SWOT ANALYSIS OF THE CIRCULAR WATERWAY AROUND DHAKA CITY

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ABSTRACT

The present status of the Circular Waterway in Dhaka City which encompasses a route of 112.07 kilometers has been studied through the SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis framework to evaluate its significance as a transformative urban transportation solution. This study offers an in-depth analysis of the present status through a comprehensive literature review, official reports, and planning documents. Notably, we recognize that a multiple-phase project by BIWTA (Bangladesh Inland Water Transport Authority) is underway in the Circular Waterway. The first phase of BIWTA's project, covering 20 kilometers, has been completed. Currently, the second phase, extending over 52 kilometers, is underway. The Circular Waterway, aiming to alleviate traffic congestion, reduce environmental impact, and enhance overall urban mobility, is important in Dhaka's evolving urban landscape. Preliminary findings reveal notable strengths and opportunities, emphasizing the potential for significant traffic decongestion through the attraction of cargo traffic, accompanied by substantial environmental benefits. However, concurrent weaknesses and threats, particularly in terms of infrastructural and water pollution challenges were identified. The preliminary findings underscore the pressing need for collaborative efforts among governmental entities, private stakeholders, and local communities to overcome these obstacles and advance the Circular Waterway project. Adaptive regulations, sustainable practices, effective governance mechanisms, and public awareness are identified as essential components for realizing the full potential. In summary, this research offers a comprehensive evaluation of the Circular Waterway in Dhaka City, highlighting its potential as a transformative urban transportation solution, while emphasizing the critical importance of cooperative actions that strengths and opportunities while addressing weaknesses and threats.

Keywords: *Circular Waterway, SWOT analysis, urban transportation, Navigational Challenges, sustainability*

1. INTRODUCTION

The Circular waterway around Dhaka city is around 112 km long, linking five rivers and connecting four river ports and administrative jurisdiction. It has significance in transportation, environmental impact, recreational impact, and stormwater management. The waterway's potential is being utilized through ongoing phases by the Bangladesh Inland Water Transport Authority (BIWTA). This paper assesses the present status and initiative and covers into the strengths, weaknesses, opportunities, and threats associated.

2. METHODOLOGY

The foundation of this paper is based on secondary data collected from various departments of the Bangladesh Inland Water Transport Authority (BIWTA). This encompassed official reports, project documents, and planning records related to the Circular Waterway's development phases. In addition to BIWTA Files and reports, a review of literature and articles was conducted. Additionally, expert consultations were undertaken.

3. LITERATURE REVIEW

Urban recreational spaces, as evidenced in Ali's work on the Buriganga Eco-park (Ali, 2022), stand as essential components in providing relief from urban monotony. However, challenges in implementation due to poor planning, as highlighted in Ali's earlier study (Ali, 2008), have raised pertinent concerns about the circular waterway project's viability. Environmental concerns, such as the threat to aquatic biodiversity, have been addressed in recent news reports (The Financial Express, 2022). Studies by Barnamala (Barnamala, 2015) and others have extensively discussed the ramifications of traffic congestion on the city's economic and environmental well-being. The exploration of Dhaka's urban dynamics and infrastructural development has been significantly shaped by studies such as Adhikary's recent analysis on the forthcoming expansions of the Dhaka Metro Rail Network (Adhikary, 2023). Furthermore, reports by government bodies like BIWTA (BIWTA, 2021) and DWASA (DWASA, 2016) offer critical insights into ongoing projects and master plans aimed at improving Dhaka's infrastructure. Studies exploring water transport systems in Dhaka, such as Hossain et al. (Hossain et al, 2013) and initiatives like the circular waterway speedboat service (Sun, 2022), underscore the significance of efficient transport networks within the city. These diverse studies and reports collectively form the foundational knowledge base shaping the current study's exploration of urban infrastructure and development in Dhaka.

4. LOCATION OF THE CIRCULAR WATERWAY

4.1 Location of Rivers

The waterway is formed by five rivers and connects major river ports and administrative jurisdictions. Information about river lengths, widths, and depths are provided (Kabir, 2023)

River Name	Location	Length of River (km)	Average width of River (m)	Minimum Depth in LLW (m)
Buriganga	BG Mouth to Basila	20.11	250.00	10.00
Turag / Turag Khal	Basila to Ashulia	23.78	120-50	3.00
	Ashulia to Termukh Bridge	13.89	40.00	2.50

Balu	Termukh to Demra	22.47	50.00	2.50
Sitalakhya	Demra to Munshigonj Launch Ghat	20.44	250.00	6.00
Dholessori	Munshigonj Launch Ghat to BG Mouth	11.38	350.00	6.00
		Total 112 km in One direction		

4.2 River Ports & Administrative Jurisdiction

The Circular Waterway incorporates four essential river ports: Dhaka River Port, Tongi River Port, Narayanganj River Port, and Mirkadim River Port. The Circular Waterway encompasses the administrative jurisdictions of four city corporations, namely Dhaka South City Corporation, Dhaka North City Corporation, Narayanganj City Corporation, and Gazipur City Corporation(Kabir, 2023). Additionally, it includes 5 Pourosova, 45 Union within the RAJUK area, and 20 Union outside the RAJUK area (Dhaka Transformation Partnership: Technical Assistance to Develop an Umbrella Investment Program Design and to Prioritize Investments for the Restoration of the Rivers surrounding Dhaka City (Final), 2022).

4.3 Map of Dhaka Circular waterway

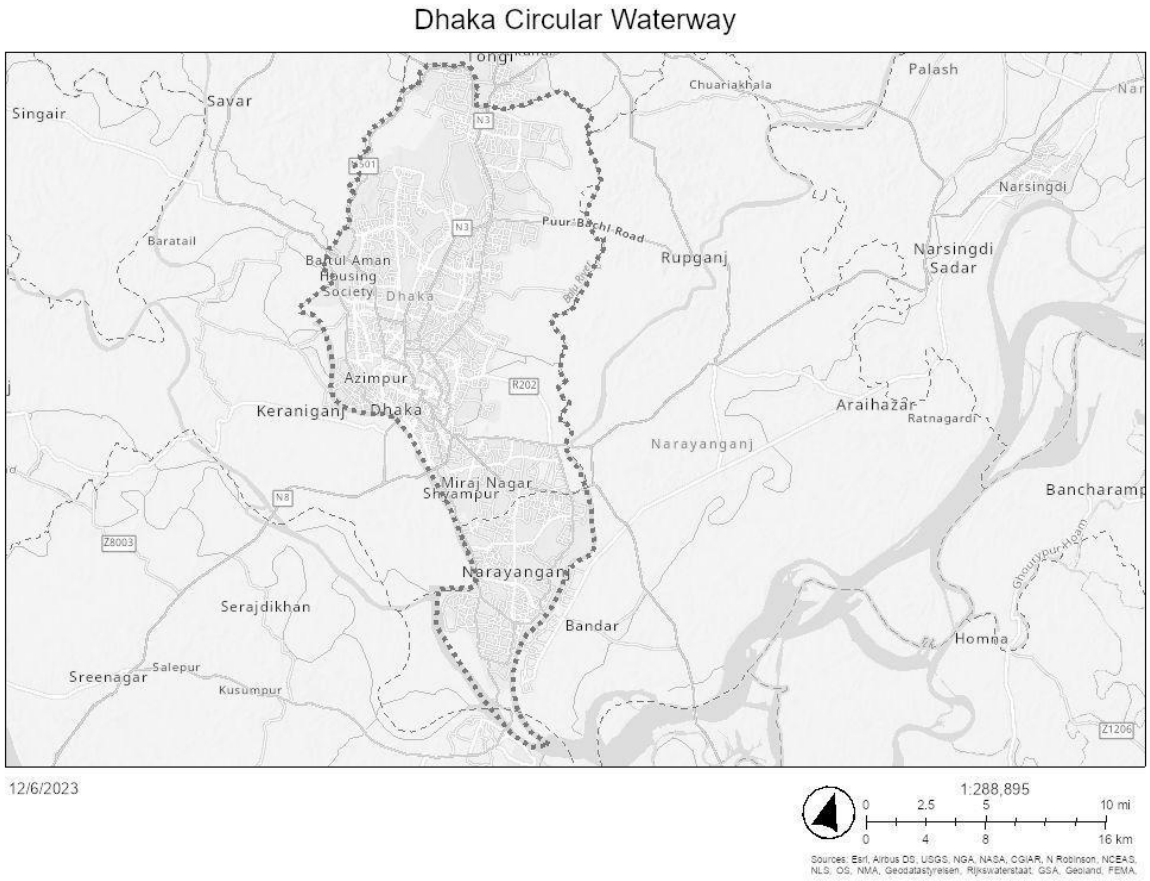

Figure: Map of the circular waterway (Prepared by ArcGIS software)

5. SWOT ANALYSIS

5.1 Strengths

5.1.1 Potential for traffic decongestion

Road traffic jams are a very noticeable problem nowadays. From a study in 2015 people in Dhaka city are losing 1.30 hours of time on average due to traffic jams (Barnamala, 2015). By using high-speed water vehicles like speed boats, people can save their time to go from one corner of the City to another time. It is noted that In 2022, a circular speedboat service commenced operations from Tongi River Port in Gazipur. The initial phase will feature five-speed boats operating along two routes: from Tongi or Abdullahpur to Kodda and from Tongi or Abdullahpur (Gazipur) to Ulukhola (Kaliganj) under a private initiative. (Sun, 2022)

If a 112 km circular route can be used, that will solve the congestion problem in the roadway in several places. By using waterway, it can divert a significant portion of transportation demand, alleviating congestion on roads, especially during peak hours. This can effectively distribute traffic flow and reduce vehicular density on key road networks. It will be very useful for cargo transportation. Utilizing high-speed water vehicles like speed boats saves people time traveling from one corner of the city to another.

5.1.2 Part of the waterway is already in use for transport

A part of the waterway is already used for transportation. This may demonstrate the feasibility of the waterway as a navigable route, showing its potential for expansion and optimization.

5.1.3 Potential for the water supply

The groundwater level is decreasing day by day. Water from the Circular waterway can be used as a potential source of drinking water. After purifying it from a water treatment plant, it can be supplied to households and industries. It is notable that extracting water from a circular waterway for drinking purposes can involve various costs depending on the method used and the quality of the water. The expenses can stem from purification processes, infrastructure development, filtration systems, and maintenance to ensure the water meets safety standards. Additionally, costs might also include testing, treatment, and distribution. The overall expense can vary significantly based on the initial condition of the water, the level of contamination, and the technology implemented for purification. In some cases, it could be more costly than utilizing traditional sources of drinking water due to the need for advanced treatment methods to ensure safety. Therefore, while the potential for using water from a circular waterway as a drinking water source exists, the costs associated with making it a safe and reliable option can be significant. This highlights the importance of conducting a Benefit-Cost Analysis to assess whether implementing a circular waterway justifies reducing roadway traffic congestion.

5.1.4 Stormwater Management Opportunities

Dhaka City's stormwater management opportunities face challenges due to rapid urbanization and unplanned development. The natural drainage system, comprising open channels and water retention areas, has significantly diminished. Dhaka City has more than 50 Khals(River Master Plan, Report of the Technical Committee on Prevention of Pollution and Increasing Navigability of Rivers Surrounding Dhaka, n.d.) and 80 km of storm sewer lines, the system covers about 140 sq km of the city(DWASA, 2016). With proper management and integration, these Khal can efficiently channel stormwater to the nearest river or the Circular Waterway. This could mitigate flooding risks and waterlogging issues

5.1.5 Environmental benefits

It can promote the preservation of green spaces along the waterway, maintaining biodiversity and ecological balance.

5.1.6 Recreational Opportunities

Recreational waterway in various cities worldwide have been integral to urban life, offering leisure and recreation. For example, places like Venice, Italy - Grand Canal, San Antonio, Texas - Riverwalk are used as primary recreational spaces for locals and tourists. The Circular Waterway presents a unique opportunity to emulate the success of these renowned water-based recreational areas. By integrating parks, walkways, and designated leisure spots along its banks, Dhaka's Circular Waterway could transform into a vibrant social and recreational hub (Sultana and Hafiz, 2013). According to a report of BIWTA, Five potential locations have been proposed for the establishment of Eco-parks along Dhaka's Circular Waterway: at Modhyer Char near the mouth of Atibazar Khal, near Gabtoli at upstream of the bridge, opposite the Ijtema Maydan (field), at Bholanthpur near Purbachal, and at Brahmangaon on the bank of Buriganga opposite to Enayetnagar.(BIWTA, 2021) The proposed plans encompass infrastructure developments like river bank protection, dredging, and eco-friendly space creation, aiming to restore the environment for better water quality, natural flow, and improved surroundings, benefiting navigation, households, industries, flood control, tourism, biodiversity, and overall environmental health(BIWTA, 2021). Ensuring clean water is key to enabling activities such as boating and fishing. It is noteworthy that Currently, there is one operational eco-park named Buriganga Eco Park. Situated on the foreshore and the eastern side of the Buriganga River, specifically in Shampur, the park was inaugurated in October 2012 by BIWTA (Ali, 2022). It features a riverside walkway for visitors to enjoy. Notably, recreational activities can contribute to the local economy, but they may also bring challenges like increased traffic congestion, which can impact the daily routines of residents. It might influence the usage of public transportation.

5.1.7 Connection to major river ports

Connectivity to major ports facilitates trade and increases economic growth and regional connectivity

5.1.8 A potential source of Fisheries

In the Dhaka District, the annual fish catch from all rivers in 2018-2019 amounted to 1156 metric tons, with the lower Padma contributing 709 metric tons. The remaining catch is distributed across other rivers, excluding principal ones such as Lower Meghna, Upper Meghna, Lower Padma, Upper Padma, and Brahmaputra.Fish production trend from 1983-84 to 2018-19 the production growth rate of river and Estuary is 1.52 in the whole of Bangladesh (Department of Fisheries Bangladesh, 2020). So if maintained properly there is a potential to increase fish production from the peripheral river of Dhaka City.

5.2 Weaknesses

5.2.1 Inadequate waste management along the water

Dhaka's waterway suffers from significant pollution due to various sources, including industrial, domestic, and untreated wastewater. The absence of effective waste management contributes to water quality deterioration.

5.2.2 Inadequate emergency response infrastructure along the waterway

The lack of sufficient emergency infrastructure along the waterway poses risks in cases of accidents or emergencies. This inadequacy hampers the efficient handling of unexpected situations.

5.2.3 Seasonal variations affect water levels, impacting transportation reliability

Fluctuations in water levels due to seasonal changes can disrupt navigation, affecting the reliability of transportation along the waterway. Addressing these variations becomes crucial for consistent and reliable water transport.

5.2.4 Limited public awareness about the potential benefits of the waterway

Lack of public awareness about the benefits of using the waterway for transportation or recreation could hinder its widespread adoption and support from the community.

5.2.5 Passenger interest naturally wanes with slower modes of transportation. (Ali, 2008)

If we compare with the road network, from a study it is found the average traffic speed of a motorized vehicle in the morning on primary roads in Dhaka city can be nearly 19 km/h (Mahmud et al., 2021). Though the circular water has a huge potential to transport cargo goods in a relatively short time, if it needs to transport a mass amount of people, there will be a need for larger water vehicles or buses, which are generally low-speed water vehicles, and require a larger width of the river. Again, the size of vehicle speed can be slow due to navigation clearance, and river width Designing high-speed waterway routes will be very challenging. So, if we compare again, waterway development is in a weak position in comparison to the road and MRT in case of rapid movement of mass people (*People's Republic of Bangladesh Revival of Inland Water Transport*, 2007).

There is an ambitious plan for a 140-kilometer metro rail network within 2030 to combat traffic congestion in Dhaka city and its neighboring areas (Adhikary, 2023). In 2023, Among a total of 6 MRT line projects, a mass rapid transaction line (MRT–6) was opened where the proposed route is from Uttara to Kamalapur. If the whole city is covered by the MRT network, the demand for the waterway network will be low for local transportation.

5.2.6 Poor Access to the Landing Stations

The insufficient infrastructure at landing stations makes it challenging for vessels to dock or land, affecting the operational efficiency of waterway transportation. In a few places, there is a lack of coordination with roads. (Sultana and Hafiz, 2013)

5.3 Opportunities

5.3.1 Use as a transportation route

Dhaka is a congested city. Circular waterway can be used as alternatives to Roadways. Connectivity through the river network allows the movement of goods and people with reduced congestion for recreation. Cargo vehicles can use this route to transport goods efficiently.

5.3.2 Development of infrastructure along the waterway

The development of infrastructure along the waterway opens doors for economic growth. Building docking stations, warehouses, and trade-related facilities can pull investment and trade activities, amplifying economic prospects.

5.3.3 Economic growth through enhanced transportation

Private sectors expressing interest in waterway development indicate the potential for economic growth. By improving water transportation, the city can experience economic benefits through enhanced trade and accessibility.

5.3.4 Improved urban mobility

As an alternate mode of transportation, the circular waterway aids in reducing congestion on city roads by attracting some traffic on that route, enhancing urban mobility, and mitigating traffic-related issues. Improved accessibility via water transport enhances the city's connectivity, making various areas more accessible and interconnected.

5.3.5 Collaboration for Sustainable Governance

Promoting public awareness campaigns is integral to sustainable practices and garnering public support for waterway restoration and conservation efforts. Adapting regulations for stringent environmental protection and leveraging technological advancements to monitor and maintain water quality are essential for ensuring the sustainability of the circular waterway.

5.3.6 Investment opportunities in river restoration

Restoring and maintaining the Circular Waterway opens investment opportunities. Projects focused on river restoration, conservation, and infrastructure development can attract investments and drive economic growth.

5.3.7 The cost of water transportation is cheaper

Water transportation is notably cheaper due to several factors. It requires less fuel compared to road transport. The movement of vessels relies largely on buoyancy, requiring minimal external force. This reduced energy requirement significantly contributes to its cost-effectiveness as a mode of transportation.

5.3.8 Tourism and Recreational Development

Developing recreational spaces along the waterway attract tourists and residents, creating parks, walkways, and leisure areas that contribute to the city's attractiveness and promote recreational activities. (Hossain et al., 2013)

5.4 Threats

5.4.1 Pollution of rivers around Dhaka City special from the industrial source

From a study it was found that the presence of various types of waste, including industrial, tannery, medical, domestic, e-waste, hazardous waste, and pollution from water vehicles and poultry, significantly contributes to river pollution. During the dry season, decreased water flow intensifies the issue by reducing the river's capacity to carry materials and silt, which creates more pollution problems. Most of the industries are built near the River around Dhaka City. In a study, it was found that about

60000m^3/day of toxic waste was discharged from the Nine Industrial Cluster (River Master Plan, Report of the Technical Committee on Prevention of Pollution and Increasing Navigability of Rivers Surrounding Dhaka, n.d.). This industrial waste is identified as a significant source of river pollution in the area. The discharge of toxic water poses severe health hazards, altering water quality, impacting biodiversity, and even causing fatalities. This endangers both aquatic life and human health. The smelly water and the ugly look of the river stop people from using it for transportation. According to a study of IWM, there are 349 wastewater outfalls in the circular waterway (BIWTA, 2021) To ensure the project's sustainability, strict policies and regulations prohibiting untreated wastewater discharge and solid waste dumping are necessary for river protection and restoration.

5.4.2 Encroachment and Illegal Settlements

When riversides are encroached upon or occupied illegally, it can disrupt the natural flow patterns of the river. This can change the river's course, slowing down the flow of water. As a result, sedimentation may increase, causing shallow areas or even blocking water flow entirely in certain sections. Encroachment disturbs the natural habitat along riverbanks. The ecosystems that rely on the river, including flora and fauna, face disruption, causing a decline in fish populations. River encroachment often leads to pollution and habitat destruction. Again, by encroaching sides of the river, the aesthetic appeal of the rivers suffers, impacting the tourism potential and recreational activities. It is noteworthy that BIWTA does not have any special forces or manpower to conserve of foreshore land of the circular waterway (BIWTA, 2021)

5.4.3 Political or bureaucratic hurdles delaying project advancements

Different types of government and non-government organizations, and stockholders are involved in this project. So, it can cause delays.

5.4.4 Security Concerns Leading to Limitations on Waterway Usage

Security concerns regarding waterway usage can restrict its potential and utilization, especially if safety measures and regulations are not effectively implemented and managed.

5.4.5 Limited integration with other modes of transportation hinders overall connectivity.

The integration of the waterway with the roadway restricts the overall connectivity and the efficient utilization of the river routes. There is a lack of linked roads between the landing stations (Ali, 2008)

5.4.6 Navigational Problem in Different Places

Navigational problems create significant challenges to the efficient use of the Circular Waterway. Issues like low navigational depth in certain sections, seasonal variations affecting water levels, and bridge height clearance create hindrances to smooth river transportation. There is a total of 17 bridges in the Dhaka circular waterway (BIWTA, 2021), and It's revealed that at least one dozen bridges built over rivers surrounding Dhaka city will need to be demolished, and reconstructed to facilitate smooth water traffic (Dhaka Tribune, 2021). Reduced water levels during dry seasons and continuous depth monitoring become significant issues for safe navigation. Additionally, inadequate infrastructure and clearance for larger water vehicles contribute to slower modes of transportation, impacting the Waterway's ability to efficiently move both goods and people.To overcome these navigational issues strategies for dredging, excavation, bridge modifications, consistent depth management River training, ensuring regular flow, decentralized illegal establishment, and Reconstruction, demolishing, or repairing all of the low-height bridges in the circular waterway is highly needed. According to officials, BIWTA is continuously dredging the circular waterway according to the need (Kabir, 2023). The minimum horizontal clearances for Class-I and Class-II vessels are 76m and 53m (BIWTA, 2021), From Table 1 it is seen that the horizontal distance of Ashulia to Termukh Bridge and Termukh to Demra does not satisfy this.

5.4.7 Suckerfish

At present three to four species of suckermouth catfish (*Hypostomus plecostomus*) are found in Bangladesh. Along with different rivers, the fish is seen to survive in the river Buriganga. Although

sucker fish are not predatory fish. The reproduction rate of sucker fish is very high. But when there are too many sucker fishes in the water, they eat too much algae. This can make it hard for other small fish to find enough food. It messes up the balance in the water and risks the local species. This is a foreign fish and is considered a threat to biodiversity according to experts and different acts.This has become a very concern for circular waterway and other rivers. The government has finally taken the initiative to ban the 'suckermouth catfish' species (“Bangladesh to ban ‘suckermouth catfish’ as it threatens aquatic biodiversity”, 2022).

6. INITIATIVES BY BIWTA

BIWTA (Bangladesh Inland Water Transport Authority) has undertaken a three-phase project along the Circular Waterway.

6.1 First Phase

The completed first phase encompassed the construction of a 20.6-kilometer walkway, focusing notably on riverbank protection near Burganga, Turag, and Balur River until June 30, 2015.

6.2 Second Phase

The ongoing second phase of the circular waterway spans 52 kilometers along the Buriganga, Turag, Shitalakhya, and Balu rivers. These objectives are preventing unauthorized encroachments, enhancing the visual appeal of riverbanks, implementing environmental development initiatives, navigability, and mitigating pollution in circular waterway. The targeted scope of this phase involves constructing extensive walkways (34 km along riverbanks and 18 km above columns), liberating 52 km of riverbank areas for public use, and infrastructural development. These include protective measures such as riverbank protection work (25 km), construction of RCC fences (80 units), key walls (10 km), high-ground river boundary pillars (3712 units), and low-ground river boundary pillars (3850 units). Additionally, the phase includes the construction of drainage systems along walkways (35 km), unauthorized soil excavation from within the river (18.21 million cubic meters), boulder protection for scour (2.65 km), footbridges (0.4 km), bench berms (291 units), jetties for heavy vehicles (14 units), and associated road and parking yard construction (9000 and 23000 square meters, respectively). Notably, eco-park construction along the riverbank (3 units), ghats for passenger service (4 units), and extensive tree plantation along the 52 km stretch near the riverside walkway are prime components of this phase. As of July 2023, approximately 67% of the proposed work has been completed (Kabir, 2023).

6.3 Third Phase

Plans are in progress for a third phase, extending over 148 kilometers length of walkway. The third phase proposes infrastructure development along the Circular Waterway, including seven jetties and thirteen landing stairs for improved vessel facilities. It focuses on dredging and widening the waterway, with Class-I and II navigational routes identified, necessitating different depth requirements. The plan ensures river restoration through protective measures, eco-parks, and walkways, aiming to enhance water quality, and enable various uses like navigation, drainage, and fisheries, while providing economic and environmental benefits to the surrounding areas(BIWTA, 2021) The construction of walkways for foreshore conservation and recreational amenities is a commendable initiative undertaken by BIWTA and the government. Moreover, There is an umbrella project for Dhaka Rivers going on to Prioritize Investments for the Restoration of the Rivers surrounding Dhaka City with challenges like Dealing with Uncertainties of Complex Transformations, UIP to deal with a variety and fragmentation of plans and projects, Dealing with limited resources for the joint investments needed, to support coordination of implementation. (HASKONINGDHV NEDERLAND B.V., 2022)

7. CONCLUSIONS

This analysis addresses the Circular Waterway's role from the perspective of Dhaka City. The Circular Waterway around Dhaka City faces a mixed landscape of challenges and promises, shaping its role in the city's evolution. While it may not immediately attract local commuters due to its slower speed of vehicle, it stands as an exceptionally cost-effective and efficient means of cargo transportation.

This potential is offset by weaknesses in waste management, limited infrastructure, and seasonal variations impacting water levels, and navigational requirements alongside threats posed by pollution, encroachment, and bureaucratic hurdles. Critical environmental crises like the proliferation of sucker fish and rampant pollution pose significant threats. Toxic industrial waste and untreated water discharge threaten the waterway's health, public health, aquatic ecosystems, and ecological balance, demanding urgent remedial action.

The waterway's potential for recreation, stormwater management, and water supply underscores its vital role in Dhaka's landscape. With proper planning and investment, it can preserve green spaces, manage stormwater effectively, and even supplement water supply, enhancing the city's resilience. Moreover, it holds promising economic potential. Its efficient cargo transportation capabilities offer cost-effective solutions that can boost trade and economic growth. Balancing the mitigation of environmental crises and leveraging its potential demands collaborative efforts, stringent regulations, infrastructure enhancements, and public awareness campaigns. To fully discover its potential, strategic actions are compulsory. Collaborative efforts among stakeholders should be maintained, emphasizing inclusive planning involving governmental bodies, private entities, and local communities.

It's crucial to note the significant steps taken by BIWTA in the ongoing development phases of the Circular Waterway. The completed and ongoing phases, notably the construction of walkways, riverbank protection, and environmental enhancements, signify a commitment toward realizing the Waterway's potential.

In conclusion, the Circular Waterway stands as a hope in Dhaka's urban landscape, offering transformative solutions to critical challenges. Its optimization, coupled with the proactive initiatives by BIWTA, if successful - holds the promise of a greener, more accessible, and more efficient city infrastructure.

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