UNIVERSIDADE DE ÉVORA

Mestrado em Gestão e Valorização do Património Histórico e Cultural

Master Erasmus Mundus TPTI

(Techniques, Patrimoine, Territoires de l'Industrie : Histoire, Valorisation, Didactique)

Riverine Landscape of Dhaka: analysis and identification of cultural landscape of the city a focus on Ghat area

Fahima Salam

Orientador / under the direction of : **Aurora Carapinha**

"This essay does not include criticism or suggestions made by the jury."
"Esta dissertação não contém as críticas e sugestões feitas pelo júri"

Évora, Setembro de 2023 | Évora, September 2023

UNIVERSIDADE DE ÉVORA

Mestrado em Gestão e Valorização do Património Histórico e Cultural

Master Erasmus Mundus TPTI
(Techniques, Patrimoine, Territoires de l'Industrie : Histoire, Valorisation, Didactique)

Riverine Landscape of Dhaka: analysis and identification of cultural landscape of the city a focus on Ghat area

Fahima Salam

Orientador / under the direction of : **Aurora Carapinha**

"This essay does not include criticism or suggestions made by the jury."
"Esta dissertação não contém as críticas e sugestões feitas pelo júri"

Évora, Setembro de 2023 | Évora, September 2023

Title

Riverine Landscape of Dhaka: Identification of Riverine cultural landscape of the city a focus on Ghat area.

Abstract

Dhaka is the Capital city of Bangladesh and it's over 400 years old. The city is a part of the world's largest Delta and has a special riverine landscape character. The city is an island, surrounded by five rivers and one canal, these rivers create 110 km long waterways. The city starts from the river Buriganga and is still dependent on these rivers and they work as the vein of the city. Over time the population grew faster and the new parts of the city lost the connection with rivers. Ghats are the connection point where land and water interact with each other. To make a better connection with the river Ghats are the connection points between land and water. The focus of this study is to Identify the cultural landscape of the Ghat for a better connection with the rivers.

Keywords:

Riverine cultural landscape character, Ghat,110km long waterways, Delta, vein.

Titre de l'étude

Paysage fluvial de Dhaka : Identification du paysage culturel fluvial de la ville, en particulier dans la région de Ghat.

Résumé

Dhaka est la capitale du Bangladesh et a plus de 400 ans. La ville fait partie du plus grand delta du monde et possède un paysage fluvial particulier. La ville est une île, entourée de cinq rivières et d'un canal, ces rivières créant des voies navigables de 110 km de long. La ville part de la rivière Buriganga et dépend toujours de ces rivières, qui constituent la veine de la ville. Au fil du temps, la population a augmenté plus rapidement et les nouvelles parties de la ville ont perdu la connexion avec les rivières. Les ghats sont le point de connexion où la terre et l'eau interagissent l'une avec l'autre. Pour améliorer la connexion avec les rivières, les ghats sont les points de connexion entre la terre et l'eau. L'objectif de cette étude est d'identifier le paysage culturel des ghats pour une meilleure connexion avec les rivières.

Mots-clés :

Paysage culturel fluvial, Ghat, voies d'eau de 110 km de long, Delta, veine.

Título

Paisagem ribeirinha de Dhaka: Identificação da paisagem cultural ribeirinha da cidade com enfoque na zona de Ghat.

Resumo

Dhaka é a capital do Bangladesh e tem mais de 400 anos. A cidade faz parte do maior delta do mundo e tem um carácter especial de paisagem ribeirinha. A cidade é uma ilha, rodeada por cinco rios e um canal, que criam cursos de água com 110 km de comprimento. A cidade começa no rio Buriganga e continua a depender destes rios, que funcionam como a veia da cidade. Com o tempo, a população cresceu mais rapidamente e as novas partes da cidade perderam a ligação aos rios. Os Ghats são o ponto de ligação onde a terra e a água interagem entre si. Para estabelecer uma melhor ligação com o rio, os Ghats são os pontos de ligação entre a terra e a água. O objetivo deste estudo é identificar a paisagem cultural do Ghat para uma melhor ligação com os rios.

Palavras-chave:

Paisagem cultural ribeirinha, Ghat,110 km de extensão de cursos de água, Delta, veia.

Dedication

To my beloved daughters Meghmonjree Rahman and Deeptoamborie Rahman who sacrificed for their mother's education

Dedicated to my beloved late parents, Khan Abdus salam and Zobyda Salam, for the opportunities of education they have provided me with

To my talented Siblings

To my Colleagues and Friends
who supported me throughout this journey

To all my friends here and there, from whom I learned and who supported me.

বহু যুগের ওপার হতে আষাঢ় এলো।
সে দিন এমনি মেঘের ঘটা রেবানদীর তীরে এমনি বারি ঝরেছিল শ্যামলশৈলশিরে,
মালবিকা অনিমিখে চেয়ে ছিল পথের দিকে সেই চাহনি এল ভেসে সেই চাহনি এল ভেসে,
কালো মেঘের ছায়ার সনে,
ঝরো ঝরো বরিষনে,
বহু যুগের ওপার হতে আষাঢ় এলো।

Acknowledgments:

The thesis that was developed with the support of the support of the European Union is titled “Riverine Landscape of Dhaka: analysis and identification of cultural landscape of the city a focus on Ghat area”

I began in September 2021, with the support of my family, who didn’t let my determination waver amidst uncertainty

First and foremost my gratitude to my advisor, Professor Aurora Da Conceição Parreira Carapinha, and all the other professors of the master's program Valérie Nègre, who was of great help when needed the most professors Luigi Fontana, Guido do Zucconi, Massimo Preite, Julia Gartner, Jean-Luc Rigaud, Marco Bertilorenzi, Massimo Negri, Ana Cardoso de Matos, Antónia Conde, and Maria Sampaio, whose classes allowed me to direct the thesis with a more focused approaches, and I hope they see their teachings reflected in the content of this thesis.

To the members of the three secretariats of the water's program-Claire Dubert, Anne-Sophie, Helena Espadaneira, Raffaella Mase, and the tireless Adriana Martin -I am grateful for the assistance and support provided during these two years of education.

Of course, I express my gratitude to my dear friends from the aptly named "Promotion 15: Dekapente.” Knowing that I have learned from each and every one of you, I am grateful to have been in your care for all these years.

To my Mexican sister Elisa Angeles and my Brazilian sister, Leticia Gonçalves, who was there with me at every moment with whom I shared many adventures, I am equally grateful!

Also, my dear Rummm-ma's family! Charlotte, Fabio, Facunde, Jaya, Juliet, Rodrigo, Thomas, being in the company of you guys is always a joyful experience.

I would also like to thank my Bangladeshi colleagues professor Sajid Bin DOZA and Azka Eshita, for his advice and support.

To all those who, in one way or another, have contributed to the completion of this project,

I express my gratitude.

List of Figures

List of Photographs

List of Maps

ACRONYMS

ADB-Asian Development Bank
BBS-(বাংলাদেশ পরিসংখ্যান ব্যুরো-গণপ্রজাতন্ত্রী বাংলাদেশ সরকার)Bangladesh Bureau of Statistics.
BIWTA-The Bangladesh Inland Waterways Transport Authority.
CBD- Central Business District.
CW- Circular Waterways.
DAP-Detailed Area Plan.
DEM-Digital Elevation Models.
DIT-Dacca Improvement Trust.
DMP-Dacca Master Plan.
DMB-Desi Machine Boat.
DMDP -Dhaka Metropolitan Development Plan.
DMAI UDP- Dhaka Metropolitan Area Integrated Urban Development Project.
DSCC-(ঢাকা দক্ষিণ সিটি কর্পোরেশন)Dhaka South City Corporation.
DWASA-Dhaka Water Supply And Sewerage Authority.
FY-Fiscal Year
GBM-Ganges-Brahmaputra-Meghna
GDP- Gross Domestic Product.
IWA-The Inland Waterways Association's IWA
IW-Inland waterways IW
MSL-mean sea level.
PIWTT-The Protocol of Inland Water Transit and commerce.
PPP-Public private participation.
RAJUK-(রাজধানী উন্নয়ন কর্তৃপক্ষ)Dhaka City Development Authority
RCC-Reinforced Cement Concrete
RDPP-Revised Development Project Proposal.
TIB-Transparency International Bangladesh
UNESCO-United Nations Educational, Scientific and Cultural Organization
UN-United Nations
VOC- Vereenigde Oost-Indische Compagnie.
WARPO-Water Resources Planning Organization
WDB-Water Development Board, Bangladesh

Table of contents

INTRODUCTION

Figure 01.0: Shows the study area and a typical section of a Ghat.

1.1 Background of the study

Dhaka with an area of 306.38 square Kilometers (118.29 sq mi) and population the current metro area population of Dhaka in 2023 is 23,210,000, a 3.26%. It is the center of political, economic, administrative and cultural life of Bangladesh[1]. Dhakan has seen modernization of transport, communications and its urban infrastructure is the most developed in the country, it is a megacity city with challenges of pollution, congestion, inefficient management and lack of breathing space within the city due to rapid urbanization and constant growing number of vehicles and population. In the City Corporation area, there are only 1286 km of road which is nearly 6 percent of the overall city area. This smaller amount of road is not properly arranged and functioned at all[2].

Dhaka is a child of the River Buriganga, and yet it turns its back to the fundamental reality of being part of the world's most dynamic hydrological system. A brave vision for Dhaka has to begin from where Dhaka began, that is at the edge of the water [3].The development of townships and a significant growth in population came as the city was proclaimed as a provincial capital city of Bengal under Mughal ruler Islam Khan Chisti in 1610[4]. Following these trends, the earliest settlements in Dhaka city grew along the River Buriganga; it continued to grow.

River has a significant role in the development of settlements. This has been true throughout the ages, from ancient civilizations to the present day. Rivers are particularly relevant to settlement in Bangladesh, a riverine country. River has always been recognized as one of the most important natural resources. It is evident from history that in the establishment of a city river used to play a key role. A river can influence the growth of any city as it offers easy communication for trade and commerce, water supply and recreation. Rivers occupy a prominent place in the Bengali psyche and have influenced the culture of the region immensely. During the Mughal period Dhaka was both a center of trade and commerce and an important manufacturing town. As Dhaka was connected by rivers and Khals with the surrounding area, it played a strategic role in the flourishing of trade and commerce. The most important factor was the establishment of a Shah Bandar or Imperial Custom House in

[1] World population review, 2018 (http://worldpopulationreview.com/world-cities/dhaka-population) accessed on 29th January, 2023 at 10 pm.

[2] Mahmud, S. M.; Hoque, Md. [2010], Unplanned development and transportation problems in Dhaka city.

[3] Ashraf, K. K. (2007) "Dhaka: A postcard from New Orleans", Article published in Forum-a monthly publication of 'The Daily star', January, 2007.

[4] Karim, Dr. A. (1991), "Origin and Development of Mughal Dhaka", in Sharif Uddin Ahmed, ed., Dhaka past present future, proceeding.

Dhaka, which attracted merchants and traders from all over[5].

The River Buriganga has always provided the greatest facility for commerce in Dhaka and that is why the main business quarter lies close to the river. The wholesale dealers have their godowns radiating from Chawkbazaar along the river towards the east and west. Islampur Road, Banglabazar Road, Nawabpur Road, etc. have their distinct character and style and owe to the River Buriganga for their business[6]. Dhaka city not only stood beside the River Buriganga but also was itself crisscrossed by minor rivers and canals, the most notable of which is Dulai Khal. The city had an excellent network of internal waterways of great strategic and commercial importance. Situated in the center of East Bengal, Dhaka was able to command all the great water routes. Through the River Buriganga and the River Dhaleswari, Dhaka is permanently navigable by waterways with all major rivers like the River Padma, the River Brahmaputra and the River Meghna and thus with all the neighboring districts[7].

1.2 Present state of the problem:

Dhaka once renowned for its waterways and lush greeneries, inspiring travelers to call it the "Venice of the East" - has now turned into one of the most polluted and crowded cities in the world[8]. Dhaka is surrounded by a system of rivers Buriganga, Turg, Balu and Shitalakhya which were traditionally used as water ways. These could be re-established as a circular waterway[9] [10] for Dhaka. This waterway would be able to take off the traffic that unnecessarily crosses through the city, thus easing up much of the traffic load. Dhaka was once crisscrossed by a system of canals connecting to the surrounding rivers[11]. This system of water bodies served as channels of traffic and transportation besides other uses. People and goods loaded and unloaded in the Ghats of river Buriganga have to be transported through the city to their destination in the remote area of the city. A couple of years back an attempt was made to introduce a circular waterway in Dhaka but it failed[12]. In spite of the fact that water transport was a popular mode of traffic and transportation, urbanization in this region actually took off from Ghats,

[5] Karim, A. [1965], Dacca: the Mughal Capital. Dhaka: Asiatic Society of Pakistan.

[6] Dani, A. H. (1956), Dacca A record of its changing fortunes, Dhaka Museum, Dhaka.

[7] Ahmed, Sharif Uddin [1986], Dacca: A study in Urban History and Development. London: Curzon Press

[8] Biswas, M. 2002. "Pattern and Trend of Recreation Activities in Dhaka City". An unpublished MURP Thesis. BUET, Dhaka.

[9] Asad, R, Ahsan, R, Structuring urban sustainability with water: A Case Study of Kamrangir Chor, Dhaka, Bangladesh.Vol.3, N0.8.p-293-303,*Journal of Social and Development Science*.(P-295,L-21,22,23,33)(P-299,L-24), Aug2012.

[10] DMAP: Integrated Detailed Area Plan 2010-2015, Source:Approved (sro no-232-law/2010)Dated22-06-2010 and published in Bangladesh.

[11] Mowla, Q.A, Role of Water Bodies in Dhaka for Sustainable Urban Design', *Jahangirnagar Planning Review*, Vol. 8, June 2010, Dhaka, pp.1-10. (P-6, L-6,7), (P-6,L-21,22), (P-6,L-6,7), June 2010.

[12] Mahmud, K; Gope, K; Chowdhary, S.M.R. Possible Causes & Solutions of traffic Jam and Their Impact on the Economy of Dhaka City, Vol.2, No.2, *Journal of management and sustainability*, (P-114, L-10,11,12), 2012.URL: http://dx.doi.org/10.5539/jms.v2n2p112

which gave Dhaka a hydraulic character.

Inland waterways (IW) are a living infrastructure which has benefited countries all over the world and which has immense potential to intensify recreational activities[13]. IW is also enhancing communication, environmental improvement, enhancing cultural heritage, promoting healthy lifestyles and improved wellbeing and sports, sustainable transport, encouraging active communities, can also act as a visual amenity and contribute to place making (The Inland Waterways Association's proposals, 2010)[14]. Kolbe notes, a city along a water-route, with the presence of water, creates a powerful aesthetic image for the city[15]. Worldwide attempts have started to rejuvenate eco-friendly and sustainable waterways to cater to transportation, tourism, place making, etc (ITPI Journal, March, 2002)[16]. The appeal of spending leisure time on the water is a common theme in recent urban waterfront development all around the globe. Although dramatically different in their geography and culture, people around the world like to associate relaxation and enjoyment with being on the water (Breen, A and Rigby. D, 1996)[17].

Dhaka has the fortune of riverbanks that are a natural treasure of potential public spaces. Through place making the city can meet the recreational needs of its dwellers, as there seems to be very limited opportunities in Dhaka for residents to spend their leisure time or short holidays within the city. The waterways of Dhaka can provide excellent opportunities to enhance all these. However, to make it sustainable, the proposed CW will need to be hooked up and integrated with the rest of the city.

The river and the land interact with each other with a point which is called Ghat. Ghat is a traditional Cultural space for Bangladeshi heritage. Every civilization starts with a Ghat. There are different types of ghat and their purposes are different but it is the main point of interaction with other parts of the city as well as sometimes other parts of the world.

The magnitude of Ghat[18] depends on the commercial and ferry activities that happened there. As well

[13] Ken and Guy (1991) "Prospects of Waterway Development as a Catalyst to Improve Regional and Community Socio-Economy Level" American Journal of Economics and Business Administration 2010, 2(3) 240-246.

[14] The Inland Waterways Association's (IWA) proposals (2010), "The inland waterway conservancy- The IWA Vision", URL: http://www.waterways.org.uk/documents/inland_waterways_conservancy accessed on 12 February 2023.

[15] Kolbe, L. (2009) "Capital City of Dhaka as a Place of Power: Histories, Symbols and Urban Landmarks" paper presented at the International Workshop on History Heritage and Urban Issues o f Capital Dhaka, organized by the Asiatic Society of Bangladesh, 1 7-19 February 2010, Nabab Nawab Ali Chowdhury Senate Bhaban, University of Dhaka.

[16] "Inland Waterways for Transportation and Tourism: A Journey through Parvathy Puthanar Canal, Kerala", ITPI Journal, March, 2002, Vol. 20, No. 1 (180) 49-59.

[17] Breen, A and Rigby. D (1996) "The new waterfront: a worldwide urban success story" Thames and Hudson, pp. 137.

[18] Ghat is a node where waterway and land circulation meet with each other and make their own special character. From the ancient period, Ghat worked as an interaction space. It has different scales such as Ghat for Bazar, Ghat for a village, Ghat for aIndividual household, Shashan Ghat etc. Different Ghats have different cultural landscape characters due to the difference in the surrounding landscape.
[In Chapter II and in Chapter III, a brief elaboration about Ghat and types of Ghat are described. Due to Ghat being a very indigenous character so there fewer studies happened on this subject]

as the Ghat location and navigation quality also important for a world well Ghat or Bondor[19]. All kinds of commerce are happening here even now. It also happened in Bangladesh due the whole county is connected with river and sea and riverway is the ancient way of connection.

The Ghats are also a meeting point for the nearby people. They come to the Ghat for commerce and use the ferry to go to other parts of the city. Almost all people near the river use the Ghat everyday so it is an interaction point for them, it is part of their life. They may never meet with each other but they use the same Ghat everyday. It is an emotional connection point for the culture who uses it.

The study would be exploring the introduction of the Ghat, its integration with the rest of the city's morphology. The study focuses on resultant interface or Ghat morphology vis-à-vis city morphology. Thus, this thesis's intention is also to show how this can also make a positive contribution towards the total traffic and transportation system of Dhaka through better planning and design.

1.3. Objectives

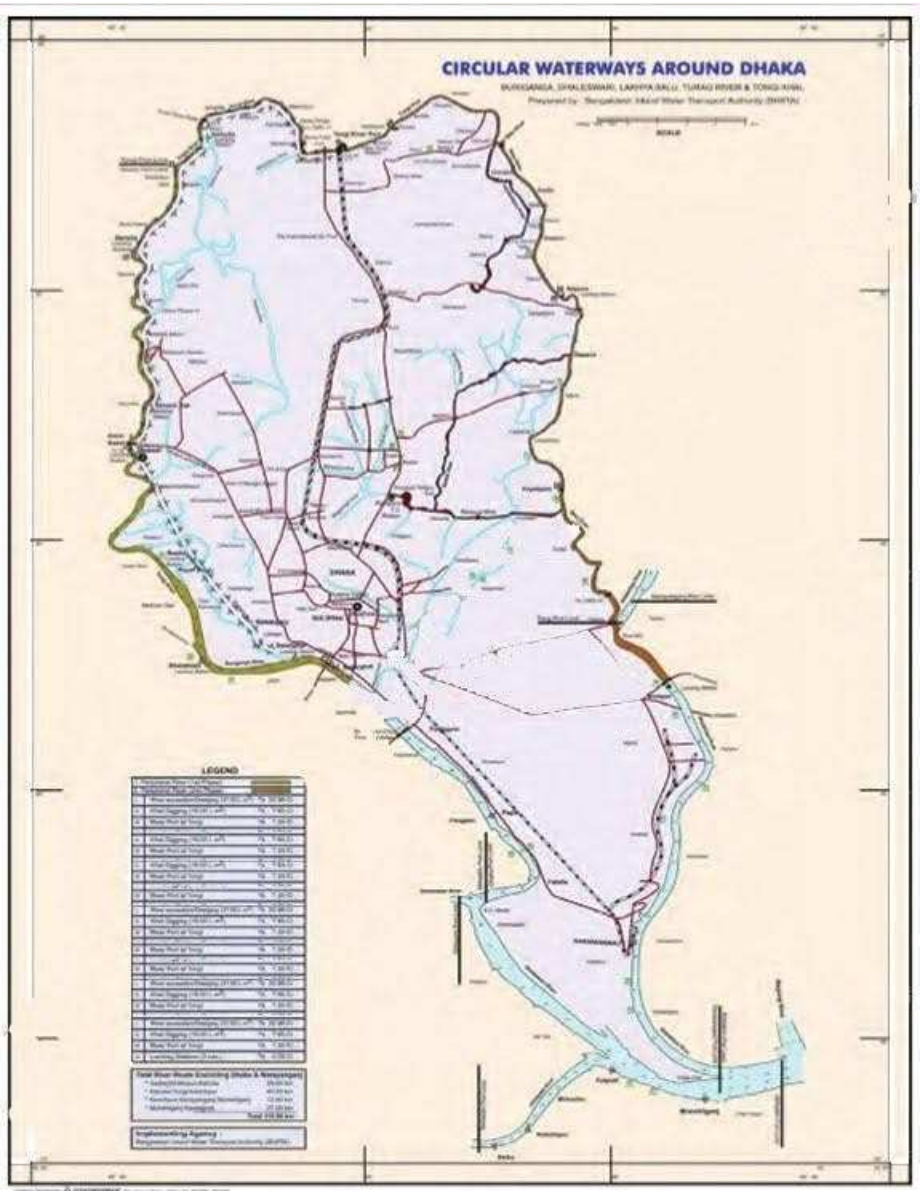
1.3.1 Objectives:

The primary focus of the study would be to evaluate the present condition of Ghat and landing station morphology and its relation with the surrounding urban fabric.
The effects on human life, economy, morphology of the surrounding areas, the environmental quality of the city and the river due to circular waterway would be studied
i) to investigate the effects of the Ghat on city life and city morphology.
ii) to ascertain the causes of the ineffective existing river system and Ghat of the Dhaka
iii) to provide a clear scenario of the riverine cultural landscape of the Ghat area.
iv)to give strategies, policies and recommendations for the waterways as well as for the Ghat to make it sustainable and successful for the city people.

1.3.2 Possible Outcome:

To know, understand and identify the cultural landscape patterns of Ghat and its effect on the waterways and as well as urban Dhaka. These identified riverine cultural landscapes will work as evidence-based decision-making in the urban design and planning process for Dhaka.

[19] Bondor is basically a Port. In this study Bondor is mainly used for riverport. A port is a place on the coast or on the beach where land or luggage can be shared by anchor ships in one or more harbors. The port space is selected by navigable waterways and the income of the land, the premises of the port are selected. Safety from commercial needs, storms and waves is remembered when choosing a port. The deep water port is rare. But this port of the major ships. [https://educalingo.com/en/dic-bn/bandara]



Map 01.1: Shows the Circular Waterway Around Dhaka (BIWTA)

Final Report, BIWTA, 2001),[20] (Revised Development Project Proposal, BIWTA, 2009)[21]. So this thesis uses the term[22] "Circular Waterways' ' which signifies the 110 km waterways around Dhaka as denoted by BIWTA and seeks scope for enhancing recreational facilities for the city dwellers.

1.3.3 Need for such study

Dhaka is a tender land-mass -- virtually an island -- framed by four rivers and a fluid landscape (Ashraf, K. K. 2010)[23]. Dhaka was established on the north bank in a planned way by the Buriganga river side. The other areas were purely rural in characteristics that had a superb beauty of their own which city administrators have failed to protect. This character has been lost due to unplanned developments. In many countries and cities all over the world that have only one river or canal, the water body is covered and protected like a precious gem and the activities taking place around them.

Dhaka experienced a population boom after independence in 1971 when it was established as the capital of an independent new country Bangladesh. The population grew very fast due to rapid urbanization and migration from surrounding smaller cities and villages from 1.5 million in 1975 to 23 million in 2023[1].However, infrastructures weren't developed at the same speed. And over the last decade, the growing number of cars made the situation worse. The whole traffic system is at a dead end, resulting in a difficult situation for the city dwellers to travel daily for everyday needs.

Dhaka has problems from the small scale to the big scale. The first problem can be stated as the car dominancy but at the same time there is no alternative available except buses which can no longer keep pace with the demand as there are very few numbers and the route is also not extended all over the city. Lack of accessibility both in pedestrian and vehicular communication is also noticeable in connections due to traffic congestion.

Waterway is the easiest, cheapest and less time consuming in comparison to other transportation systems. The water way did not need heavy investment like roads and air. The experience of the waterway was also pleasant. The waterway exists, we have to revive the waterway by connecting the river with the city as well as the city people. The Ghat is an interaction point with the river. So if we know the morphology of the ghat we can understand how we interact with the river successfully and we can easily introduce new ghats for the city dwellers and for commerce.

---

[20] BIWTA, (2001) "Introduction of Waterways around Dhaka City, First Phase: Improvement of Navigability and providing Landing Station Facilities from Sadarghat to Ashulia Bridge" Final Report, BIWTA.

[21] BIWTA, (2009) "Introduction of Circular Waterways in and around Dhaka City (2nd Phase) (1st Revised)" Revised Development Project Proposal (RDPP).

[22] The 110 km waterway around Dhaka has been denoted as the "Circular Waterways" by the BIWTA (Bangladesh Inland Water Transport Authority) who initiated a project called "Introduction of Circular Waterways in and around Dhaka City". The BIWTA is taking attempts

[23] Ashraf, K. K. (March 2010) "A new Dhaka is possible" Forum: A monthly publication of The Daily Star. Volume 3, issue 3.

When these waterways become popular these rivers also live ecologically and become beautiful as they were before and the people of Dhaka will own this river. These rivers are also used as the lifeline of Dhaka mega city. If this life line becomes blocked the city would fail. If we want to vibrant this city, these rivers must be vibrant and bring back the life of the River. It's need to upgrade the rivers and canals in order to solve the environmental problems like increased water logging, flooding, heat buildup, increased pollution; enhancing communication and transportation and promoting tourism and recreation.

1.4 Statement of Research Problems/Research Questions

This research aimed to evaluate the present condition of the Ghat, how it hooked up with the city traffic system and its impact on surrounding urban fabric as well as the total city.

Research Questions01. What is the existing condition of the Ghat?
Research Questions02. How does the Ghat cultural landscape character or morphology affect the surrounding urban fabric as well as the total city and traffic system?

1.5 Research Methodology

1.5.1 Nature of research

The present study attempts to find out the connection aspects of the river and the land, how trip makers currently perceive and use the water- routes, what are main characteristics of a successful Ghat, why the Ghat is not working, and what improvements they expect along selected routes and Ghats. The intention is to identify how a better identification of indigenous morphology and planning guide lines of Ghats would be provided at the selected water-routes. Nature of this study is exploratory rather than testing any hypothesis. By definition, exploratory research involves investigation of problems on which little formal knowledge is available (Shumi, A.S. 2011)[24]. Being the nature of this study an exploratory one and using descriptive statistical tools rather than inferential statistical ones, the present study is both a theoretical as well as an empirical one. Both the qualitative and quantitative approach has been used to explore the research.

1.5.2 Outline of methodology

The overall approach to the study has been formulated with conformity to the scopes of the study and to provide a complete guideline to fulfill the objectives. The methodology for the study has been shown on a flowchart in Figure no. 1.1 and is described in detail below.

i. Conceptualization

[24] Shumi, A. S . (2011) "Refining Tourists' Place Experience through Place making: A case study of Dhaka". An unpublished MURP Thesis. BUET, Dhaka.

The study begins with the conceptualization of the potentials of water based Ghat, transportation along the waterways around Dhaka. With the perception of the role that Ghats could play an important role to improve the overall traffic condition of mega city Dhaka, this thesis has been initiated to justify its prospects, and further steps have been planned accordingly.

ii. Reconnaissance survey

After making the first thoughts of the project, a reconnaissance survey has been conducted to have a general understanding about the Ghat and waterways to see how people use the water routes for communication as well as economic and recreation. For this, the survey has been made on the both banks of the River Buriganga, TuragTongi Khal, Balu,Shitalakhya and Dhaleshwari. The total route divided into three route those are

i. Sadarghat is upstream up to Tongi Ijtema field (in map, it is a light green part).
ii. Tongi Ijtema field to Rampura and (in map, it is the red part).
iii. Sadarghat to Fattullaha, Demra, Noapara and then Rampura (In map, it is yellow part).

Reconnaissance survey has been made to recognize existing riverside activities and the extent includes the physical infrastructure for the waterway transport, the land uses on the riverbanks, Ghats, existing landing stations, road linkage to the landing stations, and circulation pattern of the waterway users.

iii. Formulation of Objectives

Two specific objectives have been developed for the study and the total study intends to fulfill these objectives.

iv. Formulation of thesis plan

After the formulation of the objectives, a comprehensive work plan has been prepared to carry out the study. By maintaining sequential flow and interrelationship of activities thesis plan has been developed to achieve the desired result.

v. Literature review

An elaborate literature survey was carried out to have a basic understanding on river based water transportation and Ghat and its morphology and water based transportation practice around the south asian continent. Dhaka city has a great potential for water transportation. Historically it happened and some parts of Dhaka it is vibrant but somehow it was neglected by the policy makers. It has huge potential to expand and could be able to make a significant contribution in the traffic system of Dhaka. No research has been conducted on that issue yet. For this reason, projects named

“Indian National Waterway – 2” based on water transportation of greater India,
“Istanbul Ferry transportation” on of the oldest ferry transportation between Asia and Europe,
“Hong Kong Ferry Transportation” on of vibrant water transport system of the world and

"Mumbai Water Transportation" in these cases are very similar to Dhaka, and have been used as a guide for this research. The purpose of these studies was to understand how these are successful and how these would be used for Dhaka.

Map 01.2: Shows the Circular Waterway and location of fiveriver and a Khal around Dhaka

The map represents the four study rivers and one Khal, those areBuriganga river, Turag River, Tongi Khal, Balu river, Sitalakhya River and Dhaleswari River. The Red Dot represents the five detailed study Ghats. The Ghat and landing stations are-Kholomora landing Station, Bosila Landing Staton,Gabtoli Landing Station, Chaurangi Fantasy Park Ghat and Pagla Ferry Ghat.

vi. Survey of some Successful Waterways in Bangladesh

Bangladesh is the largest Delta of the world. Bangladesh, a small country of 147570 sq km of surface area is criss-crossed by a network of some 230 rivers of different sizes and shapes. These watercourses cover nearly 7% of the total area of the country[25]. Almost all rivers get navigable during the rainy

[25] Bangladesh National Programme of Action for Protection of the Coastal and Marine Environment from Land-Based Activities (https://doe.portal.gov.bd/sites/default/files/files/doe.portal.gov.bd/publications/2686e3bc_b152_44fb_964b_1746bc42092d/NPA%20Final%20Draft.pdf) -accessed on 29th June 2023 at 10 pm.

season. We have successful river ports like Narayangang Bondor, Chandpur River Port, Rupsha Ghat and Karnaphuli river water based transportation system. All these are served and try to find out their aspects of success.

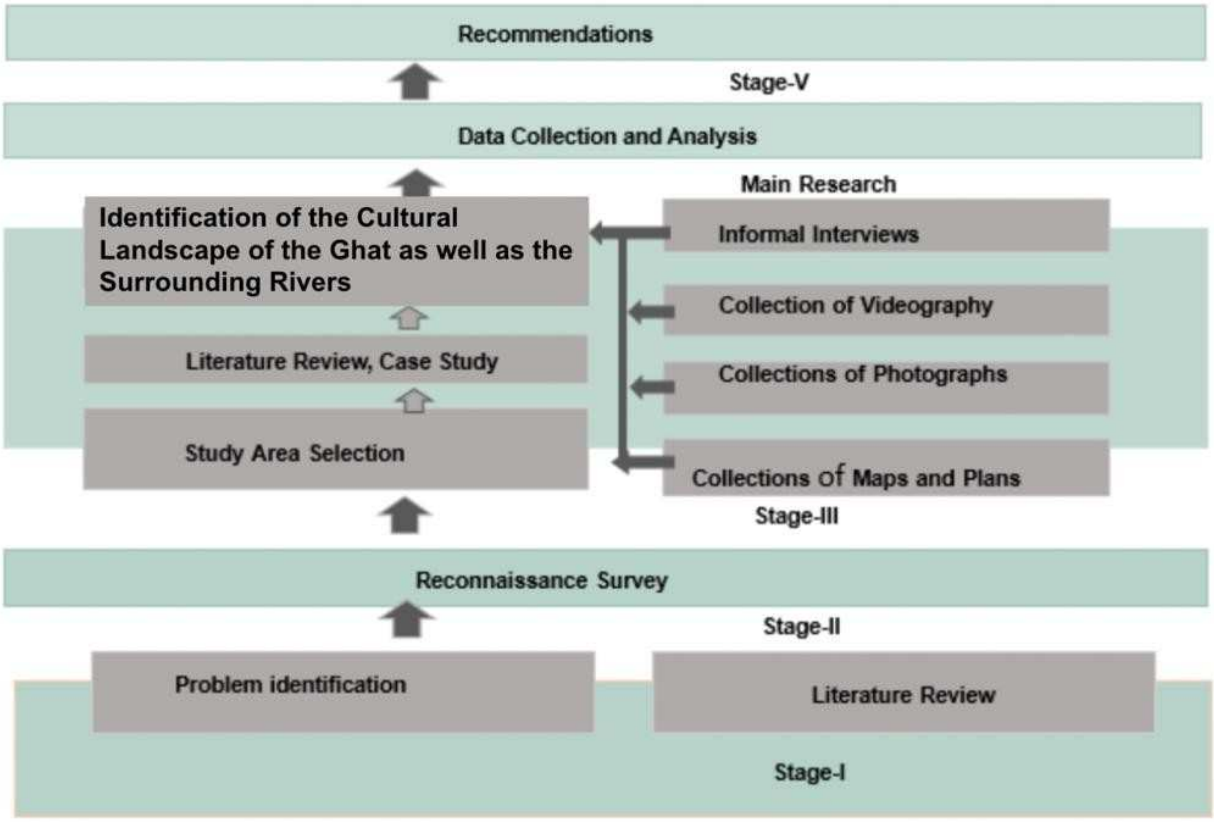


Figure 01.2: Structure of the Research Work

vii. Selection of Study Area

Reconnaissance survey has identified that the total 110km waterway have three distinct character those are-

a. Route number 01

From Sadarghat to upstream up to Kholamora has a unique pattern of water transport for passengers, upstream up to Aminbazar for goods transportation and Aminbazar to Eshapura have navigation only for small cargos and boats. During the rainy season the river got a new look. Big vehicles can navigate during the rainy season. At that time these rivers are also used for water based recreational purposes.

b. Route number 02

From Sadarghat to Fattulha, Paglahat, Choorongi Ghat, Demra thana Bonosree at the end of Hatirjheel Project (Badda Point).
Narayangang was famous for its port. There is a port in Pagla Pangau, a number of cement factories, a dockyard, thousands of brick fields, warehouses, recreational activities, pharmaceutical industries are situated on both sides of the river Buriganga and river Shitalakhya. This path is vibrant for economic activities as well as having good waterway connectivity from various parts of Bangladesh and some parts of India.
After passing the Demra area the industrial activities stop, it is a pure residential area on both sides of the river. At the east bank it is Munshigang and west it is Dhaka. At Munshiganj bank the river looks like rural landscape and almost every house has its own Ghat, on the other part the river bank is used for damping areas and buildings were built without any setback.

c. Route number 03

From Aminbazar to Banasree, Rampura at the end of Hatirjheel Project (Badda Point). This part almost lost its navigation. During the dry season it lost its navigability.There are lots of housing projects around the both sides of river Balu.
From the reconnaissance survey two potential routes are selected for detail survey those are-

i.From Sadarghat to upstream Aminbazar and

ii.From Sadarghat to Fattulha, Paglahat, Choorongi Ghat, Demra than Banasree.

From these selected two routes five Ghats and surroundings urban fabric are selected for a more detailed survey to identify a Ghat pattern. For sample selection both BIWTA design Ghat and Deshi ghat/ indigenous ghats are taken into consideration.

viii. Sampling

There are 76 numbers of BIWTA (The Bangladesh Inland Waterways Transport Authority) tax collection Ghats are situated on this110 km waterway from which 7% Ghats are used as samples. 2 nos Ghat from Buriganga, 1 nos Ghat from Shitalakhya,1 nos Ghat from Dhaleshwari And 1 no Ghat from Turg for detailed study. Introduction of a new Ghat is a planning issue but the city authority, most of the time, introduces it without any urban considerations.
In these riverways there are about150 desi Ghats that are used for ferry (carry people one bank of the river to other bank) purposes as well as they are also inter connected. Most of the tax collection Ghat must have more than one ferry Ghat /desi Ghat. Deshi Ghats are indigenous that are developed over time and need.
Sample are selected on the consideration of observation (on the basis of Ghat related activity and location)

ix.Method of Data collection

1. Primary Data

Primary data has been collected through observation, survey and interview methods.

i.Observation: Observation method has been applied to identify user's trip pattern, pattern of user's activities, characteristics of routes, existing physical infrastructure, neighboring land use, accessibility condition of link road, tourist attraction points along the route, type of vessel, its existing condition and speed, number of landing stations, Ghats and their condition, river bank vegetation type, water quality of river and behavior pattern of Ghat users'. Along with o observation methods photographs and videographs have been taken to demonstrate the existing condition of the study area.

ii.Interview: Interview has been conducted with different experts and key personnel of concerned authorities to be acquainted with their views about Waterways potentialities, their perceptions about Ghat and waterways, problems and opportunities, recommendations for increasing and improving the use, to provide information regarding the gaps, and then plans for future development. In this regard a semi structured questionnaire was used to collect required information to improve the recreational aspects of the water way. Interviews with key personnel of BIWTA, architects, and planners have been made at different times throughout the thesis preparation which helped to conceptualize and formulate thesis plans and suggest recommendations.

2.Secondary Data collection

The sources of secondary data were several books, reports, theses, different journals, periodicals, newspapers and through the internet, which is one of the best and helpful sources of secondary data. Beside these, different official publications of government agencies like RAJUK, BIWTA were also a prime source of secondary data. Maps have been collected from different organizations like DCC(Dhaka City Corporation), RAJUK(Dhaka City Development Authority) BIWTA, and DWASA(Dhaka Water Supply And Sewerage Authority),Organizations showed different information for the same issues written the same period which illustrated immense lack of coordination between the agencies in data preparation. As a result, some required maps have been made by adjusting and coordinating existing information obtained from different agencies. But the Map prepared by RAJUK for DAP(Detailed Area Plan,data source of 2006) has been considered and it is always compared with the Google earth, Google map and Google Open Street map as a base map.

x. Data analysis and Findings:

This study is based on an exploratory Research approach[26].

xi. Proposed design concepts for study routes

Some design proposals have been suggested through sketches for the Ghat development of the study routes in respect to the existing situation for enhancing the waterway for the city dwellers. Sketches

[26] In an Exploratory Research approach, initially the researcher may not be very clear about the different aspects of the problem. In exploratory research, initial hypotheses which are tentatively formulated are refined on the basis of continuous observation. Rajasekar, D.Verma, R.(2023)'"RESEARCH METHODOLOGY", ISBN 9789394958500 (Page 37)Archers and elevators publishing house, Bangalore, India.

have been provided to show how specific problems may be solved and places can be created. Photographs have been used to represent the present conditions, simultaneously elaborate writings for description.

xii. Recommendation

To improve the present condition of riverside recreation points and to explore the hidden potentialities of selected routes some recommendation has been proposed. Recommendations have been suggested on the basis of restoration and conservation of the Ghat and water way, physical development on the route side area, landscaping and plantation type, management and maintenance and over all places making through water sensitive urban design.

1.6 Limitations of the study

The study encompasses four portions of routes of the waterways as well as the Ghats which have immense potentials for mega city Dhaka. The overall methodology and approach of the study, however, are not beyond its limitations. The major limitations of the study are:

1. The major limitation was that there is absence of comprehensive research work which can give a clear perspective regarding water transportation and the Ghat morphology in Dhaka. Waterways are a much neglected issue in Bangladesh. There are a few or very limited studies conducting on the development of waterways. Unavailability of required secondary data has also been a major constraint in this regard. Some of the data have been used from the internet sources (website).

2. Different organizations showed different information for the same issues written in the same time period. Sufficient updated data are not available for all priority issues.

3. The riverways are about 110 km long and the Numberof Ghats are large. This site is too large even for a Reconnaissance survey.

4. Seasonal restraint is a great limitation of this study. These rivers have two different water levels and activities. Mainly during the winter due to less rainwater,the water level of these rivers goes down 2 to 4.5 meters[27].[24] A field survey was conducted during the dry (winter) season. In the monsoon season, the river levels reach around 6.5m MSL (mean sea level) and drop to about 2.5m MSL in the dry season (Flood Forecasting and Warning Centre, Bangladesh Water Development Board) but due to different geographical location and tide it may be varied. The collected data in this waterway reveal the activities and pattern of activities during the winter (November-February) as well as the rainy season(March to September) also.

5. Above all, time, manpower and money were insufficient for such an elaborate but interesting study.

[27] The daily star.net (https://www.thedailystar.net/opinion/environment/dhaka-and-her-rivers-1444537) -accessed on 29th June 2023 at 10 pm.

1.7 Thesis Organization

The research is organized into six chapters. These are discussed below:

Chapter	Description
INTRODUCTION	Discusses the background of the study, problem statement, aims and objectives, rationale and importance of the study, describes the methodology applied to fulfill the objectives and possible outcome along with the limitations encountered.
CHAPTER-I: Literature Review-Historical Background and the General Context on the basis of Geographical, Political, Culture, Economic activities and history Bangladesh Delta	The Historical background of the river and the capital city Dhaka.on the basis of Geographical, Political, Culture, Economic activities and Religious History of Bangladesh Delta. Provides the theoretical background, Including discussion on ancient Bangladesh. This chapter describes the concept about rivers and relation with our culture, history and religion. And some 'Literature evidence from ancient histories, religious book 'Ramayana' and poems' how rivers are integrated with the life of delta'.
CHAPTER-II: The Context-The riverine landscape that shaped up the capital, Dhaka, over time is one of the best examples of water urbanism.	The Historical background of the river and the capital city Dhaka.on the basis of Geographical, Political, Culture, Economic activities and Religious History of the selected Rivers and surroundings. Provides the theoretical background which is related to the study.
CHAPTER- III: Site Analysis-Study Area Profile and Identification of Cultural landscape of the River a focus on Ghat area.	**Part-A: Identification of Cultural landscape of the River.** Incorporates a complete description of the study routes and Including discussion of the past and present condition of the selected rivers. This chapter describes the concept about these rivers and relation of Ghat with surrounding urban fabric. **Part -B: Identification of cultural landscape of the Selected Ghats** A detailed Presentation of Ghat and its Surroundings. Describes the survey design, findings and, however, a detailed analysis on the present pattern and activities of the selected Sample (Ghat) of the cultural landscape characteristics in the form of literature, numeric data, graphical interpretation and maps.
CHAPTER-IV: Strategies, Policies for the 110 km waterway and Proposals for Individual Ghat	Describes and Presents the Proposals for the waterways and Sample (Ghat) to enhance the positive performances on the basis of the cultural landscape characteristics already identified (Chapter-III), in the form of literature, numeric data, graphical interpretation and maps.
CONCLUSIONS	A description of the objectives and how the objectives are achieved step by step.
BIBLIOGRAPHY AND	Bibliography and Sources.

SOURCES

Annex Annex

CHAPTER I: Historical Background and the General Context

The political, geographical, religious, and economic history of Bangladesh and the cultural values expressed through literature and landscape about the rivers of Bangladesh will be presented.

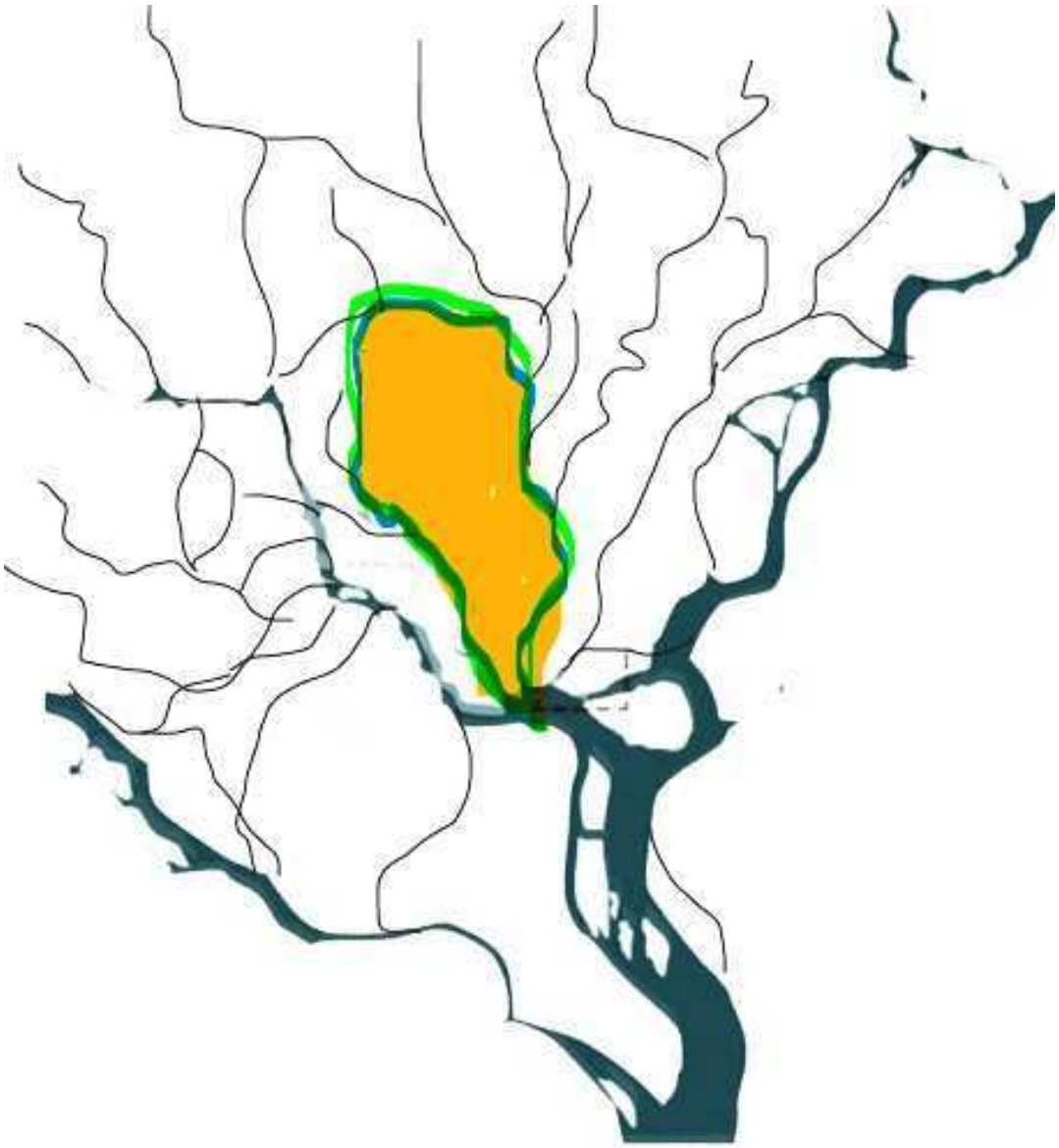


Figure 1.2.0: The figure shows the Geographical context of Dhaka with the riverine cultural context of the biggest delta of the world.

1.1 Introduction

The geographic, political, religious, and economic history of Bengal is interwoven with the history of India. From the ancient period on, Bengal changed its geographical borders. Under the rule of different kingdoms, some land was added and some land was taken away from other provinces of India for administrative purposes. Basically, it is the most eastern part of Southeast Asia. In ancient times, Bengal was looked at from the north, at the end of the Himalayan mountain ranges, or from the foot plains of the Himalayan mountain ranges, to the south, at the apex of the Bay of Bengal. It roughly encompasses the present-day nation of Bangladesh as well as the eastern Indian states of West Bengal, Tripura, and the Karimganj region of Assam, and is influenced by the Ganges Delta. The ancient Greeks and Romans knew the area as Gangaridai. The Ganges and Brahmaputra rivers not only serve as a geographical landmark for Bengal but also for the larger Indian subcontinent.

From the ancient period, politically, Bengal worked as a province of India, but due to its geographical diversification (the Delta character), the provincial king worked independently or declared it an independent state. Indian continental people followed Hinduism before Buddhism flourished. Late came Islam, brought by Persian Sufis at the end of the 11th century[28].[25] The Portuguese monks brought Christianity from Europe to India at the end of the 15th century.

Due to its deltic character, the land is fertile for agriculture, and the climatic conditions are very good for fine cotton. There are a lot of ports in the Bay of Bengal for operating businesses around the world. Ancient Bengal had a connection with the Silk Road. During the Mughal Empire, more than half of the total taxes were collected in Bengal's province.

Due to the deltic character, people, their everyday activities and beliefs about rivers are interlinked. Rivers are influential in geography, politics, religious values, agriculture, and economics, as well as the cultural landscape and heritage. Still, in Hinduism, there are religious values from birth to death, and they offer everyday prayers to the river.

In this chapter, the geographical, political, religious, and economic histories of ancient Bengal and present-day Bangladesh will be described. The cultural values expressed through literature and the landscape along the rivers of Bangladesh are also described.

[28] The daily Star, August 1, 2013,(https://www.thedailystar.net/news/sufi-influence-in-bengal)accessed on 29th January, 2023 at 10 pm.

For writing this chapter, references from these books were used. One book is by R. C. Majumdar (2018), Ancient India. Motilal Banarsidass Publishers Private Limited, Delhi. ISBN 978-81-208-0436-4. And the other book is by Nitish Sengupta (2011), Land of Two Rivers 'A History of Baangal from the Mahabharata to Mujib.' Published by Penguin Group, New Delhi, ISBN: 978-01-434-1678-4.

1. 2 Geographical History of Bangladesh

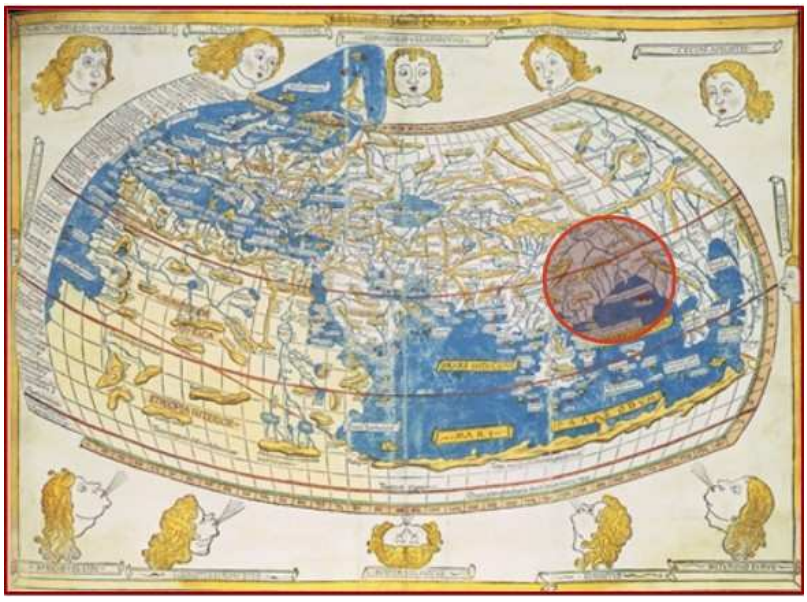
Due to political changes, the size and shape of Bangladesh change over time. But the biggest 'Delta' is always its part. And almost all the time, it started at the footplate of the Himalayan mountain ranges and ended at the Bay of Bengal. Most of the time, some provinces were added and deducted from the west of Bangladesh.

1.2.1 Geographical Location from Published Maps

In the political history part, it described how political history changes over time. Here are some maps presented to help understand how present-day Bangladesh took shape. All the maps are taken from the two reference books.

Ptolemy's World Map[29] and the Location of the 'Biggest Delta'

This map, which was produced in the late 15th century, depicts the perspective of the late Roman era. It represents Southeast Asia, the Mighty River Ganga, the Delta, and the Bay of Bengal. This exactly represents how the two longest rivers create the delta and then fall into the Bay of Bengal. The latitude and longitude are almost the same, presenting the exact location of ancient Bangladesh. Some of his mathematical calculations, ideas, and predictions were inaccurate, but it was a milestone in world map making history.



[29] The daily Star, August 1, 2013 (https://www.thedailystar.net/news/sufi-influence-in-bengal)accessed on 29th January, 2023 at 10 pm.

Map 1.2.0 - Ptolemy's World Map, here the marks represent the biggest delta, two longest rivers and the Bay of Bengal.[30]

Mattheus van den Broucke Map[31]

During the years (1658–1663), Mattheus van den Broucke served as the director of the Bengal branch of the Dutch East India Company (Vereenigde Oost-Indische Compagnie, or VOC). Van den Broucke gave the go-ahead for Commander Johan van Leenen to survey Bengal between 1666 and 1667.

The map may be positioned historically to show the time when Shaista Khan served as the Subahdar (Governor) of Bengal and Aurangzeb was the Mughal Emperor. The amount of detail on the map makes it arguably the most significant map of Bengal produced in Europe during the 17th century.

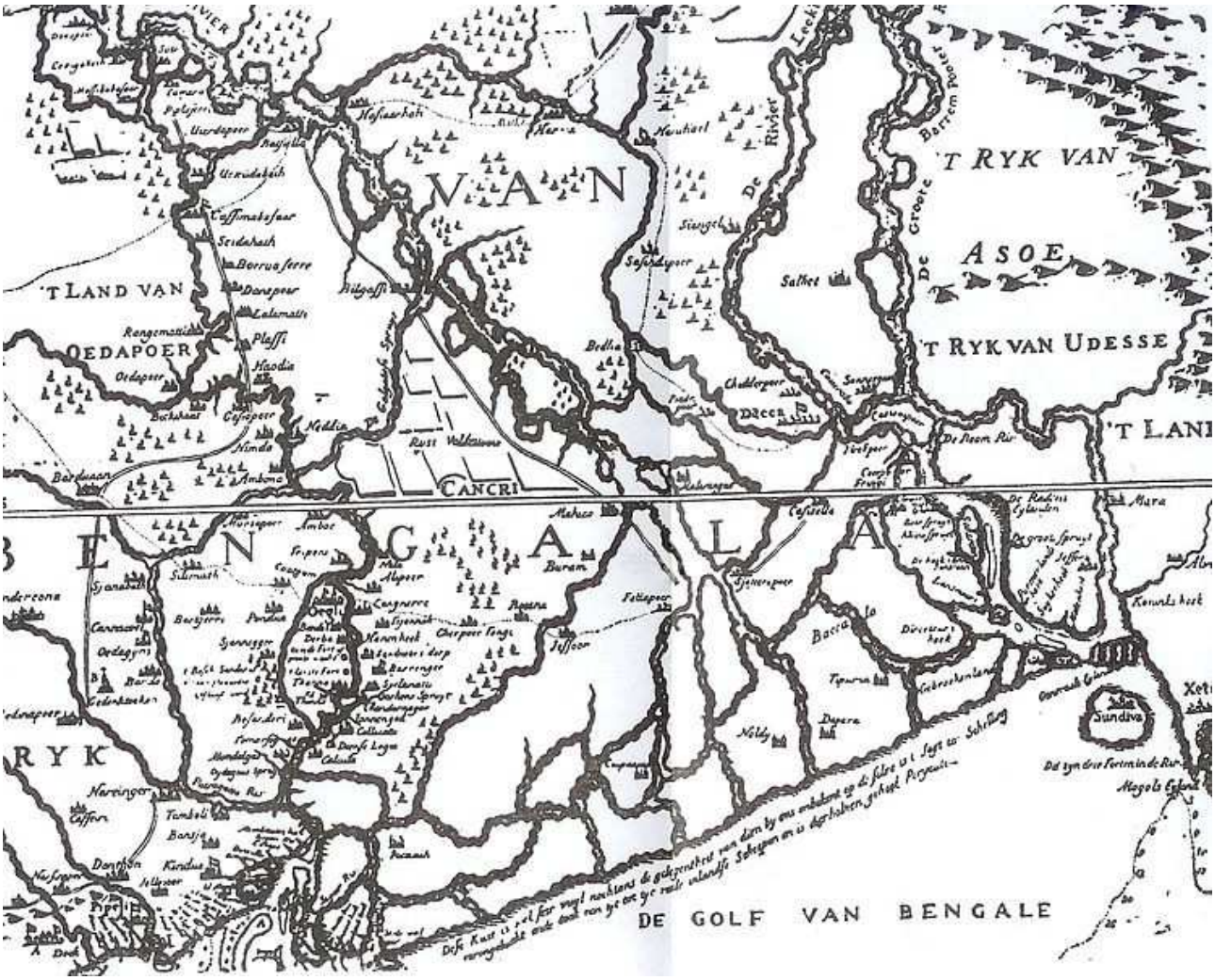
This map exactly represents how the two longest rivers met, created **tributaries**[32] and **distributaries**[33], created the delta, and then fell into the Bay of Bengal. But over time, rivers changed their paths and again created hundreds of their tributaries and distributaries, continuing the delta making process.

[30] https://www.pakistantoday.com.pk/2021/03/14/another-east-bengal-in-west-bengal

[31] *Bangalir Itihas* by Niharranjan Roy,Bengali, first published in 1972,reprint 2005,Dey's Publishing, 13 Bankim Chatterjee Street, Kolkata, ISBN 81-7079-270-3.

[32] **tributaries**-Flows towards the parent water body, drains the surrounding water basin of its groundwater and surface water, and does not flow directly toward the sea.

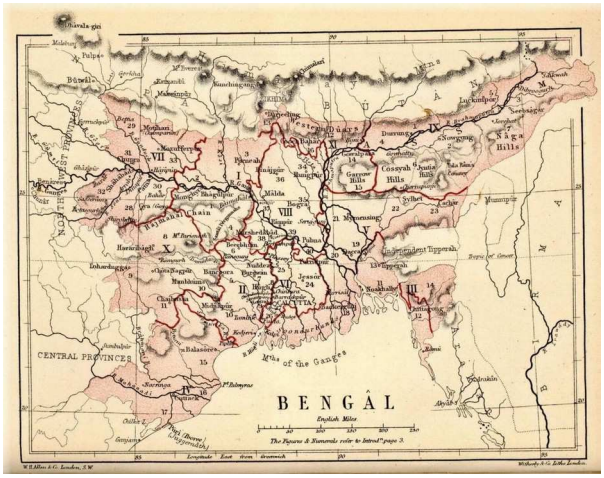
[33] **distributaries**-Flows away from the parent water body, forms a delta or an estuary, it may or may not flow directly towards a larger water body, like a sea.



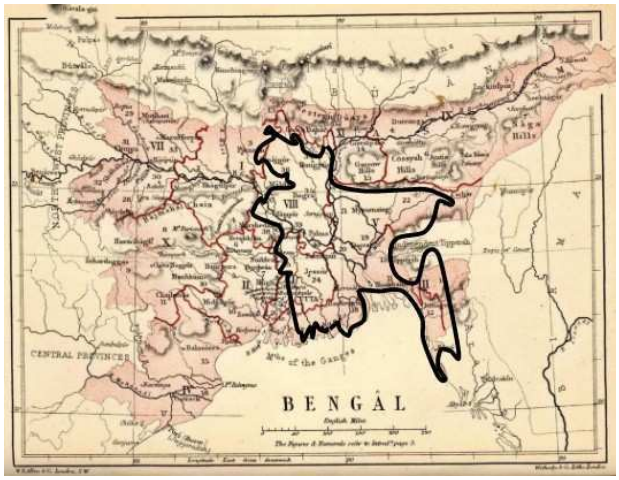
Map 1.2.1: Van den Brouck' map. This is one of the earliest published maps of Bengal. The map was published in 1660.

Bengal Map at 1880[34]

It represented the British Raj in India, along with the other provinces and Bengal. This map represents the last united Bengal. After that, it was divided into two parts: East Bengal and West Bengal, and the division happened only on the basis of religious belief. The Gangetic delta, which was the creation of the two rivers Ganga and Brahmaputra, was divided into two parts due to political issues during the colonial era.



Map1.2.2A



Map1.2.2B

Map 1.2.2A. Map of Bengal Presidency in relation to other surrounding provinces of India at 1880,
Map 1.2.2B. Map of Bengal Presidency in Relation to Other Surrounding Provinces of India at 1880, The mark represented present-day Bangladesh.

The Map of Bengal in 1947,[35] [36]

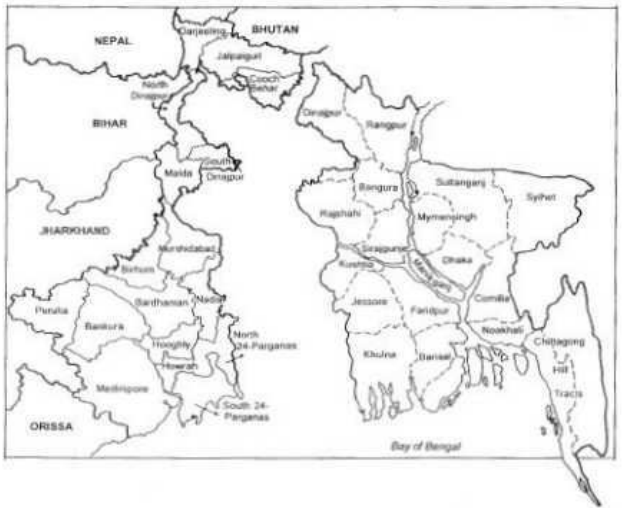
In 1947, the British left India. They divided India into two parts on the basis of religious values. With the Partition in 1947, West Bengal (on the left) became a state within the Indian Union, and East Bengal became a province of Pakistan. The division of the two Bengals was established. Eventually, only religious values were the focus at that time. These Bengali people speak in the same language,

[34] Figure 1.3.A: The Map of Bengal in 1880 created by W. H. Allen and Co.
Pope, G. U. (1880), *Textbook of Indian History: Geographical Notes, Genealogical Tables, and Examination Questions*, London: W. H. Allen & Co. Pp. vii, 574, 16 maps.

[35] Nitish Sengupta (2011), Land of Two Rivers 'A History of Baangal from the Mahabharata to Mujib.' Published by Penguin Group, New Delhi, ISBN: 978-01-434-1678-4.

[36] https://www.pakistantoday.com.pk/2021/03/14/another-east-bengal-in-west-bengal/

and have the same culture. It was a political decision by the colonial government to break the strong Bengali nationality. In 1971, Bangladesh (on the right) proclaimed its independence from Pakistan's oppressive rule. Overnight, they became part of two counties, like they divided their mother into two pieces. The people need a visa to visit their relatives.



Map1.3.A **Map 1.3.B**

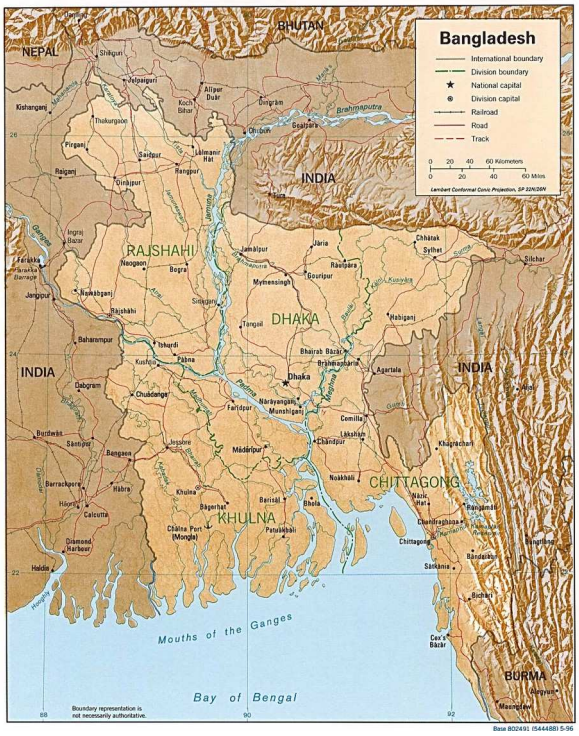
Map 1.3.A: Map of West Bengal and East Bengal during 1947.The map represents how the United Bengali States separated from each other.
Map 1.3.B: Map of West Bengal and East Bengal after1947. Some districts were also divided into two parts. Overnight, they became part of two counties. The red part belongs to East Bengal, later Bangladesh. The dark gray part belongs to West Bengal.

1. 2. 2 Map of Bangladesh from 1971[37]

Geographical location in South Asia, between 20°34' to 26°38' north latitude and 88°01' to 92°41' east longitude. On December 16th, 1971, Bangladesh attained independence and became a sovereign nation after a nine-month liberation struggle. Its capital is Dhaka (formerly spelled Dacca). Bangladesh share Border with India 4,096-kilometers and 271 kilometers with Myanmar. And 720 kilometers shore line with Bay of Bengal[38].

[37] Administrative map of Bangladesh [source: (Map, 2019)]
[38]https://www.un.org/depts/los/nippon/unnff_programme_home/fellows_pages/fellows_papers/hoque_0506_bangladesh.pdf

The country of Bangladesh has a diverse physical landscape, but two aspects stand out in particular: a large deltaic plain that experiences regular floods, and tiny mountainous areas on its most eastern parts.



Map 1.4.A **Map1.4.B**

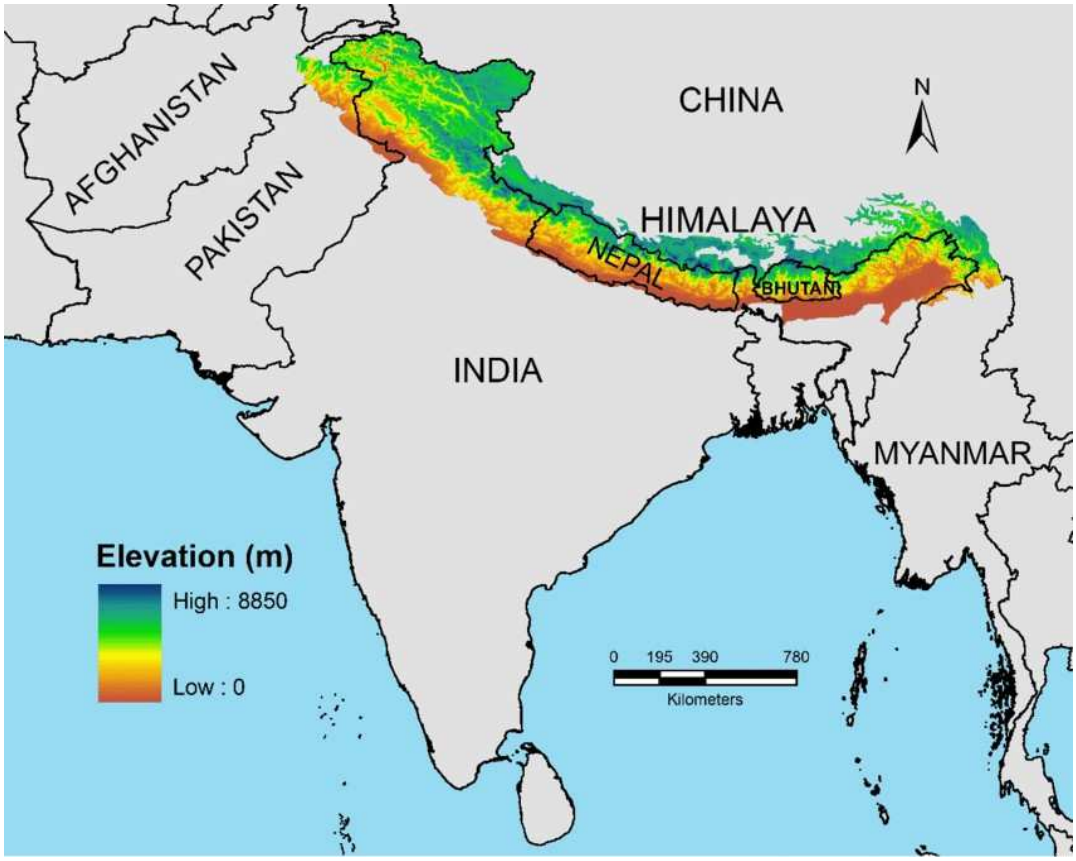
Map 1.4.A:Administrative Map of Bangladesh. It represents the Borders of Bangladesh and small divisions of administrative zones of the Country.31

Map1.4.B:Geographical Map of Bangladesh(Source: www.lib.utexas.edu/maps) It represents the geography of Bangladesh are mainly plain Land and a very Small amount of hilly areas.

1.2.3 Climatic Conditions

The surrounding geographical features impact on the climate of Bangladesh, at the North the Himalayan mountain ranges and at the south the Bay of Bengal these two features impacts on the climatic condition of the country.The Climate of bangladesh is tropical sub-monsoon. Maximum and lowest summer temperatures are between 34°C and 21°C, while the average maximum and minimum winter temperatures are 29°C and 11°C. 1,194 to 3,454 mm of rain falls annually. Humidity ranges from 80% to 100% in August to September and 36% in February to March. Bangladesh is located in the Tropical Monsoon zone climatologically. With two shorter transitional seasons in between the two

prominent seasons mentioned above, its climate is primarily characterized by the seasonal reversal of wind circulation between the summer and winter. As a result, the nation has four distinct climatic seasons: a chilly, dry winter, a hot, pre-monsoon summer, a wet, monsoon summer, and a moderate, pleasant autumn[39].



Map 1.5: Spatial spread of the Himalayan mountain system across seven nations. The elevational gradient of the Himalayas represents the longest bioclimatic gradient of the Earth (0-8,500 m) and encompasses a myriad of ecosystems ranging from tropical, temperate and alpine. The base map was prepared using Digital Elevation Models (DEM) in ArcGIS 9.3 software (Environmental Systems)[40]

1.2.4 Soil condition and sources

[39] Rafique Ahmed, M. Shamsul Alam, M. Matinur Rahman, Journal of Environment and Earth Science www.iiste.org ISSN 2224-3216 (Paper) ISSN 2225-0948 (Online) Vol.6, No.4, 2016

[40]https://www.researchgate.net/figure/Spatial-spread-of-the-Himalayan-mountain-system-across-seven-nations-The-elevational_fig1_328790994

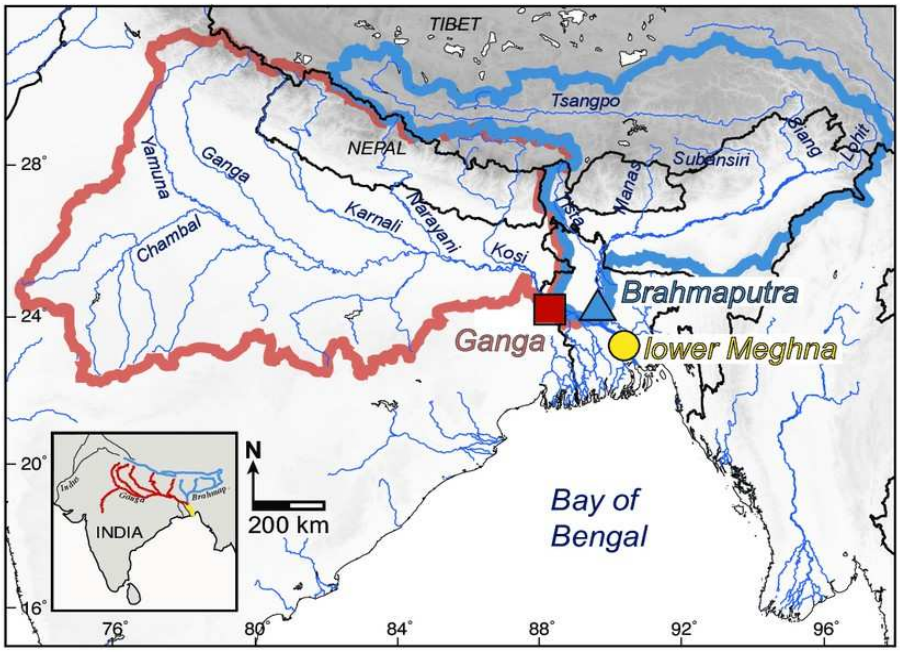
In Bangladesh, there are three primary types of soils: old alluvial soils, modern alluvial soils, and hill soils with sandstone and shale as their basis. The fertile recent alluvial soils are often clays and loams, varying in color from pale brown to sandy to chalky to mica-rich, and are mostly found in flooded regions. The greater Ganges Delta covers some 23,000 square miles (60,000 square kilometers), the bulk of it in southwestern Bangladesh. The rivers Ganga and Brahmaputra bring soils from the Himalayan mountain ranges and construct the delta. The two mighty rivers carved out an area of about 20 square kilometers each year. Approximately 75% of the area is below 3 meters above mean sea level (MSL), making it susceptible to storms and floods[41].

1.2.5 Water Conditions and Water Shades[42]

The Himalayas do not serve as a significant watershed, and several rivers pass through the range, especially in its eastern portion. As a result, unlike other mountain ranges, the main ridge of the Himalayas is not well defined, and mountain passes are not as important for traveling the range. The Himalayan rivers flow into two significant river systems. Water resources Both surface water and groundwater are abundant in Bangladesh. The nation receives surface water inflows that range from a maximum of 140,000 cumec in August to a minimum of 7,000 cumec in February. In Bangladesh, groundwater is found in floodplains where recent river deposits have created abundant aquifers at extremely shallow depths.

[41] https://www.researchgate.net/figure/Map-of-the-Ganga-and-Brahmaputra-basins-respectively-delimited-in-red-and-blue-and_fig1_301832466

[42] A watershed is an area of land that drains or "sheds" water into a specific waterbody. Every body of water has a watershed. Watersheds drain rainfall and snowmelt into streams and rivers. These smaller bodies of water flow into larger ones, including lakes, bays, and oceans. Gravity helps to guide the path that water takes across the landscape. [https://education.nationalgeographic.org/resource/watershed/]

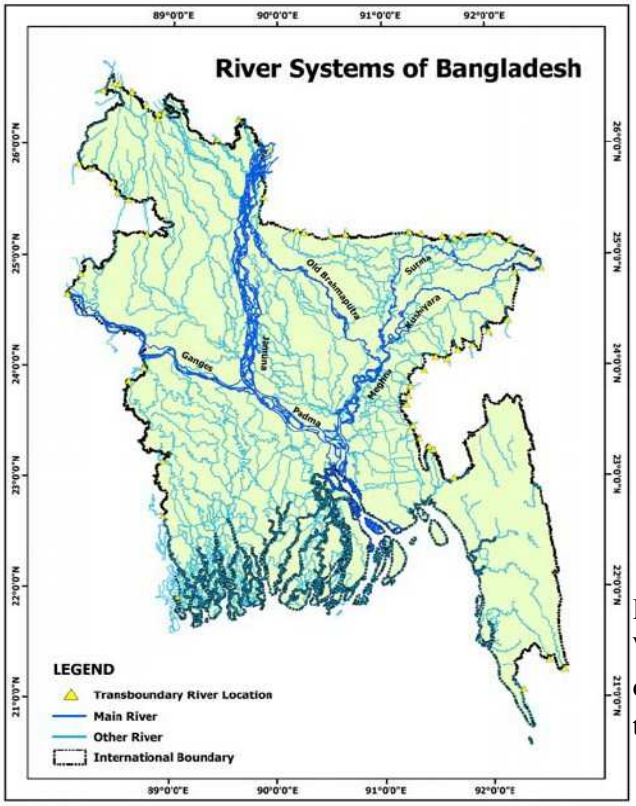


Map 1.6:Location or Travel map of the Ganges, Brahmaputra, and Meghna catchments and their water shade areas. It represents the watershed areas how they flow from different countries and then fall into the bay of Bengal.

1.2.6 Hydrology, Flooding, and the Main Water Shade

The delta plain of the Ganges (Padma), Brahmaputra (Jamuna), and Meghna Rivers and their tributaries work as the main water shade area. The Bangladesh Plain, a lush alluvial lowland, makes up around 80% of the area. Bangladesh has a total size of around 10,000 square kilometers (3,900 square miles), and greater portions frequently flood during the monsoon season[43].

[43] "Sunderbans the world's largest delta". gits4u.com. Archived from the original on 3 January 2015. Retrieved 3 January 2015.



Map 1.7: River system of Bangladesh (Data Source: WARPO). This map shows how hundreds of river criss crossed over Bangladesh, three mighty rivers and their tributaries and distributaries.

The Ganges-Brahmaputra Basin is crisscrossing other Himalayan rivers. The Ganges, the Brahmaputra, and the Jamuna are some of its principal rivers, as are additional tributaries (Figure 1.7). The Brahmaputra River gets its start in western Tibet, runs east through Tibet and then west into the plains of Assam. The biggest river delta in the world, the Sunderbans, is where the Ganges and the Brahmaputra converge in Bangladesh before emptying into the Bay of Bengal.[44]

Over hundreds of rivers criss-crossing all over the country, most of which are either tributaries or distributaries to the Ganges-Brahmaputra-Meghna (GBM) river systems. Bangladesh is located at the downstream area and covers roughly 7% of the drainage catchments of GBM river systems (Figure 1.7). [45]

There are as many as 700 or more names of rivers listed in various archives (Banglapedia, 2019). The Water Development Board, Bangladesh (WDB, 2019) has published documents with names of 406 rivers. This number varies from source to source as some rivers have already vanished with time and some have taken different names at different places. There are 57 international rivers in Bangladesh of which 53 flow from India and 3 from Myanmar[46].

[44] https://www.researchgate.net/publication/235707918_Climate_Change_and_Water_Resources

[45] Huq, S., Karim, Z., Asaduzzaman, M. and Mahtab, F., 1999. Vulnerability and Adaptation to Climate Change in Bangladesh, Kluwer Academic Publishers, Dondrecht, Netherland

1.3 Political history

The term Bangla's precise ancestry is uncertain, however, it is generally accepted that it comes from the Dravidian-speaking tribe Bang/Banga, who came to the region about 1000 BCE [47]. Other theories postulate that the name Venga (Bôngo), which derives from the Austric term "Bonga," signifying the Sun -God, is where it got its origin. Vanga, who established the Vanga Kingdom, was one of King Vali's adopted sons, according to the Mahabharata[48], the Puranas[49], and the Harivamsha[50]. With the exception of a few years under the Pals, it took place either under the Magadh or Kalinga Rules. The Nesari plates of Rashtrakuta Govinda III (805 CE) mention "Vangala " (Bôngal) for the first time, referring to Dharmapala as the ruler of Vangala. Rajendra Chola I of the Chola Dynasty, who invaded Bengal in the 11th century, used the term *Vangaladesa*[51].

1.3.1 Stone, Copper, and Iron Age

There is evidence of human habitation in the Stone Age and the Copper Age. Large urban settlements formed at that time, and the Northern Black Polished Ware culture dominated the northern part of the Indian subcontinent. They used iron weapons and irrigation systems in agriculture[52].

1.3.2 Bengal under Empires (322 BCE-1204)

From around c.345 through the 12th century, ancient Bengal was governed by many empires. The empires throughout history include:

Nanda Empire (c. 345–322 BCE)

Maurya Empire (c. 322–185 BCE)

---

[46] https://www.thedailystar.net/supplements/30th-anniversary-supplements/news/challenges-and-opportunities-river-management-2042613

[47] Ahmed, Helal Uddin (2012). "History". In Islam, Sirajul; Jamal, Ahmed A. (eds.). *Banglapedia: National Encyclopedia of Bangladesh* (Second ed.). Asiatic Society of Bangladesh

[48] **Mahabharata** is one of the two major Sanskrit epics of ancient India in Hinduism. It narrates the struggle between two groups of cousins in the Kurukshetra War. Orally narrated for centuries before being written down in the 1st century,

[49] **Puranas** are ancient Hindu texts praising various deities, most notably the divine Trimurti God in Hinduism, through divine stories. Puranas can also be described as a genre of important Hindu religious texts, alongside some Jain and Buddhist religious texts. consisting notably of narratives of the history of the universe from creation to destruction, genealogies of kings, heroes, sages, and demigods, and descriptions of Hindu cosmology, philosophy, and geography. orally narrated for centuries before being written down from the 2nd century CE onward.

[50] **Mahabharata** is one of the two major Sanskrit epics of ancient India in Hinduism. It narrates the struggle between two groups of cousins in the Kurukshetra War. Orally narrated for centuries before being written down in the 1st century,

[51] Sen, Sailendra Nath (1999) [first published in 1988]. Ancient Indian History and Civilization. New Age International. p. 281. ISBN 978-81-224-1198-0

[52] Pieris, Sita; Raven, Ellen (2010). *ABIA: South and Southeast Asian Art and Archaeology Index*. Vol. Three. Brill. p. 116. ISBN 978-9004191488

The Grand Trunk Road, which connects the Indian subcontinent with Central Asia, is one of Asia's oldest and longest significant roadways. The Mauryan Empire developed these international routes.

Shunga Empire and Kanva Dynasty (c. 185–28 BCE)

Gupta Empire

The Gupta Empire (approximately 319–467 CE) is the most notable era in the history of this subcontinent. Numerical systems started to emerge during that period.

Gauda Kingdom

According to some academics, King Shashanka was the first monarch of a single Bengali state. Within the walls of Gauda's castle, Shashanka founded a kingdom. He was in power (590–625 CE).

Varman Dynasty

North Bengal and the Sylhet area were under the dominion of the Varman Dynasty (350–650 CE) of Kamarupa. Bengali and Bengali-Assamese languages coexisted in the region.

Khadga Dynasty

Eastern Bengal's Khadga dynasty (625–716 CE) was a Buddhist one. One of the dynasty's legacies is its gold currency, which bears the names of kings like Rajabhata written on it.

Pala Empire

The last Buddhist imperial state to rule the Indian subcontinent was the Bengali kingdom known as the Pala (750–1120 CE).

Chandra Dynasty

Southeast Bengal and Arakan were under the control of the Chandra dynasty throughout the 10th and 11th centuries CE.

Sena Empire

In the 12th century, they were successful in unifying Bengal under a single king.

1.3.3 Medieval and Early Modern Bengal (1204-1757)

Delhi Sultanate (1204–1352)

The victory of Gauda over the Sena kingdom in 1204 marked the start of the Islamic invasion of Bengal. An army of thousands of Ghurid riders under the command of Bakhtiar Khilji[53] overcame Bengali Hindu warriors during the blitzkrieg battle.

Small Sultanates (1338–1352)

During the middle of the 14th century, three breakaway sultanates emerged in the Delhi Sultanate's province of Bengal. Fakhruddin Mubarak Shah (and later his son) controlled the empire from Sonargaon.

[53] **Bakhtiar Khilji,** a Turko-Afghan general who served under the Ghurid emperor Muhammad of Ghor, oversaw the Muslim invasions of Bengal and Bihar in eastern India and established himself as their leader.

Bengal Sultanate (1352–1576)
Ilyas Shahi Dynasty (1342–1414 and 1435–1487)
Hindu-Muslim usurpers (1414–1435)
Raja Ganesha, the Hindu nobleman who served as the sultan's minister, led a rebellion that ended the Ilyas Shahi dynasty. Although Ganesha put his son Jadu on the throne, the Sufi clerics of the palace persuaded Jadu to convert to Islam. Jadu adopted Jalaluddin Muhammad Shah as his name.
Hussain Shahi dynasty (1494–1538)
Suri interruption (1539–1564)
Karrani dynasty (1564–1576)
Baro-Bhuyans (1576–1610)
Mughal period (1574–1717)
Subedar period (1574–1727)
Subedars were the Mughal viceroys in Bengal. The Bengal Subah was a component of a larger, prosperous empire, impacted by imperial policies. The Mughals built the provincial capital in Dhaka in 1610 with fortifications, gardens, tombs, palaces, and mosques. Dhaka was also named in honor of Emperor Jahangir as Jahangirnagar.
Nawabs of Bengal (1717–1757)
Nasiri dynasty (1717–1740)
Afsar dynasty (1740–1757)
1.3.4 Colonial Bengal (1757-1947)

Portuguese Chittagong (1528-1666)

Portuguese colonialists in Chittagong established the first European colony in Bengal. The town was created after the Bengal Sultanate gave the Portuguese and Indian diplomatic missions permission to construct a trade station. Bureaucrats, merchants, soldiers, sailors, missionaries, slave dealers, and pirates were among the Portuguese colonialists in Chittagong.

Dutch settlements (1610–1824) The Dutch East India Company operated a directorate in Bengal for nearly two centuries. The directorate later became a colony of the Dutch Empire in 1725. Dutch territories in Bengal were ceded to Britain in 1824.

Early English settlements (1600s)

In the 1630s, the East India Company founded its first colonies in Bengal, close to Hooghly. In 1651, Mughal viceroy Shah Shuja gave it the go-ahead to engage in commerce. The firm made an attempt in 1689 to seize Chittagong and make it the hub of their Bengal commerce, but the English expedition discovered the port to be well-defended[54].

British East India Company (1757–1858)

[54] Erikson, Emily (21 July 2014). Between Monopoly and Free Trade: The English East India Company, 1600-1757.*Princeton.edu.ISBN 9780691159065*. Retrieved June 3, June 2022

The East India Company built Fort William in Calcutta and started bolstering its fortifications. At the Battle of Plassey, which took place on June 23, 1757, British soldiers vanquished the Nawab of Bengal. At the Battle of Buxar (1765), British forces defeated the Mughal Emperor Sultan Shah Alam II but lost again. After the fall of the Mughal Empire, Calcutta emerged as a global hub for trade and culture.

British crown rule (1858–1947)

Following the Indian Rebellion of 1857, the British Crown took direct authority over Bengal in place of company governance. Queen Victoria took the title of, 'Empress of India'. The British crown decided on Calcutta as the capital of the British Raj.

French Settlement (1692-1952)

The French established colonies and factories in Benga (I962) with the permission of Shaista Khan. They built a garden in Tejgaon, factories in Cossimbazar and Balasore in Dhaka.

Danish Settlement (1625-1845)

The first settlement of the Danish East India Company in Bengal was established in Pipli in 1625.

Austrian Settlement (1700)

Bengal in place of the company's governance. The seat of government for British-controlled territory in India remained Fort William. For many years, the Governor of Bengal also served as the Governor-General of India. When Victoria was crowned "Empress of India" in 1877, the British proclaimed Calcutta as the capital of the British Raj.

Bengal Renaissance

Rabindranath Tagore was a great poet and writer in Bengali. He had a great influence on Bengali literature. In 1913, Tagore won the Nobel Peace Prize as the first Asian.

During the British era, in the Bengal area of undivided India, there was a social reform movement known as the Bengal Renaissance that took place in the late 19th and early 20th centuries. The Bengal Renaissance began with reformer and humanitarian Raja Ram Mohan Roy (1775–1833)[55] and culminated with *Rabindranath Tagore (1861–1941). David Kopf, a historian, calls this era "one of the most creative periods in Indian history" because of the flourishing of religious and social reformers, academics, and authors[56].

Partition of Bengal (1947)

---

[55] **Raja Ram Mohan Roy,** Indian reformer of religion, society, and education who questioned conventional Hindu culture and suggested directions for advancement for Indian civilization under British control. He has been referred to as the "father of modern India."

[56] Kopf, David (December 1994). " Amiya P.Sen. Hindu Revivalism in Bengal, 1872". American Historical Review (book review).doi:10.2307/2168519.JSTOR 2168519.

Before leaving India, the British divided Bengal into two parts- east Bengal and west Bengal, based on Hindu and Muslim majorities, respectively. They break the unity of religious belief. Later, East Bengal became Bangladesh after the liberation war in 1971.

1.3.5 Pakistan Period (1947- 1971)

Bengal joined a special state experiment by the British Raj. They divided India on a religious basis. East Bengal is a Muslim priority territory, so it became a part of Pakistan, which is 2200 km away from Bangladesh. East Bengal became East Pakistan in 1955.

Bengali Language Movement (1952)

The Bengali Language Movement was a political movement in Bangladesh (then known as East Pakistan) that pushed for Bengali to be recognized as Pakistan's official language. Bengali would be able to be utilized in official matters with such recognition. The government of Pakistan declared Urdu to be the only official language on February 23, 1948, which led to widespread unrest among East Pakistan's Bengali-speaking majority. The government banned public gatherings and demonstrations in response to escalating sectarian tensions and widespread opposition to the new law. On February 21, 1952, University of Dhaka students and other political activists launched a rally in defiance of the law. When police started shooting at the students that day, the protest came to a head. The national government finally gave up and made Bengali an official language in 1956, after years of strife. In honor of the Language Movement and the rights to their native tongues on November 17, 1999, UNESCO established February 21 as International Mother Language Day for the entire globe to observe[57].

Independent Bangladesh (1971)

After nine months of sanguinary fighting with the West Pakistan Army, Bangladesh became independent on December 16, 1971. It became the People's Republic of Bangladesh, and it practiced the parliamentary system. The national parliament is called 'Jatiya Sangsad."[58] Now the 11th Parliament is ongoing. The people of Bangladesh elected each and every member of the parliament. The Constitution of Bangladesh came into force on 16th December 1972[59].

---

[57] Glassie, Henry; Mahmud, Feroz (2008). *Living Traditions*. Cultural Survey of Bangladesh Series. Vol. 11. Dhaka: Asiatic Society of Bangladesh. p. 578.OCLC 2993798

[58] Jatiya Sangsad, The Bangladeshi parliament is made up of 300 members who are elected by the general public to serve five-year terms and 45 women-only seats who are chosen by the elected members. In a state of war, the tenure of Sangsad may be prolonged for a maximum of one year. The speaker serves as the Sangsad's top executive. The Chief Government Executive, or Prime Minister, is chosen from among the Sangsad members who have earned their trust. The Sangsad speak a language called Bangla.

[59] Under the Proclamation of Independence Order of April 10, 1971, Bangladesh first adopted an ad hoc constitution that was later replaced by the Provisional Constitution of Bangladesh Order of 1972. The Constituent Assembly approved the current constitution on November 4, 1972, and it went into effect on December 16, 1972. The Constitution is divided into four schedules and eleven portions, totaling 153 articles.

1.4 Religious Cultural Heritage- Existence of four Religious values together

Hinduism and the Indus Valley

The Indus River and its tributaries serve as the backdrop for the history of South Asian religious life. The Indus Valley or Harappan civilization (c. 2800–1500 B.C.E.) was the epicenter of the first complex urban culture for which we have evidence in the area. Some academics propose parallels between cultural aspects, such as the potential goddess of fertility worship, and later South Asian religious developments, such as the expansion of the goddess cult in Hinduism. Shiva, a powerful Hindu deity who rose to prominence later.

The northern central plains' Vedic culture eventually came to rule. The Veda, a work of literature from the time, gave rise to the moniker "Vedic culture." Veda, which typically refers to "wisdom," is derived from the Sanskrit verb vid (to know), and in this context, refers to a collection of literature that focuses mostly on ritual.

Buddhism

Siddartha Gautama was born in what is now Nepal and is known as "the Buddha" (around 563–about 483). In what is now Lumbini, in south-central Nepal, he was a young prince. During his first tour of the realm, the young prince was horrified to discover the misery that exists in the world. He had never experienced illness, aging, or death in the palace, but witnessing such misery touched him so deeply that he resolved to look for a solution to these issues. Siddartha renounced his opulent palace lifestyle and all of his material belongings. As a monk, he experimented with several meditation techniques before founding his own school or philosophy to put a stop to human suffering on earth.

Many people believed him to be a heavenly messenger or a deity, despite the fact that he just considered himself as a teacher who taught them the Four Noble Truths and the Eightfold Path. He was known as "Buddha, the enlightened one" and is credited with founding the religion of Buddhism, which is practiced all over the world. Buddhism progressively waned in India before moving to East and Southeast Asia, where it is still widely practiced today[60].

Islam

Saudi Arabia is where Islam first emerged. "Submission to God" is the meaning of the term. Islam entered South Asia by commerce and conquest, respectively. South Asia initially experienced the arrival of Islam in the eighth century A.D. Islam did not take root in northern India until the 12th and 13th centuries, when Turks from Central Asia seized authority. Islam entered in southern India predominantly through trade, as opposed to the north where it spread by military methods. Similar to how bhakti saints influenced religious belief and practice among individuals we now refer to as

[60] https://asiasociety.org/education/religions-south-asia

"Hindus," sufi saints influenced the formation of popular Islam. Similar to bhakti poets, Sufis (many of them were poets as well) spoke of their personal encounters with god and the necessity of moving past merely observing formal religious customs to a genuine and active religious involvement.

Similar tactics were employed by these religious leaders, including the creation of regional centers accessible to a wide range of people, the invocation of a direct, unmediated encounter with Almighty, and the validation of facets of local culture through the incorporation of localized economic and social images into poetry. As theological speculating and advanced study in the elite languages of Sanskrit and Arabic continued, popular religious leaders and practices also interacted with more orthodox and established forms. Mosques and madrasas (religious institutions) for Muslims were widely dispersed, while Hindu sites also did so, despite the fact that huge temple centers were almost extinct in the north. Even under the shadow of the Mughal Empire, the Krishna cult gained immense appeal, and its center south of Delhi developed into a significant pilgrimage place.[61]

Christianity

The Portuguese missionaries brought Christianity to Bengal in the sixteenth century. The first church known to have been built is the Basilica of the Holy Rosary, Bandel, which was built in 1599 in Hugli-Chuchura in the Hooghly district of West Bengal, India. Around this time, Chittagong (previously known as Diang), which had significant Portuguese and trading settlements, had its first hermitages and churches built. The first Vicar Apostolic in Bengal was held at the Portuguese colony in Chittagong.

Religious beliefs and practices affect everyone in the community, from the individual to the whole. Bangladesh's culture is more vibrant since the four most dominant religious ideals coexist there in harmony. The vibrant religious presence of South Asian cultures may be seen all over the world. Because of the shrinking global community, new media, shifting social norms, and political and economic upheaval, religious traditions are being altered. Fundamental religious doctrines and practices will keep evolving in the future, just like contemporary civilizations do.[62] [63]

1.5 Culture, religious values, Literature, and Its relation with Riparian Culture

1.5.1 Ganga as per Cultural Myth and Puran verses about Ganga

'The Ganges has been a symbol of India's age-long culture and civilization, ever changing, ever flowing, and yet ever the same Ganga.'
Jawaharlal Nehru[64], born in Allahabad on the Ganges.

[61] https://www.thedailystar.net/news/sufi-influence-in-bengal

[62] https://www.niu.edu/clas/cseas/_pdf/lesson-plans/k-12/origins-religion.pdf

[63] https://southasiaoutreach.wisc.edu/religions/

[64] Jawaharlal Nehru,First Indian Primister, after the colonial era.

The Mughal emperor[65] Akbar's preference for "the water of immortality" from Ganga for drinking and cooking is described at length in the Ain-i-Akbari by Abul Fazl.

The Vedas and the Puranas both make mention of Ganga. Those who have bathed in Ganga's river are on the road to paradise. A significant river in the Indian subcontinent is the Ganga or Ganges River. It is connected to both mythology and the reality of the Indian people. It is personified as a Goddess in Hinduism and is vital to the faith.

Ganga as per Puran verses:
"pavanah pavatam asmi ramah shastra-bhrtam aham jhasanam makaras chasmi srotasam asmi jahnavi" (Shrimad Bhagwat Gita: **(X : iii)**

Meaning: "Sri Krishna said to Arjuna: Of all the purifiers I am the wind; of the wielders of weapons I am Rama; of fishes I am the shark; and of all the flowing rivers I am the River Ganges. Lord Krishna himself declares that among all the rivers, God himself is there as "River Ganga" on this earth. So it is a form of a living goddess.

***anye ca nadā nadyaś ca varṣe varṣe santi bahuśo merv-ādi-giri-duhitaraḥ śataśaḥ.(Srimad Bhagavatam Canto 05, Chapter 17, Text 10*)**

TRANSLATION
Many other rivers, both big and small, flow from the top of Mount Meru. These rivers are like daughters of the mountain, and they flow to the various tracts of land in hundreds of branches.

1.5.2 Cultural Practices about Rivers of Bangladesh -Festivity and rituals

Pilgrims travel to the Ganga river to use Ganga water in the significant ceremonies of their spiritual rebirth. These rites often take place in Haridwar, Allahabad, and Varanasi (Kashi or Banaras).

The Abhishek Puja: Every infant born to Hindu parents receives a "abhishek," which includes a wash in milk and the Ganges' sacred waters. For a new start in this life, the infant is "purified" per se from the sins of its previous existence.

The Holy Bath before Marriage: According to Hindu religion, being married is like giving birth to a new soul with two bodies. Therefore, it is crucial that everyone getting ready for holy matrimony be cleansed of all soul impurities.

[65] Mughal Emperor Akbar, the great Emperor of India,unified the vast Mughal state and established a centralized system of administration throughout diplomacy.

The Asthi Visarjan: Hinduism has a very strong ceremonial connection to the idea of rebirth. Asthi Visarjan is a component of a person's last rituals. Hindus are required to dispose of the leftover ashes into any of the sacred river waters once the deceased person has been cremated. This type of dying in the spiritual water will guarantee the deceased's soul a good rebirth.
The Visarjan of Idols: The idols of Gods created for significant religious celebrations like Ganesh Chaturthi and Durga Puja must be submerged in water, according to a global Hindu tradition. Therefore, the usage of water in religion extends beyond living things to the Gods as well. During these festivals, Hindus prepare the Gods for their journey to their heavenly home by submerging them in water.

The Ardh Kumbh: According to a recent research conducted in Haridwar, lakhs of pilgrims bathed in the river Ganga during the Kumbh Mela, which is revered as the "Moksha Dayini" (the one who grants salvation).

1.5.3 Socio Economic significance of Rivers

The Ganga basin is one of the most populous regions on Earth, sustaining over 450 million people. The average population density in the Ganga basin is 520 persons per square km, as compared to 312 for the rest of India[66]. In the delta zone, the population density rises to over 900 people per square kilometers.

The Ganga basin, with its fertile soil, is the major contributor to the agricultural economies of India and Bangladesh. The Ganga and its tributaries have formed a large flat and fertile plain in North India extending over an area of 1,086,000 km[67].

Bangladesh is home to five major river ports: Dhaka, Narayanganj, Chandpur, Barisal, and Khulna. There are 8,372 km of navigable waterways in the inland water system, including 2,575 km of primary cargo routes. Similar to that, Bangladesh frequently uses river-based transportation for both people and cargo[68].[53]

Despite rivers being essential to Bengali history, very little effort has been taken to create a narrative of how Bengali culture was influenced by its rivers. The Ganga basin served as the home of the mighty kingdoms of Magadha, Gupta, and the Mughals. Additionally, Buddhism, the foundation of Hinduism, was born there. It had a significant impact on transportation, agricultural, economic advantages, and religious and cultural legacy. Rivers in general, including the Ganga, are the living heritage. The only

[66] GOI, 2001. Primary Census Abstract. Census of India, 2001. Ministry of Home Affairs, New Delhi.
[67] Jain, S. K., Agarwal, P. K., Singh, V. P., 2007. Hydrology and water resources of India. Water Science and Technology Library. Springer, Netherlands.
[68] https://www.researchgate.net/publication/316952532_River_GangesHistorical_cultural_and_socioeconomic_attributes

means of preserving and safeguarding the river for future generations is to take into account and treat it as a "Living Heritage."

1.5.4 Literature and Riparian Culture (cultural practices about interaction with rivers)

A river flow as it is, naturally. Human beings interact with rivers or make connections with them at a specific point of the river. The river and the land are two different materials and their levels are also different. The river has different water levels due to season and tide. The point or the area where people use rivers for transportation and religious ritual purposes *'Ghat' grows[69] there. Ghat is also a part of heritage. It takes time to grow and it is a witness of a lot of history. Most of the time it grows spontaneously like the river moves.

The riverfront at the bend consists of a number of structures called "Ghats" (a plaza with steps leading to water) that work as an urban edge linking water with the land. People traditionally use the ghats for socio-cultural performance, goods and passenger movement, recreational promenade, religious rituals, etc[70].

*Ghat is a node where waterway and land circulation meet with each other and make their own special character. From the ancient period Ghat work as an interaction space. It has different scales such as Gonger-er Ghat, Bazer-er Ghat, Gramer-er Ghat, Baree-er Ghat, Shashan Ghat etc. Different Ghat have different pattern due to the difference of surrounding settlement pattern. Ghat is mainly indigenous and spontaneous. It grows from necessity. A lots of Great Literature grown on Ghat. Ghat is an issue of our economy, commerce, culture, history, Settlement growth as well as Urban.
About 400 years ago Dhaka started from the river Buriganga. From the time being the river Buriganga loses its beauty and importance. The Buriganga River plays an important role in the economy of our country.* 'Shaderghat' Inland water station makes connections with the whole country.most of the foreign vehicles as well as the european businessman enter Dhaka from this Ghat A large number of goods are still also loading and unloading at different Ghat of the river Buriganga[71].

---

[69] 'Ghat' -From where people and Goods are moved from one place to another place. This is also used for religious ritual, social gathering space and Tax also collected from Ghat.The dark lanes dramatically open onto ghats, which resemble a majestic podium stepping down to meet the rippling water. On the other end, the podiums hit the gigantic edifices, which are the ghat structures visible from a long distance and characterized by their distinctive architectural style. Illustrative of the evaluation of human society and settlement over time under the influence of the physical constraint or opportunity presented by the natural environment and successive social, economic, social, and cultural forces. As combined works of nature and mankind, they express a long and intimate relationship between people and their relationships

[70] .(https://issuu.com/amitasinha/docs/orchha_report)

[71] Mowla, Q. A, *Mozumder,* [2015] '*Deteriorating Buriganga River: It's Impact on Dhaka's Urban Life*', *PSC Journal, October 2015, Vol.2, Issue 2, pp.01-10. 2015/11/01.*

Ghat, a term used in the Indian subcontinent, could depending on the context could either refer to a range of stepped-hill with valleys. The word is also used in some places outside the Indian subcontinent where there are Indian communities. For example, in George Town, Penang in Malaysia, the label "Ghaut " is used to identify the extensions of those streets that formally ended in ghats before reclamation of the quayside.

‘পাষাণে ঘটনা যদি অঙ্কিত হইত তবে কতদিনকার কত কথা আমার সোপানে সোপানে পাঠ করিতে পারিতে। পুরাতন কথা যদি শুনিতে চাও, তবে আমার এই ধাপে বইস; মনোযোগ দিয়া জলকল্লোলে কান পাতিয়া থাকো, বহুদিনকার কত বিস্মৃত কথা শুনিতে পাইবে।
সে বড়ো বেশি দিনের কথা নহে। তোমাদের অনেক দিন বলিয়া মনে হইতে পারে। কিন্তু আমার মনে হইতেছে এই সেদিনের কথা। আমার দিনগুলি কিনা গঙ্গার স্রোতের উপর খেলাইতে খেলাইতে ভাসিয়া যায়, বহুকাল ধরিয়া স্থিরভাবে তাহাই দেখিতেছি— এইজন্য সময় বড়ো দীর্ঘ বলিয়া মনে হয় না। আমার দিনের আলো রাত্রের ছায়া প্রতিদিন গঙ্গার উপরে পড়ে আবার প্রতিদিন গঙ্গার উপর হইতে মুছিয়া যায়, কোথাও তাহাদের ছবি রাখিয়া যায় না। সেইজন্য, যদিও আমাকে বৃদ্ধের মতো দেখিতে হইয়াছে, আমার হৃদয় চিরকাল নবীন। বহু বৎসরের স্মৃতির শৈবালভারে আচ্ছন্ন হইয়া আমার সূর্যকিরণ মারা পড়ে নাই। দৈবাৎ, একটা ছিন্ন শৈবাল ভাসিয়া আসিয়া গায়ে লাগিয়া থাকে, আবার স্রোতে ভাসিয়া যায়। তাই বলিয়া যে কিছু নাই এমন বলিতে পারি না। যেখানে গঙ্গার স্রোত পৌঁছায় না, সেখানে আমার ছিদ্রে ছিদ্রে যে লতাগুল্মশৈবাল জন্মিয়াছে, তাহারাই আমার পুরাতনের সাক্ষী, তাহারাই পুরাতন কালকে স্নেহপাশে বাঁধিয়া চিরদিন শ্যামল মধুর, চিরদিন নূতন করিয়া রাখিয়াছে। গঙ্গা প্রতিদিন আমার কাছ হইতে এক-এক ধাপ সরিয়া যাইতেছেন, আমিও এক-এক ধাপ করিয়া পুরাতন হইতেছি’ ঘাটের কথা, Rabindranath Tagore)।[72]

If the events were engraved in stone, how many words of the past could be read on my terrace. If you want to hear the old story, then come to my step; Keep listening to the water with attention, you will hear many long-forgotten words.

It's not a long time. It may seem like a long time. But I remember this day. As my days float playfully on the Ganges stream, I watch it steadily for a long time — so time does not seem long. My light of day and shadow of nightfall on the Ganga every day and are erased from the Ganga every day, their image cannot be kept anywhere. Therefore, though I may look old, my heart is forever young. My sunshine has not died covered by the algae of many years of memories. At night, a broken piece of algae floats up, clings to the body, and floats back into the stream. So I can't say that there is nothing. Where the stream of the Ganges does not reach, the vines that have grown in my holes, they are the witnesses of my past, they have tied the past with love and kept it forever green and sweet, forever new. Every day the Ganga is receding from me one step at a time, I am also getting old one step at a time (Story of a Ghat/Ghater Khatha Rabindranath Tagore[2*]).

[72]*Rabindranath Tagore was a Bengali poet, writer, playwright, composer, philosopher, social reformer and painter. He reshaped Bengali literature and music as well as Indian art with Contextual Modernism in the late 19th and early 20th centuries.Poet Rabindranath Tagore won the Nobel Prize for Literature in 1913 for his collection Gitanjali published in London in 1912. the Nobel Prize for Literature in 1913 for his collection Gitanjali published in London in 1912.

1.6. Economic history and its Relation with the Riparian Culture

1.6.1 Economy of Bangladesh and its Relation with River

River is like my mother. The cultural name of the river Ganga is 'Ganga Ma' that means mother Ganga. The economy of Bangladesh is based on agriculture. About 50 percent of the population are employed in this sector and about 70 percent people overall depend on agriculture for their livelihood[73]. Agriculture dependent on river water. All rivers have an impact on our daily lives, either directly or indirectly, because they may serve as supplies of water for fishing, farming, and entertainment, as well as a fun way of transportation for both. We must safeguard and maintain this natural abundance if we are to profit from our rivers responsibly. Bangladesh's economy is largely dependent on working waterways and the transportation sector they support.

1.6.2 Ancient Bengal's Economic Connection to the World Economy

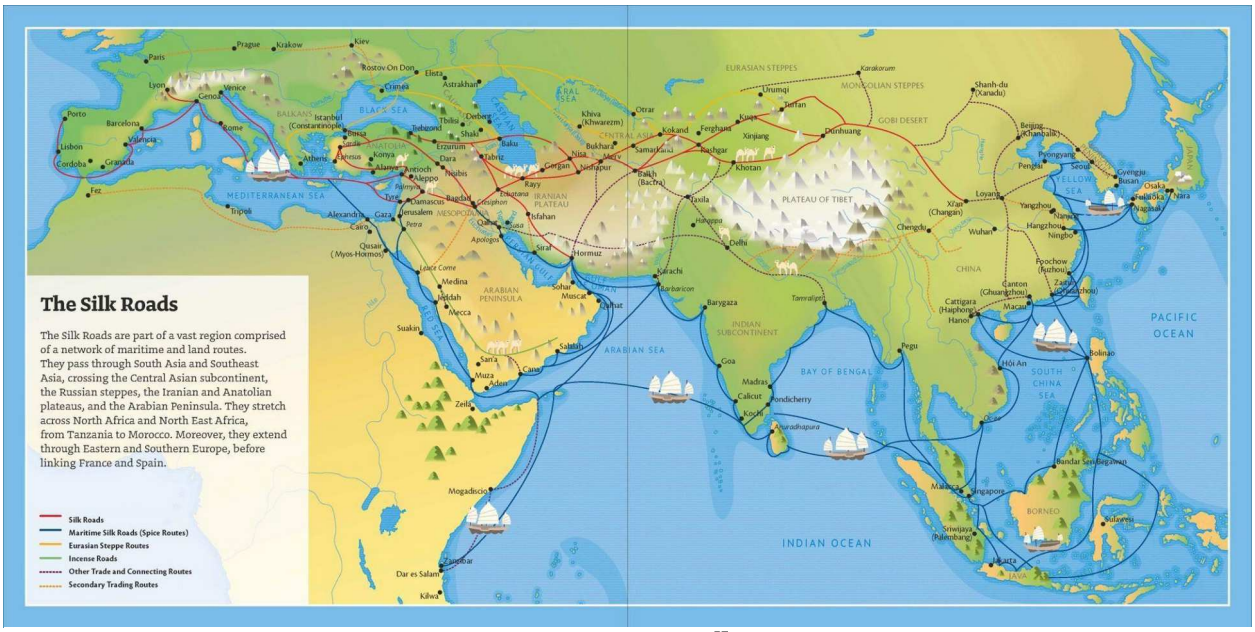
The first towns in ancient Bengal date to the Vedic era, and the region was home to numerous prominent kingdoms at the time. Strong commercial ties between ancient Bengal and Persia, Arabia, and the Mediterranean region were centered on its highly valuable cotton *muslin fabrics[74] by the Silk Road and Muslin Road[75][Figure 1.8].

Vasco da Gama, a Portuguese explorer, arrived in the subcontinent in 1498 after mooring off Calicut on the Malabar Coast. Within a few decades, he would sail the coastline of the subcontinent with other Portuguese. Following that, Bengal was also connected to Europe via a marine trade route.

[73]https://www.thedailystar.net/supplements/30th-anniversary-supplements/news/challenges-and-opportunities-river-management-2042613

[74] muslin fabrics-Muslin of uncommonly delicate handspun yarn was handwoven in the Bengal region of South Asia and imported into Europe for much of the 17th and early 18th centuries. During the 17th and 18th centuries, Mughal Bengal emerged as the foremost muslin exporter in the world, with Mughal Dhaka as capital of the worldwide muslin trade. (Karim, Abdul (2012). "Muslim". In Islam, Sirajul; Jamal, Ahmed A. (eds.). *Banglapedia: National Encyclopedia of Bangladesh* (Second ed.). Asiatic Society of Bangladesh.)

[75] https://en.unesco.org/silkroad/about-silk-roads#pid=1



Map 1.8: Shows the silk routes and the maritime routes.[57] This map represents the main silk road and its connection with central Asia, South Asia, the Arab world, Africa, and Europe. There were some connection routes from different ports.

1.6.3 Economic History at the Time of Sultans Before Colonization

The Muslim conquest of the Indian subcontinent absorbed Bengal into the medieval Islamic and Persianate worlds. Between 1204 and 1352, Bengal was a province of the Delhi Sultanate[76]. This era saw the introduction of the taka[77] as a monetary currency, which has endured into the modern era. An independent Bengal Sultanate was formed in 1352 and ruled the region for two centuries, Bengal was known as a major trading nation in the world[78]. The ruling elite also turned Bengal into the easternmost haven of Indo-Persian culture.

Ibn Battuta[79] wrote regarding the Bangla economy of the time in terms of the cheapness and plenty of everyday necessities that he had never seen anywhere else in the globe. He kept a record of how the people of Bangala interacted with both internal and foreign trade. He has talked about the many boats

[76] Richard M. Eaton (31 July 1996). *The Rise of Islam and the Bengal Frontier, 1204–1760*. University of California Press. p. 32. ISBN 978-0-520-20507-9.

[77] taka-The history of the **taka**, also known as the **tanka** or **tangka**, refers to one of the major historical currencies of Asia, particularly in the Indian subcontinent and Tibet. It was introduced in the 14th century and became a currency of the Silk Road.

[78] Syed Ejaz Hussain (2003). *The Bengal Sultanate: Politics, Economy and Coins, A.D. 1205–1576*. Manohar. ISBN 978-81-7304-482-3.

[79] Ibn Battuta (1304-1378)- Moroccan traveler who visited Bengal in 1346 AD. he wrote a book name 'Rehla' about his traveling

that travel the river carrying people and products, the marketplaces that line its banks, and the Chinese junks that moor at Sonargoan port on their route to Java. The exchange of grains between Bangladesh and the Maldives was also brought up[80].

In the 1700s, Dhaka had a population of over a million people, was one of the richest cities in the world, and had an estimated 80,000 expert textile weavers working there. Within a generation, the people of Dhaka, which formerly exported textiles made of silk and cotton, steel, saltpeter, and many agricultural and industrial products, were reduced to beggars and starving to death. Prior to British colonialism, Moghul India may have had 25% of the global GDP, but over 50% of it was based in the State of Bengal, the richest and most industrialized state in Mughal India, with Dhaka serving as its capital. Therefore, it may be said that Bangladesh made up about 12 percent of the world's GDP, whereas contemporary India had a comparatively minor share[81].

1.6.4 The Present Economy of Bangladesh

Bangladesh's economy is a sizable emerging market economy[82]. South Asia's second-largest economy[83], Bangladesh's economy ranks 25th globally in terms of purchasing power parity and 35th globally in nominal terms. Several financial institutions consider Bangladesh to be one of the Next Eleven, an emerging market, a middle-income country, and a frontier market. Bangladesh is a participant in both the World Trade Organization and the South Asian Free Trade Area. Bangladesh's GDP grew by 7.2% in the fiscal year 2021–2022 as a result of the worldwide pandemic[84]. One of the economies in the world with the quickest growth rates is Bangladesh.

The nation contains around 24,000 km of waterways, of which 16 percent (3,800 km) are navigable during the dry season and 25 percent (6,000 km) during the monsoon (BIWTA, 2018). The country has 173 million people[85]. The Department of Shipping has tallied about 12,500 registered boats for Inland Waterway Transportation (DOS, 2019). Over a million unregistered country boats that are in use on all waterways have an impact on peoples' economic well-being. Nearly 90% of all imports and exports are handled by the two largest ports in the nation, with a significant portion (more than 85 million Tons annually) being transported inland by inland water transports. The Protocol of Inland Water Transit

[80] Rehla, English translation by Mahdi Husain as the Rehla of Ibn Battuta, Boroda, 1953; Muazzam Hussain Khan : *Fakhruddin Mubarak Shah of Sonargan*, Dhaka, 2005.

[81] https://www.thedailystar.net/op-ed/politics/which-india-claiming-have-been-colonised-119284

[82] market economy- is a type of economic system where supply and demand regulate the economy, rather than government intervention.

[83] Chowdhury, M.S. (2007), "Overcoming entrepreneurship development constraints: the case of Bangladesh", Journal of Enterprising Communities: People and Places in the Global Economy, Vol. 1 No. 3, pp. 240-251. doi:10.1108/17506200710779549

[84] "Bangladesh Economy, Politics and GDP Growth Summary - The Economist Intelligence Unit". *Country.eiu.com*.

[85] https://worldpopulationreview.com/countries/bangladesh-population

and commerce (PIWTT) between Bangladesh and India has recently been reinforced by the Bangladeshi government in order to increase chances for transboundary commerce between the two nations. According to DS, September 6, 2020, BIWTA, the amount of cargo transported across inland waterways between Bangladesh and India has just about quadrupled, from 1.44 MT a decade ago to 2.78 MT during FY 2019–20[86]. [65]

1.7. Conclusion

Bangladesh is the world's largest Delta. Two mighty rivers, the Ganga and the Bramaputra, travel from this country and then fall into the Bay of Bengal. In this chapter, political, geographical, cultural, religious, and economic histories and heritages were presented. Some River related literature was presented for understanding the beliefs and relations between the river and our everyday lives. River and river-related culture, literature, and religious rituals were practiced from the Vedic period to today. People are dependent on rivers for their livelihood, agricultural irrigation, fishing, waterways, socio-economic activities, cultural practices, religious rituals, and sports.

The economy and commerce of the Deltic riverine landscapes are significant from the ancient period. Delta is full of resources, for these foreign nations come here for commerce and later make their colonies here. Rivers are used as easy waterways to connect with foreign trades. This study area is famous for international trade and commerce, the cause behind these are analyzed in this chapter. An analysis is presented on the basis of historical evidence of geography, politics, culture with religious values, and economic activities to understand the riverine landscape significance of the Delta.Every river of the study area has heritage values, and itself is a living heritage. To understand its heritage values, we have to study the river and the interaction between the river and inhabited places.

The next chapter is also an historical analysis but it is more the study area focused. It will be an analysis of the history of the capital city, its population growth history, water urbanization history, and analyzed the older master plans, as well the economic history of the study areas.

[86] https://www.maritimegateway.com/trade-flourishes-through-protocol-routes/

Chapter II: The riverine landscape that shaped up the capital, Dhaka, over time is one of the best examples of water urbanism.

Dhaka was characterized as a city on an island in the "[...] broadest and most eastern branch of the Ganges" in a London-based magazine article from March 1756.

[It is the] largest city in Bengal, and manufactures the best and cheapest cotton and silk. The cheapness of provisions here is also incredible. In short, it is a populous and wealthy town, and resorted to by merchants from China, and diverse parts of India. (N.n. 1756: 123)[87]

Figure 2.1: A view of the River Buriganga /A Ghat/ Trading Center on the bank of the River Buriganga[88]

Deltic Riverine Landscape of the Ghat/ Trading Center -Water based Trading Center on the Bank of the River Buriganga. There are different types of boats in the painting that were used for goods and

[87] N.n. 1756. An Account of the Kingdom of Bengal, in the East-Indies, and of the Trade carried on there by the European Nations. Universal Magazine of Knowledge and Pleasure, 18. N.n. 1765.

[88] https://collections.vam.ac.uk/item/O105764/painting-frederick-william-alexander/ Accessed 08.06.2023
(Painting, view of the river Burhi Ganga, by F. W. A. De Fabeck, watercolor and pencil on paper, Dhaka, 1861)

people's movements. The building that was shown in the painting presented the characteristics of Mughal architecture (due to the arches, windows, and dome /gumbaz). Lang thatch huts /houses represent the trading areas.

Figure 2.2: Present view of the Deltic city[89]

2.1 Introduction

Dhaka is the capital city of Bangladesh, and it has a vibrant history as a capital. The river system of this city is the main feature that made this area a capital in different time periods. It has long been a significant historical figure and a prominent political, cultural, and economic hub. Dhaka is one of the fastest growing megacities in the world. It is the 4th most populated city after Tokyo (Japan), Delhi (India), and Shanghai (China)[90].

Such amazing water urbanism dynamics have influenced present and upcoming issues of city development. Given how little attention has been paid to the city's riverine landscape history, it is even more astounding how disconnected Dhaka's past, present, and future urban concerns are from one another. The aim is to investigate the nature of the riverine landscape character as a planning issue for city development.

[89] https://www.worldatlas.com/cities/10-largest-cities-in-the-world.html, Accessed 08.06.2023

[90] (https://www.worldatlas.com/cities/10-largest-cities-in-the-world.html)

The city stands upon the northern bank of the Boorigonga [Buriganga], about eight miles above its confluence with the Dullaserry [Dhaleswari]. The river, which is here deep and navigable, by large boats, expands in the season of inundation to a considerable breadth, and gives to Dacca with its minarets and spacious buildings, the appearance, like that of Venice in the west, of a city rising from the surface of the water. (Taylor 1840: 86)[91].

Due to the deltic riverine landscape character, the land is fertile for agriculture, and the air carries humidity, which helps to produce a very high quality cotton fabric that is scientifically proven[92]. The deltaic rivers have better navigation because of the proximity of the Bay of Bengal, the foreign voyagers were came here for trade so naturally it becomes an international economic area.

The main focus of this chapter is to understand how the deltic riverine landscape feature influenced the different rulers to select these areas as their capital from 2500 years ago to now. And analysis of the master plans to understand riverine landscape analysis by the experts.

2.2 History of a Capital-Deltic Riverine Landscape Character is the greatest factor for shifting location of the capitals till 19th century

In the past 2,500 years, the city of Dhaka has prospered, collapsed, and reemerged at least five different sites (Figure 2.3), the locations are— Wari-Bateshwar, Savar, Vikrampur, Sonargaon, and the current position where it first appeared in the early 17th century. It was revealed that Dhaka will continue to exist as an urban center, but with other names and in nearby regions due its closeness to the Bay of Bengal and interior rivers. As a result, Dhaka's precise locations have all been within a radius of around 50 miles and all the settlements show a similarity in terms of geographical settings, located in between two major rivers - either as an island. The old capitals and Dhaka have a greater riverine landscape influence of the core of the Delta, where several phases of Dhaka first developed.

First time

WariBateshwar, approximately 45 miles from modern-day Dhaka, was possibly the first of these geographically informed places. The urban location served as a trading hub for the Indian Ocean, as shown by its cash-based economy in the 300 BCE and Buddhist symbols are imprinted on ancient silver punched coins[93].Alt hough Ptolemy's knowledge of this area has since been questioned, there are reasons to think that coastal Bengal would not have attracted as much interest during Alexander's time if it had not been a prosperous trade location.

Second time

[91] Taylor, James. 1840. A Sketch of the Topography and Statistics of Dacca. Calcutta: Military Orphan Press.

[92] https://www.thedailystar.net/views/in-focus/news/the-dhaka-muslin-industry-2136751

[93] 20.Rahman, M. (2012). City of an architect (pp. 11-60). Dhaka: Delvistaa foundation.

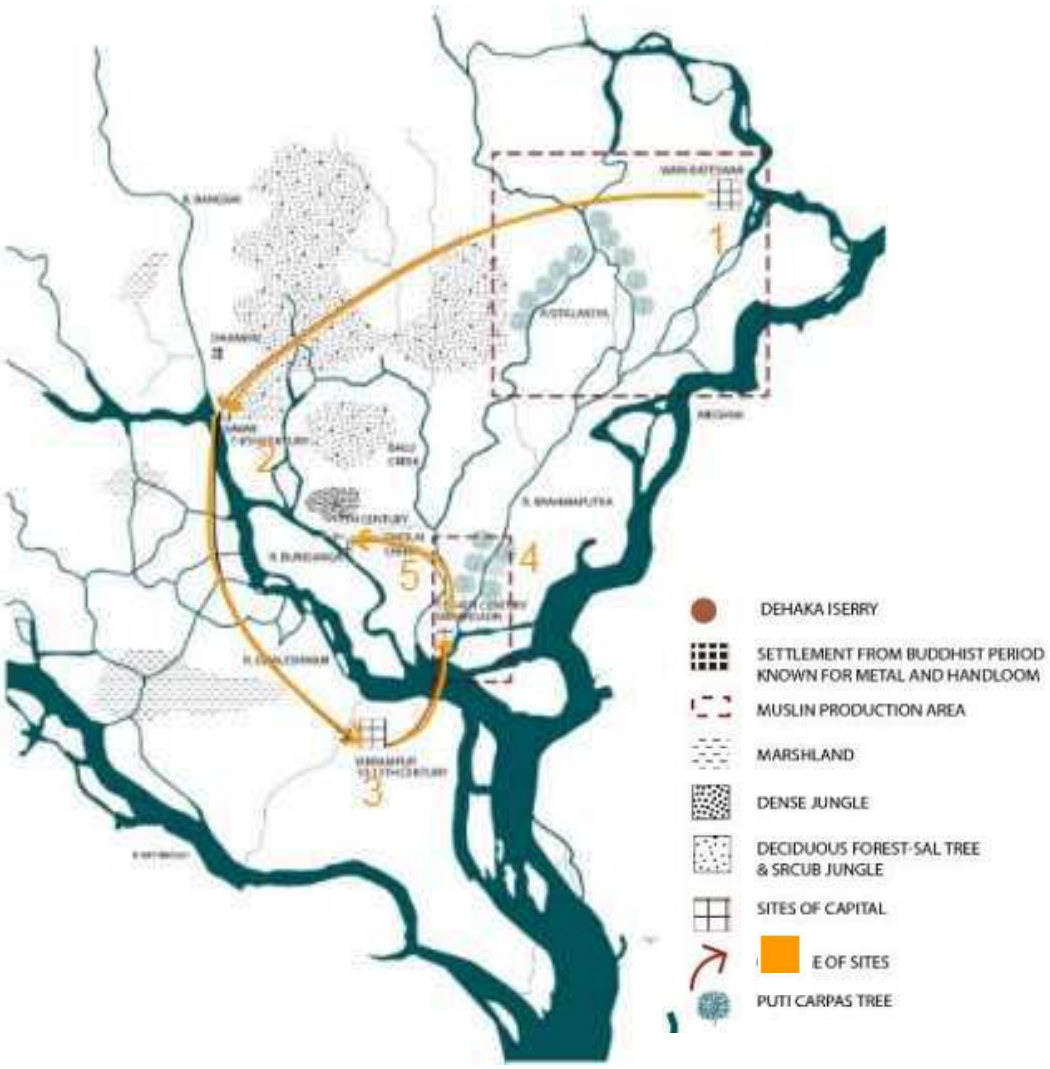
Vikrampur formed the second phase of Dhaka. Raja Vikramaditya, who lived in the first century BCE, is credited with coining the name "Vikram." According to legend, Vikramaditya traveled throughout India, choosing as his royal residence an island at the confluence of the Ganga and Brahmaputra[73].In his article A Sketch of the Topography and Statistics of Dacca, James Taylor, a colonial government officer stationed in Dhaka, says that three of the Pala dynasty's forefathers established in various parts of the Dhaka district, including Savar, Kapasia in Bhawal, and Tullipabad.

Third time

Many physical structures serve as witnesses to the third phase of Sonargaon's history as the pre-Mughal Muslim Sultanate's capital, which is widely recognized as a part of national heritage.

Fourth time

During the Mughal Empire in the 17th century, Dhaka got the status of capital of Bengal. In 1608, Islam Khan, a Mughal viceroy, declared Dhaka as the capital of Bengal, a significant administrative division of the empire. Under Mughal rule, the city grew and developed into a significant hub for trade, commerce, and culture



Map 2.1: Deltic Riverine Landscape Character is the greatest factor for shifting location of capitals until the 19th century[94].

These towns were all located near rivers or other large bodies of water. The city was well-suited to international trade and served as a strategic refuge from northern invaders due to the area's river system. Over time the deltic river changed its course lines. The 'island' type of the city character helps the city administrator with natural fortification. Without a strong naval force the bangla is almost unreachable. As the capitals are on the bank of navigable river banks, International trade is

[94] Salma Begum (2020). Reclaiming Public Open Space within the Shifting Landscape of Dhaka, Bangladesh. Civil Engineering and Architecture, 8(6), 1178 - 1193. DOI: 10.13189/cea.2020.080603. https://www.hrpub.org/download/20201130/CEA3-14891390.pdf

welcome there. From the Ancient period, this area was famous for cotton, silk, and the low price of agricultural products for the foreign traders.

It might be argued that all three regions—Wari-Bateshwar, Vikrampur, and Sonargaon—were manifestations of a single metropolis, created by the same biological characteristics and geostrategic positions of the Bengal Delta, without diving deeper into the history of Sonargaon as a metropolis. In fact, there is a theory that WariBateshwar might be Ptolemy's "Souanagoura."[95].

2.3 Population growth history of Dhaka City

Dhaka city is the home to more than 22,478,116 people, ranked 4th largest in the world with a solid growth rate of 3.26%% in 2022[96]. Dhaka holds 15.4 million people in only 1530 square kilometers. It holds the position of world's 8th largest megacity in 2013 (UN 2013)[97]. Between the years from 1990 to 2005, the city's population doubled — from 6 million to 12 million (Burkat, 2008)[98][7]. Dhaka got a population of 19,578,000 in 2018 as 9th largest city. Present population density of the megacity of Dhaka is approximately 8573 persons per sq. km (BBS, 2011).Soon this megacity come to the 4th rank in 2030 with population of 28,076,000 as predicted. (UN report, 2018) (Table 1). Until 2018, this megacity administers a huge urbanized area of 1530 square kilometers, while the city proper is compared by 360 square kilometers[99].

[95] Chakrabarty, Dilip K. 2006. Relating History to the Land. Urban Centres, Geographical Units, and Trade Routes in the Gangetic and Central India of circa 200 BCE. In: Patrick Olivelle, ed. Between the Empires: Society in India 300 BCE to 400 CE. Oxford: Oxford University Press.

[96] Kabir A, Parolin B. (2012). *Planning and development of Dhaka – a story of 400 years,* (http://www.fau.usp.br/iphs/abstracts and papers files/sessions/09/kabir_par olin.pdf) in. 15th international planning history society conference, 15–18 July. São Paulo: University of Sao Paulo press, pp. 1–20. [Accessed 28.05.2023].

[97] United Nations. (2013) World Urbanization Prospect: The 2012 Revision. Department of Economic and Social Affairs, Population Division. UN, New York.

[98] Burkat K et al. (2008) *Megacity Dhaka: urban environment, informal settlements and public health.* Geographische Rundschau. Germany. Volume 4, issue 1, pp. 5–10.

[99] Bird, Julia; et al (2018) Toward Great Dhaka, A New Urban Development Paradigm Eastward, World Bank group.

Table 2.1. Population growth of Dhaka city in the past 8 decades

Year Population	Population	Growth	Growth Rate
2023	23,209,616	2926064	0.032545
2019	20283552	2686375	0.036156
2015	17597177	2866640	0.036203
2010	14730537	2399658	0.036203
2005	12330879	2045932	0.036951
2000	10284947	1952473	0.043003
1995	8332474	1711777	0.047066
1990	6620697	1960313	0.072745
1985	4660384	1394721	0.073718
1980	3265663	1044608	0.080146
1975	2221055	847337	0.100861
1970	1373718	552978	0.108507
1965	820740	312819	0.100733
1960	507921	99055	0.044343
1955	408866	73106	0.040185
1950	335760	-	0.000000

(https://worldpopulationreview.com/world-cities/dhaka-population)[100] [101].

[100] https://www.dhakatribune.com/world/2022/12/04/dhaka-4th-most-populous-city-globally https://worldpopulationreview.com/world-cities/dhaka-population,
[101] Bangladesh Bureau of Statistics - Dhaka information and statistics.

2.4 The Rapid Urbanization and its Impact of the City Riverine Landscape Character

Now, The city this megacity has the population of 23,209,616 with a huge urbanized area of 1530 square kilometers, whereas the city proper is compared by 360 square kilometers[102].

This enormous population is particularly affected by Dhaka city's environmental issues during the monsoon since only during this lengthy season of five months (Daily Star news, 2014)[83] the city experiences significant waterlogging and pollution, due to It lost it connections between rivers and canals/khals. It must be taken into account the fact that this city lacks an effective or its natural urban drainage infrastructure. However, this city was never able to adopt any "European model" drainage system, and it was a completely incorrect course for the city's development.

All over the world, especially in the humid tropical region with strong deltic character like Dhaka; Inner-city growth has significant negative consequences on the area's water supplies. Our action plans over time have consistently lacked long-term planning. Even while we received some excellent advice from experts and academics about some planning initiatives like the DAP and DMP, etc., these recommendations were either not adequately executed or were only partially followed.

City policies had always been to promote the private companies to develop unplanned housings. As a result, the issue has been made more difficult by random encroachment under the pretense of improving infrastructure and services including the roadway network, water supply, public health, sewage, and drainage services towards the nearby floodplain and low-lying regions.

The question of preservation and conservation of the riverine landscape character is always neglected. The results are flash floods during monsoon is common, long time waterlogging, ecological imbalance, over heat during summer, environmental pollution. regrettably, it's our shame that even some government wings did some fatal treatment over the natural ecological state of this city. For example; Rajuk, the capital city development authority, filled some canals/khals, DCC (Dhaka City Corporation). It's the absence of a long visionary policy for this riverine city. The city already has a natural system of drainage— inner city rainwater falls into Khals and the Khals flows to the river and the rivers flows to the sea. For Illegal encroachment the Khals lost the connectivity and even the rivers are encroached. The city needs policies and its implementation to conserve its riverine landscape character.

Transparency International Bangladesh (TIB) noted that there were nearly 1,000 ponds in the city, now totally vanished and 800 acres of land of the surrounding five rivers, especially, both Buriganga and Shitalakshya rivers were unlawfully snatched by the developers, are clear violation of Wetland Protection Act, 2000 (Bangladesh news, 2009)[103][84].The metropolis is completely unsustainable and has changed the terrain from how it began. All temporary marshes will soon be filled if the current pace of wetland loss continues. The above discussion is also alarming for sustainability.

[102] Bird, Julia; et al (2018) Toward Great Dhaka, A New Urban Development Paradigm Eastward, World Bank group.

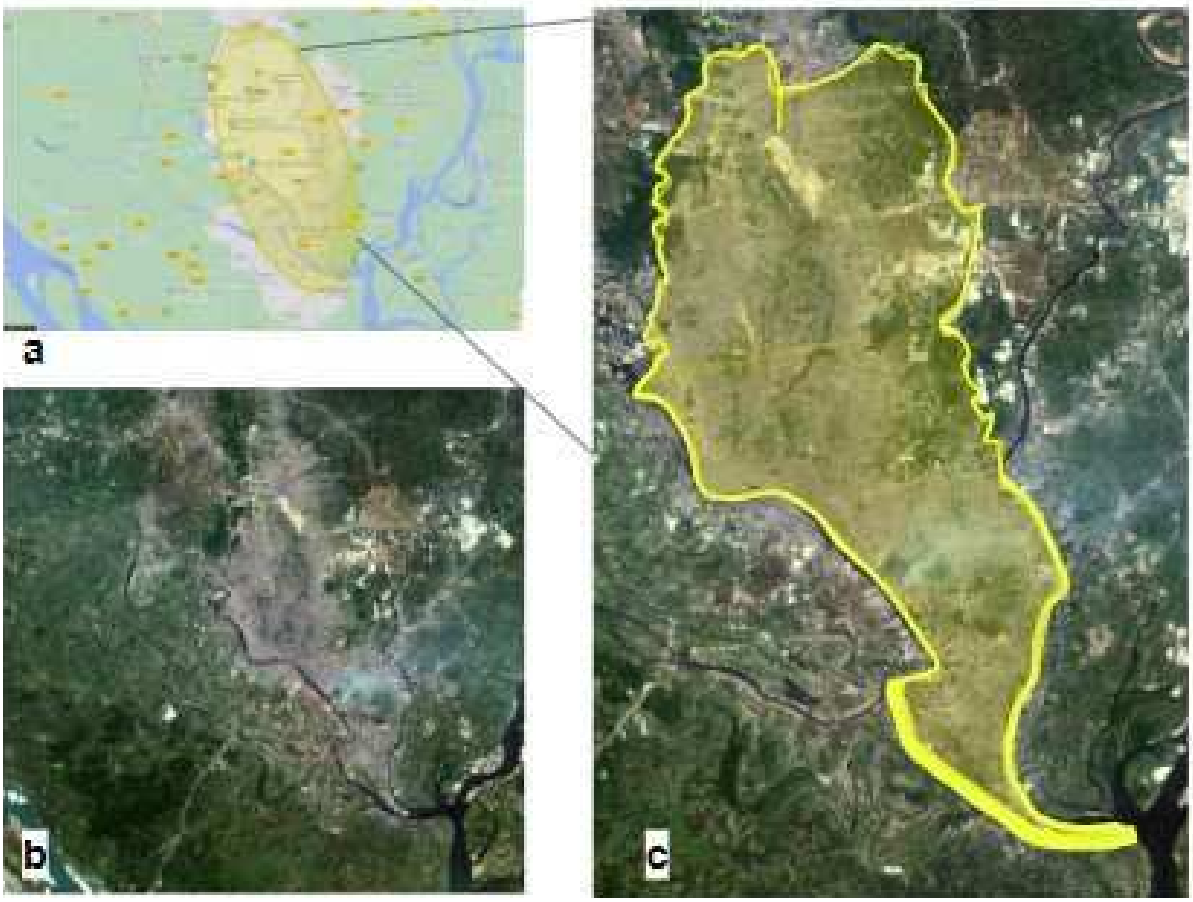
[103] Bangladesh news, (2009). http://www.bangladeshnews.com.bd/ 2009/07/30/restore-canals-wetlands to-stop-waterlogging/, accessed on 30 June, 2018

In 1947, after the 2nd world war, at the end of colonization, by examining the map, it was discovered that nearly 50% of present-day Dhaka was low-lying flood plain with a web of water bodies. But most crucially, this city's residents and officials filled all of its water bodies to build every type of structure, destroying its natural wetland surroundings, when it was freed from British colonial rule until independence from Pakistan. Open water regions and peaty Balu River floodplain areas filled the eastern section of Dhaka city in 1968, and these features may still be seen today. Unwisely, amid the recent century's fast urbanization, Western urban development strategies that ignore aquatic bodies were not even cross-checked.

To state the current natural settings and environmental situation in Dhaka city from the terms of sustainable urban riverine landscape, literally there might be no opportunities in reality, some urban planners are optimistic enough to shift the capital city to another location. According to scholars, decentralization is necessary for Dhaka while expanding the civic services and connecting smaller urban hubs with functional communications networks in the outskirts around the city. For current condition or for future it need to understand the riverine landscape and to preserved it for better liveable conditions But the burning question is how to make this city livable again? Eventually, as a capital, it witnessed recurrent morphological transformation through different periods of four centuries, so we cannot let this historic city be abandoned. How much opportunity can it provide us for its few left over water bodies?

The Focus of these Chapter will study Dhaka's historical and contemporary riverine landscapes for—

01.To understand and achieve the deltic city’s urban riverine landscape character for better policies and planning to sustain the city.



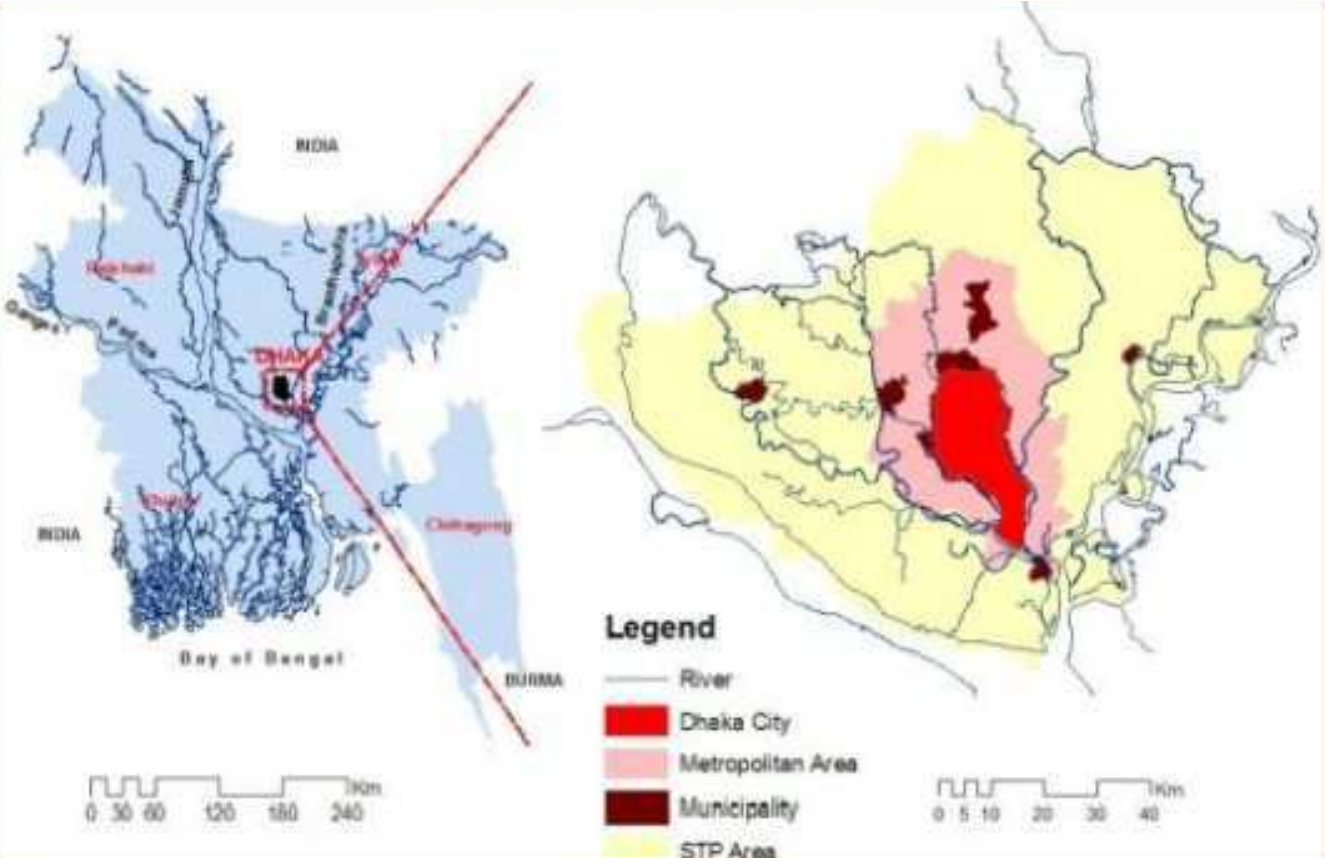
02. What factors are the most effective on water body and wetland preservation.

Map 2.2: The google Map represents the mega city and its peripheral rivers and the relation with other peripheral rivers, all the rivers make a riverine water network which is one of the greatest riverine landscape characters of this Bengal delta[104].

2.5 Urbanization History of Dhaka - 'Dhaka from Small Urban Business center to Megacity'

I.Pre Mughal Dhaka (before1608)

Pre-Mughal Dhaka was a moderate Hindu Small commerce center. According to cartographic data, the land east, north, and south of Babur Bazaar that rises to the Dholai River on the Buriganga's northern bank appears to face the ancient town. Since its founding until 1608, when the Mughal era began, it is believed that Dhaka was restricted to the Dholai Canal and the Buriganga River.

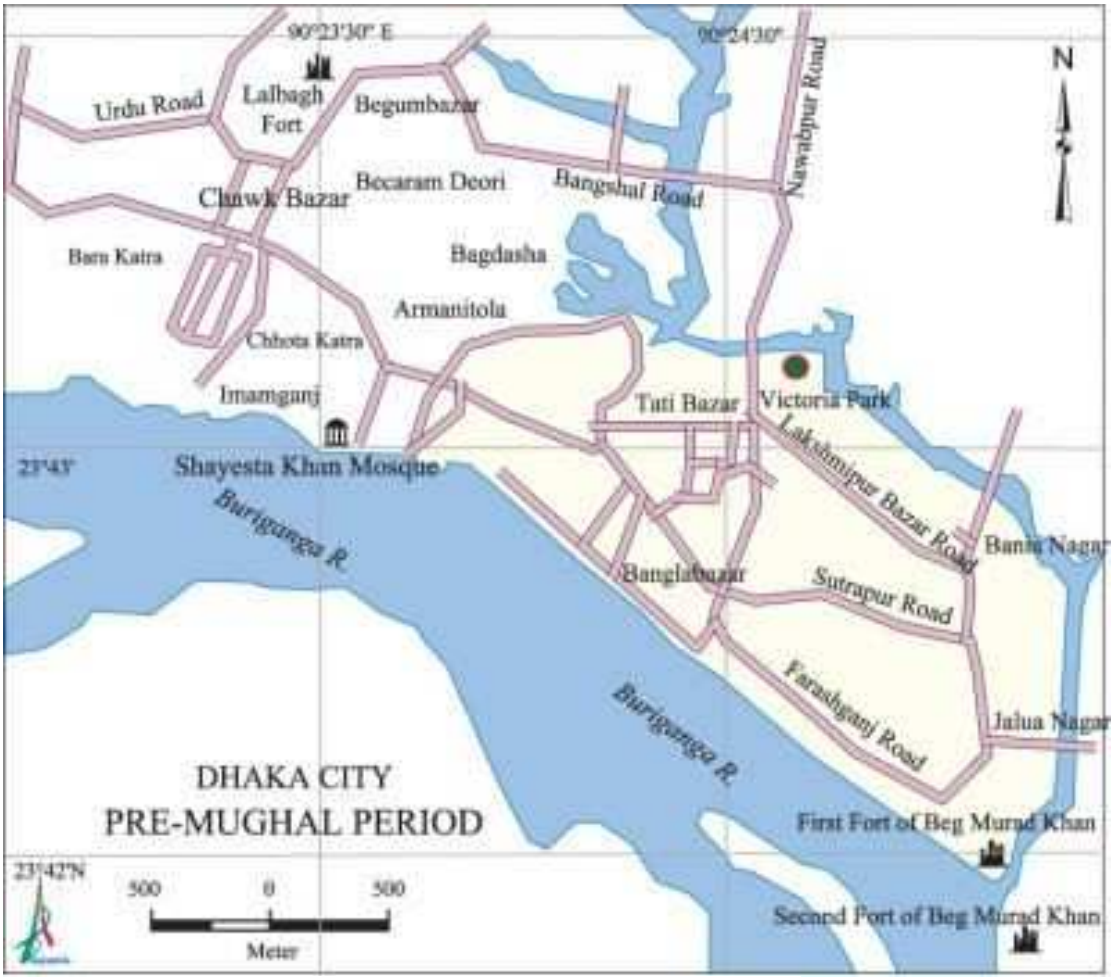


[104] https://earth.google.com/web/search/Dhaka- accessed on 15/05/2023

Map 2.3: Study Area with compare to Bangladesh and with compare to the neighboring districts and rivers[105].

The oldest city consisted of a few market centers and few localities of craftsman and businessmen like Patua-toli, Kumar-toli etc. The center is thought to have been near the Bangla Bazaar. According to Dani, the main business area was in Sadar Ghat and Victoria Park, which had extended up to Nawabpur Road in the later part of the 15th century[106]. Before the Mughal Capital the Portuguese traders settled in Dhaka in 1580.The features. The features of the city during Pre Mugal period

01. All the communication and the commerce of the city were dependent on the river.
02. Main trading materials were cotton and silk.
03. All the roads ended/ started on/from the riverbank.
04. All th city structures were river facing.



Map 2.4: Dhaka City Pre-Mughal Period[107]

[105]https://www.researchgate.net/publication/324746990_PLANNING_AND_DEVELOPMENT_OF_DHAKA-A_STORY_OF_400_YEARS

[106] http://dhakadailyphoto.blogspot.com/2007/06/maps-dhaka-and-bangladesh.html

[107] Dani, A. Hasan [1956],*Dacca: A Record of it's Changing Fortune.*Dhaka: Asiatic Press.

II.Mughal Dhaka (1608- 1764)

Dhaka was chosen to serve as Bengal's capital under the Mughals in 1610 A.D. it began to gain popularity. With the founding of Lalbagh Fort, ChandniGhat, and the Chawk [the market area next to the ancient fort, now Central Jail] in 1679, Islam Khan launched the area that was then known as "New Dhaka,"at that time and it continued to expand under succeeding Mughal Subaders until 1717[108] . The Portuguese monk Sabastain Manrique traveled to Dhaka in 1640, he estimated that the population of an expanded Dhaka was about 200,000, excluding Europeans and tourists, along 4.5 miles of the Buriganga river. Which increased in 1700 to 9,00,000[10988].

The Mughal ruins revealed the city's expansion, which mostly followed the river bank west of the Fort. The 'Old Fort' served as the focal point of the expansion. The main traits of a Mughal metropolis may be seen in this expansion of Mughal Dhaka. The Fort functioned as the city's hub, while the nearby markets and surrounding mohalla[110] grew as a result of residential requirements, following the city's well-established layout of meandering roadways.

The features of the city during Mughal Period —
Since there isn't a complete map of the city, this study led to the creation of a second reconstruction of Mughal Dhaka. Rather, it is based on historical evidence and the findings of other researchers who have made an effort to map out the city's limits. It is likewise based on the original map from 1859.

01.The sections north and north-east of the fort expanded primarily as residential areas, whereas the areas south and south-west of the Fort up to the river bank grew as commercial areas[111].

02.The provincial capital was previously relocated to Murshidabad in 1717, Islam Khan founded the "new Dhaka," which continued to grow under the subsequent subahdars. Dhaka was regarded as the provincial capital for just over a century, but due to administrative demands and expanding commercial activity, Dhaka has since developed into a metropolis.

03.Mughal Dhaka encompassed "old Dhaka" within its boundaries and stretched to the north to the Fulbaria region, which lies on the fringes of the Ramna area, to the west to Rayer Bazar, and to the east up to Narinda (Figure:2.7).

---

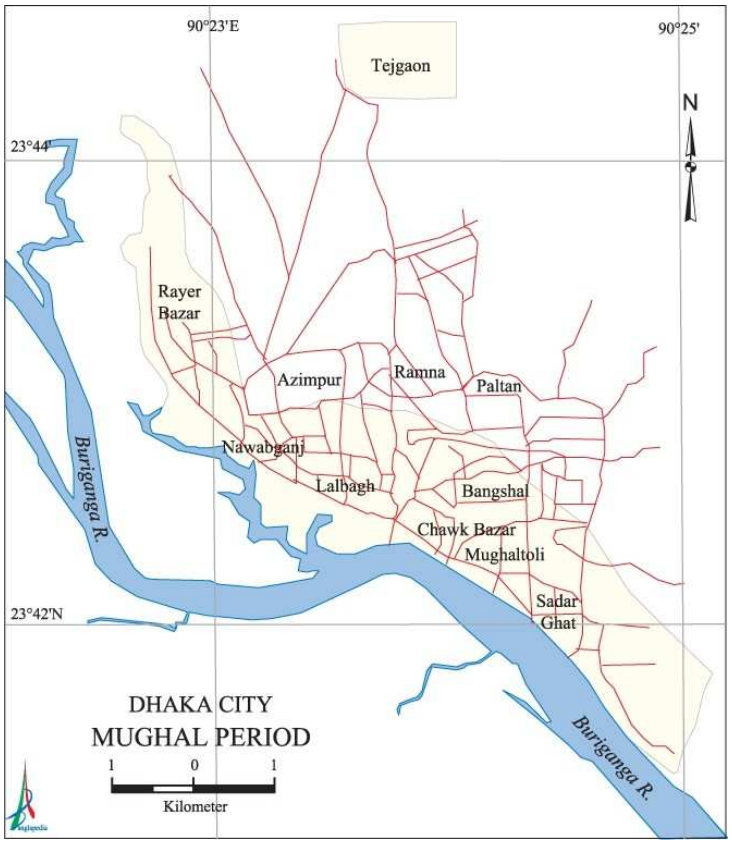
[108] Taifoor, Syed Muhammed [1956],Glimpses of Old Dhaka.Dhaka: Pioneer.

[109] Dani, A. Hasan [1956],*Dacca: A Record of it's Changing Fortune.*Dhaka: Asiatic Press.

[110] mohalla also means an urban neighborhood.

[111] .Chowdhury, A. M. & Faruqui, Shabnam (1991), ÒPhysical Growth of DhakaÓ, in Sharif Uddin Ahmed (ed.), Dhaka Past Present Future. Dhaka: The Asiatic Society of Bangladesh. p.43- 63.

04. At that period, all other European nations except the Portuguese like the Dutch, the French, and the English came to Dhaka for business purposes by using the Bay of Bengal and River Buriganga.



Map 2.5: Dhaka City Mughal Period[112].[91]

III. Dhaka in the Pre-Colonial Period- Rule of the East India Company [1764-1857]

In 1757, The colonial ruler took the administrative power of this subcontinent. That time was a transitional point for Dhaka and Dhaka saw a severe drop in its economy, population, and administrative prominence with the fall of the Mughal Empire in 1707, which led to the subsequent shrinking of the urban area. In 1764, an English commercial corporation gained political dominance and took over administration of Dhaka. The features of the city during Pre-colonial Period —

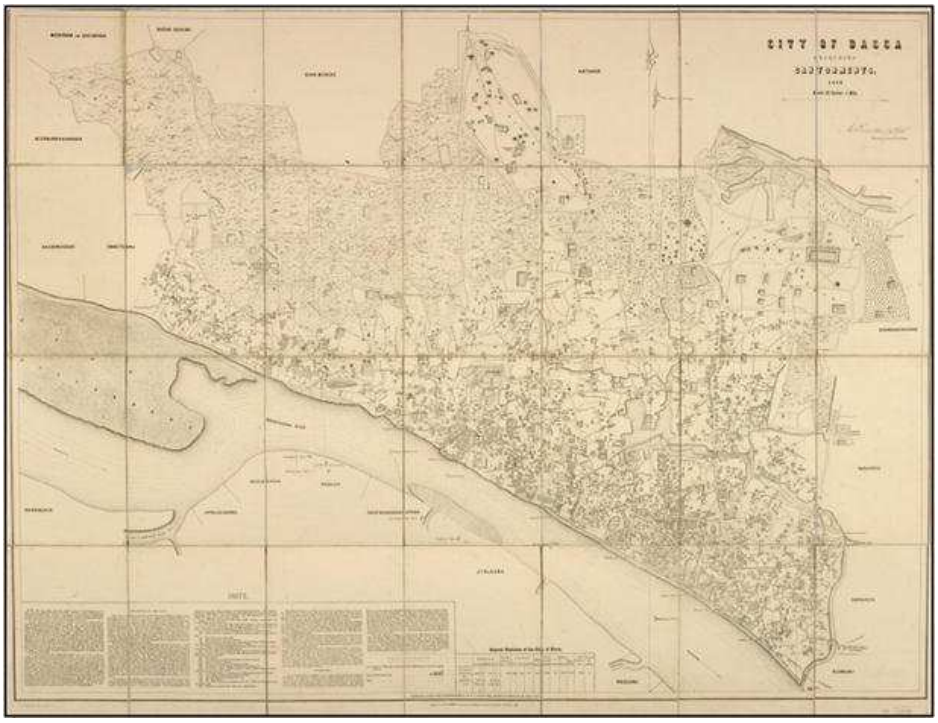
01.The historic fort and its surrounds continued to be the center of the city, where all the central and provincial offices were still housed, and the majority of the commercial operations that persisted were conducted there[113].

[112] https://en.banglapedia.org/index.php/Dhaka#/media/File:DhakaMughalPeriod.jpg

[113] Ahsan, R. Majid [1991], "Changing Pattern of the Commercial Area of the Dhaka City", in Sharif Uddin Ahmed [ed.],Dhaka Past Present Future . Dhaka: The Asiatic Society of Bangladesh.p.396- 414.

02.Dhaka's population fell to 200 thousand in 1800, matching that of 160 years earlier. According to Rennell In 1793, the city was four miles long and two and a half miles broad. By 1814, those dimensions had decreased to three miles long and one and a half miles wide[114].

03.Rennell created a map of Dhaka in 1859 that showed it to be located between Narayanganj and Iron Bridge, as well as between the Buriganga River and Nimtali Kothi (the current Asiatic Society). The jungles on this map represent a population drop and the following shrinkage of the urban area. In actuality, the area of Dhaka city shrunk due to declines in the economy, population, and administrative importance. [Figure:2.8]



Map 2.6: One of the Land Use map of Capital Dhaka During British Colonization[115]

IV. British Colonization of Dhaka [1858-1947]

The urban area of Dhaka expanded from 6 square miles in 1947 to 25 square miles in 1962, a 20-year period. Initially, the Ramna area's government buildings were appropriated to meet the demands of the

[114] Mamun, Muntasir [1990],Coronel Davidson Jokhon Dhakay.[Bengali] Dhaka: Pallab Publishers.
[115]https://www.researchgate.net/figure/Map-of-Dhaka-in-post-Mughal-period-Surveyor-Generals-Map-1859_fig3_303956315.

administration. To organize the city the colonial administration commissioned town planner Sir Patrick Geddes for Planning Dhaka. He gave his urban design proposals in 1917. The features of the city during British Colonization Period.

01.The historic Mughal town did not grow during British administration, but it experienced a significant physical restoration without a clear design. This turned the ancient city of Dhaka into a contemporary one with streets made of metal, open areas, street lights, and a piped water supply[116].

02.In order to connect the city with locations outside of Dhaka, the State Railway was established in 1885–1886[117]. The positioning of the railway line provides information about the existence of the major city in the neighborhoods to the south and west of the loop that is created by the railway line. But at Ramna, beyond the train line, construction of a new town began.

03.The majority of the residential areas were located inside the historic center, and high income people cherished their access to the Victoria Park and riverfront areas. The old center had a disorganized road layout to the south, but Wari and Gandaria, two planned residential neighborhoods, were where the city's first grid-style road system was established in 1885[118].

04.Bengal was partitioned in 1905, in the midst of British rule, and Dhaka was chosen as the capital of the eastern portion. The establishment of Dhaka University in the area of Ramna in 1921 was another important event for the city of Dhaka. The city boundaries are defined as following: Buriganga in south, Tongi north, Mirpur west, and Postogola east in early records of the East India Company [1786][119].

05. With the introduction of rail, An industrial zone grew towards the north-middle part of the city, along with the railroad. The city started to grow toward the north.

06. New European urban design elements were introduced like the racecourse field, victoria park, Industrial area, Cristian graveyards, churches, Buckland Dam on the north of river Buriganga etc which make the city more sustainable for the colonial administration as well as for the city dwellers.

V.Dhaka as the Capital of Pakistan [1947-1971]

After 200 years of colonialism, the British Colony gained its independence, and Dhaka was designated the province capital of East Pakistan. Dhaka did not experience a significant colonial influence, in

[116] Ahmed, Sharif Uddin [1986], Dacca: A study in Urban History and Development. London: Curzon Press

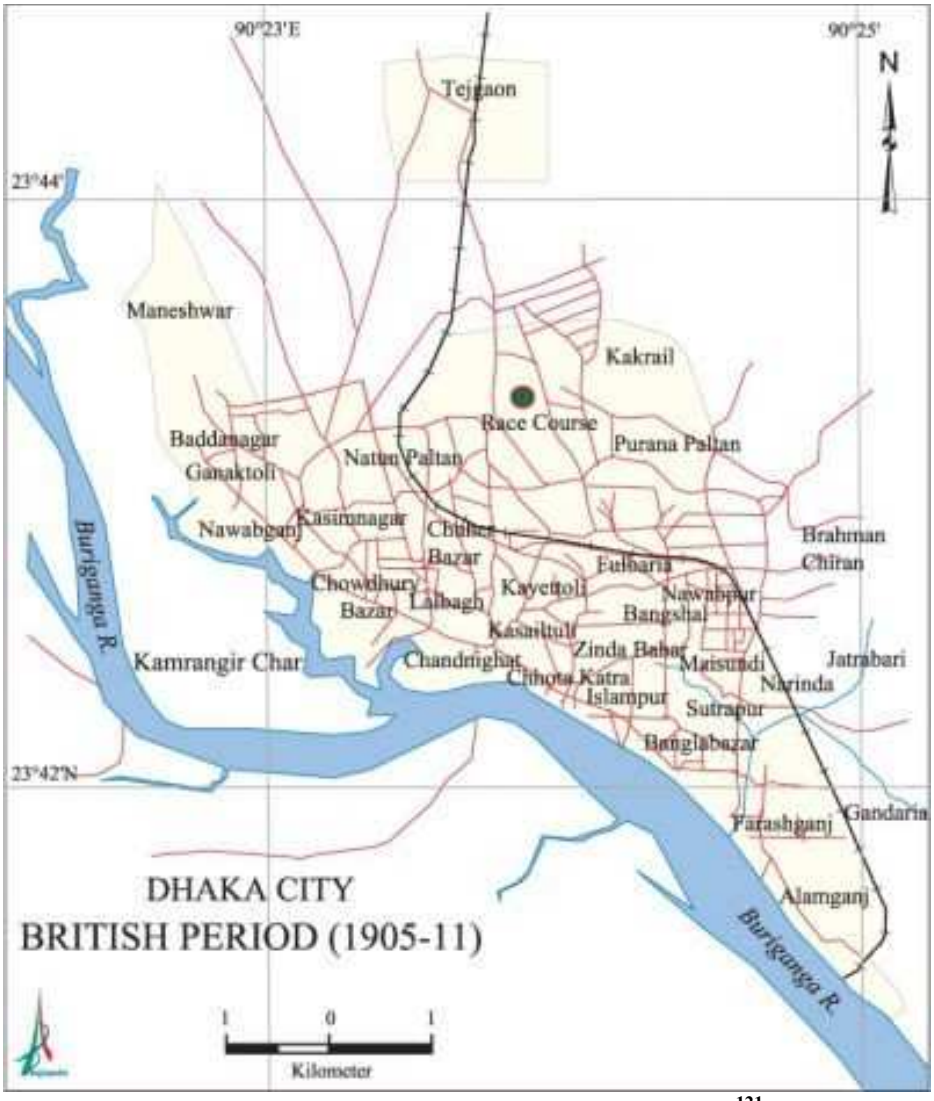
[117] Ahsan, R. Majid [1991], "Changing Pattern of the Commercial Area of the Dhaka City", in Sharif.

[118] Islam, M. Nazrul [1996], Dhaka from City to Megacity. Dhaka: Urban Studies Programme, Department of Geography, Dhaka University.

[119] Karim, A. [1964], Dacca: the Mughal Capital. Dhaka: Asiatic Society of Pakistan.

contrast to many other colonial cities in India. Beginning in 1947, the city started to grow[120]. The features of the city during Pakistan Period—

01.Administrative, commercial, and residential requirements brought a surge of people, which led to a major expansion of the city. The north was where the city grew the fastest.



Map 2.7: Map shows Dhaka During (1905-11)[121].

02.After 1955, the Dhanmondi region, which was formerly bordered by paddy fields and is located on the northwestern edge of Dhaka, became a residential neighborhood. The Mohammadpur and Mirpur highlands were occupied on each side of the Mirpur Road, which served as an axis. The city started to grow through the axis.

[120] Haq, A. T. M. Zahiru,[1991] "Transport planning for Dhaka City."in Sharif Uddin Ahmed [ed]Dhaka Past Present Future. The Asiatic Society of Bangladesh, Dhaka

[121] https://en.banglapedia.org/index.php/Dhaka

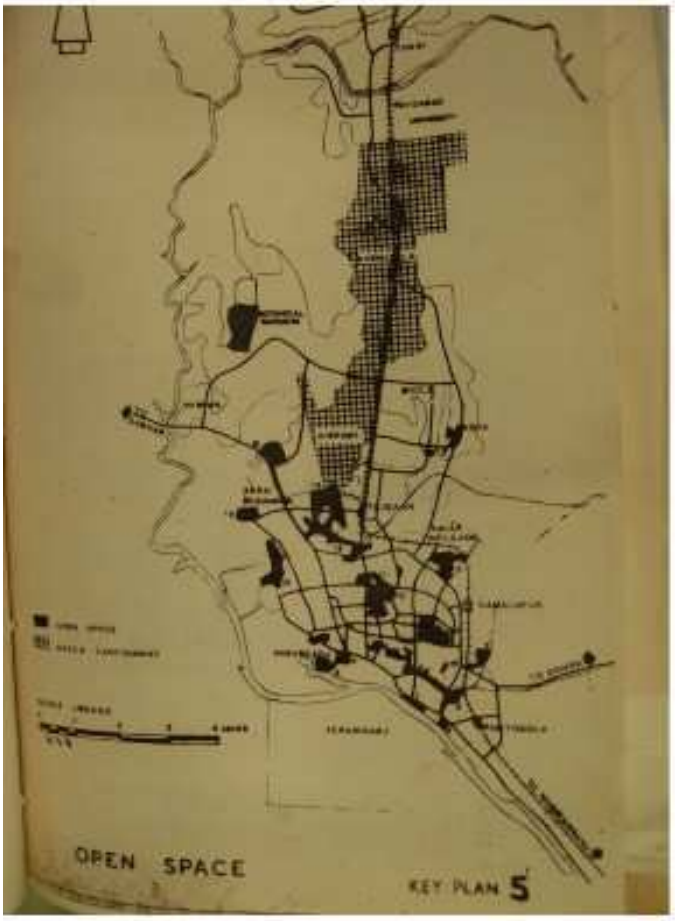
03. In 1956, the government established the Dacca Improvement Trust (DIT) and DIT commissioned a British urban planning firm to design concepts for this growing city. began piecemeal planning for the industrial district in Tejgaon, the New Market in Azimpur, the staff housing in Motijheel, and the high-income residential area in Dhanmondi[101].

04.The year 1960 is depicted on the next available map. The Pakistan era was in its midway stage at the time. In comparison to the preceding phase, the city had significantly expanded and emerged as a cohesive entity with some separated areas at its northern and eastern ends. The ancient city appears to be the segregated portion of this overall framework.

05.In every way, Dhaka was growing in the 1960s. In 1952, the growth of Dhaka was restricted to a small region, mostly in Tejgaon and close to the present-day Sher-e-Bangla Nagar neighborhood, which had historically been the site of British residential and industrial concentrations.

06. Urban planner and Architect Louis Kahn were commissioned for the 2nd parliament building for Pakistan which grew as an individual satellite city within the city—Sher-e-Bangla Nagar which is still successful and world renowned.

The entire system was made up of extremely loosely built sections in the northern portion of the city and intricate and dense organic development along the riverbank, or the ancient city.



Map 2.8: Open space in the Dhaka Master Plan 1960. Source: Dacca Improvement Trust 1960[122].

VI.Dhaka as the Capital of Bangladesh [1971-2023]

In 1971, Bangladesh gained its independence, and Dhaka was designated as the nation's capital. "Dhaka City's growth in the 1950s could very well be described as slow and gradual, the pace picked up in the 1960s, and in the years following Bangladesh's establishment, it could be said to have been rapid." be phenomenal[123][Chowdhury & Faruqui, 1991:60]. After Independence, floating populations created pressure on the city, which led to the development of slums in any open spaces between densely populated districts. All the government head office are established in Dhaka the main commercial and industrial activities are growing there. So, it has become the best place for job opportunities. Job opportunity works like a pull factor and the population grows faster and the capital city turns into a mega city. Overpopulation, slums, squatters, failure of implementation of planning

[122]https://www.academia.edu/245137/
Urban_Morphology_of_Dhaka_City_Spatial_Dynamics_of_Growing_City_and_the_Urban_Core.

[123] Chowdhury, A. M. & Faruqui, Shabnam (1991), ÒPhysical Growth of DhakaÓ, in Sharif Uddin Ahmed (ed.), Dhaka Past Present Future. Dhaka: The Asiatic Society of Bangladesh. p.43- 63.

guidelines means the city loses all kinds of cultural landscape features. Whereas the city has a strong riverine landscape character.

The recent emergence of high-rise structures in both the business and residential sectors makes it abundantly evident that the city's mountain ranges have been used up. The city lost connection with its peripheral river as well as the city lost its own water network. As a result, Dhaka has begun to rise, a natural and regular occurrence in many contemporary cities with high populations and limited room for horizontal expansion owing to topographical constraints. The urban nature of Dhaka is about to alter, as the water network works like the blood circulation of the human body. For the name of development the natural waterbody filled and roads, buildings etc were made over it. Over the period of roughly four centuries, Dhaka has transformed from a tiny suburban town to a megacity. The features of the city during Bangladesh —

02.The flood protection embankment, which was constructed around the city in 1990, helped to shield it from the effects of flooding while also inspiring private entrepreneurs to develop new residential areas by filling in low-lying marshy lands on both the eastern and western sides of the built-up city. Which is very contrast to its previous landscape feature — the city city is composed of lowland and highland.

03.From 1949 to 2023, Dhaka expanded within the bounds set by the Mughals [i.e., toward the north up to Tongi, toward the north-west up to Mirpur, and toward the south-east up to Postagola]. However, as a result of the population increase, many low-lying regions were filled in and the low-lying portions on the eastern and western sides were completely settled. The high lands that were expanding towards the north began to be inhabited as population pressure increased. A planned city has not been created with any real effort.

04.The 1st , 2nd and 3rd Buriganga bridge expanded the city and connected the two sides of the historical river Buriganga.A lot of significant housing projects have been built in the previous 35 years entirely on private initiative, but most of them didn’t follow the wetland protection laws. And it is becoming a new participant in the development of the city of Dhaka.

05.Although a thorough research on urban elements was started in 1981, it never happened. Dhaka has been expanding due to demand. For the capital city, a Structure Plan was created in 1995, after that worked on, the structure plan's detailed area plan and then revised detailed area plan were provided from the last century the capital city going through different master plans those are: There is a huge difference between a master plan and its implementation.

The city developed with the guideline of the development partner which is in contrast to the indigenous pattern. It almost lost its own landscape character, its waternetwork. The development of

the city is not sustainable for the present and for the future as this development didn't make a bridge with the past of the city.

2.6 Establishment and the Development of Dhaka and its Relation with Rivers, canals and the master plans- Planning Initiatives for Dhaka City

Because of the city's ongoing geo-commercial prominence, the British government chose Dhaka as the capital of the new province of Eastern Bengal and Assam in 1905. During the pre-plan phases, three issues dominated Dhaka's environmental dynamics:
First, the need to save the city or relocate its locations in the context of river bank erosion; and
Second, there was an unavoidable urge to maintain the city's status as an emporium connected to the Bay of Bengal. The Mughals devised a plan to prevent the city's river bank from eroding, and as British dominance increased, the ecological benefit of the Mughal capital's location was recognized. However,
Third, Dhaka began to grow in population again in the latter part of the 19th century, the British were compelled to institute some kind of planning.
Since the start of last century, the British Raj has organized the city by commissioning an urban planner. After that the pakistan government and Independent Bangladesh also provided a number of master plans. Following are the master plans that are provided for the city -

I. Sir Patrick Geddes Town Planning proposals for Dhaka in -1917
II. Dacca Master Plan 1959
III. Dhaka metropolitan Area Integrated Urban Development Project1981
IV. Dhaka Metropolitan Development Plan (1995-2015)
V. Detailed Area Plan (DAP 2015)

I. Sir Patrick Geddes Town Planning proposals for Dhaka in -1917

Sir Patrick Geddes promoted the idea that knowing history is the first step in designing the present and future after visiting fifty Indian towns, including Dhaka, between 1915 and 1919. 256 [Spodek, 1993][124] Geddes continued by comment that -

"The diagnostic survey . . . seeks to unravel the old city's labyrinth and discern how this has grown up. Though, like all organic growths, this may at first seem confused to our modern eyes, that have for so long been trained to a mechanical order, gradually a higher form of order can be discerned - the order of life in development . . . In city planning then, we must constantly keep in view the whole city,

[124] Spodek, Howard [1993], "Beyond Research Tests: Palimpsest and Nodes, Conflicts and Consciousness in south Asian Urban theory", in Howard Spodek and Doris Meth Srinivasan [eds.], Urban Form and Meaning in South Asia: The Shaping of Cities from Prehistoric to Precolonial Times. Washington: National Gallery of Art. p. 255-267.

old and new alike in all its aspects and at all its levels. The transition in an Indian city, from narrow lanes and earthen dwellings to small streets, great streets and buildings of high importance and architectural beauty, forms an inseparably interwoven structure. Once this is understood, the city plan ceases to appear instead as a great chessboard on which the manifold game of life is in active progress". [Geddes, 1919 as in Tyrwhitt 1947: 26-27][125]

The planned development of Dhaka in the wake of Geddes' report was remarkable. The original homes in Ramna were built among "true wilderness." The Race Course, which is now Suhrawardy Park and the city's most noticeable green space, was constructed. South of it, the government buildings were built, while north of it, a large garden neighborhood with white bungalows for the civil service was planned. However, it is reasonable to believe that a large portion of the wetlands vanished with the development of the former British Dhaka. The first ecologically irresponsible projects in Dhaka started with the city's growth away from the river Buriganga in the early 20th century. The importance of the smaller water areas, such as canals, as stressed by Patrick Geddes, was disregarded. As a result, the chance to include tiny water spaces into the built environment of contemporary Dhaka was lost. These spaces may have been conserved, utilized, and functioned as an essential component of both urban life and drainage. The most gorgeous section of the city is still the growth of areas that followed Geddes' study, nevertheless.

II. Master Plan-1959

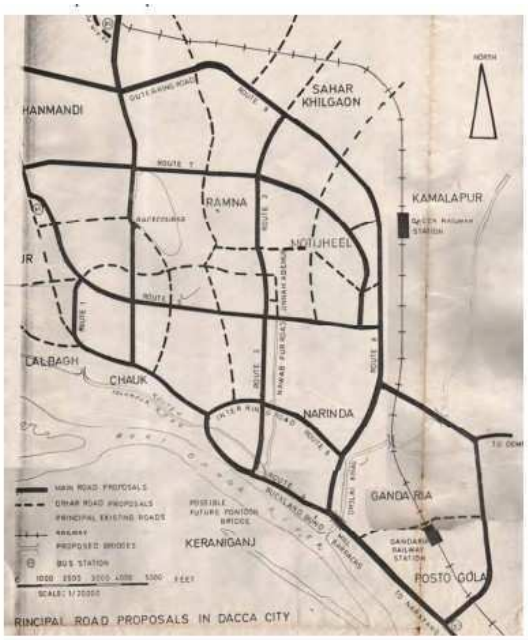
East Pakistan Planning Sub-Committee-1948

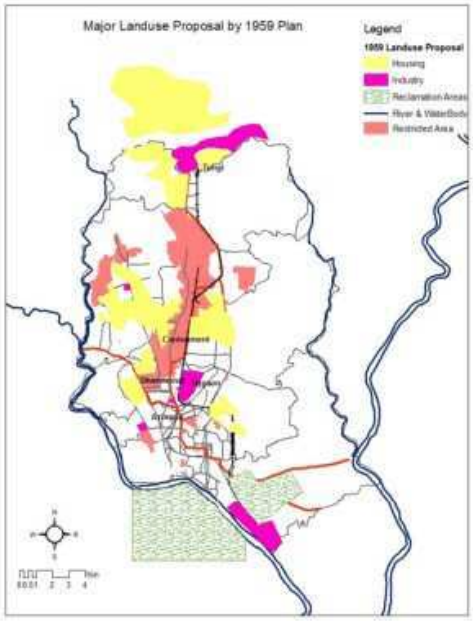
To accommodate the fast development, it was considered that adequate planning was necessary. The East Bengal (or East Pakistan) administration established a planning division in 1948 as a result of the lack of a planning organization, and a subcommittee within that division drafted a physical plan for the city's growth (Islam, 1996b)[126]. However, there was no official background research included in this design. The strategy was a form of development plan with a 50 square kilometer radius.

This committee tries to introduce different zones for the city, while the city has its own distinctive mixeduse character. Different area was used for different purposes like residential area, commercial area, industrial area all are well connected with the road network. These new physical developments, though piecemeal in their efforts, reflect European concepts of urban planning and design with functional zoning of land use (Mowla, 2007)[127].These represented the first introduction of the Western concept of 'sites and services' and the 'core house' for the general masses.

[125] Tyrwhitt, Jacqueline [ed.] [1947], Patrick Geddes in India. London: Lund Humphies. Dhaka Metropolitan area Integrated Urban Development Project [DMAIUDP], [1981], Final Report. Vol. 2. Dhaka

[126] Islam, N. Dhaka from City to Mega City: Perspective on People, Places, Planning and Development Issues: Urban Studies Programme, Department of Geography, University of Dhaka.1996b, Reprint.





Map 2.9.a: Map showing proposed road network for Dhaka city in DIT Master Plan, 1958 Source: DIT Master Plan, 1958 and 2.9.b: Land use proposal in 1958 master plan[128] [108]

An expatriate company called Minupria & Macfarlane created the first thorough master plan in 1958. Instead of laying out a precise and rigid framework, the goal of this master plan was to develop planning principles. The plan was created over a 20-year planning period (1958–1988) with an expected 40% (or 1.75%) annual growth in population. The plan specified the zoning, water bodies, flood-prone areas, and buildable zones. The plan also recommended taking control of the land on the south bank of the Buriganga River: "any unsuitable development there could, on account of its proximity to Dhaka, be most detrimental to the town's amenities" (Minupria and Macfarlane, 1959)[129].

III. Dhaka metropolitan Area Integrated Urban Development Project1981

An international company named Shankland Cox Partnership and others started the "Dhaka Metropolitan Area Integrated Urban Development Project " (DMAIUDP) in 1981 with financial support from ADB. The Dhaka metropolitan area's stormwater drainage and flood issues served as the

[127] Mowla, Q. A., "A Review of Dhaka's Urban Morphology". The Jahangirnagar Review, Part II: Social Sciences. Vol. XXXI, Dhaka: 2007, 15-29.

[128]https://www.semanticscholar.org/paper/Riverfront-redevelopment-in-Dhaka%3A-reviewing-the-of-Khan/834e00e8597268d6831e947f096260bba38fac87

[129] Minoprio & Spencely and P. W. Macfarlane, Master Plan for Dacca, Minoprio and Spencely and P.W. Macfarlane, Dhaka: 1959.

plan's catalyst, and its goal was to establish a long-term growth strategy for urban expansion. The outstanding study took into account nine possibilities and made a number of suggestions. They came to understand that the city's biggest issues are rainwater drainage and floods.

Low-lying places cannot be made flood-free due to a lack of resources. New territory was developed in order for expansion,more linearly in a new direction. The suggested route was for a public transportation corridor running from north to south with branches going to Savar and eventually Aricha. Reorganizations inside institutions were also recommended.

IV. Dhaka Metropolitan Development Plan (1995-2015)

in 1995: Dhaka Metropolitan Development Plan (DMDP) was developed by some expatriate organizations like Mott Macdonald, Culpin Planning Ltd., and other parties to complete the project. The plan was presented as a structure plan and has four major components: (a) Strategic growth options (b) Structure plan (c) Urban area plan, and (d) Detailed area plan.

The DMDP structural plan offers a long-term strategy for the development of the greater Dhaka region, which has a total size of 1528 square kilometers and is managed by RAJUK in accordance with the Town Improvement Act of 1953.

The plan presupposed that after the Flood Action Plan is implemented, a significant portion of the area, including the current low areas, will be flood-free, and that new peripheral expansion will occur on the east and west by encroaching on suburban and with agricultural land, with the northern area being primarily for wealthier groups of population following existing trends of growth. It is suggested to connect the vast new projects with more roads and highways, creating a low rise, low density city shape with lengthy commutes to work (Zaman and Lau, 2000)[130]. The goal of these suggestions was to ease traffic in the city's historic districts. It focuses on accommodation for the growing population and the city traffic. But it escapes from the sustainable city which has strong relationships with its cultural landscape, it’s previous growth pattern.

[130] Zaman, Q. M. M. U., and S. S. Y. Lau."City Expansion Policy Versus Compact City Demand - the Case of Dhaka." In Compact Cities: Sustainable Urban Forms for Developing Countries, edited by Mike Jenks and Rod Burgess: Spon Press. 2000.

V. Detailed Area Plan (DAP 2015)

Detailed Area Plan (DAP) is the third and final tier of the Dhaka Metropolitan Development Plan (DMDP) 1995-2015. DMDP is a three-tier plan package, the urban Plan, the Urban Area Plan, and the Detailed Area Plan (DAP). The current plan of DAP is from 2016 to 2035. The original plan will provide better plans for the city and make it more efficient, and structured and implemented by the city authorities. All the local experts working and on DAP. A lot of public participation happened and their demand was implemented by the city authority. It is ongoing and still not over.
The aims of DAP
-decentralized this megacity.
-to secure the flood flow zone and natural water network of this city
- to secure a balanced environment for economic growth across the development areas of the city
-Complete guidelines for growing a new neighborhood.
As the DAP is still revised from time to time when discussion or expert opinions come for any kind of development of the city.

2.7 The Riverine landscape of Dhaka and the typology of the water bodies

Dhaka developed on a wedge-shaped land mass that was crisscrossed by multiple water canals that were connected to the local river network (Fig.-01). In general, fringe regions were low, including flood plains, depressions, etc.
Tectonic faults are often where water bodies are formed. The difficulty with filling up those bodies of water has two sides: inadequate construction and decreased water retention. Other than the local river system, Dhaka's water bodies may be divided into six categories according on the form of filling, excavation, natural condition, etc.: ditch, pond, lake, naturally occurring depression or lowland, Khal/canal, swamp/wetland. (Fig.2.7). There are connections between swaps to khal, and khal to the river for water drainage during the rainy season. If the connection were cut the water logging is obvious these water bodies connectivity is the one of the main features of the riverine landscape of this city.

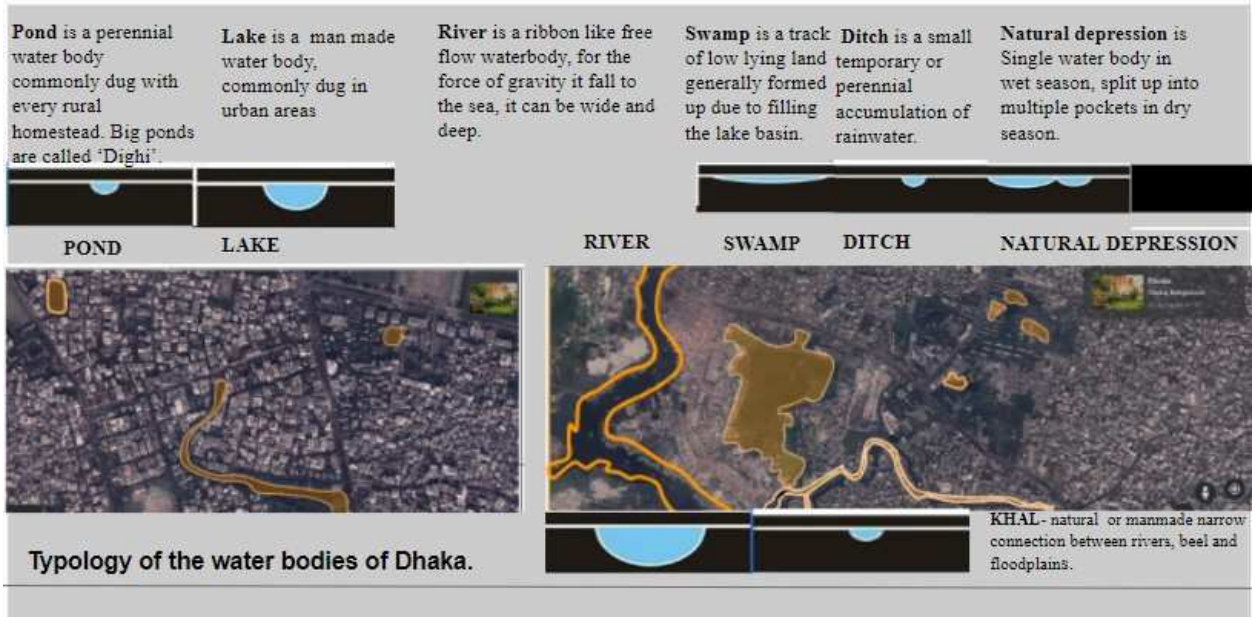


Figure 2.3: Typology of the water bodies (not in Scale)[131]

2.8 Characteristics Riverine landscape of Dhaka city

Dhaka starts on the banks of the Buriganga River and is known for its riverine landscape. The city has a network of rivers, canals, and water bodies that shape its unique geographical features and cultural landscape heritage. In the late 17th century Thomas Bowrey (1905: 143)[132,] Dhaka is described as a "large spacious" city that is next to a "fine large river" that can be navigated by ships of 500 to 600 tons and is positioned next to low marshy area with brackish water. Borey reports Thevenot as saying the following about Dhaka:

[...] properly the capital City of Bengala, stretches upon near a League and a half in length along the river. The tide comes up as far as Dacca, so that the Galleys which are built there may easily Trade in the Gulf of Bengala, the Dutch make most use of it for their commerce [...]. (cit. in Bowrey 1905: 143)[133]

The environmental conditions that caused the relocation of the capital to other areas are well understood. However, one reasonable explanation is the unpredictable nature of river flows, which must apply at least to Wari-Bateshwar, Vikrampur, or Sonargaon. By the time Mughal Dhaka was founded, environmental issues connected to erosion had mostly disappeared, putting Dhaka on a solid

[131] Ishrat Islam,(2009)Wetlands of Dhaka metro area,AH Development Pub. House

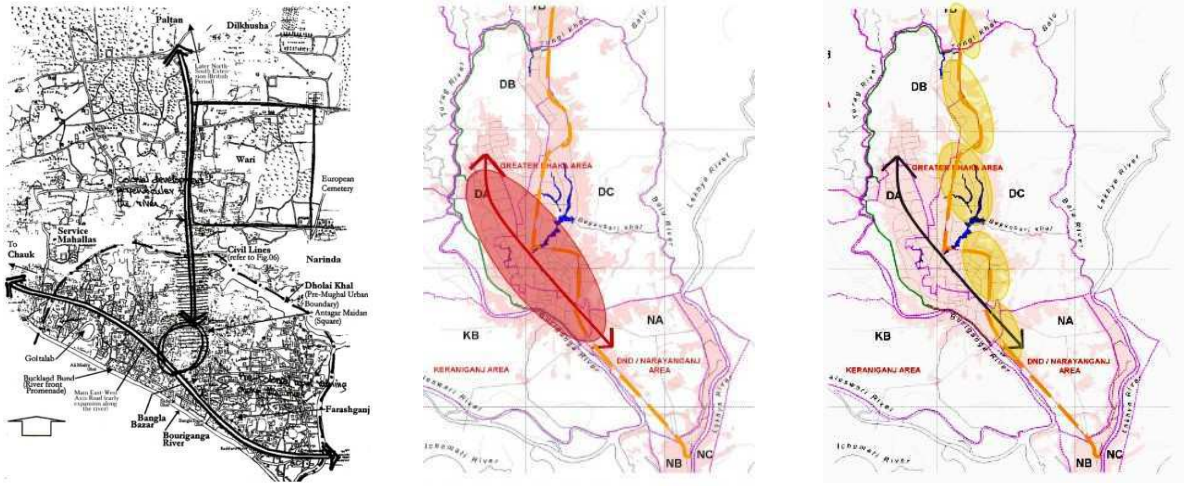
[132] Bowrey, Thomas, 1905. A geographical account of countries around the Bay of Bengal, 1669 to 1679. Ed. by Richard Temple, Cambridge: the Hakluyt Society.

[133] Bowrey, Thomas, 1905. A geographical account of countries around the Bay of Bengal, 1669 to 1679. Ed. by Richard Temple, Cambridge: the Hakluyt Society.

physical foundation. Despite being on a river's edge, the city's location was a little higher above the ground. [James Rennell (1781: 106)][113], the fluvial fury of Dhaka's rivers was less than in regions further north in the Delta, according to, the first surveyor general of India.

I. Rivers and its relation with city Growth trend

At the beginning of the 1600s, the city's growth was along the Buriganga River. The city was fortified by the river Buriganga and the Dholi canal. All the city fabric was grown along with the river. The city growth axis was east to west (figure:2.13.a and Figure:2.13.b). In 1885, the 144-km long Narayanganj-Dhaka-Mymensingh meter gauge (1000 mm) railway line was opened under the title of Dhaka State Railway mainly for carriage of raw jute up to the inland port of Narayanganj and then onwards by river to Calcutta[134]. With the construction of the rail line, the city's growth pattern changes. Rapid industrialization started. And the city growth pattern changed, and the axis shifted towards the railroad, the new axis running south to north (figure:2.13.c).



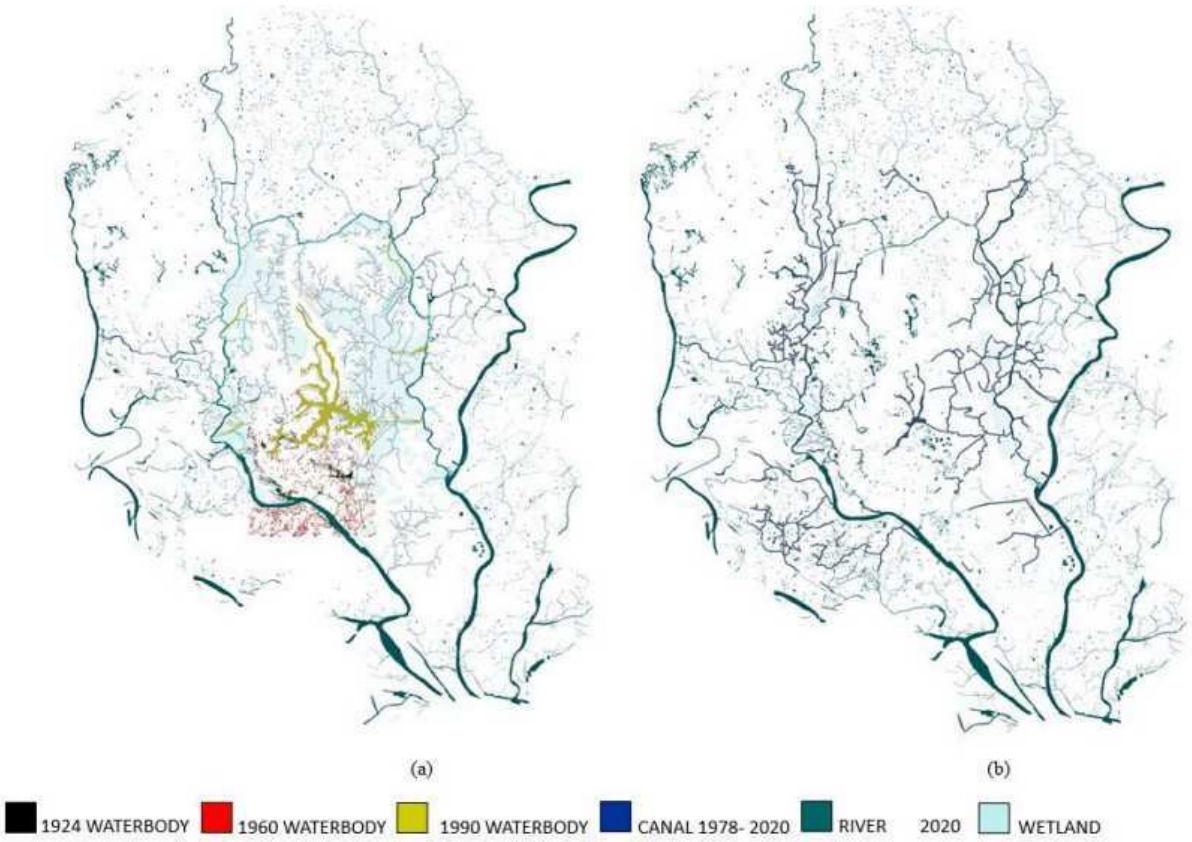
Map:2.10.a **Map:2.10.b** **Map: 2.10.c**

Map2.10: How Dhaka grows over time and how the axis changes over time.(not in Scale).

II. The natural geological and hydrological morphology of greater Dhaka

The natural geography of Dhaka is composed of highland and lowland. Highland is used for human habitation, and low land was a flood flow zone and agriculture during the rainy season. Figure:2.14.a and Figure:2.14.b are the comparison between how the lowland ditches, ponds, and canals disappeared from Dhaka. Over time, low land was filled and new unplanned habitation started. That change of the basic geographic and hydrological morphology of this city impacted the total natural riverine landscape of the city.

[134] https://en.banglapedia.org/index.php/Railway



Map 2.11a and 2.11.b: Loss of water bodies, wetlands, and canal from 1924 to 2020 (2.11.a) 20th century water map (2.11.b) 21st century water map[135].

The study city is surrounded by the major rivers' tributaries. The city is up to 13 meters above mean sea level. Peripheral embankments in Dhaka West, as well as certain regions in the north and south, provide flood protection from rivers. The city of Dhaka and the surroundings around it are frequently flooded. For three to four months, 2 to 4 meters of water can overflow in flood-prone locations. Thus, the physical features of the environment in and around the city, notably the river system and the height of the land in relation to flood levels, have shaped the area of Dhaka's expansion.

III. Chronological growth in size of the city Dhaka

Dhaka was established nearly 400 years ago. The location of earlier settlements was exceptionally strategic due to its accessibility, water communication and trading routes. The earlier settlements of the city were mainly located on the bank of Buriganga River and have gradually extended towards the north. The city grows and grows, over the millennia. The land use changes, its environmental concerns. The city almost lost its indigenous riverine landscape character due to failure of major

[135] CEA3-14891390.pdf (hrpub.org)

planning initiatives as described. Present time studies on land use and development patterns indicate that new urban areas and satellite towns are being developed spontaneously and organically on landfills and encroachment, by both the government and the private sector development organizations.

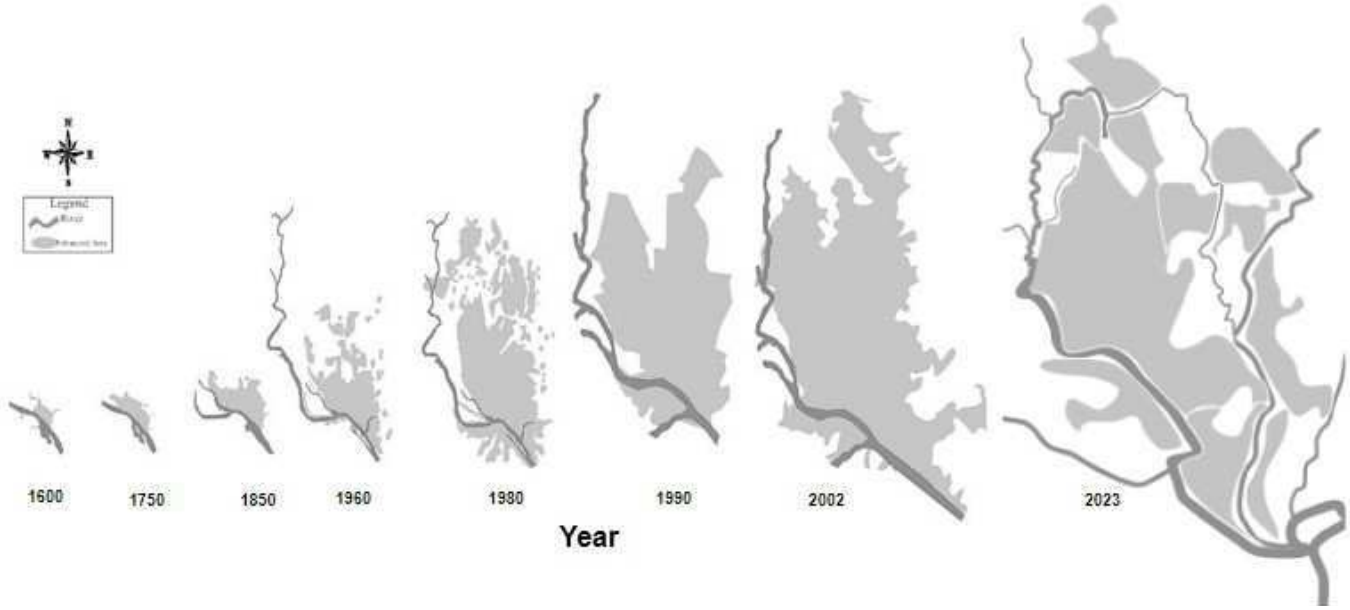


Figure 2.4:Over the millennia, how has Dhaka grown in size. (not in Scale)

1600: The city is like a small trading predominant by the Hindu traders.
1610 to 1750: The size of the city increased from 124 km2 to 248 km2 between early to the late 17th century during the Mughal Empire[136].
1750 to 1960: 248 km2 to cover an area of 830 km2[137].
1960 to 2023:830 km2 to cover an area more than 1528 km2. Now the city is the 4th most populated city in the world.

IV. Riverine landscape and its relation with city Fabric*

Rivers are connected with each other directly, the city has more than 40 canals. The canals make connections to the south to north and to west to the east. The canal has a connection with the flood flow zone. Flood plains and the connecting inland depressions provided a hierarchical network of waterways and navigation routes. It caused an upsurge of settlements alongside waters on available high ground or other artificial mounds. History reveals that the correlation between sprawls and water

[136] .Karim, A. Origin and development of Mughal Dhaka. In Dhaka: Past Present Future, 2nd ed.; Ahmed, S.U., Ed.; The Asiatic Society of Bangladesh: Dhaka, Bangladesh, 2009; pp. 34–55. [Google Scholar]
[137] Bari, M.; Efroymson, D. Detailed Area Plan (DAP) for Dhaka Metropolitan Development Plan (DMDP): A Critical Review; WBB Trust: Dhaka, Bangladesh, 2009. [Google Scholar]

bodies was complementary, as these inmates are a hydraulic settlement character of this region (Mowla, 2005)[138] .The extension of Dhaka has been administered by such physical configuration of the deltaic riverine landscape. This physiographic consequence of water and land is also distinct in all available settlement arrangements. Settlements are connected with the water, there is a unique composition between land and water. The whole thing makes a water connection network and it works like the vein and sub-vein of the human body [Figure:2.14.b].

.

V. Evaluation of Urban Fabric[139] pattern over time

When the city started to grow, patterns were focused on the river but over time the focus changed and the city fabric lost its geological and morphological characteristics. As it is very concentrated city the city fabric is concentrated interwoven by the urban gains[140]. The older city has different patterns like the linear masses which end with narrow streets and a strong connection with the river. (Figure:2.16.a) The new city has different patterns like the planned part has different fabric, the organic growth part has different fabric and the slum has different fabric. And the new also stand on the bank of big water bodies but it have no connection with the river (Figure:2.16.b,2.16.c,2.16.d)[141]

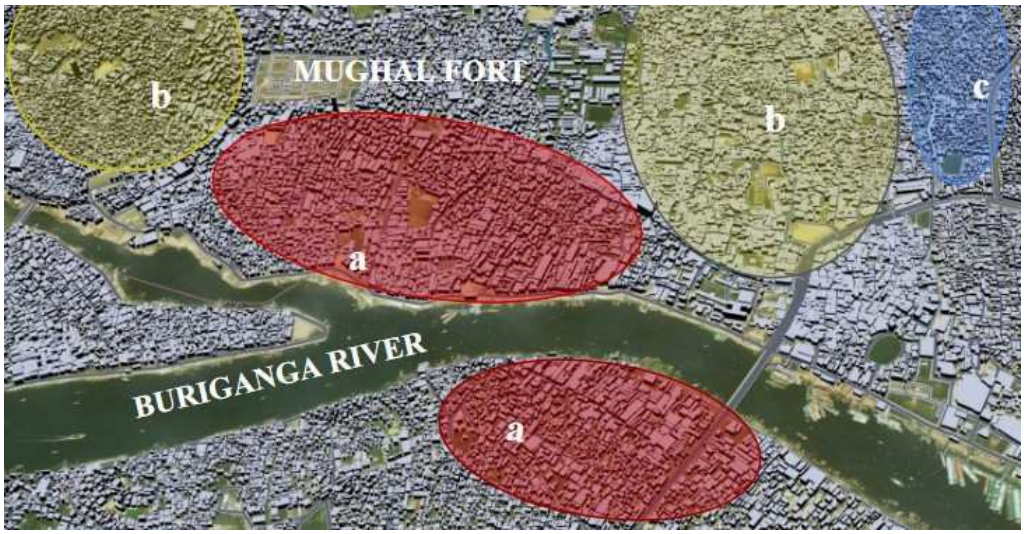


Figure 2.05.a:All kind of fabric.

[138] Mowla QA. (2005). *Ecosystems and Sustainable Urban Design Nexus – A Borderless Concept,* in the Global IIT 2005 Alumni Conference on Beyond ii Technology, with the theme Technology without Borders 20–22 May, 2005, Bethesda, Washington DC, USA.

[139] Urban fabric is the physical form of towns and cities.

[140] Urban grain is essentially a description of the pattern of plots in an urban block and when this pattern is dominated by small plots it is described as fine urban grain.
https://rethinkurban.com/2012/places-and-spaces/understanding-urban-forms/

[141] https://earth.google.com/web/search/Dhaka-Accessed -10.06.2023

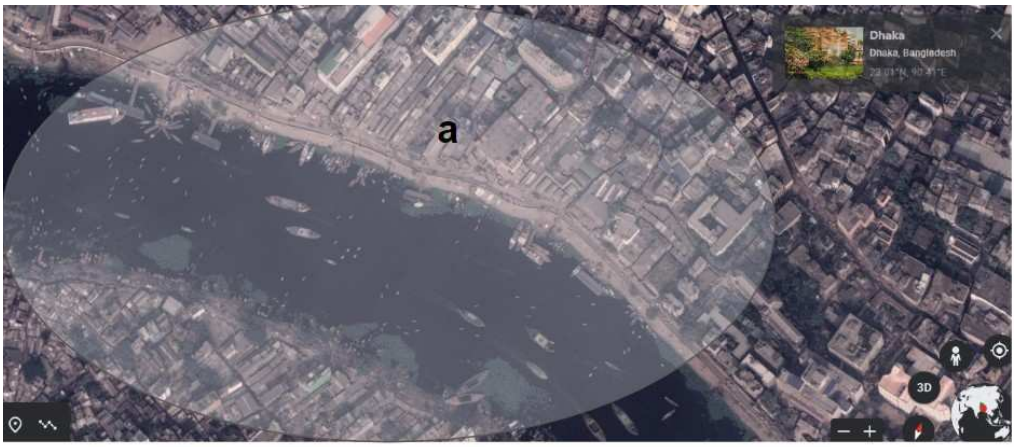


Figure 2.05.b:Old Dhaka fabric.

Figure 2.05.c:New Dhaka fabric

Figure 2.05: city Fabric.

[Figure 2.05 a: Overall city fabric.
Figure 2.05b: Old Dhaka fabric.
Figure 2.05 c: New Dhaka fabric,b:Organic growth area(Gulshan),c:Slum Area(Gulshan)
d: Gulshan residential area (Gulshan)]

All the maps are collected from google map. After that it is analyzed.

VI. Water Urbanism

A network of rivers, canals, and waterways that crisscross the city and its surroundings define Dhaka's riverine landscape. These bodies of water act as vital transit corridors, enabling people to move products and go both within and outside the city. Additionally, they offer chances for leisure pursuits like boating and fishing.

Water Transport: The riverine terrain of Dhaka City has been used for this purpose. The employment of launches, boats, and ferries to cross the rivers offers an alternate method of transportation for people and cargo.

City Fabric: All the city fabric has a strong relation with the river, basically the old city fabric is oriented to the river.
City Livelihood and city Economy: Buriganga River is very significant to Dhaka. It works as a vital commercial route in addition to providing the city with its water supply. The city's active river ports are served by a huge number of small and big vessels that go up and down the river transporting cargo. Bulging wholesale marketplaces and warehouses border the riverbanks, showing the city's thriving trade and commerce.

Rituals and recreational activity: All kinds of river related religious rituals happen on rivers like Durga Puja. Boat races happen frequently in these rivers.

Rivers are the source of water and drainage system: these rivers are the source of water and the rain water drain by these water systems.


Photograph 2.1.a: Traditional Boat Race from Turag River to Buriganga River[142].

.

Photograph 2.1.c : Aerial view of the Buriganga River Bank.(River related Commerce, Transportation and the relation between river and city fabric)[143][119].

[142] https://www.travelmate.com.bd/rivers-in-and-around-dhaka-bangladesh/
[143] Photograph 2.1..b:Sacrifice the Abandonment of idols in The River Buriganga. Photo credit: Mohammad Minhaj Uddin/UNB

VII. The Main causes of lost the connection between water bodies

The water connections were lost due to encroachments, box culvert, and pollution (figure 2.18.a, 2.18.b, 2.18.c, 2.18d and 2.18.e).

The government and several groups have worked to preserve and restore Dhaka's riverine scenery. To reduce pollution and restore the health of the rivers, projects have been conducted for river dredging, waste management programs, and awareness raising efforts. Urban planning measures are also being put into practice to guarantee sustainable growth and safeguard the city's natural resources.

The swampy lowlands are in the northwest, west and east part of the city, slowly disappearing by the land grabbers especially the swampy area of the river Turag, Balu. If it happened the city would totally lose its indigenous riverine landscape character. It already changes the riverine landscape character of this city.

Photograph 2.2.a: Brick field development and the encroaching river Turag[144].

[144] https://core.ac.uk/download/pdf/234665018.pdf

Photograph 2.2.b: Dholai Khal.[145]
Photograph 2.2.c: Dholai Road, the Khal transformed in to a road.[146]

Photograph 2.2.d: Hazaribagh canal, existing condition. Source: Reza and Alam (2002)[147]
Photograph 2.2.e: Present condition of Mirpur-1 canal. Source: Reza and Alam (2002)[148]

2.9 The Economic connection with the Riverine landscape of these Delatic area

i.Ancient period

Bangladesh was mentioned in commercial connections to the Roman world[149]. It is thought that the Wari-Bateshwar ruins are the emporium (trading hub) of Sonargaon, that Roman geographer Claudius Ptolemy[150] refers to Bengal's eastern portion has long been affluent. The Ganges Delta benefited from a temperature that was moderate and practically tropical, good land, plenty of water, and a profusion of fish, fauna, and fruit. Compared to other regions of the Indian subcontinent, the aristocracy had higher living standards. The region was connected to the surrounding area via trade routes including the Silk Road, Tea Horse Road, and Grand Trunk Road[151].

In terms of land ownership, agriculture, cattle, shipping, trade, commerce, taxes, and banking, the area had a well-developed economy between 400 and 1200[152]. Following the fall of the Sasanian Empire

[145] https://foursquare.com/v/dholai-khal/5088f320e4b0a0983849c189

[146]https://dhakadesigners.wordpress.com/2012/07/26/old-pictures-of-dhaka/dholai-khal-bridge-dhka-lohar-pool-bridge-1904/

[147] Reza ANMG, Alam MS. (2012). *Wetland transformation in the western part of Dhaka city from 1963–2000.* Bhugal Patrika (Journal of Geography). Issue 21, pp. 23–40.

[148] Idem

[149] "A Family's Passion - Archaeology Magazine". *www.archaeology.org*.

[150] Hossain, Emran (19 March 2008). "Wari-Bateshwar one of earliest kingdoms". *The Daily Star*.

[151] Lawrence B. Lesser. "Historical Perspective". *A Country Study: Bangladesh* (James Heitzman and Robert Worden, editors). Library of Congress Federal Research Division (September 1988). *This article incorporates text from this source, which is in the public domain.* About the Country Studies / Area Handbooks Program: Country Studies – Federal Research Division, Library of Congress

[152] Kamrunnesa Islam (1996). *Economic History of Bengal* (PhD thesis). SOAS, University of London. doi:10.25501/SOAS.00029147.

and the Arab conquest of the Persian trade routes, Muslim commerce with Bengal expanded. In southeast Bengal, a large portion of this commerce took place east of the Meghna River[153].

II. Economy during Mughal

Bengal Subah produced 50% of the empire's GDP and 12% of the global GDP under the Mughal Empire, which had 25% of the global GDP[154]. Bengal, the richest province of the empire, was a wealthy area with a Bengali Hindu majority and a Bengali Muslim minority. Indrajit Ray, an economic historian, claims that it had a significant worldwide presence in sectors including shipbuilding and textile production.[61] An estimated 80,000 professional textile weavers worked in the capital city of Dhaka. Textiles made of silk and cotton, steel, saltpeter, and industrial and agricultural products were all exported by this country[155].

III. Economy during Colonial period

A conservative estimate suggests that the city's revenue in 1765, a few years after the British took over, was generated at 20 million Taka annually, just from the custom duties levied on the items exported through Dhaka. This earning was more than one-sixth of the total revenue earnings of Bengal and Bihar (N.n. 1765: 413)[156],

Bengal produced the majority of the world's jute, and when the Industrial Revolution got underway in Britain, Dhaka emerged as a major hub for the jute trade.[63] But up until the late 19th century, the British paid little attention to the urban and industrial growth of Dhaka. The pre-colonial, early industrial textile sector stopped producing any money. Following the implementation of a 75% tax on the export of cotton from Bengal[157] and the rise in the importation of inexpensive, British-made textiles following the invention of the spinning mule and steam power, Bengali weavers went out of business. During Bengal's severe famines under British administration, many of the city's weavers perished from hunger[158].

At the end of colonial period they made these areas as their raw material production area for English industries in England. For colonial business policy. At that time this area slowly lost its economic dominance from the world.

---

153 Arabs, The – Banglapedia". *en.banglapedia.org*.

154 "Which India is claiming to have been colonised?". *The Daily Star* (Opinion). 31 July 2015.

155 Indrajit Ray (2011). *Bengal Industries and the British Industrial Revolution (1757–1857)*. Routledge. pp. 57, 90, 174. ISBN 978-1-136-82552-1.

156 "Worldview". Archived from the original on 13 April 2015. Retrieved 14 August 2015.

157 Taylor, James (1840). A Sketch of the Topography and Statistics of Dacca. Calcutta: G.H. Huttmann, Military Orphan Press. pp. 301–307.

158 "Which India is claiming to have been colonizsed?". *The Daily Star* (Op-ed). 31 July 2015. Archived from the original on 28 March 2019. Retrieved 14 August 2015.

62.N.n. 1765. A further Account of a Book, Intitled, Interesting Events Relative to Bengal. Gentleman's Magazine, 35.

IV. Economy During Pakistan Period

The East Bengali river and sea ports, such as Goalundo Ghat[159], the Ports of Dhaka, Narayanganj, and Chittagong, served as hubs for commerce between Bengal, Assam, and Burma. British Bengal is where some of Bangladesh's most illustrious and established businesses, such A K Khan & Company, M. M. Ispahani Limited, James Finlay Bangladesh, and Anwar Group of Industries, were founded.

The economic geography of the area was altered by India's division. On the basis of regional raw commodities like jute, cotton, and leather, the Pakistani administration in East Bengal gave priority to certain businesses. The Korean War increased the need for jute-based goods[160]. The Port of Narayanganj is home to Adamjee Jute Mills, the biggest jute processing facility in the world. The facility served as a metaphor for the industrialisation of East Pakistan. By the late 1960s, just 50% of Pakistan's exports were coming from East Pakistan, down from 70%[161].

V. Economy During Bangladesh

Bangladesh's economy is a sizable emerging market economy. The economy of Bangladesh, which is the second-largest in South Asia, is ranked 25th by purchasing power parity and 37th overall in nominal terms. Many financial organizations consider Bangladesh to be one of the Next Eleven. Following the worldwide epidemic, Bangladesh had a 7.2% increase in GDP.[137] One of the economies in the world with the quickest growth rates is Bangladesh.

The Greater Dhaka Area makes up 35% of Bangladesh's economy and is the area with the largest industrialization in the nation[162].[138] According to the Globalization and World Cities Research Network, Dhaka is considered a beta global city, which means it plays a significant role in integrating its region into the global economy[163]. Tejgaon, Shyampur, and Hazaribagh are significant industrial hubs[164]. Around 800,000 people are employed in the textile sector.

2.10 Dhaka was attracted by Different Nations - which make it more vibrant over time, All of them come from rivers

---

[159] Zaki, Hossain Muhammed (19 September 2022). "The glorious history of Goalanda". *The Daily Star*.

[160] Sengupta, Anwesha (29 July 2019). "Unthreading Partition: The politics of jute sharing between two Bengals". *The Daily Star*.

[161] "Bangladesh - The "Revolution" of Ayub Khan, 1958-66". *Countrystudies.us*.

[162] Rezaul Karim (24 February 2017). "Dhaka's economic activities unplanned: analysts". *The Daily Star*. Archived from the original on 13 July 2019. Retrieved 13 July 2019.

[163] Bangladesh Economy, Politics and GDP Growth Summary - The Economist Intelligence Unit". *country.eiu.com*

[164] "Dhaka City State of Environment" (PDF). Regional Resource center for Asia and the Pacific, United Nations Environment Programme. 2005. Archived from the original (PDF) on 7 February 2009. Retrieved 24 January 2009.

One of the oldest megacities still inhabited in the world is Dhaka (Dacca). Beginning in the 7th century CE, urbanized communities existed in the region that is now Dhaka, marking the beginning of the city's history. Before coming under the influence of the Hindu Sena dynasty in the 10th century CE, the city region was governed by the Buddhist and Shaivite Pala Empire, the Hindu Gauda Kingdom, and the Shaivite Gauda Empire[165].The Hindu Deva Dynasty governed the city after the Sena dynasty.Before the Mughals arrived in 1608, Dhaka was consecutively governed by Turkic and Afghan rulers descended from the Delhi Sultanate, followed by the Bengal Sultanate.

The city underwent proto-industrialization and was named the capital of Mughal Bengal as well as the commercial and financial center of Mughal India. Since the sixteenth century CE, records have been kept of the Dhaka natural riverine port. Because of its advantageous riverine location in Bengal, Dhaka served as a center for Eurasian traders including Armenians, Portuguese, French, Dutch, and British. The vibrant ancient city was referred to as the "Venice of the East." After the Mughals, the British dominated the area for 200 years, up to 1947, when India gained its freedom. Dhaka was chosen to serve as the new state's capital when Bangladesh gained its independence in 1971[166].

2.11The Trade and Commercial activities by the Colonial Nations

The English East India Company, the Dutch East India Company, and the French East India Company all had factories in Dhaka[167]. The French first purchased the Ahsan Manzil site for their factory before selling it to the Dhaka Nawab Family. According to rumors, cheese was first introduced by the Portuguese[168] [169]. During the Mughal Empire, Dhaka had a migratory surge. A Safavid Empire Armenian community relocated to Dhaka and participated in the city's textile industry while contributing 3.5% of their income as taxes[170].

The social life of the city was quite vibrant among the Armenians. The Pogose School was established. The Hindu commercial group was known as Marwaris. Jews and Greeks moved to Dhaka as well[171]. There is a Greek monument in the city. The wealthy households in Dhaka featured poets who spoke Urdu. Persians also made their way to the city to work as military leaders and administrators for the Bengali Mughal authority.[147] Old Dhaka's areas, such as Farashganj (French Bazaar), Armanitola (Armenian Quarter), and Postogola (Portuguese Quarter), bear the names of these international commercial groups.

The hinterland of the city supplied rice, jute, gunny sacks, turmeric, ginger, leather skins, silk, carpets, saltpeter, salt, sugar, indigo, cotton, and iron. British opium policy in Bengal had an impact on the

---

[165] Dhaka City Corporation (5 September 2006). "Pre-Mughal History of Dhaka". Retrieved 4 October 2012.

[166] Roy, Niharranjan (1993). *Bangalir Itihas: Adiparba* Calcutta: Dey's Publishing, ISBN 81-7079-270-3, pp.408-9

[167] "French, the". *Banglapedia*.

[168] "Você fala Bangla?". *Dhaka Tribune*. 24 January 2014.62.

[169] Portuguese influence in Bengal". *The Asian Age*. Bangladesh.

[170] Ali, Ansar; Chaudhury, Sushil; Islam, Sirajul (2012). "Armenians, The". In Islam, Sirajul; Jamal, Ahmed A. (eds.). *Banglapedia: National Encyclopedia of Bangladesh* (Second ed.). Asiatic Society of Bangladesh.

[171] Karim, Abdul (2012). "Iranians, The". In Islam, Sirajul; Jamal, Ahmed A. (eds.). *Banglapedia: National Encyclopedia of Bangladesh* (Second ed.). Asiatic Society of Bangladesh.

Opium Wars with China. American traders returned with artwork, handicrafts, terracotta, sculptures, manuscripts, religious and literary publications, and artifacts from the military from Bengal. Some objects from the region are on display in the Peabody Essex Museum. The growth of international trade brought prosperity to many city households, allowing them to afford costly goods. [https://www.banglapedia.org/]

2.12 Conclusion

Dhaka is the child of the Buriganga River.The city has a 400 years old history as a capital.Dhaka was a Hindu trading center on the bank of river Buriganga. Moguls chose these Hindu trading centers as their provincial capital because of its geographical location. The rivers and the canals/khal were used as natural fortifications. After that, all the European traders, like the Dutch, the French, the Portuguese, the Armenians, and the English, came to Dhaka for its fine cotton, silk and agricultural crops. Some of the European nations were Christian monks. They stayed the delta for its unique geographical character. The deltic riverine landscape makes the city unique to the world. Dacca (Dhaka) Municipality was established on 1st August, 1864[172,] At that time, the area of Dhaka was 20.72 square kilometers, with a population of around 52,000[173,] Now the city size is around 1530 square kilometers, and the population is 23,209,616.

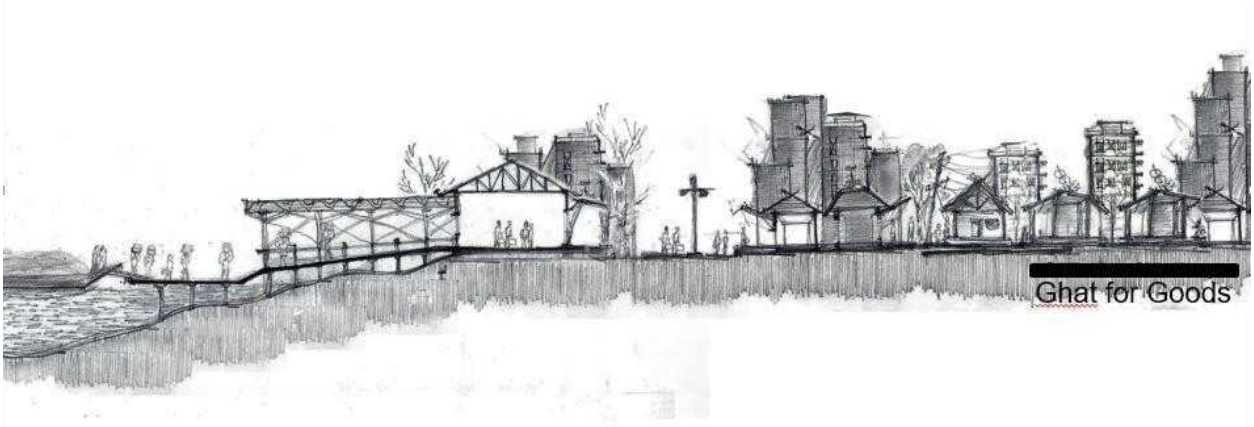
Over time, the city loses its riverine landscape character. The focus of the chapter is to know the riverine history of Dhaka and find out the riverine landscape character, and the urban problems that happened due to the loss of riverine landscape characteristics. Rivers, in particular, play a significant role in the city's trade, transportation, and cultural legacy. This chapter is a brief analysis of the geographical causes of why this are chosen as the capital from the ancient Bangla period and the master plans for Dhaka from the beginning of the 20th century, why the rivers and waterbodies are important for the Deltic characteristics, the influences of the riverine landscapes on the economic activities of the cities are analyzed.

The next chapter will be an analysis of the individual river that makes a river system for the mega city and how it interacts with the city. Individual river interacts with the city in different ways. The point or the area where the city interacts with the river is called Ghat. Different Ghats have different purposes. The Ghat activity depends on the river and the peripheral urban fabric depends on Ghat activity. The road networks and land use patterns grew from Ghat. The success of individual Ghat depends upon different factors. The next chapter is an analysis and identification of the cultural landscape of individual rivers as well as the Ghat areas.

[172]"Don't split Dhaka, Khoka urges govt". *UNBConnect*. 12 November 2011. Archived from the original on 5 April 2012. Retrieved 12 September 2012.
[173] Md Shahnawaz Khan Chandan (8 May 2015). "Reminiscing Dhaka's Legacy". *The Daily Star*.

Chapter III: Study Area Profile and Identification of Cultural landscape of the River a focus on Ghat area.

Part-A: Identification of Cultural landscape of the River.



Sketch 3.1: Shows the Ghat that is used for Goods River around Dhaka city (by the author).

3.1 Introduction

Dhaka is encircled by rivers, these rivers contribute to the urban growth of the city, basically this city is one of the best examples of water urbanization. The old city was selected as the Magul capital later by the colonial ruler for its riverine landscape character. The north bank of the river Buriganga surrendered by the Dholaikhal/Dholai channel was the capital area of that time. Water transport and water fortification are the main causes at that time to select this area as capital. At that time Dhaka had

a great linkage with the outer world by using its riverine character. The riverine character or the deltic riverine character also influences its Agriculture, fine cotton, silk, jute production, ship building of these areas. From the ancient time it was famous for these unique products and commerce characters.

As it is the part of the largest delta of the world, it has its unique riverine character to interact with the surroundings. and the total water network of the delta. Before 1950 the city was the capital city but at that time the population was manageable so the riverine landscape was preserved and the city took benefits from the rivers. But by the name of so-called development the canals and rivers were encroached and roads and structures were built up.The old capital grew with a focus on the river, the road network of the old city focused and ended at the rivers. The urban fabric was focused and elongated to the river. All the social and cultural activities were related to the river and river banks.

But over time that riverine landscape character was lost. In this chapter the five rivers that give Dhaka an island character will be analyzed to identify their Individual riverine landscape character. Due to these individual rivers having different locations, different city fabric and the individual river interact with the city in different ways as because of their geographical locations. As the deltic character the four rivers are connected with each other and make a 110 km long river network. Still these rivers have the navigability for water vehicles. It was anticipated that these waterways could also encourage development of riverine landscape characters like commercial activities, recreational facilities, drainage and source of water, water transports of Dhaka (DAP Final Report, RAJUK)[174].

The survey was done in Five steps. but the broad analysis happened in their layers—
Chapter 3 has two parts. Part A is the presentation of Analysis -01 and Analysis-02. And Part B is the presentation of Analysis-03.

Analysis and Identification of Cultural Landscape	Description
parts A	**Analysis -01:** Setp-01, step-02 and step-03 is for identification of the present condition of the cultural landscape of the 110 km long water system **Analysis -02:** Step-03 and step-04 is for identification of the present condition of the cultural landscape of the 110 km long water system
parts B	**Analysis -03:** Step-05 is for identification of the present condition of the cultural landscape of the five selected Ghats from the 110 km long water system. Analysis -01 and Analysis-02 is for Identification of Present Cultural landscape of the river and Analysis -03 is for the identification of the present cultural landscape of the selected Ghats areas

This chapter is the presentation of served areas and a detailed presentation of the understanding and identification of the Cultural landscape of the rivers and as well as the focused Ghat areas. Chapter 3,

[174] "Final Report, Chapter-I: Background, Preparation of Detailed Area Plan (DAP) for DMDP Area: Group-C" Report No. GBL-DDC 225, RAJUK

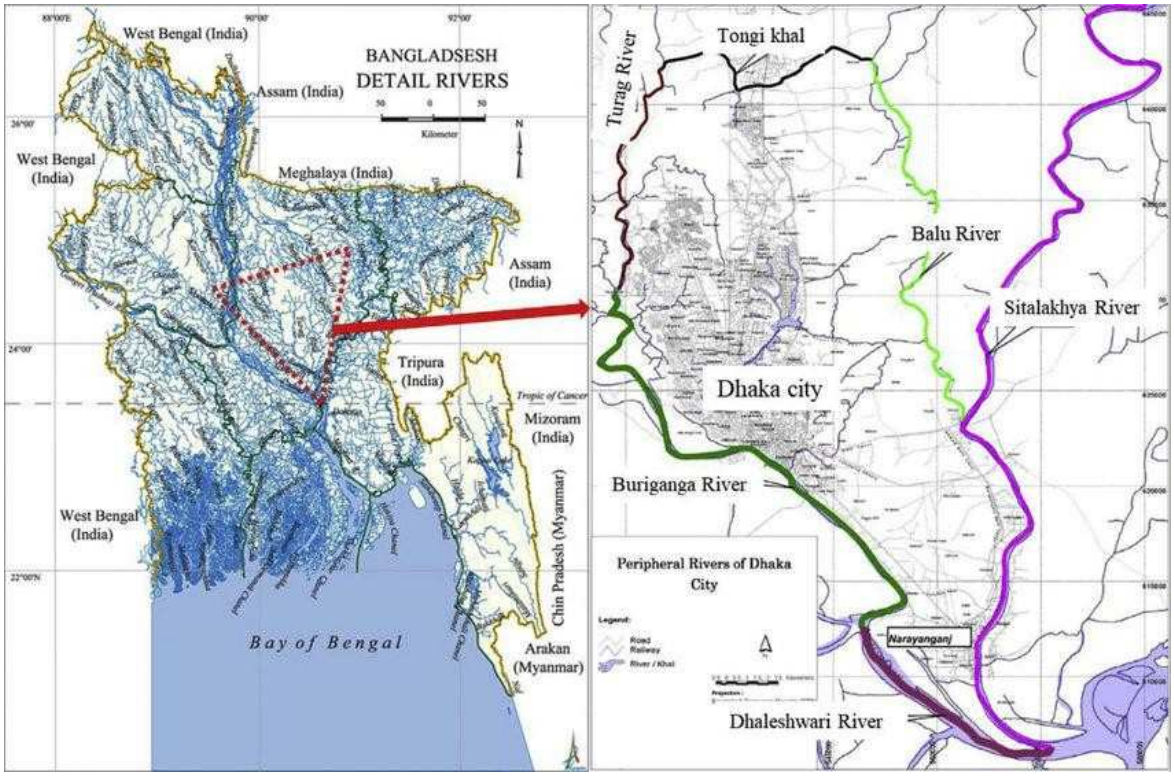
has *two parts A and part B. Part A is the presentation of Analysis -01 and Analysis-02. And Part B is the presentation of Analysis-03.

3.2 A general description of the Five Rivers and one Khal[175]

Dhaka is surrounded by five rivers and one khal.The rivers are Buriganga, Turag, Tongi khal, Balu and Sitalakhya and Dhaleshwari. They create 110 km long ring waterways around the periphery of the city.

Burning river: The capital started from here, and gradually grows on the North west bank of the river bank of Buriganga. It has a great navigability. [Map3.1 and map3.2]

Turag river: The city extended with this river bank after the fall of colonial rulers. It flows from the west part of the city. The river is encroached by the river grabbers and has great navigability.[Map3.1 and map3.2]



Map3.1: The 1st Map Shows the rivers of bangladesh and 2nd map showsthe rivers around Dhaka city. [https://www.researchgate.net/figure/Dhaka-city-surrounded-by-different-rivers-40_fig4_349196045]

[175] Khal is also a kind of canal, which has passed through various cities, urban canals. Such as Venice, Amsterdam or Bangkok .[https://educalingo.com/en/dic-bn/khala-1]

Tongi khal: It is situated at the north of the city. it lost its navigability due to industrial waste and land grabbers. [Map3.1 and map3.2]

Balu river: Balu riviera situated at the east part of the city. new city or the Purbachal city grows on the bank of this river, it has a medium level of navigability. [Map3.1 and map3.2]

Sitalakhya river: This river is situated on the east part of the city. This river has a great navigability and directly falls into the great river meghna.[Map3.1 and map3.2]

Dhaleshwari river: This river flows from the south west part of the city.It has a great navigability. [Map3.1 and map3.2]

The river around the city is about 110 km long. There are 73 government operated Ghats existing on these long waterways. The government of Bangladesh has a program to make a circular water way project from 2005 but it is still unsuccessful and ongoing. This government project is one of the life saving projects for these rivers. There are non-government organizations who are also fighting for these rivers. The rivers will survive when the city interacts with the river more. This city already has a cultural heritage about the river. If we identify it properly and implement it with the other parts of the city the rivers will survive and again revive. The Ministry of Shipping had the finances and the idea, but no strategy for reviving this historic waterway was in place. The project is likewise a victim of carelessness and utterly uneven management.

3.3 Present numbers of Ghats around these 110 km long rivers around Dhaka

The length of the rivers are about 110 km. In this 110km, BIWTA has 43 nos Ghat/ toll points including two river ports at Naryangang and Tongi. Besides this there are100 over Deshi Ghats work on the waterway. Out of these four rivers Sitalakhya and Buriganga is the most vibrant river and thanTurag and Balu. In this chapter there is a brief discussion about these rivers.

Six rivers around Dhaka and its connection with the main deltaic river system Ganges and Brahmaputra

Map3.2: Google map shows the rivers around Dhaka city. (Based on Google earth-accessed 02/ 07/2023)

There are 43 numbers BIWTA Ghat/Launch terminal/ Tax Collection Point in Dhaleshwari, Buriganga,Turag,Tongi khal and Balu river under Sadarghat river port river port.out of 43 ghats 26 are in river Buriganga.The Ghats and there locations are given below(Personally collected from BIWTA office)-

Serial no	Name of the Ghat	River Name
01	Sayadpur Launch Ghat	Dhaleshwari
02	Baktaboli Launch Ghat	Dhaleshwari
03	Fattullha Launch Ghat	Buriganga
04	Dapa kandapara Launch Ghat	Dhaleshwari
05	Fattullha to Dhrmogang tax collection area	Dhaleshwari
06	Aligang Ghat	Dhaleshwari
07	Pagla Ghat	Buriganga
08	Pagla pangau Ferry Ghat tax collection Point	Buriganga/ Dhaleshwari
09	Munshi Khola to M.V. Oil Mill ghat tax collection point	Buriganga
10	Kodomtoli to Dolershor Ferry Ghat And Kodomtoli Ghat	Buriganga
11	Hasnabad Ghat	Buriganga
12	Millbarak to Shashan Ghat tax collection point and Mireerbagh Ferry Ghat	Buriganga
13	Farashganj tax collection Pointchor Kajurbag Ferry Ghat	Buriganga
14	Shambazar Ghat and Kaligang Ferry Ghat	Buriganga

15	BaklandBadh to Badamtoli tax collection point	Buriganga
16	Badamtoli Dhoba Ghat	Buriganga
17	Aganagar to Babubazer Tax collection point and Aganagar Ferry ghat	Buriganga
18	Babubazer Ghat	Buriganga
19	Nolgola to Jijjera tax collection point and Ferry Ghat	Buriganga
20	PanGhat	Buriganga
21	Emamagang Ghat	Buriganga
22	Choto Katra Ghat	Buriganga
23	Champatoli Ghat	Buriganga
24	Machua Ghat	Buriganga
25	Shuaree Ghat Landing Station and Shuaree Ghat to Jinjera Ferry ghat	Buriganga
26	Jingera to Tinpotiee Tax collection point	Buriganga
27	Naberebag landing Station	Buriganga
28	Muslimbag Ghat	Buriganga
29	Mandail to Barieeshur tax collection point and Barieesur to kamragirchor Ferry Ghat	Buriganga
30	Kholamora Landing Station	Buriganga
31	Bosila Landing Station	Buriganga
32	Gabtoli landing Station	Turag
33	Amin Bazar Landing Station	Turag
34	Shinnertak Landing Station	Turag
35	Shinnertak to Ashulia tax collection point	Turag
36	Ashulia Landing Station	Turag
37	Rosadia Masimpur Ferry Ghat	Turag
38	Rajbariee Mireshpara Ferry Ghat	Turag
39	Tongi Bazar Ichiei Hospital Ferry Ghat	Tongi khal
40	Sultana Kamal Bridge to Tongi Riverport Terminal Building	Tongi khal
41	Harannagar to Kornopara tax collection point	Turag
42	Eshapura landing Station	Balu
43	Doleshor to BJ mouth tax collection point	Balu

There are 30 numbers BIWTA Ghat/Launch terminal/ Tax Collection Point in Sitalakhya and Dhaleshwari river under Narayanganj river port. The Ghats and there locations are given below(Personally collected from BIWTA office)-

Serial no	**Name of the Ghat**	**River Name**
01	Muktarpur-Bigimouth Tax Collection Point	Dhaleshwari
02	Koila ghat Ferry Ghat and Tax Collection Point	Dhaleshwari
03	Vagobangang Ferry Ghat	Sitalakhya
04	MachuaBazar Tax Collection Point	Buriganga
05	Tanbazar-Kadomtoli Labor handling Point	Sitalakhya
06	KiroshenGhat-Netaigang Tax Collection Point	Sitalakhya
07	Tanbazar Tax Collection Point and Bondar Ferry Ghat	Sitalakhya
08	Central Ferry Ghat	Sitalakhya
09	Narayangang 1-3 no Ghat Labor Handling and Tax Collection Point	Sitalakhya
10	Narayangang 4-5 no Ghat Labor Handling and Tax Collection Point	Sitalakhya
11	Narayangang 4-9 no Ghat Labor Handling and Tax Collection Point	Sitalakhya
12	Ekrampur Ferry Ghat	Sitalakhya
13	Narayangang 10-14 no Ghat Labor Handling and Tax Collection Point	Sitalakhya
14	Khanpur R.C.C. Area Labor Handling and Tax Collection Point	Sitalakhya
15	Hajeegang Ferry Ghat	Sitalakhya
16	Choudhuree Baree Tax Collection Point	Sitalakhya
17	Chor Shemulpara Tax Collection Point	Sitalakhya
18	Silopoint	Sitalakhya
19	Kachpur landing Station and Tax Collection Point	Sitalakhya
20	Shimrail 2 and 3 jati Tax Collection Point	Sitalakhya
21	Sherulia Labor Handling and Tax Collection Point	Sitalakhya
22	Mirkadim Port and Tax Collection Point	Sitalakhya
23	Munshigang launch ghat	Sitalakhya
24	Gagoria launch Ghat	Sitalakhya
25	Madongang Lunch Ghat	Sitalakhya
26	Shonakanda Ghat -Ekrampur Labour Handling and Tax Collection Point	Sitalakhya
27	Tarabo Bazar Ghat and Labour Handling and Tax Collection Point	Sitalakhya
28	Tarabo(Rupshee)_kanchon Bridge Tax Collection Point	Balu
29	Megna Ghat Lunch Ghat	Sitalakhya
30	Rampur Lunch Ghat	Sitalakhya

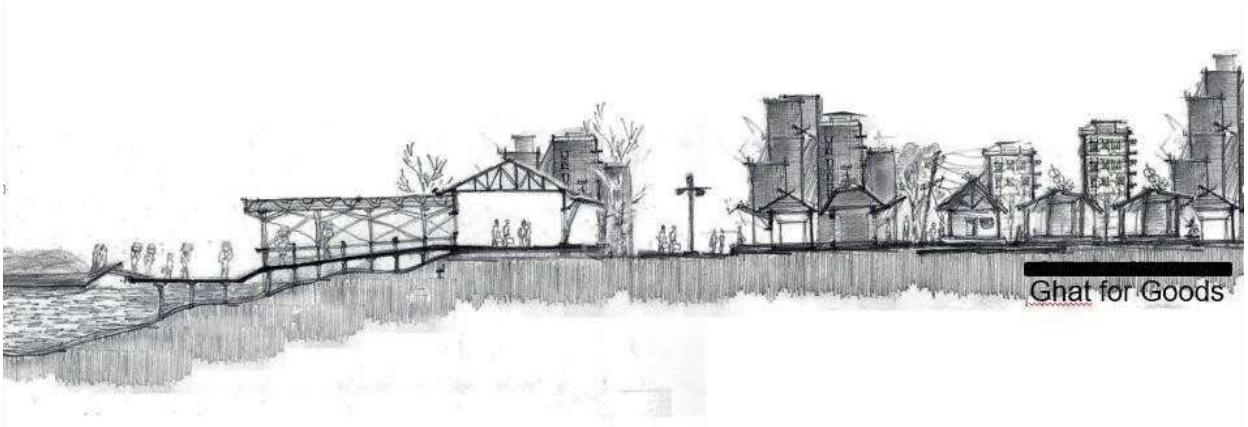
3.4 Types of Ghat

From the **Reconnaissance survey,** it is found that there are three types of Ghat that works in these rivers those are-

01. Ghats for Goods
02. Ghats for ferry
03. Shashan Ghat
04. Indigenous Ghat/ Desi Ghat

01. Ghats for Goods

These Ghats are mainly used for goods. Everyday lots of goods around Bangladesh come to these Ghats, unload and then enter into the city by using other vehicles. In the same way every day lots of goods are loaded on the water vehicles and moved to other parts of Bangladesh. Goods like many kinds of spices, Brick, sandstone, Fish, Vegetables, fruits, cattle, garments almost all kinds of goods.

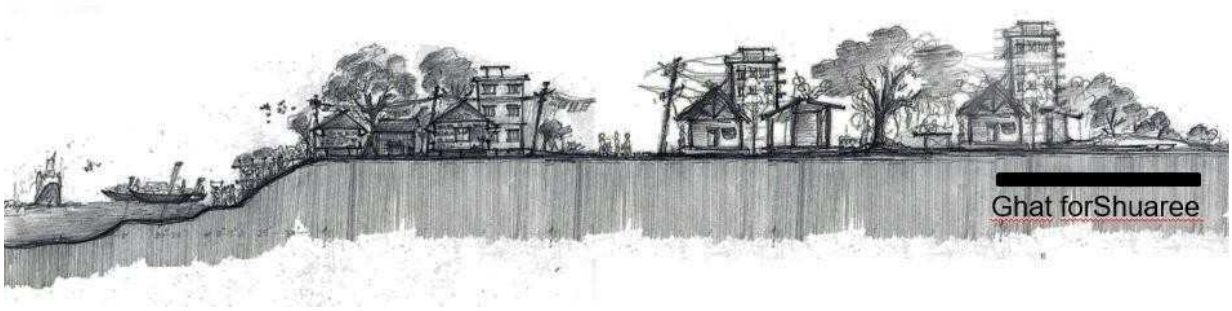


Sketch 3.1: Shows the Ghat that is used for Goods River around Dhaka city(by the author).

02. Ghats for Shuaree or People movement

These Ghats are mainly used for human movement and ferry purposes. Everyday lots of people around Bangladesh come to these Ghats, water vehicles unload them and then they enter into the city by using other vehicles. In the same way every day lots of people are loaded on the water vehicles and move to other parts of Bangladesh. There are mainly two types of Shuaree Ghat those are

i. Intercity people movement and
ii. Ferry movement



Sketch 3.2: Shows the Ghat that is used for Shuree River around Dhaka city(by the author).

03.Shashan Ghat

These are only used for religious purposes. Hindu religion used these Ghats for dead bodies to be burnt on fire. It is a Hindu cremation ground, where dead bodies are brought to be burnt on a pyre. It is usually located near a river or body of water on the outskirts of a village or town; as they are usually located near river Ghats they are also called Shamshan Ghat.

Sketch 3.3: Shows the Shashan Ghat (by the author).

04. Indigenous Ghat/ Desi Ghat

Indigenous Ghat, also known as Desi Ghat, is the name given to a historically prominent riverbank cremation or bathing location in the Indian subcontinent. A set of stairs descending down to a body of water, frequently a river or a holy water body, is referred to as a "Ghat" in common parlance. Used also a social gathering space.

Hindus congregate in these Ghats for a variety of rites, ceremonies, and spiritual activities, and they are extremely significant from a religious and cultural perspective.

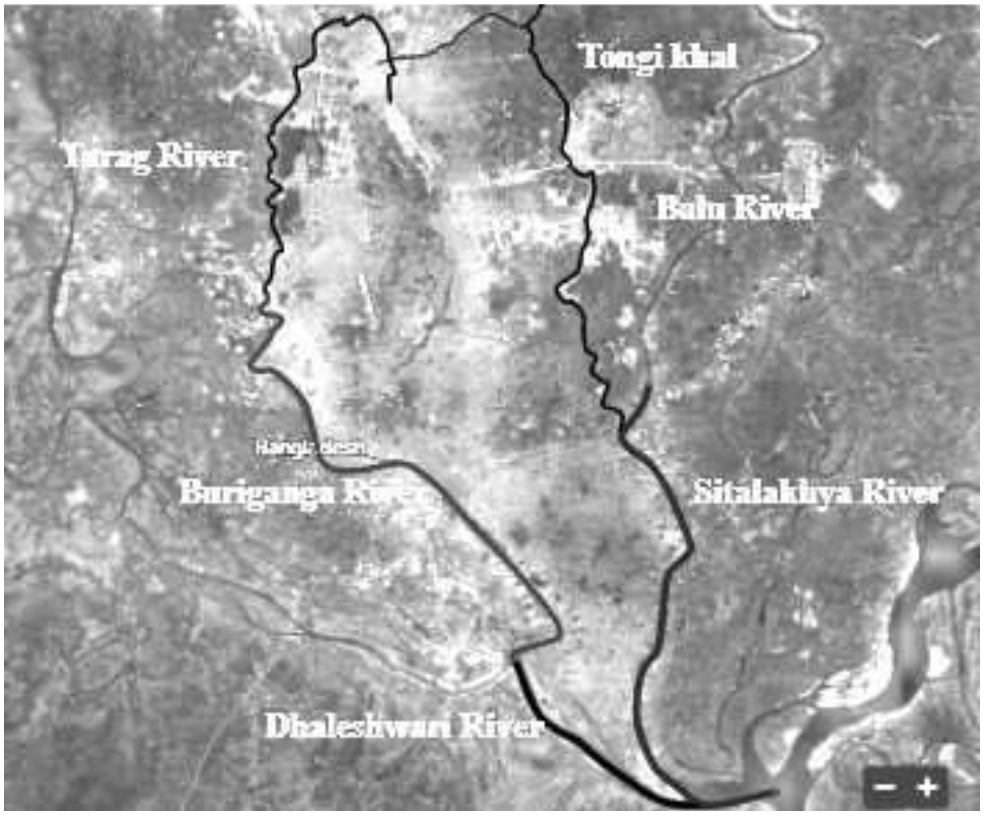
Sketch 3.4: Indigenous Ghat/ Desi Ghat (by the author).

3.5 Survey Design and Ghat Selections Process

3.5.1 Study Area: The study area is the 110 km long river system that is naturally situated around the periphery of the city.A reconnaissance survey was done to understand the present condition of these

rivers and khal. and categorized the whole rivers system into four types according to the following factors—

1. Connection with the city fabric
2. Connection with the present road network
3. Navigation throughout the whole year
4. Commercial impact on city and periphery area
5. Ecological impact on the city and periphery area
6. Future potentiality to make the city more functional
7. Water quality, pollution condition and water drainage impact as part of the total river system
8. Encroachment condition



Map3.3: Shows the rivers and khal around Dhaka city or the reconnaissance survey areas for study[Based on Google earth-accessed 02/ 07/2023]

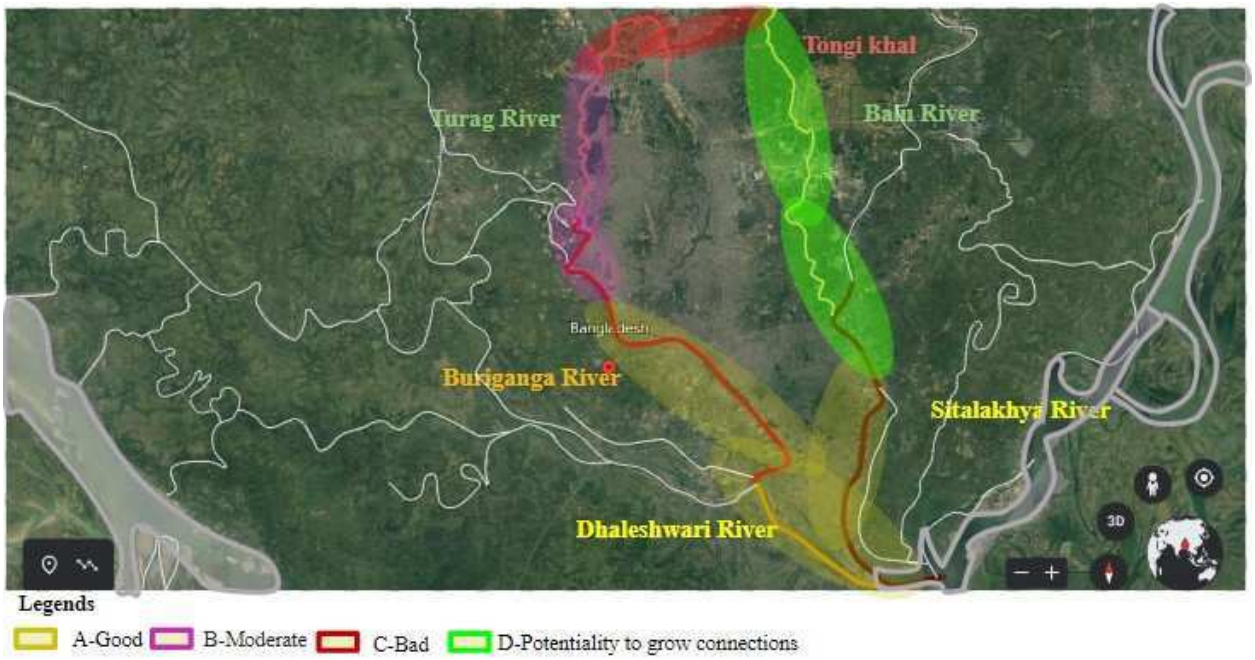
3.5.2 Survey Design

Step-01: Reconnaissance Survey

A reconnaissance survey was done through the whole 110 km river system. For this survey Deshi machine drive boat was used. The survey was done in May 2022.It took two whole days from 8am to 6pm.

Day01— Started from Buriganga river and then Turag river then Tongi Khal and ended under Kcanch bridge at Balu river.It covered the west and north part of the city.
Day 02—Started from Buriganga river and then Dhaleshwari river then Sitalakhya river and ended under Kcanch bridge at Balu river. It covered the south and east part of the city.
But after that worked, The analysis of the photograph, video and map were used to categorize the river system . If any confusion arrived some area surveyed again.
Step-02: Categorized the River with the present physical condition of the River
After the reconnaissance survey, these five rivers and one khal are divided into four categories for better analysis. the categories are—
01.A- Good Condition,
02.B-Moderate Condition
03.C-Bad condition
04.D-Potentiality to grow connections with the city.

01.A- Good Condition: On the basis of the reconnaissance survey and the eight points of analysis, the Buriganga river, the biggest part of Sitalakhya river and the Dhaleshwari river are in good condition.[Map3.3 and Map3.4]
02.B-Moderate Condition: On the basis of the reconnaissance survey and the eight points of analysis,A small part of river Buriganga (at Hazaribagh industrial area near the Turag river) and the total river Turag are in moderate condition.[Map3.3 and Map3.4]
03.C-Bad condition: On the basis of the reconnaissance survey and the eight points of analysis, A small part of river Turag , Tongi khal and small part of Balu river are in Bad condition due to industrial pollution, encroachment. The river is totally ignored when the city grown, so, the connection with the city fabric and the connection with the road network are too bad. Due to pollution, encroachment the river lost the navigation quality and the drainage system also went down.[Map3.3 and Map3.4]
04.D- Potential Condition: On the basis of the reconnaissance survey and the eight points of analysis, the biggest part of river Balu and a small part of river Sitalakhya have a great potentiality to make connection with the new capital and these area is less dense due to new city is growing there.[Map3.3 and Map3.4]



Map3.4: Map Shows the reconnaissance survey areas for study areas and the categories of the study areas.[Based on Google earth-accessed 02/ 07/2023]

Step-03:Selection of Ghat for Detailed Study

From these four categories of river conditions, five Ghats were selected for detailed study.

From category A, Three well functional Ghats are selected for detailed analysis. One of the Ghat is used for people movement (Sitalakhya river), one is for goods movement (Sitalakhya river) and the other one (Buriganga river) is for both people and goods movement.

From Category B, one ghat is selected , which is used for people movement(Turag river).

From Category C, one Ghat is selected, which is used for people movement(Turag river).

From Category D, the city is growing there so, there are potentiality to implement the indigenous riverine cultural landscape

Step-04:Identification of the Cultural Landscape of Ghat area

The following five Ghats were selected for a detailed survey[Map3.5] to identify the cultural landscape character of the ghat areas. the name are mentioned below—

From river Buriganga two Ghats/Landing station are selected those are

01.Kholamor Landing Station

02. Bosila Landing Station

From river Turag One Ghat/Landing Station is selected

03.GabtoliGhat/ landing Station

From river Shytalakhya one Ghat is selected

04.Eco park Ghat, Narayangang.

From river Dhaleshwari one Ghat is selected

05.Pagla Bazar Ghat, Narayangang

Map3.5:Map Shows the reconnaissance survey areas for study areas and the categories of the study areas.[Based on Google earth-accessed 02/ 07/2023]

Step-05: Individual ghat survey and Detailed Analysis

Individual Ghat was surveyed for many times to understand how it works, whether it is successful or not . What are the factors behind the success? If it is not successful what are the factors that worked behind it.

And the main thing is to identify the cultural landscape of the Ghat area.

3.5.3 Analysis Presentation

The survey was done in Five steps. but the broad analysis happened in their layers—

Analysis -01:

setp-01, step-02 and step-03 is for identification of the present condition of the cultural landscape of the 110 km long water system

Analysis -02:

step-03 and step-04 is for identification of the present condition of the cultural landscape of the 110 km long water system

Analysis -03:

step-05 is for identification of the present condition of the cultural landscape of the five selected Ghats from the 110 km long water system

Analysis -01 and Analysis-02 is for Identification of Present Cultural landscape of the river and Analysis -03 is for the identification of the present cultural landscape of the selected Ghats areas

Chapter 3 has two parts. Part A is the presentation of Analysis -01 and Analysis-02. And Part B is the presentation of Analysis-03.

3.6 "Buriganga" Rivers as a part of identification of cultural landscape

On the basis of the reconnaissance survey and the overall analysis -Ghat condition, Ghat activities and its impacts on the city commerce and economy, the Buriganga river categorized as very good condition. From river Buriganga two Ghats/Landing station are selected those are

01.Kholamor Landing Station

02. Bosila Landing Station

3.6.1 General information and history

Historically, the ancient city had a waterway linked and was easily navigable, allowing the great Mughal fleet (the Nawara) to frequently anchor close to the town. A significant branch of the Dhaleshwari River, the Buriganga travels in a zigzag pattern for nearly 41 km before rejoining the mainstream, skirting the border of the former alluvium. It begins south of Savar and passes through. Buriganga has a 29 km long part from the 110 km long circular waterway. In these 29 km of the riverway, it has 26 Ghats. However, the capital benefits greatly from the river, as it provides a regular route for passengers and goods for the whole South part of the Bangladesh,especially to Khulna, Narayangong, Chandpur, and Barisal **(BIWTA, 2001)**[176] [177][18]. SaderGhat is one of the oldest riverports of Dhaka that stands on the south part of the city. It contributes to less pressure on the road and is very cheap for both people and goods movement.

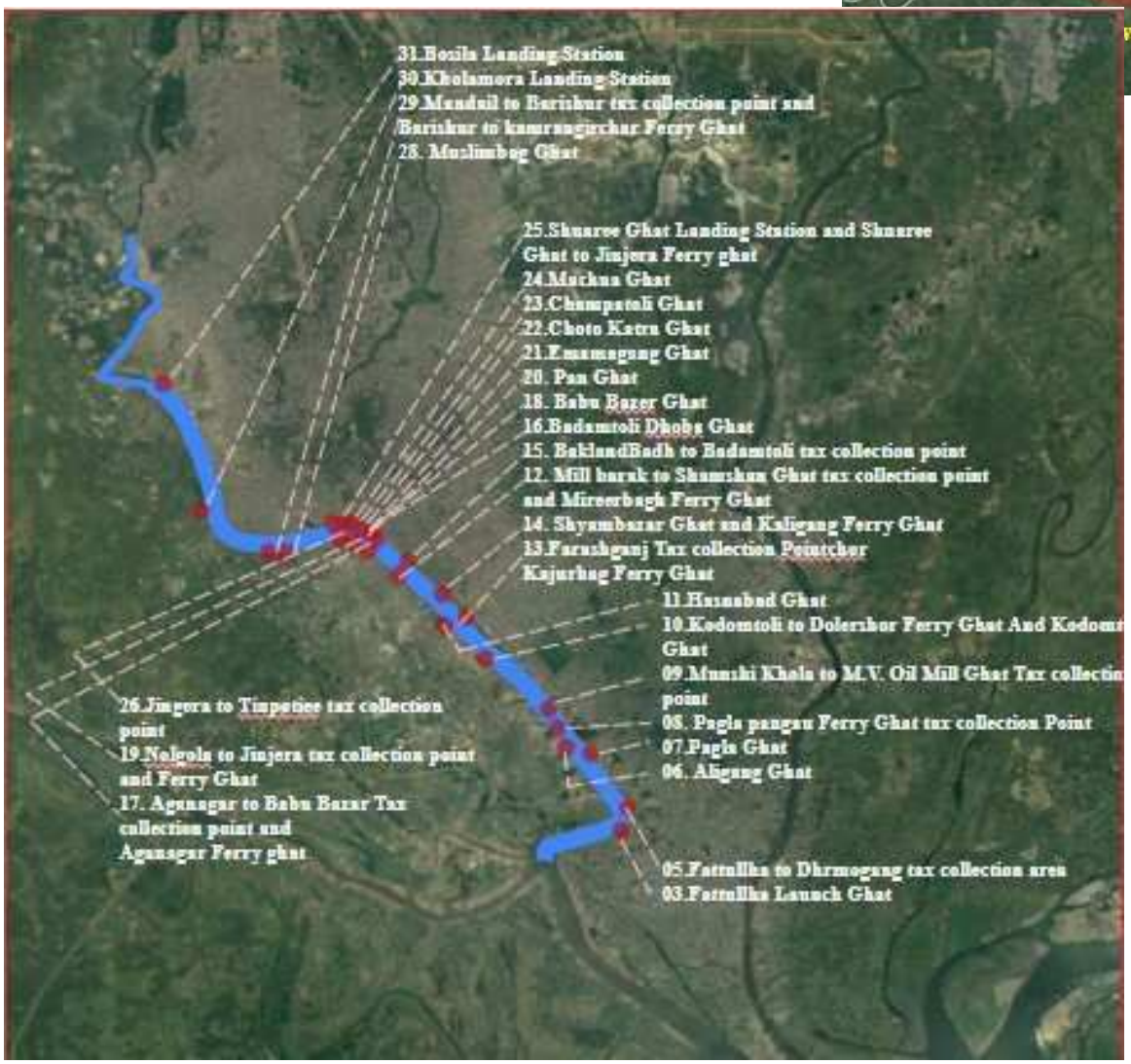
[176] Government of Bangladesh (GoB), 2001. Introduction of Waterway around Dhaka City, First Phase: Improvement of Navigability and Providing Landing Facilities from Sadarghat to Ashula Bridge, Final Report, September 2001. Dhaka: BIWTA.

[177] BIWTA, (2001) "Introduction of Waterways around Dhaka City, First Phase: Improvement of Navigability and providing Landing Station Facilities from Sadarghat to Ashulia Bridge" Final Report, BIWTA.

Map3.5.1: Shows the rivers around Dhaka city.

Map3.5.2: Shows the rivers Buriganga.

Map3.5.3: Shows the existing Ghats of river Buriganga.[All the three Maps Based on Google earth-accessed 02/ 07/2023]



The north riverbank of Buriganga is known as Old Dhaka, the Old Capital. The subsequent development in the KamrangirChar region, where the river alters its course, and in the extreme north, at the beginning of the river Turog. Both parts have unique characteristics in terms of their use of the land, population, buildings, services, and transportation infrastructure.

Photograph 3.1:View of Buriganga River from the bridge-1 in Dhaka.Picture Credite-Rangan Datta.

3.6.2 Navigability and Geographical information:

The river starts from Dhaleshwari near Kalatia and TheTurag has joined the Buriganga at Kamrangirchar of Dhaka City. It flows from the south west part of the city. Water pollution in the River Buriganga is so high. The most significant source of pollution appears to be from tanneries in the Hazaribagh Industrial area. But due to a part of the Deltic river system in the rainy season it becomes a pollution free river. Due to huge rainfall and the pollution flows to the Bay of Bengal.
The average width and depth are 400m and 10m respectively. This river is only 27 km long. Its average depth is 7.6 meters and its maximum depth is 18 meters[178].

3.6.3 Existing Urban Fabric surrounding to the River (like Turag and pictures)

Early in the 17th century, when Dhaka was chosen as the Mughals' provincial capital, it steadily developed into a hub for trade and commerce. As a result, the city grew, structures were built along the riverbed, and eventually it spread north. The riverfront was a desirable site for a number of opulent homes. The neighborhood had mixed-use development from the beginning, and after 400 years, nothing had changed except that the mix-use had actually changed to include all potential functions. Walking along the river bank will show you homes, medical schools, hospitals, museums, shops, warehouses, fish markets, mosques, offices, wholesale fruit and vegetable markets, institutions, housing, small industries, and many other uses, most of which are housed in dilapidated, old buildings.

[178] .[https://en.banglapedia.org/index.php/Buriganga_River][Figureshow0.0]

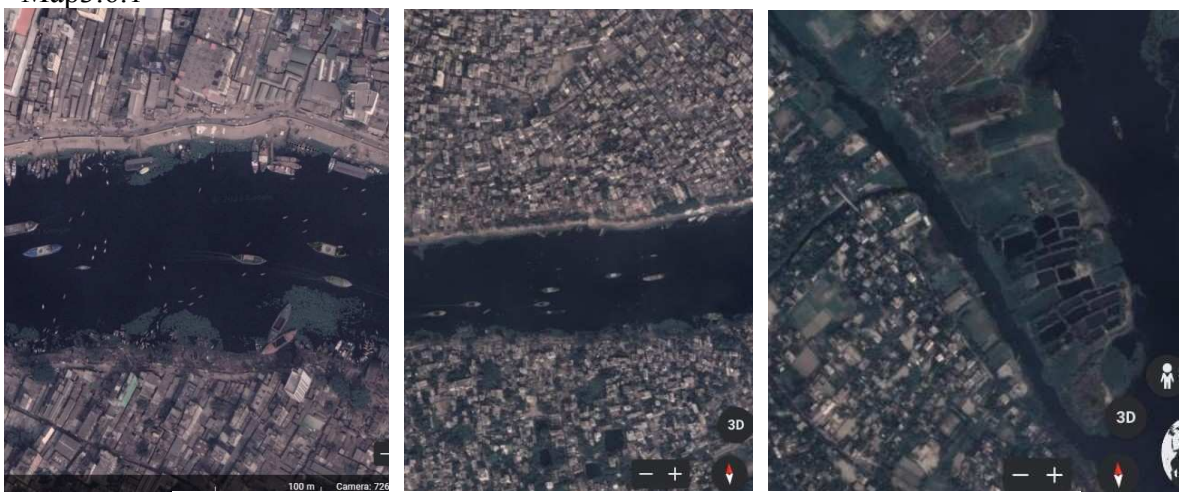
From the beginning the old commercial part of the city has a very unique mixed-use character, the ground floor of any structure is used for a shop or outlet, the second floor is used for storage of the business and the upper floor is used for residential purposes. Till now old Dhaka carried the same characteristics. The owner of the business lived in that building. The people that work in that business lived nearby the low-cost residential areas, especially on the other bank of the river.

The outskirts of Dhaka, KamrangirChar, have grown haphazardly without RAJUK rules. The majority of the land is on a low plane and prone to frequent flooding; as result, it was never considered a suitable site by the authorities and was disregarded in the plans for Dhaka city.

During British rule, they introduced an industrial zone along the rail connectivity, which is away from Buriganga river. But an unplanned Industrial area grow near Hazaribagh using the river water and drainage facilities the fabric is shared below-

Map3.6.1: Shows the existing city fabric of river Buriganga.[All the three Maps Based on Google earth-accessed 02/ 07/2023]

Map3.6.1



3.6.2.A **3.6.2.B** **3.6.2.B'**

Map3.6.2: A, B and B' all maps show the existing city fabric of river Buriganga.[All the three Maps Based on Google earth-accessed 02/ 07/2023]

3.6.4 Connection with Transportation and the overall Road network of the city

The whole of Old Dhaka is criss-crossed with lanes and bylanes of narrow width. Old Dhaka and later developed Dhaka which lies more or less parallel to the river Buriganga, only two roads go near the riverfront in north south direction roughly maintaining an equal width. Sayed Nazrul Islam Sarani which turns to Nawab Yusuf Road to meet the second Buriganga Bridge and Nawabpur Road turns to Chittaranjan Avenue to meet Sadarghat Terminal. The majority of the roads are pucca, although they are in extremely poor condition and lack any pedestrian areas. Despite being near to the main city, Kamrangirchar did not develop much because of inadequate communication and the people's bad economic situation. Rapid growth is occurring in the region without taking into account the adequacy of the road network and quality because of the strong demand for land by a rapidly expanding economy. From that point forward, the road network continued to expand as it had already done. The route was constructed at the time to accommodate horse-drawn carriages; it is too narrow and frequently congested with traffic. Due to its limited roadways, it doesn't operate as it should given that it is one of Bangladesh's primary and oldest business centers. But this part of the city is well connected with the river traffic.

The importance of the waterway progressively declined in the 20th century as a result of the fast improvement of the road transportation system, which quickly replaced it as the primary route of transportation for city people.The Buriganga River continues to be an important transit route for bringing together residents of both banks of the river. Numerous thousands of people use the river each day to travel to their destinations. However, excessive usage and inadequate maintenance, in addition to heavy traffic on riverfront roads and other land uses, worsen the situation. The river is still the primary method of transportation for the products and goods of large commercial communities and minor industries on both banks of the river. Both the river's attractions and its transportation system no longer exist.

Photograph 3.2: The water traffic of river Buriganga and its connection with road networks[179].

3.6.5 Existing overall Ghats condition of the River

Ghats are more vibrant in the river Buriganga. From these Ghats old Dhaka is connected with the whole country. **In the river Buriganga BIWTA has 26 nos of Ghats. These Ghats** related activities are **one of the main driving forces of old Dhaka's economies**. Although the river provides a regular conduit for people and products for the entire South of Bangladesh, particularly to Khulna, Narayangong, Chandpur, and Barisal, the capital benefits significantly from it. One of Dhaka's oldest riverports, SaderGhat, is located in the southern section of the city. It helps relieve traffic congestion and is relatively affordable for the movement of both people and goods.

Throughout history, it reveals that Waterways play an important role in the sphere of metropolitan transport. Maximum flow is found along the banks of the Buriganga, from **Shyambazar to Shawarighat, within this area lies about 15 Ghats.** During Mughal time, as already mentioned, Dholai Khal played a major role in handling city traffic. Despite the filling of the Dholai Khal in Pakistan time, movement by water transport has not totally ceased as people find it cheaper and easier to move goods, usually of bulky nature from one Ghat to another for a distance of half a mile and above along the banks of the Buriganga by non mechanized country boats than by road vehicles.

However, the position of these waterways had made it easier for linear commercial and industrial towns to grow along them. For instance, the river Buriganga's side was home to a glass plant, docks, aluminum manufacturers, and other enterprises. The main commercial settlement attributable to water transport was, of course, the Sadar Ghat river port and Buckland Bund which acted as a hub of city transactions. Buckland Bund extends from Badamtali Ghat to Shyambazar Ghat having a length of

[179] https://www.wallpaperflare.com/buriganga-river-with-lots-of-boats-in-dhaka-bangladesh-photos-wallpaper-

4700 feet (Hamid, 1985)[180]. Other than the ports, the Ghats were continuously busy transporting people from both banks, typically in tiny boats. There were six prominent Ghats on the Buckland Bund e.g. Shambazar Ghat, Kaliganj Ghat, Nawabbari Ghat and Badamtali Ghat (Nabi, 2006)[181].
It is the busiest port in Bangladesh in terms of passenger flow. The port offers services to the majority of Bangladesh's districts. A container facility for handling oceangoing ships opened in 2013 20 kilometers (12 miles) from the city. In 2013–14, the Dhaka port, along with Barisal, Chandpur, and Narayanganj, handled 53 million tonnes of cargo and 22 million passengers[182].

About 10,000 passengers entered and left the city through this river port and another 10,000 by different Ghats between Swarghat to Shambazar Ghat. (Hamid, 1985)[154].This many passengers generally has an adverse effect on other forms of transportation, particularly on road vehicles. In addition to these, a seemingly endless number of individuals also entered the city via other, smaller Ghats. They were all inseparable components of daily metropolitan traffic and an essential element of the hectic urban life. It must be noted that some Ghats suited the needs of particular hinterlands in this context. For instance, when fish from Sylhet, Chittagong, Chandpur, Barisal, Bhola, Tongi, and Aro-bill (Nawabganj) arrived at Machua Ghat early in the morning, it was swiftly unloaded and enjoyed by city residents everywhere. Pan Ghat was famous for waste broken glasses which in large quantities come from different places, especially from the coastal districts of Khulna and Barisal. Dhambazar was mainly famous for all kinds of vegetables. Various types of vegetables reaching this Ghats are stocked over here and then carried to different city markets by country boats along the Buriganga or by road transport (Nabi, 2006)

Buriganga has long since lost its ecological equilibrium and is now a source of health risks. The river Buriganga has been the main asset for the city as a whole as well as the neighborhood. But unlike other large cities where rivers and canals are heavily incorporated into city design and transportation, this river has been ignored for the same reason ever since the end of the Mughal period.

3.7 “Turag” Rivers as a part of the circular waterway

On the basis of the reconnaissance survey and the overall analysis -Ghat condition, Ghat activities and its impacts on the city commerce and economy, the Buriganga river categorized as moderate condition. From river Turag One Ghat/Landing Station is selected for detailed study, the landing station is –

GabtoliGhat/ landing Station.

[180] Halim,A.M. 1985. The Morphology of Urban Transport in Dhaka City, M.Sc thesis. Dhaka : Jahangirnagar University, Savar.

[181] Nabi, A. M. 2006. An Investigation to Water Transport Potential: A Case Study of Aminbazar to Sadarghat, unpublished BURP thesis. Dhaka: Jahangirnagar University.

[182] World Bank to give Bangladesh $360m for the waterway project". *The Independent*. Dhaka. 2016-05-29. Retrieved 2017-07-23.

3.7.1 General information and history

The Turag River is the upper tributary of the Buriganga, a major river in Bangladesh. The Turag originates from the Bangshi River, the latter an important tributary of the Dhaleshwari River, flows through Gazipur and joins the Buriganga at Mirpur in Dhaka District. It is navigable by boat all year round.

Map3.7: The blue line represents the Turag river. The red dots represent the BIWTA landing stations. A, B and B' all maps show the existing city fabric of river Turag.[All the three Maps Based on Google earth-accessed 02/ 07/2023]

3.7.2 Navigability and Geographical information

The river is about 62 km long. It joins the Buriganga near Mirpur (Dhaka) and is tidal in its lower reaches. It is navigable by country boats throughout the year. The whole of the Turag valley south of the Mymensingh Trunk Road is notable for boro rice cultivation[183].

The average depth and width of the Turag river are about 13.5 m (Rahman et al., 2013)[184][158] and 82 m, respectively. The river has different fabrics on its both banks. The city part has urban fabrics and the other part is still agricultural lands.

Photograph 3.3

Photograph 3.4

Photograph 3.3 and Photograph 3.4: The water traffic of river Turag and its present connections with the city[185] [186].[159,160]

3.7.3 Existing Urban Fabric surrounding to the River

The both banks of river Turag have low density with vast wetlands and some industrial areas. Existing water route proximate areas are: Tongi, Ashulia, Rustampur, Binodpur, Birulia, Kaundia on the right bank of the route and Mirpur, Turag, Dhaur, Diabari on the left bank of the route area. Ashulia is a suburban area near Dhaka. Nearby areas are Savar and Tongi. Two major theme parks namely Fantasy Kingdom and Nandan are also located at Ashulia. There are small islands or chars spread all throughout the route. Most of the route's proximate areas are agricultural and vacant lands.

---

[183] .[https://en.banglapedia.org/index.php?title=Turag_River]

[184] [158].Rahman, Mirza.,Moly, Sanjida.,Saadat, A H M.(2013) Environmental Flow Requirement and Comparative Study of the Turag River, Bangladesh,International Journal of Scientific Research in Environmental Sciences(p291-p299).VL - 1,DO-10.12983/ijsres-2013-p291-299

[185] .https://www.travelmate.com.bd/rivers-in-and-around-dhaka-bangladesh/

[186] IMAGE number UIG798815 ,Image title:A view of the Turag river on the outskirts of Dhaka city, in Bangladesh. April 17, 2008. (photo),Photo credit: Majority World/UIG / Bridgeman Images

Both the banks are totally different. One side is the capital Dhaka and the other side is still a village where farming, agricultural land and green chunks of land are present. The buildings or houses on the village side are mainly low rise whereas the other side has multi storied buildings.

This river bank has three distinct characters those are

- Mirpur to Uttara is used as a recreational zone with a lot of private picnic spots like Tamanna Complex, Turag reception center, etc and many floating restaurants like Monpura, Tamanna etc.
- Rest of the area become wet lands during Monsoon and dry season it is used for Agriculture
- Some private housing projects also take place in Mirpur and Uttara.
- Near Tongi both bank of the river is enclosed by industries
- Bishwa Ijtema (2nd largest Islamic discussion meeting Field) is situated on the bank of river Turag.

Map3.8: A, B and B' all maps show the existing city fabric of river Buriganga.[All the three Maps Based on Google earth-accessed 02/ 07/2023]

This area of the city is well known as Ashulia and it is a beautiful wetland area- only 10 km southwest of Dhaka. The embankment road creates a good road link from the city. The flood embankment road is the main approach road for most of the landing stations and Ghats. But the link road accessibility condition to the route is not good enough. Proper Link between road network and water routes is one of the main causes. This waterway is not as successful as the Buriganga, Dhaleshwari, Shitalakshya. The access links are mostly dirt roads and few of them are brick paved. From Ashulia Landing Station, it takes about 30 minutes to arrive at Rustampur ghat, approximately one hour to Birulia Landing Station and around one and half hour to reach Tamanna complex area through motorized country boat (MCB).

In the dry season Ashulia has high agricultural value. On the other hand, during the months May to September there is immense opportunity for fishing and boating. Wetlands of Ashulia play a vital role

as catchment area in facilitating the drainage of Dhaka city in the wet season (Khadiza Begum, K. 2011)[187].[161]There is no formal recreational arrangement in Ashulia landing station area.But a lot of non-formal and private sector invested in small food corners near the landing station.

3.7.4 Transportation,road network and Accessibility with the river Turag

The embankment road is parallel to the river and it goes along with the river about 15 km , and it ends when the river meets with Tongi khal. The embankment road is used as the main road which at the same time works as the connector with the city and river. The Waterway passengers from any Ghat of the river Turag reach the embankment road to get transportation for their destination. The embankment road is designed as an arterial road which is used by heavy vehicles. All the year round this waterway is used for goods transportation. Ferry boats work at many points of this river for people's transportation, these people serve the city and take services from the city.

Photograph 3.5

Photograph 3.6

Photograph 3.5 and Photograph 3.6: The river Turag and its present connections with the city. Photo Credits-Riad.

3.7.5 Existing overall Ghats condition of the River "Turg"

There are four BIWTA recognized Landing Stations identified in this river. The Landing Stations are: Ashulia, Shinnir Tek, Gabtoli and Amin Bazar landing Stations and the Landing Ghats are in due order: Mudapara Ghat, Ashulia Ghat, Rustampur Ghat, Sluice gate Ghat, Tamanna Ghat and Shinnir Tek Ghat.
Brief descriptions of the Landing Stations are given below.

Ashulia Landing Station
Ashulia Landing station is situated at the meeting point of the flood control embankment on the bank with the Tongi- Ashulia Highway. The station has two RCC ramps, one steel gangway for passengers,

[187] Khadiza Begum, K. (2011) " Save Ashulia: A significant wetland but facing threat"

two spuds and one 100 ft pontoon for the passengers. There is also one steel gangway and one 100 ft pontoon for cargo. The station has a two storied passenger cum terminal building with one office, one passenger waiting shed, public toilet facilities and parking space for cars and trucks (BIWTA, 2001) [18]. These landing stations in monsoon are used for a water recreation area for the city. There are boats for picnics, for day trips and water related public gatherings.

Shinnir Tek Landing Station

Shinnir Tek Landing Station is situated on the left bank of the Turag River mid- way between Gabtoli and Ashulia Bridge. It is a very busy landing. mainly used for goods unloading and loading.

Gabtoli Landing Station

This Landing station is situated on the gabtoli side bank of the Turag River. It is an important landing station and marketplace as it is connected with Savar by road. This station has one passenger waiting shed cum Toll office of 100 sq ft, one steel gangway and one RCC step both for cargo and passengers.

Amin Bazar Landing Station

This Landing station is situated on the opposite side of gabtoli bus stand of the Turag River. It is an important landing station for cargo handling. This station has a two storied terminal building, one steel gangway and one RCC step both for cargo and passengers. This Station is very important for cargo connection all over Bangladesh. It is a very busy landing. mainly used for goods unloading and loading. It connects the Tongi industrial area with the rest of Bangladesh by using the waterway.

3.8 "Tongi Khal" as a part of identification of cultural landscape

On the basis of the reconnaissance survey and the overall analysis -Ghat condition, Ghat activities and its impacts on the city commerce and economy, the Buriganga river categorized as bad condition.

3.8.1 General information and history

The Tongi Khal, which marks Dhaka's northern border, is heavily contaminated with municipal and industrial waste.In the Uttarakhand region, which is on the right bank of the Tongi Khal and is next to the Tongi industrial sector, a portion of the pollution load reaches the floodplain with monsoon floods increasing the spatial extent and exposure to risk.

For the past 40 years, when the Industrial bloom happened in the Tongi area the Tongi Khal, a significant river in the Greater Dhaka Watershed and a component of the Turag-Balu system, has been impacted by sediment pollution and untreated industrial and urban effluent. This khal is neglected by the city people as well as the government whereas it would be a source of water based communication and recreation for the neighborhood.

3.8.2 Navigability and Geographical information

The Tongi Khal links the Turag with the Balu River. The river extends for about 15 km from Rustampur at the offtake from Turag river and follows a westerly direction to meet the Balu river near Mausaid area of North-Eastern Dhaka. This khal offers a drainage system, water for various uses, a variety of fish, and also canals for transport to the neighboring areas. According to Google Maps, the river has an average width of 59 meters.

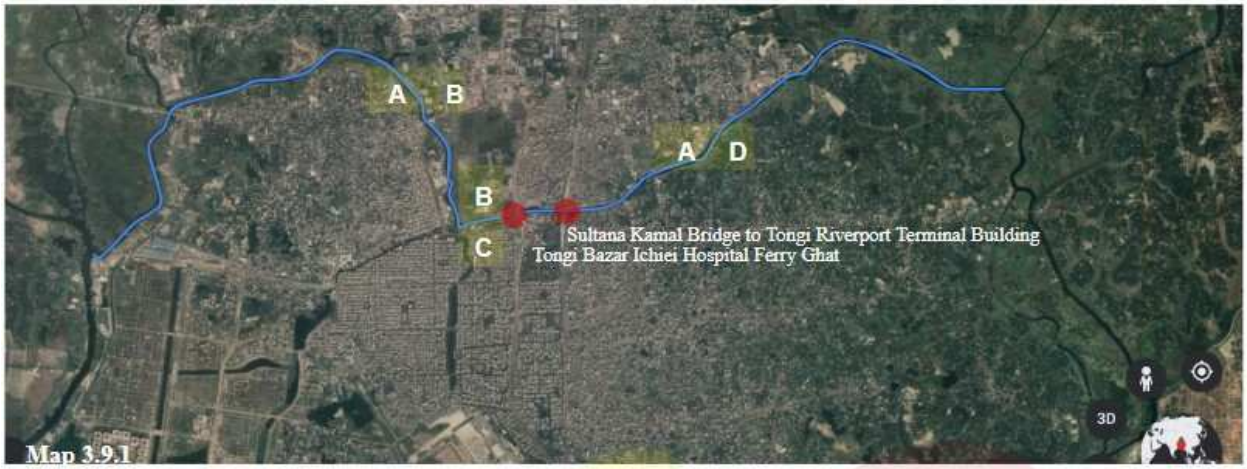
In the rainy season, these rivers acquire water from the Jamuna (Brahmaputra river), while in the dry season, groundwater gently seeps into the rivers' upper reaches to slowly replenish them. The tidal changes coming upstream from the Bay of Bengal have an impact on the lower portions of the rivers as well. According to the Flood Forecasting and Warning Centre of the Bangladesh Water Development Board, river levels peak at around 6.5 m MSL (mean sea level) during the monsoon season and fall to about 2.5 m MSL during the dry season. Around 8m MSL was the highest level ever recorded during the 1998 flood[188][24]

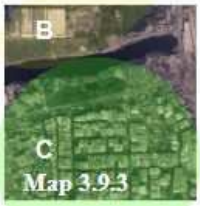
3.8.3 Existing Urban Fabric surrounding to the River

The embankment road is parallel to the river and it goes along with the river about 15 km, and it ends when the river meets with Tongi khal. The embankment road is used as the main road which at the same time works as the connector with the city and river.
This river bank has three distinct characters those are

- A-Planned residential area, B, Industrial Area, C- Organic residential area,D-low dense fringe area and E-water retention area.
- The government Introduced new Purbachal city and housing project also took place at the last end of the Tongi Khal. It was dying to give birth to a new planned city.
- On the north bank of Tongi khal, the bank is enclosed by industries
- Rest of the area become wet lands during Monsoon and dry season it is used for Agriculture
- There are big chunks of green areas which are used for holiday homes for the city peoples. Whwer as the green chunk is used as water retention area in Monsoon.

[188] .https://www.thedailystar.net/opinion/environment/dhaka-and-her-rivers-1444537





Map3.9.1: Map shows the existing two BIWTA ghat at Tongi Khal, the flowing path of the Tongi Khal and its geographical location and its connection points with other rivers.
Map3.9.2: A, B part of the map shows the existing city fabric of Tongi Khal. A- organic growth area near the khal ,B- Industrial area on the North bank of the Khal.
Map3.9.3: B, C part of the map shows the existing city fabric of Tongi Khal.C- Planned residential area(Uttara Residential area)) near the khal ,B- Industrial area on the North bank of the Khal.
Map3.9.4: A, D part of the map shows the existing city fabric of Tongi Khal. A- organic growth area near the khal ,D- Green Chunk on both the banks of the Khal.
[All the three Maps Based on Google earth-accessed 02/ 07/2023]

3.8.4 Transportation,road network and Accessibility with the Tongi Khal

The embankment road is parallel to the river and it goes along with the river about 7.5 km. The rest of the Tongi khal have no sidewalk or embankment road.The embankment road is used as the main road which at the same time works as the connector with the city and river. The embankment road ends at Abdullahpur. The rest of the khal has no sidewalk or any embankment. The river connected with Balu river at the starting of new city Purbachal and the end of Kanchkura, Uttarkhan.At the end of embankment road the fabric of Dhaka City side is organic and less dense. On the other bank, the industrial area of Tongi is very dense.The Tongi side has organic roads and some of them are connected with the river.The Khal is the backside of this Industrial area. Both Dhaka city and the Tongi city road network ignore the Tongi khal.

3.8.5 Existing overall Ghats condition of the "Tongi khal"

There are two BIWTA recognized Landing Stations identified in this kal. The Landing Stations are: Tongi Bazar Ichiei Hospital Ferry Ghat and Sultana Kamal Bridge to Tongi Riverport Terminal Building. But besides these there are lots of desi Ghat at Tongi industrial area bank for different industries. both the bank has spuds for the passengers
Brief descriptions of the Landing Stations are given below.

Tongi Bazar Ichiei Hospital Ferry Ghat
Ichiei Hospital Ferry Ghat is a well-functioning Ghat. This Ghat is used for ferry purposes. and the Ghat has a great connectivity with the other road network of the city, so, iit wook well.

Sultana Kamal Bridge to Tongi Riverport Terminal Building
Sultana Kamal Bridge to Tongi Riverport Terminal Building Ghat is one of the biggest Ghat at Tongi Khal. This Ghat is used for Both ferry and Goods movement. It is a well designed Ghat with a multistoried building. which is used for goods loading and unloading, storage and service areas for the people. The goods were coming from different parts of Bangladesh for Tongi industrial area and also distributed to different parts of Bangladesh. Low income people that lived on the outskirts of the city use this ghat for free and do work on the Industries of the Tong Industrial area.

The station has two RCC ramps, one steel gangway for passengers, two spuds for the passengers. There is also one steel gangway and one pontoon for cargo. The station has a multistoried passenger cum terminal building with one office, one passenger waiting shed, public toilet facilities and parking space for cars and trucks (BIWTA, 2001) [189] [18].BDuring dry season it lose its navigation so small Desi sand and other cargo are only move from the Khal.

Photograph 3.7

Photograph 3.8[162]

Photograph 3.7 and Photograph 3.8: The river Turag and its present connections with the city. Photo Credits-Shameem Bakhshi.

[189] https://www.thedailystar.net/news-detail-175814

3.9. “Balu” Rivers as a part of the circular waterway

On the basis of the reconnaissance survey and the overall analysis -Ghat condition, Ghat activities and its impacts on the city commerce and economy, the Buriganga river categorized as potentiality to grow connections with the city.

3.9.1 General information and history

The Balu River, is a tributary of the Shitalakshya River. It passes through the wetlands of Beel Belai and Dhaka before its confluence with the Shitalakshya[190].Balu River runs mainly through the extensive swamps of Beel Belai and those east of Dhaka, joining the Shitalakshya near Demra. It has a narrow connection through the Suti Nadi near kapasia with the Shitalakshya, and also by way of the Tongi Khal with the Turag River; there is also a link with the Shitalakshya near kaliganj. Although it carries floodwater from the Shitalakshya and the Turag during the flood season, the Balu is of importance mainly for local drainage and access by small boats.

3.9.2 Navigability and Geographical information

The Balu River, located in the east end of Dhaka. It passes through the wetlands of Belai beel at Gazipur District before entering Dhaka its join with river Shitalakshya.Its total length is The 44 km long. Balu River is a drainage channel of the Sitalakhya River (Bhuiyan et al., 2020)[191].The average weight of the river is about 89 m(Based on Google earth-accessed 02/ 07/2023) in the dry season. but during Monson the picture is different as it is connected with the swamps of Beel Belai it becomes wider with small depth. And its Ecosystem is totally different from other four rivers and Khal of Dhaka. The river navigability of this river is good for deshi boats and Deshi machine boats.

3.9.3 Existing Urban Fabric and the overall condition of the river

Basically, this river has rural settlement and agricultural land on both sides. But a new city is growing on the east bank of this river. When the new city is open for human habitation the river will get the urban fabric.

Purbachal, a brand-new metropolis being built on 6,000 acres of land in the Dhaka Narayanganj and Gazipur districts by the Rajdhani Unnayan Kartripakkha RAJUK, is being born while the river is being

[190] https://en.banglapedia.org/index.php?title=Balu_River

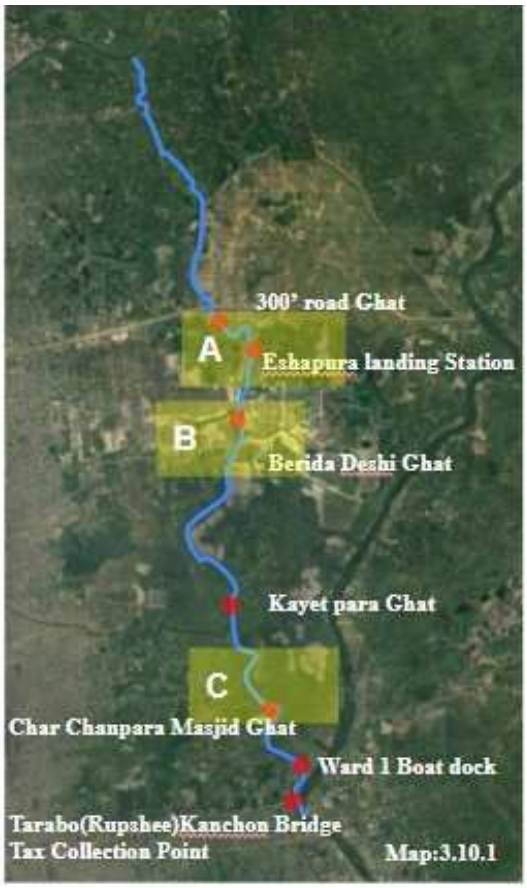
[191].https://doi.org/10.3329/jbcbm.v6i1.51330

choked. Sand from the River Meghna and Munshiganj Areas is being transported by hundreds of barges to fill in low areas.

Untreated effluents from businesses like textiles, lead batteries, pulp and paper, pharmaceuticals, paints, detergents, iron and steel, rubber, and others are dumped into the river close to Tongi (15 miles north of Dhaka). Since many regions along its banks have been filled in to sustain a variety of new constructions, including brick kilns, stores, cinema halls, pucca residences, and Ghats, the river is also gradually receding, making navigation more challenging.

The river is losing its natural flow as a result of river encroachment and the disposal of solid waste in the river. Locals claim that during the lean season, it is difficult for them to breathe because of the foul odor in the river Balu. "During the lean season, which lasts for more than four months, we cannot even consider touching the water. According to Ali Ahasan of the village of Boro Beraid on the western bank of the river, the water is so dirty and offensive-smelling that it makes the skin white.The river, which flows to Shitalakhya from the Lakkhah and the old Brahmmaputra in Mymensingh, has become so narrow as a result of the steady encroachment that goods-carrying vessels frequently become caught on the riverbank.

It practically turns into a tiny waterway throughout the winter. Since they can no longer utilize the river water for daily duties like bathing and washing clothes, thousands of people who live along the 44-kilometer long river's banks are also experiencing a severe water shortage. The river water was clean and suitable for use in different domestic applications even ten years ago. In the Dhaka watershed, there has been significant industrialization during the past ten years, particularly in the dyeing, washing, and textiles sectors, according to a World Bank assessment.



Map3.10.1: Map shows the existing two BIWTA ghat at Balu river, the flowing path of the river and its geographical location and its connection points with other rivers.

Map3.10.2: A- The map shows the existing rural settlement and the new city is growing (sand filling). The west bank and east bank are connected by a bridge.

Map3.10.3: B- The map shows the existing conditions of the both banks of the river. Planned city and rural settlements near the Berida Desi Ghat

Map3.10.4: C- The map shows the existing organic growth on both banks of the river near Char Chanpara Masjid Ghat.

[All the three Maps Based on Google earth-accessed 02/ 07/2023]

Photograph 3.9[192]

Photograph 3.10[193]

[192] https://www.shutterstock.com/image-photo/dhaka-bangladesh-november-28-2020-top-1863739423

[193] https://dailyasianage.com/news/52797/the-gypsies-of-balu-river

Photograph 3.9 and Photograph 3.10:A top view of the Balu River at Dhaka in Bangladesh. The Balu River has now become the most polluted river in the country because of rampant dumping of waste (November 28, 2020). Bede/gypsy boats (a special gypsy who lived on the water), a community usually involved in snake charming, on their boats busy in chores. The photo was taken from the Pubail Bridge of Balu River in Gazipur recently.

3.9.4 Transportation, road network and Accessibility with the "Balu"

There is no embankment road or sidewalk on the bank of the river. The river has an indigenous character— the river is connected with the village with Desi Ghat. Where the Bazar or the village trading space is situated there are ferry Ghats, for the community people, to ensure the trading facilities. Some trading centers have bigger Ghats with platoons for greater movement of goods. The Bigger Ghat has a good connection with the surrounding neighborhood. But for the Balu River, both banks of the river have less connectivity with vehicular roads. But All the Ghat are connected with narrow brick soling road and narrow asphalt road or paca road and works well. The Village people have less connection with Dhaka due to road connectivity. But they used the waterway to connect with Narangang. But during the dry season, the river lost navigation for big boats.

When the new city will grow and the city will open for new construction and new human habitation. The river will be busy like Buriganga if we take care of the cultural heritage of the river properly.

3.9.5 Existing overall Ghats condition of the River "Balu"

Balu river has a great connection with both banks and the villages around the both sides of the river have connection with the river. And the Ghat are the connection point with the villages and river. The village people used the waterway to connect with the nearby city and they used the waterway to go to their works. there are seven numbers of BIWTA Ghats that are given below—
300' road Ghat
Eshapura landing Station
Berida Desi Ghat
Kayet para launch Ghat
Ward 1 Boat dock
Tarabo(Rupshee)Kanchan Bridge Tax Collection Point
Among those only

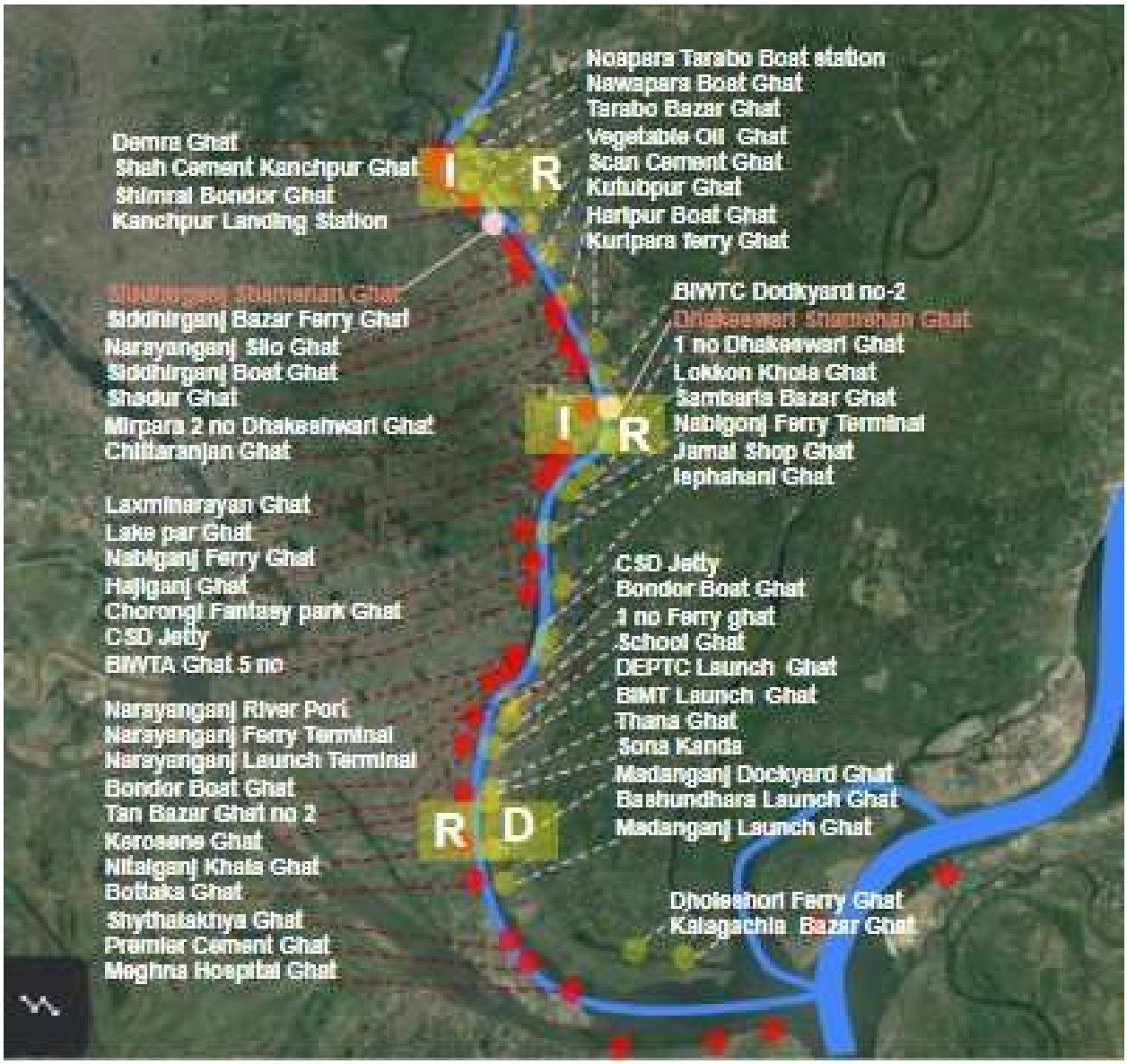
Eshapura landing Station and Kayet para launch Ghat are well pontoons for cargo handling but not the big one and around the Ghat there are other services like bazar facilities, restaurant facilities, and other social gathering spaces. There are other facilities like boat making and boat maintenance

dockyard. And The Ghat area is connected with the surrounding neighbourhood. These are well functioning Ghat.
Other Ghats are used as ferry Ghat and handle desi machine boats. But the Ghats are well connected with the community and work well.

3.11 A brief analysis of River "Sitalakhya

On the basis of the reconnaissance survey and the overall analysis -Ghat condition, Ghat activities and its impacts on the city commerce and economy, the Sitalakhya river categorized as very good condition. Over All 110 km round water system the river has only 20 km but it has 26 numbers of BIWTA enlisted Ghats.Besides these 26 nos Ghats the individual Industry have their own Ghat to operate their goods smoothly.The biggest riverport situated on the bank of this river and it worked as the biggest and well functional river port from the colonial times.this part of the city has very old industrial history especially for the fine cotton, and ship building industry as well as the jute industries. This river is directly linked with the mighty river Meghna at Munshiganj. One Ghat is selected from this river for detailed analysis, that Ghat is —
Eco park Ghat, Narayangang.

Map3.11.1.A



Map3.11

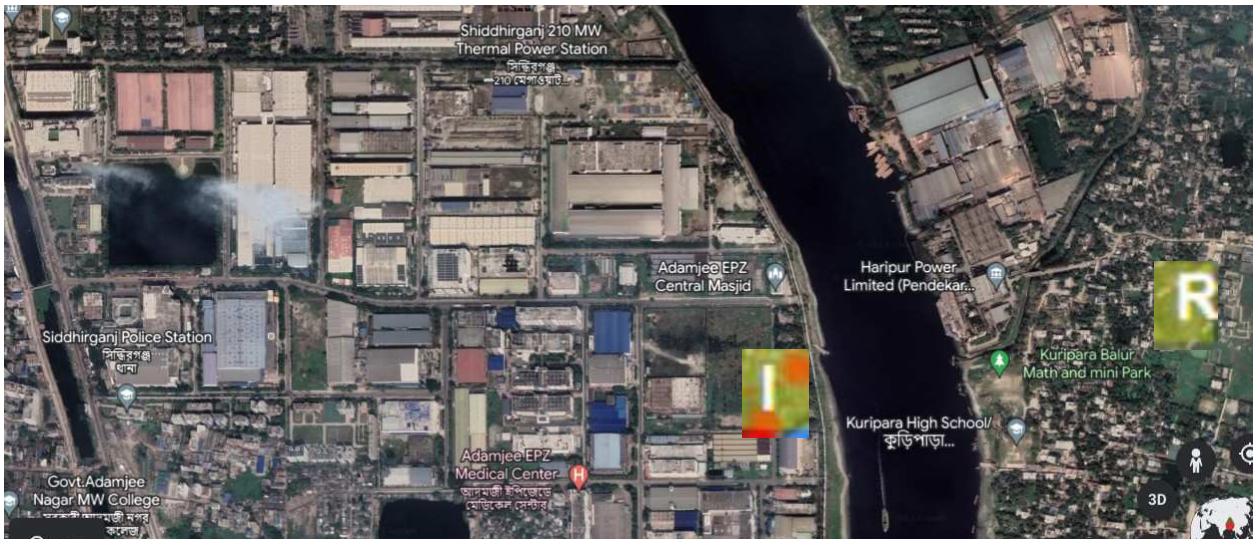
Map3.11: Map shows the existing BIWTA Ghats (with other ghats that are under Other BIWTAGhats) at Sitalakhya river, the flowing path of the river and its geographical location and its connection points with other rivers.

Map3.11. A- The map shows the existing Industerialarea on the left(I) side of the bank of the river Dhaleshwari and the right side of the bank(R) the existing organic settlement area.

Map3.11. B- The map shows the existing Industerialarea on the left(I) side of the bank of the river Dhaleshwari and the right side of the bank(R) the organic settlement area.

Map3.11.C- The map shows the existing organic settlement on the left(R) side of the bank of the river Dhaleshwari and the right side of the bank(D) the dockyard area.

[All the three Maps Based on Google earth-accessed 02/ 07/2023]



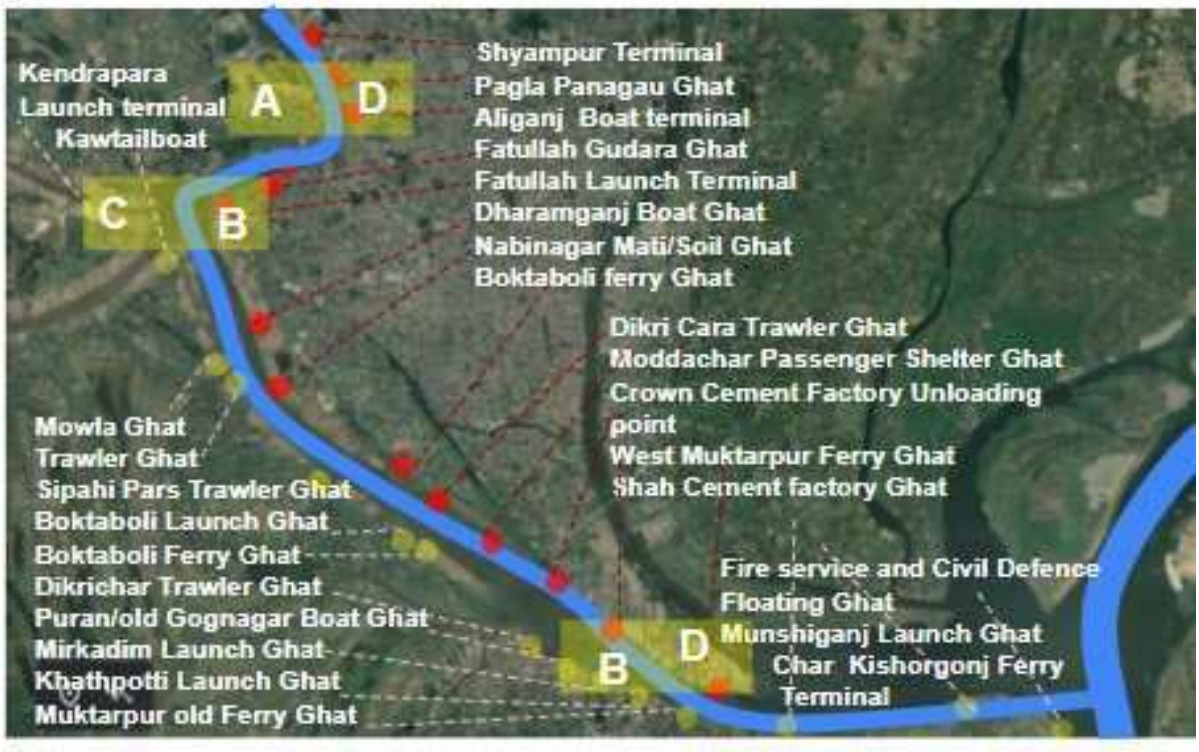
Map3.11.1.B

Map3.11.1.C

3.11 A brief analysis of River "Dhaleshwari "

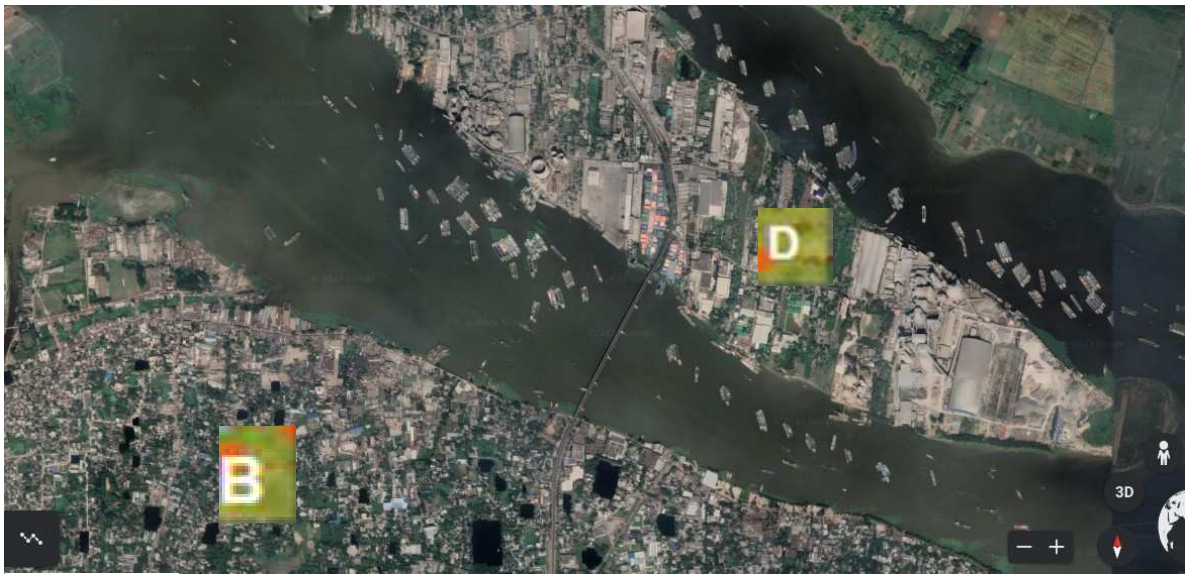
On the basis of the reconnaissance survey and the overall analysis -Ghat condition, Ghat activities and its impacts on the city commerce and economy, the Dhaleshwari river categorized as very good condition. Over All 110 km round water system the river has only 11 km but it has 07 numbers of BIWTA enlisted Ghats. Besides these the individual Industry have their own Ghat to operate their goods smoothly.This river is directly linked with the mighty river Meghna at Munshiganj. One Ghat is selected from this river for detailed analysis, that Ghat is —

Pagla Bazar Ghat, Narayangang



Map3.12

Map3.12.1.A



Map3.12.1.B

Map3.12.1.C

Map3.12- Map shows the existing BIWTA Ghats (with other ghats that are under Other BIWTAGhats) at Dhaleshwari river, the flowing path of the river and its geographical location and its connection points with other rivers.

Map3.12. A- The map shows the existing rural settlement on the left(A) side of the bank of the river Dhaleshwari and the right side of the bank(D) the industrial area.

Map3.12. B- The map shows the existing organic settlement on the left(B) side of the bank of the river Dhaleshwari and the right side of the bank(D) the industrial area.

Map3.12.C- The map shows the existing brick field on the left(C) side of the bank of the river Dhaleshwari and the right side of the bank(B) the existing organic settlement area.

[All the three Maps Based on Google earth-accessed 02/ 07/2023]

3.12 Conclusion

Chapter III part A, is the analysis of the river system of the Megacity. Five rivers and the Khal/Channel are individually analyzed. The present geographical location, navigation quality, average depth and width of the river, the river and its connection with surrounding urban fabrics, river and its connection with the existing road network, and overall ecological condition of the river are analyzed. Over time, the city loses its riverine landscape character. The focus of the chapter is to know the riverine history of the individual river.

To find out the riverine landscape character, first, understand the urban problems that happened due to the loss of the riverine landscape character. These rivers play a significant role in the city's trade, transportation, and cultural legacy. Although urbanization and pollution present difficulties, efforts are being done to maintain and rehabilitate these water basins. In addition to providing business possibilities, Dhaka's riverine landscape also has the potential to boost tourism by exhibiting the natural beauty and historical value of the city's rivers.

The next chapter III part B will be an analysis of the individual selected Ghat. How it works, how it makes connections with other Ghats and the overall city network. The point or the area where the neighborhood interacts with the river is called Ghat. Different Ghats have different purposes. The Ghat activity depends on the river and the peripheral urban fabric depends on Ghat activity. The road networks and land use patterns grew from Ghat. The success of individual Ghats depends upon different factors. The ‘Part B’ is an analysis and identification of the cultural landscape of the individual Ghat area.

Chapter III

Part B
Identification of cultural landscape of the Selected Ghats

Map3.13. Shows the overall and focused study area for Identification of cultural landscape.

Map3.13: Map shows the existing two BIWTA Ghats and three Landing stations (Design Ghat) in the 110 km long waterways around the periphery of the city of Dhaka. Ghat/ Landing station. It's the interaction points between land and water. These five points are selected for detailed study for identify the cultural landscape character of these Ghats for this city. The Ghat grows in indigenous ways from the demand of Neighbourhood demand. It Introduced by the neighborhood demand for communication between the different neighborhood and also for commercial The Main purpose of Ghat is to ferry people and movement of Goods from on Ghat to another by using the waterways. The focus of this Chapter-III , Part B is to understand how they Ghats work with the neighborhood, how the connected with the rest of the city and other Ghats. Understand the Economic and ecological significance of the

Ghats on the overall city. For making this map google earth map is used and the pictures are also taken from earth for each individual location.

3.13 Introduction

Bangladesh is a land of rivers. Rivers play a role in our everyday life, most of the rivers that have navigation are used as waterways. The physical character of land and water are different. Rivers are dynamic and fluid, moreover the rivers water level varies from dry season to rainy season and when the rivers are near the sea these water levels change two times each day due to tide. Indigenous Ghats have some basic cultural landscape characteristics which respect the water level changes, fluid and dynamic character of the rivers. Basically, from the ancient period all of the cities and the main trading centers are established on the bank of the river . Dhaka city grows in the same way but over time the newer part of the city loses connection with the rivers. But Still these rivers have potentiality in terms of environmental, heritage and waterways. Waterways need less infrastructures and the passenger fare is less, so these rivers have potentiality to work as an efficient waterways. The environmental and heritage impacts are already analyzed in the previous chapters. Here, in this part for the analysis three Indigenous Ghat and two new Design Landing Stations are selected for study for identification of the basic landscape character of the Ghats. After that some proposals/ recommendations will be suggested to the policy makers, which will help them to make the 110 km waterways and Ghats more efficient.

3.14 Survey Design and Ghat Selections Process

This chapter is one of the most important parts of this thesis. The CW and its relation with the surroundings depend on Ghats. Ghat is the interaction point of CW and surrounding settlements. The aim of this chapter is to analyze the cultural landscape characters of selected five Ghats. To fulfill this aim it is necessary to find out the—

i.Present land use and surrounding Urban Fabric,
ii. Accessibility facilities
iii. Slope of the river bank with the Ghat
iv. Connection of other waterways and waterway related activities
v. Socio-economic activities that impacts on Ghat,
vi. Important structures that influence on Ghat etc. analyzed
vii.amusement, recreational and other facilities (Nearby industries, dock yard, amusement park, picnic spot holiday home)s that impacts on Ghat
viii.Administrative and management of the Ghats

Ghats are spontaneous. It grows from the time being it has its own language, there are some factors that act like a positive ingredient to become a Ghat as a successful workable Ghat. The circular waterway exists but somehow it did not make relation with the surroundings. The purpose of this study

is to explore a cultural landscape character for a successful Ghat/Landing Station which has proper interaction with the surrounding urban fabric.
For this reason, from the river Buriganga two Ghats/Landing station are selected those are—
01.Kholamor Landing Station
02. Bosila Landing Station,
From theriver Turag One Landing Station is selected—
03.Gabtoli Ghat/ landing Station,
From the river Shytalakhya one Ghat is selected —
04.Chaurongi Fantasy Park Ghat, Narayangang
From the river Dhaleshwari one Ghat is selected—
05.Pagla Bazar Ferry Ghat, Narayangang

For analysis of each Ghat observation of the individual Ghat is the main element. The observation is done in different times as well as different seasons especially during summer and monsoon. A structured interview had taken by the users of the Ghat to understand the users opinions about the Ghat.

What type of transportation would be used it depends upon behavior of a person or a group of people is influenced by economic changes (Technology, production market), socio-cultural (social values, demographic condition, education), psychological (motivations, perceptions), physical and structural changes (transport and communications, land use pattern).But somewhere in these 110 km long waterways, it would be the more convenient for the user or neighborhood people. But after that city people lost interest in waterways.

Waterway and Ghat related activities/Gong/urban growth center come from our soil. All of our cultural Gong/ Urban growth centers developed on the river bank. It is not a new concept, It already exist in our country from the ancient period. If we go through any literature we found the existence of Ghat/Gong. We have lots of river ports such as Narayangang, Chandpur, Barisal, Kornopholi etc. Due to geographical location from the ancient period Ghat work as an urban growth center. The waterway is one of the cheapest mode of transportation, it did not need investment like Road and Rail.

3.15.1 Reconnaissance surveys and Findings of Study Ghats

The reconnaissance surveys of the total 110 km long waterways were done several times due to understanding its connection with the city fabric and to identify several typical patterns of Ghat for detailed analysis documentation. A Ghat is not a single building for the passengers; its compositions consist of lot services like—Connector road for main city traffic, boat dock yard, parking facilities for motorized and non motorized vehicles, social gathering spaces and Bazar activities, recreational

facilities etc. Some geographical features like the riverbank slope at the Ghat point, river navigation throughout the year and Management of the Ghat are the main things behind an efficient Ghat.

The Ghat area is basically organic development having uniformly distributed goli and structures for economic activities. As it is an organic development, it is climatically and socially comfortable, and responsive to its users. Selected Ghats were surveyed to identify the common characteristics which are elaborated on below. Analysis of the different Ghats/landing stations are represented in Graphical Languages due to proper interpretation, some descriptive analysis is also present for better understanding. For understanding the surroundings and land use some map sources are used like-- Dhaka city map(the capital development authority Map), Google Earth, Google map, and open street map are used. All the sections and drawings are developed from surveys. All these five ghats are surveyed several times for better understanding and analysis.

3.15.2 Identification of the Spatial Pattern

The Ghats grow organically, for better understanding of the cultural landscape of the Ghat areas and the surrounding land use pattern observed closely. To understand the relation between activity patterns and land use of the surrounding area the following points are analyzed—

a. For the Perception of the Study Areas
Grow pattern of the surrounding area, Geometry, Morphology, Complexity of the Form, the connection between road network and waterways

b.The pattern of the study Ghat areas
For Ghat area study these points are observed–
i. Sequences of spaces
ii. Natural setting
iii. Thoroughfare pattern of the study area
iv. Infrastructure

c. Urban pattern and and it relation with the Ghat
i. economic activities
ii. Sequence of spaces arrival and departure pattern
iii. Impacts on surrounding urban fabric.
iv. Socio cultural impact on surrounding urban fabric
Though this 400 years old city is organic and spontaneous in nature, its relation with the waterway is very natural ovious, the thoroughfare layout pattern resembles an artery and veins in the human body, that is a hierarchic pattern is prevalent. The old town has a major street and the main street is lined

with commercial activities, mixed use, ritual and residential uses. The city works well where waterways and the roadways are worked properly.

d. Management of the Ghat area

Management of the Ghat area is also an intangible cultural character of the Ghat. Culturally the Ghats are mainly managed by the local authority. Which makes it more functionally sustainable.

3.16 KholamoraGhat and Landing Station

Keraniganj is an upazila of Dhaka District.Kholamore is village of Keraniganj Upazila.This village is situated at the west bank of River Buriganga. Kamragirchor is situated on the other side of the river. The Kholomora Ghat is about 5 km north from Sodargaht, by using the DMB(Desi Machine Boat) it takes only 15 to 20 minutes to reached on the Ghat. From kolamora to gabtoli waterway distance is about 10 kilometer and using DMB it takes 30 to35 minutes. From Kholamora to Diabaree (Uttara) the waterway distance is about 20 Km and takes less than one hour whereas it takes near 2 and ½ hours by road from Sodarghat to Uttara. This Ghat is selected due to this Ghat having ferry Ghat, Landing Station, and also used for goods also. From the reconnaissance survey it found that this Ghat is one of the successful Ghat .

Figure 3.1:Shows Ghat location and connectivity at Kholamora landing Station and Ghat area.

Photograph1 : Photograph shows the Ghats and the Landing station with the surroundings.
Photograph2 : Photograph shows the Ghats and the adjacent boat dock yard.
Photograph3 : Photograph shows the Ghats ferry activity and connection with the other Ghat.
Photograph4: Figure ground map shows the Ghats and the Landing station with the surroundings.
Photograph5: '3D' shows the Ghats and the Landing station with the surroundings and the axial road connection with the Ghat area.
For making the figure ground map and for the '3D' Google earth map used as base map and for the pictures google earth pictures at KholamoraGhat points pictures are used.

3.16.1 Present land use and surrounding Urban Fabric

The town of Keraniganj stands on the southwest side of Dhaka City, on the bank of the Burigangariver. From the figure ground map, it will be found that the Ghat is the focal point of the main axial road of Kholamora and the Bazar grows from the Ghat and the residential area is connected with the Ghat.The people of these areas mainly work on the other side of the river. The main rivers are the Buriganga and Dhaleshwari, but the land use pattern grows from the Ghat.Lots of industries are situated at Keraniganj. Almost every household is related to industrial production and the whole country depends on those products. The government has a plan to integrate KeraniganjUpazila in Dhaka municipality in the near future, to accommodate the expansion of the capital.

3.16.2 History of the Ghat

The history of Keraniganj travels back to the times of Nawab Sayesta Khan in the 18th century. Many believe the name derives from the clerical staff quarters of the nawab's administration built across the river Buriganga. The word Kerani is the Bangla equivalent to clerks. The two major rivers encircling Keraniganj have been the main sources of water for hundreds of natural canals and water bodies crisscrossing the area. Only the other day one could hire a boat from the city's Rayer Bazaar and travel anywhere in Keraniganj.

After our independence in 1971. As millions poured into Dhaka for jobs and shelters, Zinzira became the hub of the new migrants ready for any jobs that would ensure sustenance. Innovative thoughts were abundant. Ideas to replicate anything from a Japanese fountain pen to life saving drugs, from Toyota spare parts to Scotch whisky spread roots quickly. Soon Made-in-Zinzira became a household name. (The daily Star, 03 June, 2011)[194.]

3.16.3 Road network influences on Ghat

Mainly Keraniganj is connected with Dhaka by the Buriganga bridges— no 01,02, and 03. Before that waterway and ferry connection was very prominent on the two banks of river Buriganga. Keraniganj was a boom industrial area after Independence and it became the fringe area of the capital. A huge amount of low income people found their accommodation in this area.
Everyday thousands of people cross the river for their work purpose in Dhaka. They used the Kholamora Ghat, due to every 30 minutes a launch depart for Sodarghat and the same way Sadarghat to Kholamora.Desi boats are used for ferry purposes and short distance communication. Kholamora Ghat is behind the Kholamora tempo and CNG auto rickshaw station. People around Keraniganj come to the Auto Rickshaw station and then go to the Ghat. It takes 2 minutes to reach the Ghat.

[194] https://archive.thedailystar.net/magazine/2011/06/01/cover.htm

The Goli/ lane ends at the secondary road and the secondary road ends at the main road. At the meeting point of each type of road there are some gathering spaces for the neighborhood people.The Kholamora Bazar and Tempo stand is behind the Ghat a lot of activities (Bazar related activities) happen in the Ghat adjacent area.

3.16.4. Present water and Road network

There is a BIWTA landing station which was introduced in 2004. This landing Station makes connections with the old Dhaka and other parts of Dhaka for long distance passengers and goods also. There is a Deshi boat Ghat that makes connections with the two banks of Buriganga. The Roads end at the yard of the Ghat which makes the Ghat work perfectly. This Kholamora Ghat is one of the successful Ghat of the 110 km waterways.

3.16.5 Socio Economic Activities and its influence on Ghat

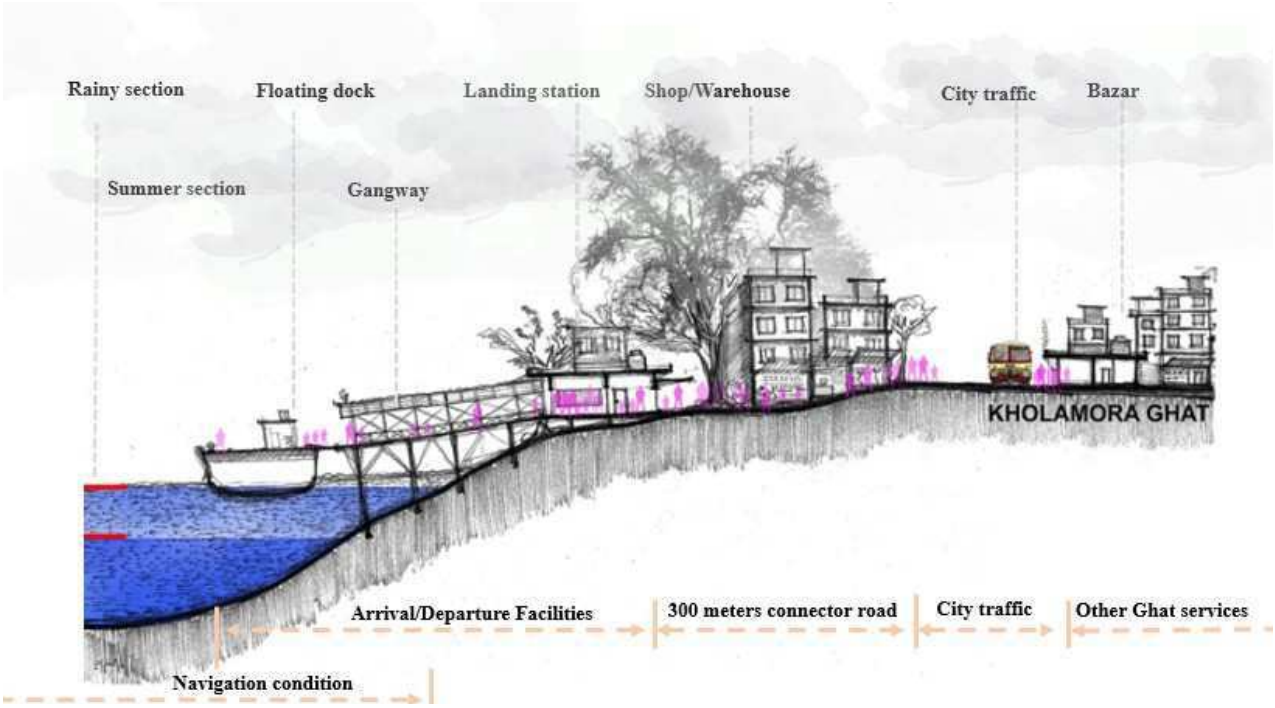
The Kholamora Bazar and Desi motorized vehicles and non motorized vehicles stand behind the Ghat which makes the passengers more spontaneous about the use of Ghat. A lot of activities (Bazar related activities) happened in the Ghat adjacent areas. Lots of industries are situated at Keraniganj. Almost every household is related with industrial production and the whole country depends on those products.The industries use the Ghat for their communications. The Ghat adjacent dockyard makes and maintain the boats which is used for Ghats.

Figure-3.2: Figure Show Ghats and water and road connectivity at Kholamora landing Station and Ghat area.

Photograph01 : Photograph shows the Ghats yard and its connection with the axial roads
Photograph02 : Photograph shows the Ghats and the river with water vehicles.
Photograph03 : Photograph shows the Ghats ferry activity and connection with the other Ghat.
Photograph04: The connecting ferry Ghat and its connection with other parts of the city road network which makes the Ghat more successful.

Photograph05: Bazar behind the Ghat area.
Photography06:Figure ground map shows the Ghats and the Landing station with the surroundings.
Photograph07: Map shows the Ghats and the Landing station with the surroundings and the axial road connection with the Ghat area. For waterways, the red line is for the long distance connection and the blue lines are for ferry purposes.

For making the figure ground map google open street map and for the landmark map Google earth map used as base map and for the pictures google earth pictures at KholamoraGhat points pictures are used.



Sketch 3.5:Section of the Ghat adjacent area (Ghat to Main Road). The section represents navigation during the dry and rainy seasons. the slope of the gangway. The connector road distance with the main axial road. the land use of the Ghat adjacent areas and the building heights around the Ghat area, the vegetation of the Ghat area.

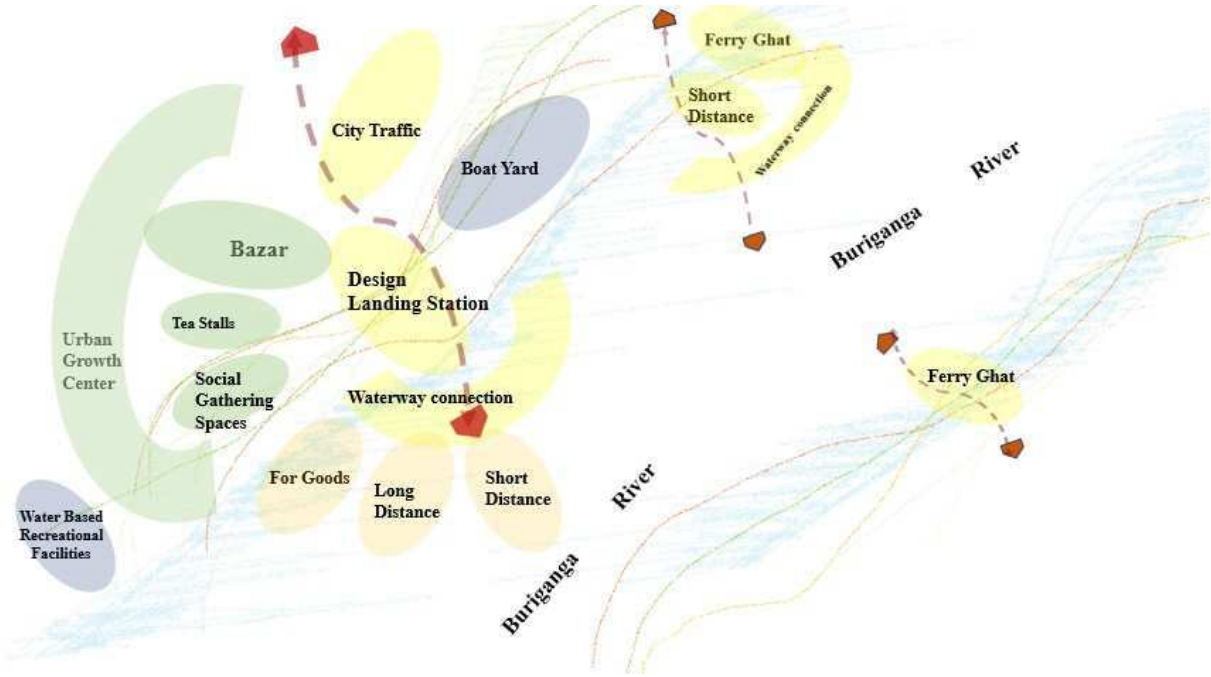


Figure 3.3:Functional flow charts of the landing station and the Ghats at Kholamora landing Station and Ghat area.

Its relation with the other economic, social, and recreational activities. The whole thing is informal but works like a single complex. The individual functions work individually but impact the whole Ghat activities as well as the Waterways activities.

3.16.6 Ghat Management

Ghat is managed by the autonomous authority. It is the authority that was selected by the BIWTA. For every two years, the BIWTA selected an authority to operate the Ghat. The selection process is an open tender. The selected authority will maintain the Ghat and collect the money from the people who used the Ghat.BIWTA is the government organization that manages the whole management of the Ghats.

3.16.7 Identified Cultural Landscape—

- A compact organic settlement, with about 70% void area.
- In the figure ground map it was clearly identified that Ghats are the center point of the roads network.
- All the structures grow from the Ghat (focus point is the Ghat and the landing Station).
- Buildings are largely two to 5 stories with modern structure.Adjacent buildings near the Ghat, the ground floor and 1st floor used for commercial purposes.

- The Goli/ lane(access road) ends at the collector road and the collector roads end at the main road.
- At the meeting point of each type of road, there are some gathering spaces for the neighborhood people.
- The Ghat Gangways ends at Ghat yard and the Gangway slope is very suitable for the passengers as well as for the goods.
- There are Bazar and other economic and recreational activities which depend on Ghat.
- With the BIWTA landing station there are Desi boat Ghats and Desi boat dock yard is adjacent to the Ghat which make it more sustainable.
- Huge amounts of trees make the total area more sustainable.
- For the desi ferry boats Ghat the river slope, the use of indigenous material is also a cultural landscape character for a Ferry Ghat and it is user friendly also.

3.17 Bosila Landing Station

In the DAP(Detailed Area plan) Bosila was first identified as an urban village. The people that lived in this village are related to fishing and boatmen. Except for the Bosila village the whole area goes under the water during the rainy season. The surrounding area of Bosila was water retention area and almost all the area of Ramchandrapur and Bosila goes under water during monsoon. But rapid urbanization the whole area became residential area and a gentrification happened the boatmen and fishermen left this village.bosila become a residential area for the city.

3.17.1 Present land use and surrounding Urban Fabric

Due to the pressure of urbanization, dramatic changes happened from the introduction of the Buriganga bridge number 3, in 2008 to till today. Urban gentrification happened when the fishing community sold their land and migrated to the other part of the river Buriganga. The housing company grabbed the whole Ramchadarpur and made their housing projects, but still Bosila has an organic growth pattern with meandering goalies which end on the secondary roads. If we study the google earth images from 2005 to till today we can find the evidence. of the rapid changes of these areas.

The figure ground map shows that all the structures and road network are totally ignored in the landing station area and the river also.It represents how these areas grow focused on the beribadh(city embankment which is used as road) . but still some old houses have small desi Ghats.

Nearby Housing area is Ramchadrapur housing area. This residential area was developed by the housing company and the pattern is grid iron pattern. Individual plot owners developed individual plots.

3.17.2 History of the Bosila Landing Station

The history of this Landing station is not too old. In 2004, the government of Bangladesh undertook a new project to rearrange and revive the waterways around Dhaka. Under this project this landing Station was built. But this landing Station did not work due to the gangway being useless due to its ramp not being user friendly.The landing Station has no connection with the Axial road, and there are no connector roads to connect the landing station with the city traffic.

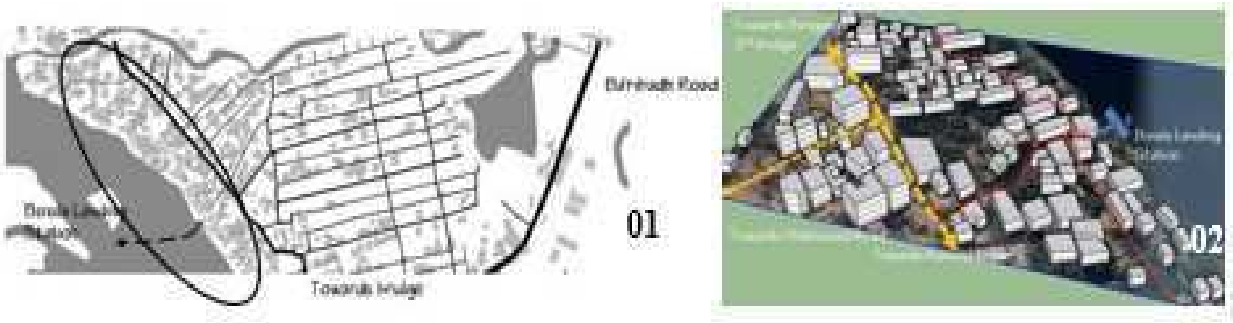


Figure 3.4: Figure Show Ghats and water and road connectivity at Bosila landing Station.
Photograph01: Figure Ground Map shows the organic growth pattern of the Bosila area and the location of the landing station.

Photograph02: '3D' shows the organic growth pattern of the Bosila area and the access road and collector roads near the Landing Station area.
For making the figure ground map and for the '3D' Google earth map used as base map.

3.17.3 Road network influences on the Landing Station

As the Landing station has no connection with the road networks so there is no influence.

3.17.4 Present water and Road network

There is a Desi boat Ghat about 400 meters away from this landing station, under the Buriganga Bridge-03. That Ghat that make connection with the two banks of Buriganga. The Desi Ghat has connection with the city road network but the Bosila landing Station has no connection with the city traffic. It sometimes used as parking for DMB.

The beribadh (embankment road) is the main road of Bosila which is directly connected with the Asad Avenue and the 3rd Buriganga bridge. Bosila Desi boat Ghat is situated under the 3rd Buriganga bridge which is popular for water amusement in adjacent areas.

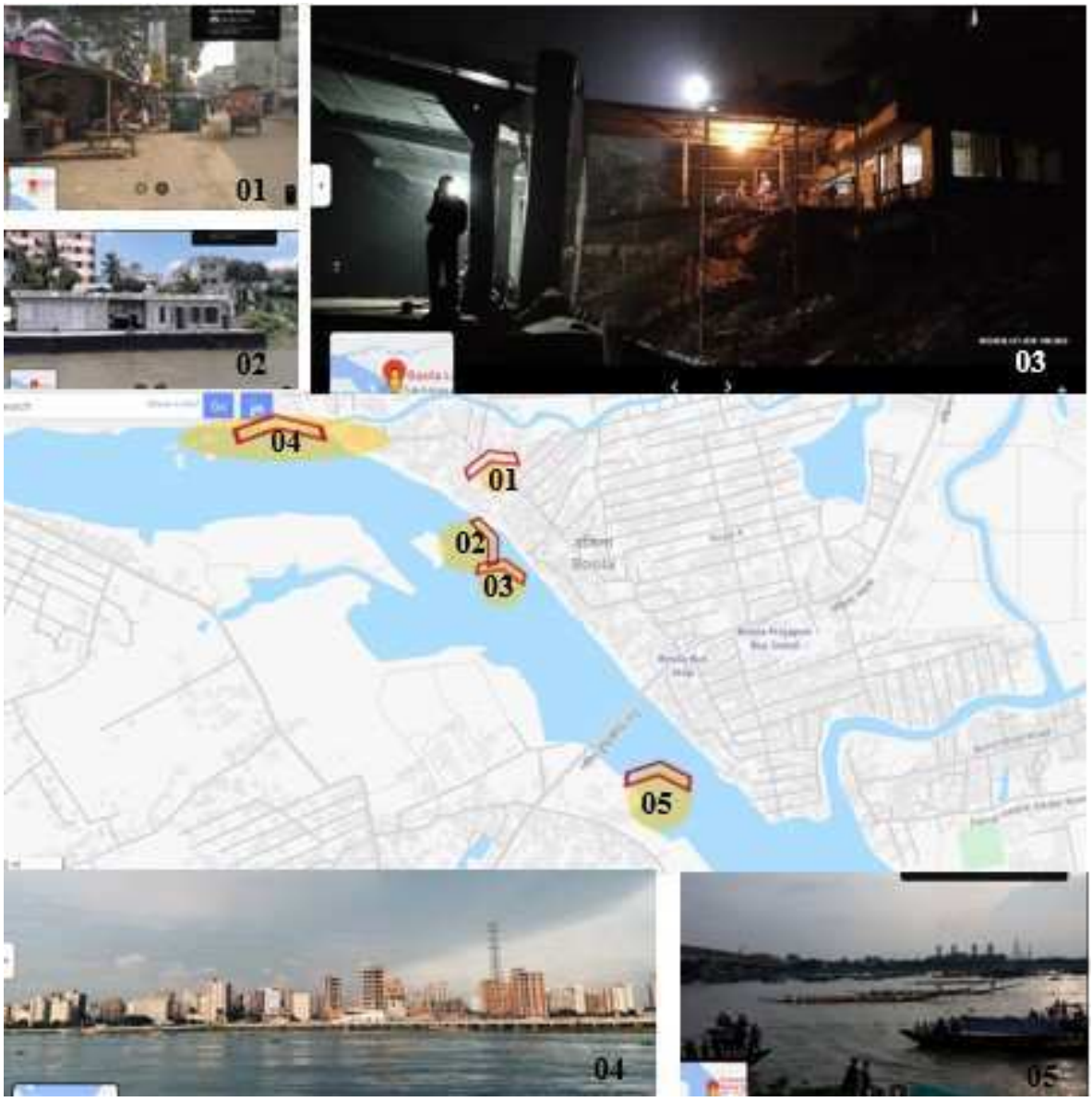


Figure-3.5: Figure Shows Bosila Landing Station area and its surrounding area.

Photograph01 : Photograph shows the nearby connector road.
Photograph02 : Photograph shows the Landing Station and the river .
Photograph03 : Photograph shows the steel sheet made staircase used as a gangway.
Photograph04: Adjacent residential area.or nearby cityscape from the river Buriganga.
Photograph05: boat race on the Ghat adjacent area near the Buriganga Bridge-03.
Photography06:Figure ground map shows the Landing station with the surrounding areas, the river Buriganga and Buriganga bridge-03.
For making the figure ground map google open street map at Bosila point is used and for the pictures google earth pictures at Bosila Landing Station point pictures are used.

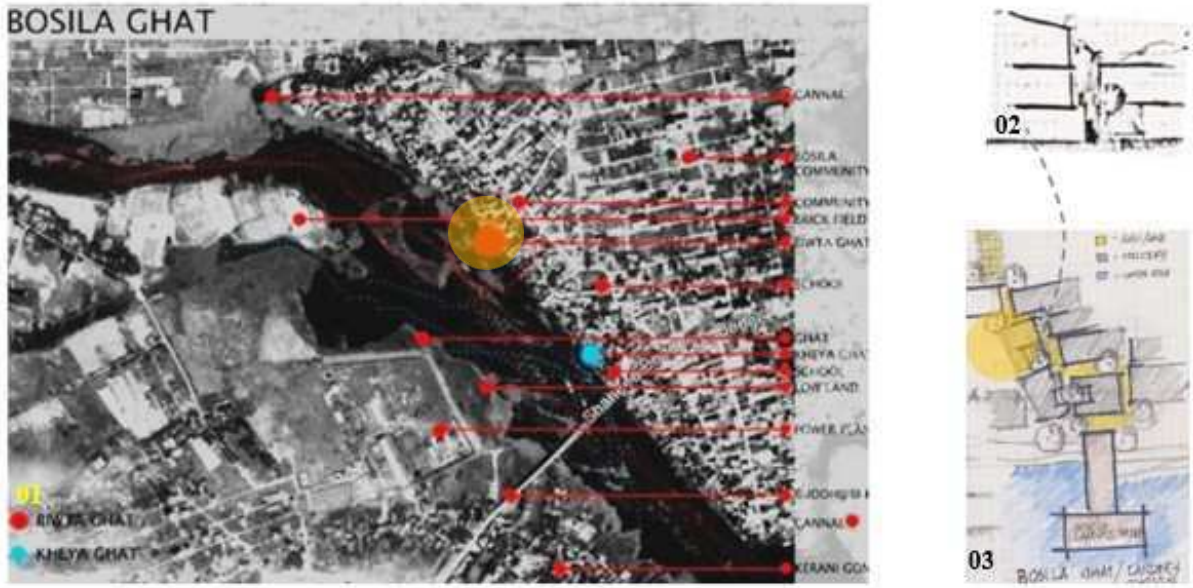


Figure-3.6: Figure Shows the Bosila Landing Station area and its surrounding area.

Figure01: Map shows Landing Station and other important structures of the Adjacent area.
Figure02:Section of the connector road of the landing Station.
Figure02:Plan shows the connector road and the landing station connection.
For making the landmark map Google earth map used for the base map.

Sketch 3.6: Section of the Bosila Landing station adjacent area (landing station to Main Road). The section represents navigation during the dry and rainy seasons.The land use of the Landing Station adjacent areas and the building heights around the landing station area, the vegetation of the Landing station area.

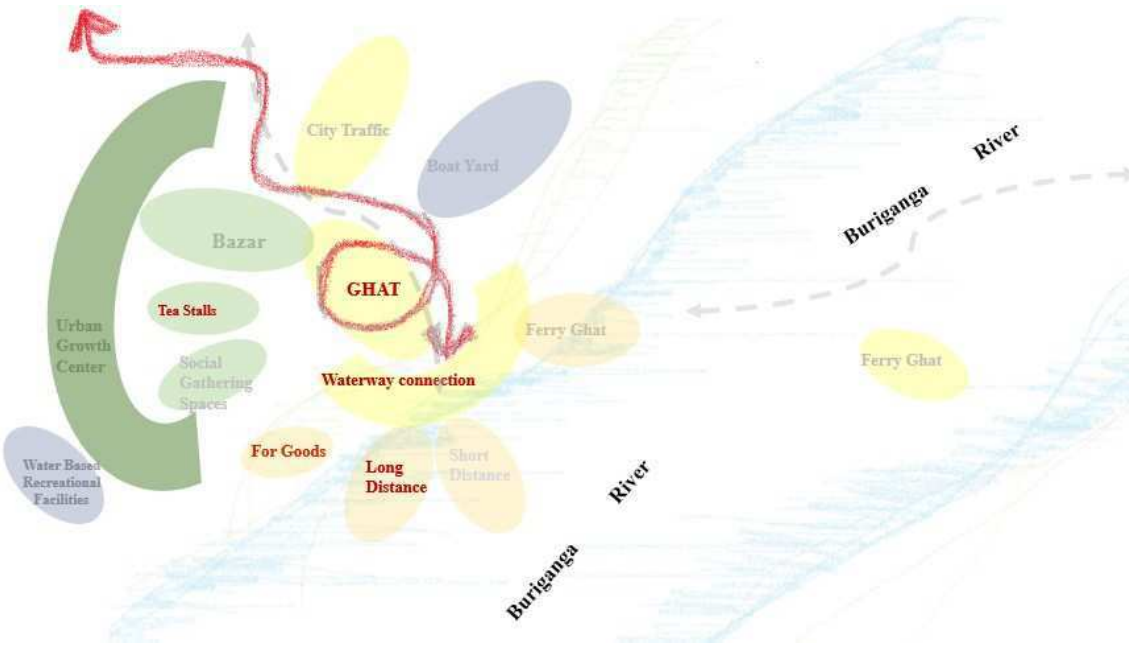


Figure 3.7: Functional flow charts of the Bosila landing station and its relation with the other economic, social, and recreational activities. The whole thing is not working at all due to there is no connector road.There is no gangway in the landing station.

3.17.5 Socio Economic Activities and its influence on Landing Station

The Economic significance of this landing Station is almost zero. It's a non functional Landing Station.

3.16.6 landing Station Management

Landing station is managed by the autonomous authority. It is the authority that was selected by the BIWTA. For every two years, the BIWTA selected an authority to operate the Ghat. The selection process is an open tender. But the Landing Station is under lock and key and it's a nonfunctional landing station in this 110 km waterway.

3.17.7 Identified Cultural Landscape

- A compact organic settlement, with about 35%-45% void area.
- In the figure ground map, it was clearly identified that the Landing Station is at the back of the road network and the residential area. It has no direct connection with the main road.
- The Landing Station is the back of all buildings. It is very hard to find out the landing Station due to it having no proper connection with the main secondary roads.
- Built forms are largely 4 to 6 stories with a contemporary look.
- All the buildings are used for residential purposes and not more than 5% of buildings are for other activities.
- The Goli/ lane ends at the secondary road and the secondary road ends at the main road.

- At the meeting point of each type of road there are some gathering spaces for the neighborhood people, which have no relation with the Ghat.
- The Landing Station has no gangway.
- There are no Bazar and other economic activities near the landing Station.
- With the BIWTA landing station there is no Desi boat Ghat which makes it more vulnerable to the Landing Station.
- And the bank is so high from the water level and there is no proper gangway. It makes the landing station useless.
- Huge amounts of trees make the total area more sustainable.

3.18 Gabtoli Landing Station

The study area along the Dhaka Aricha Road lies under the gabtoli to Amin bazar Bridge. Opposite to this Ghat kaundia union of shaver District. The study area was linked with Dhaka city with comparatively high traffic density and has industrial influence. It carries, on an average, 9000 motor vehicles per day. The study area is surrounded by numerous brick fields and a Landfill area near Aminbazar. Gabtoli-Amin bazar area is the transition point of Dhaka city, the largest bus stand acting as entry and exit point from the city. One of the biggest track stands is also very near the site. There are a number of deshi boats Ghat is located around the site. Amin bazaar landing station is very near to this landing station.

The landing station at Amin Bazaar is crucial for transporting goods and commodities by using the waterways around the whole of Bangladesh. Only regular passengers are intended for the Gabtoli landing point. It began operating in 2004. Certain Kaundia Union communities and other Saver District villages rely more heavily on water-based transportation. The river Turag is crucial to the area's reliance on water transportation.

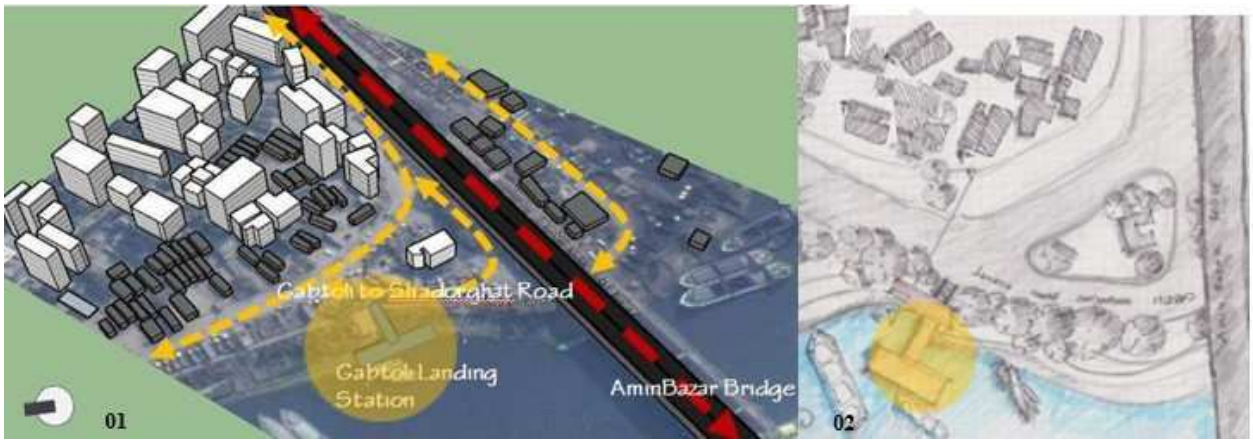


Figure 3.9: Figure Shows The Gabtoli Landing station and road connectivity.

Photograph01:‘3D’ shows the organic growth pattern of the gabtoli area and the axial road is used as an access road for the Landing Station area.
Photograph02: Figure Ground Map shows the organic growth pattern of the Gabtoli area and the location of the landing station.
For making the ‘3D’ Google earth map used as base map.

Figure-3.10: Figure Show the Gabtoli Landing Station area and its surrounding area.

Photograph01 : Photograph shows the huge stair used as gangway which is culturally not accepted by the passengers
Photograph02 : Photograph shows the Landing Station and the river with a lot of water vehicles.
Photograph03 : Photograph shows the sAmin bazar landing station.
Photograph04: Adjacent residential area or nearby cityscape from the river Turag.

Photograph05: Figure ground map shows the road network connectivity.
For making the figure ground map google open street map is used as base map and for the pictures google earth pictures at Gabtoli Landing station point pictures are used.

3.18.1 Present land use and surrounding Urban Fabric

Gabtoli area is well known as the entry point of Dhaka city,about 9000 motor vehicles per use this bus terminal and pass away this interdistrict bus terminal.A huge numbers of people work in this bus terminal and live nearby areas especially on the other bank of the river Turag.They used the ferry boats for ferry purpose for home to work and work to home.The Ghat adjacent area is also organically grows, but as it is the most busy road transport hub most of the road adjacent building have shops and commercial activities live motorparts shop and travel offices.

3.18.2 History of the landing Station

The history of this Landing station is not too old. In 2004, the government of Bangladesh took a new project to rearrange the and revive the waterways of Dhaka. Under this project this landing Station was built. But this landing Station did not work due to there being no gangway in this landing station.The Ghat is set on the axial road which also does not go the cultural landscape character of a Ghat.

3.18.3 Road network influences on Landing Station

The Axial roads like Gabtoli Sadarghat embankment road and Dhaka Aricha inter districts road connect this landing station. And the Amin Bazar Landing station makes connections with the whole country by waterways. The navigation quality is good in the rainy season but for dry season it is only for DMB.But the landing Station is on the embankment road level which is unnecessary too high for the daily passengers.The landing station is directly connected with a busy axial road. There is no proper bus stop for the landing station.

Sketch 3.7:Section of the Gabtoli Landing Station adjacent area (Landing Station to main road).

The section represents navigation during the dry and rainy seasons.There is no gangway.The Landing Station is too high from the water level of the river.The land use of the Ghat adjacent areas ,the building heights around the Ghat area, and the vegetation of the Ghat area.

3.18.4 Present water and Road network

This Landing Station is very well for industrial material departure and arrival and a well waterway and road way connection through the whole country. The Ghat is directly connected with the main Axial road. There are huge material departures around the Ghat adjacent areas. And for the road trucks are are standalone the roads for loading and unloading of construction materials. Same as the water vehicles also stand near the Ghat area for material loading and unloading. beside the Ghat there is a ferry Ghat for ferrying people from one bank to the other bank.

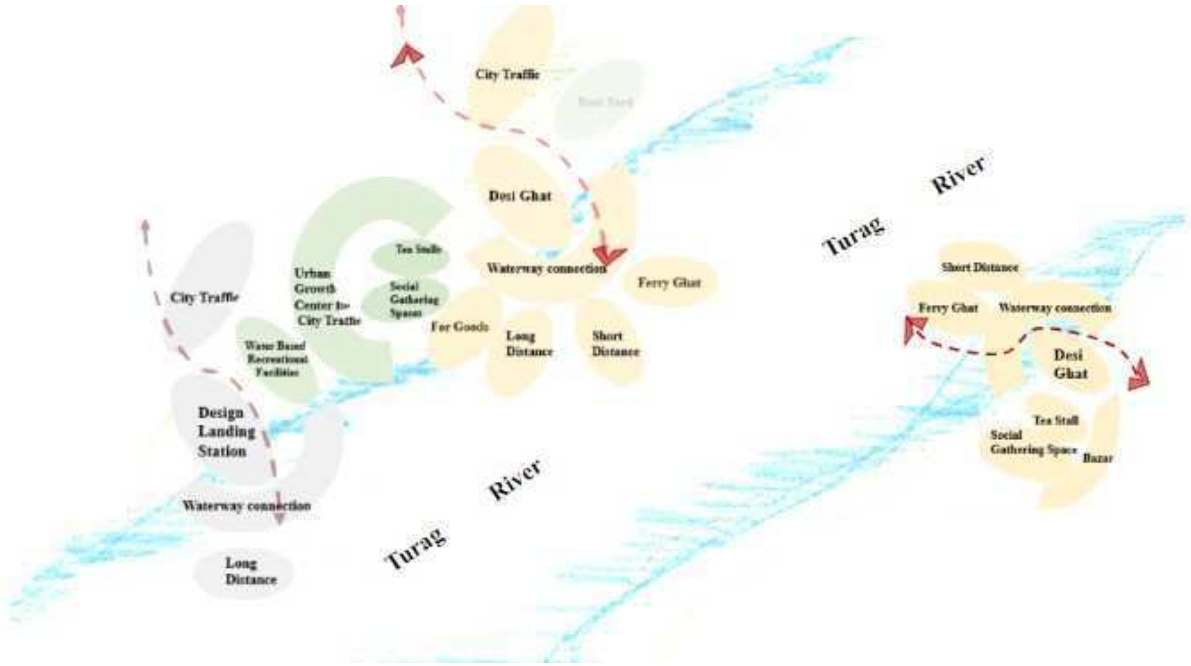


Figure 3.11: Functional flow charts of the Gabtoli landing station and the Ghats.

The Landing Station is dysfunctional but the Ghats work very well. The Ghats have relations with the other economic, social, and recreational activities. The whole thing is informal but works like a single complex. The individual functions work individually but they impact the whole Ghats activities as well as the Waterways activities.

3.18.5 Socio Economic Activities and its influences of Landing Station

This Landing Station has no economic significance due to its dysfunctional landing station. Adjacent Ghats have a great significance on the economic activities of the total adjacent areas. due to a huge amount of workforce use the Ghats for ferry purposes and they work at the bus terminal and this bus terminal is one of the biggest Interdistrict terminals of the country.

2.18.6 Landing station Management

Ghat is by the authority that was selected by the BIWTA.For every two years the BIWTA, selected an authority to operate the Ghat. The selection process is an open tender. The selected authority will maintain the Ghat and collect the money from the people who used the Ghat. But BIWTA is a government organization who manages the whole management of all the Ghats.But the landing station is not working

3.18.7 Identified Cultural Landscape

- The Landing Station is a compact organic settlement, with about a huge void area, due to this area is the junction point of Sadarghat to Gabtoli embankment road and one of the ending points of Mirpur road.
- In the figure ground map it clearly shows that the Landing station did not get any preparation space or setback. for its passengers or the users.The entry of the Landing Station is direct from the Axial road.
- Built form of largely five to nine stories with modern structure and materials.
- The ground floor and the 1st floor are used for Commercial activities.
- The Goli/ lane ends at the main road.
- At the meeting point of each type of road there are some gathering spaces for the neighborhood people but it is not Landing Station related people.
- the Landing Station Building in the road level that is so high from the water level of the river.
- The Ghat has no Gangway.
- Almost all built structures are related to road vehicle service related activities
- With the BIWTA landing station there are Desi boat Ghats adjacent to these landing stations which make it more sustainable.
- These Desi boat Ghats are live from early in the morning to midnight.
- Huge amount of trees make the total area more sustainable

3.19 Pagla Bazar Ghat, Narayangang

The Narayanganj Sadar Upazila is where Pagla is located. One of Bangladesh's oldest industrial areas is Narayanganj. Additionally, it serves as a hub for commerce and industry, particularly for the nation's textile industry, shipbuilding, and jute trading and processing facilities. This "PAGLA PANGAU GHAT" is not far from the Pagla water treatment facility. Numerous ghats run parallel to the embankment road. These Ghats are mostly used for loading and unloading building materials. This Ghats is associated with several workers, watercraft, and trucks. This location is quite active all day for Ghat-related activities. The authority (BIWTA) doesn't do a good job of maintaining these antique Ghats. Every day, there is a significant amount of business activity in and around the ghat region. These Ghats activities also affect the nearby Pagla market. Structures around the Ghat are semi-paka. According to the 3D perspective, the nearby structures enlarge to form the Ghat's central point.

3.19.1 Present land use and surrounding Urban Fabric

Pagla area is well known at the time of colonial period because this area is well established for jute trading and the Ghats of this area are used for jute movement. Over time the jute trading shifted.Now, these Ghats are well known for carrying construction material and ferrying the workers that work on the industries adjacent textile industries.At the Ghat areas all the training companies have 'semi pacca' trading houses which is the culture of the riverside business hub of Dhaka as well as Bangladesh.

The figure ground map shows that all the structures and road network are focused on The Ghat area.it represents how these areas grow from the Ghat activities. The land use represents the organic growth of informal residential areas used by the workers who work in these Ghat areas.

3.19.2 History of the Ghat

This Ghat and adjacent areas is about more than hundred years old for jute trading during the colonial perid. The Ghatwas used for the jute loading and unloading during the the Adamji jute mill run. For different water level this Ghat used indigenous materials which makes the Ghat work properly.For these reason this over 100 years old Ghat had no permanent structures. The axial road is directly connected with the main city as well as the other parts of the city.

3.19.3 Road network influences on Ghat

The Axial road connects the Ghat with Dhaka and Narayangong as well as the whole bangladesh. And the waterway and its navigation quality connected the whole Bangladesh with the Ghat and all kinds of water vehicles all the year round.

3.19.4 Present water and Road network

This Ghat is for industrial material transportation and has a well waterway and road way connection through the whole country. The Ghat is directly connected with the main Axial road. There are huge materials loading areas around the Ghat adjacent areas. And the trucks are standalone the roads for loading and unloading the materials.Same as the water vehicles also stand near the ghat area for material loading and unloading. beside the Ghat there is a ferry Ghat for ferrying people from one bank to the other bank

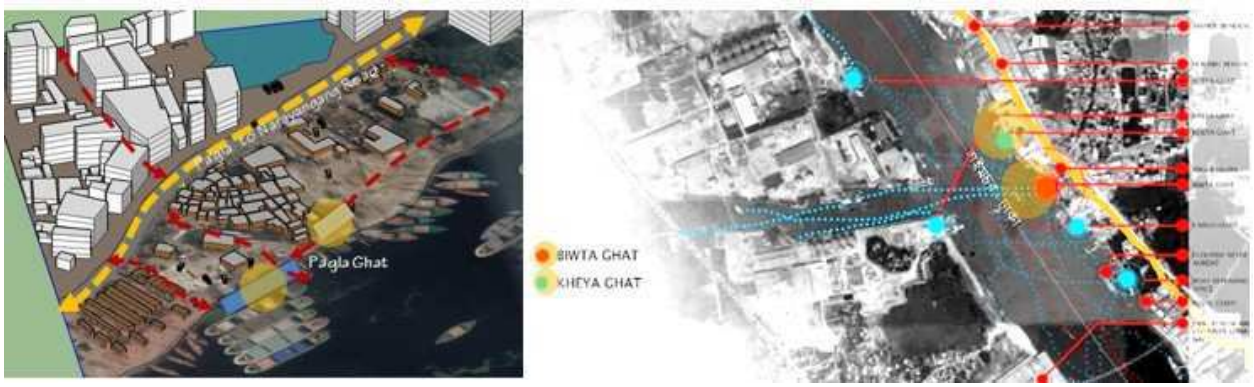


Figure 3.12: Figure Shows the Pagla Bazar Ghat, water and road connectivity, important Structures around Ghat.

Photograph01: Figure Ground Map shows the organic growth pattern of the Bosila area and the location of the landing station.
Photograph02: '3D' shows the organic growth pattern of the Bosila area and the access road and collector roads near the Landing Station area.
For making the '3D' Google earth map used as base map and for the landmark map google earth map is also used.

3.19.5 Socio Economic Activity and its influences on Ghat

The Economic significance of this Ghat is high. All the trading organizations have their agent offices in the ghat complex. This Ghat is well functional and well known to all over Bangladesh for goods transport. A huge economic activity happened in this Ghat and many people are working in this Ghat.

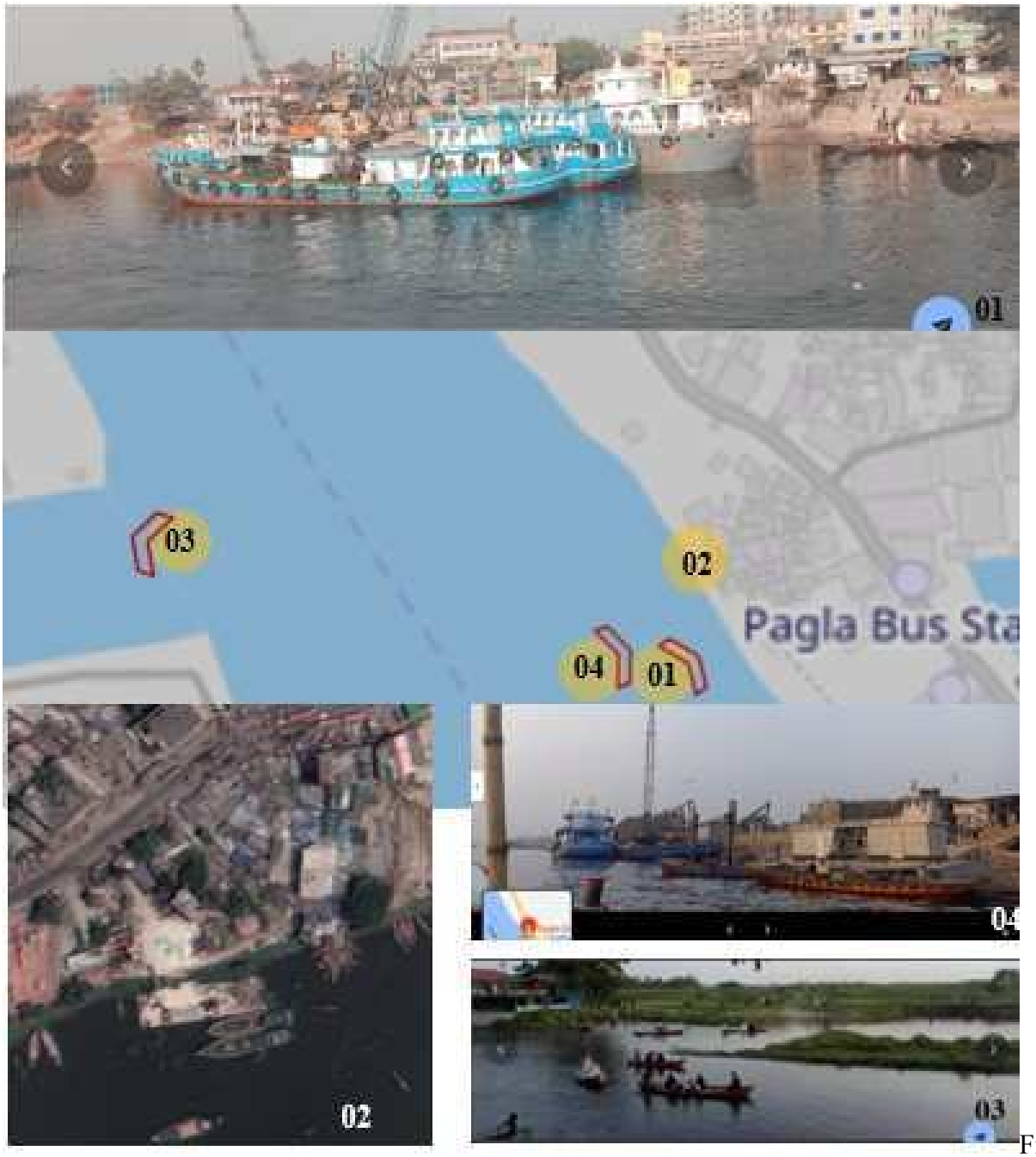


Figure-

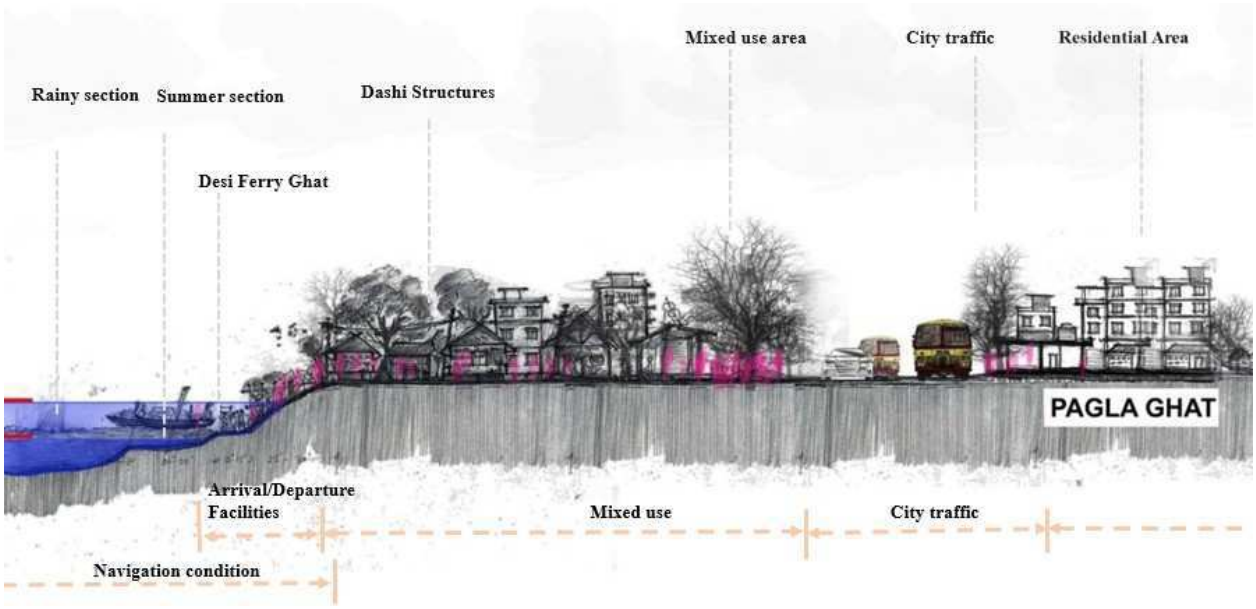
3.13: Figure Shows the Pagla Bazar Ghat area and its surrounding area.

Photograph01 : Photograph shows the Ghats and the river Dhaleshwari .
Photograph02 : Google map '3D' view of the Ghats and material loading and unloading area and its connection with the Axial road.
Photograph03 : Water Based recreation, opposite bank to the river, people are rowing on boats.
Photograph04: Ghats from the river Dhaleshwari.
Photograph05: Figure ground map shows how the adjacent area grows from the ghats.

For making the figure ground map, google open street map is used as base map and for the pictures google earth pictures at Pagla Ghat point pictures are used.

Figure 3.14: Figure Shows Ghats and water and road connectivity and surroundings of Ghat area.

Plan 01 : Plan shows the Ghats, the river and the surroundings
Photograph01 : Picture shows the unloading of the construction materials.
Photograph02 : Picture shows the narrow lanes between the traditional trading centers.
Photograph04 : Picture shows the narrow spaces in front of the traditional trading centers.
The map and the pictures are credited by Fahima Salam.
Photograph05 : Picture shows the Ghat yards and its connection with axial roads.



Sketch 3.8: Section of the Pagla Ghat adjacent area (Ghat to Main Road).

The section represents navigation during the dry and rainy seasons. the slope of the gangway. The connector road distance with the main axial road. the land use of the Ghat adjacent areas and the building heights around the Ghat area, the vegetation of the Ghat area.

2.19.6 Ghat Management

Ghat is managed by the autonomous authority. It is the authority that was selected by the BIWTA. For every two years, the BIWTA selected an authority to operate the Ghat. The selection process is an open tender. The selected authority will maintain the Ghat and collect the money from the people who used the Ghat.BIWTA is the government organization that manages the whole management of the Ghats.

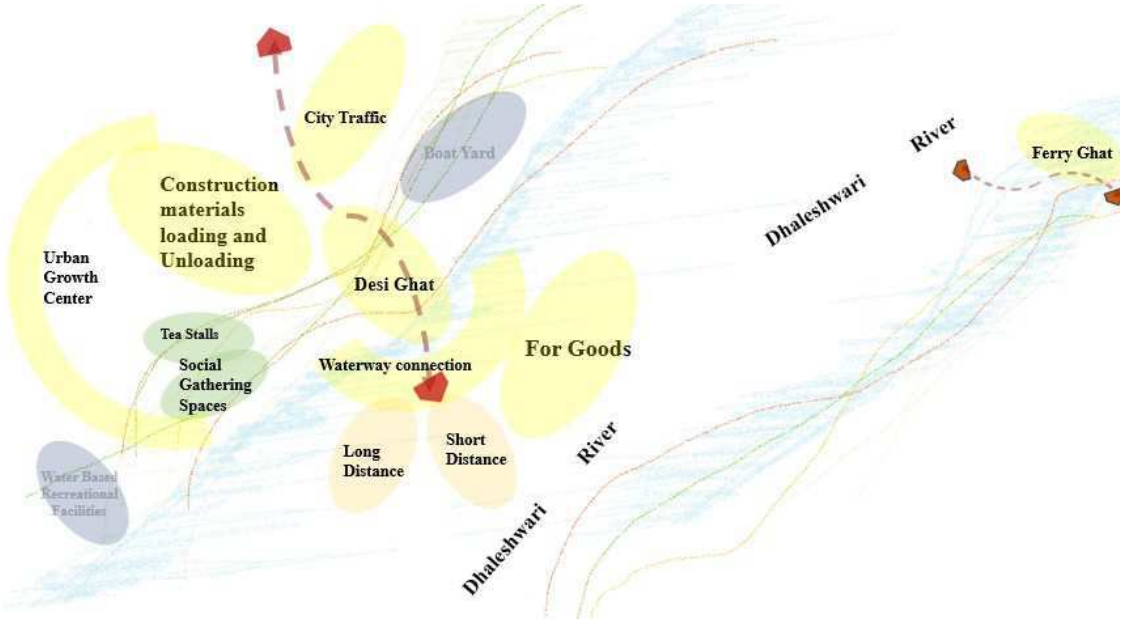


Figure 3.15: Functional flow charts of the landing station and the Ghats.

Its relation with the other economic, social, and recreational activities. The whole thing is informal but works like a single complex. The individual functions work individually but impact the whole Ghat activities as well as the Waterways activities.

3.19.7 Identified Cultural Landscape

- A compact organic settlement, with about 60% -70% void area near the Ghats adjacent areas.
- In the figure ground map it was clearly identified that Ghats are the center point of the road network and neighborhood growth center point.

- All the structures grew from the focused point of the Ghat.
- Ghats adjacent trading centers are ‘semi pacca’ which represent the cultural landscape character of the structures near the Ghat area.
- Built form of largely two to 5 stories with modern structure .
- The Goli/ lane ends at the secondary road and the secondary road ends at the main road.
- At the meeting point of each type of road there are some gathering spaces for the neighborhood people.
- The Ghat Gangways ends at Ghat yard. and made with traditional materials
- There are Bazar and other economic activities which depend on Ghat.
- There are mainly two types of Ghat activities working on the study area there one is Ghat for Materials transportation and other is for ferry purposes.
- Huge yard area used for material dumping and loading area for road and water transport.
- Huge amounts of trees make the total area more sustainable.
- Boat rowing area on the opposite bank of the Ghat of the river Dhaleshwari makes the ghats more sustainable.

3.20. Chourongi Ghat, Narayangang.

Chourongi Ghat is popular for desi kheya Ghat. It connected the peoples of two banks of river Shitalakhya. The east bank is Khanpur and the west bank is Ekrampur. Water amusement park (Chorongi fantasy park) is on the border of this ghat area. The ghat and the park area is mainly the BIWTA area. But the east bank or Khanpur is more residential area and west bank or Ekrampur is mainly Industrial area.

Figure 3.16: Figure Shows Chorongi Ghats and water and road connectivity.

Photograph01: ‘3D’ shows the organic growth pattern of the Khanpur and the access road and collector roads near the Ghat area.
Photograph02: Figure Ground Map shows the organic growth pattern and important structures of the east bank Khanpur and the west bank Ikrampur Which is located near the Ghat.
For making the ‘3D’ and the landmark map Google earth map used as base map.

3.20.1 Present land use and surrounding Urban Fabric

The east bank is mainly a residential area and the west bank is mainly Industrial area. Everyday people use this Ghat, in the morning from home to their work and in the evening they use this Ghat again from work to go home.On the largest cement factory, dock yard and some textile industries are situated on the industrial area.

3.20.2 History of the Ghat

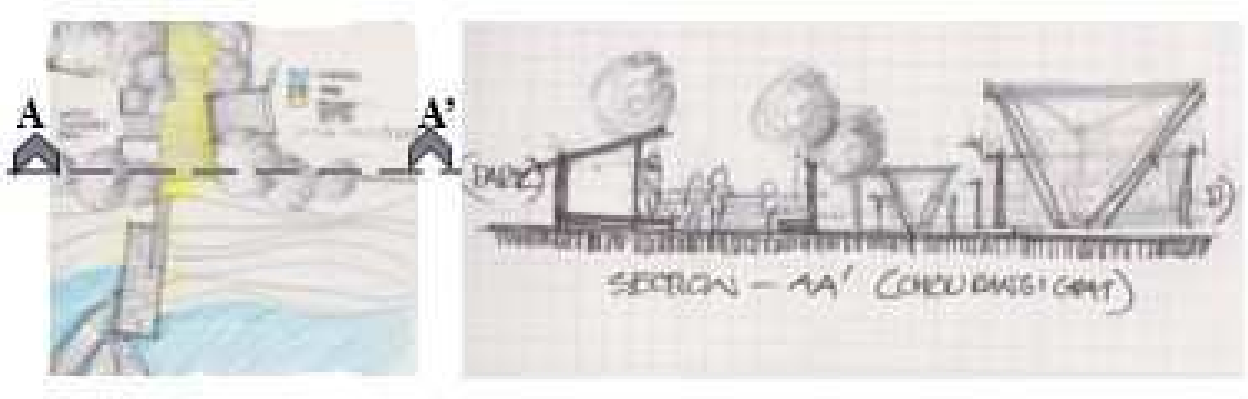
This Ghat has been set up on the land of Bangladesh Inland Water Transport Authority's (BIWTA). The BIWTA water vehicles dock yard is situated on the north of this Ghat, and A floating restaurant and fantasy park on the south of the Ghat.The history of Ghat is Older than the park and dockyard. It connected the two banks of the river Shyatalakhya. This Ghat becomes busy after these areas become a dense Industrial area. these amusement park make these Ghat more significant for the neighborhood people. The use of this Ghat goes up due the park also.

3.20.3 Road network influences on Ghat

This Ghat is directly connected by a connector road from Ghat to the axial city road which is directly connected with the city center as well as connected with the rail station.the city center and the rail and main bus stop of the city is about only 1.5 kilometer radius of the Ghat.for this reason this ferry Ghat is used by the neighborhood people for easy communication

3.20.4 Present water and Road network

This Ghat is mainly a traditional ferry Ghat, used for ferrying people from one bank to the other bank. But these rivers and the surrounding neighborhood also depend on waterways.So, there are short distance boats that are connected between each Ghat to the other.



Sketch 3.9: Sketch shows Ghat plan and section.

Photograph01: Picture shows the plan of the Ghat.
Photograph02: 'Section of the Ghat' with the dockyard of BIWTA.

3.20.5 Socio Economic Activity and its influences on Ghat

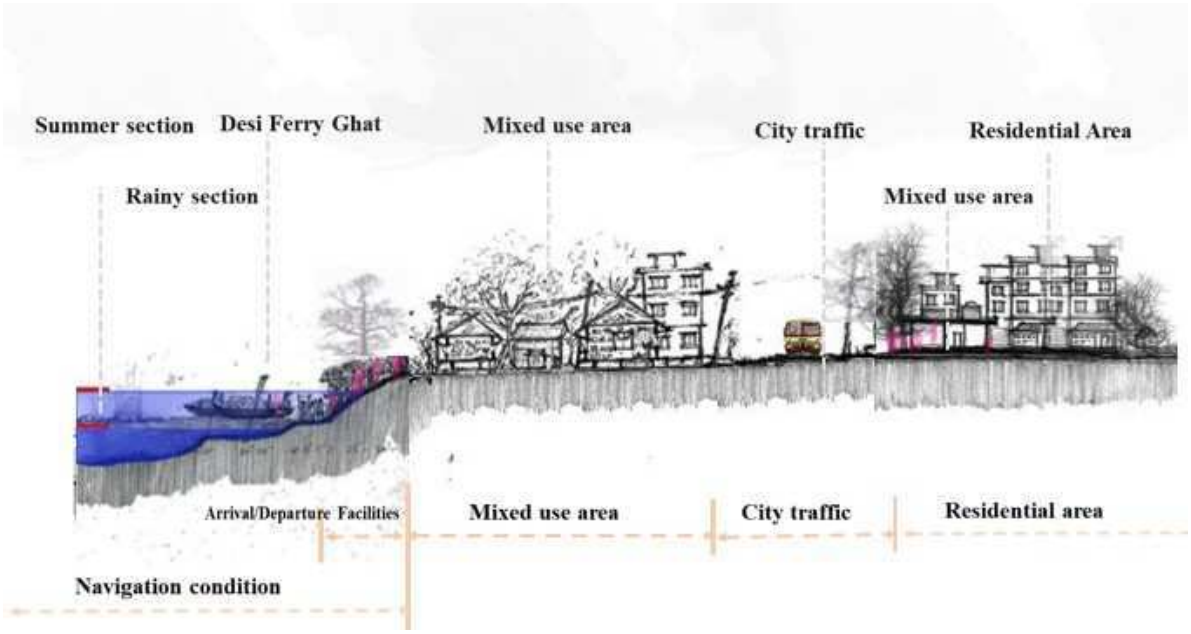
These Ghat are not related with the Goods carrings and goods arrival and departure activities. This Ghat has a significant influence on the economic activities on the industrial area of the other bank. Huge number of the factory workers live on the east bank. Everyday they use the Ghat to go to work and come back home. This Ghat also used by the people who come the amusement park. So, it is used for recreational and social influences for the neighboring people.

3.20.6 Ghat Management

Ghat is managed by the autonomous authority. It is the authority that was selected by the BIWTA. For every two years, the BIWTA selected an authority to operate the Ghat. The selection process is an open tender. The selected authority will maintain the Ghat and collect the money from the people who used the Ghat.BIWTA is the government organization that manages the whole management of the Ghats.

Figure-3.17: Figure Shows Chorongi Ghat area and its surrounding area.

Photograph01 : Photograph shows the indigenous materials also used with the concrete steps.
Photograph02 : Photograph shows the concrete steps are used for Ghat slope.
Photograph03 : Photograph shows the other banks land use from the Ghat.
Photograph04: The Ghat from the river Shytalakhya.
Photograph05: The Ghat at dry season and for the dry season indigenous materials are used for ramp materials.
Photograph06: Old and abundant ships are dumped in the nearby BIWTA dockyard.
Photograph07: The figure ground map shows the road network around the Ghat area.
For making the figure ground map Google open street map used as base map and for the pictures google earth pictures at Chourongi Ghat point pictures are used.



Sketch 3.10:Section of the Chorongi Ghat adjacent area (Ghat to Main Road).

The section represents navigation during the dry and rainy seasons. the slope of the gangway. The connector road distance with the main axial road. the land use of the Ghat adjacent areas and the building heights around the Ghat area, the vegetation of the Ghat area.

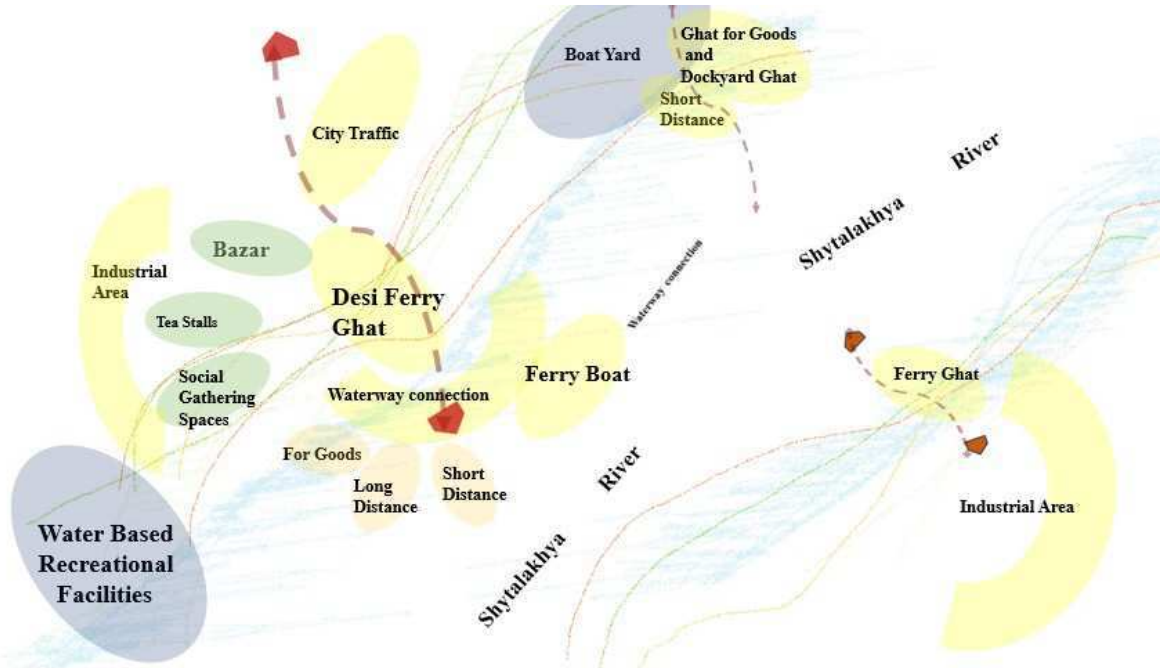


Figure 3.18: Functional flow charts of the Chorongi Ghats.

Its relation with the other economic, social, and recreational activities. The whole thing is informal but works like a single complex. The individual functions work individually but impact the whole Ghat activities as well as the Waterways activities.

3.20.7 Identified Cultural Landscape

- Both banks are composed of organic growth neighborhoods.
- In the figure ground map, it was clearly identified that Ghat is directly connected with the road network.
- Built form of largely 4 to 10 stories with modern structures.
- The Goli/ lane ends at the secondary road and the secondary road ends at the main road.
- At the meeting point of each type of road there are some gathering spaces for the neighborhood people.
- Minimal frontages and narrow lanes create a small compact streetscape which then opens out to a later, wider street pattern of winding nature.
- The Ghat Gangways are made with desi materials which are traditionally used and works very well for Ghat with different water levels.
- The Industrial area and the fantasy park depend on Ghat.
- With the BIWTA dock yard and other Ghats connected with this Ghat which make it more sustainable.
- This area of the Narangang industrial area depends on waterways in terms of ferry people as well as goods movement throughout the whole country.
- Huge amounts of trees make the total area more sustainable.

3.21 Cultural landscape that Found for a functional Ghat

The Ghats are works on basic things-

iGhat connection with the city road network and and commerces

ii.Functions of the Ghat

i.Ghat connection with the city road network and and commerces

The city depends on services and the services depend on efficient road networks. City works on in time presence of goods and services.The old Ghats of the city and its adjacent areas are the old CBD and still works as CBD.There are narrow lanes that all are end at Ghats and have well connection with the whole city,

The Ghat adjacent areas are used for informal and formal business activities,

the boat maintenance and boat garages are very near to the Ghats,

the goods that are carried by the waterways it has warehouse near the Ghat areas,

There are intermediate vehicles from the Ghat to the nearby terminals.

Waterways are economic with compare the road and rail

These are the main causes that make it sustainable and successful.

ii.Functions of the Ghat

01. The arrival of the Ghat area,
01. The waterway and the boat
02. The departure from the Ghat area and connection to nearby road network
03. Informal and formal Ghat rated commercial and recreational activities
04. Floating restaurants and recreational boats

01. The arrival of the Ghat area

After arriving at the Ghat area there need proper gangways to enter into the water vehicles. Rivers are natural things and the water level changes due to seasons and tide. So for the new Ghats adjustable gangways are mandatory. But for the old Ghats the indigenous gangway was made with bamboo and it's functional.

02.The waterway and the boat

Boat making and driving is a very indigenous technique. A smooth boat and boatman are mandatory for the waterways.the indigenous system the people who have interest about boats they work as an assistant of the main boatman or boatmaker and overtime he becomes the boatman or boat maker.

03.The departure from the Ghat area and connection to nearby road network

The departure of the passengers and goods from the Ghat, the easy movement of the passengers to the nearby vehicle station is the departure system of a Ghat.In the old Ghats this system worked informally.

04.Informal and formal Ghat rated commercial and recreational activities

Most of the Ghat area have informal and formal Ghat related socio-economic activities. They are both formal and informal.

05.Floating restaurants and recreational boats

There are small boats that are used for recreational purposes and there are floating restaurants. It's both formal and informal. Those facilities are used by the passengers and nearby neighborhood people.

Old Ghats of the city are very efficient and the road network of the city is connected with the Ghats so the whole thing works together as a part of a system. The arrival of the goods and passengers arrived in the Ghat and then it derpart for the city is organically interconnected. It works very functionally. Same for the passengers of the waterway users sometimes for the passengers using other vehicles to reach the nearby terminal but for goods the Ghat is connected with the warehouses with narrow lanes and human labors are used for the movements of the goods from ghat to warehouses and it's the indigenous.

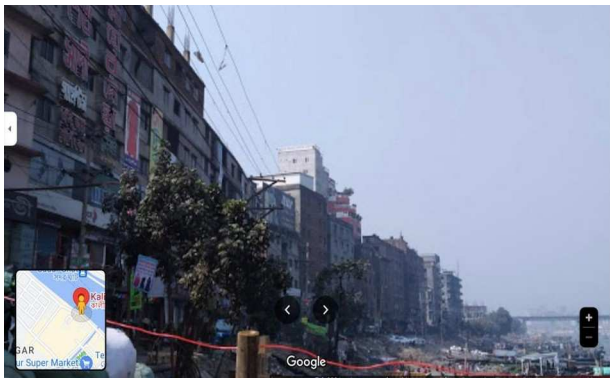
3.22 Conclusion

Part B is an analysis of the individual selected Ghat. How it works, how it makes connections with other Ghats and the overall city network. The point or the area where the neighborhood interacts with the river is called Ghat. Different Ghats have different purposes. The Ghat activity depends on the river and the peripheral urban fabric depends on Ghat activity. The road networks and land use patterns grew from Ghat. The success of individual Ghats depends upon different factors. The 'Part B' is an analysis and identification of the cultural landscape of the individual Ghat area.

For analysis, four indigenous Ghats and three landing stations (newly designed Ghats) are analyzed to understand the cultural landscape of the Ghats. There are some specific issues to analyze the Ghats. Old Ghats are more functional compared to the new Design landing stations but the Old Ghat needs more services for the passengers and needs some policy-level interventions to make it more user-friendly. In the next chapter, there are some policies, proposals, and recommendations for the waterways and as well as for the Ghats are provided to enhance the cultural landscape of the city.

All Ghats are analyzed with the same issues to understand it on a common platform. And after the analysis, it found some factors or the cultural landscape characteristics that work behind a Ghat becoming sustainable and functional over time.

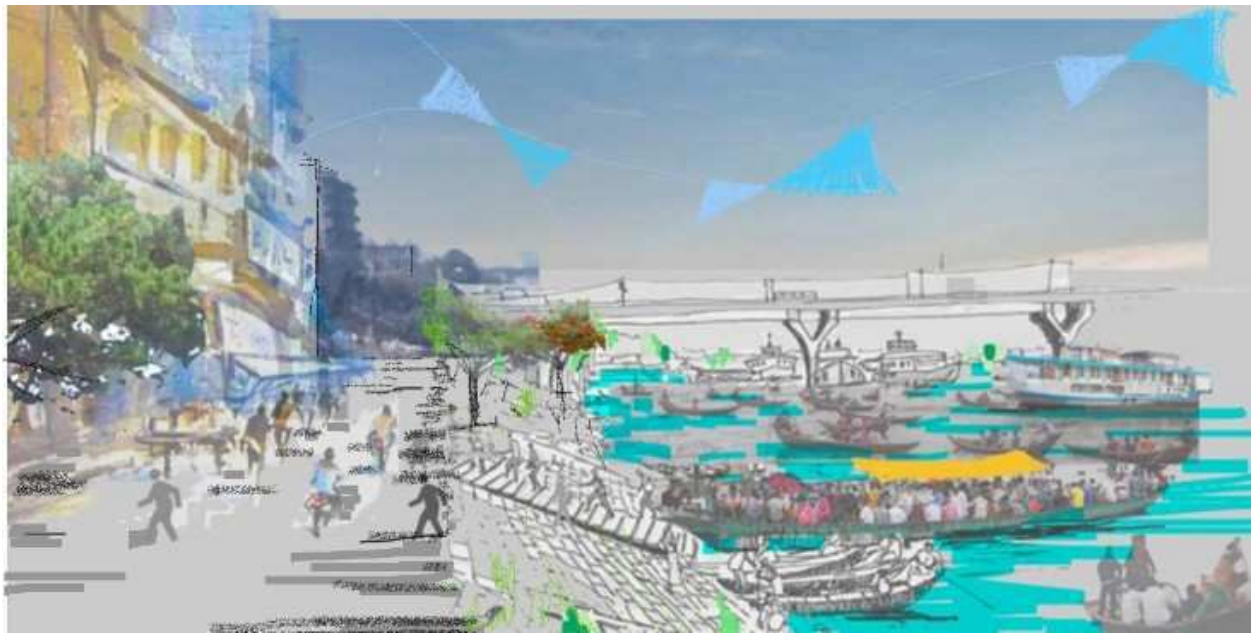
Chapter IV: Strategies, policies for the 110 km waterway and proposals for Individual Ghat



Photograph 4.1 and 4.2: Present Condition-01(A) and 01(B)[195] [196]

[195] Google map at Kaliganj Ghat point, Picture contributor, Md. Sajid, feb2021.

[196] https://www.dreamstime.com/banks-buriganga-river-dhaka-bangladesh-october-capital-largest-city-image166155537



Sketch 4.1: Proposed Condition

4.1 Introduction

In the previous chapter reality as well as the present conditions of the 110 km long river system on the periphery of the 400 years old capital city and the Ghat morphology was analyzed.This 110 km long river system traditionally used as waterways so, the waterways interacts with the city with in the Ghat areas. From the reconnaissance survey and analysis the cultural heritage of the rivers and some selected Ghats are identified.The impacts of these river system and Ghats to the city are enormous.Some Ghats lost their basic characteristics as well as the waterway also lost its previous cultural landscape.so some recommendations have been suggested.

Through the 110 km waterways. There are five rivers and one khal. These waterways have different conditions or different characteristics with the surroundings. With the help of the analysis of the previous chapter of the waterways and Ghats some proposals and recommendations have been suggested for the redevelopment of the study waterways in respect to the existing situation for enhancing the water based activities for surrounding people and also the uses of the Ghats and existing surrounding areas of the Ghats for the city people. Proposals have been suggested through sketches and by using some simulation softwares to show how specific problems may be solved and to make them understandable to the reader.

Dhaka may be a successful example of urbanism, and a continuous waterway around the city.A Successful waterway may be provided in both the inner and outer parts of Dhaka if the waterway is created as a single continuous course and is operated as a continuous entity. At various locations, the

waterways may be linked to the city's traffic, which will improve Ghat activity and canal use while easing the city's traffic congestion. It needs a decent link to the major city traffic in order to improve the Ghat's activity. Urban areas that are water sensitive will enhance areas around rivers and provide residents with a variety of picturesque locations. The water based urban spaces are also enhance and preserve the ecosystem of the critical points where water and land interacts with each other. In this chapter some examples have been shown to give some ideas how these waterways and Ghats can be redeveloped by using the identified cultural landscape of the Ghat areas.

4.2 Strategies, policies and proposals for waterways and Ghat

Dhaka's water features have made the city distinctive, a requirement for a particular approach to urban planning and development. But since the industrialization, as it works as a capital as well as one of the biggest industrial cities of Bangladesh everything has been ruined, either deliberately or as a result of a series of poor choices. We need political will, a big vision, and a real commitment to carry it out in order to make changes in a metropolis like Dhaka. More than technocracy, creativity is required for Dhaka's planning.

People who understand the designing of cities should be brought to the helm and not bureaucrats and seemingly uninformed technocrats (Ashraf, K. K. 2010)[20]. First and foremost, we need to safeguard our rivers and try to return them to their pre-industrial state. We require appropriate planning, policy, and execution in order to achieve this. There should be some effective actions made in order to preserve and improve the waterway value of the studied water channels surrounding Dhaka city.

According to Patrick Geddes's hypothesis, the riverfront may be developed as an esplanade and utilized as one of the open spaces. The thoughts of his first master plan about this city, the riverfront might be developed exclusively as a park and recreation area, leisurely space, urban agricultural space. Along with that, the river itself may offer a variety of leisure opportunities, such as afternoon boat racing and boat riding, and the islands can be visited and preserved as a reserved ecosystem area. Constructed parks and gardens for the community to use for holiday picnics and afternoon romps. The river museums will serve the people as a communication point of the old history of these rivers and its impacts on the city.

In the Analysis there are two parts. One is to understand the overall river condition and the surroundings to introduce a successful waterway and to make it functional we need successful Ghats.Part two is for identification of the cultural landscapes for the Ghats. so the strategies and recommendations are also focused on the waterways and the Ghats.

4.2.A. Strategies

These river systems need two type of basis strategies

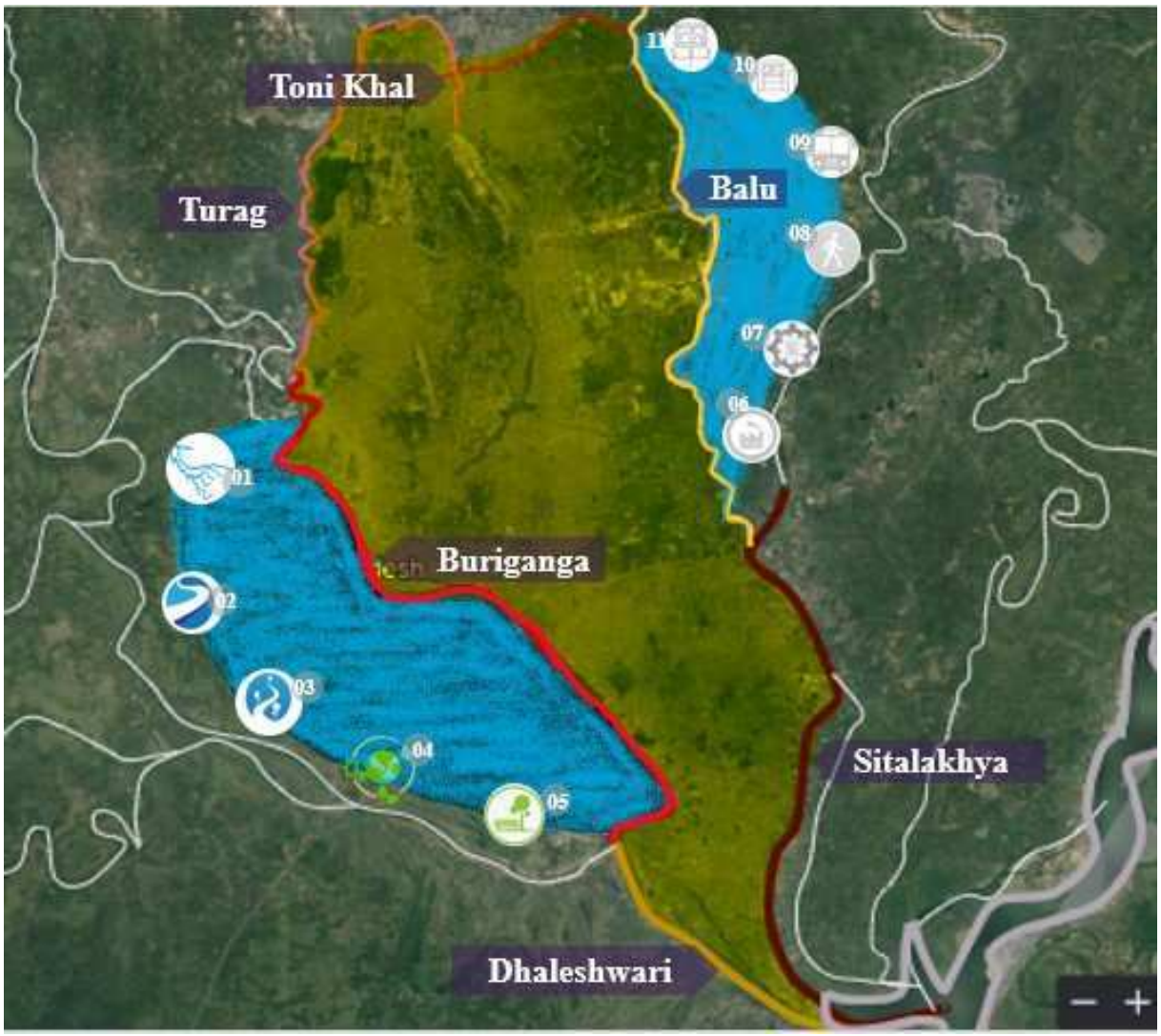
I. The water system should work as a water urbanism issues for the mega city as well as bring back the better urban environment for the city,
II. Water urbanism heritage preservation by more involvement of the city people and government.

4.2.B. Proposals

I. **Proposals for the110km long waterway.**

4.2.A.I.The water system should work as a water urbanism issues for the mega city as well as bring back the better urban environment for the city—

01. Make a connection with the nearby meghna river (Picture green river connectivity) which brings a lot of water to the river system.
02. Better connection between these five rivers and the khal, make the river revive, they are dying
03. Introducing a continuous waterway, for the people and goods carrying. Inshort distance and for long distances. PPP(Public private participation) investment for the waterway.
04. Creates a buffer ecotone zone for individual rivers and also protects the river in terms of dry and rainy season sections.
05. Create a blue and green network around the periphery of the capital.
06. Small green park and small seasonal urban agricultural land that may be introduced for the city people. For healthy life and a healthy ecosystem river bank should be used as a breathing space and for better connectivity with rivers for the city people.



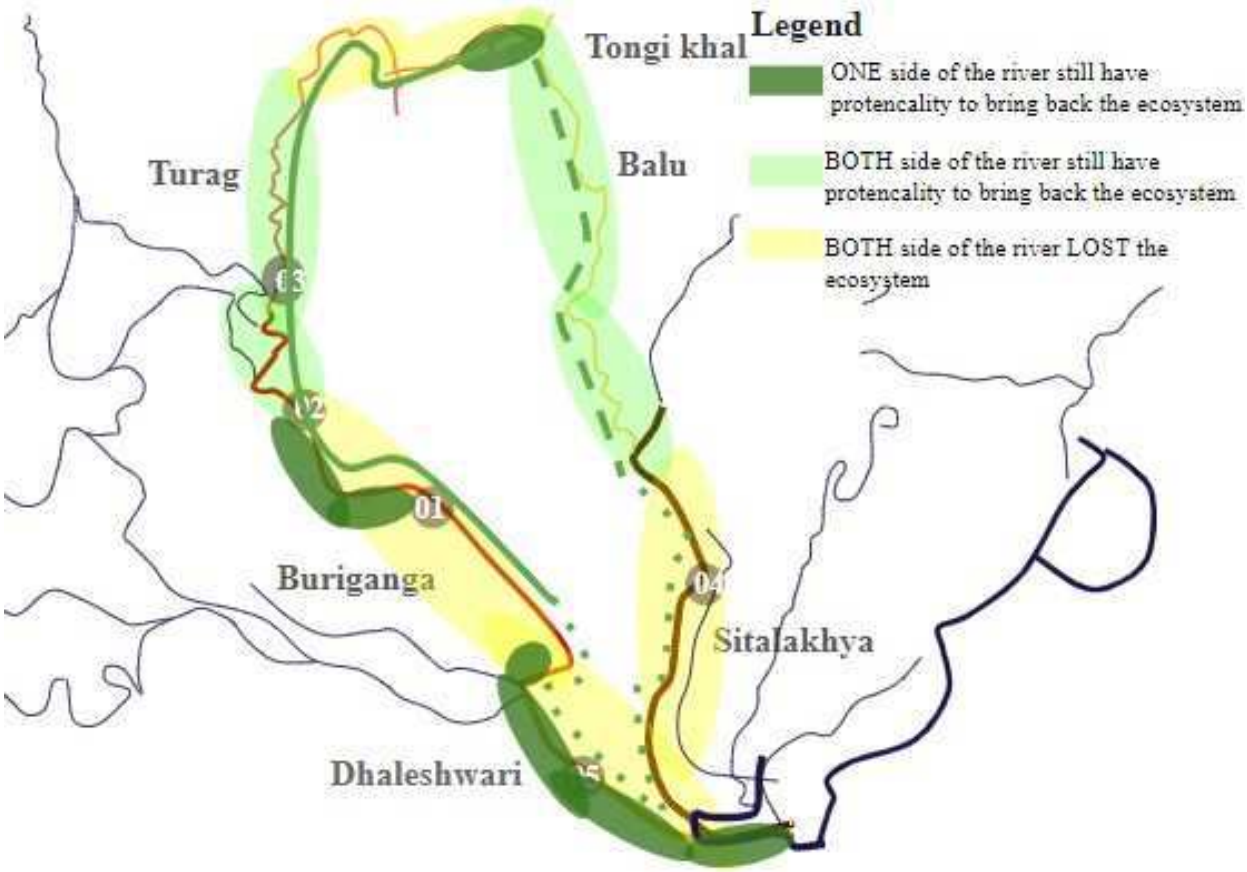
Map 4.1: Main strategies for the 110 km long waterway.

The left side strategies for the cultural landscape of the river like— bring water to this system in the dry season, make a continuous river system,a good connection with the city people, create a green belt with the blue belt , create ecotone and small parks. The right side strategies are more service related like— the Industries and the other structures should make a buffer of 50 meters and then the green belt should be continuous throughout the 110 km, there should be public volunteer groups for individual rivers, there green belt is used for city people.non motorized vehicle for nearby main city traffic connection, The river museum for each river.as well as someGhat have a few hundred years old history , so the museum needs to preserve the heritage and virtual museum and websites for the easy connection with the history.

4.2.A.II. Water urbanism heritage preservation by more involvement of the city people and government—

01. a continuous road network through the whole river network for better connectivity with the river and the city people,
02. It will be used for the non motorized vehicles but more for walking and enjoying the river,
03. An Environmentally friendly rickshaw network from the river road to the nearby bus stop or rail stop should be established for better traffic connectivity.
04. River museums for individual rivers for understanding the cultural heritage of the individual rivers.
05. Virtual river museums for Individual rivers for anyone can see and enjoy the past and the present of the river history and up to date about the waterway vehicle times and as well as the events for the Individual Ghat area.
06. Ensure Public participation for any kind of intervention of the river related issues when it becomes a public issue everything will be more democratic.

4.2.B. Proposals



Map 4.2: Map shows the river conditions along both sides of the 110 km long waterway.

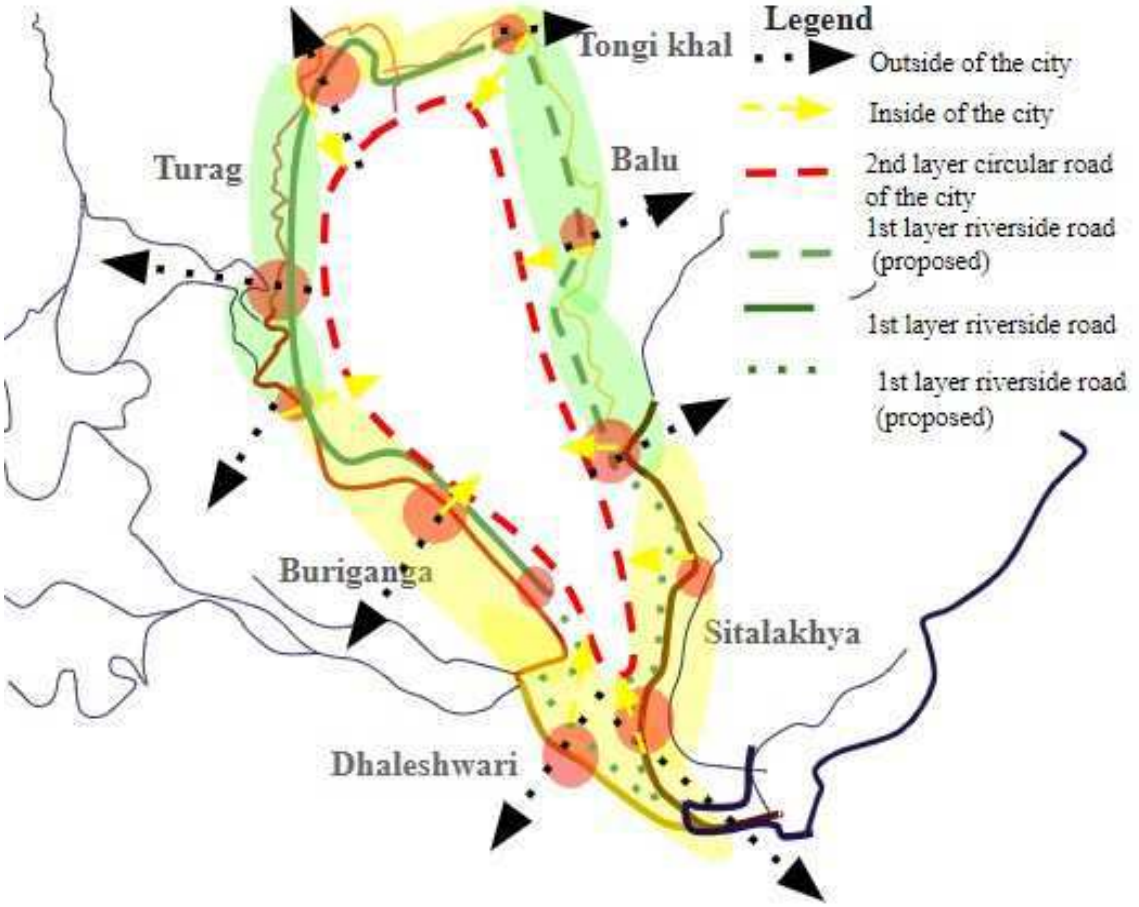
The dark green area represents that the opposite bank of the city still has the opportunity to create urban breathing spaces due to it not being at all urbanized yet. The Yellow area represents that the both side is highly urbanized by commercial and industrial fabrics and there are less scopes and some where there is no scope to develop some urban breathing spaces. The light green area representing the both sides of the river have scopes to develop as urban breathing spaces only some where there are urban squatters around the periphery of the river bank.

III.Proposals for the 110 km long waterway redevelopment

There are five rivers and one khal, from the reconnaissance survey it categorized on the basis of both side river conditions. There are some strategies based on the cultural heritage of the river bank which bring back the preservation of the natural environment for the city people.

4.2.a.110 km endless green belt for the periphery of the city

a.110 km Continuous green belt throughout the110 km long way with the composition of small and big parks for the neighborhood people. Compared to the size it will be dedicated for different activities like for street food, urban agriculture, fresh agricultural market for the morning and in the evening, it will be the teenage play area, yoga field, net fishing for the child. informal physical activity corner for different age groups. (Map4.2 and Map4.4)



Sketch Map 4.2: Strategic proposals.

In Map, Green continuous line represents the existing circular road with respect to the river. The green dot line represents there is a road network with respect to the river but it's not continuous and the green dashed line represents there is no road network with respect to river and river is less accessible at that area. The red dashed line is the main city traffic line. The red green line must have a non

motorized vehicle connection with the red dashed line or the main city traffic line. In Map the big red dots are the points where the city traffic goes to nearby other cities. and there are Ghats and landing stations inside or near the Dot area. These Dot areas may grow as a multimodal traffic area for the city. which will reduce inside city traffic flow and reduce the traffic pressure of the city.

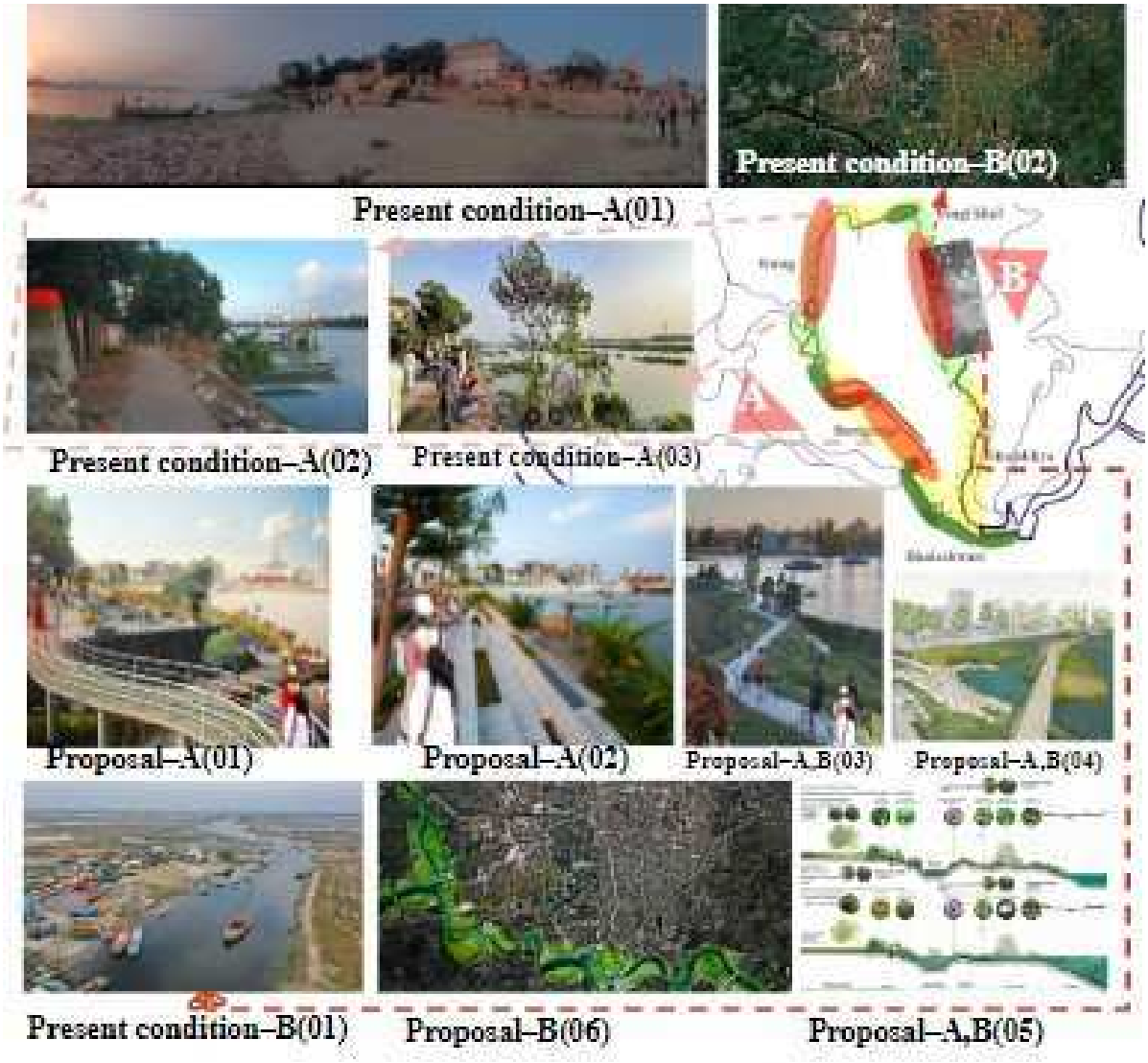


Figure 4.1:This figure shows some selected existing areas and proposals for the existing areas redevelopment.

In the map–Area A, represents the river Buriganga and river Turag. Area B represents the river Balu.C(01)

Present condition A(01):It's a selected riverbank of the river Buriganga and for its redevelopment and endless green belt proposal A(01), and proposalA,B(03)are conceptualized.

Present condition A(02):It's a selected riverbank of the river Turag and for its redevelopment and endless green belt proposal A(02), and proposal A,B(05) are conceptualized.
Present condition A(03):It's a selected riverbank of the river Buriganga and for its redevelopment and endless green belt proposal A,B(03),A,B(04) and proposal A,B(05) are conceptualized.
Present condition B(01) and B(02):It's a selected riverbank of the river Balu and for its redevelopment and endless green belt proposal B(06) A,B(03),A,B(04) and proposal A,B(05) are conceptualized.

4.2. b.Cultural landscape study Center and river Museum

These five rivers and one khal are a part of a few millennium years old river system that creates the biggest delta of the world. Over time these rivers change their courses due to natural geographical events. But since the last century these rivers have gone through a lot of human intervention related changes. This mega city Dhaka is the 4th most populated city of the world and economic hub for Bangladesh.The rivers and the Internal channels are inter connected like the vain of human body. These river system work as the vain of the city. If these river systems work well, the physical environment of the city works well. These river systems are also a part of a bigger river system that creates the Bengal delta.to understand the cultural landscape of the river to study them, study center and museum is obvious. This issue is related to our geographical existence as well as our existence. River is an indigenous thing, the boatman fisherman and fish market that are obvious for every river. So, a museum will preserve the evaluation of these indigenous professions of that river. Every river has his/her own geographical location so it has its own natural ecotone with a lot of variety, Which has an impact on the overall ecosystem of that geographical area. We need to study them to preserve them in the museum from where everyone can understand them and use them

4.2.c. Virtual Museum

Virtual museum would be the virtual version of the museum. More over, a virtual museum may have websites that operate a lot of cultural landscape related activities. The neighborhood people may know them from the websites and join the activities. Those who do not join physically may join virtually. A physical museum is necessary for physical study but a virtual museum is more effective for virtual study, communication as well as up to date information. From a virtual museum anyone from any part of the world can access then study and observe what the person needs for specific rivers and observe the cultural landscape of the rivers.

4.2.d.Ecotone and a shallow chanel for water reservation area

About these 110 km long waterways about 60 percent area have the embankment, its for the river bank inside Dhaka. On the other side it is less than 45 percent due to most of the area still developing as future housing, agricultural land and swamp area (Map 4.4).There is big potential to introduce section

B,with another river water reservation channel.this extra channel will work as a rainy season water reserver. It will work as an embankment where there are no flood protection embankments and a green belt for the whole city. The three that are thought for this section are all local trees, local shrubs and groundcovers and those can live with water and even without water and a very balanced environment for other small birds and insects. The city will become a green city. where the city urban fabric is so dense even in those areas that section would be introduced by a small area focused plan. and compensation For the landlords of these areas will be worked as a reward from the government. Like how much area they will give for the community development, they will get that square feet from other new buildings that will be built by the government. These section can be implemented and may study by make it more layers and may make it short for already developed or dense areas of the city.

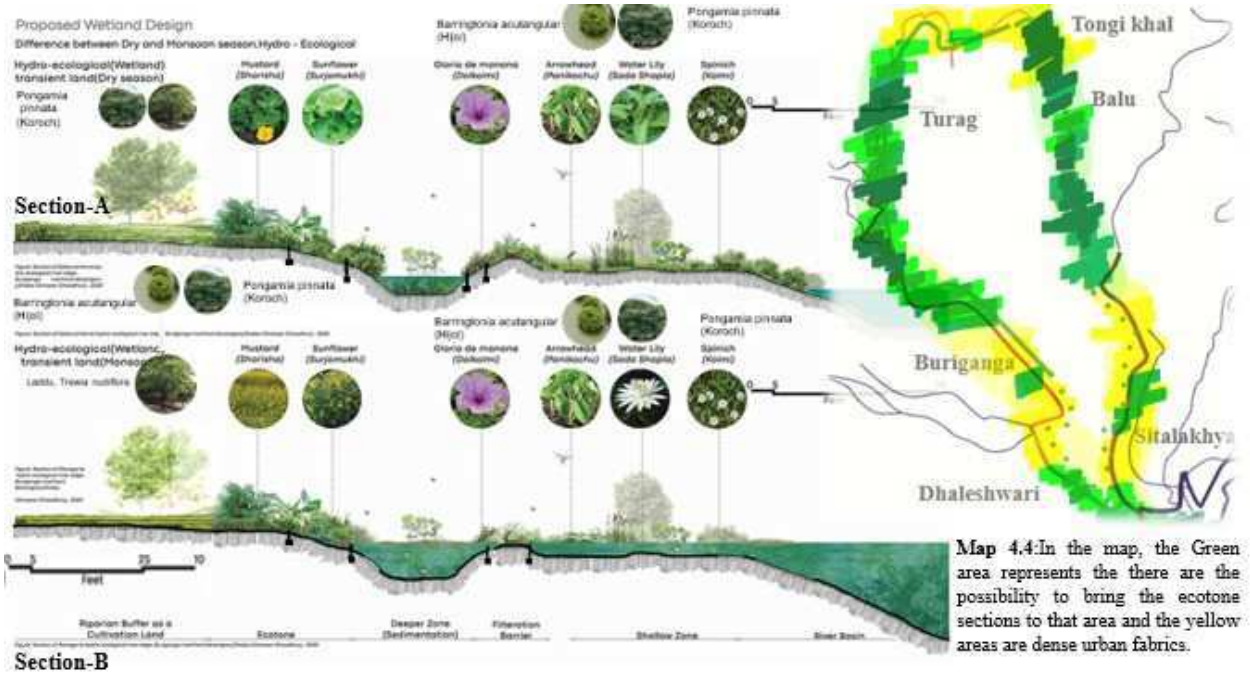


Figure 4.2: It has two sections—Section A and section B and a Map 4.4.

Map 4.4: In the map, the Green area represents the possibility to bring the ecotone and the endless green belt and the yellow areas represent the dense urban fabrics of the city.
Section-A: It's the summer season/dry season section for the ecotone and for the endless green belt.
Section-B: It's the rainy season section for the ecotone and for the endless green belt.
Both sections are conceptual sections for a 50 meter.50 meter is the buffer zone from the river to nearby manmade permanent structures. All the trees, shrubs and groundcovers live both in water and dry areas. The extra channel is used for the rainy season water reservation area and this will be used as swamp areas for the endless green belt. These extra channels will protect the neighborhood from flash flood especially where there are no embankments.

4.2.e. Individual river need elected committee from the local people to work with the policy makers

Individual rivers flow through different Administrative units or different wards. Every Individual ward has a different elected administrative group. Each river flows through more than one wards[197]. When some part of the river is polluted and illegal structures are established on its bank, no one takes responsibility. So, for each river there would be an elected committee that will work with the policy makers.

Figure 4.3: This figure shows some selected existing areas and proposals for the existing areas redevelopment.

In the map–Area C, represents the river Shatalakhya and. Area D represents theTongi Khal.
Present condition C(01):It's a selected riverbank of the river Shhytalakhya and for its redevelopment and endless green belt proposal C(02), proposals C,D(05) andC,D(04) are conceptualized.

[197] A ward is an optional division of a city or town, especially an electoral district, for administrative and representative purposes. It is an elective unit of a City Corporation. Dhaka city has 129 numbers of wards.

Present condition C(02):It's a selected riverbank of the river Turag and for its redevelopment and endless green beltproposal C,D(03), proposals C,D(04) andC,D(05) are conceptualized.
Present condition D(03):It's a selected bank of the Tongi Khal and for its redevelopment and endless green belt proposal C,D(03),and proposal C,D(05) are conceptualized.
Present condition D(01) and D(02):It's a selected bank of the Tongi Khal and for its redevelopment and endless green belt proposal D(01) is conceptualized.

4.2.f. The Islands

There are some islands that are identified as islam and some work as part of the mainland. First the islands are identified and then with the participation of local people and experts there should be a committee to redefine its development strategies and the preservation of cultural landscape strategies of those islands.

- The island may be introduced as a seasonal agricultural area due to the fact that in the rainy season it goes under water.
- Some islands that did not go under water during the rainy season may be used as preserved forest for local trees and animals.
- Some islands may be used as a place to live as a river heritage museum.
- Some islands are used for ship making industries for over 100 years, they may also be used as museums.
- Some of them work as a part of the mainland, so these islands may work as amusement parks for the city people.

4.2.g. make a connection with city main traffic

Around these 110 long ways there are embankments for the rivers Buriganga and Turag and some area Tongi khal. These are used as parallel roads with the river. In some were of river Shatalakhya and Dhaleashary also have embankments but it not continuous like river Buriganga and Turag.For better connectivity of the surroundings urban fringe near and other banks of the rivers of this mega city the both banks need continuous greenbelt/ greenway for better environment and non motor vehicles are used in these ways. These green ways are connected with the main city traffic with the connector roads (Map 4.3).The whole thing will reduce the city traffic and make connections between waterways and roadways.It will reduce the migration between fringe areas to main city.

4.3 The strategic recommendations for Ghats

a. Location of new Ghat or Landing Station,

b. Connections between the Ghats and better services routes
c. Ghat connections with the surrounding urban fabric
d. Ghat connection with other city traffic
d. Management reformation

4.4 Proposals for Individual Ghats

From the reconnaissance survey it found that the a successfully run Ghat depends on two issues one is —

4.4.a.Ghat functional issue and

4.4.b.Ghat management issue—

i.Ghat management(already discussed in strategis recommendations)

ii.Management through website

Websites for the users

4.3.a Location of new Ghat or Landing Station

Over the time the population grows, the use of Ghat also increases but the number of Ghat is not increased. New Landing stations should be placed at appropriate locations such as where the Desi Ghat is already running over a certain period of time. That will be the new locations for introducing new Ghats.

4.3.b Connections between the Ghats and better services routes

Ferry Ghats are mainly used for vertical connection between one bank to the other. The horizontal connection between one Ghat to nearby another Ghat decreases the city traffic and makes the Ghat and waterway more sustainable. there may be four type of services —

I.Direct Service
II.Local Service
III.Connector Service
IV.Ferry Service

I.Direct Service:

These services often convey a large number of passengers across great distances. These will go between the origin and destination where a sizable number of passengers travel daily, and they'll be quick to get people where they're going in the shortest amount of time. The boats should be bigger and able to hold a lot of people since they will need to transport a lot of weight.

II.Local Service:

There are often big boats that can carry a lot of people and go quickly. These will link horizontally different landing locations and run on both long-distance and short routes. These services will also make it possible to go vertically through water, where road networks are least developed, as well as within Dhaka City, where traffic is so bad.

III.Connector Service:

The ferry Ghats and the main landing point will be connected by these small, slower boats with a low passenger capacity. The horizontal mobility of consumers between nearby places will be the main goal of these services.

IV.Ferry Service:

These will go between the regions with the highest trip generating. Although most ferry Ghats are busy, the boats move slowly. By deploying comparably bigger desi machine boats, they might be more effective in this situation. That will address two problems.

1. A moderate size Machine boat should travel at a quicker rate and have the capacity to transport more passengers at once.
2. for that there is no need for any permanent structures

4.3.c Ghat connections with the surrounding urban fabric

Currently, there is a functioning Ghat and canals on the rivers Buriganga, Dhaleswari, and Shytalakya.In the research region, other rivers lack a structured water transportation network. which lowers the management and operation of water transport's efficiency and dependability. To enable the rivers to fulfill their potential, it is crucial to develop a well-organized circulation pattern and choose the proper courses. The local community has no connection with the river whereas the waterway is cheap and comfortable compared to other roads and trains. Due to overpressure roads are always congested at peak hours. At the same time waterways are free and if it is possible to connect the people with the waterways that eliminate the road pressures.

There have been suggestions made for an organized and systematic water transport network following a thorough analysis of the links between origin and destination and the anticipated volume of traffic on each route.

4.3.d Ghat connection with other city traffic

The waterways are always ignored by the policy makers. There are embankment roads which are parallel to the rivers. Due to lack of strategic view the embankment road has no connection with the waterways. Ghats are directly connected with the city traffic with the connector road. And this connector road may be direct and shorter distance. If it becomes a longer distance than small desi motorized vehicle may be used for connecting to the other traffic mood.

An effective link to the current transportation system should be made through a water transportation system. At the landing locations, bus service should be offered for all feasible modes of road transportation. There should be a connection between the landing points and the neighboring public transportation hubs. The projected bus services would probably improve the Ghats' connectivity to mass transit facilities. Vigorous investigations should be done to gauge the real demand for the needed links in order to decide on the best linkages available. An efficient traffic took less travel time from departure to arrival and same as arrival to departure.

4.3.e Management reformation

The total waterways around the city is about 110 km long. There are 73 Ghats that are directly connected with BIWTA.Other small Ghats are under the control of a nearby bigger Ghat or landing station. BIWTA is comparably small in strength compared with these huge waterways and water resources. Under these circumstances the government can involve the PPP (private public partnership) to run this total system more efficiently. The system needs to be reformed. When other authorities are involved there are more possibilities to reform the system. System modernization and reformation is the priority issue to succeed the Ghat as well as the waterway around the city.

Total System management

Due to a lack of personnel and other physical restrictions, BIWTA is unable to operate all of the landing stations that are under its supervision directly. As a result, landing sites are run by hiring licenses on a yearly basis. The bilateral agreement with BIWTA shall serve as a reference for the grader's operations. Control should remain in BIWTA's hands in this situation. Arrangement is required, otherwise, the cargo must be placed in launches in the exact same state as when it was on the trucks. It will contribute to boosting the business people's confidence that the items would arrive at launches undamaged. In such a situation, they will split the expense of hiring security personnel for the loading and unloading process.

Individual Ghat management

In order to run the Ghat and make the committee or agency more democratic, local agencies involved in the Ghat management issue should involve the local community at every step of planning, implementation, operation, and maintenance. It is time to update the way that tolls are currently collected from travelers. Instead of the current system of fares (part), the ticketing system at the landing stations should be implemented. The cost of the ticket may include the cost of the landing station toll.

Regular monitor of the Ghat facilities

The entire system should be continuously monitored and assessed. Regular monitoring of passenger demand on different routes is necessary, and the service must meet the demand for trips. The cost of the services should also be continuously monitored. The majority of waterway users are those with modest incomes. Therefore, they ought to be paid in accordance with their abilities at a rate that will also be sufficient to cover the project's ongoing costs.

Safety issues

Safety issues are important for successful water waterways. So life jacket, lifebuoy should be used by every boat and for every passenger.Water ambulance and water police should be sufficient at least with the proportion of the vehicles and users.

4.3.a Proposals for Individual Ghat functional issue

Ghat needs some Specific physical Facilities to run it well that are described below

i. Parking and Connector traffic services

All of the landing locations don't have any parking facilities. Even there are no bicycle parking facilities. Same as there are no connector traffic services to functioning the Ghat properly. Where the facilities are present, the demand is not met. The demand for parking should be made available in accordance with demand. For goods carrying there are no proper loading and unloading spaces. It is not working properly. For the renowned material carrying Ghat parking and loading and unloading is the primary requirement. The demand for private automobile parking is quite low because the majority of journeys are mostly taken by persons in lower socioeconomic groups. Therefore, a focus should be placed on providing parking places for Para transportation services, as well as for rickshaws and other public vehicles, in the finest areas available. The facilities may be made available by making advantage of the neighboring vacant and open locations.

ii.Physical facilities for individual Ghat areas

Modern landing facilities should be offered to cater to the comfort and safety of the passengers when traveling by waterways and to guarantee quick, safe, and unrestricted turning of vessels. The following actions might be taken:

a. Passenger arrival and departure facilities

A covered gangway that serves as a shore link and makes it easier for passengers to board and exit should be available. The Indigenous gangway, especially the indigenous material-made gangway for the ferry services is more efficient due to the water level of the river varying within a short period of time.

b. Cargo handling facilities or material caring facilities

Depending on the kind and quantity of the cargo, different facilities for handling it should be offered at different Ghat locations. Due to varying water levels, R.C.C. jetties are not always successful; thus, mechanical handling equipment should be offered alongside wooden jetties supported by timber piles with the R.C.C. jetties. Particularly at Amin Bazar at River Turag, Sadarghat at River Buriganga, and certain cargo handling Ghats at River Shythalakhya, there should be a provision for a go-down transit shed with enough parking for vehicle movement and parking. Where required, electricity and security should also be offered.

iii.Additional physical facilities

For some selective Ghats additional physical amenities such a ticket booth, post office, police box, passenger waiting area, restrooms, a prayer room, and small businesses should be offered at the landing station. The amenities will improve the Ghats' ability to operate smoothly, effectively, and with the needs of users in mind. The amenities offered may change according to the landing sites and the amount of people gathered in each Ghat. The amenities must be planned such that they don't interfere with the flow of traffic while also attracting attention from both other people and those who use the waterways. The government may be able to make substantial money from some of the amenities (like stores).

iv.River management

River management is crucial due to most of the rivers being polluted and almost dying from pollution. Another issue for the deltic river is heavy erosion.

River channels regularly shift as a result of water level fluctuations, significant erosion, and accretion. The steps listed below should be done in order to remedy this issue:

- a. Maintaining the navigability of the water route by dredging;
- b. Avoiding dredging and relocating the Ghat in accordance with the availability of navigable depth and building other roads; and
- c.Combining the two aforementioned solutions.

v.Other facilities for the Ghat users

Traditionally Ghat is the starting point of any urban growth center. Where village people used to come to buy and sell their products. The farmers come with their agricultural products, the wavers come with their clothes, the fisherman with their fish.They interact with each other, friends and relatives.As Ghat adjacent area is public gathering area so the traditional singers use the generated public for music presentation and their income and it was away to access to the mass population, The Ghat and adjacent areas are crowded for the all the time.To revive that cultural character of the Ghat some strategic functions should be introduced to make it more sustainable for the city people—

a. Multi functional open spaces for the city people

Near the Ghat Complex there are open spaces for multi functions like early in the morning it will be used for vegetable market, in evening it will be used for children's play area and after sunset it will be used for public gathering and street food for the city people.

but it would be designed in a way that it will not hinder the busy commuters.

b. Identification and address the land use nearby Ghat areas

land use plan near the ghat should be revised by the urban planners. Traditionally the buildings near the ghat area are multi storied and the ground floor and the first floor are used for commercial purposes. This mixed use characteristic is very vital for the economic activity of the ghat area. and it's a commercial cultural landscape character for this city.

vi. Boats management and Safety issues

Different types of boats are used for different purposes and they are motorized and non-motorized also. These boats are a part of our cultural landscape. But some boat relates issues should be addressed

- The country boat, the boat man has indigenous knowledge or he works with a senior boatman's intern. But for the motorized Besi boat they need training for the improvement of the transport services. For the user safety individual boats must use sufficient number of lifeboats and life buya.
- All boatmen and all boats are registered by the authority for good management of boat and boatman.

vii. promoting of Ghat activities

- Associations for country boat owners and operators should be established in order to organize the disorganized industry.
- how many users use the landing station should be registered by the Ghat and their feedback should be implemented in every issue.
- The policy makers should take some policies to promote the waterways like fair, focus on waterways with comparison to the parallel waterways.
- All the waterways related activities like floating restaurants, water amusement parks and holiday homes near the Ghat areas should be less taxed compared to road and rail.
- The numerous routes, costs, and schedule of the canal services should all be readily available information. Such publicity would be the responsibility of the authority.
- The authorities should maintain the para-transport system's circulation. It is possible to offer incentives to promote the adoption of these services. This will encourage waterway users to use these services and lessen the need for rickshaws and private automobiles. Such actions will also promote the usage of waterways.

viii. Recreational use of the waterways

Using the waterway for recreational purposes is an effective way to make it more sustainable. Since BIWTA is in charge of the waterway services, they ought to be in charge of their provision and upkeep. To provide or maintain such facilities on a leasehold basis. BIWTA and private sector partnerships may also be encouraged in this regard. It will be a source of income for BIWTA. It is possible to organize a variety of leisure and recreation packages.

Followings are some potential recreational uses of the waterways:

- Large boats for lower-income groups' affordable leisure trips to the waterways
- Pleasure outings for the high-income group
- Boats (large or little) utilized for ceremonial purposes during events like weddings or picnics.
- Floating restaurants
- Floating hotels for a few days.

ix.Museum and virtual museums

There are Some Ghats that are hundreds of years old and have some historical value . so the museum should be introduced for preservation and introduction of the cultural landscape to the new generation.

4.4 Proposals for Individual Ghats

From the reconnaissance survey it found that the a successfully run Ghat depends on two issues one is —

4.4.a. Ghat functional issue and

4.4.b. Ghat management issue—

i.Ghat management (already discussed in strategis recommendations)

4.4.a. Ghat Functional issue—

1. Individual Ghat must have a boat servicing and boat making area.
2. Children recreational area for individual Ghat.
3. A recreational area for all age groups.
4. Small parks with a continuous green walkway for the city people.
5. Individual Ghat website for the user.
6. websites for individual Ghat websites for the water vehicles movement and online ticket reservation.
7. museum for the neighborhood as well as the city people.
8. The individual Landing Station at must have three different type of service for people—
   a. for ferry purpose Ghat,

b. for Small distance and
c.for long distance

9. Every Ghat must have a recreational Ghat for the neighboring people.
10. Every landing station must have an area for goods loading and unloading.
11. An informal desi moveable cart shopping area near the Ghat area.
12. Fresh /bio agricultural market near every ghat to make the ghat more sustainable.
13. Seasonal wetlands may be used for seasonal agriculture.
14. Individual Ghats must have an elected public community to operate it.
15. Individual rivers must have a fish cultivation and fish catching community.

4.4.b. Ghat management issue—

ii.Management through website

Websites for the users

The numerous routes, costs, and schedule of the canal services should all be readily available information. Such publicity would be the responsibility of the authority. and it will be dedicated to the serving websites.

The schedules and quantity of waterway services should be decided based on thorough research, average daily traffic, peak hour traffic, and variations in travel patterns at various times. Demand should also be regularly checked to make necessary adjustments. online survey is also effective for betterment for the users.

There should be open discussion sessions for the authority people and users of the waterways. That will make the waterways more sustainable for the users. If it is not possible face to face it may be possible in virtually.

4.5 Conclusion

The waterway is 110 km long and the existing use of these waterways is very indigenous. The cultural landscape character is indigenous and user friendly for the people who use it. It's necessary to protect the waterway and connect it with the city traffic. For that there are some proposals for the rivers also recommended. And proposals for the Ghat are also provided. Some Ghats are over hundreds years old and need to be preserved as museums.

The city grows from the river. The old city still has a strong relationship with the river. Over time it lost this cultural landscape. The Newly developed part of this city failed to make connections with these rivers. Which makes the city more vulnerable in terms of blue and green networks, flash flood,

riverfront public spaces for city people, ecosystem preservation, and overall climatically livable city. The city is overpopulated. The city traffic is also overcrowded but still, we have the potential to use these waterways as a proper integrated waterway and make connections with the city traffic that will eliminate the extra traffic pressure from the city. There are possibilities to make satellite cities on the outskirts of the city and use the river as the connector between the new and the older city.

Final Conclusions

Bangladesh is the world's largest Delta. Two mighty rivers, the Ganga and the Bramaputra, travel from this country and then fall into the Bay of Bengal. The geographical, political, cultural, religious, and economic histories and heritages of this country are related to the riverine culture. People are dependent on rivers for their livelihood, agricultural irrigation, fishing, waterways, socio-economic activities, sports and recreational purposes. They also practice river-related culture, literature, and religious rituals from the Vedic period to today. The economy and commerce of the Deltic riverine landscapes are significant from the ancient period. Delta is full of resources, for these foreign nations come here for commerce and later make their colonies here. Rivers are used as easy waterways to connect with foreign trades.

The city has a 400 years old history as a capital. Dhaka was a Hindu trading center on the bank of river Buriganga. Mughals chose these Hindu trading centers as their provincial capital because of its geographical location. The rivers and the canal (*khal*) were used as natural fortifications. After that, all the European traders, like the Dutch, the French, the Portuguese, the Armenians, and the English, came to Dhaka for its fine cotton, silk and agricultural crops. Some of the European nations were Christian monks. They stayed the delta for its unique geographical character and resources. The Deltic riverine landscape makes the city unique to the world. Dacca (Dhaka) Municipality was about 160 years old starting from 20 square km, now 1530 square km and becoming the 4th populated city in the world. The city has an unique island character due to the city having 110 km long waterways around the periphery of the city.

Dhaka is the child of the Buriganga River. The city grows from the river and the old city still has a strong relationship with the river. Over time it lost this cultural landscape. The Newly developed part of this city failed to make connections with these rivers. Which makes the city more vulnerable in terms of blue and green networks, flash flood, riverfront public spaces for city people, ecosystem preservation, and overall climatically livable city. The city is overpopulated. The city traffic is also overcrowded but still, we have the potential to use these waterways as a proper integrated waterway and make connections

with the city traffic that will eliminate the extra traffic pressure from the city. There are possibilities to make satellite cities on the outskirts of the city and use the river as the connector between the new and the older city.

The traffic condition of present Dhaka has reached a critical situation. Serious congestion and delays have been the most common objections of the everyday life of the people who live in or come to the city. The existing road transport system cannot meet the demand for trip making. Poor traffic management and inadequate conditions, along with the absence of integration between different transportation modes have made the situation worse. It is very important for Dhaka city to improve its waterway transport system to prevent the traffic jam and also provide a good transport system for the increasing number of people traditionally the surrounding rivers are used as waterways.

The surrounding rivers may be used as waterways and the government took initiatives for different times but it failed. but the rivers are used as waterways traditionally. The main objectives of this study are-to ascertain the causes of the ineffective existing river system and Ghat of Dhaka, to provide a clear scenario of the riverine cultural landscape of the Ghat area. These identified riverine cultural landscapes will work as evidence-based decision-making in the urban design and planning process for Dhaka.

For achieving the objectives, five rivers and the channel (*Khal)* are individually analyzed. The present geographical location, navigation quality, average depth and width of the river, the river and its connection with surrounding urban fabrics, the commercial influences on the surrounding urban fabrics, river and its connection with the existing road network, and overall ecological condition of the river are analyzed. Over time, the city loses its riverine landscape character. The focus of the chapter is to know the riverine history of the individual river.

An analysis of the individual selected Ghat. How it works, how it makes connections with other Ghats and the overall city network. The point or the area where the neighborhood interacts with the river is called Ghat. Different Ghats have different purposes. The Ghat activity depends on the river and the peripheral urban fabric depends on Ghat activity. The road networks and land use patterns grew from Ghat. The success of individual Ghats depends upon different factors. The analysis of four indigenous Ghats and three landing stations (newly designed Ghats) are analyzed to understand the cultural landscape of the Ghats.

To find out the riverine landscape character, first, understand the urban problems that happened due to the loss of the riverine landscape character. These rivers play a significant role in the city's trade, water transportation, and cultural legacy. Although urbanization and pollution present difficulties, efforts are being done to maintain and rehabilitate these water basins. In addition to providing business

possibilities, Dhaka's riverine landscape also has the potential to boost tourism by exhibiting the natural beauty and historical value of the city's rivers.

Some policies, proposals, and recommendations for the waterways and as well as for the Ghats are provided to enhance the cultural landscape of the city. The development of recreation and tourism along these water routes will bring together the community's needs for leisure and economic growth and act as a catalyst for urban regeneration. That will make a contribution to improving the quality of life for those living in our more deprived communities along waterways as well as for other communities. The whole length of the riverbank of waterways should be developed as a tree shaded promenade, largely a pedestrian public space that is linked to other open and green spaces, parks and gardens, historic sites, and specially designed buildings for special purposes creating a clear and legible pedestrian network. Innovative building types will have to be conceived that conform to the river and canal-front conditions.

Dhaka, seen from the river, was a stunning sight and presented a spectacular image to passersby. However, the city authorities failed to preserve the urban fabric, most of the structures adorning the riverbank and also the places surrounding that area. Inconsiderate development of the city destroyed most of the natural assets it possessed, which contemporary cities struggle to achieve with hard-hearted planning measures. Most of the development concerned authorities are silent watchers to most illegal land filling and riverbank encroachment. Many scenic places existed, and some still exist in Dhaka. There were no plans to preserve them as scenic places within the city. Many canals were covered by box culvert and many people are least aware of their existence. Many of the places could have been designed by including them and this would have given those places special significance. Still, we have the opportunities to make it again a scenic land of greeneries and water.

The waterways of this city can be developed as one continuous route and could be performed like an entity which has the immense scope for providing waterway and recreation facilities. waterways will also act as a tourism asset and provide a link between existing and new attractions and support the holiday industry through water-based activities. Visitors drawn to the waterways contribute to the economy of the waterway corridor through expenditure on local goods and services. Through conservation of the water way and its scenic places along the water routes and create immense income opportunities for the locals.

BIBLIOGRAPHY and SOURCES

[1].World population review, 2018 (http://worldpopulationreview.com/world-cities/dhaka-population) accessed on 29th January, 2023 at 10 pm.

[2].Mahmud, S. M.;Hoque, Md.[2010],Unplanned development and transportation problems in Dhaka city.

[3]. Ashraf, K. K. (2007) "Dhaka: A postcard from New Orleans", Article published in Forum-a monthly publication of 'The Daily star', January, 2007

[4].Karim, Dr. A. (1991), "Origin and Development of Mughal Dhaka", in Sharif Uddin Ahmed, ed., Dhaka past present future, proceeding

[5].Karim, A. [1965],Dacca: the Mughal Capital . Dhaka: Asiatic Society of Pakistan

[6].Dani, A. H. (1956), Dacca A record of its changing fortunes, Dhaka Museum, Dhaka.

[7].Ahmed, Sharif Uddin [1986], Dacca: A study in Urban History and Development. London:Curzon Press

[8].Biswas, M. 2002. "Pattern and Trend of Recreation Activities in Dhaka City". An unpublished MURP Thesis. BUET, Dhaka.

[9]. Asad, R, Ahsan,R,Structuring urban sustainability with water: A Case Study of Kamrangir Chor,Dhaka ,Bangladesh.Vol.3,N0.8.p-293-303,Journal of Social and Development Science.(P-295,L-21,22,23,33)(P-299,L-24), Aug2012.

[10].DMAP: Integrated Detailed Area Plan 2010-2015, Source: Approved (sro no-232-law/2010)Dated22-06-2010 and published in Bangladesh.

[11]. Mowla, Q.A, Role of Water Bodies in Dhaka for Sustainable Urban Design', Jahangirnagar Planning Review, Vol. 8, June 2010, Dhaka, pp.1-10. (P-6, L-6,7), (P-6,L-21,22), (P-6,L-6,7), June 2010.

[12].Mahmud, K; Gope, K; Chowdhary, S.M.R. Possible Causes & Solutions of traffic Jam and Their Impact on the Economy of Dhaka City, Vol.2,No.2,Journal of management and sustainability,(P-114,L-10,11,12), 2012.URL: http://dx.doi.org/10.5539/jms.v2n2p112

[13]. Ken and Guy (1991) "Prospects of Waterway Development as a Catalyst to Improve Regional and Community Socio-Economy Level" American Journal of Economics and Business Administration 2010, 2(3) 240-246.

[14]. The Inland Waterways Association's (IWA) proposals (2010), "The inland waterway conservancy-The IWA Vision", URL:http://www.waterways.org.uk/documents/inland_waterways_conservancy accessed on 12 February 2023.

[15].Kolbe, L . (2009) "Capital City o f Dhaka as a Place of Power: Histories, Symbols and Urban Landmarks" paper presented at the International Workshop on History Heritage and Urban Issues o f Capital Dhaka, organized by the Asiatic Society of Bangladesh, 1 7-19 February 2010, Nabab Nawab Ali Chowdhury Senate Bhaban, University of Dhaka.

[16]."Inland Waterways for Transportation and Tourism: A Journey through Parvathy Puthanar Canal, Kerala", ITPI Journal, March, 2002, Vol. 20, No. 1 (180) 49-59.

[17]. Breen, A and Rigby. D (1996) “The new waterfront: a worldwide urban success story” Thames and Hudson, pp. 137.
[18]. BIWTA, (2001) “Introduction of Waterways around Dhaka City, First Phase: Improvement of Navigability and providing Landing Station Facilities from Sadarghat to Ashulia Bridge” Final Report, BIWTA.
[19]. BIWTA, (2009) “Introduction of Circular Waterways in and around Dhaka City (2nd Phase) (1st Revised)” Revised Development Project Proposal (RDPP).
[20]. Ashraf, K. K. (March 2010) “A new Dhaka is possible” Forum: A monthly publication of The Daily Star. Volume 3, issue 3.
[21]. Shumi, A. S . (2011) “Refining Tourists' Place Experience through Place making: A case study of Dhaka”. An unpublished MURP Thesis. BUET, Dhaka.
[22].Bangladesh National Programme of Action for Protection of the Coastal and Marine Environment from Land-Based Activities (https://doe.portal.gov.bd/sites/default/files/files/doe.portal.gov.bd/publications/2686e3bc_b152_44fb_964b_1746bc42092d/NPA%20Final%20Draft.pdf) -accessed on 29th June 2023 at 10 pm.
[23].Rajasekar, D. Verma, R.(2023)’“RESEARCH METHODOLOGY”, ISBN 9789394958500(Page 37)Archers and elevators publishing house, Bangalore,India.
[24]. The daily star.net (https://www.thedailystar.net/opinion/environment/dhaka-and-her-rivers-1444537) -accessed on 29th June 2023 at 10 pm.
[25].The daily Star, Aug 1, 2013, (https://www.thedailystar.net/news/sufi-influence-in-bengal)accessed on 29th January, 2023 at 10 pm.
[26]. Ptolemy's World Map, Published 1482, Beatissimo Patri Paulo Secundo Pontifici Maximo. Donis Nicolaus Germanus, creator Claudius Ptolemy, British Library.
[27].Bangalir Itihas by Niharranjan Roy,Bengali, first published in 1972,reprint 2005,Dey’s Publishing, 13 Bankim Chatterjee Street, Kolkata, ISBN 81-7079-270-3
[28].Figure 1.3.A: The Map of Bengal in 1880, created by W. H. Allen and Co.
Pope, G. U. (1880), Textbook of Indian History: Geographical Notes, Genealogical Tables, and Examination Questions, London: W. H. Allen & Co. Pp. vii, 574, 16 maps
[29].Nitish Sengupta (2011), Land of Two Rivers ‘A History of Baangal from the Mahabharata to Mujib.' Published by Penguin Group, New Delhi, ISBN: 978-01-434-1678-4.
[30]. https://www.pakistantoday.com.pk/2021/03/14/another-east-bengal-in-west-bengal/
[31].Administrative map of Bangladesh [source: (Map, 2019)]
[32].https://www.un.org/depts/los/nippon/unnff_programme_home/fellows_pages/fellows_papers/hoque_0506_bangladesh.pdf
[33].Rafique Ahmed, M. Shamsul Alam, M. Matinur Rahman, Journal of Environment and Earth Science www.iiste.org ISSN 2224-3216 (Paper) ISSN 2225-0948 (Online) Vol.6, No.4, 2016
[34].https://www.researchgate.net/figure/Spatial-spread-of-the-Himalayan-mountain-system-across-seven-nations-The-elevational_fig1_328790994
[35].https://www.researchgate.net/figure/Map-of-the-Ganga-and-Brahmaputra-basins-respectively-delimited-in-red-and-blue-and_fig1_301832466

[36].https://education.nationalgeographic.org/resource/watershed/
[37]. "Sunderbans the world's largest delta". gits4u.com. Archived from the original on 3 January 2015. Retrieved 3 January 2015.
[38].https://www.researchgate.net/publication/235707918_Climate_Change_and_Water_Resources
[39].Huq, S., Karim, Z., Asaduzzaman, M. and Mahtab, F., 1999. Vulnerability and Adaptation to Climate Change in Bangladesh, Kluwer Academic Publishers, Dondrecht, Netherland
[40].https://www.thedailystar.net/supplements/30th-anniversary-supplements/news/challenges-and-opportunities-river-management-2042613
[41]. Ahmed, Helal Uddin (2012). "History". In Islam, Sirajul; Jamal, Ahmed A. (eds.). Banglapedia: National Encyclopedia of Bangladesh (Second ed.). Asiatic Society of Bangladesh.
[42]. Sen, Sailendra Nath (1999) [first published in 1988]. Ancient Indian History and Civilization. New Age International. p. 281. ISBN 978-81-224-1198-0.
[43]. Pieris, Sita; Raven, Ellen (2010). ABIA: South and Southeast Asian Art and Archaeology Index. Vol. Three. Brill. p. 116. ISBN 978-9004191488.
[44]. Erikson, Emily (21 July 2014). Between Monopoly and Free Trade: The English East India Company, 1600-1757.Princeton.edu.ISBN 9780691159065. Retrieved June 3, June 2022.
[45]. Kopf, David (December 1994). " Amiya P.Sen. Hindu Revivalism in Bengal, 1872". American Historical Review (book review).doi:10.2307/2168519.JSTOR 2168519.
[46]. Glassie, Henry; Mahmud, Feroz (2008). Living Traditions. Cultural Survey of Bangladesh Series. Vol. 11. Dhaka: Asiatic Society of Bangladesh. p. 578.OCLC 2993798.
[47].https://asiasociety.org/education/religions-south-asia
[48].https://www.thedailystar.net/news/sufi-influence-in-bengal
[49].https://www.niu.edu/clas/cseas/_pdf/lesson-plans/k-12/origins-religion.pdf
[50].https://southasiaoutreach.wisc.edu/religions/
[51].GOI, 2001. Primary Census Abstract. Census of India, 2001. Ministry of Home Affairs, New Delhi.
[52].Jain, S. K., Agarwal, P. K., Singh, V. P., 2007. Hydrology and water resources of India. Water Science and Technology Library. Springer, Netherlands.
[53].https://www.researchgate.net/publication/316952532_River_Ganges-Historical_cultural_and_socioeconomic_attributes
[54].(https://issuu.com/amitasinha/docs/orchha_report).
[55]. Mowla, Q.A, Mozumder, [2015]'Deteriorating Buriganga River: Its Impact on Dhaka's Urban Life', PSC Journal, October 2015, Vol.2, Issue 2, pp.01-10. 2015/11/01
[56].https://www.thedailystar.net/supplements/30th-anniversary-supplements/news/challenges-and-opportunities-river-management-2042613
[57]. https://en.unesco.org/silkroad/about-silk-roads#pid=1
[58]. Richard M. Eaton (31 July 1996). The Rise of Islam and the Bengal Frontier, 1204–1760. University of California Press. p. 32. ISBN 978-0-520-20507-9.
[59]. Syed Ejaz Hussain (2003). The Bengal Sultanate: Politics, Economy and Coins, A.D. 1205–1576. Manohar. ISBN 978-81-7304-482-3.

[60].Rehla, English translation by Mahdi Husain as the Rehla of Ibn Battuta, Boroda, 1953; Muazzam Hussain Khan : Fakhruddin Mubarak Shah of Sonargan, Dhaka, 2005.
[61].(https://www.thedailystar.net/op-ed/politics/which-india-claiming-have-been-colonised-119284)
[62].Chowdhury, M.S. (2007), "Overcoming entrepreneurship development constraints: the case of Bangladesh", Journal of Enterprising Communities: People and Places in the Global Economy, Vol. 1 No. 3, pp. 240-251. doi:10.1108/17506200710779549
[63]."Bangladesh Economy, Politics and GDP Growth Summary - The Economist Intelligence Unit". Country.eiu.com..
[64].https://worldpopulationreview.com/countries/bangladesh-populationg
[65].https://www.maritimegateway.com/trade-flourishes-through-protocol-routes/
[66].N.n. 1756. An Account of the Kingdom of Bengal, in the East-Indies, and of the Trade carried on there by the European Nations. Universal Magazine of Knowledge and Pleasure, 18. N.n. 1765.
[67].https://collections.vam.ac.uk/item/O105764/painting-frederick-william-alexander/ Accessed 08.06.2023
[68].https://www.worldatlas.com/cities/10-largest-cities-in-the-world.html, Accessed 08.06.2023
[69].(https://www.worldatlas.com/cities/10-largest-cities-in-the-world.html)
[70].Taylor, James. 1840. A Sketch of the Topography and Statistics of Dacca. Calcutta: Military Orphan Press.
[71].https://www.thedailystar.net/views/in-focus/news/the-dhaka-muslin-industry-2136751
[72].Rahman, M. (2012). City of an architect (pp. 11-60). Dhaka: Delvistaa foundation.
[73].Taylor, James. 1840. A Sketch of the Topography and Statistics of Dacca. Calcutta: Military Orphan Press.
[74].Salma Begum (2020). Reclaiming Public Open Space within the Shifting Landscape of Dhaka, Bangladesh. Civil Engineering and Architecture, 8(6), 1178 - 1193. DOI:
[75].Chakrabarty, Dilip K. 2006. Relating History to the Land. Urban Centres, Geographical Units, and Trade Routes in the Gangetic and Central India of circa 200 BCE. In: Patrick Olivelle, ed. Between the Empires: Society in India 300 BCE to 400 CE. Oxford: Oxford University Press.
[76].Kabir A, Parolin B. (2012). Planning and development of Dhaka – a story of 400 years, (http://www.fau.usp.br/iphs/abstracts and papers files/sessions/09/kabir_par olin.pdf) in. 15th international planning history society conference, 15–18 July. São Paulo: University of Sao Paulo press, pp. 1–20. [Accessed 28.05.2023].
[77].United Nations. (2013) World Urbanization Prospect: The 2012 Revision. Department of Economic and Social Affairs, Population Division. UN, New York.
[78].Burkat K et al. (2008) Megacity Dhaka: urban environment, informal settlements and public health. Geographische Rundschau. Germany. Volume 4, issue 1, pp. 5–10.
[79].Bird, Julia; et al (2018) Toward Great Dhaka, A New Urban Development Paradigm Eastward, World Bank group.
[80].https://www.dhakatribune.com/world/2022/12/04/dhaka-4th-most-populous-city-globally (https://worldpopulationreview.com/world-cities/dhaka-population,)
[81].Bangladesh Bureau of Statistics - Dhaka information and statistics.

[82].Bird, Julia; et al (2018) Toward Great Dhaka, A New Urban Development Paradigm Eastward, World Bank group.
[83].The Daily Star, News Paper (2014,https://www.thedailystar.net/city/hatirjheel-offer-more-entertainment-facilities-138538, accessed 18 October 2018 at 12 am)
[84].Bangladesh news, (2009). http://www.bangladeshnews.com.bd/ 2009/07/30/restore-canals-wetlands to-stop-waterlogging/, accessed on 30 June, 2018
[85].https://earth.google.com/web/search/Dhaka- accessed on 15/05/2023)
[86].https://www.researchgate.net/publication/ 324746990_PLANNING_AND_DEVELOPMENT_OF_DHAKA-A_STORY_OF_400_YEARS.
[87].http://dhakadailyphoto.blogspot.com/2007/06/maps-dhaka-and-bangladesh.html
[88].Dani, A. Hasan [1956],Dacca: A Record of its Changing Fortune.Dhaka: Asiatic Press.
[89].Taifoor, Syed Muhammed [1956],Glimpses of Old Dhaka.Dhaka: Pioneer.
[90].Chowdhury, A. M. & Faruqui, Shabnam (1991), ÒPhysical Growth of DhakaÓ, in Sharif Uddin Ahmed (ed.), Dhaka Past Present Future. Dhaka: The Asiatic Society of Bangladesh. p.43- 63.
[91].https://en.banglapedia.org/index.php/Dhaka#/media/File:DhakaMughalPeriod.jpg.
[92].Ahsan, R. Majid [1991], "Changing Pattern of the Commercial Area of the Dhaka City", in Sharif Uddin Ahmed [ed.],Dhaka Past Present Future . Dhaka: The Asiatic Society of Bangladesh.p.396- 414.
[93].Mamun, Muntasir [1990],Coronel Davidson Jokhon Dhakay.[Bengali] Dhaka: Pallab Publishers.
[94].https://www.researchgate.net/figure/Map-of-Dhaka-in-post-Mughal-period-Surveyor-Generals-Map-1859_fig3_303956315.
[95].Ahmed, Sharif Uddin [1986], Dacca: A study in Urban History and Development. London:Curzon Press.
[96].Ahsan, R. Majid [1991], "Changing Pattern of the Commercial Area of the Dhaka City", in Sharif.
[97].Islam, M. Nazrul [1996], Dhaka from City to Megacity.Dhaka: Urban Studies Programme, Department of Geography, Dhaka University.
[98].Karim, A. [1964], Dacca: the Mughal Capital . Dhaka: Asiatic Society of Pakistan.
[99].https://en.banglapedia.org/index.php/Dhaka.
[100].Haq, A. T. M. Zahiru,[1991] “Transport planning for Dhaka City.”in Sharif Uddin Ahmed [ed]Dhaka Past Present Future.The Asiatic Society of Bangladesh, Dhaka.
[101].https://edoc.hu-berlin.de/bitstream/handle/18452/9110/86.pdf?sequence=1
[102].https://www.academia.edu/245137/ Urban_Morphology_of_Dhaka_City_Spatial_Dynamics_of_Growing_City_and_the_Urban_Core.
[103].103.Chowdhury, A. M. & Faruqui, Shabnam (1991), ÒPhysical Growth of DhakaÓ, in Sharif Uddin Ahmed (ed.), Dhaka Past Present Future. Dhaka: The Asiatic Society of Bangladesh. p.43- 63.
[104].Spodek, Howard [1993], "Beyond Research Tests: Palimpsest and Nodes, Conflicts and Consciousness in south Asian Urban theory", in Howard Spodek and Doris Meth Srinivasan [eds.], Urban Form and Meaning in South Asia: The Shaping of Cities from Prehistoric to Precolonial Times. Washington: National Gallery of Art. p. 255-267.

[105].Tyrwhitt, Jacqueline [ed.] [1947], Patrick Geddes in India. London: Lund Humphies. Dhaka Metropolitan area Integrated Urban Development Project [DMAI UDP], [1981], Final Report. Vol. 2. Dhaka.

[106].Islam, N. Dhaka from City to Mega City: Perspective on People, Places, Planning and Development Issues: Urban Studies Programme, Department of Geography, University of Dhaka.1996b, Reprint.

[107].Mowla, Q. A., "A Review of Dhaka's Urban Morphology". The Jahangirnagar Review, Part II: Social Sciences.Vol. XXXI, Dhaka: 2007, 15-29.

[108].https://www.semanticscholar.org/paper/Riverfront-redevelopment-in-Dhaka%3A-reviewing-the-of-Khan/834e00e8597268d6831e947f096260bba38fac87.

[109].Minoprio & Spencely and.P.W. Macfarlane, Master Plan for Dacca, Minoprio and Spencely and P.W. Macfarlane, Dhaka: 1959.

[110]. Zaman, Q. M. M. U., and S. S. Y. Lau."City Expansion Policy Versus Compact City Demand - the Case of Dhaka." In Compact Cities: Sustainable Urban Forms for Developing Countries, edited by Mike Jenks and Rod Burgess: Spon Press. 2000.

[111].Ishrat Islam,(2009)Wetlands of Dhaka metro area,AH Development Pub. House.

[112]. Bowrey, Thomas, 1905. A geographical account of countries around the Bay of Bengal, 1669 to 1679. Ed. by Richard Temple, Cambridge: the Hakluyt Society.

[113].Rennell, James. 1781. An Account of the Ganges and Burrampooter Rivers. Philosophical Transactions of the Royal Society of London, 71, pp. 87-114.

[114]. https://en.banglapedia.org/index.php/Railway.

[115].CEA3-14891390.pdf (hrpub.org)

[116].Karim, A. Origin and development of Mughal Dhaka. In Dhaka: Past Present Future, 2nd ed.; Ahmed, S.U., Ed.; The Asiatic Society of Bangladesh: Dhaka, Bangladesh, 2009; pp. 34–55. [Google Scholar]

[117].Bari, M.; Efroymson, D. Detailed Area Plan (DAP) for Dhaka Metropolitan Development Plan (DMDP): A Critical Review; WBB Trust: Dhaka, Bangladesh, 2009. [Google Scholar]

[118].Mowla QA. (2005). Ecosystems and Sustainable Urban Design Nexus – A Borderless Concept, in the Global IIT 2005 Alumni Conference on Beyond ii Technology, with the theme Technology without Borders 20–22 May, 2005, Bethesda, Washington DC, USA.

[119].https://www.travelmate.com.bd/rivers-in-and-around-dhaka-bangladesh/

[120].https://core.ac.uk/download/pdf/234665018.pdf

[121].https://foursquare.com/v/dholai-khal/5088f320e4b0a0983849c189

[122].https://dhakadesigners.wordpress.com/2012/07/26/old-pictures-of-dhaka/dholai-khal-bridge-dhka-lohar-pool-bridge-1904/

[123].Reza ANMG, Alam MS. (2012). Wetland transformation in the western part of Dhaka city from 1963–2000. Bhugal Patrika (Journal of Geography). Issue 21, pp. 23–40.

[124]. "A Family's Passion - Archaeology Magazine". www.archaeology.org.

[125]. Hossain, Emran (19 March 2008). "Wari-Bateshwar one of earliest kingdoms". The Daily Star.

[126].Lawrence B. Lesser. "Historical Perspective". A Country Study: Bangladesh (James Heitzman and Robert Worden, editors). Library of Congress Federal Research Division (September 1988). This

article incorporates text from this source, which is in the public domain.About the Country Studies / Area Handbooks Program: Country Studies – Federal Research Division, Library of Congress.

[127]. Kamrunnesa Islam (1996). Economic History of Bengal (PhD thesis). SOAS, University of London. doi:10.25501/SOAS.00029147.

[128].Arabs, The – Banglapedia". en.banglapedia.org.

[129]. "Which India is claiming to have been colonised?". The Daily Star (Opinion). 31 July 2015.

[130].Indrajit Ray (2011). Bengal Industries and the British Industrial Revolution (1757–1857). Routledge. pp. 57, 90, 174. ISBN 978-1-136-82552-1.

[131]. "Worldview". Archived from the original on 13 April 2015. Retrieved 14 August 2015.

[132].Taylor, James (1840). A Sketch of the Topography and Statistics of Dacca. Calcutta: G.H. Huttmann, Military Orphan Press. pp. 301–307.

[133]. "Which India is claiming to have been colonized?". The Daily Star (Op-ed). 31 July 2015. Archived from the original on 28 March 2019. Retrieved 14 August 2015.

[134].Zaki, Hossain Muhammed (19 September 2022). "The glorious history of Goalanda". The Daily Star.

[135].Sengupta, Anwesha (29 July 2019). "Unthreading Partition: The politics of jute sharing between two Bengals". The Daily Star.

[136]. "Bangladesh - The "Revolution" of Ayub Khan, 1958-66". Countrystudies.us.

[137].Bangladesh Economy, Politics and GDP Growth Summary - The Economist Intelligence Unit". Country.eiu.com

[138].Rezaul Karim (24 February 2017). "Dhaka's economic activities unplanned: analysts". The Daily Star. Archived from the original on 13 July 2019. Retrieved 13 July 2019.

[139]."Dhaka City State of Environment" (PDF). Regional Resource center for Asia and the Pacific, United Nations Environment Programme. 2005. Archived from the original (PDF) on 7 February 2009. Retrieved 24 January 2009.

[140].Dhaka City Corporation (5 September 2006). "Pre-Mughal History of Dhaka". Retrieved 4 October 2012.

[141].Roy, Niharranjan (1993). Bangalir Itihas: Adiparba Calcutta: Dey's Publishing, ISBN 81-7079-270-3, pp.408-9.

[142]. "French, the". Banglapedia.

[143]. "Você fala Bangla?". Dhaka Tribune. 24 January 2014.62.

[144].Portuguese influence in Bengal". The Asian Age. Bangladesh.

[145]. Ali, Ansar; Chaudhury, Sushil; Islam, Sirajul (2012). "Armenians, The". In Islam, Sirajul; Jamal, Ahmed A. (eds.). Banglapedia: National Encyclopedia of Bangladesh (Second ed.). Asiatic Society of Bangladesh.

[146]."History of the Greek community in Dhaka". The Daily Star. 11 January 2021.

[147]. Karim, Abdul (2012). "Iranians, The". In Islam, Sirajul; Jamal, Ahmed A. (eds.). Banglapedia: National Encyclopedia of Bangladesh (Second ed.). Asiatic Society of Bangladesh.

[148]. "Don't split Dhaka, Khoka urges govt". UNBConnect. 12 November 2011. Archived from the original on 5 April 2012. Retrieved 12 September 2012.

[149]. Md Shahnawaz Khan Chandan (8 May 2015). "Reminiscing Dhaka's Legacy". The Daily Star.
[150]. "Final Report, Chapter-I: Background, Preparation of Detailed Area Plan (DAP) for DMDP Area: Group-C" Report No. GBL-DDC 225, RAJUK.
[151].Uddin, Md. Jamal; Jeong, Yeon Koo(2021).Urban river pollution in Bangladesh during last 40 years: potential public health and ecological risk, present policy, and future prospects toward smart water management,Heliyon,10.1016/j.heliyon.2021.e06107, volume no:07.
[152].[https://en.banglapedia.org/index.php/Buriganga_River]
[153].https://www.wallpaperflare.com/buriganga-river-with-lots-of-boats-in-dhaka-bangladesh-photos-wallpaper-znwho
[154].Halim, A.M. 1985. The Morphology of Urban Transport in Dhaka City, M.Sc thesis. Dhaka: Jahangirnagar University, Savar.
[155].Nabi, A. M. 2006. An Investigation to Water Transport Potential: A Case Study of Aminbazar to Sadarghat, unpublished BURP thesis. Dhaka: Jahangirnagar University.
[156].World Bank to give Bangladesh $360m for the waterway project". The Independent. Dhaka. 2016-05-29. Retrieved 2017-07-23.
[157].[https://en.banglapedia.org/index.php?title=Turag_River]
[158].Rahman, Mirza.,Moly, Sanjida.,Saadat, A H M.(2013) Environmental Flow Requirement and Comparative Study of the Turag River, Bangladesh,International Journal of Scientific Research in Environmental Sciences(p291-p299).VL - 1,DO-10.12983/ijsres-2013-p291-299
[159].https://www.travelmate.com.bd/rivers-in-and-around-dhaka-bangladesh/
[160].IMAGE number UIG798815 ,Image title:A view of the Turag river on the outskirts of Dhaka city, in Bangladesh. April 17, 2008. (photo),Photo credit: Majority World/UIG / Bridgeman Images.
[161]. Khadiza Begum, K. (2011) " Save Ashulia: A significant wetland but facing threat"
[162].https://www.thedailystar.net/news-detail-175814
[163].https://en.banglapedia.org/index.php?title=Balu_River
[164].https://doi.org/10.3329/jbcbm.v6i1.51330
[165].https://www.shutterstock.com/image-photo/dhaka-bangladesh-november-28-2020-top-1863739423
[166].https://dailyasianage.com/news/52797/the-gypsies-of-balu-river
[167].https://archive.thedailystar.net/magazine/2011/06/01/cover.htm
[168].Google map at Kaliganj Ghat point, Picture contributor , Md. Sajid, feb2021.
[169].https://www.dreamstime.com/banks-buriganga-river-dhaka-bangladesh-october-capital-largest-city-image166155537
[170].http://www.dscc.gov.bd/

---

webliography

01.http://worldpopulationreview.com/world-cities/dhaka-population
02.https://education.nationalgeographic.org/resource/watershed/
03.https://www.banglapedia.org/

04.https://www.asiaticsociety.org.bd/contact/
05.https://censusindia.gov.in/nada/index.php/catalog/20614
06.https://issuu.com/amitasinha/docs/orchha_report
07.[67].https://www.worldatlas.com/cities/10-largest-cities-in-the-world.html,Accessed08.06.223
08.[84].https://earth.google.com/web/search/Dhaka- accessed on 15/05/2023
09[114]. https://en.banglapedia.org/index.php/Railway.
10[115[.CEA3-14891390.pdf (hrpub.org)
11.https://www.thedailystar.net/opinion/environment/dhaka-and-her-rivers-1444537

ANNEXES

Annex(chapter-1)

Photograph:01

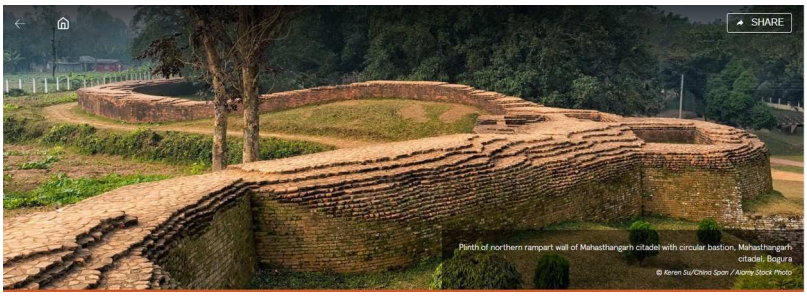
Photograph:01

Source: https://www.britishmuseum.org/collection/term/x72914

Source:https://worldarchitecture.org/article-links/eeeev/craft-before-common-erathe-northern-black-polished-ware.html

Name: Fragments of Northern Black Polished Ware (NBPW) from Kaushambi (Uttar Pradesh), 63/154, and Rajghat (Uttar Pradesh), 2017/19. About 500-400 B.C. British Museum.

Description: The Northern Black Polished Ware culture, also known as NBPW or NBP, is an urban Iron Age Indian culture that originated on the Indian Subcontinent. It began to emerge around 700 BCE during the late Vedic period and reached its apex between 500 and 300 BCE. Northern Black Polished Ware is a high-class form of burnished pottery that was used by elites.



Photograph:02

Photograph:03

Souce:https://visitworldheritage.com/en/buddha/mahasthangarh/550d37f2-d576-4d7b-8b7a-4b87c13cdc05

Photograph 1: Plinth of northern rampart wall of Mahasthangarh citadel with circular bastion, Mahasthangarh citadel, Bogra.bangladesh.
Photograph 2: Remnants of the city wall in Mahasthangarh, one of the oldest urban settlements in Bengal.
Description: Mahasthangarh, the earliest urban archaeological site ever found in Bangladesh, dates to at least the 4th century BCE.The capital of the Pundra Kingdom mentioned in the Rigveda was located at the archaeological site of Mahasthangarh, according to Alexander Cunningham, who founded the Archaeological Survey of India.The earliest archaeological site in Bangladesh is Mahasthangarh. It served as the Pundra Kingdom's first capital and dates around 300 BCE.

Photograph:04

Sources:https://www.britishmuseum.org/collection/object/C_1920-1016-10
Name: Gold coin. During EmpireChandragupta (approximately 319–467 CE)
Description:
Description of the first coin
Goddess seated facing on a recumbent lion facing to the right. Wearing a loose robe and with a halo around head. Right arm outstretched, holding a filet, with a cornucopia resting on left arm. In left field, a symbol. surrounded by a border of dots. (reverse) (reverse)
Description of the Second coin
Chandragupta I, with halo, standing facing left, wearing a cap, decorated coat and trousers, ear rings, and armlets. Holds a crescent topped standard in left hand and offers an object to Kumaradevi with his right hand. Kumaradevi, standing facing right, wears a long, loose robe, a necklace, earrings, and a headdress. A halo surrounds her head. (obverse) (obverse)

Photograph:05

Photograph:06

Source:whc.unesco.org/en/documents/121908

Name: Ruins of the Buddhist Vihara at Paharpur,Bangladesh.

Description: The Pala Empire (750–1120 CE) was a Bengali Empire and the last Buddhist imperial power on the Indian subcontinent South of the Himalayas, the second-largest solitary Buddhist monastery. After many invasions beginning in the 12th century, the monks began to depart, which caused the monastery structures to deteriorate and fall apart.Its remnants still stand at a height of 21 meters and have three terraces that get smaller with time. Burnt bricks were used to construct the walls, and some of them included floral and sitting Buddha images. Around the terraces, there were also bands of terracotta plaques arranged in rows.

Source: Bandel, de Reede van de vermaerde Coopstadt Arrakan. [Chittagong], **publisher:**SCHENK, P.Amsterdam, 1702

Mughal-Arakanese battle on the Karnaphuli River in Chittagong in 1666,Chittagong University Museum

Name:A view of Chittagong's harbor, 1702

Mughal-Arakanese battle on the Karnaphuli River in Chittagong in 1666.

Description: An image of the harbor of Chittagong, Bangladesh, which lies at the mouth of a river teeming with boats like a Dutch East Indiaman.

a picture depicting the 1666 Karnaphuli River fight between the Arakanese and the Mughals, during which the Mughals got assistance from the Portuguese.

Painting:03
Painting:04
Sources: https://www.npg.org.uk/collections/search/portrait/mw01347/Robert-Clive-and-Mir-Jafar-after-the-Battle-of-Plassey-1757,by Francis Hayman
oil on canvas, circa 1760
https://warfarehistorynetwork.com/article/triumph-at-plassey/
Name: Battle of Plassey, Starting of English Colonization

Description:
Painting 02: The Battle of Plassey in 1757, Robert Clive, Mir Muhammad Dja'far Khan, and his son Mir Miran (Sadiq Ali Khan Bahadur) were accompanied by a number of British and Mughal attendants.
Painting 03: Colonel Robert Clive's British counteroffensive in Bengal, India, in 1757 resulted in a showdown with the Nawab of Bengal during a violent monsoon.

Stamp:01Raja Ram Mohan Roy **Stamp:02 Rabindranath Tagore**
Sources: https://www.pinterest.com/pin/353603008217781811/

https://www.dreamstime.com/editorial-stock-photo-rabindranath-tagore-building-india-circa-stamp-printed-india-shows-circa-image86585893

Name: Bengal Renaissance

Description: Stamp 01 and Stamp 02:

The Bengal Renaissance began with reformer and humanitarian **Raja Ram Mohan Roy (1775–1833)** and culminated with **Rabindranath Tagore (1861–1941)**. David Kopf, a historian, calls this era "one of the most creative periods in Indian history" because of the flourishing of religious and social reformers, academics, and authors.

Sources: https://www.bbc.co.uk/programmes/w3ct1x1w
http://www.mediabd.com/newissue/fdc_details.php?country_id=1&entry_id=156&from_theme=Monuments&page=2

Name: Photograph :07The Language Movement.

Stamp and Envelope:01 Language Movement happened 1952.It Published 1972.

Description: In February 1952.Thousands marched in Dhaka in support of the Bengali language Police shot and killed eight demonstrators on what became known as Language Movement Day.In Bengalis' thoughts, the language movement sparked a sense of nationalism and unlocked new possibilities. It has opened a brand-new chapter that has earned a prestigious position in the long-running battle for Bengalis' emancipation. The fight for language was a fight for culture and for one's own survival.

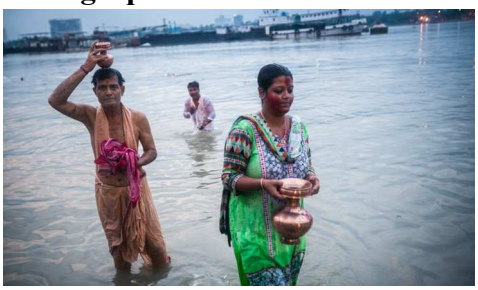
Photograph :08

Photograph :09

Sources:https://ajayjalvayu.medium.com https://www.franckvogel.com/english/portfolio-Ganges.html
Name: The Holy Journey of the River Ganga (Mother Ganga) in the Himalayan Mountains.
Description: These two photos represent the water sources of the river Ganga as it travels through the Himalayan Mountains. The water sources are the glaciers in the mountains. Most of our Hindu gods and goddesses live on that mountain where the Ganga started its journey. Its Water is the holy water.

Photograph :10

Photograph :11



PhotoGraph:12

Photograph:13

Sources:https://www.franckvogel.com/english/portfolio-Ganges.html
https://ajayjalvayu.medium.com
Name:
Photograph 10 and Photograph11: Prayers and Homage to Ganga River on River Bank
Photograph 10 and Photograph11: Holly birthing at Ganga River.
Description:
In Photograph 10 and Photograph11, The priest and the normal people offer their evening prayers to the river Ganga.
In Photograph 12, people are bathing and taking holy water for home.

In Photograph 13, A monk is taking a bath, before performing his prayers . The Holy water purifies him,not only symbolically but also the Ganga water carries a high rate of dissolved oxygen, and contains bacteriophages(able to kill bacteria). A Unique character of the river to cure people.

Source:
https://www.bbc.com/future/article/20210316-the-legendary-fabric-that-no-one-knows-how-to-make
https://collections.britishart.yale.edu/catalog/tms:1003
Name:
Painting 05: A Bangladeshi woman in fine Bengali muslin, by Francesco Renaldi (c. 1789)
Painting 06: Joséphine Bonaparte, the wife of Napoleon wearing the Dhaka muslin
Description: An oil painting by Francesco Renaldi (c. 1789).it represents, At that time the contemporary affluent women were the Dhakai Muslin.
Dhaka muslin was a favorite cloth material for the queen and affluent European women. Joséphine Bonaparte, the wife of Napoleon, liked to wear the Muslim.

Annex(Chapter-II)

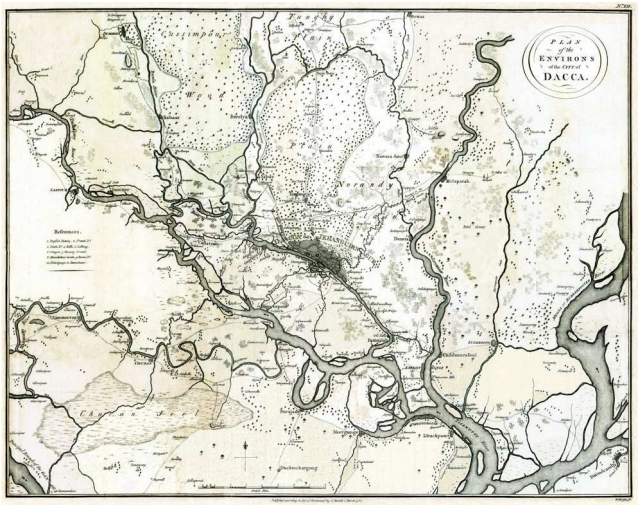


Figure 2.19: 1st Map drawn by the colonial british. [A Bengal Atlas, James Rennell, London, 1781]
James Rennell was appointed the first Surveyor General of Bengal in 1764 by the East India Company (EIC), seven years after the Battle of Plassey. The next year, 1765 after the treaty of Allahabad, the EIC became the de facto ruling authority in Bengal. Rennell from his headquarters in Dhaka completed a comprehensive and systematic survey of Bengal and Bihar over a 13 year period. In 1780 his work was compiled and

published in “A Bengal Atlas”. This map is one of the maps from the 1781 edition of this atlas. [https://mappingbengal.com/earliest-map-of-dhaka]
The map representing Deltic Riverine Landscape Character is the greatest factor of these Delta and the location of the capital city. This map is one of the first maps that represent Dhaka with its peripheral geography.

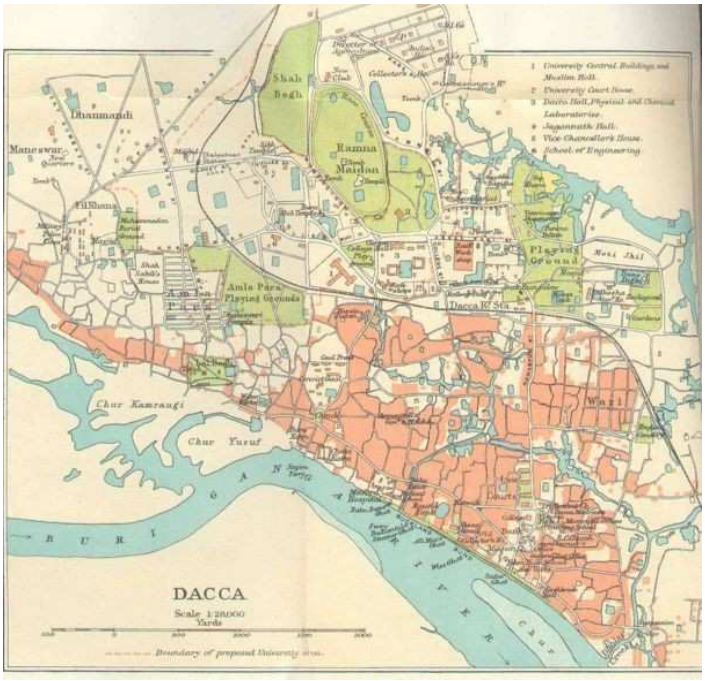


Figure 2.20: Dhaka City Map of 1914 Dhaka City map - before WWI.
Land Use is totally present by the map. The rail road , the horse course field, the road network of the city. The river network of the city.

https://cityterritoryarchitecture.springeropen.com/articles/10.1186/s40410-016-0036-y

Riverine Landscape Drawings of the river Buriganga, Dhaka city (1847)

Figure 2.21.a: RCXBF7A view of the river and city of Dacca. Panorama of the city of Dacca. [London] : lithographed and published by Dickinson, [1847?]. Source: V.6640, pages 7-8.

Figure 2.21.b: RCY4KM–A view of the river and city of Dacca. Panorama of the city of Dacca. [London] : lithographed and published by Dickinson, [1847?]. Source: V.6640, pages 19-20.

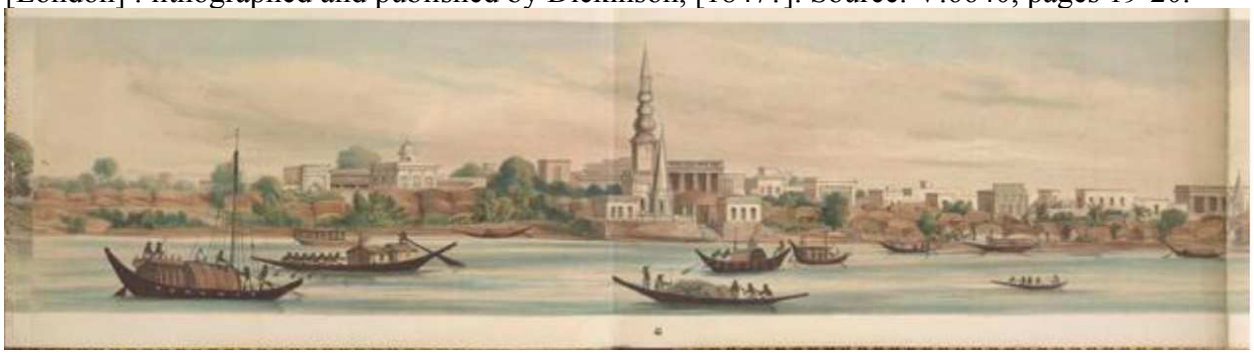


Figure 2.21.c:RC4D2W–A view of the river and city of Dacca. Panorama of the city of Dacca. [London] : lithographed and published by Dickinson, [1847?]. Source: V.6640, pages 5-6.

Figure 2.21.d:RCD3WT–A view of the river and city of Dacca. Panorama of the city of Dacca. [London] : lithographed and published by Dickinson, [1847?]. Source: V.6640, pages 21-22.

Figure 2.21.e:RCY2NH–A view of the river and city of Dacca. Panorama of the city of Dacca. [London] : lithographed and published by Dickinson, [1847?]. Source: V.6640, pages 1-2.

Figure 2.21.f:RCY8TG–A view of the river and city of Dacca. Panorama of the city of Dacca. [London] : lithographed and published by Dickinson, [1847?]. Source: V.6640, pages 3-4.

Figure 2.21.g: RCBWKJ–A view of the river and city of Dacca. Panorama of the city of Dacca. [London] : lithographed and published by Dickinson, [1847?]. Source: V.6640, pages 23-24

Figure 2.21.h: RCBPEP–A view of the river and city of Dacca. Panorama of the city of Dacca. [London] : lithographed and published by Dickinson, [1847?]. Source: V.6640, pages 17-18.

Figure 2.21.i:RCEED1–A view of the river and city of Dacca. Panorama of the city of Dacca. [London] : lithographed and published by Dickinson, [1847?]. Source: V.6640, pages 11-12.

Figure 2.21.j:RCY2C9–A view of the river and city of Dacca. Panorama of the city of Dacca. [London] : lithographed and published by Dickinson, [1847?]. Source: V.6640, pages 15-16.

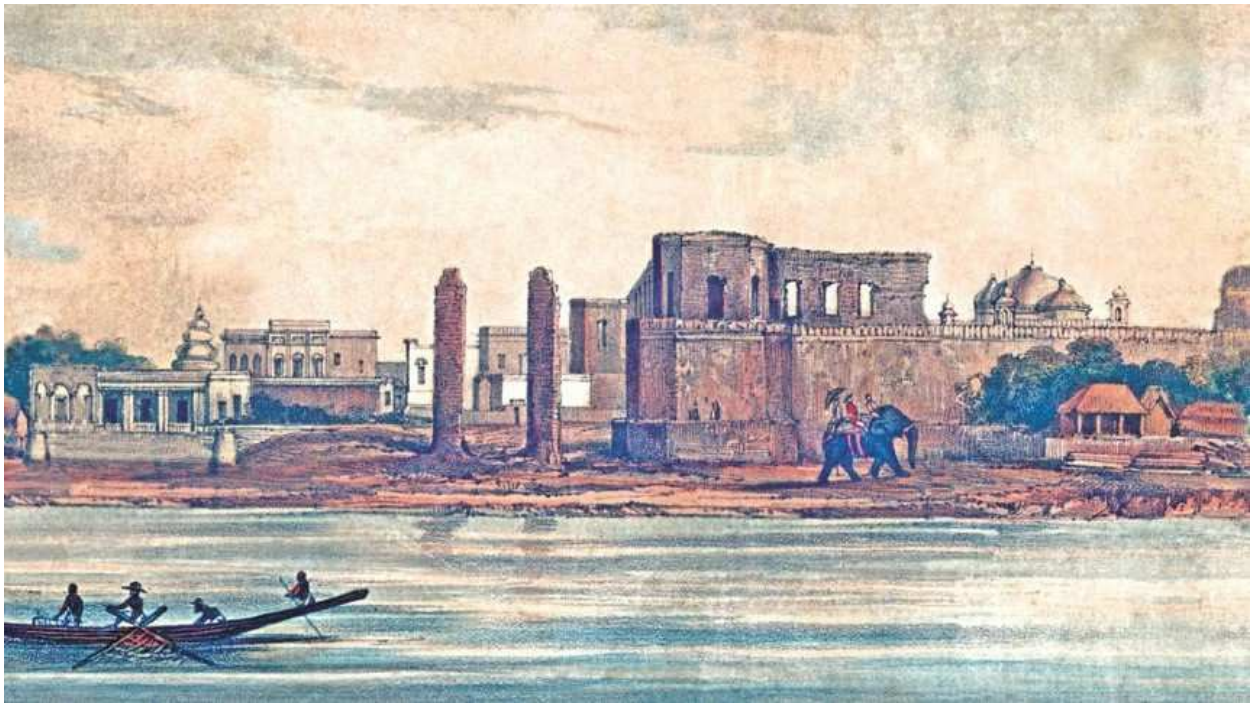


Figure 2.22: The ruins of the Fort and the Palace of the Nawabs of Dacca, called Lall Bag. Source: Panorama of the City of Dacca, 1847.
https://www.thedailystar.net/in-focus/news/the-bastion-the-lalbagh-fort-1736110,Accessed - 10.06.2023

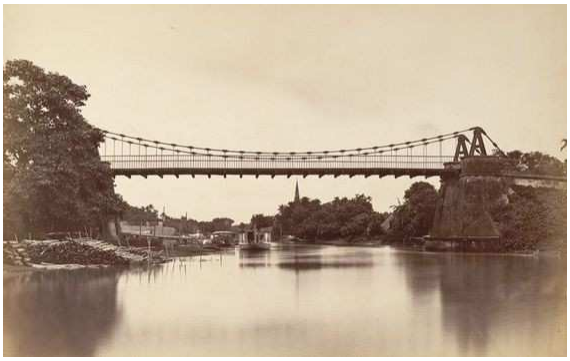


Figure 2.23: Bastion of the Lal Bagh, Dacca, by Sir Charles D'Oyly. Source: Antiquities of Dacca, 1823. Courtesy: Mohammad Shahidullah.

https://www.thedailystar.net/in-focus/news/the-bastion-the-lalbagh-fort-1736110,Accessed - 10.06.2023

Figure 2.24: LOHARPUL BRIDGE - In 1832 Collector of Dhaka Mr. Walter put up work for a single-span hanging bridge over the canal at Sutrapur (Farashganj) for facilitating passage from Dhaka to Narayanganj. 1880s photo by Johnston and Hoffman.

https://www.pinterest.com/pin/96827460728126794/, Accessed -10.06.2023

Figure 2.25: Mill buildings, Gandharia, 1870's Dhaka

Photograph of Mill buildings in Gandharia. This print was taken in Gandharia, Dhaka District, Bangladesh by an unknown photographer in the 1870s and is from the Temple collection of photographs.

http://oldcityphotos.blogspot.com/2011/02/mill-buildings-gandharia-1870s-dhaka.html ,Accessed -10.06.2023

Figure 2.26: Cemetery, Narind, 1870's Dhaka

Photograph taken by an unknown photographer in the 1870s of the Christian Cemetery at Narind in Dhaka, the capital of Bangladesh. The view shows the arched Mughal style gateway to the cemetery on the left and on the right is an elaborate tomb built in the Indo-Gothic style with its pointed archway doors and jali screen windows.

http://oldcityphotos.blogspot.com/search/label/1870%27s%20Dhaka,Accessed -10.06.2023

Figure 2.27: Toongee [Tungi], near Dhaka, 1880's Dhaka

Photograph of a bridge at Tungi in Dacca (Dhaka) taken in the 1880s, from an album 'Architectural Views of Dacca', containing 13 prints by Johnston and Hoffman. The photograph offers a view of an iron-girder bridge, spanning the River Buriganga and built shortly before this image was taken.
http://oldcityphotos.blogspot.com/search/label/OLD%20Tungi, Accessed -10.06.2023

Figure 2.29: Sutrapur or hanging bridge, built c1834, since demolished, 1870's Dhaka
Photograph of the Hanging Bridge at Dhaka taken in the 1870s by an unknown photographer. Formerly.The city is situated on the north bank of the Buriganga River and is crossed by a branch of the Dolai Creek. It is now the capital of Bangladesh.
http://oldcityphotos.blogspot.com/search/label/River%20Scene,Accessed -10.06.2023
Figure 2.30: Buriganga River, 1880's Dhaka
Photograph of Dacca (Dhaka) taken in the 1880s, from an album 'Architectural Views of Dacca', containing 13 prints by Johnston and Hoffman. View looking along the river Buriganga towards the city of Dhaka situated on the left bank. A Hindu temple tower stands at the water's edge. As the fortunes of the Nawabs declined, the power of the East India Company became a new factor. Queen Victoria's Proclamation in 1858 brought all the territories held by the Company (including Dhaka) under British rule.
http://oldcityphotos.blogspot.com/search/label/OLD%20Dhaka,Accessed-10.06.2023

Figure 2.31: Hindu Temple, 1880's Dhaka

Photograph of temples at Dacca (Dhaka) taken in the 1880s, from an album 'Architectural Views of Dacca', containing 13 prints by Johnston and Hoffman. This temple was also nearly collapsing when the photograph was taken. Native boats may be seen on the left of the image.

http://oldcityphotos.blogspot.com/search/label/OLD%20Dhaka, Accessed -10.06.2023

Figure 2.32: Mahomed Mosque, 1880's Dhaka

Photograph of seven Gumbuz Mosque at Dacca (Dhaka) taken in the 1880s, from an album 'Architectural Views of Dacca', containing 13 prints by Johnston and Hoffman.. This is a view looking towards the domes of the mosque, the rest of the building largely concealed by vegetation in the foreground..

http://oldcityphotos.blogspot.com/search/label/OLD%20Dhaka,Accessed -10.06.2023

Figure 2.33: Christian cemetery, Narinda, 1870's Dhaka

Photograph of the Christian cemetery at Narinda in Dhaka, the capital of Bangladesh taken in the 1870s by an unknown photographer. The tombstones are displayed in this view.

http://oldcityphotos.blogspot.com/search/label/OLD%20Dhaka, Accessed -10.06.2023

Figure 2.34: This African giraffe was imported into Bengal and re-exported to China circa 1415.
On 20 September 1414, Bengali envoys presented a tribute giraffe in the name of King Saif Al-Din Hamzah Shah of Bengal (r. 1410–12) to the Yongle Emperor of Ming China (r. 1402–24). The Yongle Emperor commissioned Shen Du to paint this giraffe. This file depicts the original painting by Shen Du.

https://en.wikipedia.org/wiki/Economy_of_Bangladesh#/media/File:Adamjee_Jute_Mills.jpg, Accessed -10.06.2023

Figure 2.35: In the 1950s and 1960s, Adamjee Jute Mills was the largest jute processing plant in the world.

https://en.wikipedia.org/wiki/Economy_of_Bangladesh#/media/File:Adamjee_Jute_Mills.jpg ,Accessed -10.06.2023

Annex(Chapter-III,Part-A)

Photograph 3.11[21]

Photograph 3.11: View of Buriganga River from the Buriganga Bridge 01.It represents the desi boat, desi machine boat and big multistoried ship, cargo moving through the Ghats of river Buriganga.

21.https://www.wallpaperflare.com/bangladesh-buriganga-river-evening-cloud-boat-launch-sky-wallpaper-eahtf

Photograph 3.12[22]

Photograph 3.13[23]

Photograph 3.14[24]

Photograph 5.15[25]

Photograph 3.12 and Photograph 3.13:A top view of the Buriganga River,Dhaka. The River has a great navigation and creates a water based connection through the south part of Bangladesh.But now it has become the most polluted river in the country because of rampant dumping of waste.

Photograph 3.14 and Photograph 3.15:A view of pollution in Buriganga River,Dhaka. The river has become the most polluted river in the country because of rampant dumping of waste.

22.https://www.shutterstock.com/image-photo/dhaka-bangladesh-july-08-2021-birdseye-2178251595

23.https://www.shutterstock.com/image-photo/sadarghat-dhaka-bangladesh-10th-november-2020-1863262333

24.https://www.aljazeera.com/gallery/2022/6/22/photos-bangladeshs-garment-driven-economic-boom-killing-rivers

25.https://www.theguardian.com/global-development-professionals-network/gallery/2015/oct/23/the-river-runs-black-pollution-from-bangladeshs-tanneries-in-pictures

Photograph 3.16[26]

Photograph 3.17[26]

Photograph 3.16: The river Turag and its relation with the city fabric near Abdullahpur,Uttara.

Photograph 3.17:The river Turag and its Navigation,Different types of boat and ships are moving on the river near Mirpur..

Photograph 3.18[26]

Photograph 3.19[27]

Photograph 3.20[28]

Photograph 3.21[29]

Photograph 3.22[30]

Photograph 3.23[30]

Photograph 3.18: The river Turag bank used by the garment factory Abdullahpur, Uttara Dhaka.

Photograph 3.19: The photos taken over three years show how land grabbers occupied the Turag's foreshore following the incorrectly placed demarcation pillars by the authorities concerned. The Turag just north of Birulia Bridge is merely 100 feet across now. Photo: Sk Enamul Haq.

Photograph 3.20: River bank restoration by the authority.The Authority removed the structures that are squatter.

Photograph 3.21: River banks are occupied by the structures that are mainly squatter.These squatters cut the connection between city and river and destroyed the cultural landscape of the river.

Photograph 3.22: Still with a lot of pollution and encroachment the river got a healthy ecosystem during monsoon due to at that time the river got fresh water from the up stream.Fresh water Dolphins come to this river for fish during Monsoon

26.https://earth.google.com/web/search/Turag+river/@23.89231665,90.3418998,5.13294684a,34007.89896523d,35y,0h,0.00000006t,0r/data=CnYaTBJGCiUweDM3NTVjNDQxYjkwNTZkOGI6MHg1ZjRmN2UwZTcyZjhlMDJmGeoKEcvB4zdAIdSvGYXJlVZAKgtUdXJhZyByaXZlchgDIAEiJgokCVrZjP2bojdAET--KIFmnjdAGRfQL1NhmVZAIcVqhVyumFZA

27.https://www.thedailystar.net/frontpage/time-declare-turag-dead-1310182#lg=1&slide=0

28.https://thefinancialexpress.com.bd/views/columns/treating-rivers-as-living-entities-1562860873(picture Credit-Maruf Hossain)

29.http://southasiajournal.net/bangladesh-landmark-judgement-of-high-court-against-river-grabbing/

30.https://esajournals.onlinelibrary.wiley.com/doi/full/10.1002/bes2.1227

Photograph 3.24[31]

Photograph 3.24: A panoramic view of the Tongi Khal, the rightbank is Dhaka District and the left bank is Tongi District.The Tongi rail crossing also makes connection between two districts.

Photograph 3.25[31]

Photograph 3.25: A panoramic view of the Tongi Khal, the rightbank is Dhaka District and the left bank is Tongi District.The Tongi Khal and its relation with city fabric.

31.https://earth.google.com/web/search/Tongi+khal/@23.86383536,90.44088329,9.92826767a,17014.36533977d,35y,0h,0.00000001t,0r/data=CnUaSxJFCiUweDM3NTVjMzk3NDQxYjE5MmY6MHhkNTJjNWNhYmIyZTNjZjM4GW3UVGAS4DdAISpVouytnVZAKgpUb25naSBraGFsGAMgASImCiQJBJDhPx79N0AROcnuC6vLN0AZ05nLyPKjVkAhTSealtCHVkA

Photograph 3.26A[27]

Photograph 3.26B[32]

Photograph 3.27[33]

Photograph 3.28[34]

Photograph 3.26A and Photograph 3.26A: Both pictures show the khal encroachment in the east part of Dhaka.

Photograph 3.27: It shows the pollution of the khal at Uttarkhan, Uttara, Dhaka.

Photograph 3.28:It shows theTongiKhal and its Navigation. Different types of boats and ships are moving on the Khal near Uttara, Dhaka.

27.https://www.thedailystar.net/frontpage/time-declare-turag-dead-1310182#lg=1&slide=0

32.https://www.tbsnews.net/bangladesh/biwta-removing-garbage-turag-river-42907

33.https://bdnews24.com/media-en/waste-dumped-into-turag-river

34.DHAKA-2018. Boats on the polluted turag River in Dhaka-ID:MAMGK3

Photograph 3.29[35]

Photograph 3.30[36]

Photograph 3.29:Fishing (with Dhormo Jaal) at Tongi Khal near Ijtema Site , Uttara, Dhaka.During Monsoon the river receive lot of fresh water from the upper stream and it clean the the river again.Photograph Credit-Shameem Bakhshi.[35]

Photograph 3.30:It shows the polluted water of the Khal during dry season.and the nevigation quality of the river during dry season.

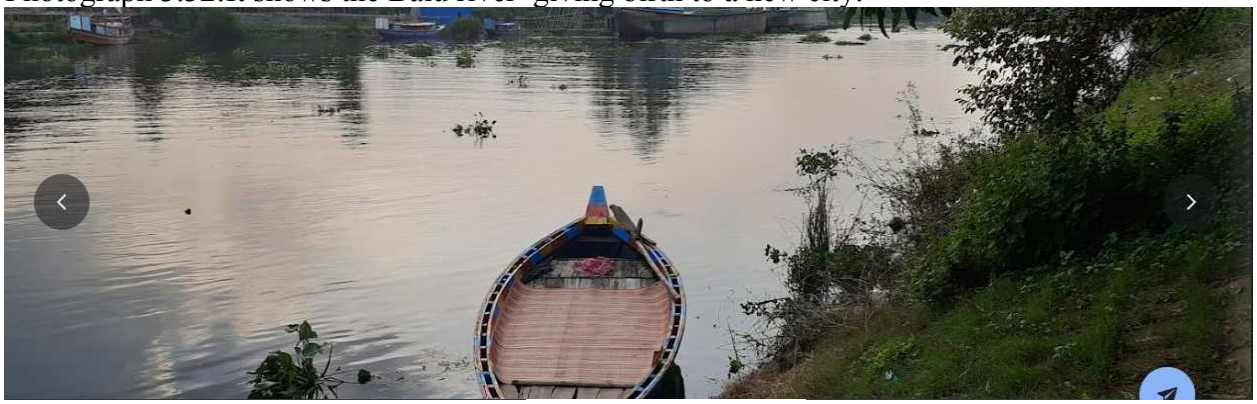
36.https://www.thedailystar.net/news-detail-175814

Photograph 3.31[37]

Photograph 3.31:It shows the Balu river bank with heavy industries with navigation of ships.

Photograph 3.32, photograph credit-JOLSHIRI ABASHON

Photograph 3.32:It shows the Balu river giving birth to a new city.



Photograph 3.33[37]

Photograph 3.32:It shows how Balu river interact with the rural settlement, desi boat at desi Ghat.

37.https://earth.google.com/web/@23.81823222,90.54597852,10.06630678a,1834.0154388d,35y,-165.27255505h,44.28196729t,0.00000001r/

data=CnoaeBJyCiUweDM3NTVjYmM4NTA2NzU3Mjk6MHgxZjY5OWUzNTg5NDA5ZTdhKklIYXJpbmRhIEphbWUgTWFzamlkCuCmueCmvuCmsOCmv-CmqOCnjeCmpuCmvgrgppzgpr7gpq7gp4cg4Kau4Ka44Kac4Ka_4KamGAMgAQ

Photograph 3.34[38]

Photograph 3.35[39]

Photograph 3.34:A top view of the Balu River at Dhaka in Bangladesh. The Balu River has now become the most polluted river in the country because of rampant dumping of waste.

Photograph 3.35:A housing company occupies the Balu river in Ichhapura of Narayanganj for an illegal project. A team of the Department of Environment yesterday fined the company Tk 18 lakh for causing damage to the environment. Photograph credit- Rashed Shumon.

38.https://www.shutterstock.com/image-photo/dhaka-bangladesh-november-28-2020-top-1863739429

39.https://www.thedailystar.net/news-detail-192335

Photograph 3.36[40]

Photograph 3.37,P.C.-Tawhidul islam

Photograph 3.36:Bridges made of bamboo are still used in some parts of Dhaka South City Corporation. There are also several such bridges on the Rampura canal. But the largest bamboo bridge in the area has been made in Dhaka's Demra, near an estuary of the Balu River. Photo: Mahmud Zaman Ovi

Photograph 3.37: Dhesi ferry Ghat with Deshi boat,Char Chanpara Masjid Ghat, Balu rive.

40.https://bdnews24.com/media-en/the-largest-bamboo-bridge-in-demra

Photograph 3.38,P.C.-Tawhidul islam .

Photograph 3.38: It shows the amusement facilities of the river Balu during Monsoon season. the amusement boats, Balu river.

Photograph 3.39[41]

Photograph 3.40[42]

Photograph 3.39:An aerial view of the shrinking Balu. The river is an important means of draining flood waters out of the capital.Photo: Syed Zakir Hossain.

Photograph 3.40: An aerial view of the Balu. The river is an important means of different types of deshi machine boats and desi boats and the polluted water during the dry season.

41.https://www.thedailystar.net/news-detail-14659

42.https://www.shutterstock.com/image-photo/dhaka-bangladesh-november-06-2017-water-749424733

Photograph 3.41[43]

Photograph 3.42[43]

Photograph 3.41 and Photograph 3.42 : The oldest and largest riverport of Bangladesh at the river Shitalakshya,All types of desi boats and multistoried ships were moving in the river and the navigation status of the river.

43.https://www.gettyimages.in/photos/narayanganj-port

Photograph 3.43[44]

Photograph 3.44[44]

Photograph 3.45[44]

Photograph 3.43,Photograph 3.44 and Photograph3.45: All are the river banks fabric of river Shitalakshya.Respectivly, the rural settlement, Dockyard and city fabric,Heavy Industries.

Photograph 3.46[44]

Photograph 3.46: Ship waited to unload the goods near the biggest riverport of Shitalakshya river, Narangang and the Industrial fabric on the bank of the river Shitalakshya.

44.https://earth.google.com/web/search/narayangong+dockyard+,shytalakhya+river/@23.63665533,90.51800412,3.93003313a,1443.64913205d,35y,-122.8364267h,45.00308593t,-0r/data=CmIaOBIyCiUweDM3NTViMWY4YjRlYjRiYzU6MHg1ZDcxZmMxMDhkZTgxYWQ5KglTaGlwd3JlY2sYAyABIiYKJAmHBHdkmKU3QBFDuw7wq6E3QBkXHWENHaBWQCGYI474HZ9WQA

Photograph 3.47[45]

Photograph 3.48[45]

Photograph 3.47:Heavy Industries on the bank of Shitalakshya river.

Photograph 3.48:All the lighter ships waited to unload the goods near the biggest riverport of Shitalakshya river, Narangang.

45.https://www.alamy.com/stock-photo/shitalakshya-river.html?sortBy=relevant

Photograph 3.50[46]

Photograph 3.51[46]

Photograph 3.50:The brick field encroached the Shitalakshya river.

Photograph 3.51:The sand filling by the land graber near the Tarabo bridge, Shitalakshya river.
46.https://www.alamy.com/stock-photo/shitalakshya-river.html?sortBy=relevant

Photograph 3.52[47]

Photograph 3.53[48]

Photograph 3.52:Shitalakshya River in dire condition from trash, pollution, chemical waste, and illegal structures in Narayanganj Dhaka Tribune
Photograph 3.53:The Shitalakshya River lost its color due to pollution.
47.https://thegreenpagebd.com/the-shitalakshya-river-lost-its-color-due-to-pollution-2/
48.https://www.alamy.com/stock-photo/shitalakshya-river.html?sortBy=relevant

Photograph 3.54[49]

Photograph 3.55[49]

Photograph 3.56[49]

Photograph 3.54,Photograph 3.55 and Photograph 3.56: All are the river banks fabric of river Dhaleshwari .Respectively, Dockyard and city fabric with heavy Industries and the the rural settlements,

49.https://earth.google.com/web/search/Dhaleshwarie+river/@23.6262964,90.3893589,2.28397581a,958.25476987d,35y,0h,45t,0r/data=CnwaUhJMCiUweDM3NTViYjg2NTE3N2ZjMTE6MHhlZjdkYjdlNWY3YTQ2ZGIxGZ4mM95WoDdAIbHD863qmFZAKhFEaGFsZXNod2FyaSByaXZlchgDIAEiJgokCY-OcIOJvDdAEWiL-qeATzdAGYK-cT5tqVZAIcPW9C75jVZA

Photograph 3.57[50]

Photograph 3.58[50]

Photograph 3.59[51]

Photograph 3.57 and Photograph 3.58:Solid waste of the Savar Tannery Industrial Estate on the outskirts of the capital being discarded into the temporary dumping station there. But the waste eventually makes its way into the Dhaleshwari river. Photo credit: Aklakur Rahman Akash,Photo: Palash.

Photograph 3.59:Boats and the ships moving in the river Dhaleshwari.

50.https://www.thedailystar.net/frontpage/dhaleshwari-danger-1590847#lg=1&slide=0

51.https://www.gettyimages.com.br/fotos/dhaleshwari-river

Photograph 3.60[52]

Photograph 3.61[52]

Photograph 3.62[52]

Photograph 3.60,Photograph 3.61 and Photograph 3.62:Aerial view of chimney kilns from brick factory surrounding the area along Dhaleshwari river near Keraniganj.

52.https://www.westend61.de/en/imageView/AAEF10524/aerial-view-of-chimneys-kilns-from-brick-factory-surrounding-the-area-along-dhaleshwari-river-near-keraniganj-township-dhaka-bangladesh

Annex(Chapter-III,Part-B)

A.Types of water vehicles used for people movement, the pictures are given below.

All the pictures are taken from the river Buriganga.

Photograph 01 : Picture shows long distance water Desi water vehicles that are commonly used on these waterways .

Photograph 02: Picture shows the Desi non motorized boats that are used for ferry purposes on these waterways .

Photograph 02: Picture shows the Desi motorized boats that are used for ferry purposes and for short distances on these waterways .

Photograph 04: Picture shows the big Desi water vehicles that are used for long distances on these waterways..

Sources:
01 and 03.https://www.istockphoto.com/pt/foto/dhaka-river-port-gm1175855408-327606220
02.https://www.travelandexplorebd.com/tour/full-day-river-cruise
04.https://en.wikipedia.org/wiki/Buriganga_River

B.Types of materials that are carried in these 110 km waterways, the pictures are given below.

All the pictures 01, 02 and 03 are taken from the river Turag, 04 and 06 are taken from river Dhaleshwari and picture 05 is taken from river Buriganga.
Photograph 01 : Picture shows the cows are caring by using the waterways .
Photograph 02 and 03: Pictures shows the construction materials like cement and stones are carried by the waterways.
Photograph 04: Picture shows the jute being carried by the waterways.
Photograph 05: Picture shows the fruits and vegetables carried by the waterways.
Photograph 06: Picture shows the construction materials like sand is carried by the waterways.

Sources:

01.02.and 03.Google map pictures at Gabtoli landing station point are used.

04.06. Google earth pictures at Pagla point are used.

05.ID:MCP37M,ContributorJahangir Alam Onuchcha / Alamy Stock Photo,17 April 2018,Dhaka, Bangladesh

C .Indigenous materials are used for floating dock for ferry boats and how it works with different navigation level of the river.

All the pictures are taken from the river Shythalakhya to the Chourongi Ghat.

Photograph 01: Pictures shows the water level touching the concrete step of the ferry Ghat.

Photograph 02: Pictures shows the water level goes far away from the concrete steps of the ferry ghat and the indigenous material made deck is used by the ferry boats.

Photograph 03: Pictures shows the water level touching the concrete steps but still the Bamboo deck is used due to boat navigation.

Photograph 04: Pictures shows the water level touching the concrete steps but still the Bamboo deck is used due to boat navigation and for boat parking bamboo decks are used.

For all the pictures Google earth map at Chourongi Ghat, Narayanganj, was used.