



A Project Report

On

**Stakeholder's Perspective on Inland Water
Transportation: Turag River Area**

Supervised by

Aftab Hossain

Assistant professor & Head

Department of Journalism, Media & Communication

Communication Faculty of Humanities & Social Science

Daffodil International University

Submitted by

Hasan Shariar

ID: 201-24-730

Department of Journalism, Media & Communication

Communication Faculty of Humanities & Social Science

Daffodil International University

Date of Submission

16 July 2024

Application for Approval of Project

Mr. Aftab Hossain
Assistant Professor & Head
Department of Journalism, Media & communication
Daffodil International University

Subject: Application for Project Submission approval

Dear Sir,

I have conducted a project entitled “Stakeholder’s Perspective on Inland Water Transportation: Turag River Area ” as a course requirement for my BSS program in journalism, media and Communication.

I believe that this project has enriched both my knowledge and experience. I hope you will assess my report considering the limitations of the study. I will be grateful if you kindly accept my project.

Sincerely,

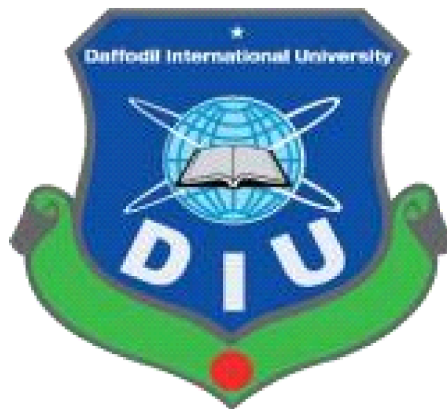


.....
Name: Hasan Shariar

ID: 201-24-730

Department of Journalism, Media & communication
Daffodil International University

Certificate of Approval



I am pleased to certify that the project entitled "Stakeholder's Perspective on Inland Water Transportation: Turag River Area " prepared by Hasan Shariar bearing ID No. 201-24-730 of the Department of Journalism, Media and Communication, has been approved for presentation and defence. Under my supervision, he worked very effectively. He completed the work during the semester of Spring 2024.

I am pleased to certify that the data and findings presented in the report are the authentic work of Hasan Shariar. I wish him all success in life.

A handwritten signature in black ink, reading "Aftab Hossain".

.....
Mr. Aftab Hossain

Assistant Professor & Head

Department of Journalism,Media & communication

Communication Faculty of Humanities and Social science

Daffodil International University

Declaration

I hereby declare that this project, entitled "Stakeholder's Perspective on Inland Water Transportation: Turag River Area" has been carried out by me in fulfilment of the requirement for the BSS degree in Journalism, Media and Communication under the Faculty of Humanities and Social Science, Daffodil International University. I have composed this paper based on the researchers' findings from various literature, to the best of my knowledge, and the result of my own investigations. This has not been submitted in part or full to any other institution for any other degree.



.....
Name: Hasan Shariar

ID: 201-24-730

Department of Journalism, Media & communication

Daffodil International University

Acknowledgement

From the start, I should give thanks to the Almighty God for empowering me to finish my final project safely and soundly. At this point, I want to offer my heartiest thanks to my supervisor, Mr. Aftab Hossain, Assistant Professor & Head of the Department, for his extreme help, motivation, and appreciation all through my examination and exploration. I could not have finished my work on time without the help and guidance of my supervisor.

I want to express my gratitude to my parents for their constant support and encouragement throughout my project. I need to thank my loving guardians and my companions for their gigantic motivation and support. Without their psychological help, I couldn't achieve the goal of my work. And I need to thank my friends for their support.



.....
Name: Hasan Shariar

ID: 201-24-730

Department of Journalism, Media & communication

Daffodil International University

Abstract

This study explores the development of inland water transportation (IWT), specifically evaluating the feasibility of constructing IWT in the Turag River area of Dhaka to ease the traffic congestion that affects the city. The paper looks into the possible advantages of IWT, such as increased access, transport integration, economic development, and environmentalism. The study also examines the obstacles to applying IWT and analyzes challenges relating to pollution and Seized lands of the Turag River. The study introduces IWT as a viable form of transportation that may transform the mobility of individuals in cities and drastically bring down traffic hitches and emissions of carbon. The study paints a picture of a city without unbearable traffic congestion, reduced air pollution, and an efficient water transport system. Spotlighting the positive Tourist Centric Impacts and the ability to connect the Turag River to the transportation network, studying the conveniences that IWT can offer, such as less traffic congestion, economic upliftment, and environmental concerns, is the primary positive focus of the study. It also identifies the assessed impact of implementing IWT, where pollution and illegal river occupation are some of the many concerns of the Turag River.

Contents

Chapter & Serial No.	Content	Page No
Chapter 1	Introduction	1-4
1.1	IWT as a Sustainable Transportation Option	2
1.2	Problem Statement	3
1.3	Objective	4
1.4	Research Question	4
Chapter 2	Literature Review	5-9
2.1	Understanding Inland Water Transportation (IWT)	5
2.2	IWT worldwide	5-6
2.3	Integrating IWT in Dhaka	6-8
2.4	Stakeholders Contribution on Project Development	8-9
2.4.1	Stakeholder's importance in IWT	9
Chapter 3	Methodology	10-16
3.1	Research Design	10-11
3.2	Data Collection	11-13
3.3	Data Analysis	14-15
3.4	Method Rationale	15-16
Chapter 4	Findings	17-19
4.1	The Potential of Turag for Sustainable Transportation	17
4.2	Urgent Environmental Changes	18
4.3	Fit Vehicles and Strict Laws	18

4.4	Navigability and Maintenance	18
4.5	Pollution and Environmental Degradation	19
4.6	Encroachment and Land Acquisition	19
4.7	Regulatory and Policy Barriers	19
4.8	Public-Private Partnership (PPP)	19
Chapter 5	Analysis and Discussion	20-40
5.1	Potentiality of Turag for Sustainable Transportation	21-29
5.1.1	Navigability and Alternative Routes	21-22
5.1.2	Alleviating Road Traffic Congestion	22-23
5.1.3	Environmental Considerations	24-25
5.1.4	Infrastructure Development	26-27
5.1.5	Legal and Regulatory Framework	28-29
5.2	Obstacles to Developing Sustainable Transportation	30-33
5.2.1	Pollution and Environmental Degradation	30-31
5.2.2	Lack of Cooperation	31-32
5.2.3	Financial Constraints	33
5.3	Practical Implications	34-36
5.3.1	Policy and Regulation	34
5.3.2	Public-Private Partnerships	35
5.3.3	Community Engagement	35-36
5.4	Stakeholder Theory and Its Application	36-38
5.5	Limitations of the Study	38-39
5.6	Recommendations for Future Research	39-40
Chapter 6	Conclusion	41-45
	References	42-45

Chapter 1

Introduction

The average traffic speed in Dhaka is around 5 km per hour. Dhaka's traffic speed is just a bit faster than the average walking speed of humans (M. Rahman & Nower, 2023). Moreover, the number of roads and highways is incompatible with the population density and the drastic increase in vehicle numbers (Mahmud et al., 2012). At least 532 new vehicles hit the road in Dhaka daily (Sun, 2022). The number of roads and highways is incompatible with the population density and the drastic increase in vehicle numbers (Y. Ali et al., 2023). A study published by the Centre for Policy Dialogue (CPD) shows that, on average, commuters waste 23 minutes in an hour in traffic (Khatun et al., 2023). In terms of finance, a study by (Khan & Mcips, 2013) estimated that traffic congestion generated a loss of \$3.8 billion in that year. The traffic situation in Dhaka alone causes a 2.9 percent loss in Bangladesh's GDP (Dhaka Traffic Congestion Eats up 2.9% of GDP, 2021). Traffic congestion is also one of the significant reasons behind air pollution (Khatun et al., 2023). Due to its demography, the traffic condition of this megacity impacts its GDP and the living conditions of residents. There are better solutions to traffic congestion than building more and more roads. More roads mean more vehicles, thus resulting in more carbon emissions. Bangladesh is committed to UNDP's SDG 2030 agenda, and it is essential to ensure environmentally compliant developments, which are also part of sustainable development goals (SDGs).

1.1 IWT as a Sustainable Transportation Option

Transportation networks based on waterways can potentially revolutionize urban mobility (Golus' sin et al., 2012). This form of transportation is not only efficient but also environmentally friendly. Waterway routes could significantly reduce traffic congestion and carbon emissions (Achmadi et al., 2018; Mircetic et al., 2017). Imagine a Dhaka where residents and visitors can rely on a reliable and efficient water transportation system, free from the shackles of traffic jams and air pollution. This is the vision that this project aims to bring to life. The commute experience for residents in the northern part of Dhaka city can be backbreaking. This side of the city has residential and industrial areas, such as Mirpur, Uttara, Ashulia, and Tongi. This part of the city is connected with the Gazipur district. In short, the northern region connects Dhaka's residential counterparts with countries, one of the major industrial zones. Despite the short distance, it takes several hours to travel due to terrible traffic congestion on the highways connecting the city's northern areas. The Turag River, a significant watercourse flowing across the northern part of Dhaka city, could be a perfect option for exploitation on inland water transport. Utilizing the river as a transportation route could offer multiple benefits. The first one is that integrated waterways can improve connectivity. Water transportation could provide a direct and efficient mode of transit, enhancing connectivity within the region and linking critical areas of the city. Secondly, developing an IWT line will alleviate traffic congestion. IWT will be an alternative to road transport; the project has the potential to reduce congestion on major roads and highways, leading to smoother traffic flow. Another potential benefit is that it can enhance economic activity in the connected areas. Inland water transportation can facilitate the movement of goods and people, supporting local businesses and economic development. Lastly, integrating IWT into the transportation network promotes environmental sustainability. Water transport is generally associated with lower emissions than road transport, contributing to the region's sustainability goals.

1.2 Problem Statement

However, the viability of implementing the proposed inland water transportation system along the Turag River has limitations. For instance, the river's current state is being harmed by pollution and land grabbing (Kabir et al., 2022). The Turag River, which spreads across the northwestern part of Dhaka, has become severely polluted due to the improper disposal of industrial effluents, agricultural chemicals, and sewage. The end product is that polluted water is now used for irrigation, which is the cause of the ecological crisis. The waste of toxic metals has accumulated in crops and wildlife products, leading to several health risks (Afrad et al., 2020; Arefin et al., 2016; M. M. Rahman et al., 2020) .

From the problem statement, it is clear that a number of questions surround the overall feasibility of developing an IWT network in Turag even though the concept may be viable. The rationale for this study was to make a number of proposition toward the success of the proposed system. A study done on water transport system in Dhaka, Bangladesh highlighted above like (Hossain et al,2013) and existing services like circular water way speed boat service (Sun, 2022b) illustrate the importance of a well developed transport network in the city of Dhaka. These diverse studies and reports therefore provide the current study's context into explaining that these challenges must be studied further so as to understand how they can be overcome to enable the proposed system to succeed. The launching of a successful inland water transportation project of course in the Turag river would demand collaboration with the BIWTA together with the local government institutions as well as the regulating bodies. This coordination should cover safety standards, land use, and environmental measures among others. Another important factor is how the public will react to the proposed project. Residents may be concerned about disruptions to their daily lives, including noise pollution, safety risks, and changes in the visual landscape. Engaging with the community and addressing their concerns is essential for building support for the project and ensuring its long-term success.

1.3 Objective

This research aims to conduct a comprehensive study on the potential of a water transportation system on the Turag River from a stakeholder's point of view. The research objective is to evaluate stakeholder perceptions on developing the IWT network in Turag. The research will collect and analyse the views and perceptions of key individuals and groups, such as development experts, commuters, and the government, concerning the viability of inland water transportation on the Turag River. This study will analyse the SWOT of integrating IWT in the area by collecting perceptions.

1.4 Research Questions

RQ 1: “What are the perspectives of various stakeholders on the feasibility of developing an inland water transportation system on the Turag River?”

RQ 2: “What are this project's Strengths, Weaknesses, Opportunities, and Threats?”

Chapter 2

Literature Review

2.1 Understanding Inland Water Transportation (IWT)

In this study, IWT is defined as freight that is moved on inland waterways (IWW) such as canals, rivers, and lakes either during the entire transportation process of an order or during part of this transportation process. From the IWW perspective and as defined by (Wiegman et al., 2015), inland ports are transportation infrastructures along waterways with facilities and equipment for loading and unloading ships. In northern Europe, where IWT is essential in the transport system, space limitations and congestion in port areas have led to the emergence of inland ports along the waterways to enable more reliable connections and increase the geographical scope (Caris et al., 2014). IWT generally does not face congestion problems like road transportation challenges (Mircetic et al., 2017). This, in turn, brings reliability as opposed to the case of road transportation, where highly congested roads result in poor reliability in some areas. Achmadi et al. (2018) argued that IWT could reduce traffic density. Furthermore, IWT is generally regarded as a transport mode with high safety (Hendrickx & Breemers, 2012), which is also confirmed by Caris et al. (2014), who state that since IWT is considered safe and secure, using barges for hazardous cargo is suggested to enhance transport safety both for the society and the cargo owner. It is very energy efficient, where high volumes transported over long distances contribute to more sustainable performance (Mircetic et al., 2017).

2.2 IWT worldwide

Many developed cities worldwide, such as London, New York, Venice, and Shanghai, have successfully implemented waterway networks within their towns (Sumaiya et al., n.d.). Inland Waterway Transport contributes to achieving Sustainable Development Goals related to sustainable transport, energy efficiency, lower greenhouse gas emissions, and large freight capacity ("Inland Waterway Transport and the 2030 Agenda," 2022). This form of transportation has proved to be effective in densely crowded cities. (Utomo &

Mateo-Babiano, 2015) A study described how, in Bangkok, IWTs remain a faster mode of transportation than land transport despite having motorcycles as taxis.

The express boats in Thailand allow commuters to travel to and from outer Bangkok, providing more comprehensive mobility access through Khlongs (This refers to canals that connect with the rivers Chao Phraya, Tha Chin, and Mae Klong, along with their tributaries in the low-lying areas of central Thailand). The reason behind its efficiency is the network of water routes, such as the Chao Phraya River and its tributaries. This river network provides direct access to various parts of the city (Iamtrakul & Thongplu, 2008). A World Bank study about inland water transportation in Bangladesh suggests that the strength of developing IWT is that it comes with a relatively low cost compared to other modes of transportation. This element of being economy-friendly and having a large population of commuters contradicts the idea that there is potential for increased demand for IWT (Guillossou et al.). Lagos, the capital of Nigeria's waterway transportation, has been commuters' faster way to reach their destination (Aiyegbajeje, 2021). These examples prove that the river transportation system can reduce commuting time. (Golušin et al., 2012) A study in Serbia suggested that the use of IWT can be increased through government policies that encourage its adoption. The findings conclude that Despite the challenges to be overcome, IWT can be a viable and sustainable option to promote urban mobility and trade in the European region.

2.3 Integrating IWT in Dhaka

An intricate network of waterways that have played a crucial role in the city's transportation landscape. These inland water routes have historically served as vital arteries for both commercial and recreational activities, connecting the city's diverse neighbourhoods and providing a unique mode of transit (Sultana & Hafiz, 2013). Historically, the city's waterways, particularly the Buriganga River, were renowned for their recreational and promenade value, serving as a hub for leisure activities (Sultana & Hafiz, 2013). However, over the years, these once-thriving waterways have faced significant degradation, with the construction of embankments and the encroachment of commercial activities diminishing their public accessibility and appeal.

Studies have highlighted the potential for revitalising Dhaka's inland water transportation network to alleviate the city's chronic traffic congestion and provide a more sustainable mode of transportation. One such study proposes the development of a "Blue-Green

Infrastructure (BGI) Network” that would integrate the city’s waterways with its green spaces, creating a cohesive system that promotes water-sensitive urban growth and design (Ahmed et al., 2019). This approach emphasises the importance of enhancing the recreational and place-making potential of the city’s rivers and canals, thereby reintegrating them into the fabric of urban life. Amreen Shajahan and Farida Nilufar took a morphological approach to developing an integrated transportation system. Their research provides insights into revitalising Dhaka’s inland waterways and their relationship with rapid population growth. As per the existing literature, the Circular Waterway project in Dhaka is a noteworthy transportation initiative that integrates waterways with land transportation to provide an efficient and convenient alternative route for commuters. The project is designed to expand the waterways on both sides of Dhaka city by setting up landing stations along the road. This would help reduce the traffic burden on main routes and improve overall transportation efficiency. The initiative is expected to impact the transportation sector in the region significantly and could serve as a model for similar initiatives in the future. Developing such transport options will contribute to sustainable urban development (Shajahan & Nilufar, 2013).

Abu Sumaiya et al. focused on developing an inland water transport network in the northern region of Dhaka. The paper demonstrated the essence of developing five waterway networks in this region. Their study also mentioned using a water bus as an alternative to inland public transport. One proposed river network of that study is the Turag River network. As the Shajahan & Nilufar (2013) study indicates, there are potential benefits to implementing inland water transit networks in Dhaka. (Rahaman et al., 2022) evaluated the Integration of public transportation with the development of the inland water transit network in Northern Dhaka’s Turag River, which can contribute to more sustainable and efficient transportation.

However, challenges in implementation due to poor planning, as highlighted in (T. Ali, 2008), have raised appropriate concerns about the circular waterway project’s viability. Environmental concerns, such as the threat to aquatic biodiversity, have been addressed in recent news reports (Bangladesh to Ban ‘Suckermouth Catfish’ as It Threatens Aquatic Biodiversity, n.d.). Studies by (Y. Ali et al., 2023, 2023; Barnamala, n.d.) have extensively discussed the ramifications of traffic congestion on the city’s economic and environmental well-being. Traffic congestion in Dhaka has significantly held back the city’s economic

growth and development(Y. Ali et al., 2023). Such situations require innovative and practical solutions. Implementing an IWT network in Dhaka has the po-tential to ease traffic congestion. (Guillossou,Jean-Noel, n.d.). Dhaka can transform the city's transportation landscape and create new opportunities for sustainable development. This form of transportation requires less fossil burning.

However, such development requires the cooperation of stakeholders. In a recent paper by (Trivedi et al., 2021), a case study of India was presented, which analysed the barriers to implementing IWT using a hybrid Multi-Criteria decision-making model. This study highlighted the correlations among various variables and provided additional insights to policymakers and decision-makers to address critical points and identify measures to overcome them. (Vilarinho et al., 2019) offer insights into the main challenges and opportunities for using waterways as an alternative to traditional carbon-emitting vehicles for mobility. The authors conducted an extensive review of recent research on river logistics and surveyed various stakeholders to validate their findings. With a different focus,(Boudhoum et al., 2021) identified the success and failure factors to ensure the effective implementation of IWT, taking into account not only its logistics benefits but also its potential impact on other areas such as flood protection, water supply, hydropower generation, recreation, and the environment. The authors presented a valuation analysis to support investment decisions and an optimisation model to maximise the benefits associated with the investment.

There is a lack of study on stakeholders related to IWT development in the Turag River. The gap in literature appears when searching for the perspective of groups of people involved in the project. This study defines stakeholders as people who can di-rectly affect and be affected by the project in Freeman et al. 's (2010) words. Vilarinho et al. (2019) study surveyed stakeholders and showcased the primary challenges and opportunities of using IWT.

2.4 Stakeholders Contribution on Project Development

The common thread connecting all early publications on project development is that enterprises should adopt a broad strategy-making perspective that considers the require-ments and desires of various stakeholder groups to achieve high performance (Harrison et al., 2010). The role of individuals, groups of people, or organisations that might influ-ence sustainable development is fundamental (Gray, 1985). Each organisation has unique stakeholders who influence it and are affected by its actions and decisions. Therefore,

it is necessary to identify the types of stakeholders, their needs and expectations, create a dialogue with them and manage stakeholder relations (Van Huijstee et al., 2007).

Understanding their engagement in a broad sense might have a positive effect on the organisation. Gathering information from stakeholders and managing their interests can be a valuable source of knowledge and lead to value creation (Velter et al., 2020). Interaction and responsible collaboration with stakeholders allow them to be involved in decision-making and have positive outcomes for transparency, governance, accountability, and responsibility management.

Investigating cooperation with stakeholders, what it means to create value for them, and how to measure it can be crucial to understanding their role and importance in sustainable development (Geissdoerfer et al., 2018). This idea has been developed in recent years by interacting with stakeholders to create value and solve sustainability issues with their involvement (R. E. Freeman et al., 2010; Freudenreich et al., 2020). Successful stakeholder relationship management helps companies thrive under capitalist systems. It is also a moral to seek since it raises questions of morality and choice for various groups and people (Phillips, 2003).

2.4.1 Stakeholders Importance in IWT

To establish a lasting human presence while preserving the environment, Dhaka should embrace environmentally conscious practices for navigating the inland waterways (United Nations Economic Commission for Europe, 2023). Investing in Dhaka's inland water transport network could be a viable long-term strategy. (Ydersbond et al., 2020) The analysis identified that Collaboration with shareholders and local communities could lead to collective action towards this goal, resulting in potential benefits for the city's transportation landscape and sustainable urban development. Stakeholders' perceptive considerations can help city planners improve their decision-making logic regarding transportation systems by considering all stakeholders, concerns, and aspirations. This helps ensure the desired projects are at the same level as the community's overall goals and objectives (R. Freeman & Reed, 1983).

This approach coincides with the research objectives of the study. This study will close the knowledge gap by integrating stakeholder's points of view and existing literature.

Chapter 3

Methodology

This study looks at existing conditions and the possibility of implementing sustainable inland water transport in the Turag River, an area in line with the stakeholders' point of view. The issues of concern are the prospects, required steps, and challenges of developing an efficient and sustainable IWT system. In this case, the primary objective is to provide insights into several stakeholders like government, policymakers and urban planners, business people, transport specialists, ordinary users, and scholars and to regain these perceptions toward forming a coherent strategy for transport sustainability. This approach ensures that the research captures the essence of sustainable IWT development by considering different aspects that characterize sustainable development in this context.

3.1 Research Design

The research method applied in the study was qualitative. This research looks at the enumeration of the partaker's perception of the feasibility and the probability of the inland water transport system on the Turag River. Credibly, the adoption of the qualitative approach was based on the ability of the study to identify the potential stakeholders' perceptions of the feasibility of the project. This approach enables the researcher to capture the participants' unique perspectives, which are valuable in providing advice.

3.1.1 Semi-Structured Interviews

Kvale mentioned that qualitative interviews as an attempt to understand the world from the point of view of research subjects. Sewell added that the conversation is aimed to unfold the meaning of their experiences and to uncover their lived world (Sewell, 2009). This aligns with the research approach as the study aims to unfold the potentiality and obstacles of Developing IWT network in turag area. What makes this approach more suitable for this

study is proven by Rubin (2005) where he regards qualitative interviews as conversations in which a researcher gently guides a conversational partner in an extended discussion. In this context, the position of researchers is clear because they drive the conversation. As this study required such method that could extract insights from stakeholders while the researcher controls the conversation. This laid foundation for the studies methodological choice.

In social science, semi-structured interviews are widely used. Magaldi et al (2020) define the semi-structured interview as an exploratory interview. They further explain that the semi-structured interview is generally based on a guide and typically focuses on the main topic that provides a general pattern. Their study further argues that the semi-structured interview, despite its topical path offered before the interview, enables a researcher to go deep for discovery.

Diverse Stakeholder Inclusion

Including a wide range of stakeholders (government officials, urban planners, business owners, transportation experts, commuters, and academics) ensures that the research captures a holistic view of the issues. Each group brings a unique perspective, enriching the overall analysis and comprehensively understanding the potential, requirements, and obstacles for sustainable IWT.

3.2 Data Collection

Twelve stakeholders were interviewed using semi-structured interviews to gather the necessary data. Participant sampling was based on involving sufficient representatives of the major stakeholders involved in IWT development. This selection is based on a given relationship with the IWT project and the kind of information they would bring out. Data was collected through interviews. These were conducted over two months to satisfy the subject's time and ability to elaborate on the topic at hand.

3.2.1 Sampling Strategy

The participants were purposively chosen because of their interaction with the Turag River and its environs in one way or the other. These are government transport and construction officials, urban planners involved in the development of sustainable structures, business people who utilize the river for economic production, transport engineers with information

about IWT systems, consumers who would directly gain from established transport outlets, and scholars studying on the environment and transport systems.

3.2.2 Participants

A purposive sampling approach was used to obtain a list of composers and the target population comprised of those stakeholders who would be directly or indirectly involved in or affected by the proposed transport system. The sample included:

Government officials

This group of samples can be used to mold the companies, including policy, regulation, and government support associated with the project.

Urban planners

Such experts can help evaluate the planning and engineering needed to accommodate IWTS in the UN architecture.

Business owners

Preoccupied with evaluating some economic aspects and possible advantages or disadvantages of the prospects for revenues or threats related to the proposed transportation network.

Transportation experts

The following stakeholder groups can help assess the technical feasibility and efficiency of the proposed transport system.

Academics

We would like to reveal the assessment based on the socio-economic and environmental consequences of the proposed network calculated by representatives of the academic community, who offered an analytical and theoretical outlook for the mentioned problem.

3.2.3 Interview Process

Every interview consisted of open-ended questions to obtain detailed descriptions of several topics related to the potentiality, necessity, and challenges of implementing sustainable IWT in the Turag area. These were further comprised of sub-questions developed to fit the identified stakeholder groups and be more detailed. Facility-based face-to-face and virtual interviews were conducted with the participants, recorded and transcribed for analysis.

Developing questionnaire,

This process aimed to include open-ended questions focusing on the following:

- 1 Opportunities perceived for IWT development on the Turag River.
- 2 Anticipated economic, environmental, and social benefits.
- 3 Perceived obstacles and challenges, including regulatory, financial, and technical considerations.

3.2.4 Overview

The data collection process employed in this research was specifically designed to ensure comprehensive insights into the potential for developing a sustainable IWT network in the Turag River area. The purposive sampling strategy selected a diverse range of stake-holders aligned with the study's aim. This methodological approach ensured the research provided data that can influence future policy and planning for sustainable transportation development.

3.3 Data Analysis

Regarding data analysis, since this study employs interviews, qualitative data analysis using thematic analysis was conducted. Interview data are analyzed to explore patterns, emergent themes, variations, and similarities in the stakeholders' perceptions. This systematic approach to qualitative data analysis helps strengthen the methods employed for extracting relevant information on the possible development of IWT on the Turag River. This method involves several steps to ensure a thorough and systematic analysis of the data: This method involves several steps to ensure a thorough and systematic analysis of the data

Familiarization The first analysis process entailed returning to the research interview transcripts and familiarizing them. This was useful for discovering the first trends and hypotheses.

Coding The next activity was coding, which involves identifying concepts, themes, and patterns in the responses. Numbers were assigned to the text segments that concerned the study questions.

Theme Development These codes were then aggregated into higher-order themes comprehending broad areas of the data. This included searching for similarities and differences in the interviews.

Reviewing Themes In the process, the introduced themes were reconsidered to see whether they held the identified data and, indeed, answered the research questions. This step entailed further elaborating and condensing several themes intending to capture the key ideas representing stakeholders' impressions of their face value.

Defining and Naming Themes The theme discussed was clear, and the name helped to comprehend the consequences of its usage in the context of the material studied. The letter explains the themes, elaborating on how they addressed the research questions.

Reporting The last process concerned making the themes systematic to enable the writing of the findings narratively. This also involved writing several quotes from the interviews that pointed out and supported the various themes of the study.

3.4 Rationale for the Method

The reason for selecting a qualitative research method was to explore diverse aspects of the stakeholders' perceptions, and the use of the semi-structured interview was deemed appropriate for addressing this goal. This method offers general and specific information, which is crucial to comprehending multifaceted factors that can help to advance the concept of IWT sustainably. The stakeholders whose opinions were sought were chosen depending on their relationship with the IWT project and their range of views. The rationale for using the qualitative method lies in understanding the dynamics and subjectivity of the challenges from the stakeholders' points of view. Questionnaires allow the stakeholders' ideas to be examined in detail, and semi-structured interviews also allow the researcher to question the participants based on any topic that may have emerged during the interview. That's why one can mention some possible shortcomings of this methodology, such as subjectivity in qualitative data and limited reciprocity. However, the interview data provides rich details that quantitative data might not capture, making the former beneficial. Qualitative data also brings out a variety of views from the different stakeholders, increasing the credibility and validity of the findings.

3.5 Obstacles and Solutions

After reviewing the sources of literature, this study also faced one major challenge in organizing interviews with the many involved stakeholders. This was overcome by accommodating the subjects' busy schedules and offering several interview dates. Another difficulty was to guarantee the participants' anonymity and comfort; to address the former, the informed consent of the participants was obtained; in the case of the latter, it was necessary to assure the participants that their answers would remain anonymous.

Coordination Challenges: It was difficult to schedule interviews with the stakeholders since they are busy professionals.

Confidentiality and Comfort: Since participants' opinions had to be sought, informed consent was sought from them, and they were also told that their responses would not be identified. This made people develop confidence in the dealer and created goodwill, which made people honest and forthcoming with the details.

Technical Issues: Sometimes, technical hitches occurred during the videoconferencing interview. These were addressed by having an alternate means of communication (e.g., telephone interviews).

Chapter 4

Findings

This section of the paper presents the data generated from the qualitative study on the possibility of having an inland water transportation (IWT) system in the Turag area. The information was collected using open-ended questionnaires from government representatives, planners, business persons, transport specialists, consumers, professors, and lecturers. The findings are categorized into three primary themes: the actions of Turag for sustainable transport, the needs and measures

4.1 The Potential of Turag for Sustainable Transportation

The Turag River provides the best navigation geographically entrenched. For Instance, participant 4 said, “The water level of Turag remains navigable all the year round, suggesting that it could as well be used for transport most of the year round.” The heavy congestion on roads and highways in the Turag area, as noted by Participant 2, exacerbates the need for alternative routes: Primarily, the roads and highways of these areas are congested most of the time. It usually takes 50 minutes to move from one geographical location to the other. This is very irritating to job holders and small businesses.”

During this discussion, Participant 5 proposed using the experience gained during a trial project in Rampura, which links Karwan Bazar to Gulshan and Merul-Badda to Karwan Bazar through water transport. Such a model can be implemented in the Turag River, forming a potential new route of Gabtoli-Ashulia-Uttara-Tongi-Gazipur that may help decongest the transport networks and open new possibilities in the area. “This route can be a blessing for residents. They will experience reduced congestion, which entails reduced pollution levels, and everyone can travel serenely and organized,” explained Participant 5.

Participant 1 mentioned that a boat bus can generally accommodate 70 individuals, compared with buses, which accommodate 44 people. Not to mention, buses are usually crowded. This form of transportation could reduce some of the pressure and problems facing the transport business today.

4.2 Urgent Environmental Changes

People's ideas frequently highlighted the possibility of practicing environmental friendliness in transportation. Participant 1 said, "Glamorous ships will not be effective for passengers if the river's environment is poor. A clean and healthy river environment is needed. Proper boats that use renewable energy are required." Participants 6 and 3 further supported the same by emphasizing the need for a healthy river environment.

Participant 6 further said, "The marine life of Turag should be the priority first. The introduction of sustainable waste management should be made compulsory, especially for industries that use Turag to clean their waste." This supports the view of the broad management proposal emphasizing the ecological and riveric requirements.

4.3 Fit Vehicles and Strict Laws

The condition of current ships on the Turag River is another factor threatening marine life and the river's health. Participant 4 also noted that industries should be friendly to the water bodies to sustain water quality. Some of the recommendations made by participants included; extreme legislation and punishment on the use of river systems. Participant 6 came up with "Forcing the exploiters to invest in sustainable development," this might imply a financial commitment by the polluters towards improving the situation. Participant 3 suggested a public-private partnership (PPP) model: "Since many of the rivers are utilized primarily by the government and large businesses, the two can collaborate to create an efficient and environmentally friendly means of transportation in Turag."

4.4 Navigability and Maintenance

The specific factor concerning achieving the goals set by the Act, namely year-round navigability, is a realistic issue due to sedimentation and changes in water levels. Several participants have indicated that the route must be dredged and maintained to be functional. These are among the most crucial maintenance activities, demanding much money and effort.

4.5 Pollution and Environmental Degradation

High levels of polluted water from industries and other cities affect attempts to create a proper transportation system. Participant 4 also emphasized the need for the various end-user industries along the Turag to embrace environmentally friendly activities to provide high-quality water.

4.6 Encroachment and Land Acquisition

Issues such as law violations at the riverbanks are significant challenges. Regarding the social and legal issues of the area scene, Participant 3 observed that acquiring land for infrastructure development might pose issues. To solve these problems, joint actions of the government and various levels of the local population should be organized.

4.7 Regulatory and Policy Barriers

Since the guidelines for implementing IWT occur at the local, regional, and national levels, the process is cumbersome and often frustrating. Participant 2 proposed a straight-forward guide on how they can quickly and easily regulate sustainable transportation project development.

4.8 Public-Private Partnership (PPP)

Participant 3 later proposed that transport needs should be covered through a PPP to merge the values of both sectors. Participants also proposed a plan for the private companies' cargo ships to be environmentally friendly and in good condition. Participant 1 also suggested that NGOs and UN organizations can start specific awareness campaigns in the general public and then work on a solution.

Accordingly, the need to deal with the environmental issues that are bound to occur with the construction of inland water transportation systems through contingency plans and policy formulation, the logistical problems that are related to the construction of the system through site surveys and engineering evaluation, the legal and regulatory frameworks regarding the acquisition of right of way and access to water bodies and the social issues that affect the Turag area and its people. This way, with the help of stakeholders, the practical and long-term efficient transportation system can be met.

Chapter 5

Analysis and Discussion

This chapter presents the feasibility, specifications, and challenges of forming a sustainable IWT system in the Turag area. Using stakeholder theory as the analytical framework, this section interprets the data to answer the research question: What are the stakeholders' attitudes towards developing sustainable IW in the Turag area?

Seeing the current traffic jams on the existing roads, it becomes essential for people to find other ways to get around in the locality of Turag. Based on the growing cities' experience and rising populations, traditional types of transport, especially road vehicles, have lost their efficiency and become almost polluting the environment. Given the geo-graphical aspect and modularity of the river, one can use the Turag River to ease some of these pressures. This document identifies the possibilities of such a project and looks at the environmental, infrastructural, and financial costs that must be overcome to realize such a vision.

The stakeholder theory emphasizes the importance of considering the diverse participants' views and values. Stakeholders include government officials, civil servants, urban developers, business owners, transport specialists, users or daily commuters, and scholars. With such broad coverage of stakeholders, the research is anticipated to be able to ascertain areas of strength, need, and challenge. This approach guarantees considering all stakeholders' views to develop a more strategic and integrated approach to developing sustainable IWT.

Moreover, this section will analyze the findings' theoretical contribution and relate them to the previous literature on sustainable transport. It will also analyze several concrete examples concerning policy and regulation, the involvement of the private sector and non-governmental organizations, and society's views. Last, the study's limitations and suggestions for future research will be given to design the direction of further investigations and developments in this field.

5.1 Potentiality of Turag for Sustainable Transportation

5.1.1 Navigability and Alternative Routes

The study shows that there is a high prospect of the Turag River as a form of transport channel. Another aspect reflected by Participant 4 of the river's yearly accessibility for navigation is the geographic suitability of such initiatives. This is in line with the stakeholder theory, which centers on identifying stakeholders' interests regarding opportunities and risks in the development of projects. It should be recalled that Participant 2 spoke about congesting existing roads – this is proof that people need effective non-car transport. Therefore, Participant 5 explained that a trial project they implemented was a success in Rampura, meaning they can also implement similar projects in the Turag area. This complies with the stakeholder theory's assumption that organizations practice lessons from other successful models competitively.

On the aspect of viability that concerns transport, demonstrating the possibility of using the source as an avenue for transport, it is commendable that the Turag River is navigable. While many rivers can only be navigable during specific times or at certain times of the year as changes influence them in the water level, the Turag River can always be navigable at any time. It is critically essential for the proper functioning of an IWT system that such successful navigability is consistent. Thus, stakeholders believe it is possible to lessen significantly the reliance on road transportation, which is currently characterized by traffic jams and delays.

Traffic jams are evident in most of the existing road networks within the Turag region, which consequently impacts daily working people and business people. Participant 2 pointed out that transferring from one area to another takes over an hour and is trivial and annoying. Introducing an IWT system could offer a solution, as they could potentially subject the movement of commodities to less tiredness and increase efficiency. Improved road traffic management would also cause a reduction in the emission of gasses from vehicles, hence improving the environment.

Stakeholder theory is primarily focused on the concept that in management, it is essential to identify successful practices in other companies and implement them in the organization in this context. The Rampura project is a good example based on this principle. Thus, the experience of the Rampura initiative can be considered a positive one, and, based on the success and possible obstacles of the initiative, it is possible to make specific suggestions. This can then be employed to improve the IWT system for the Turag area to suit its surrounding requirements and environment.

Thus, this analysis has given the green light that the Turag River can be an alternative transportation source. It is navigable throughout the year, traffic problems demand that roads be relieved of pressure, and similar projects have been executed in other areas. Thus, referring to the stakeholder theory and studying successful examples, it is possible to create a sound perspective on making the IWT system in the Turag area.

5.1.2 Alleviating Road Traffic Congestion

The second participant stressed that traffic jams were intense, and it took half an hour or even more, 50 minutes on average, to overcome distances of 10 to 15 kilometers. This is inconvenient primarily for job holders and small business people who depend on the given routes daily. Because of the introduction of IWT, road traffic could be cut, meaning that time could be saved during transport, increasing productivity. Further, Participant 1 elaborated on the capacity strength of boat buses, with an average capacity of 70 people as opposed to 44 for standard buses. Seemly, boosting the number of persons per vehicle would lead to fewer trips, hence less traffic and air pollution.

Considering the development and expansion of the Turag area, the current state of road traffic is quite a concern for those who use the road and even business people. The heavy congestion results in a longer time tract, exert more pressure, and gives low productivity. To job holders and small business persons, time is money, and this traffic means loss of income, which affects their bottom line. The current transportation system is also inefficient, as Participant 2 said after noticing that it should have taken 50 minutes to get from one area to another.

Introducing an IWT system could give another option for transport instead of road transport. The IWT system could potentially cut travel time as it presented a faster and improved mode of transport. This would be useful for single movers and beneficial for the economy because it would help increase efficiency. Shorter travel times signify that more time is gained from needed activities such as spending time with family or leisure.

Participant 1's impression of the ability of boat buses to accommodate as many passengers as the normal bountiful buses depicts another benefit of the IWT system. On the other hand, boat buses can transport an average of 70 individuals, while normal buses can transport a maximum of forty-four individuals. This implies that more passengers can be moved on a single trip, reducing the number of trips. They decrease traffic flow since fewer cars and their owners would have made fewer trips. Further, the need to make several trips is eliminated, reducing emissions and helping to solve the pollution problem.

Moreover, the fact that boat buses have greater capacity signifies the overall efficiency of the transportation process. Thus, by accommodating more people at a time, the IWT system can alleviate the burden on road transport. This can result in a better commuter flow and distribution of transport services and structures, with every type of transport supporting the other. The IWT system that is being proposed can act as the main network, and the road transport can act as a branch and last-mile connectivity.

Thus, establishing an IWT system in the identified area of Turag will significantly reduce traffic congestion on the roads. Since the IWT system is an efficient means of transportation, it can help decrease travel time and increase productivity. Boat buses also indicate enhanced capacity advantage, meaning that the need to use general road transport is greatly minimized. Consequently, the identified advantages of the developed recommendations explain the importance of multifaceted and long-term interventions to enhance transport systems in the Turag area.

5.1.3 Environmental Considerations

A critical factor in developing sustainable transportation is increasing the river's navigability. Participant 1: The aspect of glamour was further highlighted when the participant insisted that glamorous ships will not attract passengers if the river's environment is not good; moreover, proper, fast boats, which run on renewable resources, were also called for. Participant 6 also underlined industries' actual environmental pollution problem, saying, "Marine life of Turag should be their primary concern. First, a reasonable waste disposal system should be made compulsory for the factories that use Turag as the cleaning line for their wastes."

Some environmental factors exist for setting up a sustainable IWT system in the Turag area. The river's health, an ecosystem, plays a critical juncture since it determines the feasibility and desirability of the transport system. In a polluted and degraded river environment, passengers would be equally turned off, with numerous operational problems. Thus, environmental management cannot be a one-pronged strategy but a multifaceted one.

For instance, according to Participant 1, a solution is needed for transport that is close to nature and thus environmentally friendly – boats. To minimize the carbon emission of the IWT system, modern boats used in the racing event can be designed and operated using renewable energy from solar or electrical power. This is especially true regarding international initiatives for mitigating climate change and improving the indicators of the effective concentrations of greenhouse gases. Also, green boats should be constructed to promote the increase in ridership within the IWT system since passengers booked in the IWT are environmentally conscious.

Another explanation is the level of aesthetic value of the river environment, namely the degree to which it keeps up with people's aesthetic experience. A cleaner and presentable river will likely lure more passengers and improve their experience. This demands constant exercise and cleaning to reduce pollution and every other unwanted material from the river. Participant 1's idea, "Glamorous ships will not transport passengers if the river environment is negative," smells like a sharp reminder to ensure a clean and attractive river environment.

Participant 6 addresses the crucial point of industrial pollution, which negatively impacts the health of the river's ecosystem. Companies and manufacturing companies discharging their wastes into the Turag River are attributed to the deterioration of the river's environment. Some recommendations that can help solve this problem are proper waste disposal and pollution control. This ranges from policy requirements and standards to ensuring the factories process their waste before disposal in the river. Also, the growth of sustainable waste management systems requires capital expenditure on treatment plants and recycling facilities, amongst other infrastructure.

It means that the health of the river ecosystem is reflected in the health of the marine life in the river. Participant 6 stated, "First, Turag's marine life needs to be given importance." The presence of aquatic animals and plants should not be killed and threatened anymore, and other species should be free to return the population to their multiplying or fading nature. This requires a multi-layer approach: controlling and assessing water fitness, preventing pollution, and preserving aquatic scenery. Conservation and restoration of the river and its habitats will also improve the ecological features of the river to support transportation.

Therefore, environmental factors are essential in developing a suitable IWT system in the Turag region. The physical state of the river has to be clean and healthy to support the conditions required for an efficient and appealing transportation system. This can be well addressed if sustainable environmental management, proper boat provision, adequate waste management, and environmental control measures exist. By prioritizing environmental sustainability, the IWT system can contribute to a cleaner and healthier river ecosystem, benefiting passengers and the broader community.

5.1.5 Infrastructure Development

Another strategic need of a region is building the infrastructure. Participant 4 also articulated that industries should be environmentally friendly for water quality, and stopping people from filling the river was another push. Participant 3 proposed that PPPs are possibly the most viable solution since the rivers are used mainly by the government and large-scale industries; therefore, a partnership between the two entities is most likely to use the best tactics to develop sustainable transportation in Turag.

In the following part of this paper, these key components or sub-topics of the infrastructure development for the IWT system in the Turag area are as follows. This involves investing in terminals and docking facilities, the maintenance done on the water channels, and the construction of accessory facilities that include roads and public transport networks. All these constituents discharge a very sensitive delicacy in maintaining the operations of the IWT system.

Terminals and docking facilities are considered an essential component of the IWT system. These facilities afford means of getting on and off the vessels and loading and discharging passengers and cargo. With this, these facilities need to include aspects such as the safety of the passengers, accessibility of structures, especially for the disabled, and the bearing impact on the environment. For instance, the terminals should have features such as seats, washrooms, and ticketing offices to improve the convenience of the passengers. In addition, in designing the docking facilities, there is a need to ensure that the material used is very hard-wearing and has no tendency to erode and pollute the environment.

Another equally important part of infrastructure is maintaining navigable waterways. This includes annual dredging and cleaning activities to make the river accessible for boat reception throughout the year. Techniques like dredging clear the water channel to discharge material such as silt, which hinders water passage, while cleaning operations remove pollutants and debris that pollute the water basin. All these maintenance activities are crucial in maximizing the safety and efficiency of the IWT system.

Other IWT requirements include the availability of different transport infrastructure like roads and public transport networks for easy evacuation of animals. These link-ages allow the passengers to facilitate the movement of goods to and from the terminals through the IWT

system from the other parts of the city. For instance, the Construction of roads and Public transport services can tap other areas hence improving the referral of the IWT system among the passengers and the business stakeholders.

Participant 4 was specific in recommendations, conveying to the industries that they should not exploit the water bodies and avoid degrading them. Institutional and industrial banks along the river should embrace and implement environmentally friendly activities. These aspects include treating the wastewater before discharge, minimizing the use of destructive chemicals, and eradicating the occurrence of soil deterioration. Furthermore, it is critical to guard against encroachment since their impact contributes to the loss of the river's functions and values. This necessitates the setting and implementation of tight legal measures to check the development and conversion of the wash zones for the river.

Another practical concept for solving the problems concerning infrastructure development is the PPP (public-private partnerships). According to Participant 3, the government and big firms can complement their plans for designing sustainable transport in Turag. PPP is affiliated with the governmental and commercial sectors, whereby the governmental sector entails authority, and the commercial industry entails innovation and efficiency. For instance, the government can offer regulatory assistance and cash, while private entities can provide financial assistance. The collaborative approach can also solve the funding problem, reduce the duration of the project implementation process, and guarantee the permanence of the IWT system.

Finally, it can be stated that efficient infrastructure is the key need for implementing IWTs in the Turag area. This includes building ports and harbors and keeping the waterways open for shipping and supporting structures. Industries such as making them stick to the ecological standards and anti-encroachment are some strategies that can help protect the river's ecological values. Analyzing the role of PPPs reveals that they are a feasible strategy to respond to the problems of infrastructure creation, building upon the competencies of both sectors to implement the concept of sustainable transport.

5.1.6 Legal and Regulatory Framework

Hence, a sound legal and regulatory environment has to be implemented and enforced to improve IWT. Participant Six identified that penalties should be placed on whoever exploits the river to get fined. Corporations that exploit and have exploited rivers should be fined. This indicates there is a need for tight measures to be put in place to avoid further pollution of the environment. Participant 2 also discussed the government's role in monitoring ecological standards; about cargo ships, the government should make sure that private companies use renewable energy to power the cargo ships or ships that are fit and in better condition. The government's role is to punish, encourage, and promote compliance with standard restrictions.

The IWT system in the Turag area requires a practical set of legal devices, which can be the basis for the system's further growth and development. The need to balance the project's interest with that of the general public, employees, and the environment requires that this framework considers issues of the environment, operations, safety standards, and measures to be taken in case of non-compliance. Thus, by making laws clear and easily enforceable, the government can balance and curb the IWT system's irrationality and inefficiency.

Concerning the regulatory requirements, the protection of the environment is considered to be the essential element. Pollution has to be cured to protect the surrounding environment, so there has to be regulation regarding that. This involves limiting the amount of pollutants emitted into the environment, insisting that industries purify wastewater before releasing it back into the environment, and measures to control soil and water runoff erosion. Hence, these regulations must be implemented to avoid further deterioration of the river and meet the expected environmental standards. Explaining his stand on penalties for those who pollute the river, participant 6 was forthright: "Penalties should be placed on whoever exploits the river. Corporations that exploit and have exploited rivers should be fined".

Among the key elements of the legal environment, one can also refer to operational standards and safety regulations. These regulations help maintain the IWT system's safe and efficient working. For instance, regulations can be formulated to determine specific requirements regarding the design and construction of vessels, the frequency and ways of inspection and maintenance, and other important aspects of the vessels' functioning. Participant 2 suggested the following measures to control the usage of eco-friendly parts: "The government should make sure that private companies use cargo ships that are on renewable energy or that are fit and have a better condition. " The string application of such measures will increase the general safety and sustainability of the IWT system.

Providing for compliance with the regulations is also another factor within the regulations. Thus, penalties for violators are justified, but the rewards for those who follow the rules and contribute to making the world greener are also important. For instance, the government can provide tax exemptions or subsidies to firms that use environmentally friendly vessels and technologies. Recognition programs might also be developed to recognize organizations that are compliant with environmental and operations management standards. Such measures can encourage organizations to adopt eco-friendly measures that support the IWT system.

Compliance can be checked by requiring enforcements, which help implement the laws and penalties on the violators. This includes inspection and monitoring activities and the development of enforcement agencies with the powers to enforce penalties and make corrections. The other essential precondition that entails effective enforcement of the laws is compliance with the fair provision of assets needed to enforce those laws and collaboration between government agencies. For instance, the DCC and BIWTA can cooperate in law enforcement and managing the river, stopping or minimizing the pollution of the river, and facilitating the IWT system.

5.2 Obstacles to Developing Sustainable Transportation

5.2.1 Pollution and Environmental Degradation

Pollution and environmental degradation are some of the significant challenges highlighted, and more: include. Participant 6 highlighted the importance of long-term disposal of wastes, especially for the factories that utilize the Turag River: “Concern for the marine life of Turag should be the first key issue, waste management should also be made compulsory for the factories for the wastes disposal as a cleaning element is Turag river. ” This shows the direct impact of the industrial approach to the river system, which is becoming a big challenge in providing sustainable transport. Participant 4 also highlighted that excluding the influence of non-industrial sources and waste disposal is necessary, “The industries should be environmentally friendly to maintain the water quality. Another aspect of the priority is that the public must not allow excess amounts of water to be dumped into the river.

Therefore, the environment is polluted and degraded, making it difficult to grow a sustainable IWT system in the Turag area. Another requirement is that ecosystem structures on the river must be healthy to define the feasibility and attractiveness of transport systems. This paper has shown that challenges like industrial pollution, disposal of wastes, and encroachment on the river are some of the challenges that need to be checked to protect the river and make it sustainable.

Turag River has also been receiving industrial pollution, which forms a major part of the pollution of this essential river. It has become a practice for factories and industrial facilities, most of which are situated along its sides, to dispose of their wastes in the river. This untreated waste pollutes the water, proves fatal to marines, and reduces the quality of the river. Participant 6 noted a need to ensure the proper disposal of waste to help overcome this problem. Such a system would require strong policies that compel the factories to process liquid waste before letting it into the river. Also, money spent on building waste treatment plants and recycling plants is required to support these movements.

According to the perception of Participant 4, there is a great problem of people encroaching on the wetlands and disposing of waste. Most of the construction within the river basin is carried out illegally, and the land reclamation on the river banks hinders the water supply and degrades the river. It is reasonable to underline that encroachment prevention is key to the river's proper functioning and sustainability. This calls for effectively implementing the set provisions on zoning and using the land around the river channel to discourage criminal activities. Campaigns can also generate awareness within the community so that everyone is aware of the importance of protecting the river and that people can change their behavior regarding the river.

The most critical challenges are created by water pollution and its subsequent negative impact on water quality for the further development of the IWT system. Contaminated water affects the integrity of the vessel's body. It raises the levels of consumption of associated services and products, which can be risky to the lives of passengers and crew members. Hygiene of the river's space is, therefore, vital to the safe functionality of the IWT system. This element will demand the use of surveillance in the quality of water, sensible implementation of measures in the control of pollution, and capital expenditure on the development of infrastructure for handling and managing waste.

5.2.2 Lack of Cooperation

Another huge challenge that has been noticed is the absence of essential infrastructures for creating sustainable systems that support IWT. Participant 3 also pointed out the lack of this and the organization of management over waste and Turag: "Currently, the government is fighting with the use of Turag. Dhaka North City Corporation is dumping in Turag. On the other hand, BIWTA asked the DNCC to stop dumping in the Turag several times, and there has been no prohibition to date. " This shows an inability to organize properly. Participant 2 also focused on investment in upgrading better and environment-friendly cargo ships, "The government should ensure that private players use the sea cargo that is environmentally friendly or sea cargo that is in a better shape and the shape should be perfect."

Terminals and docking structures, as well as other avenues of waterways and auxiliary facilities like roads and public transport, are being developed in relation to the IWT system infrastructure. However, these fundamental components are notably missing, complicating the system's successful application.

IWTs require terminals and docking facilities for their functions to be accomplished. They are the terminal facilities that offer interfaces to passengers and cargoes for the loading and offloading of ships. Cohesively, constructing these structures has to consider aspects like passengers' safety, accessibility for the disabled, and environmental impacts. Nonetheless, there is a major issue of no existing terminal and docking facilities along the Turag River. Hence, a functional IWT system cannot be easily developed. These establishments require lots of capital to put up and continually operate and sustain them.

Another significant part is the existence of navigable waterways. These activities include dredging and cleaning to ensure the river is free from any obstacle that may hinder water flow throughout the year. Nevertheless, there are problems with the absence of a single extensive plan and funds for the rivers' maintenance. Participant 3 commented that even between two major organizations, Dhaka North City Corporation, and Bangladesh Inland Water Transport Authority, there is no synergy to implement and execute the policies related to the river's conservation and pollution control operations.

Other essential preconditions include proper roadside facilities and layout, as well as efficient access and connection to public transportation networks in the case of the IWT system. These linkages help the passengers reach the IWT system from various parts of the city and transport goods to the terminals and vice versa. However, there are issues concerning the supporting IWT infrastructure; they include poor access to the system and inefficiency. Regarding further developing the IWT system's effectiveness, we can point out that road improvement and public transport services require proper financing.

5.2.3 Financial Constraints

One of the severe threats to attaining a sustainable IWT system is the issue of funding. Participant 6 put this idea in the following way, “compelling the exploiters to tap into sustainable development.” This indicates that while there is an inclination towards developing IWT, there are constraints regarding financing and investment. According to Participant 3, that is a suggestion; while considering improving the problem through Public-Private Partnership (PPP), the following statement was made: “PPP can be an essential tool to generate the necessary funds and support to implement IWT effectively.

” The development of this IWT system requires a large capital investment in infrastructure, vessels, and maintenance services. One of the more pressing problems is finding the right type of capital for an investment of this kind. In most cases, the government has limited funds, chocked by numerous projects, influencing the decision to reasonably provide funds for the IWT project. Furthermore, regarding factors that threaten the establishment of the IWT system, the private sector can be discouraged from investing in the IWT system due to the risk portfolio and scanty information on the feasibility of the IWT system. Therefore, it can be said that PPP presents a realistic strategy to cope with the limitations of financial resource availability. Some advantages of PPPs that can help finance the gaps and actuate the IWT system successfully are the sharing of the skills and value of public and private undertakings. For instance, the government can provide political support, funding, and land for the project, while the private sector can provide expertise, funding, and project execution. This has been done through partnership between the two sectors as they cause the efficiency and prolonged nature of the IWT system.

The presented investigation proves that challenges like pollution and degradation of the environment, lack of infrastructure, and financial problems act as significant barriers to obtaining an efficient and sustainable IWT system in the Turag area. Therefore, it is necessary to take a multimodal approach that includes adopting adequate and strict policies, reinforcing physical capacity, and developing viable financing mechanisms, including PPPs. By overcoming these obstacles, the IWT system can contribute to a cleaner and more efficient transportation network, benefiting passengers and the broader community.

5.3 Practical Implications

5.3.1 Policy and Regulation

Based on the analysis, the study concludes that environmental compliance and enforcement are necessary for interacting with the IWT project. The relevant government should develop unique policies for the use of environmentally friendly ships and have laws that punish pollution. This is where governmental and non-governmental organizations and relevant bodies like the DNCC and BIWTA come into the picture of enforcing these regulations.

This paper also supports environmental regulations for ascertaining the sustainability of IWT systems concerning the river ecosystems. Government policies and legislation should lay down the following guidelines: policies should clearly state the limits that industries must adhere to in the amount of pollutants they release into water bodies and sewage; they should also clearly state that any sewage released must first have been properly treated, and effective means to prevent soil erosion and its consequent runoff. To this end, these regulations should include proper measures within the law and proper methods of enforcing the law to punish the offenders and prevent them from repeating the same mistake in the future.

Another area within the regulation is the encouragement of environmentally friendly vessels. Safety measures should call for vessels that employ renewable energy sources, such as solar or electrical power, in the case of the IWT system. For example, financial sweeteners like tax credits or grants may make investing in environmentally friendly vessels and technologies easier for firms. Also, organizations need to be praised for good compliance in this area, and recognition programs can encourage other firms in the industry to follow the same examples.

Government agencies assist in reviewing, regulating, and implementing the practices, which is very important in enforcing and coordinating activities. If required, Dhaka North City Corporation and Bangladesh Inland Water Transport Authority should ensure compliance and conduct proper inspections and corrective actions. To tackle the issues of pollution, infrastructure development, and operation standards, there must be proper coordination between different authorities within the government.

5.3.2 Public-Private Partnerships

The PPP recommendation suggests a viable strategy ahead of time. Thus, through coordinated cooperation between the public and private sectors, it will be possible to further the development and maintenance of IWT technologies. Past examples of such collaborations, such as the water transportation project implemented in Rampura, vividly illustrate all the strengths of such a solution.

Therefore, PPP is a feasible model for creating solutions to funding and infrastructure problems. As for the solution, PPPs can tap into each sector's capabilities to improve the efficacy and endurance of the IWT system. On the government's side, there could be a fee for regulation, further financial support, and land resources. On the side of private companies, there could be technical solutions, financial investments, and operating experience.

One successful PPP is the water transportation project in Rampura. In this case, it was established that waterways could be used as a means of transport and what challenges and opportunities exist when using waterways. Thus, the success stories taught at Rampura can easily be used to develop the IWT system that can be used conveniently in the Turag River.

BP projects can also act to solve the issue of financing needs by attracting private capital and diluting the government's budget. For instance, private players can manage the construction and maintenance of terminals and docking facilities. In contrast, the government can be a policymaker and share the responsibility of infrastructure financing. It also extends its functionality to guarantee that the IWT system is brought into existence and preserved sustainably and efficiently.

5.3.3 Community Engagement

Involving local stakeholders, such as communities and Non-Governmental Organizations, in the development and execution of the project will boost its sustainability and acceptance. Promoting the experiences of young activists and journalists can also aid in tracking the processes and increasing openness.

The community must enforce the concepts of the IWT system for it to work effectively and in the long term. In light of these principles of sustainable tourism development, it is obvious that the project's activities can be legitimized locally thanks to the cooperation with communities and NGOs. It will also enable the identification of the various requirements of the people within the community to satisfy their needs and ensure that the IWT system is satisfied with the condition of the region.

Such awareness campaigns can include promoting the IWT system and creating consciousness of the need to protect the River. Such campaigns can also influence proper conduct in waste handling and other regulations. Such practices involve young activists and journalists in implementing the project to observe progress and report on the progress made and other issues as and when they arise.

Therefore, based on the established recommendations, the literature findings suggest that the government's strict environmental policies, partnerships between industry and government, and the involvement of the community members are crucial to the IWT project.

The government should set guidelines and laws to protect the river ecosystem and encourage the use of eco-friendly boats. The efficiency and sustainability of the IWT system can be improved through the PPP model by complementing the activities of both sectors. Community involvement is imperative so that the community's inhabitants deliver their support and endorse the project, hence its sustainability.

5.4 Stakeholder Theory and Its Application

The consideration of stakeholder theory offered a clear outline of major stakeholders' attitudes and concerns regarding developing IWT on the Turag River. The account that stakeholder theory presumes that the outcomes of any development project depend on the equilibrium between the requirements of the stakeholders and the input from the same stakeholders. This study supports this theory by showing how understanding the diversified views of the stakeholders can help identify issues that are strengths and weaknesses and hence facilitate better planning. Through interviewing and surveying the officials of the governmental departments involved in urban planning, businessmen, transportation professionals, transportation users, and academics, the research has found out the

possibilities, needs, and challenges that can exist. Such a strategy is more comprehensive because it considers all possible aspects of the issue, paying attention to the interests of each relevant party – this will make it possible to create a more efficient and long-lasting strategy for the further development of IWT.

Stakeholder theory is a management model that focuses on all the members, especially those interested in the project. This includes the project recipients and subsequent recipients who may indirectly receive the project's enhancement. This sampling approach was deliberate as the study sought to establish a variety of opinions that would complement the strategies developed.

The interaction with officials proved useful when dealing with the project's more technical aspects, such as the regulatory and policy framework. Ministries stressed the need for proper regulations pertinent to the conservation of the river and proper implementation of the IWT system. They also noted the integration of other agencies as a significant issue of pollution and the development of imitative infrastructures. These concerns highlight the significance of the government, which demands the institution of necessary frameworks for regulating the IWT system. At the same time, it assists in the facilitation process of such a system.

Urban transportation planners contributed recommendations for the IWT system's design and functionality. They stressed the need for terminals, docking equipment, navigable waterways, etc. They also stressed the requirement of additional complementary facilities, including roads and public transport linkages, to boost the IWT system's navigability and operability. These technical prospects are crucial for cultivating a working and lasting solution for transportation.

Small business people and all consumers solely explained and focused on the actual prospects and difficulties of the IWT system. Employers underlined the economic impacts, such as time savings for traveling and increased efficiency. In actual conversation, a bulk of laid-down transport was expressed to ease the hoops that commuters go through due to congestion on the roads, and this has to do with a reliable and efficient transport system. Such practical considerations speak to the positive possibilities for citizens' well-being and the development of IWT as a system.

Scholars brought out theoretical and empirical knowledge on designing the IWT system. They feared the concern of environmental protection and called for optimum use and proper disposal of waste and efficient measures for controlling pollution. They also pointed out the requirement for more research on the effects of this IWT system in the long term and the practices that should be followed concerning transport. These research-based findings provide background on evidence-based planning and the decision-making process.

Therefore, analyzing the IWT system in the Turag area with the help of stakeholder theory helped reveal the external actors, their views on the critical phenomenon, and their goals and values. In conducting the research, various stakeholders were consulted to identify areas of opportunity, necessity, and challenges, achieving a holistic approach and formulating an efficient and practical approach to achieving sustainable IWT. This approach also ensures that everyone's view is in some way accommodated, giving the project a more comprehensive and sustainable outlook.

5.5 Limitations of the Study

This study has its limitations. Firstly, the respondents were restricted to management and other top officials, which could hinder the generalization of the results to the larger society affected by the project. Secondly, because this study is qualitative, the results are bound to a particular context and cannot be applied to any other region or project. Finally, the focus on the stakeholder interviews also entails some bias since personal and organizational preferences may color the answers.

The work has a small number of cases, and this is among the major drawbacks of the study. Although the research targeted stakeholders such as government authorities, city planners, business people, transport professionals, users of the transport systems, and scholars, the study might have involved only some of the society affected by the project. For instance, the people directly affected by the proposed IWT network include residents and

small business people who were not in the sample. This will likely lead to failure in capturing other pertinent viewpoints and ideas; therefore, necessary perspectives may be included.

Another limitation of the study is the fact that the research is qualitative. A qualitative analysis is useful in understanding the views and impressions of the target subjects; however, the results are relevant to the context under study and may not be applied to other geographical locations or undertakings. Namely, the findings would concern only some options of the Turag area, which might differ from different regions, thus making it challenging to generalize the conclusions. Also, qualitative research results tend to be ordinal, and the explanation of the results is likely to be colored by the researchers' perceptions.

The focus on stakeholder interviews brings the risk of bias derived from the respondents' personal and organizational experiences. Various drives and concerns of the stakeholders might frame the respondents' answers. For instance, the business community could sell the IWT system based on income generation, while the environmental conservation groups may sell the same based on environmental influences. Such biases should be avoided since they may lead to invalidity and low reliability of the findings. Future research should employ multi-method and multi-source approaches to address this study's shortcomings to increase the results' release of the results.

5.6 Recommendations for Future Research

Future research and surveys should also involve a higher number of participants. They should include people living in the community and real stakeholders, such as small business owners influenced by the proposed IWT network. In the same way, quantitative studies may build upon the qualitative results by proving numerical confirmation of perceived benefits and challenges. Another recommendation to fill the identified gaps in the current research knowledge regarding the IWT project would be longitudinal studies of the project implementation process and its effects in the future. Specifying a larger and more heterogeneous population for the sample is necessary to avoid limiting the scope of different opinions and ideas. Future studies on IWT networks should consider involving the residents

and small business people directly affected by the proposed networks. Their views can help one understand the project's realistic opportunities and pitfalls. Further, widening the horizon of subjects under consideration can improve the validity and reliability of the results obtained.

Positive results of the perceived benefits identified in the qualitative studies can be supported by quantitative means that will substantiate the perceived challenges. For instance, questionnaires are used to gather information concerning passengers' preferences and satisfaction ratings, the effects of the IWT on economic life, and any environmental gains attributable to the system. This allows using quantitative approaches to assess the cost-benefit ratio and efficiency of the IWT system for decision-makers' benefit. A survey following the change process and the results of the IWT project for some time would be useful to determine the prospects of the system's work. These studies can track changes in travel patterns, the quality of the environment, and the rate of economic development, all of which give a clear picture of the effects of such a project. Longitudinal studies can also uncover future problems and solutions in the identified field, hence useful for future directions and decisions of an organization.

Thus, future research suggestions include increasing the sample size, employing quantitative methods in addition to qualitative ones, and using the longitudinal research design to investigate how the IWT project has been implemented and influenced over time. These recommendations can improve the validity, reliability, scope, and depth of the research, making it possible to help formulate sustainable strategies for developing satisfactory transportation systems.

Chapter 6

Conclusion

The practical approach of providing inland water transportation IWT through the Turag River area in Dhaka seems to hold the right solution to one of the city's biggest problems, which is traffic jams and their negative impact. The flows' current state reflects slow movement in Dhaka, with the average speed of moving rather close to the walking speed and the constant increase and existing density of traffic; all of this not only causes great economic losses and additional time for commuting but also results in air pollution that affects the GDP and the living conditions of the residents.

In this case, IWT as a sustainable transportation option has several str, as pointed out below. It also includes the expectation of better communication, less traffic, increased business, and environmentally friendly measures. For instance, by interconnecting core regions of the city, especially the northern area, and as an additional mode of transport to road transport, IWT can significantly help reduce traffic jams, freeing up most of the major roads and highways. Besides, it can act as a tool for business development and local economic consideration due to easier transport of people and goods. On the same note, incorporating IWT into the transport systems means that there is a reduction of emissions, thus working towards the sustainability objective of the region.

However, the proposed implementation of IWT along the Turag River is not problem-free. Pollution and land-grabbing complications also exist in the river, which can be considered major concerns concerning its utilization. Mitigating the mentioned challenges will prove important in achieving the goals of IWT as an environment-friendly and effective transport system to the densely populated region of Dhaka.

The following points highlight the need to overcome limitations and challenges associated with pollution and land grabbing for the comprehensive usage of IWT that could benefit the city's population. However, suppose well-planned and environmentally sensitive precautions are taken. In that case, time will prove that inland water transport can become an additional successful link in connecting the People's Republic of Bangladesh, particularly Dhaka, with other cities.

References :

- Achmadi, T., Nur, H., & Rahmadhon, L. (2018). Analysis Of Inland Waterway Transport For Container Shipping: Cikarang To Port Of Tanjung Priok. IOP Conference Series: Earth and Environmental Science, 135, 012015. <https://doi.org/10.1088/1755-1315/135/1/012015>
- Afrad, M. S. I., Monir, M. B., Haque, M. E., Barau, A. A., & Haque, M.M. (2020). Impact of industrial effluent on water, soil and Rice production in Bangladesh: A case of Turag River Bank. Journal of Environmental Health Science and Engineering, 18(2), 825–834. <https://doi.org/10.1007/s40201-020-005068>
- Ahmed, S., Meenar, M., & Alam, A. (2019). Designing a Blue-Green Infrastructure (BGI) Network: Toward Water-Sensitive Urban Growth Planning in Dhaka, Bangladesh. Land, 8(9), 138. <https://doi.org/10.3390/land8090138>
- Aiyegbaje, F. (2021). Assessment of commuters' perception of water transportation safety and patronage in Lagos Metropolis, Nigeria. Ghana Journal of Geography, 13, 146–164. <https://doi.org/10.4314/gjg.v13i3.7>
- Ali, T. (2008, October 27). Poor planning fades prospects of circular waterway project. The Daily Star. <https://www.thedailystar.net/news-detail-60473>
- Ali, Y., Rafay, M., Khan, R. D. A., Sorn, M. K., & Jiang, H. (2023). Traffic Problems in Dhaka City: Causes, Effects, and Solutions (Case Study to Develop a Business Model). Open Access Library Journal, 10(5), Article 5. <https://doi.org/10.4236/oalib.1109994>
- Arefin, T., Rahman, Md. M., Wahid-U-Zzaman, M., & Kim, J.-E. (2016). Heavy Metal Contamination in Surface Water Used for Irrigation: Functional Assessment of the Turag River in Bangladesh. Journal of Applied Biological Chemistry, 59, 83–90. <https://doi.org/10.3839/jabc.2016.015>
- Bangladesh to ban 'suckermouth catfish' as it threatens aquatic biodiversity.(n.d.). The Financial Express. Retrieved April 27, 2024, from <https://thefinancialexpress.com.bd/national/bangladesh-to-ban-suckermouth-catfish-as-it-threatens-aquatic-biodiversity-1668587412>
- Barnamala, M. T. (n.d.). Traffic Jam Is Freezing Strong Economy and Healthy Environment: A Case Study of Dhaka City. Boudhoum, O., Oztanriseven, F., & Nachtmann, H. (2021). Value-Focused Inland Waterway Infrastructure Investment Decisions. Engineering Management Journal, 34, 1–16. <https://doi.org/10.1080/10429247.2021.1884451>

Caris, A., Limbourg, S., Macharis, C., van Lier, T., & Cools, M. (2014). Integration of inland waterway transport in the intermodal supply chain: A taxonomy of research challenges. *Journal of Transport Geography*, 41(C), 126–136. Dhaka traffic congestion eats up 2.9

Freeman, R. E., Harrison, J. S., Wicks, A. C., Parmar, B. L., & Colle, S. de. (2010). *Stakeholder Theory: The State of the Art*. Cambridge University Press.

Freeman, R., & Reed, D. (1983). Stockholders and Stakeholders: A New Perspective on Corporate Governance. *California Management Review*, 25. <https://doi.org/10.2307/41165018>

Freudenreich, B., L üdeke-Freund, F., & Schaltegger, S. (2020). A Stakeholder Theory Perspective on Business Models: Value Creation for Sustainability. *Journal of Business Ethics*, 166. <https://doi.org/10.1007/s10551-019-04112-z>

Golušin, M., Ivanović, O. M., & Vučenov, S. (2012). Sustainable energy management—A prerequisite for the realization of the Kyoto Protocol. *Journal of Economic Development, Environment and People*, 1(2), 24. <https://doi.org/10.26458/jedep.v1i2.10>

Gray, B. (1985). Conditions Facilitating Interorganizational Collaboration. *Human Relations*, 38(10), 911–936. <https://doi.org/10.1177/001872678503801001>

Guillossou, Jean-Noel. (n.d.). People's Republic of Bangladesh revival of inland water transport: Options and strategies. World Bank. Retrieved April 22, 2024, from <https://documents.worldbank.org/en/publication/documentsreports/documentdetail/329261468003908999/Peoples-Republic-of-Bangladesh-revival-of-inland-water-transport-options-and-strategies>

Harrison, J., Bosse, D., & Phillips, R. (2010). Managing for Stakeholders, Stakeholder Utility Functions and Competitive Advantage. *Strategic Management Journal*, 31, 58–74. <https://doi.org/10.2307/27735509>

Hendrickx, C., & Breemers, T. (2012). The Effect of Climate Change on Inland Waterway Transport. *Procedia - Social and Behavioral Sciences*, 48, 1837–1847. <https://doi.org/10.1016/j.sbspro.2012.06.1158>

Iamtrakul, P., & Thongplu, W. (2008). Transformation of Water Transportation in Bangkok from the “Venice of East” towards the “Jungle of Concrete.” Inland waterway transport and the 2030 agenda: Taxonomy of sustainability issues. (2022). *Cleaner Engineering and Technology*, 8, 100462–100462. <https://doi.org/10.1016/j.clet.2022.100462>

Kabir, A., Sraboni, H. J., Hasan, Md. M., & Sorker, R. (2022). Eco-environmental assessment of the Turag River in the megacity of Bangladesh. *Environmental Challenges*, 6, 100423. <https://doi.org/10.1016/j.envc.2021.100423>

Khan, T., & Mcips, R. I. (2013). Estimating Costs of Traffic Congestion in Dhaka City. 2(3).

Khatun, F., Saadat, S. Y., Mahbub, A., & Islam, M. B. (2023). Reducing Air and Plastic Pollution: Towards Green Cities in Bangladesh. Dhaka: Centre for Policy Dialogue (CPD).

Mahmud, K., Gope, K., & Chowdhury, S. M. R. (2012). Possible Causes & Solutions of Traffic Jam and Their Impact on the Economy of Dhaka City. *Journal of Management and Sustainability*, 2, 112.

Mircetic, D., Nikolicic, S., Bojic, S., & Maslaric, M. (2017). Identifying the Barriers for Development of Inland Waterway Transport: A Case Study. *MATEC Web of Conferences*, 134, 00039. <https://doi.org/10.1051/matecconf/201713400039>

Phillips, R. (2003). Stakeholder Theory and Organizational Ethics. Rahaman, Md. M., Zakari, A. N. Md., & Rahman, Md. (2022). Study on the Water Transport System in the Northern Region of Dhaka; the Capital City of Bangladesh. *Deniz Taşımacılığı ve Lojistiği Dergisi*, 3(1), 8–16. <https://doi.org/10.52602/mtl.959597>

Rahman, M. M., Ferdousi, A., Rob, M. A., & Hasan, M. M. (2020). Researches in Effluence and Environmental flow of Turag River – a review. *AIUB Journal of Science and Engineering (AJSE)*, 19(1), 25–32. <https://doi.org/10.53799/ajse.v19i1.50>

Rahman, M., & Nower, N. (2023). Attention based Deep Hybrid Networks for Traffic Flow Prediction using Google Maps Data.

Shajahan, A., & Nilufar, F. (2013). REVIVING THE INLAND WATERWAYS OF DHAKA: Sultana, J. N., & Hafiz, R. (2013). The Circular Waterway: Saving Rivers of Dhaka by Enhancing Recreation and Place-Making Along Specific Routes. <https://api.semanticscholar.org/CorpusID:131053683>

Sumaiya, A., Nahid, N. A., Rahaman, M., Hasan, K. R., & Rashid, A. M. (n.d.). Development of Water Transport Network in the Northern Region of Dhaka City.

Sun, D. (2022, August 6). 532 new vehicles hitting Dhaka streets every day. *Daily-Sun*. <https://www.daily-sun.com/printversion/details/640089>

Trivedi, A., Jakhar, S., & Sinha, D. (2021). Analyzing Barriers To Inland Waterways As A Sustainable Transportation Mode In India: A DEMATEL-ISM Based Approach. *Journal of Cleaner Production*, 295, 126301. <https://doi.org/10.1016/j.jclepro.2021.126301>

Utomo, D., & Mateo-Babiano, I. (2015). Exploring Indigeneity of Inland Waterway Transport (IWT) in Asia: Case studies of Thailand, Vietnam, the Philippines, and Indonesia. *Journal of Eastern Asia Society for Transportation Studies*, 11. <https://doi.org/10.11175/easts.11.2316>

Van Huijstee, M. M., Francken, M., & Leroy, P. (2007). Partnerships for sustainable development: A review of current literature. *Environmental Sciences*, 4(2), 75–89. <https://doi.org/10.1080/15693430701526336>

Velter, M. G. E., Bitzer, V., Bocken, N. M. P., & Kemp, R. (2020). Sustainable business model innovation: The role of boundary work for multi-stakeholder alignment. *Journal of Cleaner Production*, 247, 119497. <https://doi.org/10.1016/j.jclepro.2019.119497>

Vilarinho, A., Liboni, L. B., & Siegler, J. (2019). Challenges and opportunities for the development of river logistics as a sustainable alternative: A systematic review. *Transportation Research Procedia*, 39, 576–586. <https://doi.org/10.1016/j.trpro.2019.06.059>

Wiegmans, B., Witte, P., & Spit, T. (2015). Characteristics of European inland ports: A statistical analysis of inland waterway port development in Dutch municipalities. *Transportation Research Part A: Policy and Practice*, 78(C), 566–577.

Ydersbond, I., Auvinen, H., Tuominen, A., Fearnley, N., & Aarhaug, J. (2020). Nordic Experiences with Smart Mobility: Emerging Services and Regulatory Frameworks. *Transportation Research Procedia*, 2020, 130–144. <https://doi.org/10.1016/j.trpro.2020.09.012>