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Development of Modern Transport System in the Bengal Delta and British Borneo: A Comparative Environmental Perspective, 1850-1963

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Abstract

This paper presents comparative studies of modern transportation systems in the Bengal Delta and British Borneo. To meet the demands of the new modes of resource extraction, the British colonial rulers introduced a new transportation system in both regions and built roads, railways, and navigational routes connecting major commercial and political centers. There has been little research into the historical connections between modern transportation and environmental changes in colonial South Asia and Malaysia. When modern transportation was introduced, environmental consequences were rarely considered. As a result, significant ecological changes and declines were unintentionally caused. The environmental changes brought about by these transportation systems in these two regions were not the same one from the other. For example, railroad construction harmed the plains and waterways in the Bengal Delta, whereas, in British Borneo, rubber plantations for the global market harmed the rainforests.

Keywords: *Railway, road, steamer, environment, epidemic, deforestation*

Introduction

The transport history of the Bengal delta and British Borneo is significant and fascinating because of the diverse geographical features. Both regions' physical environments have been profoundly influenced by the modernization of their economies and the expansion of their transportation networks. Multiple transportation networks are essential to many human endeavours, including agriculture, industry, urbanization, and so on. Natural processes like continental drift and volcanic eruptions have been responsible for most of the planet's environmental change in the past. Environmental changes caused by humans are more visible than those caused by natural forces. Increased resource extraction threatens the ecosystem (Millennium Ecosystem Assessment, 2005). From an environmental perspective, this paper

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compares and contrasts the introduction and development of the modern transport system in the Bengal Delta and British Borneo.

Modern transportation systems were introduced in the Bengal Delta and British Borneo by the British colonial rulers for the purposes of administration, commerce, and military. Traditional water and road transportation could not meet the needs of modern resource extraction, so they built new infrastructure like roads, railroads, and waterways to connect the major commercial and political centers of their respective countries. That modern transportation systems often ignored potential environmental impacts, which eventually led to remarkable ecological changes and declines such as landscape transformation, water body modification, deforestation and climate change is argued in the paper. When it came to environmental impacts, these two transportation systems had little in common despite their shared colonial goal of resource extraction. The railway had a negative impact on the Bengal Delta's plains and waterways. However, the rainforests of British Borneo have been largely obliterated by railway-road construction and the planting of rubber trees for export. A comparative approach is used in this paper to investigate the relationship between colonial South Asia's colonial transport system and environmental change in the Malay World.

Precolonial transport networks

The Bengal Delta

As part of the Mughal empire's Subah Banglah province, the Bengal Delta saw remarkable socio-economic and trade and commercial activity both within and outside its borders prior to British colonization. The Mughal Empire's political, economic, and strategic relations with Bengal depended on a well-developed transportation system. As a result, a well-structured transportation system developed in this area.

Waterway

Many navigable rivers and a large coastal area make the Bengal Delta an important waterway for both the export and import of passengers and goods. People have relied on rivers for commerce and trade since the beginning of time. Trade and commerce can take place on any river, depending on its size and navigability. The Ganga and Brahmaputra rivers, as well as their tributaries, served as the Bengal Delta's primary inland waterways. Throughout the year, the Ganga River was navigable (Munshi, 1980, p. 18). For centuries, the Padma River was the most important link between the Brahmaputra River system and the Meghna and Ganga rivers in the east and west. Prior to the establishment of the British Empire, this river served as one of the primary transportation corridors connecting Dhaka, Patna, and Kolkata (Munshi, 1988).

Railways in Bengal made it possible for people in the region to get around without having to rely on the Brahmaputra River. The importance of the Brahmaputra as a major waterway for trade and commerce increased as the tea and jute industries developed (Saikia, 2019; Goswami, 2010). The Meghna River was the only navigable river up to Tripura throughout the entire year in the nineteenth century (Munshi, 1980). According to Abul Fazl, Bengal's inland waterways had a wide variety of vessels designed for specific purposes, such as warships, freighters transporting both passengers and goods, and fast vessels like the Parao, Patella, and Jalia (Sarkar, 1949, p. 50). Flat-bottomed pinnaces, keelsless Bajras, Bhauliyas, Pansies, Ulak, Patelas, Hulyas, Dinggis, and Palwars were all used for inland navigation, according to Buchanan (Buchanan, 1928, pp. 588-92).

Land Route and Transportation

Roads remained important in precolonial Bengal for commercial and military purposes, as well as for reaching areas that were otherwise inaccessible by water. The Grand Trunk Road, or Badshahi Sarak (Emperor's Highway) from Sonargaon, Bengal, to Rohtas, Punjab, was precolonial South Asia's first great highway (Sarkar, 1987). In the words of Irfan Habib, the following roads and embankments are mentioned: The first road from Dhaka to Sangramgarh to traverse the elevated embankment (in Noakhali District). There is a second road, built-in antiquity, that connects Bagdwar with Kuch Bihar in North Bengal, running from Kamatapur to Ghoraghat via Bhotemari, Dhap, Malang, Pirganj and Vagdvar. The third place from the Rangamati to Kuch Bihar district (Habib, 1982, p. 48).

In the Bengal delta, before the arrival of modern transportation, carts and beasts of burden were frequently used. In the precolonial era, the humped Indian ox was a common mode of transportation (Tavernier, 1925; 1977). Rich people, government officials, and travellers rode in style on these steeds. In order to transport goods from remote areas, caravans were used (Buchanan, 1928; 1939).

The British Borneo

Precolonial British Borneo's precolonial transportation system was frequently depicted in its indigenous nature. An area's natural surroundings play an important role in the development of transportation infrastructure. Sabah, Sarawak, and Brunei, three regional states, heavily relied on their extensive river systems.

Waterway

Internal trade and communication in Sarawak relied heavily on river freight and distribution feeder services. Several major river systems cross Sarawak, including those that originate in the Sarawak-Kalimantan border ranges and those that originate on Sarawak's mid-coast but have matured over time (Kaur, 1995). Rajang is the main

river system in the area. The Belait, Brunei, Pandaruan, Temburong, and Tutong rivers comprise the Brunei river system. The different indigenous communities of British Borneo built and used a variety of boats, including the Pakerangan, Gobangigubang, Sapit, Dapang, and Kompit (Rutter, 1922, pp. 316-17, 348-50).

Land Route and Transportation

The British Borneo's land transportation system was not designed to cope with the region's challenging topography. Wet-swampy conditions downriver made it difficult to travel by land. Second, it was extremely difficult to get inside the tropical rainforest. Although the area was naturally restricted, there were a few paths and jungle tracks that were occupied by fallen tree trunks (Gomes, 1911, p. 148). Third, the mountains and hills served as an obvious physical barrier to transportation (Hatton, 1885, p. 6).

Foraging for forest goods was a common pastime in the jungles of Sabah. Although a road system was constructed in parts of the western region where rivers could not be crossed, these paths were little more than jungle tracks (Gudgeon, 1913, pp. 36-37). Sarawak, the southern part of British Borneo, had a very limited network of land routes prior to colonial rule. Only rivers and the sea served as a means of transport for goods and people between the towns and the rural areas. In the interior of the region, indigenous people built jungle paths that linked the rivers. The Dayaks, for example, constructed batang paths to gain access to interior spaces (Boyle, 1865, p. 57).

The kerbau or buffalo was the primary mode of transportation in British Borneo. In addition to being a means of transportation, the buffalo was also a source of food and currency. They pulled carts, ploughed fields, and hauled their owners around on the job. Other than buffalo, the people of the area relied on local ponies to get around (Kaur, 1994, p. 12).

Development of the Modern Transport System in the British Colonial Time

The Bengal Delta

Road Transport

Before the British colonial era, Bengal had a well-organized and extensive trunk road system. Trunk roads from the precolonial era were considered the most important communication networks in the early British period, despite the country's extensive waterways. Report of the Administrative Committee of 1867-68 stated that a large portion of Imperial communications expenses had been spent on trunk roads (Bhaduri, 1981). The British rulers recognized the importance of feeder roads in the deltaic Bengal when steam navigation and railways were put into operation in parts of the Bengal presidency. They also needed to extend imperial roads and provincial roads already in place (Bhaduri, 1981; Munshi, 1980).

The British government's road-building strategy was laid bare in the Annual Report for the years 1860-61. All districts were to have a single main road running through the center of town as the primary goal of this project. The imperial road was designed with communication in mind. The Lieutenant-Governor had attempted to build a network of local roads to serve as feeders for the railroads, linking the districts' most important cities (The Annual Report on the Administration of the Bengal Presidency, 1860-61, pp. 58-60).

Several important roads in eastern India were mentioned in the Annual Report for the years 1870 to 1871. This is a list that includes three important roads in the Bengal Delta: (a) the Darjeeling Trunk Road connecting Kolkata with Darjeeling through Berhampore, Bhagawangolla, Godagari and Dinajpur; (b) the Jessore Road connecting Kolkata with Faridpur through Bongaon and Jessore; and (c) the Chittagong Trunk Road connecting Daudkandi, Comilla and Chittagong. Annual report on the Bengal Presidency's administration, 1870-1871). The length of metalled and unmetalized roads in the Rajshahi, Dhaka, Chittagong, and Presidency Divisions of Bengal was noted in the Bengal Presidency Administration Annual Report, 1900-01 (See Table 1).

Table 1. Mileage of metalled and unmetalled roads

Name of Division	Total Metalled	Total Unmetalled
Rajshahi	$284\frac{5}{8}$	$5025\frac{1}{4}$
Dhaka	$60\frac{1}{4}$	$1395\frac{3}{4}$
Chittagong	15	$1361\frac{1}{4}$
Presidency	$534\frac{13}{24}$	$4515\frac{1}{4}$

Source: Annual Report on the Administration of Bengal Presidency, 1900-01

The First World War intervened in the pace of the construction of new all-weather roads and the development of others. Because the construction materials were not available in war time. (Munshi, 1980; Bhaduri, 1981). The road development between 1915 and 1926 is described in table 2.

Table 2. The road development between 1915 and 1926

Year	1915-14	1923-24	1924-1925	1925-1926
Surfaced Road Total Mileage	2,583 Miles	3,315	3,332	3,376

Unsurfaced Road Total Mileage	13,530	15,618	15,862	15,886

Source: Bhaduri, S. (1981). *Road Transport in West Bengal and Its Role in Area Development - A Geo-Economic Assessment*, PhD Thesis, University of Calcutta, p.18.

Road Development Projects Special Officer A. J. King was appointed by the Bengal Government in 1934 and ordered to prepare a road plan. A comprehensive report on road development projects for the Bengal government was published by him in 1938. There were approximately 91,936 miles of both metalled and unmetalled roads in the province, according to the report (King Report, 1938, p. 85).

Only after World War I did automobile transportation begin to have a significant impact on Bengal's economy. Commercial vehicles like buses and vans, on the other hand, began to be imported in significant numbers only in the early 1920s. Table 3 depicts the development of automobiles between 1913 and 1947.

Table 3 Motor Vehicles from 1913 to 1947

Year	Private cars	Motor Buses	Taxis	Commercial vehicles	Motorcycles
1913	3199		136		723
1914	3937		322		966
1923	10300		1167	867	2445
1924	12385		1430	1032	2863
1925	14560		949	818	3144
1926	17369		956	760	3482
1940	15876	1974	2245	3055	417
1941	19322	2270	2132	2833	1003
1942	16202	2341	3090	3364	506
1943	13477	1413	1611	4684	854
1944	13746	2541	4111	4871	917
1945	20984	3050	4117	6374	906
1946	13651	3921	4536	7806	1141
1947	17255	4636	4570	3921	1542

Sources: Bhaduri, S. (1981). *Road Transport in West Bengal and Its Role in Area Development - A Geo-Economic Assessment*, PhD Thesis, University of Calcutta, p. 26.

Railway

Although steam locomotives were introduced in England around 1825, Scottish engineer Macdonald Stephenson did not have the idea for an Indian railway until the 1840s. To get a better understanding of the terrain, possible routes, and cost-effectiveness, in 1844 he travelled to India after initially dismissing his first attempt as "wild project" (Mukharjee, 1994, p. 2). It wasn't until 1845 that he submitted his proposal for the first Indian railway system. At an estimated cost of about fifty million pounds, Stephenson outlines a massive outline of 'triangulating India with railway' that would connect Kolkata, Delhi, Mumbai and Madras as well as other major cities in India (Iqbal, 2006; 2010). In 1853, Lord Dalhousie's administration saw the beginning of the Indian Railway's first line between Thana and Bombay (Khosla, 1988, p. 1).

In 1862, the Eastern Bengal Railway (EBR) line was inaugurated from Kolkata to Kushtia near the Ganga to connect Kolkata with Dhaka. Southward, this line was extended to Goalando on the Ganga riverbank in 1871. (Iqbal, 2006; 2010). When the Northern Bengal State Railway was established in 1874, its route from Sara to Sirajganj and beyond was further expanded to include Dinajpur in the western Bengal region and Parbatipur in the eastern Bengal region between 1874 and 1879. It was merged with the EBR in 1887. Except for the Bahadurabad-Dhaka-Narayanganj line, the entire Eastern Bengal Railway was built on the west bank of the Brahmaputra River (Iqbal, 2010, pp. 53-54). Eastern, southern, and northern Bengal were all connected by the Eastern Bengal Railway by 1890-1891, when it had been extended to 783 miles in total. 254 miles were on a wide gauge, 491 miles on a metre gauge, and 37 miles on a 2-foot-2-inch gauge (Munshi, 1980, p.90; 1988). It was EBR's steamers that connected riverside railheads like Narayanganj to Dhaka and other places like Assam. The overnight train service between Kolkata and Goalando, the steamer between Goalando and Narayanganj, and then the train between Narayanganj and Dhaka were regular before India's partition in 1947 (Iqbal, 2006; 2010).

In order to meet the transportation needs of the Assamese tea industry, the Assam-Bengal Railway (ABR) Company was founded in 1892. In 1895, the Chittagong-Comilla section of the Assam-Bengal Railway was completed. About 342 miles of the ABR railroad had been built by 1903. Bengal and Assam Railway (B&A) was formed in 1942 when state railways bought ABR and merged it with the EBR to form a new company (Munshi, 1980, p. 93). In 1938, according to King's Report, there were 14 railways in the Bengal province, with a total length of 3,357 miles, serving the region (King Report, 1938; Bhaduri, 1981). As shown in Table 4, the railway line in the Bengal Delta is divided up by district.

Table 4 The District Railway Line

District	Railways in miles	District	Railways in miles
Jessore	66.0	Rangpur	205.0
Khulna	36.0	Bogra	86.0
Dhaka	118.0	Pabna	69.0
Mymensingh	230.0	Malda	85.0
Faridpur	90.0	24 Parganas	147.0
Chittagong	97.0	Nadia	180.0
Noakhali	48.0	Murshidabad	134.0
Dinajpur	131.0		
Rajshahi	101.0		

Source: King, A. J. (1938). *Comprehensive Report on Road Development Projects in Bengal,* Vol. I, Government of Bengal, Kolkata.

Inland Steam Navigation

There were a few instances of steam navigation of the Ganga in the early nineteenth century, most of which were conducted on an experimental basis. James Johnston, a former Royal Navy officer, started the steamer service in the Bengal delta. Even so, the East India Company established a regular steamer service on the Ganga in 1834 under its direct control (Munshi, 1980; 1988). The East India Company's officials and goods were transported between Kolkata and the country's interior by a few steamers that were in service for long periods of time. As a British-owned private enterprise, the Indian General Steam Navigation Company (IGSN) was established in 1844 to handle regular traffic (Munshi, 1980; 1988). In 1860, the Brahmaputra River had its first regular steamer service. In 1863, the Surma Valley was made accessible to steamboats for the first time. The IGSN Company began to pay more attention to the Brahmaputra and Surma Valley services over time. A second steamer company called the River Steam Navigation Company began operating on the same routes as the IGSN Company in 1862—between Kolkata and Assam. By the 1940s, there were eight steamer companies operating in the Bengal Delta region (Munshi, 1980; 1988).

The British Borneo
Railway

W. C. Cowie, a British North Borneo Company shareholder, was a key player in British Borneo's railway construction. He was convinced that the construction of the railways and the growth of the economy were intertwined. A J. West, a friend of Cowie's, was named railway superintendent after the proposal was selected (Kaur, 1994). On the west coast near Brunei Bay, construction began in 1896 on a railway connecting Sipitang with Tawau at Cowie Harbour. With its fertile land and high

population density, Cowie argued that building a trans-Borneo rail line would make sense (Kaur, 1994; 1998b). To get to Beaufort-Jesselton, which was 57 miles long and finished in 1902, the three lines were built under West's direction. To get to Tenom, which was 30 miles long and finished in 1905, it took 57 miles of line from the Beaufort-Jesselton line and 20 miles of line from Weston. The final stretch of I907 was extended to Melalap, a distance of nine miles (Kaur, 1994; 1998b).

Cowie believed that the construction of railroads would bring prosperity to the area. He died in 1919, but the railway was still underdeveloped, making upgrades necessary to deal with the influx of new passengers. Two Malayan railroad experts were hired by the new Court of Directors to prepare a report on the railway. According to the experts, the Jesselton to Beaufort line should be completely renovated. As a result, 60-pound rails were used to replace a significant portion of the 30-pound rails. Many wooden bridges were demolished and replaced with steel ones. ' Trains and other rolling stock grew in number. By 1923, the railway cost had increased to £800,000. (Kaur, 1994; 1998b). A total of more than a million people travelled in 1962, and a total of 54,864 tonnes of cargo was transported (Colony of North Borneo Annual Report, 1962).

Rail transportation in Sarawak was limited and did not demonstrate its full potential. Charles Brooke, the second white Rajah of the region, built the region's sole a-gauge railway to link the hinterland to Kuching. Sarawak's railroad only ran for ten miles, even though a survey had been carried out in I907 as far as the 24-mile line. The construction of the railway line began in 1911 and was completed in 1915. It was decided to begin road construction while also constructing a rail line, which had disastrous consequences for rail transportation. Finally, the railroad was shut down in 1933, and it lost a total of $1,063,760 over the course of its operation. Later, it was used to transport stone to Kuching from the mines located at the seventh mile (Kaur, 1995). As a result, Brunei's railway history is virtually nonexistent. The Royal Brunei Oil Company was responsible for maintaining the 8-mile-long state railway from Seria to Bada, the country's only water supply station (Colonial Office Report on Brunei, 1949).

Road Transport

Before colonial Sabah, British officials relied on indigenous paths that were the most direct route between two points and linked several river crossings (Bruce, 1924). An extensive network of bridle paths was proposed by British North Borneo Company Governor E. W. Birch in 1902 to connect remote outposts and densely forested areas of Residencies. By 1929, the bridle path's total length was approximately 640 miles long (Kaur, 1994).

I940 saw a road network of 241 miles and bridle paths of 596 miles in Sabah. Four new 149-mile roads were proposed as part of a road development project that began in 1948. (Kaur, 1994, p. 36). This project received a boost in I953 when Roland Turnbull was appointed Governor. There were some 300 miles of roads constructed in Sabah between I881 and 1954. Turnbull did it twice between 1954 and 1957 (Colony of North Borneo Annual Reports, I949-57) (See Table 5)

Table 5 Mileage of Various Type of Roads

Year	Bituminous Surface	Other Metalled	Earth / Gravel	Bridle Paths
1955	209	94	345	593
1956	225	118	359	492
1957	217	148	345	400
1958	217	78	427	389
1959	230	70	463	453
1960	233	80	456	471
1961	238	112	578	471
1962	243	221	590	471

Source: Colony of North Borneo Annual Report, 1962, p. 176.

With the road development scheme, an increasing number of motor vehicles and services functioned in Sabah. The rubber boom in the 1950s also led to a modest rise in the prosperity of the state and the import of a huge number of motor vehicles (Colony of North Borneo Annual Report, 1962). (See Table 6)

Table 6 The Number of Motor Vehicles, Bicycles and Drivers Licensed from 1958 to 1962

Type of Vehicles	1958	1959	1960	1961	1962
Motor Vehicles	5,725	6,964	8,154	9,876	12,450
Bicycles (new)	2,890	3,749	4,173	3,957	2,887
Drivers licensed	8,985	12,326	13,019	15,075	18,434

Source: Colony of North Borneo Annual Report, 1962, p. 178.

In precolonial Sarawak, there were no land networks to speak of. The only means of transportation were the small networks of streets that connected the settlements. Dayaks and other indigenous people built batang (jungle paths) in the remotest parts of the country. White Raja Brookes had no interest in transportation options. The Brookes administration's activities revolved around the waterways of the Great Lakes

region. The authority built short roads connecting various locations in the major localities, but they were not connected to one another. Short-distance roads were also built by the Borneo Company and Sarawak Oilfields to support their operations (Kaur, 1995).

He began implementing a new policy for road and bridle path construction under Vyner Brooke. Due to a lack of funds, the initiative was not successful. Consequently, in 1940, only the Kuching-Serian Road, a forty-mile stretch, was constructed thanks to this policy (Sarawak Gazette, 1922; Kaur, 1995). A British colony, Sarawak, was established in 1946 after the Second World War had ended. Construction and development projects were started under a new administration. A total of 847 miles of road had been built by 1962. Roads maintained by both government and local authorities are shown in Table 7.

Table 7 Road Type and Total Mileage in 1962

Road Type	Mileage			Total Miles
	Width over 12 ft.	Width 12 ft. — 8 ft.	Width under 8 ft.	
Bitumen or Concrete	150	29	1	180
Gravel or Stone	126	160	59	345
Earth	75	198	49	322
TOTAL	351	387	109	847

Source: Sarawak Annual Report, 1962, p. 254.

As the population and traffic in Sarawak grew, so did the demands on the state's motor vehicles. In 1962, the Sarawak Annual Report contained the following information: 3,577 motorcycles, 3,573 private cars, 210 taxis, 1,083 commercial vehicles and 206 buses had been registered by the year's end. (p. 258.)

Brunei became part of the British resident system in 1906, but the country lacked a well-developed road network. Brunei's first permanent resident, M. S. H. McArthur, had begun reforming the country's administration. Brunei's first road was a one-and-a-half-mile loop around the city center. The road that led from the old British Consulate to a square behind Kampung Ayer was built here. In 1924, Brunei became the first country in the world to import automobiles. The number of roads in Brunei had grown to 68 miles by 1934. Road development began in 1936 and finished in 1937, with a total expenditure in excess of $ 67,000. There were 102 roads by the Second World War, and the number of vehicles on the road increased. The British Malayan Petroleum Company built and maintained all of them (Sidhu, 1995, pp. 10-11). More than 122 miles of roads were in use by the end of 1947 (Brunei Annual

Report, 1947). In 1947, Brunei had 354 registered vehicles, and the following year, the number had risen to 627. Brunei's city-to-Seria main road was officially opened to traffic in 1958 (Sidhu, 1995).

Navigation

The primary mode of transportation in Sarawak was still water. For centuries, boats were used to transport goods and people between the coastal and river ports of Kuching and Sibu and between two. Most of these local vessels served as feeders to ocean-going ships. James Brooke operated the Royalist and the Swift on the Kuching-Singapore line. Another steamer, Sir James Brooke, was brought in by the Borneo Company of Sarawak. The Chamber of Commerce of Sarawak established the Singapore and Sarawak Steamship Company in 1875. Non-motorized small hand-paddled native crafts were the primary mode of transportation in the upstream territories. To conduct business, Malay and Chinese boat hawkers transported freight over long distances to rural areas in the interior (Gin, 1995; Kaur, 1998b).

When the North Borneo Chartered Company started its function in Sabah, steamer services with Singapore were irregular. Initially, the Chartered Company planned to develop trade links with the new stations at Sandakan and Kudat and other river ports on the Padas, Papar, and Tempasuk Rivers. By 1890, six steamers sailed between Sabah and Singapore, and two plied to Hong Kong. Behn Meyer and Company, a German-based shipping agent, provided a fortnightly steamer service from Singapore to Labuan, Jesselton, Kudat, and Sandakan. For inland navigation, the Chartered Company introduced launches to communicate between the trading post and the rivers. During the First World War, Behn Meyer and Company stopped their service for the Charted Company. Subsequently, the Chartered Company hired the Straits Steamship Company, a Singapore-based company, to carry a regular weekly steamer service between Singapore and the Sabah. In 1927 a local steamship company, the Sabah Steamship Company, was established to run between smaller ports such as Lahad Datu, Semporna, Tawau, and Usukan and also between the larger ports of Labuan, Sandakan, Jesselton, and Kudat (Kaur, 1998b, p. 86).

Environmental Impact of Modern Transport System

Colonization of the Bengal Delta and British Borneo by the colonial transport system had a profound impact on the water regimes, plain land and forest, wildlife and climate of the region. It was the colonial government that put in place the first modern transportation systems in both regions. The British rulers' motives for introducing

transportation in both regions were similar, but their effects differed, which necessitates further investigation.

The Bengal delta

C. A. Bentley, Bengal's Director of Public Health, noted in 1922 that rain and floodwater were to blame for both the decline of agriculture and the deterioration of public health that had followed it. When embankments were haphazardly constructed in the lower Bengal region in the name of flood prevention and, secondarily, in order to build a rail and road network that covered the region, the rivers' natural drainage system was disrupted, which had disastrous results like agricultural decline and epidemic malaria (Bentley, 1925). Throughout the Raj, medical officers' reports and experts' books provided clear and radical views on how development policies exacerbated environmental deterioration and increased malaria rates (Klein, 2001).

From Kolkata to Goalundo, an EBR line was constructed on the floodplain of the Ganga. The embankment on which the railway line was built at first had almost no channels for water to pass through (Iqbal, 2006; 2010). EBR's catastrophic impact on northern Bengal's water supply was clearly visible. The Chalan beel, a 1547-square-mile body of water, was located in Rajshahi and Pabna districts, for example. There are approximately 47 rivers in northern Bengal that drain into this drainage system, making it a major crossroads for a variety of waterways. Nearly half of the Bengal Delta's drainage was saved and discharged by the beel. It was at the beginning of this century that the beel was surrounded by the EBR line. Enormous embankments were required for the construction of the railways in these low-land areas, obstructing the system's natural drainage (Iqbal, 2006; 2010, pp.130-31).

Floods devastated Bogra and Rajshahi in 1928. Between the Hilli and Nator rail stations, the most flooded area lay on both sides of the EBR. Meanwhile, on August 24, heavy rains fell on Rajshahi, increasing the flood water draining from the upstream districts of Bogra and Dinajpur and flooding the entire northern Bengal region. The floodwater was unable to drain away because of the railway embankment. More than 200 square miles of crops were destroyed, resulting in damage to 1400 square miles of land (Iqbal, 2006; 2010).

Public health in the Bengal Delta was severely impacted by the large number of embankments that were also built for the railway and road during the massive construction project. Several devastating waterborne epidemics, such as malaria, were brought on by it. It was reported in 1878 by the Sanitary Commissioner during the construction of the Jessore and Faridpur roads that an epidemic had occurred during the Grand Trunk Road's construction (Bentey, 1925). During the construction of the

railway between Dhaka and Mymensingh in 1884, an epidemic of malaria was reported. In the Sanitary Report of 1907, the Civil Surgeon stated that a fever outbreak had occurred in Murshidabad. The railway engineers were also blamed for failing to provide any drainage for the pits and hollows along the embankment, according to the report (Bentey, 1925). Malaria became widespread in the Bengal Delta during the first quarter of the twentieth century, heralding the start of a pandemic in Bengal. Every province in India except for Eastern Bengal and Assam saw a decrease in the death rate between 1903 and 1909. (Iqbal, 2010).

Since construction began in the delta, many areas have seen catastrophic changes that can be directly attributed to the railroad construction process. Prior to that time, the water flowed from one location to another, relying on the natural drainage process. On the other hand, railways obliterated this natural water movement process (Bentley, 1925). British rule in India led to large development projects such as railways and irrigation canals, according to Ira Klein in her critical essay. There were only a few studies looking into the potential environmental harm they could cause. Later, when health officials found out about their negative effects on health, the expert's estimated funds for recovery were usually rejected because they were considered too expensive (Klein, 2001).

The British Borneo

Deforestation in Borneo was at an all-time high during the British colonial era. In addition to timber trade, new land was made available for cash crop cultivation, railway, road, and bridle path. British Borneo had a relatively slow expansion of railways and roads until the 1960s. The expansion of transportation infrastructure occurred in such a piecemeal fashion that it had no discernible impact on deforestation or the environment. British Borneo's link to transportation and deforestation can be found in the global expansion of transportation systems and automobiles. It wasn't until the early 1900s that rubber was grown in British Borneo, and it quickly became a major industry. Motor tyres in North America and Europe necessitated a great deal of rubber plantation, much of which was done at the expense of natural forest resources.

Rubber's expansion in Sabah and North Borneo was remarkable. There were 12 rubber companies in the region by 1910, and by 1928, 30 companies issued a total of approximately £4 million in the capital (Kaur, 1994). When rubber cultivation first began in 1902, only 40.5 ha of land was devoted to it; sixty years later, that number had risen to 69607 ha (Kaur, 1998b). As a result of harvesting cash crops or building roads and railways, Sabah's colonial era saw a lot of deforestation (See table 8).

Table 8 Expansion of the Rubber Industry, 1902-1960

Year	Area (ha)	Export (tonnes)	Year	Area (ha)	Export (tonnes)
1902	40.5		1947	50586	15250
1907	1306	2.26	1950	50586	24278
1910	5971	24.75	1955	49451	20422
1915	12564	1067.27	1956	51993	20218
1920	20989	4170.13	1957	54694	20218
1925	28516	5511.09	1958	60279	20523
1933	46993	7906.75	1959	65310	23266
1939	53169	12054	1960	69607	22352
1940	53812	17988			

Source: Kaur, 1994, p.23.

On the western side of the Poak Concession, on an area of about 3,000 acres, the cultivation of Para rubber began in 1902 and was Sarawak's most important cash crop. The Borneo Company Limited of Sarawak made a killing in rubber in 1910, when prices were skyrocketing. In 1912, Sungei Tengah saw the construction of a rubber processing plant (Gin, 1995). While this was happening, rubber farming became extremely popular, and many Western companies invested in the Para rubber farming industry. During the 1930s, the government of Sarawak introduced new legislation that established the government's ownership over any land that was not registered with the government (Kaur, 1998a). Throughout the 1930s and 1940s, Sarawak's rubber industry grew tremendously, with 30000 hectares of land being cultivated by 1930, 97000 hectares by 1940, and 148000 hectares by 1961 (De Jong, 2001).

The establishment of rubber estates and the construction of railway lines in British Borneo brought the indigenous Dusun people and the British rulers to blows over a different environmental issue. Due to both the rubber estate and the railway, Dusun of the Papar region was threatened by both. They witnessed the government or estates evicting them from their homes and land. Numerous Dusun people who lived near the railway were also forced to abandon their beloved orchards, grazing lands, and graveyards (Tze Ken, 2012). In this way, British Borneo's environment and landscape were altered by the railway and rubber plantations.

Conclusion

Briefly summarized, the precolonial or inherited transport system of Bengal Delta and British Borneo was used by British colonial rulers to introduce modern transportation methods. There are a number of surprises in the above discussion. Colonial rulers first used and maintained the roads and rivers they inherited until steamships, motor

vehicles, and trains were developed. When the primitive system could no longer handle the additional extraction of resources, they resorted to this method. Afterwards, both regions were brought up to date with modern transportation. A second difference was that both regions had the same motivation for implementing these new transportation systems, but they differed significantly in terms of their actual design and implementation processes. About fifty years before British Borneo, a modern transportation system was established in the Bengal Delta. The Bengal Delta had larger trafficking networks and a higher volume of people and goods than British Borneo. Although British Borneo had a relatively slow pace of growth until the end of the twentieth century, Bengal had a much faster pace.

It's also worth noting that the British government and even locals in both regions did not take environmental consequences into account during the early colonial periods. European scientists began to take environmental concerns into account after a few decades. Because many British officers involved in the construction of railways and other modes of transportation were aware, they reportedly advised colonial policymakers to take environmental concerns into account. It was an unprecedented ecological decline in the Bengal Delta. Deterioration of the water regime, agrarian structure damage, widespread epidemic morbidity, and worse public health all contributed to an increase in the death toll while also weakening the economic and social system as a whole." These phenomena eventually led to the Great Bengal Famine of 1943, which also claimed the lives of 3 million people in the Bengal region of India (Iqbal, 2010). The British Borneo, on the other hand, was the scene of extensive logging for the purposes of rubber cultivation or infrastructure development. Only deforestation was visible in this area as a sign of ecological destruction.

British rule in the Bengal Delta and British Borneo was built on an inherited precolonial transportation system. With the introduction of modern transportation, these networks were reworked. The regions' geographical layout could be modified as needed. In the Bengal Delta and British Borneo, they altered the topography to build modern railways and roads through the construction of embankments and dams, deforestation, and the cutting of rock or hills.

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