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## **The Transformation of the Damodar Canal: Challenges and Opportunities for Sustainable Canal Front Development**

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### **ABSTRACT**

Bangladesh has historically relied on its rivers, canals, and water bodies for transportation and agriculture. In the southern regions, canals were crucial for socio-ecological life but have suffered degradation due to urbanization. This paper focuses on the Damodar Canal in Pirojpur, which has narrowed from 15–20 feet to 4–5 feet due to encroachment and waste disposal, resulting in a clogged urban drain. Despite these issues, it still supports local livelihoods and cultural practices. The study explicitly aims to restore the canal's historic and functional significance through three targeted objectives: analyzing its spatial transformation, assessing the current environmental and socio-cultural conditions, and proposing strategic redevelopment initiatives. This research explores the potential to revitalize the canal through sustainable development strategies, including ecological restoration, establishing buffer zones, promoting water-based economic activities, and enhancing public connectivity. Conducted as part of a studio project in collaboration with the Urban and Regional Planning Department (UDD), the methodology encompasses field surveys, land-use analysis, spatial mapping, and a review of secondary data. The focus is placed on a critical 2 km stretch of the canal between the Baleshwar and Kocha rivers, chosen for its urban concentration. The findings reveal severe environmental and infrastructural challenges, including sewage discharge, stagnant water, and rampant, unregulated construction. At the same time, the research underscores the canal's indispensable role in sustaining community identity, cultural heritage, and local livelihoods in Pirojpur. By positioning these findings alongside comparable restoration initiatives, the study makes clear that site-specific documentation is a vital foundation for developing integrated and sustainable rehabilitation

*strategies. The research illustrates that a thorough site analysis not only uncovers critical threats but also reveals significant opportunities that will guide future*

*canal-front redevelopment and ecological restoration efforts in the Damodar Canal, Pirojpur.*

**Keywords:** *Encroachment mitigation; 10m buffer zone; floating bio-platforms; water-centric development & traditional heritage crafts*

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## **INTRODUCTION**

Canal fronts in southern Bangladesh have historically served as multifunctional spaces—water transport corridors, drainage backbones, agricultural boundaries, and socio-cultural hubs.

Over the last century, however, these landscapes have undergone significant transformations in response to urbanization, population growth, and shifting economic priorities. The result has been a progressive erosion of traditional water-based land uses and their replacement by dense, built-up environments.

### **Transformation of Land Use Along the Canal Front in Southern Bangladesh**

Traditionally, canal fronts in Barisal, Khulna, and Pirojpur were characterized by open water bodies, vegetation, agricultural land, and dispersed homesteads, forming an integrated socio-ecological landscape [1, 2].

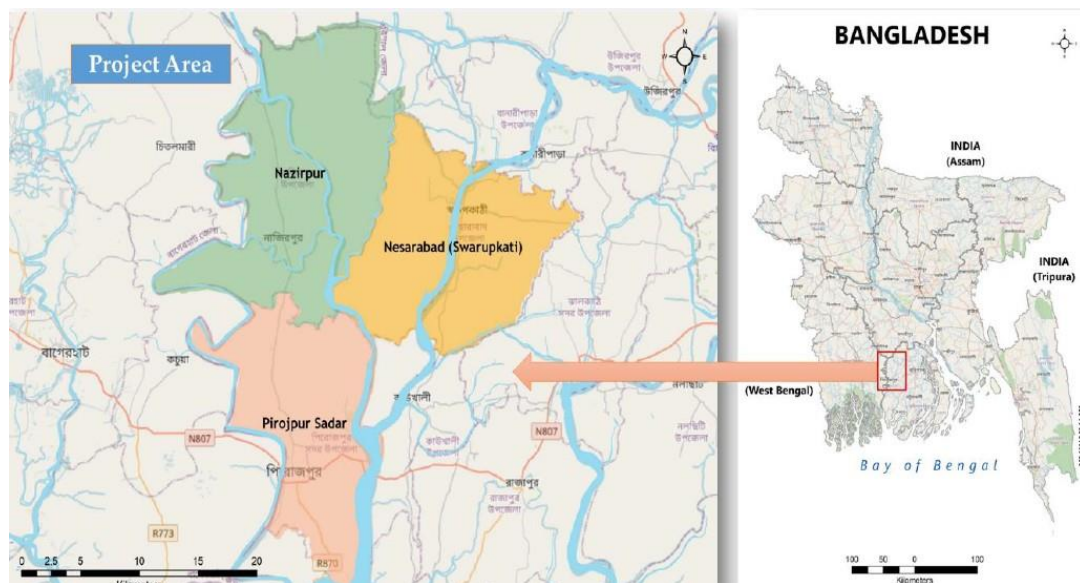
Canals served as vital transport corridors for commodities such as rice, jute, fish, and timber, while their edges supported diverse activities, including fisheries, bathing ghats, and religious institutions such as temples and mosques [3]. Canal banks were typically maintained as open spaces or utilized for seasonal agriculture, including paddy, betel

leaf, and vegetable cultivation, reflecting a close interdependence between land and water systems [4].

Beyond their economic functions, these spaces held strong socio-cultural significance, accommodating community gatherings and rituals, such as Durga Puja idol immersion in Pirojpur, as well as public activities along the ghats in Barisal [5].

However, with the expansion of road networks and the rise of motorized transport in the mid-20th century, the navigational importance of canals began to decline [3]. Concurrently, increasing population pressure in urban centers such as Barisal and Khulna accelerated the conversion of canal banks into residential and commercial uses [6].

In Khulna, canal fronts experienced the proliferation of informal settlements, while in Barisal, canal alignments were often encroached upon or replaced by roads and marketplaces [7, 15]. This shift marked the onset of widespread encroachment, transforming canals from shared ecological commons into perceived vacant land, thereby undermining their environmental, functional, and cultural roles [1, 4].



**Fig. 1: Damodar Canal in Pirojpur District, Barisal.**

(Source: Urban Development Directorate (UDD), Physical Feature Survey, 2025).

Today, canal fronts in southern Bangladesh are characterized by dense residential development, commercial establishments, and institutional structures, replacing much of the earlier open space and agricultural land. In Barisal, for example, of the 22 historic canals, many have been either filled to make way for road networks or converted into linear markets. According to The Independent (2016) and Dhaka Tribune (2024), more than 70% of these canals have either been filled, narrowed, or lost entirely due to encroachment and unplanned urbanization. Land use surveys conducted by the city corporation show that residential and commercial use along canal banks has expanded from around 35% in the 1980s to nearly 60% today. Open space and vegetation along canal fronts dropped from 25% in the 1980s to less than 8% by 2020. The water surface area of canals declined by over 50% in the last four decades, replaced by roads, markets, and housing. This rapid change has transformed once-fluid ecological corridors into fragmented urban channels, contributing to chronic waterlogging.

### Transformation of the Damodar Canal

The Damodar Canal, which formerly functioned as the Damodar River, strategically bisects the Pirojpur municipal area. Flowing through Pirojpur Paurashava, this canal serves as a vital connection between the Kaliganga and Baleshwar Rivers. Historically, this waterway was a broad river capable of accommodating navigation by ships, and it is commonly referred to as the Bharani Canal. A unique feature of the canal is that it allows tidal water to flow in both directions because of its connection to two major rivers.

Hularhat Launch Ghat, the primary access point to Pirojpur city, is located at the junction of the Damodar Canal and the Kaliganga River. The canal delineates the boundaries between various wards, effectively serving as a boundary line for seven of them, except for Ward Nos. 1 and 8. Three wards are situated on the northern side, while four wards lie on the southern side of the canal. A detailed overview of both banks of the Damodar Canal is presented in Table 2. Spanning 6.35 km with an average width of 18 meters, the canal is systematically divided into seven sections, each 1000 meters long, providing a clear, structured understanding of its dimensions.



**Fig. 2:** Damodar Canal in Pirojpur District, Barisal.

(Source: Urban Development Directorate (UDD), Physical Feature Survey, 2025).

In Pirojpur, large portions of the Damodar Canal's banks have been encroached by mixed-use housing and commercial shops. Compared to historical maps (pre-independence, when agricultural land dominated), agricultural land has shrunk to less than 5%, replaced primarily by residential and mixed-use plots. Informal commercial structures, often tin-shed or semi-pucca, are now common along canal banks, reflecting a shift from ecological to built-up land use [4]. Additionally, the absence of strict urban planning has enabled unauthorized construction and landfill activities, accelerating the loss of canal-front vegetation and ecological services. Where canals once acted as ecological corridors, they are now fragmented and reduced to narrow drainage lines clogged with waste.

Nevertheless, the canal continues to play a critical role in sustaining community identity and socio-cultural practices. Its

banks support religious activities, social gatherings, and everyday domestic uses, reinforcing the relationship between people and water [5]. The proximity of the canal to schools, health facilities, and civic institutions further underscores its ongoing role in shaping Pirojpur's urban structure. Thus, despite significant degradation, the canal represents a latent opportunity for integrated rehabilitation, in which ecological restoration can be aligned with socio-cultural revitalization and sustainable canal-front development [4, 7].

### AIM AND OBJECTIVES

The study aims to propose opportunities for the sustainable redevelopment of the Damodar canal to restore its historic legacy. For achieving the aim, the analysis is guided by three objectives:

- To trace the historical evolution and spatial transformations of the canal;
- To assess the environmental,



infrastructural, and socio-cultural challenges that shape its current condition; and

- To foreground its ecological and civic potentials within broader discussions of sustainable waterway management in Bangladesh.

By doing so, the paper emphasizes the importance of site-specific documentation as a foundation for informed design and policy interventions in urban waterway restoration.

### METHODOLOGY

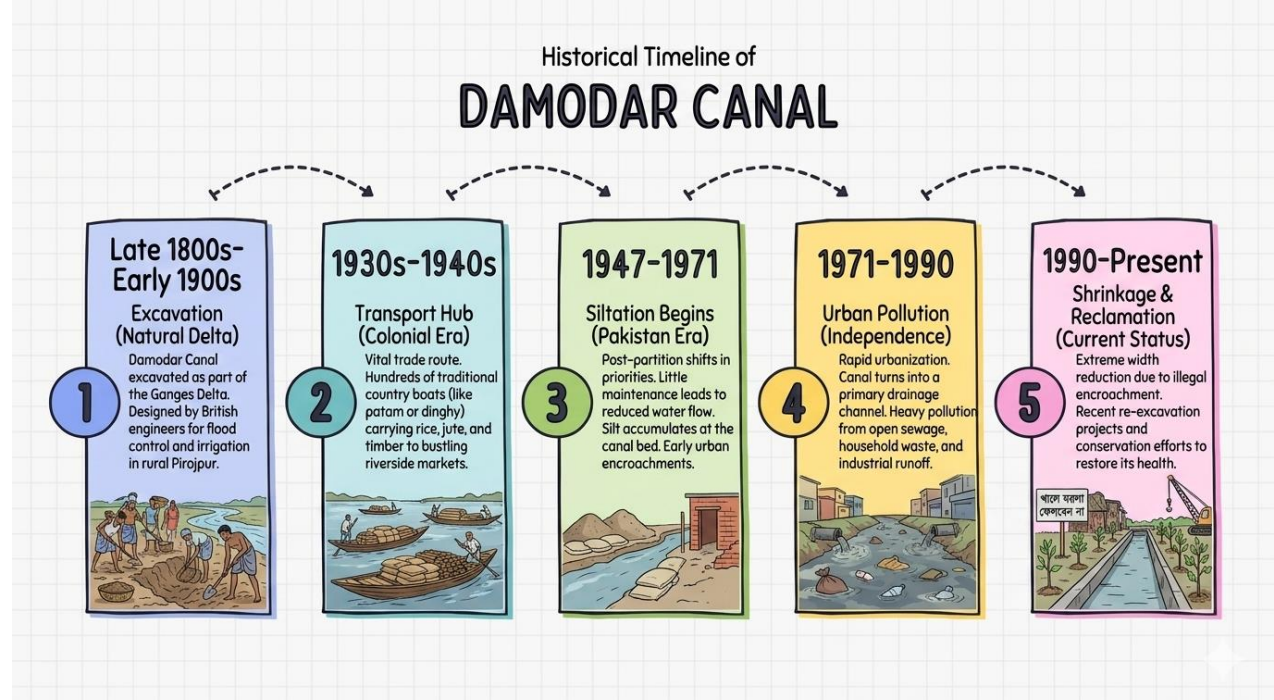
This research was conducted as part of a studio project in collaboration with the Urban and Regional Planning Department (UDD) to develop site-specific insights to inform sustainable canal-front redevelopment strategies. The Damodar Canal, which extends approximately 6.3 km through Pirojpur, was studied in detail, and a 2 km stretch was selected for a focused land-use analysis. This section was chosen because it represents the most encroached

portion of the canal and also functions as the central business district (CBD) of Pirojpur, thereby encapsulating both the intensity of urban pressures and the opportunities for civic renewal.

### HISTORIC EVOLUTION & SPATIAL TRANSFORMATION OF THE DAMODAR CANAL

#### Historic Evolution

The Damodar Canal, located in Pirojpur, Bangladesh, reflects a layered history shaped by colonial infrastructure development, post-partition neglect, and rapid urban expansion. Before British intervention, Pirojpur was part of the natural Ganges Delta, where seasonal waterways sustained agriculture and livelihoods. During the British colonial period, the canal was excavated to prevent floods, provide irrigation, and enable rural navigation. At the time, it was a vital route for transporting rice, jute, timber, and other goods through small country boats [6].



**Fig. 3: Historical Timeline of the Damodar Canal (Source: Author, 2026)**

Following the Partition of India in 1947, administrative priorities shifted during the Pakistan era, and rural canals like the Damodar received little maintenance. Siltation and reduced water flow coincided

with early urban growth in Pirojpur, where encroachments along the banks began to appear [9]. After Bangladesh's independence in 1971, urbanization accelerated, and the canal gradually lost its

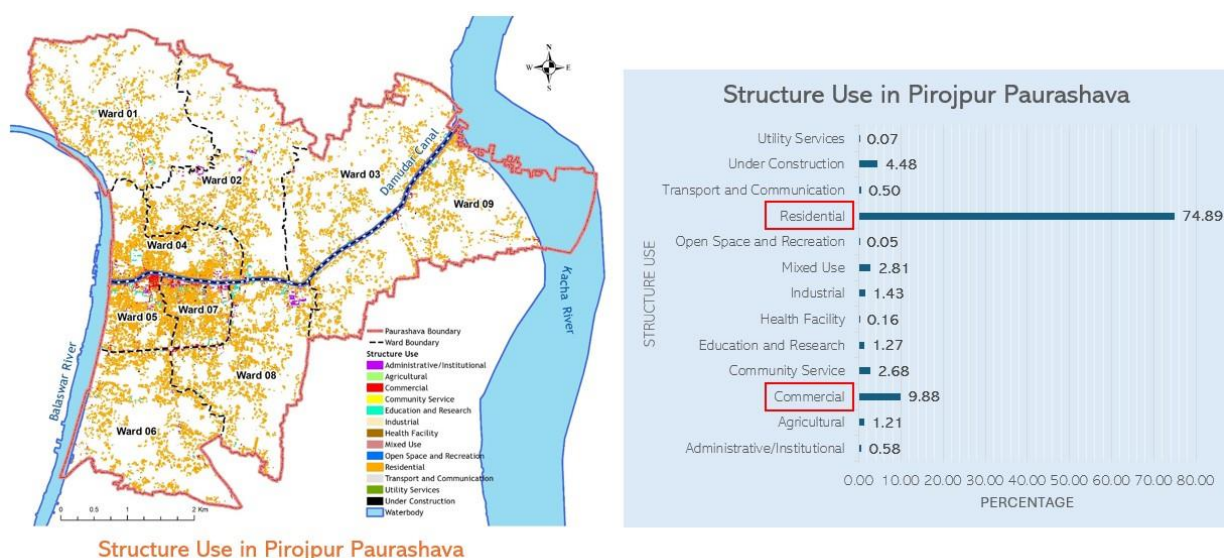
navigability, becoming a drainage channel heavily polluted by open sewage and solid waste [3].

Today, the canal's width has shrunk from its original 15–20 feet to as little as 4–5 feet in some places, largely due to illegal encroachment and unregulated construction [6]. Despite this degradation, the canal remains the major drainage backbone of Pirojpur, connecting the Baleshwar and Kocha rivers [3]. Recent re-excavation projects seek to restore parts of the waterway, highlighting its enduring ecological and cultural importance [9]. More broadly, the challenges faced by the Damodar Canal mirror the fate of many rural canals across southern Bangladesh, where siltation, encroachment, and pollution have undermined their roles in irrigation, navigation, and urban resilience [2].

### Existing Land Use Condition

From the PRA report of the Urban Development Directorate (UDD). (2024, December), The structure use survey of Pirojpur Paurashava, through which the Damodar Canal passes, reveals a predominantly residential character [10]. An overwhelming 74.89% of structures are residential, indicating the dominance of

housing around the canal front and across the town. Commercial activities constitute the second-largest category, accounting for 9.88% of structures and concentrated mainly along major road corridors and near canal crossings. Other land uses appear in much smaller proportions: under-construction buildings (4.48%), mixed-use developments (2.81%), and community services (2.68%). Institutional and service-related functions remain marginal, with educational and research facilities at 1.27%, industrial structures at 1.43%, and administrative or institutional uses at 0.58%. Agricultural land use is also minimal at 1.21%, reflecting the urbanized character of the Municipality (Pourashava). Notably, utility services (0.07%), transport and communication (0.50%), open space and recreation (0.05%), and health facilities (0.16%) together account for less than 1% each, highlighting a significant gap in public amenities. This distribution suggests that while residential and commercial structures dominate the urban landscape, the scarcity of open space and service infrastructure poses critical challenges for sustainable canal-front and town-wide development [10].



**Fig. 4:** Current land use along the Damodar Canal.  
(Source: Urban Development Directorate (UDD), Physical Feature Survey, 2025).

The site survey reveals that the first 2 km of the Damodar Canal, which begins at the Baleswar River, are more urbanized than the next 4.3 km, which is more rural and have minimal interventions. The primary marketplace, Krichnochura Mor, CO Mor, and other commercial developments, as well as hospitals and educational

institutions, are located within the first two kilometers. The next section has more residential buildings and fewer public facilities, reflecting a more natural setting. The Hularhat Launch Terminal is connected to the Damodar Canal at the point where the Damodar Canal meets the Kaliganga River.



*Fig. 5: Differences between the first 2 km span and the rest of the 4.3 km span.  
(Source: field survey, 2025).*

The land-use pattern along the Damodar Canal (over a 2 km stretch) reflects the layered relationship between natural systems and human settlements in Pirojpur Sadar. The survey findings reveal that residential development is the dominant category, accounting for approximately 38% of total land use. These residential areas are largely characterized by compact settlements, with a mix of katcha, semi-pucca, and pucca structures, reflecting both socio-economic diversity and unplanned growth along the canal's edges. Agricultural land accounts for the second-largest share (22.9%), underscoring the continued dependence of surrounding communities on agrarian practices, despite the canal's shrinking irrigation potential. This agricultural fringe creates an interface between the urbanized blocks and open landscapes yet faces increasing pressure from commercial and residential expansion.

The built environment around the Damodar Canal is mainly low-rise, reflecting Pirojpur's organic growth. Single-story

structures make up nearly 60% of the total, primarily residential buildings in katcha, semi-pucca, or tinshed forms, packed along narrow lanes. This highlights affordable housing and limited formal construction practices. Two-story buildings account for about 20% and are located on secondary and tertiary roads for mixed residential and small commercial uses, indicating gradual urban densification. Three-story buildings represent around 7%, while four- to six-story structures make up nearly 10%, often near major intersections, reflecting higher-income investments. Only about 3% are seven- to nine-story buildings, mainly along active commercial sections, signaling a shift in settlement patterns [10]. While low-rise housing creates a human scale, taller buildings disrupt the skyline and strain infrastructure. Future canal-front redevelopment must balance the need to maintain low-rise heritage with the demands of upward growth.

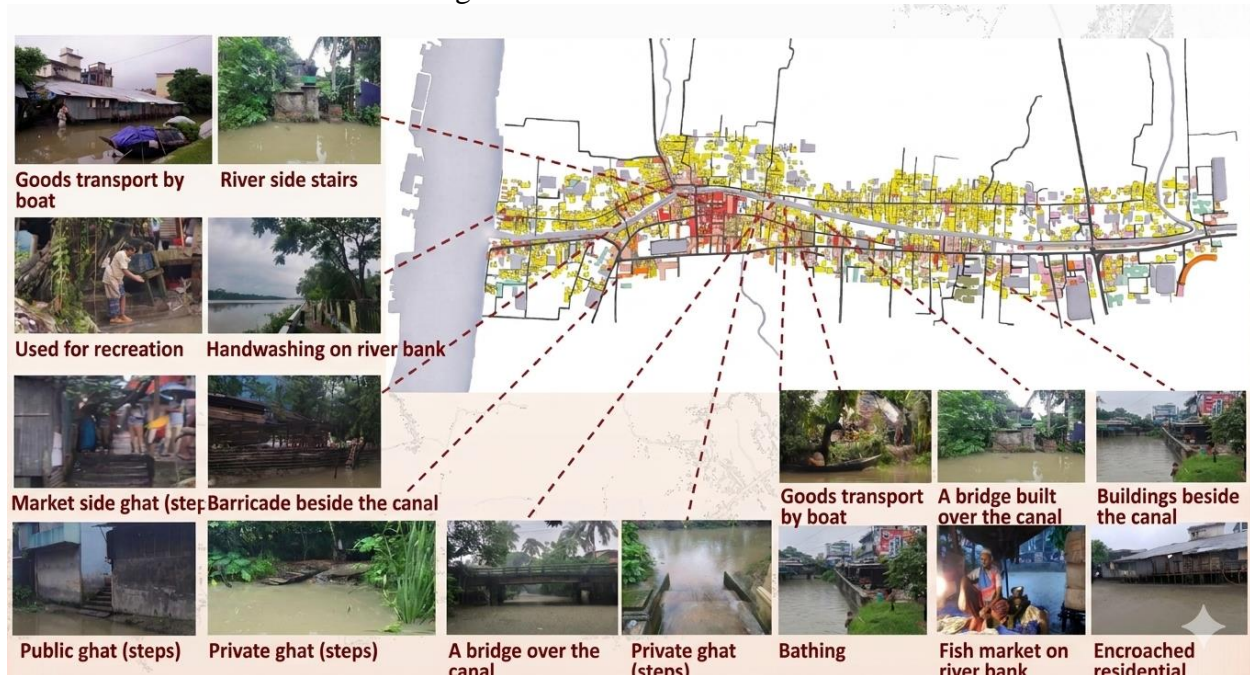
## **SOCIO-CULTURAL CONTEXT & CHALLENGES**

The Damodar Canal, located in Pirojpur



Sadar of Barisal Division, has historically served as a lifeline for transportation, commerce, and daily livelihood practices. Traditionally, boats were floated along the canal to transport goods, serving as an essential trade route connecting rural

communities with larger markets. Even today, the canal continues to be used for transporting agricultural produce, fish, and household commodities, linking local livelihoods to regional economies.



**Fig. 6:** The socio-economic activities around the first 2 km area of the Damodar Canal.  
(Source: field survey and map data, 2025).

To understand the socio-economic conditions in the area around the Damodar Canal, UDD distributed 675 questionnaires across 9 wards. Subsequently, a rigorous survey of the first 2 km of the Damodar Canal was conducted. Beyond transport, the canal plays a vital role in everyday domestic activities. Residents use its water for washing clothes, bathing, and sometimes for small-scale household agriculture or fishery. During the monsoon season, the canal becomes more active, accommodating larger volumes of water and supporting seasonal boat traffic, while in the dry season, its utility is limited, but it remains culturally relevant.

The canal is deeply embedded in the socio-cultural fabric of Pirojpur. It serves not just as a waterway but as a communal and spiritual space. The surrounding wards,

especially Ward 4, are home to a significant Hindu population (around 80%), and the canal environment is closely tied to religious practices and cultural festivals. Rituals such as Durga Puja, Kali Puja, and Saraswati Puja are observed along its banks, where families have been immersing idols for generations. The ghats and open edges of the canal act as public spaces for congregation, celebrations, and cultural expression.

Moreover, the presence of temples such as ISKCON, Hari Sitala Math, and the Sarbojanin Durga Temple near the canal reinforces its identity as a spiritual corridor. The canal's banks host a mix of social life from ritual activities and leisure gatherings to markets and everyday conversations, making it a space of continuity between heritage and modern community life.



The canal thus reflects the intersection of ecology, economy, and culture: it sustains livelihoods, anchors religious traditions, and fosters a strong sense of place for the community.

### Challenges

The socio-cultural landscape faces significant threats from a range of challenges, including

- encroachment by urban development,
- inadequate infrastructure that fails to meet the community's needs, and
- pollution that compromises both the environment and residents' quality of life.

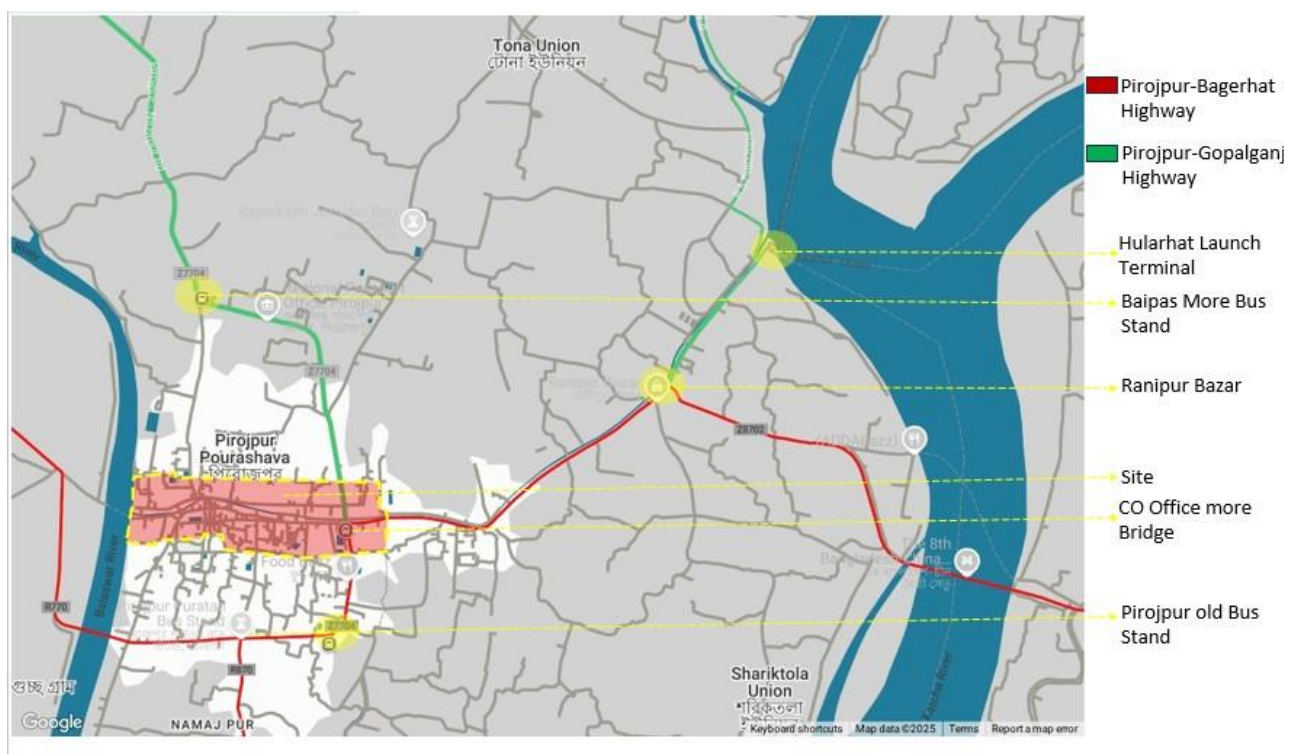
These issues underscore the urgent need for a comprehensive rehabilitation approach. This approach must not only honor and preserve the area's rich heritage but also incorporate sustainable development

strategies to ensure its viability for future generations. Thoughtful, sensitive planning is essential to balance the preservation of cultural identity with the pressures of modern demands.

### CURRENT INFRASTRUCTURE AND CHALLENGES

#### Accessibility and Connectivity

The Damodar Canal serves as a vital water corridor, effectively linking the Baleshwar River with the heart of the city. It boasts excellent accessibility on both regional and local levels. On a regional scale, the canal connects to major highways, bus stands, and a launch terminal, integrating seamlessly into Pirojpur's broader transport network. Locally, multiple bridges spanning the canal maintain continuous connectivity between neighborhoods, creating an integrated corridor for both water- and land-based transportation.



**Fig. 7: Regional Accessibility of Pirojpur Sadar.**  
(Source: field survey and map data, 2025).

The presence of bridges and boat ghats transforms the canal into a multi-modal transport spine, connecting:

- River transport (launch terminal, boat ghats)
- Road transport (bus stands, highways, local streets)

This dense network of bridges significantly enhances accessibility, reducing barriers between the city's northern and southern parts and fostering greater mobility for residents and visitors alike.

### **Regional Accessibility**

The Damodar Canal runs through Pirojpur Pourashava and connects with the Baleswar River on the west. It is directly accessible through two major highways:

- Pirojpur–Bagerhat Highway (red route)
- Pirojpur–Gopalganj Highway (green route)

Important nearby transport nodes include:

- Hularhat Launch Terminal (north-east, on the river)
- Baipas More Bus Stand
- Ranipur Bazar, and

- Pirojpur Old Bus Stand (linked via highways).

This ensures integration of water transport (launch terminal and boat ghat) with road transport (highways and bus stands).

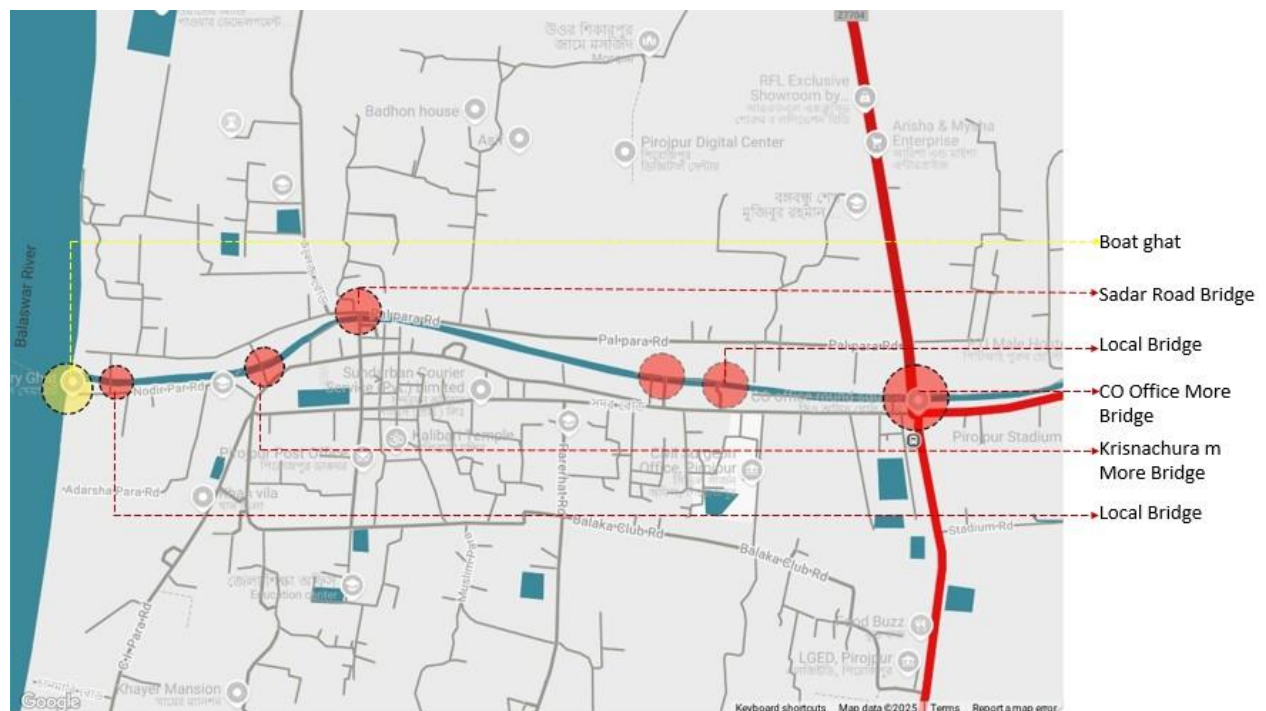
### **Local Accessibility**

- Within Pirojpur town, the Damodar Canal is lined with multiple bridges, ensuring east–west connectivity across the settlement.

- Key bridges along the canal include:

- Boat Ghat access (entry point to river transport at the western edge)
- Sadar Road Bridge
- Local Bridges (at different intervals along the canal)
- CO Office More Bridge (a major connector with the Pirojpur–Bagerhat Highway)
- Krisnachura More Bridge

- These bridges link the canal with the town's core areas: Palpara Road, Adarshapara Road, Stadium Road, and Pourashava Center.



**Fig. 8:** Local accessibility around the Damodar Canal, Pirojpur.  
(Source: field survey and map data, 2025).

The road network around the Damodar Canal is hierarchical yet uneven in accessibility and integration. The primary roads, with an average width of 8 meters, provide the main arteries of vehicular circulation, linking Pirojpur Sadar to regional routes such as Dhaka–Tungipara–Nazirpur–Pirojpur. These roads ensure regional connectivity but often remain congested due to unregulated parking, informal commercial activities, and limited pedestrian infrastructure.

Secondary roads, averaging 4.2 meters in width, penetrate residential neighborhoods. They act as intermediate connectors between the primary arterials and local tertiary roads, often running parallel to or intersecting the canal at key points. However, their narrow cross-sections and poor drainage conditions restrict efficient movement, particularly during the monsoon season when flooding and waterlogging are common.

The tertiary network, with widths ranging from 0.8 to 1.2 meters, consists of narrow lanes that provide last-mile connectivity to individual households. These passages are often informal, winding, and poorly paved, with mixed use by pedestrians, rickshaws, and small-scale vendors. While vital for daily mobility, their limited width limits emergency access and exacerbates the challenges of managing dense residential blocks adjacent to the canal.

### **Challenges**

Most of the roads in the area are classified as tertiary roads, characterized by limited capacity and the heavy presence of rickshaws as the primary mode of

transportation. Unfortunately, these roads are plagued by significant unauthorized parking, leading to congestion and accessibility challenges. The lack of dedicated pedestrians and parking facilities is a major concern, as it forces pedestrians to navigate through traffic, which not only poses safety risks but also further slows down vehicle speeds. The roads are often narrow, exacerbating the situation and contributing to a bottleneck effect. Adding to the chaos, temporary hawkers set up their stalls, encroaching on the already limited road space and creating additional obstacles for both pedestrians and vehicles alike. To address these issues, one potential solution would be to designate the narrowest roads as off-limits to cars and other larger vehicles. This could be achieved by installing gates at both ends of these roads, allowing only rickshaws to pass through, thus facilitating smoother traffic flow and enhancing pedestrian safety.

### **Service Infrastructure**

The area is equipped with shallow deep tube wells, public toilets, and a network of box culverts and open drains discharging into the canal. Waste disposal practices include both liquid discharge through pipes and solid waste dumping along the canal edges. Despite this framework, the absence of planned and well-maintained drainage significantly hampers the system's efficiency. The drainage system connected to the Damodar Canal is a critical urban infrastructure in Pirojpur Sadar. However, the current condition reflects major deficiencies that contribute to environmental degradation, public health concerns, and social discomfort.





**Fig. 9: Service infrastructures along the Damodar Canal.**  
(Source: field survey and map data, 2025).

## Major Challenges

### Drainage blockage and pollution

Many of the drains are clogged with household garbage, plastic, and other solid waste. Wastewater from households and commercial facilities flows directly into the canal without treatment, resulting in severe pollution and foul odors.

### Waterlogging

During the monsoon, the clogged drainage network fails to handle stormwater runoff, resulting in severe waterlogging in adjacent residential areas. The narrowed canal cross-section due to encroachment and sedimentation further reduces water-carrying capacity, intensifying the problem.

### Illegal encroachment

Informal settlements and construction along the canal banks have narrowed the flow channel. Encroachments limit access

for maintenance, increase solid waste dumping, and reduce the overall effectiveness of the drainage system.

## EXISTING ECOLOGICAL CONDITION & CHALLENGES

The Damodar Canal in Pirojpur, within the Barishal region of southern Bangladesh, presents a landscape of immense ecological potential but increasing environmental stress. Once a vital artery for the region's hydrological and ecological systems, the canal and its surroundings have suffered from unplanned suburban sprawl, pollution, and neglect of natural habitats. The pressures of urban expansion, sedimentation, and the loss of vegetative buffers have disrupted the delicate relationship between the human settlement and the wetland ecosystem. As a result, species diversity, particularly among birds, butterflies, and aquatic life, has declined dramatically.



**Fig. 10:** Existing ecological condition around the Damodar Canal.  
(Source: field survey, 2025).

In recent decades, the Damodar area has been undergoing a transitional phase from rural to suburban morphology. The gradual densification of settlements along the canal edge has introduced impervious surfaces, fragmented the natural drainage network, and reduced wetlands' capacity to perform essential ecological functions. Informal encroachments, lack of waste management, and unregulated land conversion further threaten both the environmental balance and the community's resilience to flooding

and climate change.

The problem, therefore, is not merely ecological degradation but the loss of an interdependent system linking people, water, and biodiversity. The challenge was to reimagine suburban growth not as a threat to the ecological landscape but as an opportunity to regenerate it. The project sought to create a spatial and ecological framework in which human habitation, biodiversity, and water systems could coexist and thrive.



**DISCUSSION**

The transformation of the Damodar Canal in Pirojpur reflects a broader trajectory of canal front degradation observed across southern Bangladesh. Once a vital corridor for irrigation, navigation, and socio-cultural activities, the canal has been progressively reduced to a dysfunctional drain due to unregulated urban expansion, solid waste dumping, and encroachment. The site analysis underscores how historical neglect, coupled with piecemeal construction and inadequate institutional oversight, has accelerated ecological loss and infrastructural stress.

One of the central findings is the drastic narrowing of the canal from 15–20 feet to as little as 4–5 feet in certain stretches. This physical constriction, caused by unauthorized settlements and informal commercial activities, has severely reduced the canal's water-carrying capacity. The hydrological implications are significant: reduced infiltration, poor stormwater drainage, and recurrent waterlogging in surrounding wards. These conditions echo in regional studies that link canal encroachment to heightened urban flood risks [4]. Without intervention, the Damodar Canal risks further functional decline, undermining Pirojpur's overall urban resilience.

Equally important are the socio-cultural dimensions revealed in the analysis. Despite physical degradation, the canal remains deeply embedded in the cultural and spiritual life of the community. Religious ceremonies such as Durga Puja idol immersion, the presence of temples along its banks, and everyday activities like bathing and washing underscore their continued role as a communal space. This dual identity—as both a drainage channel and a cultural corridor—demands rehabilitation strategies that respect heritage practices while restoring ecological health. Comparative cases, such

as canal restoration projects in Narayanganj, demonstrate that waterway rehabilitation can simultaneously reinforce cultural identity and urban livability [7].

Land use surveys further highlight the tension between ecological preservation and unplanned urbanization. Residential development dominates nearly three-fourths of structures along the canal front, while commercial pressure is growing rapidly. In contrast, agricultural land and open spaces have almost disappeared. This imbalance reflects a shift from multifunctional water-based landscapes to densely built-up environments, a trend also observed in Barisal and Khulna [6]. Such transitions fragment ecological corridors, erode biodiversity, and exacerbate environmental vulnerability. Therefore, a revival of previous land uses—such as seasonal agriculture, clay-based crafts, and communal open spaces—combined with strict enforcement to prevent future encroachment, is essential to re-establish the canal's ecological and cultural integrity.

The infrastructure assessment indicates that drainage outlets are poorly integrated with the canal, resulting in blockages, standing water, and widespread pollution. The absence of sewage treatment and solid waste management has transformed the canal into an urban dumping ground, generating both environmental and public health hazards. The community's continued dependence on the canal for daily domestic use, however, exposes residents to the risk of waterborne diseases and a declining quality of life. These findings align with broader critiques of weak urban water governance in Bangladesh, where canals are treated as vacant land rather than vital ecological assets [3].

Nevertheless, the study also reveals clear opportunities. The canal's central location, connectivity to major roads and transport hubs, and proximity to civic institutions



position it as a potential urban spine. Vacant and underutilized land parcels along its edges offer scope for green buffers, public spaces, and mixed-use redevelopment. Moreover, the persistence of cultural activities along the canal suggests a strong basis for community-led stewardship, which could complement institutional interventions.

### **POSSIBLE OPPORTUNITIES FOR DAMODAR CANAL REDEVELOPMENT**

Building on the Development Plan for Damodar Canal, Pirojpur, and drawing on relevant research on urban waterways and canal-front restoration, the following recommendations are proposed to ensure sustainable rehabilitation, socio-cultural

integration, and long-term resilience of the canal front.

#### **Floating Vegetation in Floodplain Area**

Introducing floating vegetation beds (e.g., water hyacinth-based bio-platforms or native aquatic plants) in flood-prone sections of the canal will improve water quality by absorbing pollutants and providing habitat for fish and aquatic organisms. Research shows that floating wetlands can act as natural biofilters, reducing nutrient loads and enhancing biodiversity [4, 13]. In Pirojpur, where untreated sewage and solid waste are major concerns, floating vegetation would both restore ecological balance and serve as a visible symbol of green regeneration.



*Fig. 11: Floating vegetation in Southern Bangladesh.  
(Sources: [16, 17]).*

#### **10m Vacant Buffer Zone from Canal Edge**

The development plan mandates a 10-meter setback to safeguard canal banks. This buffer is critical for preventing encroachment, facilitating dredging, and creating green linear parks along the canal front. Globally, buffer zones have been

shown to improve infiltration and reduce urban flood risks [3, 14]. In Pirojpur, this zone could be landscaped with native vegetation, seating areas, and pedestrian paths, ensuring multifunctionality: drainage safety, ecological restoration, and public access.



**Fig. 12:** Possible 10 m vacant buffer zone required along Damodar canal edge  
(Source: Author, 2026)

### **Floating Market Based on Agriculture**

Historically, canals in southern Bangladesh hosted vibrant trade in rice, jute, fish, and vegetables. Establishing a floating agricultural market along the Damodar Canal would revive this tradition while

creating an attractive socio-economic hub. Such initiatives mirror successful water-centric projects in Narayanganj and Dhaka [7]. This market would not only boost local farmers' incomes but also strengthen Pirojpur's identity as a canal city.



**Fig. 13:** Floating market in Swarupkathi, Pirojpur, Barisal.  
(Sources: [18, 19]).

### **Boat Market and Boat-Making Zone**

The canal's heritage as a navigation corridor makes it an ideal site for boat markets and small-scale boat-making industries. Boat-making is a traditional craft in southern Bangladesh, linked to local livelihoods and cultural practices. Designating specific zones would reduce

haphazard occupation of canal banks and preserve intangible heritage. Similar initiatives in Barisal have shown that promoting boat-related crafts can integrate cultural heritage with economic development [11, 12].





*Fig. 14: Boat market in Kuriana, Swarupkathi, Pirojpur, Barisal. (Sources: [20, 21]).*

### **Fishing Equipment Selling Zone**

Given the strong dependence of canal-adjacent communities on fisheries, a dedicated fishing equipment market would formalize the work of informal vendors, improve accessibility for local fishers, and

reduce encroachment pressures along canal banks. Studies emphasize that supporting traditional economic nodes enhances both community resilience and ecological stewardship [13, 14].



*Fig. 15: Fishing equipment used in Southern Bangladesh [24].*

### **Production of Equipment Using Coconut Leaf and Fiber Materials**

Southern Bangladesh's coconut groves supply raw materials for the coconut fiber and nut-leaf industries (ropes, mats, plates, dishes, and household equipment). Allocating space for coconut trees to

support fiber- and nut-leaf-based enterprises along the canal will generate employment, diversify livelihoods, and link ecological resources to economic opportunities. Promoting eco-industries also supports the sustainable use of the land-water interface [1].





**Fig. 16:** Production and use of coconut leaf and fiber materials for eco-friendly craft industries in Bangladesh. (Sources: [22, 23]).

### Clay Product Making and Selling Zone

Clay-based industries, including pottery and idol-making, are closely tied to Pirojpur's Hindu religious practices (Durga Puja and Saraswati Puja). Creating a clay-making and selling zone near ghats would

preserve this craft, provide secure livelihoods for artisans, and reinforce the canal's role as a cultural corridor. This aligns with broader heritage-based urban renewal strategies that integrate crafts into canal restoration [5].



**Fig. 17:** Existing clay craft shop beside Damodar canal (Source: Field Survey, 2025)

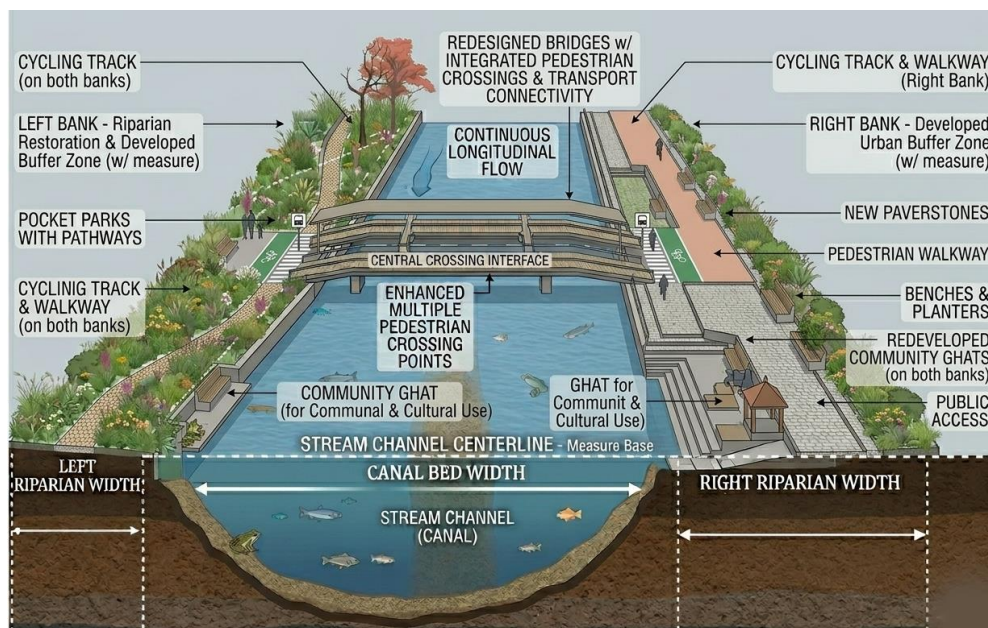
### Edge Connectivity

Improved water edge connectivity is central to repositioning the Damodar Canal as an integrated urban spine. Measures include:

- Developing walkways, cycling tracks, and green buffers along both banks, enhancing mobility and recreation.
- Redesigning bridges for safe pedestrian crossings and integrated transport connectivity.
- Introducing ghat redevelopment for

religious and communal use, balancing socio-cultural practices with ecological sensitivity.

As outlined in the development plan, improving connectivity will reduce spatial fragmentation, support tourism, and promote civic pride in the heritage building. Comparative studies in Dhaka and Narayanganj indicate that walkable, accessible canal fronts strengthen urban resilience and public ownership [7].



**Fig. 18:** Conceptual diagram of edge connectivity along Damodar canal (Source: Author, 2026)

## CONCLUSION

The proposed interventions aim to create a vibrant, sustainable future for the Damodar Canal by integrating ecological restoration, cultural heritage preservation, and economic revitalization. By incorporating floating vegetation systems, buffer zones, traditional markets, and improved connectivity, we can transform the canal from an overlooked drain into a thriving, multifunctional urban asset. This strategy aligns with global best practices in water-centric urban renewal and respects Pirojpur's unique socio-cultural and ecological context. Key recommendations include introducing floating vegetation for ecological restoration, establishing a 10-meter buffer zone to prevent encroachment, developing floating and boat markets, designating areas for fishing equipment and clay-making, and promoting coconut fiber-based industries. These initiatives will help revive lost land uses and heritage practices while effectively addressing contemporary urban challenges. Additionally, enhancing connectivity by creating walkways, bridges, and ghats will turn the canal front into an inviting public space, reinforcing its socio-cultural importance and increasing

resilience to floods and waterlogging. The Damodar Canal is a site of both pressing urban issues and untapped potential. Its present state reflects the consequences of neglect—ecological degradation, infrastructural dysfunction, and cultural erosion—while its socio-cultural significance and prime location provide avenues for comprehensive renewal. Therefore, effective redevelopment should embrace a holistic approach: restoring water functions, preventing encroachment, revitalizing historical land uses, enhancing public spaces, and protecting cultural practices. This framework, rooted in site-specific insights and strategic recommendations, will not only rehabilitate the canal as an ecological corridor but also reestablish it as a shared civic common central to Pirojpur's urban future.

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