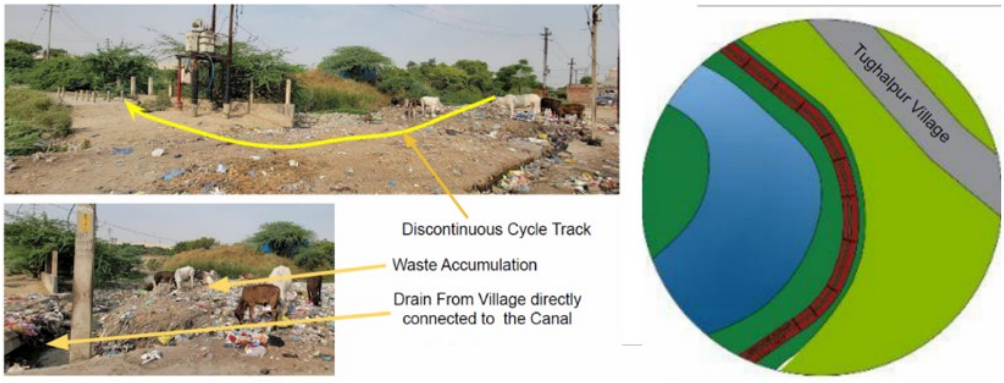



Figure 13 Cycle track connectivity and wase disposal

## 3.5.6. ZONE 6 – CYCLE UNDERPASS BELOW BRIDGE

In addressing the discontinuity in the existing cycle track due to road lanes and creating a seamless connection for pedestrians and cyclists, a comprehensive plan is proposed to reinstate the cycle track and integrate the landscaped canal area. By utilizing the existing bridge the proposal aims to provide a safe, efficient, and visually appealing route for cyclists, pedestrians, and commuters accessing the metro station and cycle stands.


Figure 14 making use of grey areas under the highway, a secret gateway

## 3.5.7. ZONE 7 – RECREATIONAL PARK ALONG THE SK ROADS

The final proposal culminates at the activity magnet for the city as Greater Noida Haat near The Grand Venice Mall to integrate recreational, cultural, and commercial elements with the natural beauty of the canal. The key goal of this intervention is to create a vibrant public realm to enhance the city's image, foster community engagement and economic vitality.


Figure 15A recreational green for the city

## 4. WAY FORWARD

The proposed intervention strategies demonstrated above are to be taken further for implementation post-through feasibility analysis from the Authority. We recommend that some of the projects can be implemented on PPP mode with the Private agency utilizing the prime land value for commercial ventures without disrupting the ecological balance, and ensuring an enhanced public placemaking along the canal. The project implementation also require the expertise of professionals from various dimensions The proposals integrated vision requires the canal's revitalization based on three layers:

- Climatic Resilience: Enhancing the canal's role as a sponge to absorb climate extremes.
- Urban Ecology: Promoting biodiversity conservation and groundwater recharge.
- Social Spaces: Utilizing the canal as a pedestrian and cycle network and a social space and redefine the image of the city.

## CONFLICT OF INTERESTS

None.

## ACKNOWLEDGMENTS

None.

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