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Waterways and Roads in the Pre-colonial Bengal Delta: A Historical Perspective

Md Mamunur Rashid[1], Dr. Nasir Ahmad[2]

[1,2]Associate Professor, Department of History, Jagannath University

Abstract

The paper reviews the general conditions of the transport networks in the pre-colonial Bengal Delta. This region has a rich history of political dynamics, a thriving economy, and active commercial ventures. In the pre-colonial period, two primary transport systems operated in the Bengal Delta: waterways, due to the riverine and coastal landscape, served as the main mode of communication, while road transport was utilised in the areas where water transport was minimal. Variations in nature, capacity, shape, and functionality of these transport systems were influenced by the distinct geo-environmental features of the region. This paper serves as an in-depth exploration of pre-colonial transport systems, providing a foundation for understanding the evolution of modern transportation in Bengal.

Keywords: Pre-colonial, Bengal Delta, Geo-environmental

Introduction

This paper provides an overview of the transport networks in the pre-colonial Bengal Delta, shedding light on the nature and characteristics of these networks. Commercial activities played a crucial role in shaping the transport networks of the region. Two types of transport systems predominantly operated in this region. Water transport was the chief means of communication due to the presence of riverine and coastal landscape. Another option was the road transport system, which was used mainly where water transport was minimal. The article argues that the Bengal Delta exhibited two distinct transport systems during the pre-colonial period, flourishing along with corresponding economic and commercial developments.

Before the British colonial period, the Bengal Delta was encompassed within *Subah Banglah*, the eastern province of the Mughal Empire. Recognised as one of the affluent provinces, *Subah Banglah* experienced notable socio-economic progress, fostering vibrant trade and commercial activities both regionally and internationally. The Mughals recognised the importance of a well-developed transport network to uphold political, economic, and strategic ties with Bengal, leading to the establishment of an efficient and organised transport system in the region. Under the rule of the Mughal Empire, an extensive road network, including the renowned Grand Trunk Road, was established in Bengal. This road network facilitated the transportation of various goods and passengers via carts, palanquins, and animals such as oxen, buffalo, and horses. On the other hand, the Bay of Bengal was a crossroads for Indian Ocean maritime trade, with numerous ports in the Bengal Delta operating as crucial international terminals. Valuable commodities such as cotton, silk, sugar, and other products were exported from the Bengal Delta to diverse global destinations, sustaining a flourishing international trade route. This paper explores a detailed analysis of the pre-colonial transport systems in greater detail as a background for studying the development of the modern transport system.

This study mainly uses qualitative methods based on primary and secondary sources. The primary sources are mainly derived from published and unpublished archival records such as government and public documents, reports, gazetteers, travellers accounts. Apart from the archival data, the research draws heavily from secondary materials, such as printed or online versions of books, journal articles, etc. These primary and secondary materials have been used to test this research's theoretical and empirical issues.

Geographical Setting of Transportation

Comprehending the transport geography is pivotal for assessing the transport infrastructure of a given region. As outlined by Rodrigue (2020), terrestrial space embodies three basic spatial features: topography, hydrology, and climate. Munshi (1980, p. 7) expounds that "the physical layout of a terrain strongly influences routes of transportation and communication, subjecting them to varying degrees of deflections from the shortest route, depending, of course, on the technology of transportation and the need of the economy."

The strategic positioning of the Bengal Delta between South Asia and Southeast Asia, coupled with diverse geographical characteristics, rendered the transport history both significant and fascinating. As early as 1688, German traveller Mandelslo (1669, p. 21) provided a geographical overview of Bengal in these words: "The Province of Bengala may no doubt be numbered amongst the most powerful of all the Country, giving its name to the Gulf into which the Ganges disembogues itself by four several channels or mouths. Its principal Cities are Raajmahal, Kaka, or Dacca, Philipatan, and Satigam." The core region of the Bengal Province, spanning both the Mughal and British colonial eras, encompassed the geographical expanse known as the Bengal Delta (Munshi, 1980; 1988).

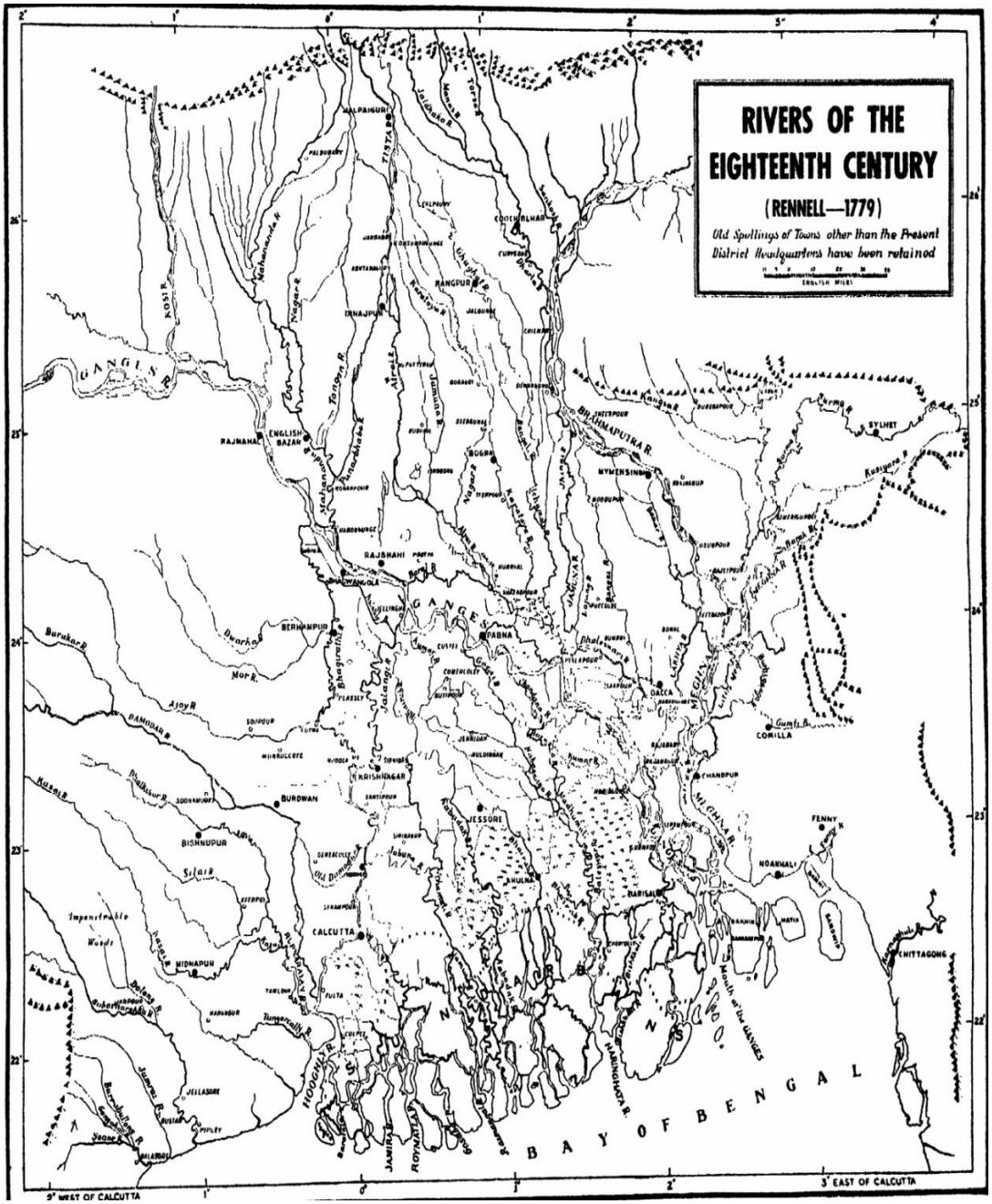
The Ganges (Padma), the Brahmaputra (Jamuna)), and the Meghna River systems formed and nurtured the Bengal Delta. This deltaic region is also unique in the world with its numerous smaller rivers, tributaries, distributaries, and tidal channels that have profoundly influenced the evolution and dynamics of the transport system within the delta. With the deltaic land rarely rising above 20 feet above sea level, the rainy season transforms it into an extensive watery labyrinth, necessitating the predominant use of various types of boats as the primary mode of transportation across many areas. Consequently, roads and railways were developed in this region only on high embankments with many culverts and bridges to drain the water of rivers and lakes (Munshi, 1988). In the pre-colonial period, the unique geographical characteristics of the Bengal Delta significantly influenced the traditional transport system. However, in the colonial period, modern projects involving the construction of railways and roads often modified this natural landscape, persisting into the post-colonial era.

Waterways

The extensive coastal region and river network in the pre-colonial Bengal Delta served as a vital waterway for trafficking passengers and goods, facilitating both local and international trade activities. The earlier people of this deltaic land depended on these rivers for trade and commerce. The arrival of European traders in the Bengal region not only resulted in a surge in business volume but also brought about significant transformations in riverine activities, shaping them into strong commercial networks. From the seventeenth to the nineteenth centuries, the creation of commercial hubs along the riverbanks paralleled the expansion of inland waterways (Munshi, 1988). Navigable rivers were also linked with a well-organised land transport system in their respective areas for trading and traveling during these periods (Habib, 1982). Concurrently, the Bay of Bengal emerged as a commercial crossroad throughout the Indian

Ocean, facilitating maritime trade activities spanning from antiquity to the modern period (Sarkar, 1987; Amrith, 2013).

Figure 1: Rivers of Bengal in the Eighteenth Century



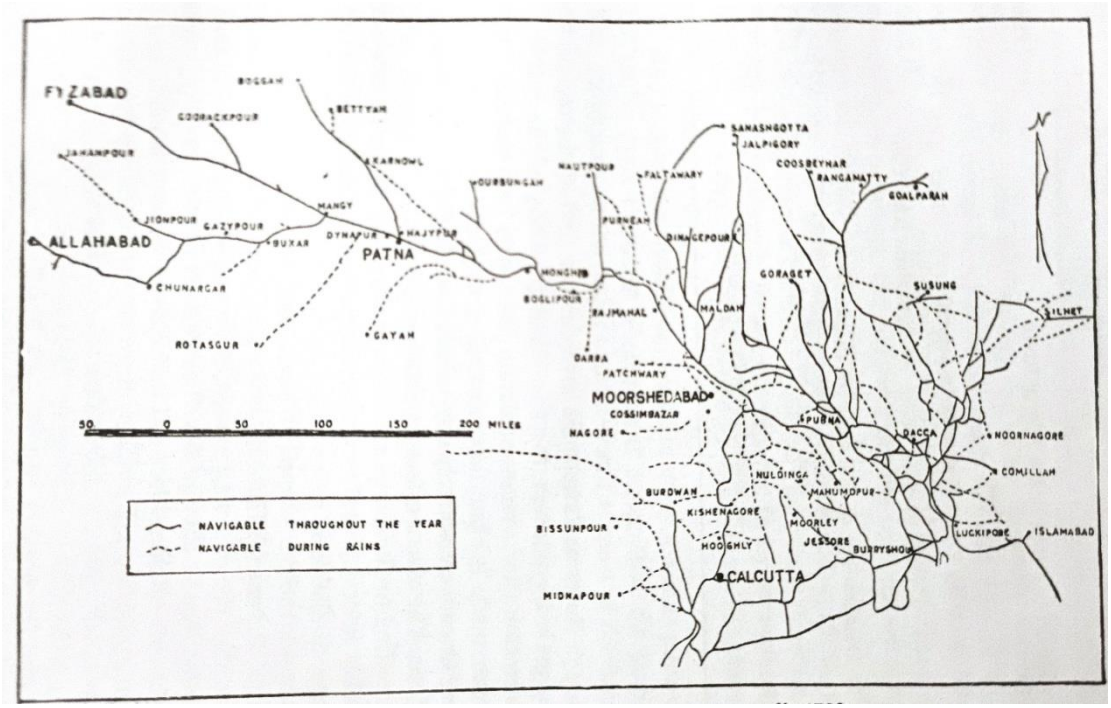
Source: Chatterjee, S. P. (1949). *Bengal in Map*. Orient Longmans Ltd. P. 13

(i) Inland Routes and Trade

The main inland navigation routes of the Bengal Delta ran through the Ganga and the Brahmaputra rivers and their tributaries. Depending on their size and navigability, all rivers were used for local or inter-regional trade. The Ganga was navigable throughout the year, and in the easterly direction, the Ganga became deep in its bed and more expansive through its tributaries. Five hundred miles from the sea, its

channel remained thirty feet deep even in the driest season. For instance, the Hooghly River ran across Kolkata and was always navigable towards the sea from the city (Munshi, 1980, p. 18).

Figure 2: Inland Navigation in the 18th Century Bengal



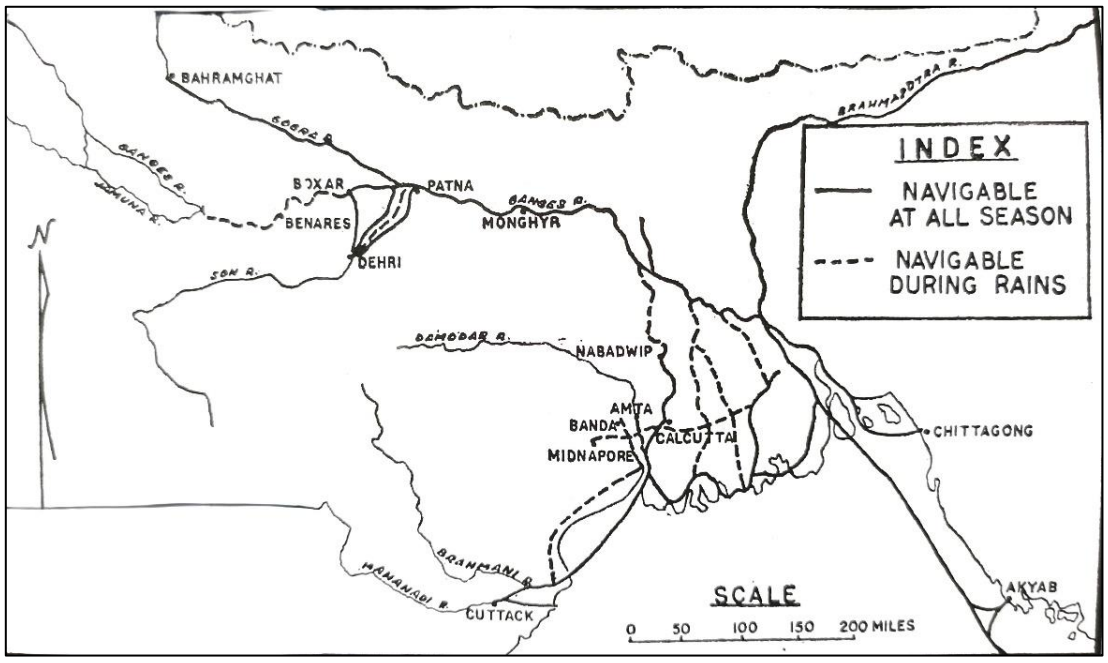
Source: Munshi, 1980, p. 19.

The Padma River emerged as a vital channel connecting the Brahmaputra and the Meghna systems in the east with the Ganga system in the west. In pre-colonial times, the Padma River was one of the busiest water routes, facilitating trade between key centres such as Dhaka, Patna, and Kolkata (Munshi, 1988). The extensive network of distributaries stemming from the Padma, moving through a triangular area bounded by the Padma-Meghna and the Bhagirathi-Hooghly systems, served as a very useful inland waterway within the Bengal Delta. By the end of the eighteenth century, the Mahananda River had evolved into a navigable and expansive water passageway. Buchanan (1928, p. 591) noted that the best and largest canoes were used in the year-long navigable branches of the Mahananda.

Prior to the advent of the railways in Bengal, the Brahmaputra River served as the only means of transportation connecting the northeast with the rest of India. As tea and jute cultivation and industries progressed, the importance of the Brahmaputra increased, establishing it as a crucial waterway for trade and commerce (Assam Report, 1880; Saikia, 2019). Concurrently, the role of the Meghna was always vital throughout the nineteenth century, standing out as the sole navigable river year-round, extending up to Tripura, and accommodating trading boats carrying burdens up to 4 tons. The major rivers, like the Surma and the Kushiyara, were the most notable for transportation over the years. Moreover, the Gumti, Dakatia, and Titas provided navigable passages for crafts weighing 4 tons throughout substantial stretches of their courses. The Buriganga and the Dhaleswari held importance within the Meghna system in the vicinity of Dhaka, fostering extensive communication and commercial activities in the region (Munshi, 1988).

According to Rennell, certain inland navigation routes in Bengal made connections between Kolkata and key destinations, including Dhaka, Dinajpur, and Rangpur. These routes encompassed diverse passages: from Kolkata to Dhaka via the Jalangi, the Sundarbans, and the Beliaghata and Chychungy Creek; to Dinajpur through Tangan, Punarbhaba, and Juffargonj; and to Rangpur via two interchangeable routes during dry and wet seasons (Rennell, 1788, pp. 363-364; Munshi, 1988). Moreover, Rennell described the major navigation routes across the delta, encompassing rivers such as the Ichamati, the Kabadak, the Bhairab, the Chitra, the Nabaganga, the Chandana, the Madhumati, the Baleswar, the Haringhata, and the Arial Khan, which established crucial links between the delta's upper regions and its southern and south-eastern perimeters. Within the Sundarbans, various streams served as an integrated inland navigation system throughout the lower part of the delta (Munshi, 1988). The Karnaphuli River, originating from the Lushai Hills and flowing south-westerly towards the Bay of Bengal, played a vital role in regional navigation. Hunter noted that the river remained year-round navigable up to Kasalang, situated above Rangamati approximately one hundred miles from the river mouth, accommodating large native boats carrying burdens of 4 tons. Beyond Kasalang, a stretch of 20 miles offered navigability for smaller boats (Hunter, 1876, pp. 25, 125).

Figure 3: Navigable Waterways on the Gangetic Plain, 1946



Source: Johnston (1947). *Inland Navigation on the Gangetic Rivers.*

Travel by water transport was time-consuming, contingent upon factors such as navigability, current velocity, and wind direction. For instance, the journey from Dhaka to Kolkata by boat spanned approximately one month in distance. In the period from early November to late May, the standard navigation speed averaged four miles per hour, enabling voyages of fifty to seventy miles per day during the remainder of the year (Rennell, 1788, p. 360). Favourable weather conditions allowed larger boats to progress against the current at a rate of seventeen to twenty miles daily (Rennell, 1781, p. 6; 1788, pp. 361). During high tide, reaching Patna from along the Ganga route could be achieved in merely twenty days (Munshi, 1980). According to a traveller from the early nineteenth century, the voyage from Kolkata

to Kanpore typically lasted close to three months (A Tour Through the Upper Provinces, 1829, p. 270). Alfred Brame, a marine superintendent of the British-India, portrayed the state of navigation by emphasising:

"In the days before steamers and railways appeared in India, the principal means of transport in Bengal and the Province of Hindustan was by boats, laboriously towed or sailed over the magnificent waterways of the Ganges and its affluent. Tedious indeed must have been the conditions of travel in days when it took one month to reach Munghyr, two months to Buxar, and three months to Allahabad, the passenger being cooped up in pinnaces and budgerows and deprived of the amenities of life as we know them in the shape of electric fans, ice, and other luxuries (Brame, 1917, p. 714)."

According to Fazl (1873, p. 50), a variety of vessels were used for inland navigation in Bengal, catering to various functionalities such as warfare, freight transport for passengers and goods, or swift movement. Among these vessels, several were commonly employed during the Mughal period, including *parao*, *patella*, and *jalia*. European travellers of the seventeenth and eighteenth centuries documented sightings of large boats capable of carrying 100 tonnes or more (Foster, 1921, p. 185). Around the same period, John Jourdain observed substantial barges with capacities of 400 or 500 tonnes (Foster, 1921, p. 162). In the 1740s, Peter Mundy encountered barges or *bazra* of 400 tonnes, described as 'Great Men's Pleasure Boats' (Temple, 1914, pp. 157-58). British traveller Bowrey (1905, pp. 149-50, 161-63) noted the presence of vessels ranging from 400 to 600 tonnes sailing up to Dhaka along the Ganga River.

In the 1780s, Bowrey (1905, pp. 225, 229) provided insights into various types of boats used in Bengal during that era. He mentioned that "all the Saltpetre is Sent hence to Hooghly in great flat-bottomed Vessels, of an exceeding strength, which is called *patelas*, each of them will bring down 150-225 tonnes." Furthermore, he identified other boat types such as Ulok, Woolock, or Olocko, which were utilised for fair, while Budgaroo or *bajras* served as pleasure boat. Purgoo, or Porgo, was engaged in carrying goods from the river to the sea, and Boora typically sailed along the coast but occasionally voyaged between Hooghly and Dhaka (Bowrey, 1905, pp. 227-29). In addition to these vessels, *Bhauliyas* and *pansis*, were designated for inland navigation and employed exclusively for private purposes rather than for hire. *Hulyas* and *Dinggis* functioned as open boats, utilising for fishing and ferry services. Canoes, characterised by their considerable size, were instrumental in transporting grain. *Palwars*, branded as pilot vessels, assisted in navigating heavy loads through sandy passages (Buchanan, 1928, pp. 588-592; 1939, p. 705).

Rennell noted the employment of around 30,000 boatmen on the Ganga, the Brahmaputra, and their tributaries. Facilitating the annual transport of goods worth approximately £2000000.00 worth of goods (Rennell, 1788, p. 335). The fertile expanse of the Bengal delta served a significant agricultural powerhouse, not only meeting local demand but also supplying food grains to regions facing deficits across India. The prime trading goods were sugar, rice, wheat, salt, mangoes, silk, cotton, and other luxury products. The principal trade and urban centres such as Sripur, Satgaon, Hooghly, Dhaka, and Kolkata emerged as pivotal nodes where all the navigation and land routes met, providing extensive commercial activities (Sarkar, 1987, pp. 141-42, 144).

(ii) Coastal and Maritime Navigation

In earlier times, Asian maritime trade revolved around the two principal spheres: the western Indian Ocean and the Bay of Bengal (Prakash, 1998, p. 14). The commercial domain of the Western Indian Ocean encompassed vital trade links spanning the Red Sea, the Persian Gulf, and the Mediterranean. On the other hand, the western Bay of Bengal facilitated trade between Bengal, Sri Lanka, the Maldives, and the Malabar Coast, while the

eastern Bay of Bengal served as a channel for trade with Burma, the Straits of Malacca, and the South China Sea. The Bengal Delta, boasting extensive coastal zones and many ports in the Bay of Bengal, flourished with sophisticated maritime navigation and overseas trading activities, notably evolving in the 12th century.

In the 1760s, Bernier (1916, p. 437) portrayed the ocean trade of Bengal with the following depiction:

"*[Bengal]* produces rice in such abundance that it supplies not only the neighbouring but remote states. It is carried up the *Ganges* as far as *Patna* and exported by sea to *Maslipatam* and many other ports on the coast of *Coromandel*. It is also sent to foreign kingdoms, principally to the islands of *Ceylon* and the *Maldives*. *Bengal* abounds likewise in sugar, with which it supplies the kingdoms of *Golkonda* and the *Kamatic*, where very little is grown, *Arabia* and *Mesopotamia*, through the towns of *Moka* and *Bassora*, and even *Persia*, by way of *Bender-Abbasi*."

Schorer, an early eighteenth-century traveller, reported on the diverse trade activities in the coastal regions of Bengal, Arakan, Pegu, and Tenasserim. Ships navigated these waters to carry a wide range of commodities, including cotton cloths, glass, iron, cotton yarn (red and white), tobacco, spice, sandalwood, and certain shells used as currency substitutes in Bengal and Arakan. Upon return, the cargo consisted of rice, butter, oil, gingelly seed, sugar, a variety of woven cloths, some finely embroidered quilts, rubies, sapphires, lac, pitch, benzoin, China root, gold, tin, eaglewood, sappan-wood (used for red dyeing), large Martaban jars, and a beverage known as nipa (Moreland, 1931, pp. 59-60). Similarly, Captain Alexander Hamilton mentioned some trading goods from Bengal, such as opium, long pepper, and ginger (Foster, 1930, p. 21). In the *Early Annals of English in Bengal*, some regular export commodities of Bengal were stated, such as rice, oil, butter, cumin seeds, long pepper, saltpetre, turmeric, and raw silk, among others (Wilson, 1895, pp. 398-99).

In pre-colonial Bengal, two distinct types of ships were prevalent—the dhow and the junk. The dhow was instrumental in the maritime trade within the western Indian Ocean and built by the influence of Arab mariners. On the other hand, junk, a larger vessel, originally stemmed from Chinese maritime traditions and was commonly used on extensive maritime trade routes in the eastern expanse of the ocean. However, the South Asian iteration of the junk was slightly modified from its Chinese prototype (Anjum, 2010, pp. 73-74; Raychaudhuri & Habib, 1982, pp. 127-28). Apart from these significant ship types, many smaller vessels, such as the *ghurab, tawry, sambuk, shibar, manchua, balloon, purgo,* and *masula*, among others, operated along the deep sea and coastal regions (Anjum, 2010, pp. 73-74).

The Bengal Delta possessed many ports with river systems, creeks, estuaries, and an expansive hinterland. Sripur, Chittagong, Satgaon, and Hooghly emerged as pivotal ports within the region. Satgao, also known as Porto Pequeno, thrived in prominence until the sixteenth century. In the mid-sixteenth century, the Portuguese established Hooghly Port, renowned for its enhanced navigability and ability to accommodate larger vessels. In the eastern territory near Dhaka, Sripur was the most common river port and trading centre. Chittagong, alternatively recognised as Chatgaon and Porto Grande, emerged as a prominent seaport and a flourishing emporium, fostering Indian maritime trade (Sarkar, 1987, pp. 80-82).

The amalgamation of traditional shipbuilding practices with Arabian and Chinese methodologies played a significant role in manufacturing a diverse type of ship in the South Asian region, culminating in a distinctive regional character (Raychaudhuri & Habib, 1982). However, as the eighteenth century unfolded, these traditional shipbuilding techniques experienced a decline influenced by Europeans practices. The East India Company actively engaged in shipbuilding industries using European methodologies. Gradually, guided by European expertise, various types of new boat and ship variants

gained momentum, reflecting a shift towards contemporary maritime construction practices (Awwal, 1992, p. 322).

In the Bengal Delta, several boatbuilding and shipbuilding factories flourished, with an emphasis on the former due to larger-scale production compared to the latter. In the Bay of Bengal, for port-to-port trade and merchandise collection, smaller ships held preference for their movability, ensuring comfort of access to ports. English traders originating from Balasore mentioned that there was no scope for trade in the Bay without small vessels, as the larger ships remained anchored at a distance from the shore due to shallow water, with smaller boats ferrying supplies to these ships (Foster, 1911, pp. 42-44; Foster, 1930, p. 394).

Sripur, a river port, played a pivotal role in the manufacturing of small ships or boats, serving as a repair centre where Portuguese sailors used to come for ship repair. In 1633, some Englishmen recognised Balasore as a great seaport where many vessels were built (Wilson, 1895, pp. 9, 11-12). European powers like the English and Dutch engaged in constructing small ships for the Mughal authorities. For instance, the Dutch crafted a galliot for the Nawab at Hooghly and delivered it to Dhaka. Under the supervision of William Pits, an Englishman, a galliot was built in Dhaka. In 1663, Thomas Pratt, another Englishman, was appointed by Subahdar (Governor) Mir Jumla to manufacture boats (Foster, 1915, pp. 70-71, 294). Moreover, the Bay territories accommodated the construction of large ships ranging from 400- 600 tonnes (Temple, 1905, pp. 161-63). The *sarkar* of *Bazuha* (partly Rajshahi, Bogura, Pabna, and Dhaka districts in Bangladesh) within the Bengal Delta possessed abundant wood and iron resources suitable for the ship construction factories (Fazl, 1873, p. 124; Habib, 1982, p. 48).

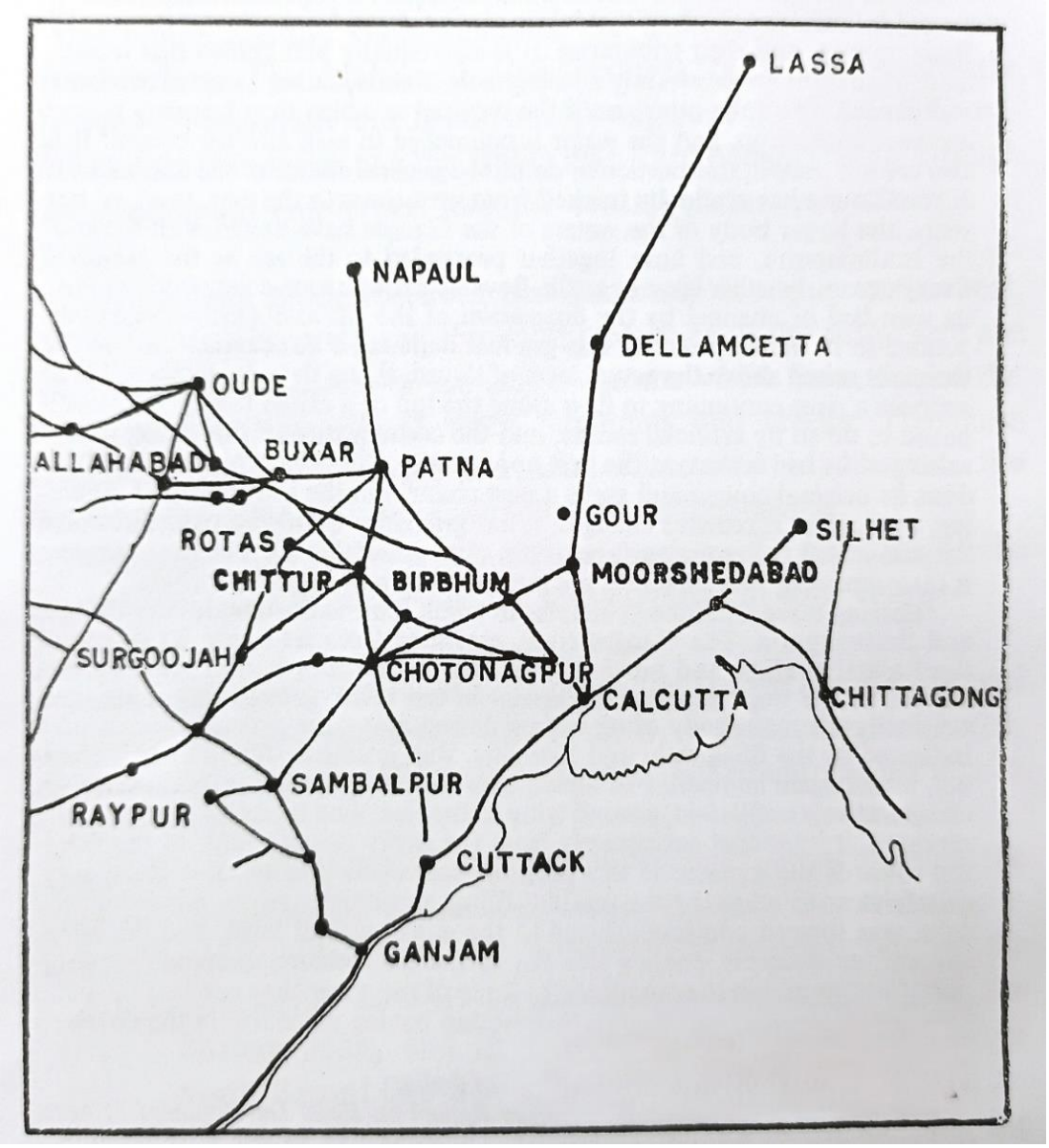
Land Routes

In pre-colonial Bengal, roads often remained important for commercial and military purposes and for the regions where the navigational route could not reach. One of the pioneering examples of a great highway in pre-colonial South Asia was the Grand Trunk Road, or Badshahi Sarak (Emperor's Highway). Constructed by the esteemed Afghan ruler Sher Shah in the early sixteenth century, this road spanned from Sonargaon in Bengal to Rohtas in Punjab, serving as a crucial linkage between the eastern and western regions of India (Sarkar, 1987). Both sides of this road were decorated with trees and spotted with wells and rest houses, or *sarais* (Sarkar, 1987; Buchanan, 1928, p. 596).

According to the comprehensive surveys conducted by Rennell (1788) as referenced by Munshi (1980, pp. 16-17), a network of six major routes interconnected all Mughal provinces with Bengal, delineated as follows:

1. The first route established a connection between Kolkata and Allahabad via Murshidabad, Monghyr, and Patna, tracing the course along the Bhagirathi and the Ganga.
2. The second route traversed through Burdwan, Birbhum, the plains of south Bihar, extending towards Benares and beyond.
3. The third route towards western India diverged from the second at Burdwan, proceeding to Rhotas on the Son River through Ramgarh on the Ranchi, subsequently re-joining the second. Collectively, these three routes constituted the primary western land roads originating from Bengal.
4. The fourth route accessed the North Bengal from Murshidabad via Rajshahi across the Padma River.
5. The fifth route meandered through southern deltaic region of Bengal en route to Dhaka and Sylhet, encompassing a rugged land passage interlaced with numerous rivers and canals.
6. The sixth route charted a course along the coast, advancing from Midnapore to Balasore, Cuttack, and Ganjam, facilitating coastal linkage and trade connectivity within the region.

Figure 4: Roads in Eastern India and Bengal in the 18th Century



Source: Munshi (1980)

As documented in Ain-i Akbari, the Bengal Delta featured a network of roads and embankments, including:

1. The first road passing atop an elevated embankment extending from Dhaka to Sangramgarh in the Noakhali District.
2. The second road from Bagdwar to Kuch Bihar, a road dating back to ancient times, spanning from Kamatapur to Ghoraghat via Bhotemari, Dhap, Malang, Pirganj, and Vagdvar in North Bengal.
3. The third road from Rangamati to Kuch Bihar (Habib, 1982, p. 48).

Additionally, numerous highways radiated from major cities and trade hubs in Bengal and Assam, including:

a. Chittagong-Noakhali-Comilla-Dhaka-Mymensingh.

b. Rajshahi-Bogura-Rangpur, potentially extending southwards via Malda and Murshidabad to the Sundarbans (Sarkar, 1987, p. 112).
c. Kamali Alli-Kuch Behar to Narainpur (approximately 350 miles).
d. Tengrai Raj Alli-Rangpur to Kamrup (approximately 400 miles) (Shakespeare, 1914, pp. 1-3; Sarkar, 1987, p. 112).

In the pre-colonial Bengal Delta, the roads were primarily earthen and lacked well-maintained surfaces. During the rainy season, the road conditions became troublesome, and goods were generally not carried in carts. Most of the bulk freight was transported by waterway. Buchanan stated that "all internal commerce became stagnant as the road conditions were so bad during the rainy season." "No one who has seen the conditions of these (crossroads) could believe that a country extremely populous and rich, and having such occasion for land conveyance, should be so ill provided," as he also noted (Buchanan, 1939, p. 705). Due to the riverine character, waterways remained the most important for transporting goods and passengers in all seasons. The extensive network of water routes, especially crucial during the monsoon season, facilitated trade and commerce by ensuring accessibility to every corner of the deltaic landscape. Consequently, trade and commerce mostly depended on the water network, as the earthen roads were unable to serve their purposes adequately.

During the Mughal period, there were some bridges across Bengal's rivers, which may provide a good picture of the road connectivity of this era. Notable bridges included those located in the north of Rajmahal, the south of Dugachhi, and masonry bridges in Dinajpur and Pagla, with the latter being brick-built under the supervision of Mir Jumla. In the west of Sripur, the masonry-built Mirkadim Bridge and Taltala Bridge featured three arches each, with the Mirkadim Bridge spanning 173 feet (Habib, 1982, p. 48). Rennell's map also highlighted bridges like Tongi Bridge, Khwaja Amber Bridge, Gandaria Bridge, and Karimpur Bridge in Dhaka, predominantly constructed using terracotta and lime mortar bricks. Skilled masons from Agra and Delhi were instrumental in the construction of these bridges (Ratul & Alam, 2020). Though these bridges enhanced the road network to some extent, their limited number rendered them insufficient for connecting all areas, leading to frequent disruptions from water bodies. As a result, the river network predominantly influenced economic activities until the advent of modern transportation systems in the delta region.

Before the advent of modern transport systems, carts and beasts of burden served as primary mode land transportation in the Bengal delta, with the humped Indian ox playing a significant role. Oxen and buffaloes were typically used to pull wagons, with one or a pair of oxen tasked with this duty (Tavernier, 1925, p. 32). However, in the case of heavier loads or uneven terrain, more than two oxen or even sixteen oxen were deployed for transportation purposes (Sen, 1949, pp. 73-75; Temple, 1914, p. 281).[1] Carriage bodies were generally made of wood, although bamboo was occasionally used in constructing the upper part of carts. According to French traveller Thévenot, wagon wheels lacked spokes and were made of one whole piece of solid timber akin to a millstone, with the wagon base comprising a thick frame of wood (Sen, 1949, p. 75). Similarly, as Fryer (1909, p. 157) notes, the main structure of coaches and carts was built of timber, emphasising durability and sturdiness.

The peasant communities usually used pack-oxen or carts to carry agricultural production from outlying villages to urban centres (Habib, 1999, p. 421). These ox-driven carriages typically carried loads ranging

[1] Thevenot referred to carts drawn by eight or ten oxen according to the heaviness of the loads.

from 120 kg to 176 kg.[2] Items of significant bulk but relatively low value, such as rice, pulses, millet, wheat, sugar, butter, and salt, were commonly freighted by oxen. The Mughal administration extensively utilised oxen for various purposes, ranging from hauling building materials and fuels to transporting water and baggage (Fazl, 1873, p. 151; Howkins, p.104). For instance, a sizable fleet of 600 carts was dedicated to carrying fuel (wood) required for the imperial kitchen throughout the year, while an additional 200 were specifically deployed for conveying building materials (Fazl, 1873, p. 151).

During the Mughal reign, emperors also showed their interest in the breeding and husbandry of animals (Fazl, 1873, p. 149). An imperial report reveals that Emperor Akbar maintained a considerable number of 7,000 oxen in his imperial stable at the time of his passing (Anjum, 2010, p. 25). Prior to the British colonial era, European trading companies in Bengal mostly used hired oxen for the transportation of goods to their factories and ports. These oxen served as vital freight carriers and cart pullers, offering a cost-effective but relatively slow mode of transport. Mundy mentioned their pace of around 6 or 7 miles daily (Temple, 1914, p. 96; Foster, Factory Record, 1906-27).

In Mughal India, oxen were also used for riding, as Tavernier mentioned, "... I come to the manner of traveling in India, where oxen take the place of horses ... These oxen allow themselves to be driven like our horses, and have for sole bridle a cord, which passes through the tendon of the muzzle or the nostrils (Tavernier & Crooke, 1925, p. 36)." Similarly, Thevenot observed the riding process on oxen, remarking that they could be saddled like horses and spurred to achieve considerable speed, akin to a well-trained equine companion (Sen, 1949, p. 73). The riding oxen proved to have swifter movement compared to the freight oxen. Abul Fazl (1873, p. 149) confirmed this argument, indicating that they could cover distances of up to 120 miles within a 24-hour period. Mandelslo (1969, p. 58) echoed this statement, describing how an ox carried him around 20-25 miles in less than 4 hours. Horses were primarily reserved for the transportation of wealthy individuals, officials, and travellers, while also serving as pack animals for small traders. A horse usually pulled around 40 kg of weight and offered faster travel speeds compared to oxen (Buchanan, 1928, p. 594). Mules were typically employed for carrying loads, providing a more affordable alternative to horses, while elephants were occasionally deployed for riding, despite being a more costly option to hire. Porters were employed to carry belongings within a settlement to the nearest location, providing localised transportation needs, while caravans were instrumental in transporting goods from remote regions (Buchanan, 1939, p. 706). Palanquins were particularly preferred by the affluent, especially for the conveyance of noblewomen in aristocratic circles.

The Bengal Delta possessed a thriving transport system long before the colonial era. During this time, the region became a centre of agriculture and a hub of sustainable trade and commerce, fostering the gradual evolution of an expansive transport network stemming from these economic activities. The surplus agriculture production and goods from trade could seamlessly be transported from one place to another using transport systems primarily reliant on waterways. A unique feature of the Bengal Delta was the dominance of the fluvial network over land transport in socio-economic life. Traditional boats, ranging in size, provided the primary means of transportation year-round, with the bulk of merchandise and passengers being freighted through the waterway. Especially in the rainy season, river networks became

[2]Mundy noted the weight of carrying goods by oxen was around 120 kg, see in Travel of Peter Mundy in Europe and Asia, 1608-1667, vol. II, Cambridge: The Hakluyt Society, p. 95, 98. Whereas Tavernier believed that it was as much as around 148.327 or 176.90kg, see in Tavernier (1925), Travels in India, 1640-67, vol. I, Oxford University Press, pp. 32-33. According to English Factory Records, a bullock generally could carry approximately 140.28 kg. See also in English Factories in India, 1618-69, 13 vols., Oxford.

vital to maintaining connectivity due to the bad conditions of the earthen roads. While land transport was moderately developed in the pre-colonial Bengal Delta, connecting the main localities with river networks. Together, these transport systems provided the pre-colonial Bengal Delta's trade, commerce, and other economic well-being. The inherited transport systems of the region proved instrumental for the British colonial rulers during their initial occupation, providing a solid foundation for the transportation infrastructure in the area.

Conclusion

In the pre-colonial Bengal Delta, the evolution of waterways and road transportation systems corresponded with socioeconomic and commercial developments. Waterway emerged as the leading commercial network, which connected almost every corner of this region. The riverine and coastal landscapes of the region usually shaped the transport networks until it corresponded with mechanised tools that upgraded the efficiency of the transport systems in the region. Despite the use of road networks in areas where water transport was minimal, its significance was determined by the extensive river network. This was largely due to the various geophysical constraints that limited the effectiveness of road transportation.

The extensive plains of the Bengal Delta played a crucial role in the development of an extended road network. As a part of the Mughal Empire, the Bengal Delta possessed a considerable road network like, the Grand Trunk Road, to provide the transportation of goods, particularly in areas where rivers were unnavigable. However, the roads in the Bengal Delta were primarily earthen, making them unmovable for carts during the rainy season. These limitations increased the importance of the river network in the region. The above discussion shows that the waterway remained the most significant means of transportation in the pre-colonial Bengal Delta due to its inherent riverine characteristics. Traditional boats of various sizes served as the primary means of conveyance throughout the year, particularly for transporting bulk merchandise. During the rainy season, the river network became even more vital when the troublesome condition of the roads did not meet cargo transportation needs effectively.

The discussion also highlights the development of the transport systems, which was shaped by their distinctive natural characteristics within Bengal territories. Boats were usually built using local traditional techniques, gradually incorporating advanced technology from outside the region. For instance, ship manufacturing methods were generally inspired by Chinese junk but synchronised with their regional nature in this region. In addition, frequent changes in the transport and communication systems were driven by increasing political, economic, and commercial activities for regional and local development. The progress of the traditional transport system continued with the expansion of other sectors. The geo-environmental features also influenced the whole development trajectory of the transport system across the region.

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