

**ADI GANGA, A SACRED RIVER OF KOLKATA, USING  
LANDSCAPE URBANISM APPROACH**

**MASTER OF ARCHITECTURE  
(LANDSCAPE)**

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2017MLA010



**SCHOOL OF PLANNING AND ARCHITECTURE, BHOPAL  
NEELBAD ROAD, BHOURI, BHOPAL – 462030**

**MAY 2019**

# ADI GANGA, A SACRED RIVER OF KOLKATA, USING LANDSCAPE URBANISM APPROACH

***Submitted***

*In partial fulfillment of the requirements for the  
award of the degree of*

## MASTER OF ARCHITECTURE (LANDSCAPE)

By

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2017MLA010



**SCHOOL OF PLANNING AND ARCHITECTURE, BHOPAL  
NEELBAD ROAD, BHAURI, BHOPAL – 462030**

**MAY 2019**

**Department of Landscape**

## School of Planning and Architecture, Bhopal



### Declaration

I \_\_\_\_\_,

Scholar No. \_\_\_\_\_

Hereby declare that the thesis entitled \_\_\_\_\_,

\_\_\_\_\_ submitted by me in partial fulfillment for the award of Master of Architecture (Landscape), in School of Planning and Architecture Bhopal, India, is a record of bonafide work carried out by me. The matter embodied in this thesis has not been submitted to any other University or Institute for the award of any degree or diploma.

.....

Student's Name

### **Certificate**

This is to certify that the declaration of \_\_\_\_\_ is true to the best of our knowledge and that the student has worked under the guidance of the following panel.

**RECOMMENDED**

Ar. Saurabh Popli

**ACCEPTED**

Prof. Sanjeev Singh  
Head, Department of Landscape Architecture

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# Adi Ganga, a sacred river of Kolkata, using landscape urbanism approach:

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By

Anjana Das

Submitted to Department of Landscape Architecture  
On May 20, 2019, for the Requirements by School of Planning and Architecture  
For Masters of Landscape Architecture

## **Abstract**

Adi Ganga or the ancient route of Ganga used to be a critical element in the socio-economic and ecological landscape of colonial Kolkata, both as a navigable waterway and as a setting of rich culturescape, dotted with numerous temples and sacred groves. The eventful history of old Kolkata unfolded on the banks of this river, remnants of which survive to this day. In the past to centuries the mighty Bhagirathi-Hoogli changed its course substantially, leaving the Adi Ganga as a dying canal. The first instance of human intervention to restore navigability of Adi Ganga was in 1776, when Major William Tolly dug a canal from Garia to redirect water flow to a minor river called Bidyadhari at Samukpota 15 kilometers to the south-east of Kolkata. The Tolly Nallah exist today as a neglected drainage and sewerage canal, its significance as both natural and cultural heritage being long lost to the citizens of the metropolis.

Landscape Urbanism has the power to integrate diverse physical programs and socio-cultural agendas through subtle interventions in urban open spaces. The Adi Ganga stretch from its confluence with Hoogli at Dai Ghat till the Major Hindu pilgrimage site of Kalighat, is envisaged as a navigable waterway with stretches of landscape part socio-culturally active spaces and re-velarized heritage structures. Through a combination of activity anchors which would manipulate visitor experience along the canal sensitization of the people to the ecological vulnerability of the canal is plan by a series of dense forested area, linear butterfly garden, park, plaza,

boating jetty, ghat, community garden. Heritage structures are made the focus of these landscape intervention projects.

To demonstrate the objective of this Landscape Urbanism thesis the stretch between Zerut Bridge and Kalighat temple road is chosen because of concentration of high footfall tourist area as well as heritage structure. Some key points of interest along the canal in this stretch include the Alipore Zoo, the Alipore European Cemetery, temples like Kali temple, Durga temple, Annapurna temple, terracotta Shiva temple etc. A huge potential of design intervention in this area is the now abandoned heritage structure of Alipore central jail. Also there are existing government proposal of inserting socio-cultural spaces along the canal. In this fortunate combination of events the thesis finds potentials to draw the people of Kolkata into a journey of re discovering of Adi Ganga.

Key words: Landscape Urbanism, *Urban Open space*, *Waterways*.

# Acknowledgements

I would like to thank the following people:

My Thesis Guide, Ar. Saurabh Popli Sir, who originated my interest in rivers. His continuous guidance and support have enriched this thesis. Furthermore, his ability to direct the complex facts and look at the rhythmical side of things, has made the process of writing this thesis stimulating and graceful.

My Thesis advisor, Prof. Surinder Suneja and Prof. Shishir Rawal Sir, who came for internal reviews. Their involvement and inputs make this thesis. They are two most important column to strengthen my thesis.

My Thesis reader, Ar. D. S. Roy, who Ex Town Planner of Kolkata, introduced me to the complexities of cities. He has consistently encouraged me to reach further and higher. The conversations that we have had, have made me look for larger goals, the bigger picture and the underlying issue rather than the superficial symptom.

Ar. Saurabh Tiwari Sir for giving me opportunity to participate in SEARCH Workshop on Landscape Urbanism of Adi Ganga, conducted by IIT Kharagpur at Kolkata Campus. I come to know about the topic and scenario of such navigable channel for the first time in mid-December. I have learnt an immense amount from the people participated there and have enjoyed every moment of our interaction.

Ar. Sandeep Memon Sir for his Mentor and insights on the group work during SEARCH workshop.

Thanks to everyone who helped me in Kolkata. I have explored the city and transformed my idea after meeting them and learning from them.

Thanks to Kolkata Municipal Corporation to share me their approach and encourage me to think about the betterment of Adi Ganga to be implement.

Thank you to my family- parents, my younger brother Rahul Das-for being there through thick and thin. The last two years would not have been possible without you.

# Chapter 1

## Introduction

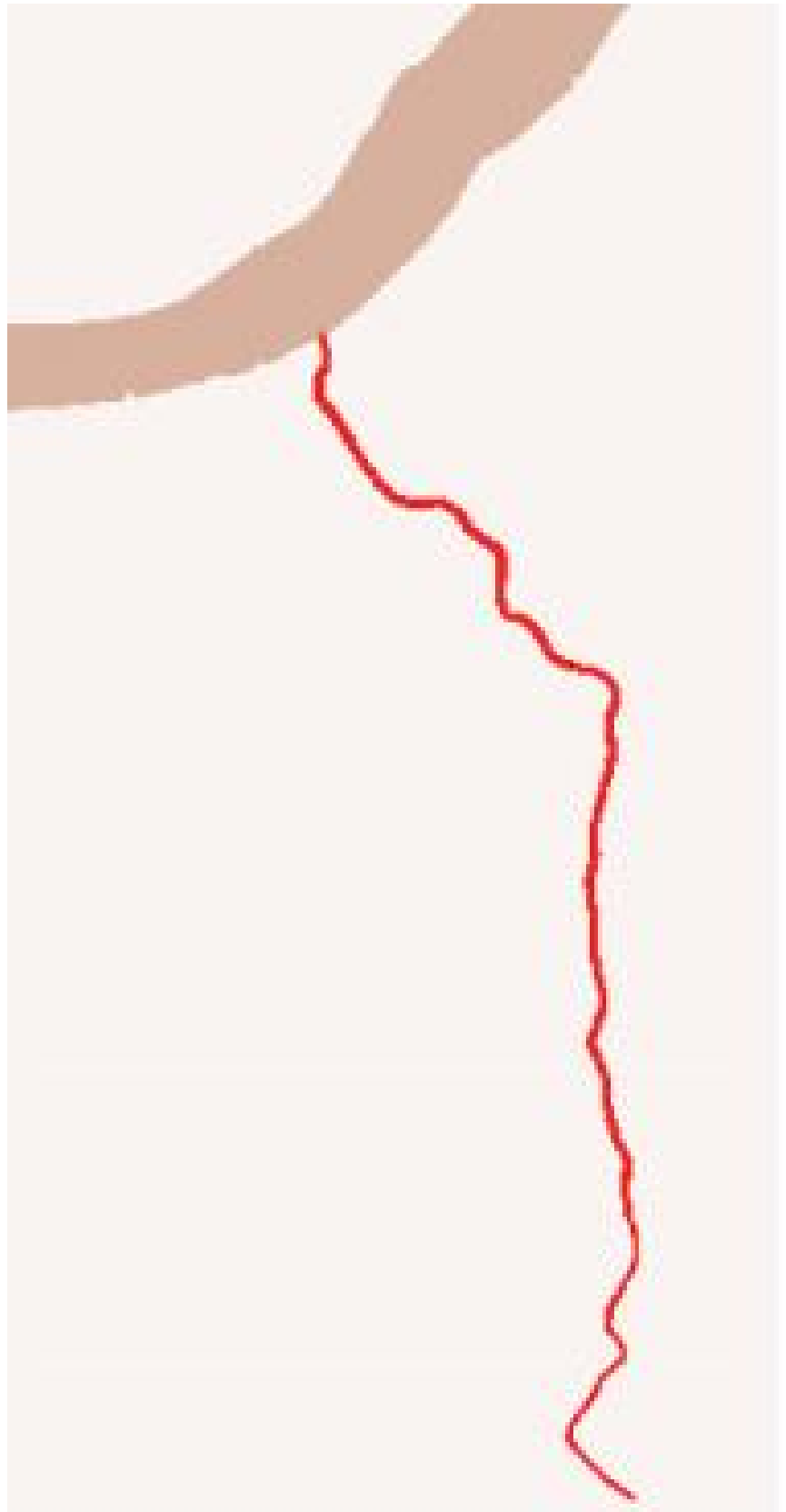
Problem statement

Methodology

Definition of Landscape Urbanism

Various examples of Landscape Urbanism  
and cities

Chapter description





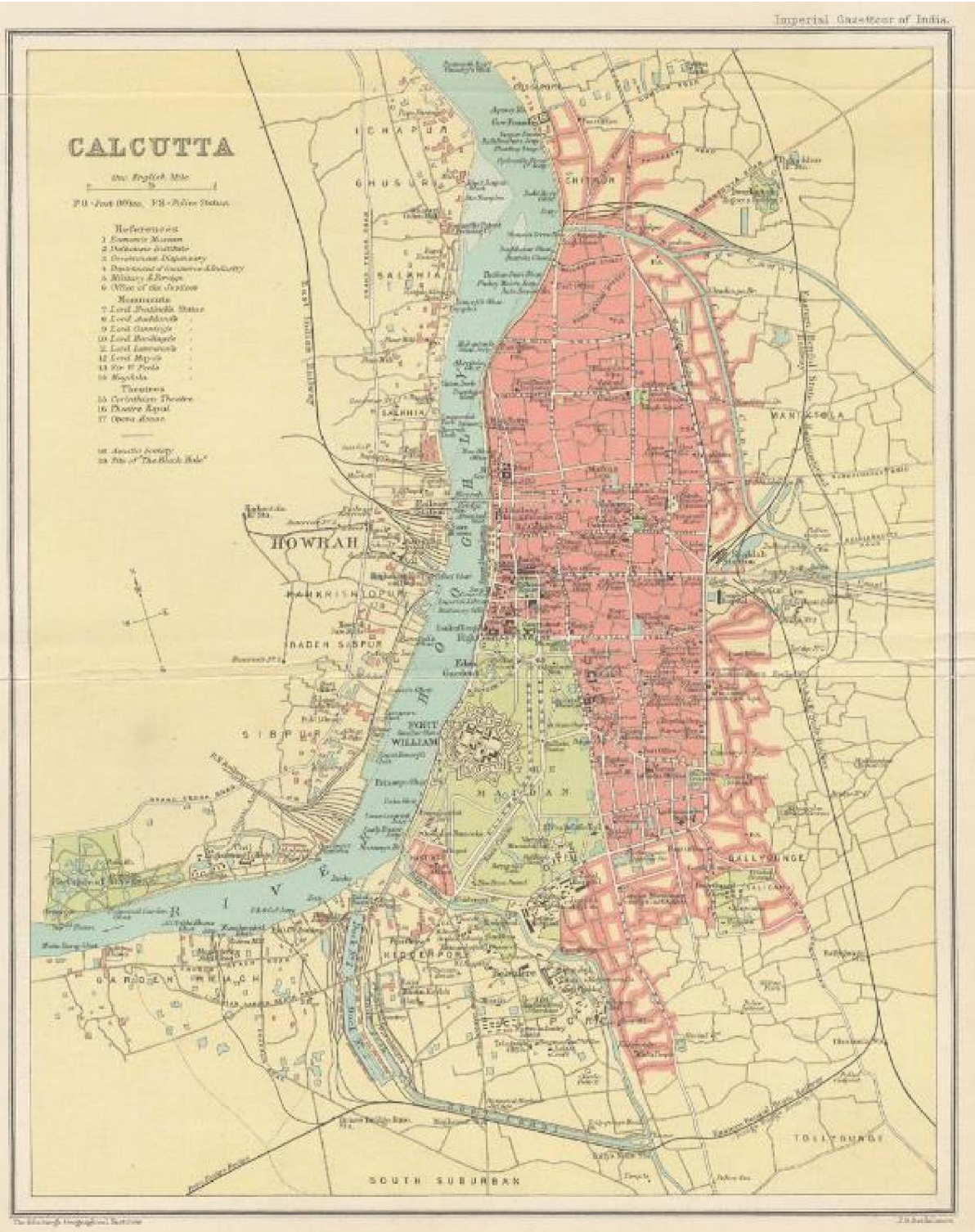


Figure 1 old map of Kolkata

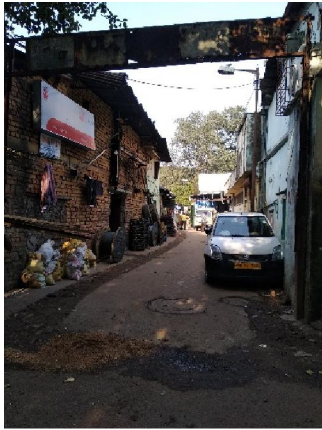


Figure 2 Visual impermeability



Figure 3 Dumping along River



Figure 4 Lost connections



Figure 5 fencing prevents bonding



Figure 6 use of polluted water



Figure 7 encroachment



Figure 8 Metro extension through the Canal



Figure 9 Netaji Subhas metro area

## 1 Introduction

Cities and civilization succeeded on the bank of rivers from the beginning. The relationship between human and nature was that mutual interdependence through sustainable transformation between social and ecological to “metabolic rift” in Marxist terms (Foster, 2000).

**The thesis deals with Adi Ganga or Tolly Nallah, a channel connects with a tributary of Bhagirathi Hoogli River in Bengal plain. It's a channel that runs from southern boundary towards northern east via East Kolkata Wetland and meeting Kulti and Piyali River.**

Adi Ganga is one of the significant paleo-distributary channel of Bhagirathi Hoogli River across momentous since medieval to present day. Therefore Political ecology leads the development and sift the remnants of the stream in colonial and precolonial Kolkata.

The present situation of the river is detreated due to pollution and smells especially near Alipore Bridge on the way to National library. This is the same channel which is the part of old route of Adi Ganga revived by William Tolly between 1772 to 1777. It was excavated and connected with old path pf Adi Ganga (Known as Adi Ganga or Tolly nallah) mainly for two reason - Trade -transportation and Drainage Sewage Sanitation (Mukharjee, 2016).

It was properly maintained in colonial period but turned into a sewer because of abandoned combine drainage outfall of Kolkata. Huge amount of silt deposition during of high tide. Gradually, it decreases bed level by 6ft to 120 ft (Mndal, 2018). **It finally became a nallah as per August 1995 report of “Environmental problems in Metropolitan Calcutta Municipal”. Environmentalist V. Ramaswamy refers “Tolly Nallah carries cities rubbish into our municipality”** (Mukharjee, 2016).

To deal with this situation,“Calcutta Environmental Management Strategy Action plan” (CEMSAP) report drew a proposal for the renewal of the East Kolkata Wetlands and Canal systems in the March 1997. It emphasis on the revitalization of the Tolly Nullah (by joining it to the Piali river. There was alternate plan of extension of the canal by 11 Kilometers to join with the Bhangal Kata Khal to avail easy transportation and allow for eco-tourism. The “Urban

Development Department of West Bengal” publish another report in December 1997 by stating renovate and make suitable for transportation of 15.5 km stretch of water course between Hastings and Garia (Mukharjee, 2016).

However none of these plan worked due to expansion of metro Rail between Tollygunge station and Garia station with raised railway tracks running directly over Tolly Nallah. It holds 300 columns at an interval of 20m center to center distance into the the nala. In July 1999, a letter against this scheme proposed by the Railway Authorities was written by Rebati Ranjan Bhattacharya, an environmental activist. This letter was followed in April 2000 by an article in the Statesmen by Mohit Ray, who received support from several citizens and prominent literati (from poets, historians, environmental activists to the former Chief Engineer of the Irrigation and Waterways in West Bengal). The letter pronounces the Nallah as a "Heritage river" and the need to examine the detrimental effect that the Metro Expansion Plan would have on it. In the meantime, an October 2000 India Today article referred to the Adi Ganga as: "a 15km toilet dispenser, an unbroken river of sludge, stink and toxins" (Kapoor, 2019).

The metro expansion issues being raised concern of Environmental protection act (EPA) 1986, Environmental Impact Notification (EIA) 1994 and against section 11 of Railway act 1989, a leftover of the colonial revised edition of the act of 1980 which provides the railway to construct "... upon across, under or over any land, any river, canals, brooks, streams or other waters..." (Mukharjee, 2016). All these issues were filed by case by Subhash Dutta, an Environmentalist and Historian to high court in March 2001.

The clause 11 of Railway act 1989 was enacted with article 253 of the constitution of India to implement the decisions of the Stockholm conference of 1972. The Clause 11 of the Railways Act, 1989 gives the Railways the power to "make or construct in or upon, across, under or over any lands, or any streets, hills, valleys, roads, railway, tramways, or any rivers, canals, brooks, streams or other waters, or any drains, water-pipes, gas-pipes, oil-pipes, sewers, electric supply lines, or telegraph lines, such temporary or permanent inclined-planes, bridges, tunnels, culverts, embankments, aqueducts, roads, lines of

railways, passages, conduits, drains, piers, cuttings and fences, in-take wells, tube wells, dams, river training and protection works as it thinks proper.

Now the question is

1. What is the future of the city? Is this a viable decision that says only built and built?
2. What prompts the activism and advocacy of construction over River?
3. What is leading the dilemma of Adi Ganga Action?
4. How come the Metro expansion project got environmental clearance?
5. What are the immediate measures?

## **1.1 Problem Statement**

Though Adi Ganga, the river become a sewer, still it's been considered sacred by city's memory. Numerous Pilgrims visit to Kalighat temple and test this sewer water as a ritual with emotional and devotional feeling.

However the river is facing many problems, most prominent is pollution and misuse. It is now considered a dead channel.

Adi Ganga was an important navigational channel since Medieval time period according to Bengali literature. It welcomes many European merchants, Portuguese, Marathi, merchants and travelers to carry various items from the Sundarban via Adi Ganga. Older remnants, and earlier embankment with several historical places still exists along the river. The river become sandwiches on both sides due to encroachment.

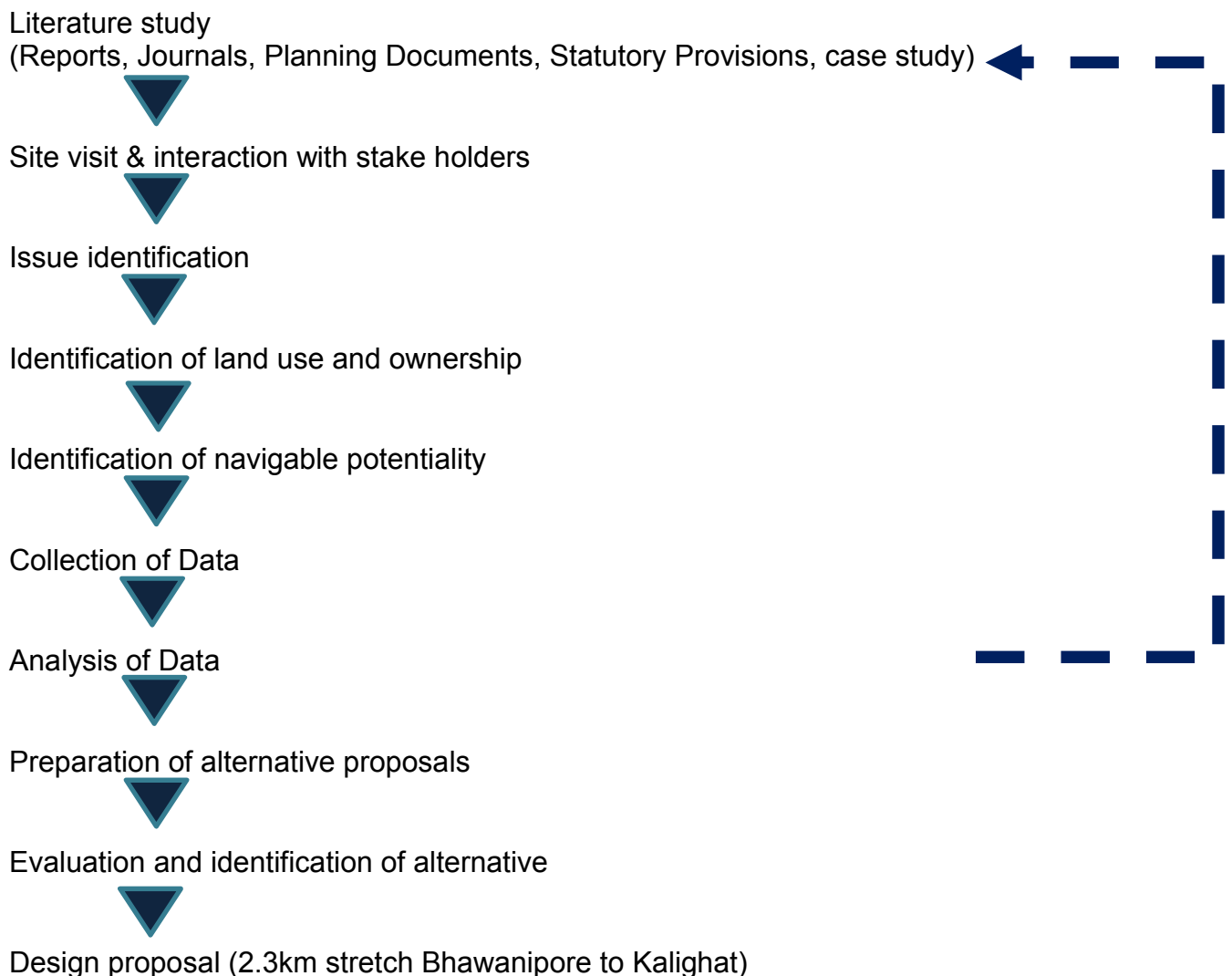
The river has lost its depth and navigability due to siltation. the change pattern of land use leading to Flood as a common phenomenon during monsoon.

**Aim: The thesis aims to reconnect water with human by integrating Kolkata’s cultural architectural heritage with nature by transformation of “Adi Ganga” Embankment through Landscape Urbanism.**

**Objective: The objective is to**

- **Increase navigability of Adi Ganga**
- **Reuse its potentiality**
- **Enhancement of Local Ecology**
- **To increase Tourist Footfalls:** Alternative access routes via Adi Ganga to dissipate crowds (water transport), Greenway & boardwalks for river-side walk
- **To create employment opportunities for Local community through:** Food vending opportunities, Showcasing local spots – temples and local life & art, Adaptive reuse of old structures

## **1.2 Methodology**



### 1.3 Definition

#### a) Landscape Urbanism

Landscape urbanism is an approach to urban design in which elements of cities such as water, vegetation, vertical and horizontal structures are composed in terms of visually, functionally and technically with regards to human use and landscape context (Turner, 2010).

##### i. Definition

Landscape urbanism is a theory of urban planning arguing that the best way to organize cities through the design of the cities landscape, rather than the design of its buildings (Landscape Urbanism, 2017).

##### ii. Various examples of Landscape Urbanism and cities

There are many examples regarding above context through city landscape to organize its features aesthetically. Such as

### 1.4 Various examples of Landscape Urbanism and cities

The thesis has various objective such as navigability, waste management, and public space for engagement. To fulfill those, three different case studies which has similar aspects has been referred.

#### 1.4.1 Case Study: Canal beautification in Alappuzha, Kerala

There is a project of Canal beautification in Alappuzha, Kerala. It's a part of project to upgrade Tourism Infrastructure in district. A program is to beautify three major canals – Vade Canal, Link Canal and Commercial Canal to facilitate circular boat services.

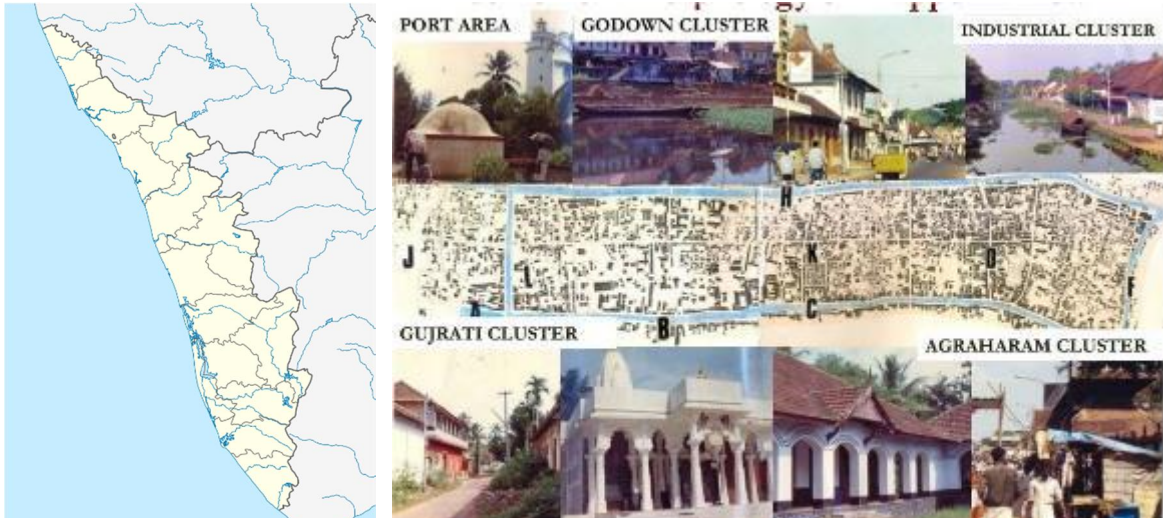


Figure 10 Site plan of circular canal, Alappuzha, Kerala



Figure 11 Edge treatment



Figure 12 various edges



### 1.4.2 Case Study: Hatijheel area including Begunbari Canal

Another project is under “urban oasis, an integrated development of Hatijheel area including Begunbari Canal”. It’s a Wetland Restoration project to protect large part of the city from flash flood. It helps to take back the waterfront heritage. The project covers an area of 311 acres. It also includes infrastructural and landscape components including expressway, overpass, lakeside walkways, seating, viewing decks, floating amphitheater, park, viaducts, taxi terminals etc.

This projects in Bangladesh has similar Dealtaitic plain like Bengal Plain and issues which has been dealt with (Architecture Masterprize, 2019).

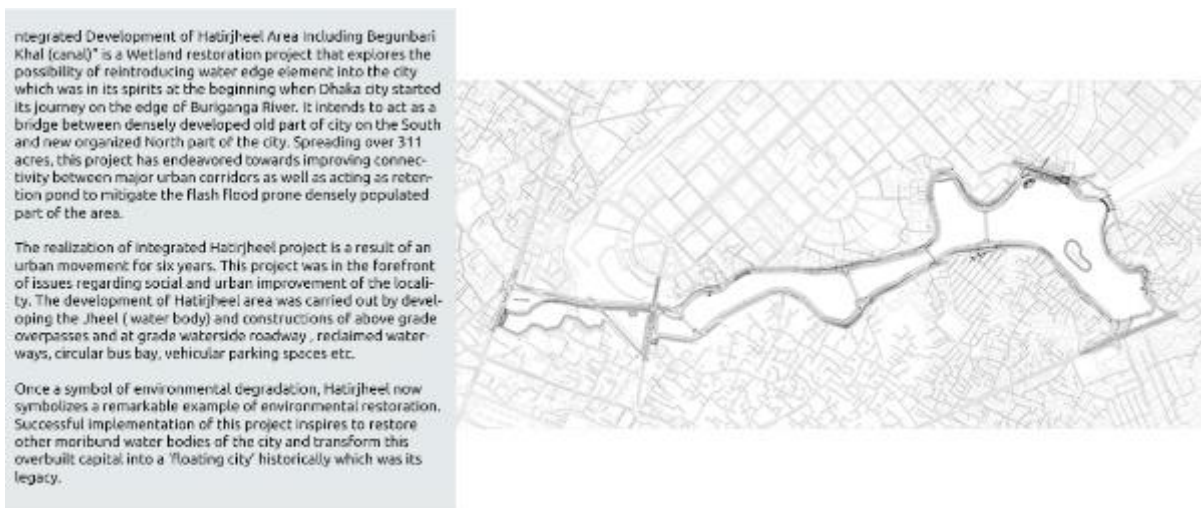


Figure 13 Site plan of Hatijheel, Begambari, Bangladesh



Figure 14 Different use of urban setting

### 1.4.3 Case Study : “Cheonggyecheon stream” at Seoul, South Korea

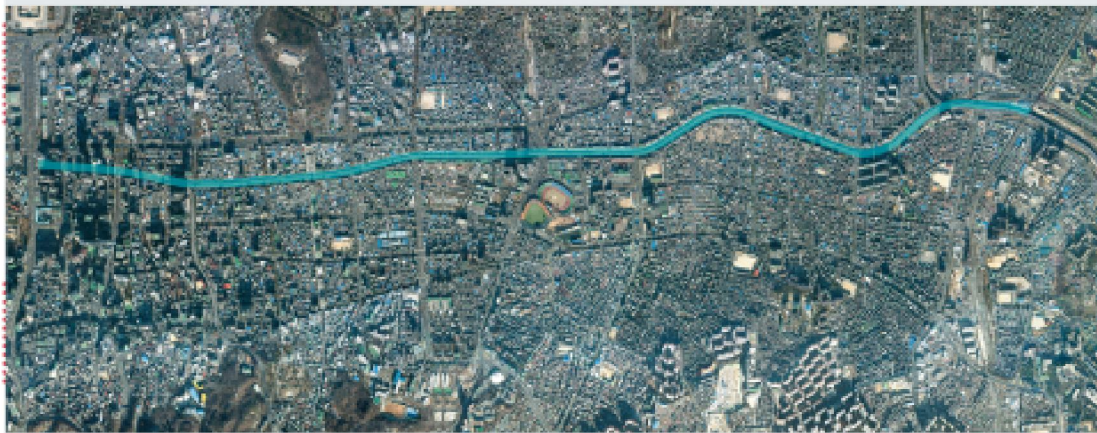
Next project is “Cheonggyecheon stream” at Seoul, South Korea. This is an 8.4 kilometer (5.2 mile) long waterway urban design revitalization project. That runs east to west throughout Seoul as an waterways and public open space.



**Location:** Jung Gu (Central District), Seoul, South Korea  
**Population:** 10.1 million  
**Metro:** 25.6 million  
**Extent:** 5.8 km (Length) 292,000 m<sup>2</sup>(Area)  
**Right-of-Ways:** 50 m  
**Context:** Mixed-Use (Residential/Commercial)  
**Cost:** 386,739 million KRW (345.2 million USD)  
**Funding:** Seoul Metropolitan Government  
**Project Sponsors:** Seoul Metropolitan Government

#### Location Map

The Seoul Metropolitan Government decided to dismantle the 10-lane roadway and the 4-lane elevated highway that carried over 170,000 vehicles daily along the Cheonggyecheon stream.



#### Location Map

The Seoul Metropolitan Government decided to dismantle the 10-lane roadway and the 4-lane elevated highway that carried over 170,000 vehicles daily along the Cheonggyecheon stream.

According to Joseon Dynasty, the stream was known as Gaecheon, meaning open stream. The stream banks were strengthened and bridges were built at the dynasty of king Taejong during 1400 to 1418 and refurbish as a national project during the time period of king Yeonjo ruled from 1724 to 1776. The stream was renamed to Cheonggyecheon during the Japanese occupation which was attempts to cover it up were unsuccessful.



Over few years, the stream condition decorate by full of trash, waste and encroachment and become an eyesore of the city. Then it was converted into

an elevated 5.6 kilometer (3.4 mile) concrete highway in 1976 (Cheonggyecheon Stream, 2019).

Before



The Seoul Metropolitan Government decided to dismantle the 10-lane roadway and the 4-lane elevated highway that carried over 170,000 vehicles daily along the Cheonggyecheon stream.

After



The transformed street encourages transit use over private car use, and more environmentally sustainable, pedestrian-oriented public space.



Restoration: *finally* Cheonggyecheon restoration work starts to restore its original beauty In July 2003. It took two years to complete which included pumping 120,000 tons of water back into the dry stream and restoring Gwangtonggyo Bridge and Supyogyo Bridge and reopened to the public in September 2005. (Cheonggyecheon Stream, 2019).



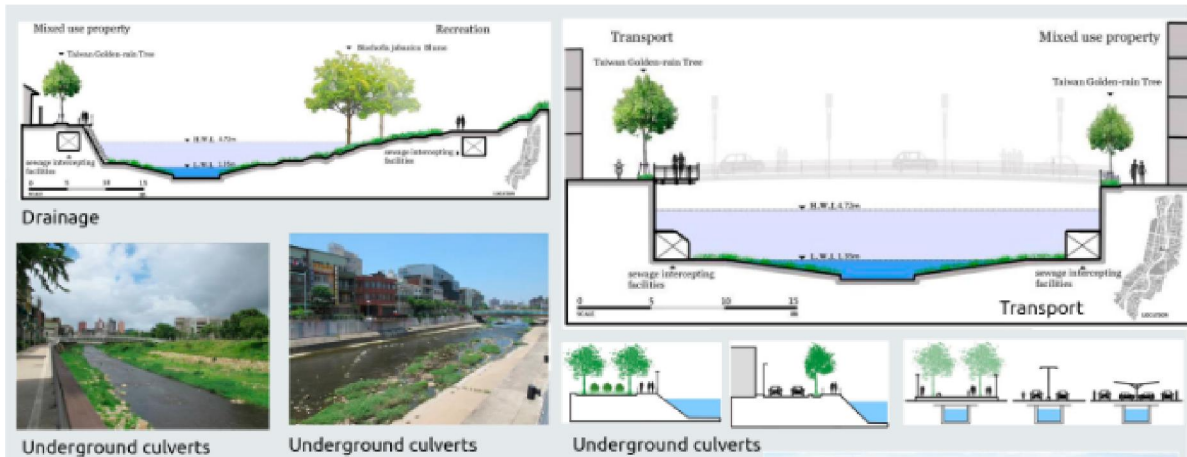
Site plan of Chenggyecheon strteam

Source: Seoul Metropolitan Government



Vision plan of Chenggyecheon stream, Source: Seoul Metropolitan Government

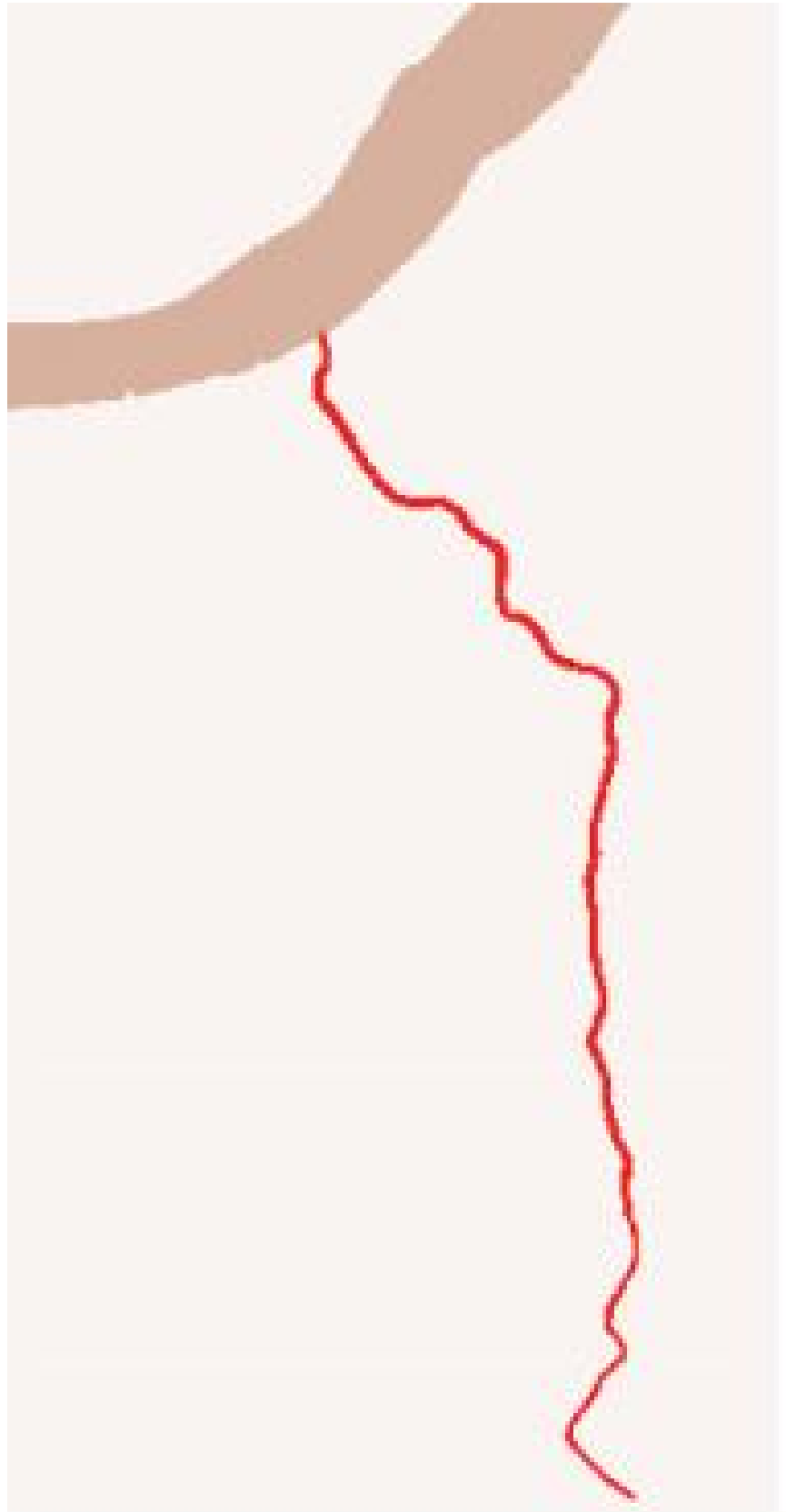
*It became a new landmark is now a popular destination for tourists and locals who want to experience natural beauty and wildlife in a large, urban city.*



## Chapter 2

### Kolkata and its Canals and Rivers

- a. Kolkata and its location in respect of the other parts of the country
- b. Climate and Rainfall
- c. Kolkata's growth from the marshy land, Bay of Bengal
- d. The river Hugli/Ganga and the Canal System of Kolkata,
- i. Habitat and Ecology



## 2 Chapter 2

### 2.1 Kolkata and its Canals and Rivers

### 2.2 Kolkata and its location in respect of the other parts of the country Kolkata comes from Calcutta;

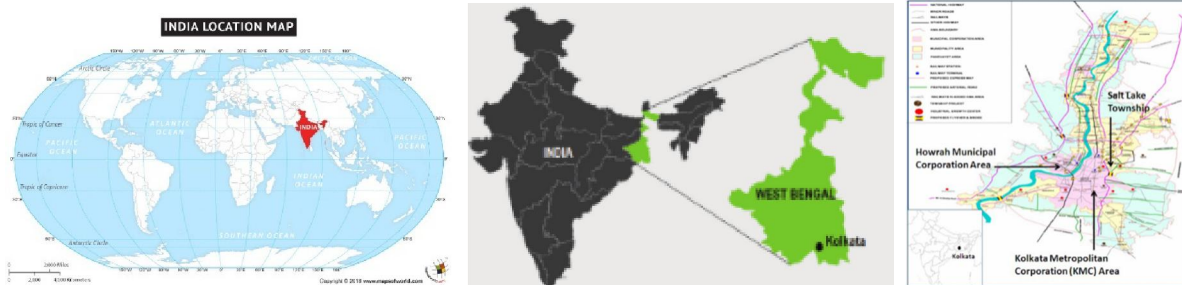


Figure 2 Kolkata Location, Source: KMDA, KOLKATA



Figure 2 Adi Ganga old route Location, Source: The Telegraph, Published 5.07.09

- The capital of West Bengal established in the year of 1686. Calcutta derived its name from small villages Sutanati, Govindpur, and Kalikata along with river bank of Ganga basin. Centuries before, Kalikata (site of present-day Kalighat) was very much a rural backwater and tales of Tigers roaming the impenetrable jungles (where Park Street now runs) are life in the city's lore. The city was entirely salt water marshes from Hoogli River up to Bidyadhari – Kulti River. The present Clive house, near Dumdum used to be Shikargarh (Hunting Lodge) of the Nawabs.

- LAND USE PATTERN OF KOLKATA:

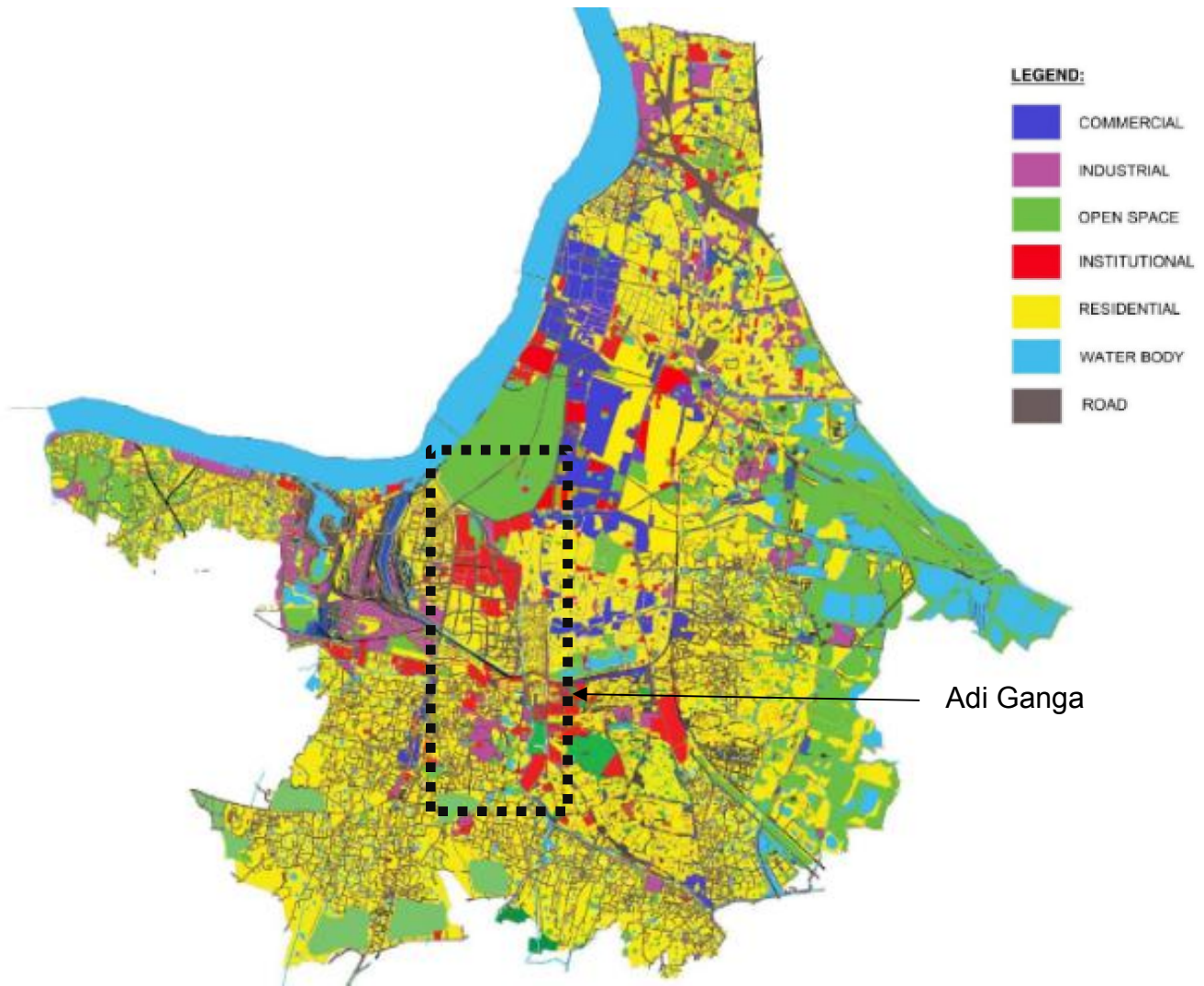


Figure 4 Land use Map of Kolkata, 2005, KMC

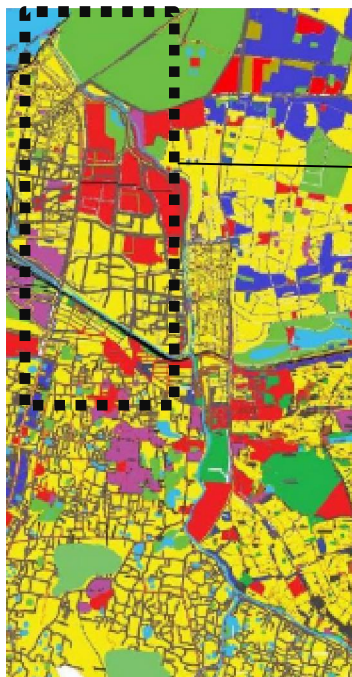


Figure 5 Adi Ganga Route

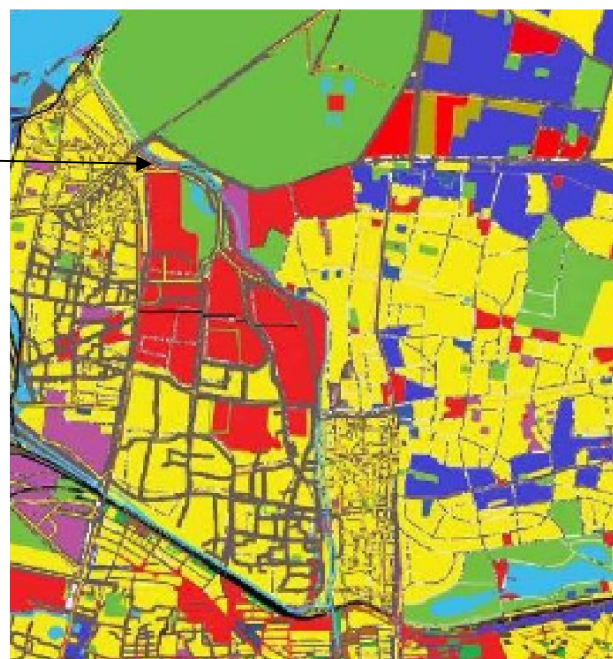


Figure 6 Landuse along Adi Ganga Bank

### 2.3 Climate and Rainfall

Kolkata falls under Tropical wet-and-dry climate (Köppen climate Classification Aw). Kolkata's annual mean temperature is 24.8 °C i.e. 80 °F; whereas monthly temperatures range from 15 °C i.e. 59 °F to 30 °C i.e. 86 °F. It contains hot and humid summers with temperatures less than 30's and during dry spells. The maximum temperatures often exceed 40 °C (104 °F) during May and June.[1] Winter tends to last for only about two and a half months, with seasonal lows dipping to 9 °C – 11 °C (48.2 °F – 51.8 °F) between December and January. The highest recorded temperature is 43.9 °C (111 °F) and the lowest is 5 °C (41 °F).[1] Often during early summer, dusty squalls followed by spells of thunderstorm and heavy rains lash the city, bringing relief from the humid heat.

### 2.4 Kolkata's growth from the marshy land, Bay of Bengal

The area governed by the **Himalayan Mountains** in the **north**, the **Meghalaya Plateau** in the **north-east** and the proximity of **Bay of Bengal** in the **south**.

Delta form: This region is a part of mature delta of River Ganges; wetlands are the "inter-distributaries" marshes in delta. These streams become inactive with the shifting of Main River, eventually few of them are dead. The mouth of some streams opened directly to Bay of Bengal and was influenced by tidal action. The Gangetic River (Bhagirathi-Hugli) has changed river course later and shifted from salt water marshy bed.

### 2.5 The river Hugli/Ganga and the Canal System of Kolkata,

Kolkata situated in Dealtaitic Bengal plain, gradually silted and created various tributaries runs through the city towards wetland and finally meets Bay of Bengal via Bidyadhari, Kulti and Piyali River. The city's entire sewage water and storm water directly carried by these canals to the wetland for treatment naturally by psiciculture. This combine drainage system not only supply sewage water for fish feeding but also lifeline of the city. Adi Ganga is not the exceptional. It is a paleo distributary channel of Bhagirathi Hugli, flowing from confluence near hestings and finally meets Bay of Bengal via Piyali River.



According to Kolkata Municipal Corporation (KMC) report 2006. KMC area produces 600 million litres of sewage and wastewater and more than 2,500 metric tons of garbage per day (KMC 2006). The KMC area is divided into basins and sub-basins. Here are following elements of drainage installations:

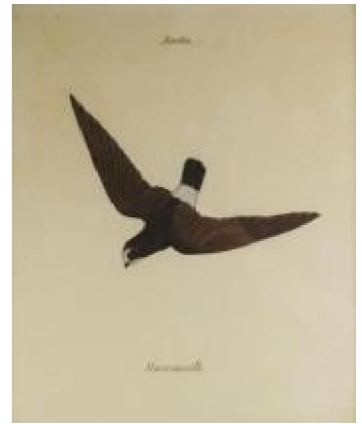
- a) Conduits for trunk and branch drains,
- b) Open channels - lined or unlined,
- c) Outfalls - with or without gates,
- d) Pumping stations,
- e) Canals,
- f) Water bodies,
- g) Wetland and
- h) The river (Kulti).

Generally Underground sewers carries drainage to pumping stations to dispose the load of channels and canals. These channels and canals places drainage partly into eastern wetland system and the rest into river Kulti. Kulti River flows over rural areas and swamps through Gangetic Delta finally meets Bay of Bengal. Similarly household sewage travels around 60 Km rout. Whereas solid waste diposites in Dhapa Dumping Groun.

## **2.6 Habitat and Ecology**

### **Old Kolkata Scenario along Adi Ganga Bank:**

Numerous birds flew from Adi Ganga corridor to Sunderbon. There were 24 species of birds, mostly familier to Paddy field. So it was a wonderful viewing route of City. It included House Crow, Oriental Magpie Robin, Seven Sisters, Bulbul, King-Crow, Common Tailorbird, Oriole, Mynah, Dhital, Sparrow, Honey-Sucker, Woodpecker, Coppersmith Barbet, Blue-Jay, Kingfisher, Swift, Koel, Parrot, Owl, Vulture, Kite, Dove, Gull, Paddy-Birds (puronokolkata, 2019).



Different folks arrived from various stages of compositions, adaptable for the different ecological diversity. It transform of Colinga before mid 18<sup>th</sup> century landscape from a marshland to cultivable woodland, paddy-field and orchard (puronokolkata, 2019).

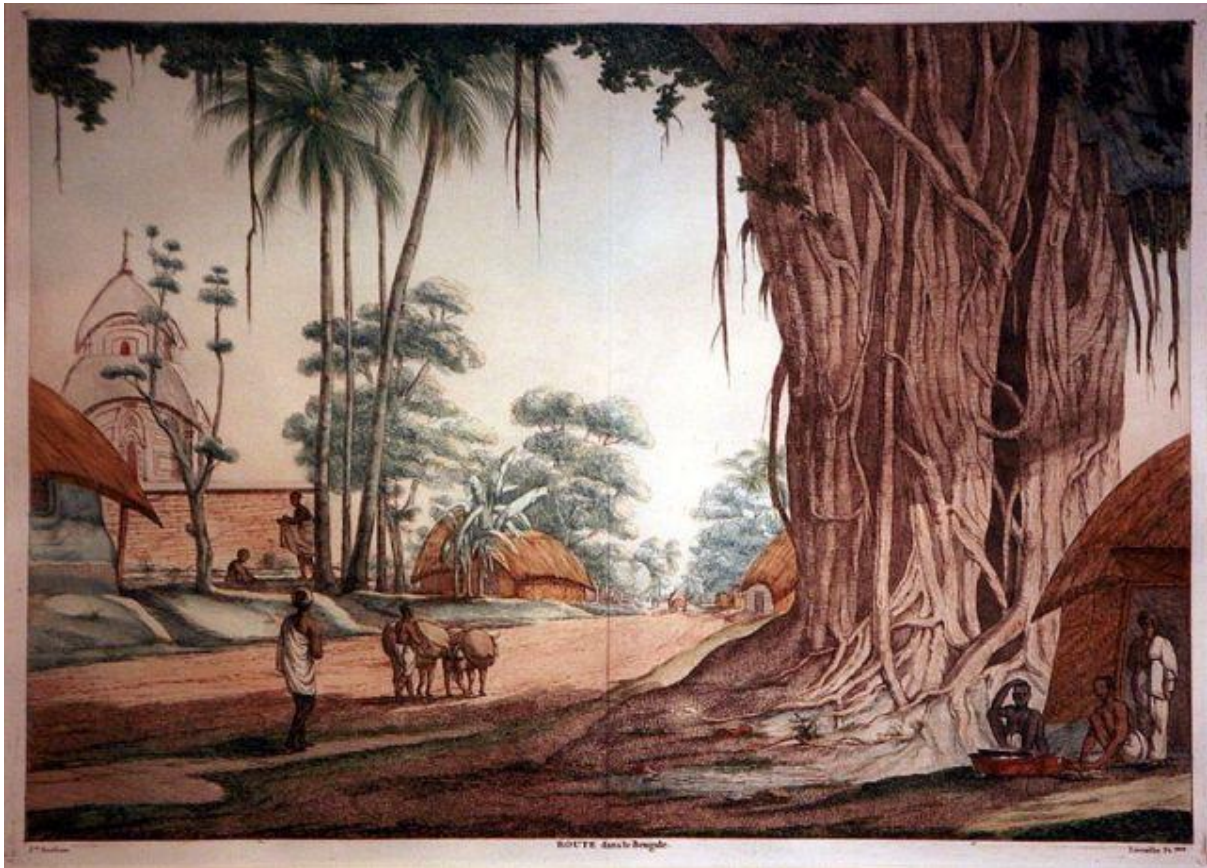


Figure 2 Route dans le Bangale. c1791-1823. Artist: François Balthasar Solvyns.

Numerous species of trees were present like **thorny beri, benchi, dumar, simul simul, siris and mangrouves**- due to delta form of the earlier city.

It is said that **there were around 69 trees that Benthall, 41 were truly indigenous, 20 are natives, 6 originated in America, 1 fom Africa and 1fom Malaya. Various plants has lost since19th century like Croton Tiglium Linn (puronokolkata, 2019).**



Cartographic study says there are old Banyan trees still standing along the ramnat. Specially one tree has imprint of roap tie for boat at Dai Ghat near confluence.



Figure 3 Banyan Tree. Artist: Unidentified. Source: *Journal of Residence In India* By Maria Graham. 1813

**Presen Scenario along Adi Ganga Bank:**

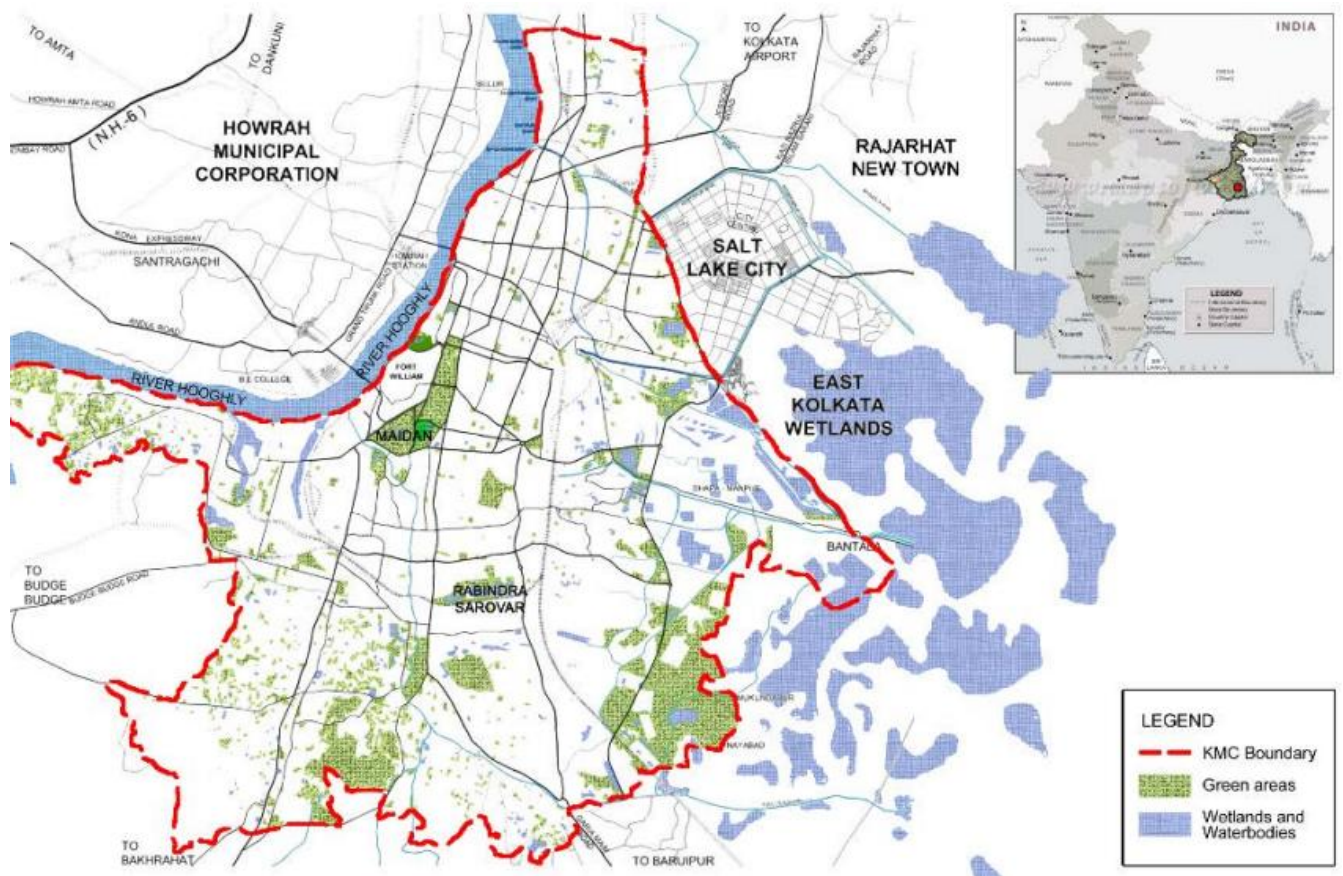


Figure 2 Public open Spaces of Kolkata, Source: TCP, KOLKATA

Kolkata considered as a “Brown city in Green Background” due to near vicinity of Alipur zoo, Maidan, Victoria Memorial Place, Rabindra Sarobar Park and East Kolkata wetland. It fades gradually with smoke and built forms.

The exotic species has been lost from the city. Kolkata estimated only 5.5% of the city’s area constitutes parks, gardens and open spaces, while the ideal share should be 15% for a city of Kolkata’s size according to World Health Organization ( Bardhan & Paul, June 2017).

The relative indicators mentioned below:

Core components	Sr. no.	Indicators	Estimated value	Score
Native biodiversity in the city	1	Proportion of natural areas in the city	8%	2
	2	Connectivity measures	n/a	-
	3	Native biodiversity in built-up areas (bird species) (baseline data)	64	Baseline data, hence no score
	4	Number of vascular plant species (baseline data)	667	
	5	Number of bird species (baseline data)	230	
	6	Number of butterfly species (baseline data)	110	
	7	Number of reptile species (baseline data)	40	
	8	Number of amphibian species (baseline data)	12	
	9	Proportion of protected natural areas	0.021	
	10	Proportion of invasive alien species	n/a	-
Ecosystem services provided by biodiversity	11	Regulation of quantity of water	0.11	1
	12	Climate regulation: carbon storage and cooling effect of vegetation	4.8%	1
	13	Recreation and education: area of parks with natural areas	0.94 ha/1000 persons	4
	14	Recreation and education: number of formal education visits per child below 16 years to natural areas per year	n/a	-
Governance and management of biodiversity	15	Budget allocated to biodiversity (2015–2016)	0.05%	1
	16	Number of biodiversity projects implemented by the city annually	< 4	1
	17	Existence of local biodiversity strategy and action plan	No	0
	18	Institutional capacity: number of biodiversity-related functions	> 3	4
	19	Institutional capacity: number of city or local government agencies involved in inter-agency cooperation pertaining to biodiversity matters	> 5	4
	20	Participation and partnership: existence of formal or informal public consultation process	N/A	0
	21	Participation and partnership: number of agencies/private companies/NGOs/ academic institutions/ international organizations with which the city is partnering in biodiversity activities projects and programs	7–12	2
	22	Education and awareness: is biodiversity or nature awareness included in the school curriculum	Included	4
	23	Education and awareness: number of outreach or public awareness events held in the city per year	1–59	1
Total baseline score of Kolkata in 2017				26

Figure 4 Sustainable Development and Planning IX823

Primary observation by site visit at part-A

# Adi Ganga: 1.5 m from Confluence Off Take Point to Khidirpur Loha Bridge

- Legend**
- Vehicular access
  - Pedestrian access
  - Water transport
  - Nature trail



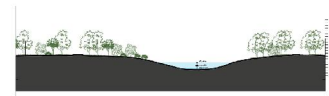
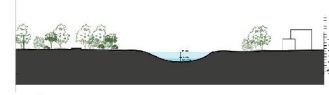
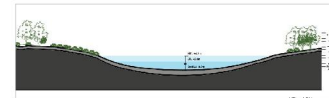
Key Plan

Part A SCALE - 1:2500

Landscape Urbanism of Kolkata through Adi Ganga

## Site Sections

Scale 1:500



Section 5

HTL: +4.80  
DL: +3.10M  
BL: +2.00M  
RNIJANA DAS, 2017MLA010

PART	PLANTS	BOTANICAL NAME	DESCRIPTION	REFERENCE IMAGES
12	Banyan Tree	Ficus bengalensis		
1	Ashoka	Fleur religiosa		
2	Gulmohar	Dalmanesia		
3	Neem Tree	Asadirachta indica		
4	Jamun	Syzygium cumini		
5	Amli	Tamarindus indica		

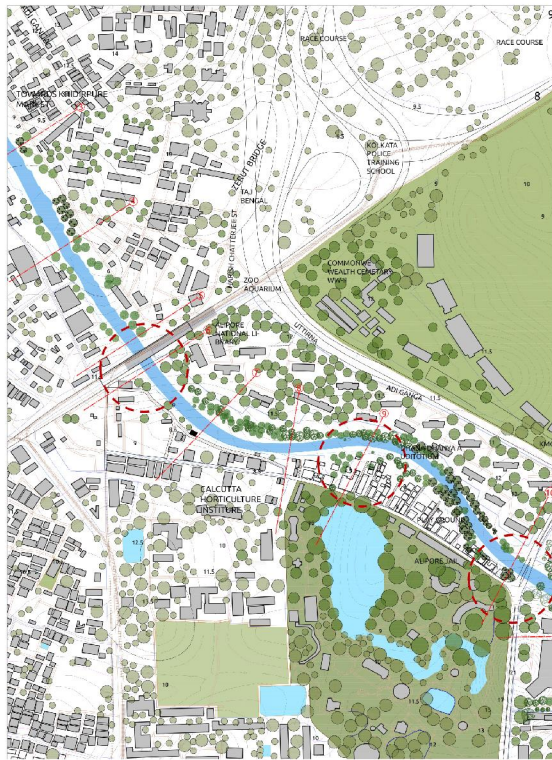
5	Amli	Tamarindus indica	
7	Arjuns	Terminalia arjuna	
8	Garul	Lagerstraeia speciosa	
10	KICHNDE	Wrightia religiosa	
11	Bala Tree	Sesuvium portulacastrum	

Primary observation by site visit at part-B

SITE SIGNIFICANCE  
Scale - 1:2500

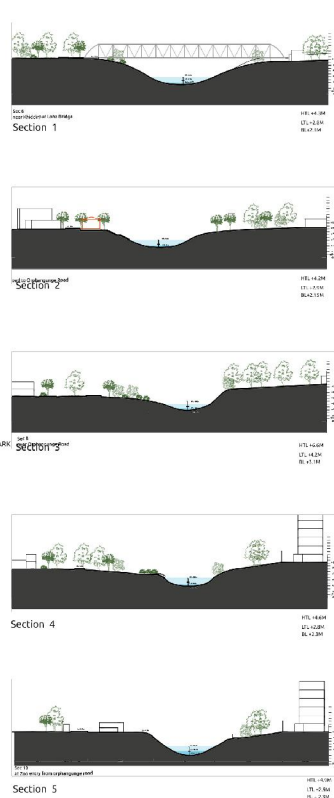


KEY PLAN



PART A SCALE - 1:2500

Landscape Urbanism of Kolkata through Adi Ganga



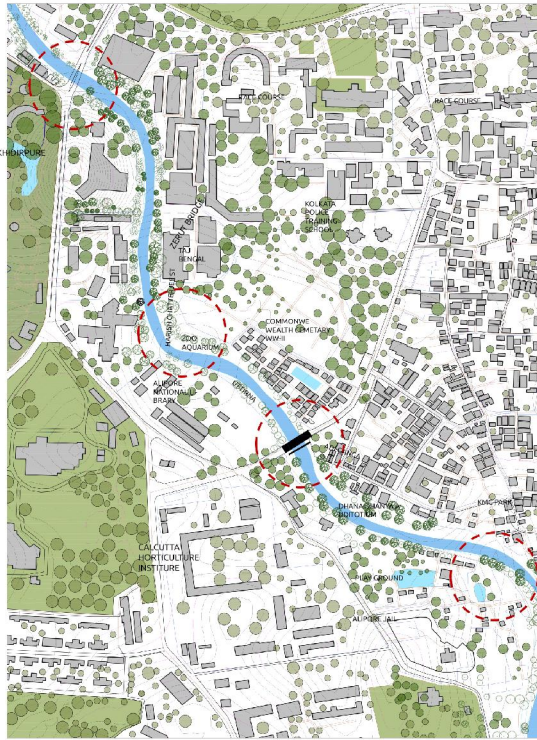
ANJANA DAS, 2017MLA010

PART	PLANTS			
SLNO	PLANT NAME	BOTANICAL NAME	DESCRIPTION	REFERENCE IMAGES
1	Bokha	<i>Ficus religiosa</i>		
2	Danigan Tree	<i>Ficus bengalensis</i>		
3	Gulmohar	<i>Delonix regia</i>		
4	JACKFRUIT	<i>Artocarpus heterophyllus</i>		
5	Doodar	<i>Palqalbia longifolia</i>		
6	Bokker Tree	<i>Ficus elastica</i>		
7	Herm Tree	<i>Acacia salicoides</i>		
8	Kadamba	<i>Moronearia kadamba</i>		



# Primary observation by site visit at part-C

SITE SIGNIFICANCE  
Scale - 1:2500



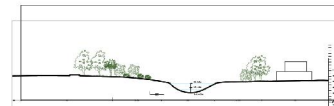
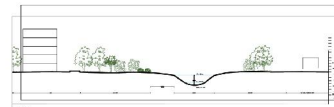
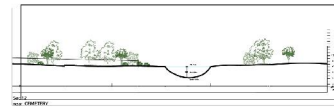
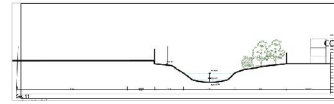
KEY PLAN

PSYCHIC - 1:2500

Landscape Urbanism of Kolkata through Adi Ganga

REES

ANJANA DAS, 2017/MLA010



CONCLUSION

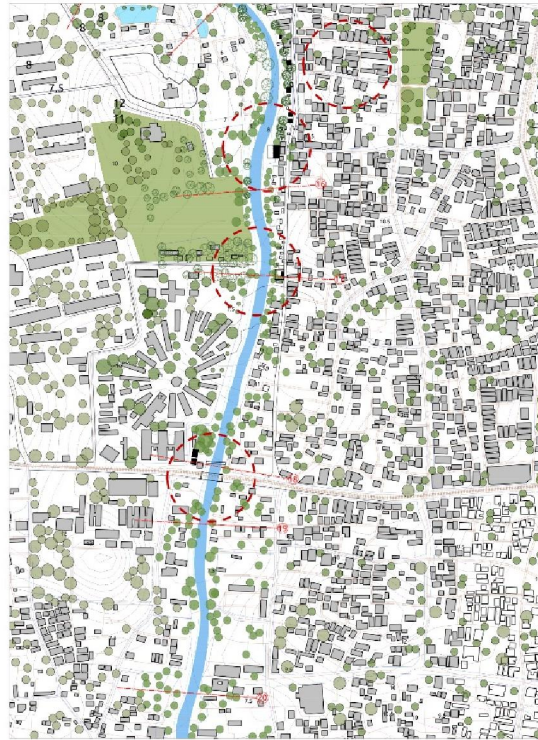
PLANT NAME	BOTANICAL NAME	DESCRIPTION	REFERENCE IMAGES
1 Ashoka	Ficus religiosa		
2 Banyan Tree	Ficus Benghalensis		
3			
4 INDIAN TULIP	Spathodia Campanulata		
5			
6 Gulmohar	Delonix regia		
7 JACKFRUIT	Artocarpus heterophyllus		

10	Neem Tree	Azadirachta Indica		
11		Bauhinia racemosa		
12	Jamun	Syzygium cumini		
13	Imli	Tamarindus Indica		
14		Ficus Bengamina		
15		Saraca Asoca		
16		Museaenda Rosa		
17		Plumeria obtusa		
18	Am	Mangifera Indica		
19	Radhachura	Peltophorum ferrugineum		

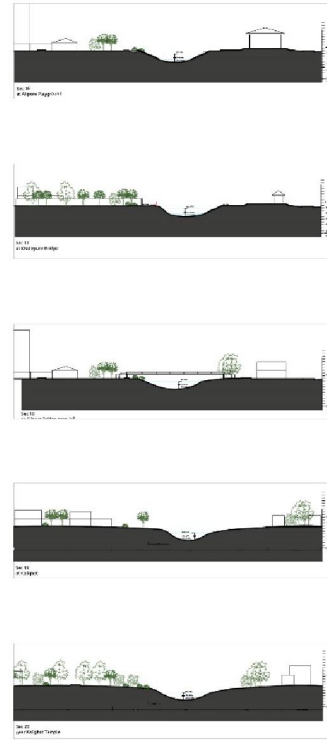
# Primary observation by site visit at part-D




KEY PLAN



PART A SCALE - 1:2500



PART D PLANTS					
SLNO	PLANT NAME	BOTANICAL NAME	DESCRIPTION	REFERENCE IMAGES	
1	Aam	<i>Mangifera Indica</i>			
4	Jamun	<i>Syzygium cumini</i>			
5	JACKFRUIT	<i>Artocarpus heterophyllus</i>			
6	Jamrul	<i>Syzygium samarangense</i>			
8	Curved Apple	<i>Annona squamosa</i>			
9	Guava	<i>Psidium guajava</i>			

# Chapter 3

## Adi Ganga/ Tolly's Nala

a. The history of Adi Ganga and Tolly's Nalla

b. Mutual dependence of Kolkata and Adi Ganga in early days

i. Transportation

ii. Drainage

iii. Pisciculture

c. The degeneration of Adi Ganga

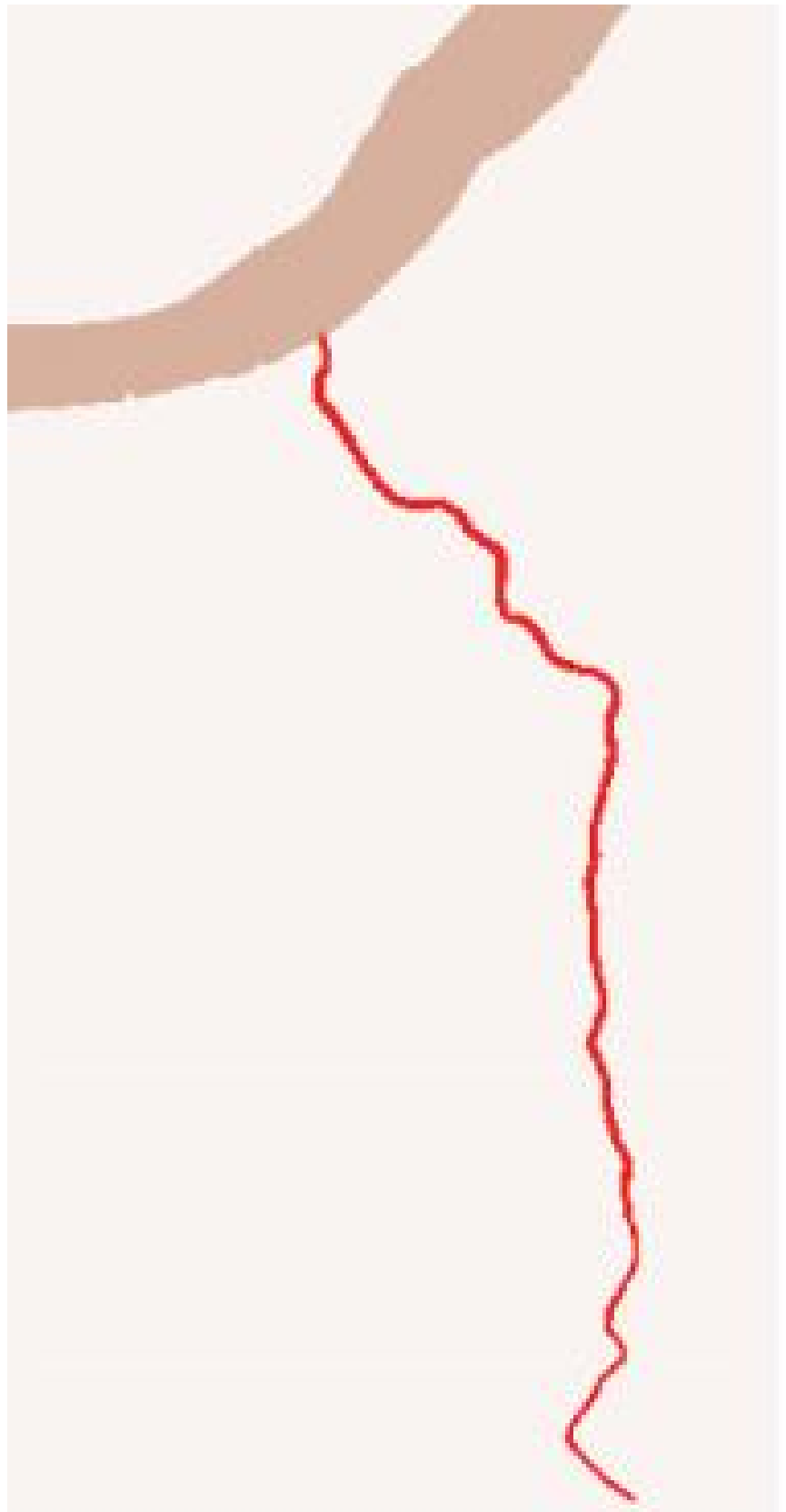
d. The present status of the project area

i. Land Uses along the banks of the Adi Ganga

ii. Navigability

iii. As part of the Drainage System of the City

iv. Environmental condition and landscape



### 3 Adi Ganga/ Tolly's Nala

#### 3.1 The history of Adi Ganga and Tolly's Nalla

Adi Ganga in Pre- Colonial Calcutta (Pre-1690). This section outlines the significance of the Adi Ganga from the 15th to 17th, Centuries, where it functioned as an important navigational route, drainage basin as well as a revered pilgrimage site to show the importance of the channel for constructing a larger argument towards its rehabilitation.

#### 3.2 AdiGanga in Colonial Calcutta (1690-1947):

Although Calcutta had a bustling economy before Job Charnock landed on her shores in 1690- Calcutta or the representation of Calcutta can be classified as between before and after colonization. Adi Ganga fell into the pitfalls of development from the time of colonization- an identity that it has succumbed to since then.

##### 3.2.1 Transportation

Present Kolkata was inhospitable in settlement, being a breeding ground of malaria and other disease. **City's drainage was artificially directed into Hugli River against natural slope in 1803.** Hugli River, city's source of drinking water becomes polluted. The **governor –general of India, Lord Wallesley**, proposed a **scheme** of underground drainage for disposal of sewage and storm water through the same conduit into salt-water Lakes, and finally into Bay of Bengal through **Matla River**. The scheme completed by constructing Tolly Nallah and connection with Adi Ganga channel in **1884**.

- **Adi Ganga in Post Independent Bengal:** Here, the position of Adi Ganga in the growing concept of the modern State of India. It is in the process of nation building and political flux key policies required for the safeguarding of ecology were ignored.

a. Mutual dependence of Kolkata and Adi Ganga in early days

i. Transportation

It was an important mode of transportation in earlier Bengal. As per Medieval Bengali literature, there are glorious description of merchant Chand Saudagar, Sri

Chaitanya Dev and many other who use to travel through Adi Ganga.

### **3.2.2 Drainage**

#### **Environmental Sustainability:**

To achieve environmental sustainability of the Tollys' Nullah and surrounding, monitoring of water quality is essential. Therefore medium & long-term vigilance and collecting water sample from five minimum reaches of selected site has been chosen at those places contaminated by solid waste entering into the Nullah are most suitable.

#### **3.2.2.1 Sampling location along Tolly'snullah**

Adi Ganga or Tolly Nallah is scrutinized to stop for betterment undesirarable activities and better landuse at both the bank. Those are following:

- a. Open defecation,
- b. Disposal of solid waste,
- c. Washing of clothes& Dhobi ghats,
- d. Throwing of floral offerings to be confined,
- e. Disposal of corpses.

#### **3.2.2.2 Water Quality Monitoring:**

According to WBPCB has taken initiation of analyse water sample from five different locations of Tolly Nallah is a continuous water quality program. It will implemented through a control room with central monitoring facility with certain water quality parameters and at different locations during a 24-hour cycle. The water quality monitoring system will provide:

- Evaluate the water quality trends in various reaches of the Nullah (diurnal and seasonal changes)
  - Assessment of nature of pollution required mitigation measures
  - Effectiveness of the sewage/waste treatment measure in place before entering into Tolly's Nullah
  - Re-plan and improve upon the pollution control strategies and measures
  - Keep watch whether desired water quality (SW-III or SW-II) is maintained and taking rectification measures if water quality drops.
  - Parameters in water quality monitoring will include: BOD, COD,DO, EC, Ammonia, NO3pH, TSS and Temperature

- For water quality monitoring different stakeholder will be sensitized and a proper implementation schedule will developed and reflected in DPR. (DPR OF POLLUTION ABATEMENT AND REHABILITATION )

### **3.2.2.3 IMPLEMENTATION OF WASTE MANAGEMENT RULES 2016**

The integrated solid waste management strategies are planned to be implemented along the Nullah and in the T. N. Basin. The detailed implementable methodology is being finalised will be present in the DPR for Implementation of new solid waste management rules declared by the MoEF Government of India (as mentioned below):

- Plastic Waste Management Rules 2016, e-waste (Management) Rules, 2016, Bio-Medical Waste Management Rules,2016, Construction and Demolition Waste Management Rules, 2016, Hazardous and Other Wastes (Management and Transboundary Movement Rules, 2016B and Solid Waste Management Rules 2016 (DPR OF POLLUTION ABATEMENT AND REHABILITATION ).

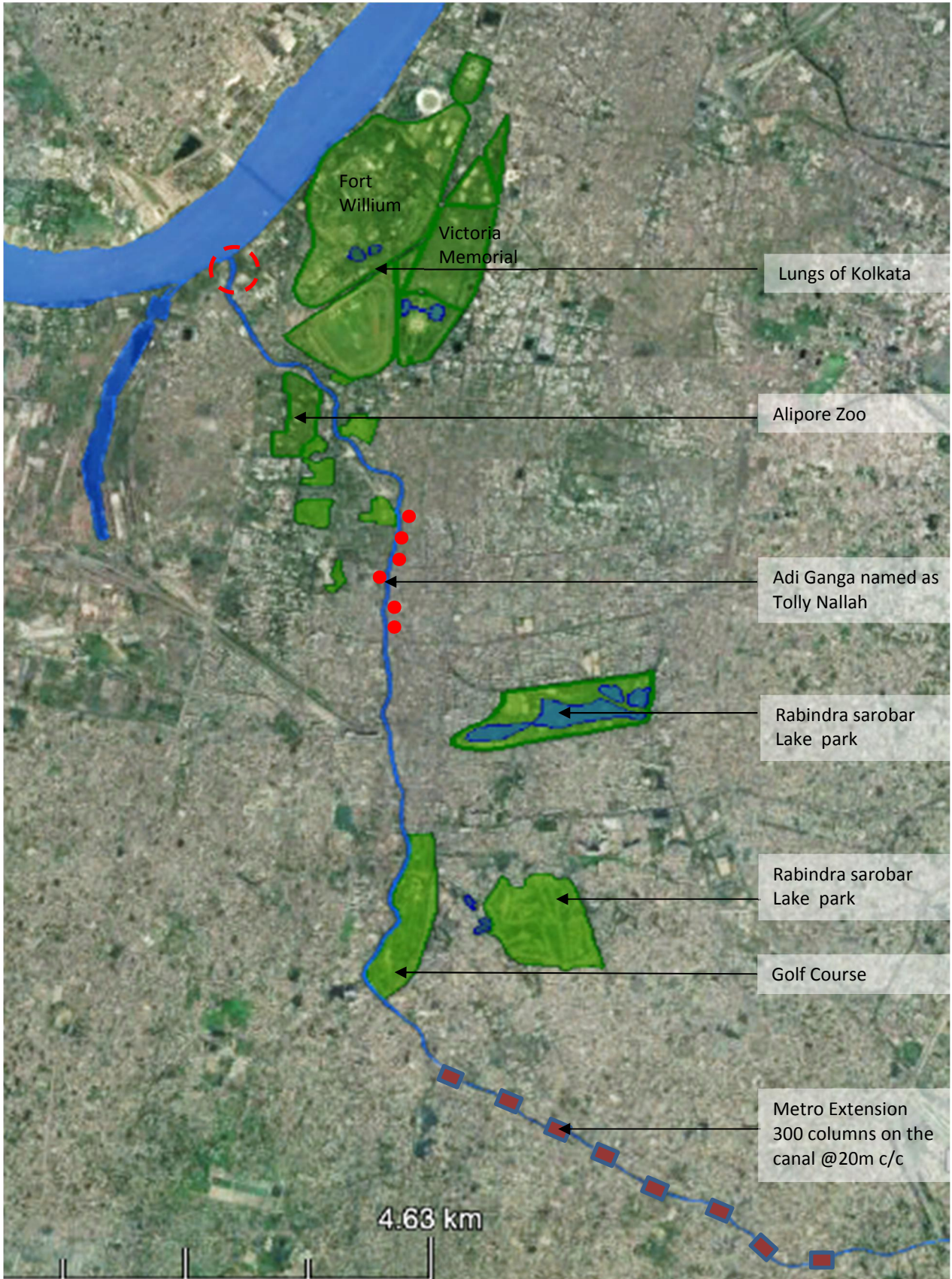
### **3.2.2.4 SOCIAL ASPECTS AND R&R PLAN FOR SLUM DWELLERS ALONG THE NULLAH**

The Nullah is directly and indirectly affected by habitants along both the bank. The degradation of land along Nullah is mostly done by dumping waste. The squatters and dwellers of slum directly responsible for visual permeability of the Nallah and improper solid & waste management along the Nullah banks. It has been interacted for assessing the different socio-economic aspects. On the other hand, nallah water is being used for holi practice especially at Temple Ghats. Also, metro line over the Nullah, there have been marked demographic changes along the Tolly's Nullah. The depth of Tolly Nallah is almost gone due to debris of metro column construction @20 mm c/c. migrated settlement is the next level of threat. In this way, socio-cultural and land use changes along the canal is changing the pattern and appearance of the Nullah gradually. The rapid growth of population is aiding to this problem.

It is planned to improve the Nullah front, keep it neat & clean free from liquid and solid dirt for which part of the slum and squatters need to be displaced. The KMC

has already started demolition and removal of Khatalas (cowsheds, buffalo-sheds etc) & piggeries along the Nullah.

- The inhabitants/ occupants with 12 feet from the Nullah banks have been identified and are proposed to be rehabilitated at suitable place nearby proposed locations
  - Land lying vacant along the Chetla boat canal near Majarhat Bridge next to pumping station LS-10
  - Suitable locations near Karunamai Bridge. No. of families and properties affected persons are summarised as table (below)
  - Locations to be cleared along the Nullah have been shown in the map
- A strategy will also be proposed for constant vigil to ensure that the vacated area is not reencroached till the desired devotement beautification, nullah front development works are not taken up.





### **3.2.2.5 LANDSCAPE/ AESTHETICAL IMPROVEMENT PLAN (DEVELOPMENT OF WATER SPORTS, PARKS ALONG THE NULLAH)**

Today, Adi Ganga has become Tolly's Nullah. People forgot the holiness of the river except few devotees. People neglect the channel and has lost the connection.

Young generation for could not consider it as part of their life. It is due to degradation of the land use pattern and misuse.

Therefore intensive natural treatment through Landscape consideration along both the bank of Tolly Nullah is the major aspect that has potential to make phenomenal transformation in perspective of all stakeholders towards the River.

Awareness and participatory program Including inhabitants, visitors, and government and private agencies can improve association and maintenance. Tolly Nallah rejuvenation under Namami Gange Flagship Program has planned to provide well maintained walkways along with suitable ornamental plants and grasses, small parks with sitting and playing facilities.

Following improvement works are being proposed for aesthetical improvements of the Nullah.

- Improvement of existing Ghats for bathing, boat riding etc.
- Providing proper excess to Nullah Front
- Walkway, cycle track etc. along the Nullah
- Wall-Wired fencing along the Nullah specially to contain the solid waste from highly

potential solid waste generating pockets along the Nullah

- Parks for sitting playing and different cultural activities
- Restoration of existing structures on the Nullah banks such as, important places of worship, monuments of historical significance, etc.
- Development of other public spaces, access roads, commercial establishments, etc (DPR OF POLLUTION ABATEMENT AND REHABILITATION )

### **3.2.2.6 STATUS OF SOLID WASTE MANAGEMENT**

**Tolly'sNallah** Project area comes under **33 wards of Kolkata Municipal**

**Corporation** as per the present solid waste management practice. All operations of solid waste management (SWM) in this area are performed under Generation, Collection, Transportation and Disposal

Solid waste disposal in the Tolly's Nallah is a common practice for the project area.

At present solid waste and wastewater from variety of sources are

disposed/discharged in the Tolly's Nallah. Sources for these wastes are household

waste, market waste, animal excreta, toilet waste, small scale industrial waste and the waste after religious ceremonies and processions.

Plastics, rags and textile waste are commonly seen clogging the flow of water in the nallah or the channels. Solid waste chokes the flow of storm water flow under peak conditions. Increased encroachment leads to uncontrolled disposal of solid waste along the banks of Tolly'snallah. This increases the risk to human health and environment. Contamination by leachates, heavy metal leaching in the food chain, ground water contamination are the major risks that are associated with solid waste dumping.

Information on the existing SWM practices was collected from the Kolkata Municipal Corporation (KMC) of the different wards in the study area. The data was collected through structured questionnaires, field inventories and reconnaissance surveys. Component wise information was collected for the existing solid waste management systems comprising collection, storage, transportation, processing and disposal during the study.

### **WASTE GENERATION SOURCES**

Solid waste is generated every day due to various activities, from households, commercial establishments, institutions, markets, street sweeping and construction/demolition activities. In the project area, solid waste generation is approximately 467 TPD inclusive of different category of wastes at present.

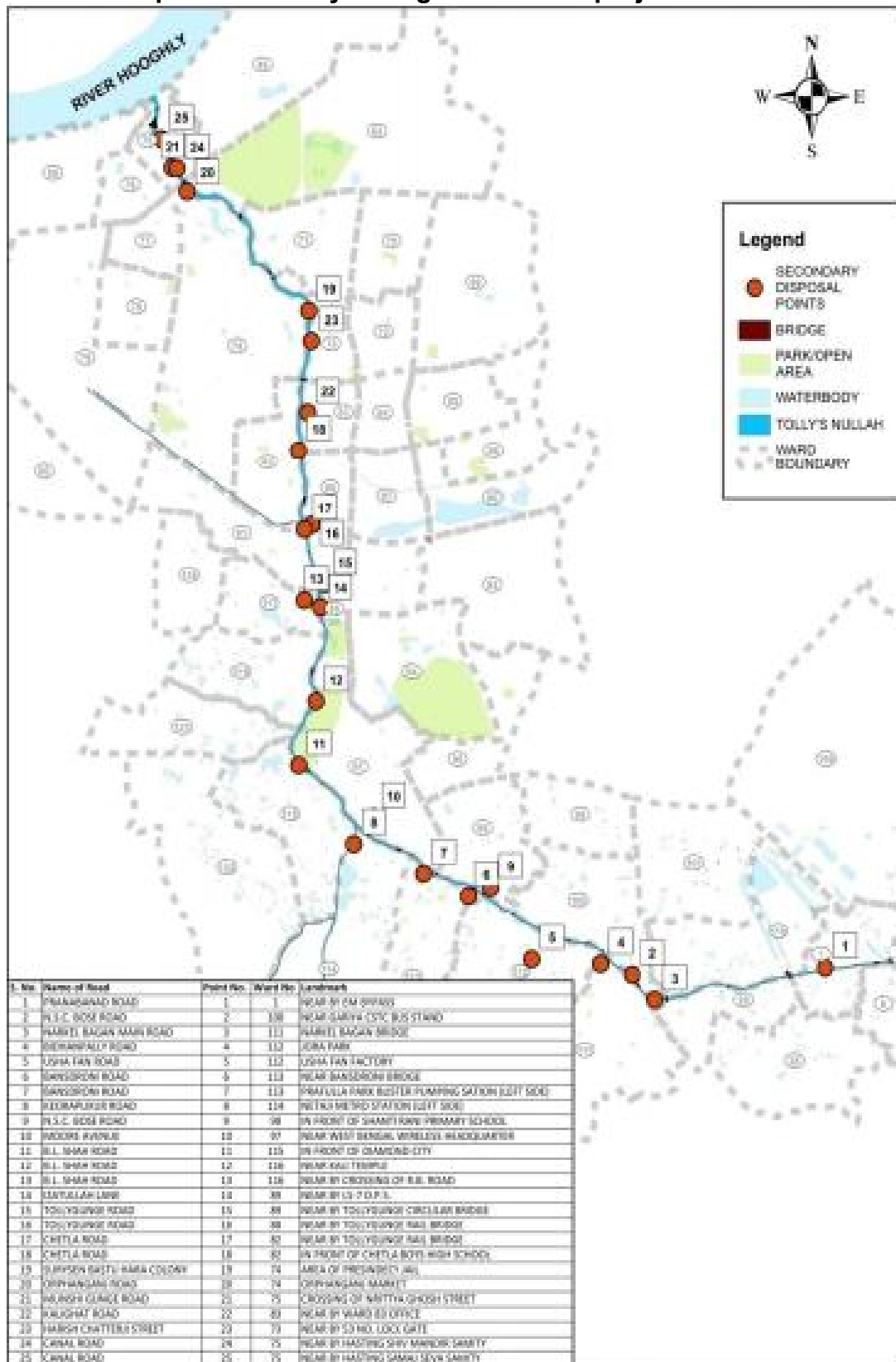
Bifurcation of different category of waste is discussed in the

Source Total Waste Generation (TPD)

1. Households 458
2. Commercial Establishments 6.18
3. Street Sweeping 1.73
4. Drains 1.4

Consultancy Services for Pollution Abatement and Rehabilitation  
of Tolly's Nullah (Adi Ganga) Draft Detailed Project Report

## Location map of secondary storage bins in the project area



### **3.2.3 Pisciculture**

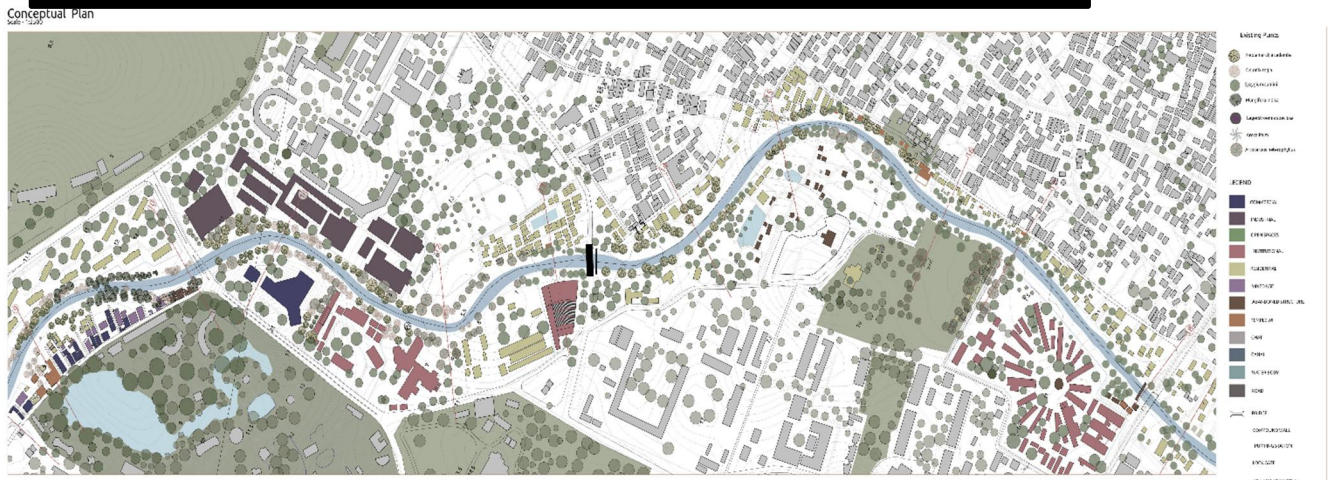
It is practice by local people mostly by using city sewage water in east Kolkata wetland by its inhabitants. Kolkata is a canal city. The entire city is run by combine sewage drainage system through canals. These canals carries waster from the city to Kolkata Wetland towards east side. Wetland Inhabitants then practice sewage feed pisciculture and treat the same water. Exces water flows through rice paddy and meets kulti river and finally reach Bay of Bengal.

#### **3.2.3.1 *The degeneration of Adi Ganga***

Its totally because of less belongingness due to over urban growth and encroachment.

### 3.2.3.2 The present status of the project area

# Land use of variation



Diminishing flood resilience efficacy of Kolkata city due to the vanishing wetlands and the main river of the city, the Adi AMERICAN CENTER ADI GANGA & WETLANDS Heal the broken link for a flood resilient.

### 3.2.3.3 Navigability

Calcutta grown from a small **trading post** of **British Merchants** during **1748**. British, Mug and others used Adi Ganga to enter Bengal. Initially British settled near **9m** high mound of **Dumdum** where lakes used to be much wider near which the **Burmese** and **Mug traders** arrived in boats, used to **anchor**. These lakes were **traverse** by **tidal channel** varying between **5m** to **6m**.

### 3.2.3.4 Land use: present land use along Adi Ganga is described below

### 3.2.3.4.1 Loha Bridge to Orphanage Chang market road (Orphan Gang road)



Ware houses of Vernacular character



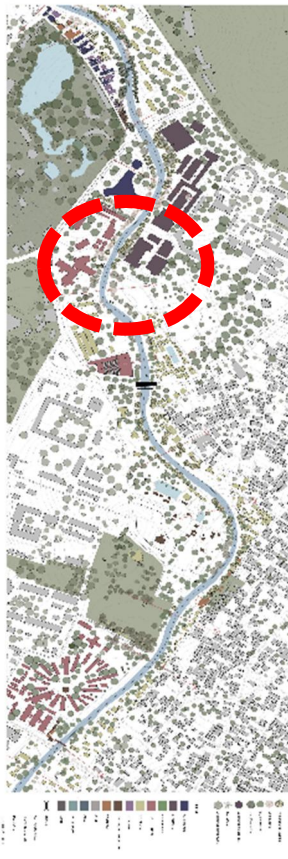
Orphan Gani Market



Strong Ecology but not maintained

Existing Flavour of the place

### 3.2.3.4.2 Zerut Bridge (Maa Sarada Setu) to Dhanadhanya Setu



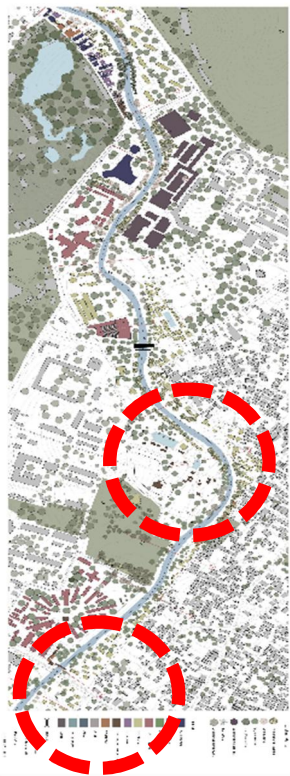
Utkingo



Commonwealth Cemetery

Existing Flavour of the place

### 3.2.3.4.3 Dhanadhanya Setu to Kalighat Temple stretch



Temples



Ghats of small Community



Colourful Facades



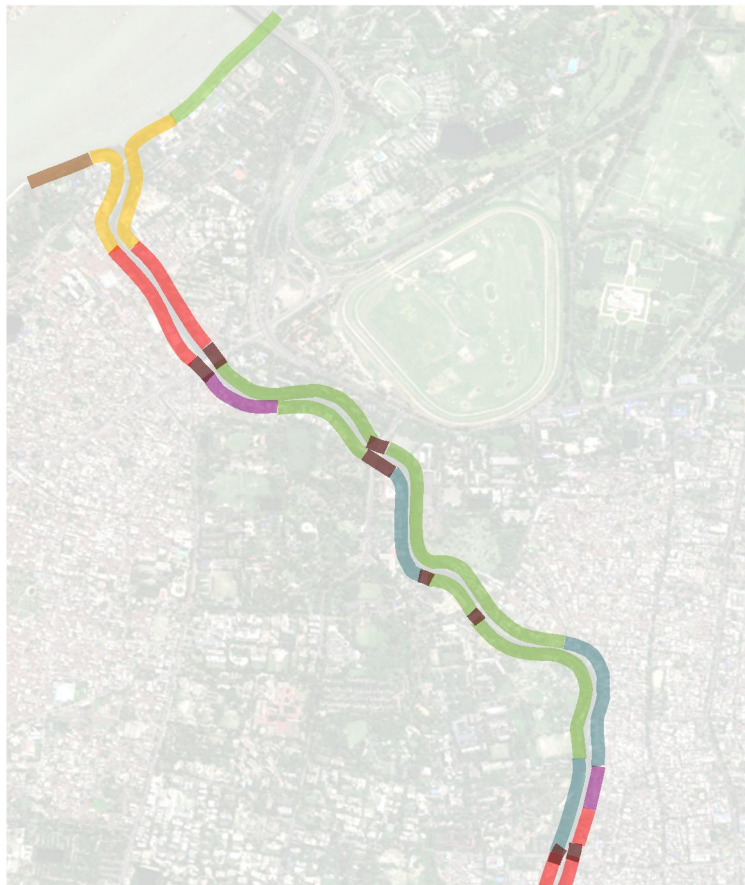
Historical Alleys



Pedestrian Connection with

Existing Flavour of the place

### Typology of River Edge Stabilization treatment



#### Legend

- TYPE 1
- TYPE 2
- TYPE 3
- TYPE 4
- TYPE 5
- TYPE 6

## Typology of River Edge Stabilizing treatment



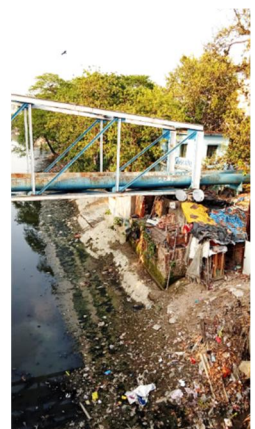
TYPE 1



## Typology of River Edge Stabilizing treatment



TYPE 2



## Typology of River Edge Stabilizing treatment

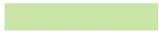


TYPE 6





Typology of River Edge Stabilizing treatment



TYPE 3



Typology of River Edge Stabilizing treatment



TYPE 4





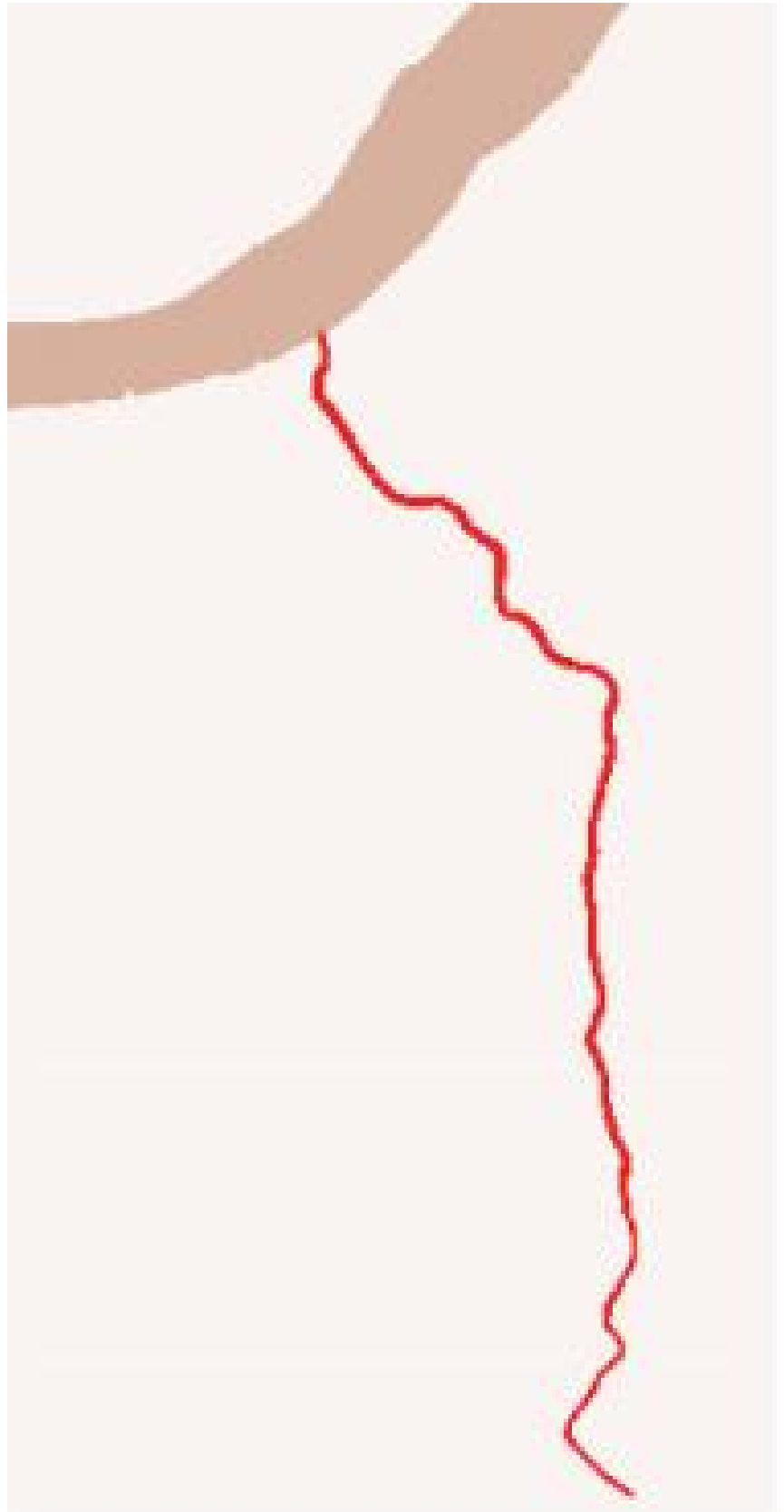
# Chapter 4

Analysis of the data and facts

Changing possibilities by landscape

Utilitarian approach

User's perspective / engagement



## 4 Chapter 4

### 4.1 Analysis of the data and facts

#### **The Scope of revitalization of the Adi Ganga/ Tolly Nalla and its banks**

A **vision** for Population disperse, green area enhance, city livelihood increase, good place for walk and breadth, Extension of maiden the Lungs of Kolkata, navigability, better place for work and visit.

#### **Brief**

The **doorway** between **the natural environment at the water edge** and **built urban fabric is a handful opportunity**. Development of **public insight** at the **water edge** can create a new **interface** to experience a **valued and essential part of urban life**. **Moving with a utilitarian approach these place can include new public infrastructure stormwater management and water filtration** as well as **water edge stabilization**. Such deliberate way can act as **one system**, the **urban water edge** can transform into **public gathering space which is completely integrated with technical processes such as water treatment followed by wetland system and local engagement**.

**Utilitarian view** allows

**landscape** and **culture** both **restorative** and **productive infrastructure** with **usability** and **accessibility**. In a single sentence, it cares about "**people's assets i.e. nature**".

People tend to go towards an engineering solution and ignore **traditional systems**. It makes them inaccessible to nature. **Adi Ganga**, A paleo distributary channel of **Bhagirathi- Hoogli** has faced the same ignorance and vanishing due to lack of attachment.

The thesis has **four sensitive issues** to deal the river these are following: The more and more **involvement** of **participant** with **urban ecology** (1<sup>st</sup>), the **treatment** of **water** by using **plants** (2<sup>nd</sup>), **public engagement** through **job opportunity** (3<sup>rd</sup>) and **public recreation** through **re-discover a journey** (4<sup>th</sup>).

**Program**

**Utility + Arian = Utilitarian**

**Utilitarian + Urban + Landscape = Landscape utilitarian Urbanism**

The design process addresses existing ecological and social issues of **Adi Ganga or Tolly Nallah**, a channel connects with a tributary of **Bhagirathi Hoogli River** in **Bengal plain**. It's a channel that runs from **southern boundary towards northern east via East Kolkata Wetland** and meeting **Kulti and Piyali River**. The focus of the chosen **2.3 km** stretch of area essentially divided into three part by **crossing the bridge** from **Bhawanipore** to **Alipore** reach

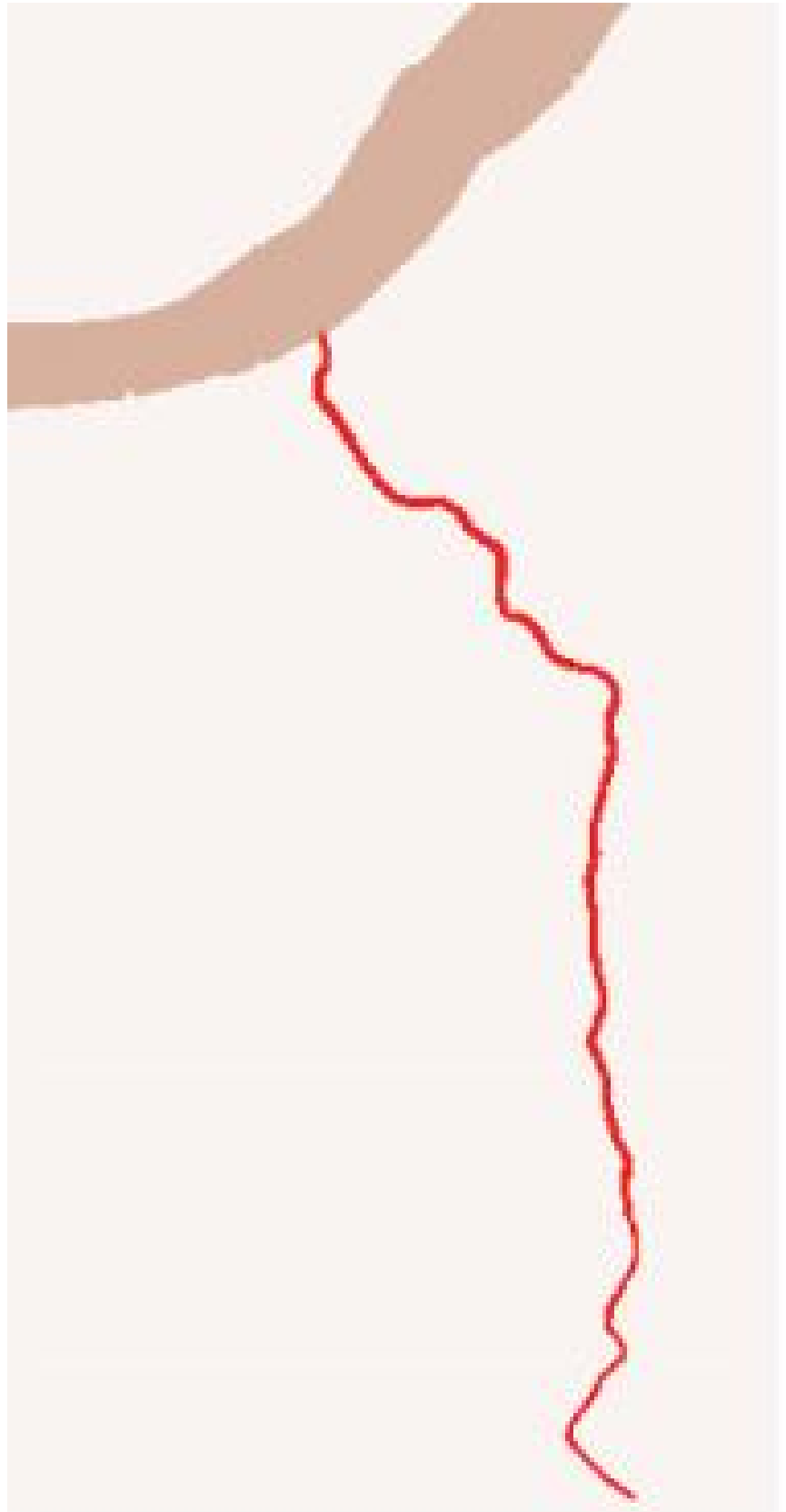
that **discourse** the **social** and **environmental responsibilities**. The selection of this stretch is based on **critical condition** and the most **suitable** as next to **confluence** can help to **envision** "for the **future** of the **entire stretch**" by **demonstrating** the same strategy. It gives the **overall design coherence** and **oneness**.

The essential three stepping stones of the design is paratransit that is by an alternate walkway along the river and series of connecting bridges. Typologies of landform that stabilize water edge along with public programs occupying some part of the landscape. Public parks, plazas, cafeterias, ghats, decks, boat riding is also assigned to the area integrating with the waste management plan. Public facilities are integrated with the landscape at intervals.

# Chapter 5

## Conclusion

Adi Ganga by using Landscape  
Urbanization



## **5 Chapter 6**

### **5.1 Conclusion**

Adi Ganga by using Landscape Urbanization is the best hope for Possibilities. It is a new possibility by reviving Kolkata's waterway. The boardwalk and cycle route along both the bank gives an opportunity to enjoy the city with traffic free movement. It itself a paratransit which reinforce city's health and wealth by utilizing city's asset

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