

Flows the blessed from Mount Lusai

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It has now almost become a cliché to raise one's voice to save the elements of nature, the rivers of Bangladesh being of much interest and media coverage what with rising silt, erosion, loss of navigability and pollution common across the land.

Without the slightest of suggestion to belittle any one of the environmentalists, many of them totally dedicated to the cause, the efforts of Forum for Planned Chittagong (FPC) to conserve the endangered Karnafuli River is the tuning of a new leaf in its very scientific approach.

By FPC's admission, not any different from other zealous warriors of Mother Nature, Karnaphuli in Chittagong is 'a generous river created for the benefit of mankind' and they feel 'responsible to take care' of this God's gift. The forum's self-imposed vow to conserve the navigable channel and to stabilize the river both upstream and down stream manifests the present's commitment to a century-old struggle.

Architect Q S Tauheed's paper, the first part of which is published today, is based on a comprehensive study undertaken to acquaint with the morphological changes in the river the city's lifeline, the consequence of training and dredging works as implemented and those proposed, and to identify the works yet to be accomplished to save the river from further humiliation. His and the forum's commendable work required in-depth search in thankfully still exiting records and reports of old.

AUC, that's us, shall carry the remaining parts of the paper in

subsequent issues.

FPC came to limelight in late 2002 because of their firm and laudable stand against uprooting of the centennial Chittagong Court building on Fairy's Hill, a unique movement in which they took in more fruits than dropped despite the fact that architectural plans had been completed by the concerned government department. One can assume with a high degree of hope that the methodical approach chosen by the 'chosen few' will have enough sap to convince and motivate decision-makers at both local and national levels.

A popular Chittagonian song narrates how the water plays up bits and pieces of waves as it comes down from Lusa Pahad (mountain) and runs to Karnaphuli. Architect Tauheed's report for FPC's socio-economic, humanitarian and environmental programme for their river is certain to cause more than just a ripple.

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Karnafuli River Forum for planned Chittagong's search for its conservation - I

ARCHITECT Q S TAUHEED

THE location of Karnafuli and its approach from the sea bears favourable conditions for the growth of trades as compared to other rivers of this region. The river was named as "SHET GANG" (SHET-DELTA; GANG-GANGES) by the Arabs. It is believed that "CHITTAGONG" has derived its name from such origin.

In 1888 the Port Commission was established by the British rule. Since then the port is ever growing and expanding to accommodate the increased numbers of vessels calling to the port. The main problem which became a routine concern for the port was to conserve the navigable channel along the side of the jetties and its approach from the sea. To this effect, the Port Commission had carried out conservation works to maintain the flow of the river in a single channel for over 65 years since 1894. During this period the extensive training works which were carried out in the lower estuary up to the mouth had shown considerable improvement but few of the works taken up in the upstream of the jetties, were partially washed away by floods or stopped by post-war situations thereby creating unstable conditions within the upper limit and the jetty reaches.

With the object of improving this condition, Sir Claude Inglis was called on four occasions between 1948 and 1954 to investigate and suggest remedial measure to the warranted problems. Other consultants who were also engaged for investigations and improvements are Hamid Committee, constituting mostly of irrigation Engineers from PWD, Punjab in 1952; Dr. Martin of UN in 1952; Fedric Harris in 1964; Netherlands Economic Institute (NEI) in 1978; Maunsell in 1982; BRTC-BUET, Dhaka, in 1984; BCL in 1984. The above consultation with the experts indicates that the port had to confront with the deteriorating conditions of the river for a period of over 105 years with the objective to conserve it as primary concern of the port. By the end of May 2000 and June 2001 the Port Authority had addressed BRTC-BUET requesting for specialist opinion on the effects of dredging, between Sadarghat to Shah Amanat bridge, on the port main jetties and other parts of Karnafuli between Halda confluence and Patenga. The question of dredging was raised because of heavy siltation that had occurred within the reach after the construction of the S. Amanat Bridge in 1989. To check this aggression of siltation and also to make the reach reactive prior to pre-construction condition, as a secondary benefit, Chittagong Port Authority (CPA) wants to de-silt the area by dredging. But since the volume of dredging is substantially big and involves sudden changes in the channel regime, CPA sought specialist opinion regarding this dredging work. The investigations were conducted and recommendations were presented to CPA in the form, draft final report of 2002.

This concern of unstable conditions in the river, within the port limits, was published in the mass media, following which, seminars were organized and dialogues opened for citizens' participation. Conservation of Karnafuli being one of its field of study, FORUM FOR PLANNED CHITTAGONG (FPC), therefore desired to undertake a detailed study on all the reports prepared by experts during 1949 to 2002. As a result, it had become the primary responsibility to collect and explore into the records of 53 years since 1840, in order to extract, firstly, the facts of 162 years of the river chronology since 1840 and secondly, 110 years of its maintenance since 1894. It was also important to ensure that this report should remain free from all political, technical and financial interpretations or statements, addressed publicly, or published in the media, which could establish controversial debates between and within the citizens, lawmakers and organizations. Instead, this report should focus on the potential study and recommendations that would draw the attention of all concerned towards maintaining a healthy river.

The river and the port

There are 57 important rivers which have their origins in the neighbouring territories and flows through Bangladesh down to the Bay. The Karnafuli River is one of these which have its origin within the mountainous terrains of Assam in India. It rises in the Lushai Hills and originates from the confluence of two major rivers, The Saga Lui and The Tuichong, about 132 miles from the coast. The Karnafuli River, 122 miles of which flows through Bangladesh is joined by numerous tributaries, the most important of which are the Thega, Bara Harina, Kasalong, Subalong, Chingri and Halda. The catchments of Karnafuli and its tributaries are approximately 5,500 square miles. The river falls 25 feet in 100 miles to its out fall with an average slope of 3" for each mile.

History reveals that these water fronts had been greatly used for over 2,500 years for the purpose of trades with other parts of the world. The history of Chittagong Port dates back to the fourth century before Christ. The Yemeni and the Arab Traders of Babylon of ancient time used to trade with Greece, Macedonia and in the East with India, Java, Sumatra and China. For the purpose of trade they used to call on the Indian Ports of Surat, Cochin, Tamralipta and Chittagong. According to Tolemi the famous historian, Chittagong was one of the finest ports in the near and far east at that time. Malayan history bears that the greatest sailor Buddha Gupta sailed from Chittagong to Malaya in the 4th century BC. The Arab traders considered Chittagong to be the delta of the Ganges. Within a period of 100 years this

port had surpassed the great port of Tamluk. The Arabs named it port "SUMUNDA". In 1517, Joaoda Silveria, the first Portuguese captain reached the port with his ship "LOPO SOANA". In 1526 captain Caaz Penira and in 1528 Captain Alfonso De Mellow landed in Chittagong port. They named it "PORTE GRANDE" (a great port).

On April 25, 1888, the first Port Commission was formed under the Port Commissioner's Act of 1887. Nine Commissioners were appointed to look after the improvement and management of the port. At that time the facilities of the port comprised of five wooden and one pontoon jetties and handled in the year 1889-90, exports totalling 1.25 lac tons and imports valued at almost 7 lac rupees. Although the port mainly handled inland cargo, it was visited by forty ocean-going vessels of average 1,500 tons. Between 1899 and 1910 four jetties were further built to cater the need of Assam Bengal Railway commissioned in 1904. In 1907 and 1916 one bucket-suction and two grab dredgers were purchased and built respectively to equip the port for maintenance of the navigable channel. After the Indian Sub-Continent was partitioned in 1947, Chittagong Port had embarked on a rapid development programme due to trebled handling of trade, previously routed through Calcutta. The only port of the then East Pakistan, had suddenly to cope with the requirements of a hinterland of 54,000 square miles and a population of 42 million. Nine jetties were added to the inherited four berths thus increasing the total water frontage from 2,300 feet to 6,930 feet. In July 1960 Chittagong Port Trust was formed and subsequently succeeded by Chittagong Port Authority in September 1976. Today the Port is visited by 2,000 vessels and handles 12 million tones of cargo per year which is about 85% of the countries total import and export. This may rightly be called as the life line of Bangladesh.

Erosion, avulsion and corresponding accretion of the river in an untrained state

Lower Estuary: The maps of lower estuary, downstream of the jetties, was prepared by Mr. J. R. Bell, an eminent engineer, based on the records of Admiralty Charts maintained from 1840 to 1901. The map illustrates that the left bank of the estuary was almost straight for about 10 miles between Sadarghat to Norman Point Lighthouse, on the coast. The river at the throat of Sadarghat had trifurcated and fanned out to a width of 2 miles causing severe erosion along the right bank - indicating a history of instability and earlier channel movement, similar in nature to those at Nazir Char and Bakalia Char, within the upper river, in the recent years. The main channel heading in concave, westward, is more nearly a volute than circular, with a radius of 3 1/2 miles (approximately) for a length of over 2 miles as far as Moresh Khal (Buffalo Creek). That 2 miles face was a harbour. The harbour was encased by a secondary-by-channel behind Lukia Char which was linked almost directly with the reverse curve (Gupta Bend) by a split-back channel at the rear of Gupta Char. Beyond Moresh Khal, the main channel had sharpened to a radius of 1 1/4 miles and then eased off to Gupta point. This portion of the navigation is called Cutting Bend. Downstream of Gupta point the river took a sharp reverse curve to its right and flowed around the Active Spit (a large shoal, projecting about 4500 feet into the river, named after the vessel ACTIVE, once grounded there), with a mean radius of five furlongs through about 100 degrees. Below the throats at Comb's pillar, a single outfall channel had moved seawards in a south-westerly direction and flowed into the Bay along the right northern bank of the bell-mouth entry, 1 1/2 miles wide in low water.

As stated earlier, the severe erosion which had occurred along the right bank about four miles foreshore of Chittagong, had allowed movement of the navigable channel towards north-west, as shown in plate-18.II. By 1883 the right-bank channel had enlarged and a solitary island, Lukia char, had grown and established. In 1901 the main channel from the left bank at Kolagoan had entered the right bank within the jetty reaches near Sadarghat and flowed downstream along the gentle curve at Cutting Bend, to Gupta Crossing, whilst Lukia Char had further enlarged and a new island, Gupta Char formed. These changes in the river are living examples of erosions, avulsion and corresponding accretions. At the beginning of the 19th century the main outfall channel followed a course approximately similar to the Judlia channel, but later broke away from the main channel flowing along the left bank at Gupta Bend whilst shoaling took place in the abandoned waterway. This formation of a cut-off is one of self-regulating compensatory process of nature for maintaining a state of minimum energy expenditure. After 1877 a new secondary outfall channel, some 2,000 feet wide at low water, opened through the left arm of a large shoal, some 2 1/2 miles long and 1/2 miles wide. This channel was later known as the Judlia Channel whilst the shoal as Middle Island or Judlia Char. The presence and growth of the shoal indicated that the direction of the littoral drifts was from the south to north. Between 1901 and 1917 the Patenga channel had moved northwest, apart from the Judlia channel by 1,500 feet, and 1,000 feet during 1921 and 1930 with corresponding increase in the area of the Middle Island to 2 1/2 square miles. This northerly movement of the Patenga channel, subsequent growth of the middle island shoal and the consequent sharpening of the Gupta Bend were the most prominent characteristics of channel movement in the

lower river, while in its untrained state.

Upper Estuary: The port limit upstream of the jetties extends 3/4 of a mile into Halda from the confluence. The shoal that had developed at the confluence is known as the Halda Char. There is no record of the changes in the upper limits of the river from 1901 to 1917 or the records of formation of Nazir and Bakalia Chars. But from the records of 1917 onward, it is seen that though the flow conditions had improved during 1917 to 1922 and were temporarily favourable, but they were far from stable because the river at Nazir Char had trifurcated and the flow flowed, part through Balur Channel, West of Nazir Char, part in the central channel, East of Nazir Char and part along the left bank. That the width of the river at Nazir Char had increased to 6,000 feet from its previous state is a sign of instability. In this regard Sir Claude Inglis pointed out "because the flow in these three channels determines the position of the river further downstream. Therefore the whole flow must be controlled in a single channel at this point to ensure stable conditions". It is important to note that this concern about the conditions of the river almost 8 miles upstream indicates as regulatory factors for unstable conditions downstream, is almost similar in nature to the concern about maintenance of navigable depths over the outer and inner bars when severe erosion had been taking place along the right bank below Moresh Khal, some eight miles upstream of the mouth, during the period 1877 to 1901. The readers must therefore note that such changes in the river does not occur because of a particular reason but are dependant on variable factors which needs further study. "It is therefore rarely justifiable to say a particular change has been due to a particular factor." Thus it is important to study the changes in the river since 1922.

Between 1921-22 flow conditions had improved, the main stream being concentrated along the left bank down to Kolagoan before crossing to the right bank near Sadarghat. By 1924-25 depositions had occurred along the left bank for three miles downstream of Kalurghat, obstructing almost half of the flow of the river which was subsequently washed away for two miles after the railway bridge was constructed in 1930. Though the flow was still mainly along the left bank downstream to Kolagoan, an unfavourable right bank channel had opened, which carried a considerable part of the flow, leaving a large char in the middle of the river, known as the Kolagoan Char; and a shoal formed on the right bank below the convex bend down to Sadarghat. This continued up to 1927, except the depths opposite to Sadarghat was rapidly decreasing from 40 feet to 10 feet. Only a small change had occurred in 1929-30, when the left bank channel had deteriorated and most of the flow had crossed to the right bank channel with further deterioration along the right bank at Sadarghat. In 1931-32 the flow flowed from the lower end of Nazir Char towards the left bank while a small part of the flow passed between the left bank and Kolagoan char. In 1932-33 the deep right bank channel between survey mark 9 and 7 silted, and the flow crossed from survey mark 12 on the left bank to survey mark 7 on the right bank but in 1933-34 the left bank channel opposite to Nazir Char closed whilst the deep channel still persisted on its right. Further downstream, the depths along the right bank downstream of Chaktai, although increased, with deep waters at Sadarghat, but had deteriorated with the reformation of sand bank in 1934-35. Between 1936-40 a shoal below Nazir Char was identified and consequently reduced to 1/8 its size due to erosion. Both Nazir Char and Bakalia Char became one by 1939. By the end of 1950 Bakalia char was re-established while the flow remaining still to its right. By 1955 the left bank channel around Bakalia had developed and enlarged considerably. Little changes have taken place in the river during 1939 and 1940; but in 1941, the whole flow of the river was nearly through the Balur channel, West of Nazir Char and crossed over to the left bank and then sharply bend towards the right bank. When the Kaptai dam was made operational in 1962 the deep water channel flowed through the left bank with increase in curvature of flow. In 1970 the tendency of developing the right bank was observed. By 1975-78 when the curvature of flow was further sharpened the river shortened its course by flowing through the right bank and by 1980 the right channel fully developed which is the present day condition. Bakalia char at the present condition is much larger and had shifted downward. These frequent changes which were taking place in the upper river for over 35 years since 1901 qualifies the sensitivity of unstable conditions during that period.

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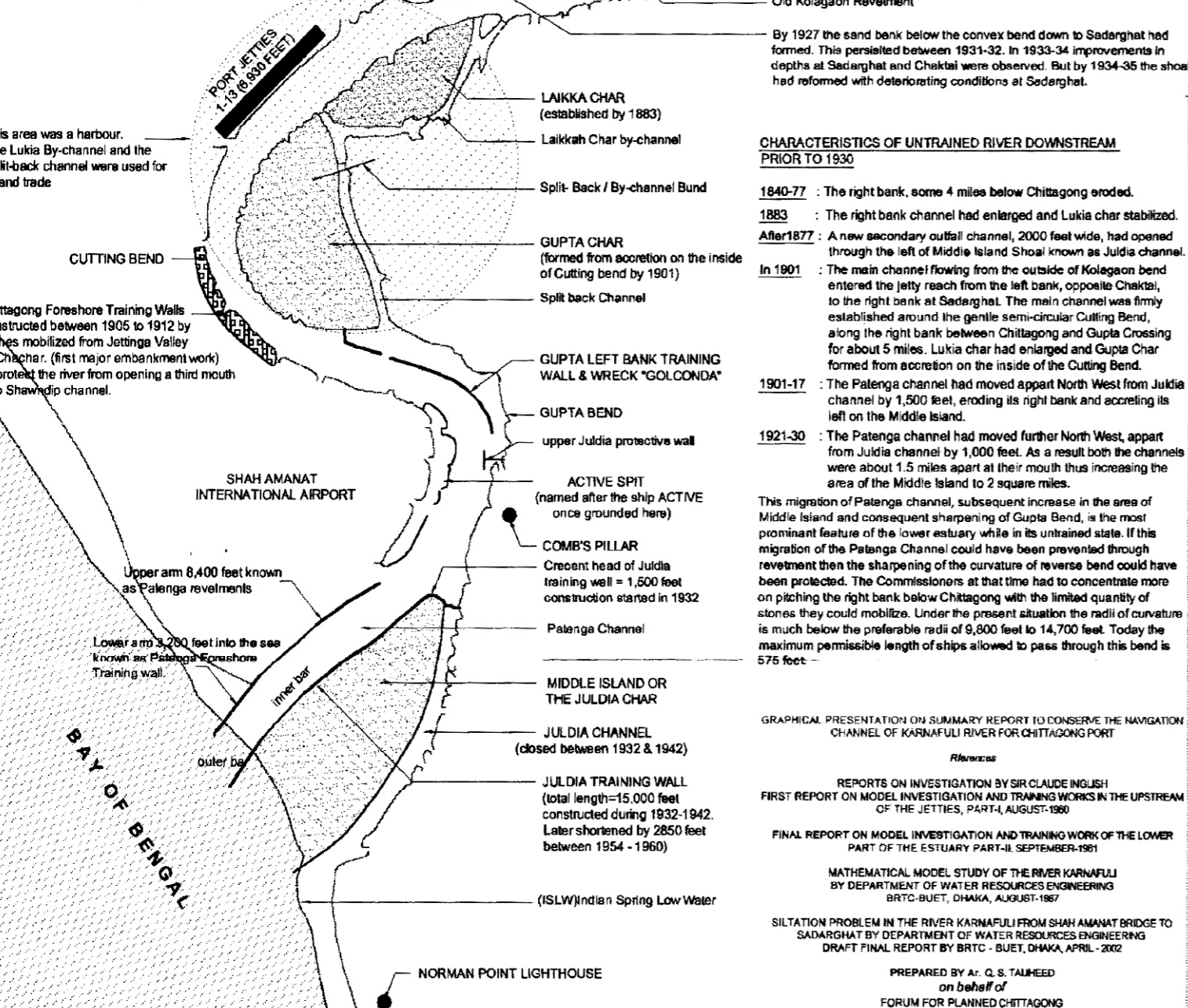
KARNAFULI RIVER CONSERVATION

PREPARED IN MARCH 29, 2005 by Ar. Q. S. Tauheed

CHARACTERISTICS OF UNTRAINED RIVER UPSTREAM BETWEEN 1922-1960

- 1924-25 : 3 miles long shoal had developed downstream of Kalurghat bridge site obstructing nearly half the width of the river opposite to Nazir Char. This was subsequently washed away for two miles after the construction of the railway bridge in 1930.
- 1925-27 : The main channel although flowed along the left bank down to Kolagoan, an unfavourable right channel had begun to open between survey mark 9 & 7 which carried a considerable part of the flow, leaving a large char in the middle of the river known as Kolagoan char.
- 1929-30 : Small changes have occurred
- 1931-32 : Flow flowed from the lower end of Nazir Char towards left bank, whence a small part of the flow passed between the left bank and Kolagoan char with most of the flow returning to the right bank at survey mark 7. The silted foreshore along the right bank at Sadarghat still persisted.
- 1932-33 : The deep channel along right bank between survey mark 7 & 9 silted.
- 1933-34 : The left bank channel opposite to Nazir char closed. The deep channel being along the right bank downstream to Nazir char, the depths along the right bank downstream of Chaktai increased with deep water at Sadarghat.
- 1934-35 : The shoal between Chaktai and Sadarghat reformed.
- 1936-37 : The conditions simultaneously improved and deteriorated at Sadarghat.
- 1938-39 : The central channel outside Nazir char closed. Nazir char and Bakalia char became one.
- 1939-41 : The whole flow was through Balur channel.
- 1950 : Bakalia char re-established while the flow remaining still on its right.
- 1955-62 : The left bank channel around Bakalia char had developed and enlarged considerably.
- 1970-80 : The right bank channel had fully developed which is the present day condition. Bakalia char had moved 3 3/4 miles further downstream.

These were the sensitive unstable conditions at that time. Please see the chronology chart for further details.



CHARACTERISTICS OF UNTRAINED RIVER DOWNSTREAM PRIOR TO 1930

- 1840-77 : The right bank, some 4 miles below Chittagong eroded.
- 1883 : The right bank channel had enlarged and Lukia char stabilized.
- After 1877 : A new secondary outfall channel, 2000 feet wide, had opened through the left of Middle Island Shoal known as Judlia channel.
- In 1901 : The main channel flowing from the outside of Kolagoan bend entered the jetty reach from the left bank, opposite Chaktai, to the right bank at Sadarghat. The main channel was firmly established around the gentle semi-circular Cutting Bend, along the right bank between Chittagong and Gupta Crossing for about 5 miles. Lukia char had enlarged and Gupta Char formed from accretion on the inside of the Cutting Bend.
- 1901-17 : The Patenga channel had moved apart North West from Judlia channel by 1,500 feet, ending its right bank and accreting its left on the Middle Island.
- 1921-30 : The Patenga channel had moved further North West, apart from Judlia channel by 1,000 feet. As a result both the channels were about 1.5 miles apart at their mouth thus increasing the area of the Middle Island to 2 square miles.

This migration of Patenga channel, subsequent increase in the area of Middle Island and consequent sharpening of Gupta Bend, is the most prominent feature of the lower estuary while in its untrained state. If this migration of the Patenga Channel could have been prevented through retraining then the sharpening of the curvature of reverse bend could have been protected. The Commissioners at that time had to concentrate more on pitching the right bank below Chittagong with the limited quantity of stones they could mobilize. Under the present situation the radii of curvature is much below the preferable radii of 9,800 feet to 14,700 feet. Today the maximum permissible length of ships allowed to pass through this bend is 575 feet.

GRAPHICAL PRESENTATION OF SUMMARY REPORT TO CONSIDER THE NAVIGATION CHANNEL OF KARNAFULI RIVER FOR CHITTAGONG PORT

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