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Situation Analysis on Inland Navigation

DIALOGUE FOR SUSTAINABLE MANAGEMENT OF TRANS-BOUNDARY WATER REGIMES IN SOUTH ASIA

ECOSYSTEMS FOR LIFE

Situation Analysis on Inland Navigation

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Ecosystems for Life: A Bangladesh-India Initiative

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Preface

Bangladesh and India share three major river systems: the Ganga, the Brahmaputra and the Meghna. Along with their tributaries, these rivers drain about 1.75 million sq km of land, with an average runoff of 1,200 cu km. The GBM system also supports over 620 million people. Thus, the need for cooperation on trans-boundary waters is crucial to the future well-being of these millions.

That is precisely the motivation for the *Ecosystems for Life: A Bangladesh- India Initiative* (Dialogue for Sustainable Management of Trans-boundary Water Regimes in South Asia) project. IUCN wishes to promote a better understanding of trans-boundary ecosystems between Bangladesh and India, by involving civil society in both counries and by providing a platform to discuss issues common and germane to the region. The overall goal is an improved, integrated management of trans-boundary water regimes in South Asia. The *Ecosystems for Life* is guided by a Project Advisory Committee (PAC) of eminent persons from Bangladesh and India. This four-and-a-half year initiative is supported by the Minister for European Affairs and International Cooperation, the Netherlands.

Ecosystems for Life will develop, through dialogue and research, longer-term relationships between various stakeholder groups within and between the countries. It will develop a common understanding to generate policy options on how to develop and manage natural resources sustainably such that livelihoods and water and food security improve. Inter-disciplinary research studies will be conducted by bringing together experts from various fields from both countries so that relevant issues are holistically grasped.

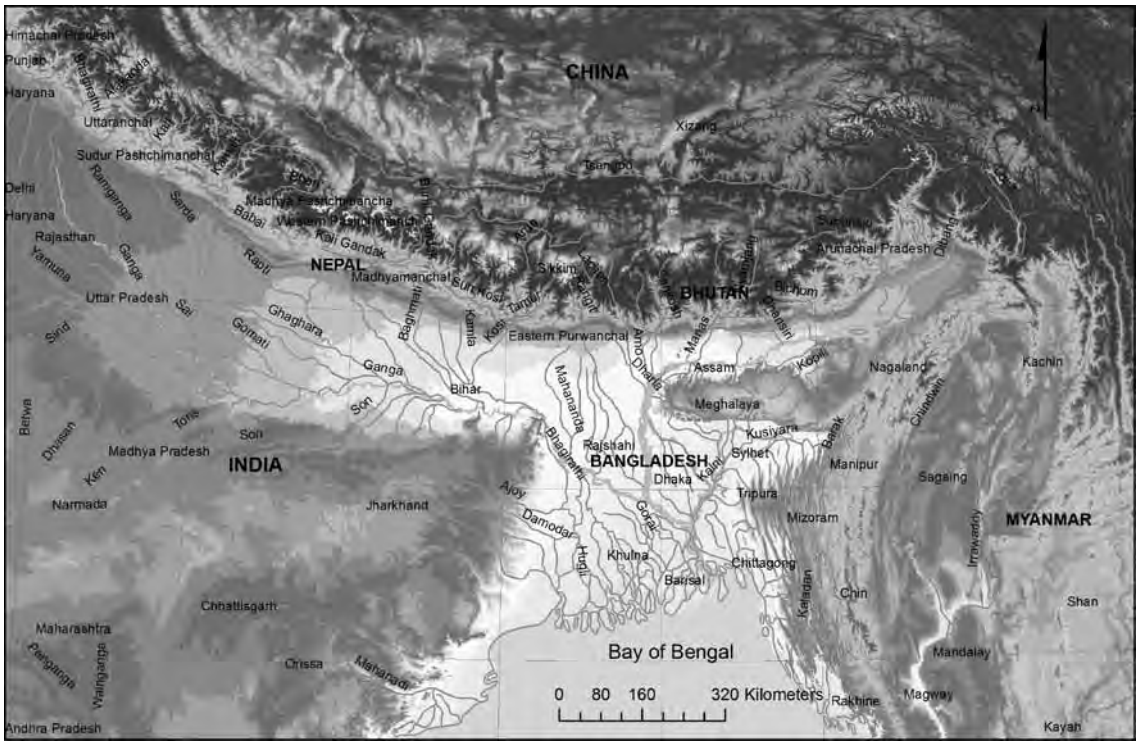
The initiative centres around five broad thematic areas:
- food security, water productivity and poverty;
- impacts of climate change;
- inland navigation;
- environmental security; and
- biodiversity conservation.

The first phase of the project concentrated on creating 'situation analyses' on each thematic area. Each analysis set identified core issues vis-a-vis a thematic area, their significance within the India-Bangladesh geographic focus, research gaps and needs and, ultimately, priority areas for joint research.

Studies were taken up in the later part of 2010 and early 2011. Authors discussed their points-of-view at a joint exercise; they shared their research. After due PAC review, the ensuing material was further circulated among multiple stakeholders in both countries. All outcomes of this dialogic process are incorporated in the final papers. 16 situation analyses related to the five thematic areas are now complete and ready for publication. We will also subsequently publish summary briefs, based on these studies. The initiative, thus, has taken a big step; now, the agenda for meaningful joint research is clear.

IUCN hopes these publications will be useful to academics, researchers and practitioners in the GBM region.

The Ganga-Brahmaputra-Meghna (GBM) region



River	Ganga	Brahmaputra	Meghna
Length[1] (km)	2,510	2,900	210
Catchment[2] (sq km)	10,87,300	5,52,000	82,000

Total area of GBM region: 17,21,300 sq km

Source: 1. Average, based on various data; 2. Joint River Commission figures

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Navigating cross-boundary rivers: an India perspective

Dinesh Kumar Mishra

Kautilya (4th Century BC) in his *Arthashastra* wrote extensively about navigation, boat sizes, port charges, ferry regulation laws, expeditions, the duties of the state and the workforce and trade and taxation in the days of the Mauryan Empire. Riverine traffic was dominant in the Mughal period; available records suggest trade between Agra and Satgam in Bengal. Mirzapur, Varanasi, Patna and Munger were important ports from where smaller vessels could ship their goods on the bigger ones. The East India Company made Calcutta (now Kolkata) an important destination and indigo, cotton, silk and grains were traded to many places in the world. The deplorable conditions of roads added to the importance of river navigation.

India's colonial rulers firmly fixed on the revenue their investments could generate. Surveys and the mapping of natural resources by Francis Buchanan and James Rennel were just a prelude to that exercise. The 1857 Mutiny compelled the British to strengthen road and rail communication, to get the army moving at a very short notice. Dominance of speed over eco-friendly transport was the beginning of questioning investment in, and growth of, navigation. Irrigation was another field attracting investors in Britain, for the 'productive' schemes gave handsome returns. A large section of the British elite, however, wanted to put in most of the resources in the railways, for this mode of transportation was very popular in Britain. The traders there wanted their goods to reach the interiors of India and be sold there. Government was also committed to promote the rail companies and guarantee interest on investment. The East India Company and the crown were subjected to continuous Parliamentary pressure to extend and multiply the railway line in India, even at a loss.

There were two pressure groups working in Britain, though, that were not very enthusiastic about railway expansion. The first was led by Sir Arthur Cotton, who had done exemplary work in irrigation in the Cauvery and Godavari river basins in south India. He was a staunch advocate of navigation canals. He maintained that 'what India wants is water carriage;...the railways have completely failed; they cannot carry goods at the price required; they cannot carry the quantities; and they cost the country three millions a year, and increasing, to support them...steamboat canals would not have cost more than one eighth of the railways; would carry any quantity at nominal prices and at any speed; would require no support from the treasury; and would be combined with irrigation.'

Cotton wanted development of irrigation, the canals so constructed as to also be navigable. The second faction opposed to the railways believed its expansion in India would become a permanent liability to the government and would have to be very heavily subsidised. This faction doubted very much whether people would use the rail services at all, instead of bullock carts. They doubted *sadhu*s, beggars, labourers and the like who did not have a paisa to spare would ever spare money on rail travel. They did not know the worth of time.

But railway expansion continued. Also, through experiences actually gained, it was realized that except for a few isolated cases, the combination of irrigation and navigation canals could not be successful. The principle factor which militated against the use of irrigation canals for navigation was that the best alignment of a canal, from the point of view of irrigation command area, need not be suitable for traffic, for the canal might not be located anywhere close to a trade centre. Indigenous transport, say by bullock cart, was found cheaper than water transport, especially in the agricultural off-season. The maximum permissible velocity of a navigation canal is usually lower than the critical velocity of an irrigation canal, upsetting the regime of the canal. Consequently, in the later irrigation projects, no provision was made for navigation works and the two functions of a waterway, irrigation and navigation, were separated.

Cotton did not realize, for instance, foodgrains could not be moved all over India by canals in times of famine. Sir George Campbell, who became Member of the Parliament after retiring from Bengal, had once commented on Sir Arthur Cotton: 'there was some truth in the saying regarding him, that he had water on his brain.' General George Balfour, however, said that he did not believe a single work he had executed had ever been a failure. 'Sir Arthur Cotton was a man of mighty genius; he was a man who had done much or the people; he had been a great benefactor to India; and his name would go down to posterity as one who had done great things for that country.'

The railways in Great Britain were marketing themselves aggressively, as evident from a letter of April 11, 1897, written by the commissioner of Bhagalpur to the secretary, department of revenue, government of Bengal: '…the railway authority keeps us in the dark and appears to avoid us and we suspect them of intentions that can only be called sinister and the proceedings of the company in London which I have seen support this view; that is, they are careless of every consideration but the financial results of the promoters'.

Thus, development of navigation through rivers and canals suffered immensely. Navigation was left to the enterprise of private owners of fleets. The state did not have much of a role to play. Writes Romesh Dutta: '…Englishmen had not appreciated the peculiar needs of India for cheaper transit as well as for irrigation. They had not realized that securing crops in the years of drought was of far greater importance in India than means of a quick transit. Having already constructed a vast system of railways along the main lines of communication, they hesitated to venture on navigational canals which compete with railways as a means of transit, and would deduct from the profits which the Government had guaranteed to Companies, or were deriving on their state lines. Nature had provided India with great navigable rivers which had been the high roads of trade from ancient times. And the system of canals, fed by these rivers, would have suited the requirements of the people for cheaper with slower transit, and would have at the same time have increased production, ensured harvests and averted famines. But Englishmen made a geographical mistake.'

Nevertheless, by 1842, a regular fortnightly steamer service operated between Kolkata and Agra on the river Yamuna and by 1863 three similar services were operating between Kolkata and Assam. River services up the river Ganga extended as far as Garhmukteshwar, 645 km above Allahabad, and Ayodhya, 325 km up the river Ghaghara. Waters that powered craft could not negotiate were

served by country boats, which ran feeder services from Delhi and the Nepal border. At the peak in 1877 as many as 180,000 country cargo boats were registered at Kolkata, 124,000 at Hooghly and 62,000 at Patna. Neglect of navigation, in favour of road and railway transport and irrigation projects, by the state led to the consumptive use of river water; as flow reduced, river-beds started silting up. The Assam earthquakes of 1897 and 1950 and the Bihar earthquake of 1934 caused many upheavals in the river beds of the Brahmaputra and tributaries of the Ganga, severely impairing drainage: navigation through these rivers was more stressed.

The year 1947, when India became independent, changed the nature of inland water navigation. Rail and road links connecting Assam and the other north-eastern states to the Indian mainland became a priority for the new nation of India, to ensure communication. Moreover, drainage congestion at the confluence of the river Hooghly with the Bay of Bengal, a long-pending issue in undivided India, remained unresolved. Nine committees and four one-man commissions had been appointed by the British during the nineteenth and twentieth centuries to suggest a solution, to no effect. Now, what was a common problem of the people before independence became a problem shared by two nations.

The Farakka barrage was constructed in the 1970s to reduce siltation in river Hooghly, which was causing great problems in the operation of Kolkata port due to reduced draft between Haldia and Kolkata. Prior to its construction, the line of navigation from Patna to Assam was through the rivers Ganga, Padma and Jamuna, linking the river Brahmaputra at Dhubri. This route was also utilised by vessels plying between Kolkata and Assam. To enable navigation from Farakka to Kolkata, a lock was also constructed. With the commissioning of the navigation lock joining the main river and the feeder canal, the navigation route linking the Ganga and Bhagirathi was opened in November 1987. However, the direct link between Farakka and Dhubri—through the river Padma in Bangladesh—was cut off. Though a navigation lock was planned at Jangipur, to enable small vessels move from the Bhagirathi river to the Padma river, this lock has not been completed by the Farakka barrage project authorities even to date. Thus, the Padma route is still closed for navigation. The incomplete navigational lock at Jangipur is much smaller compared to the lock chamber at Farakka, which is 240 m in length and 25 m wide. Furthermore, it is understood that the lock gate at Jangipur will operate only during the flood season; for the lean season, an approach channel to the Padma river needs to be created, joining the Jangipur lock with the Padma river in the north, and with the Bhagirathi river in the south. Moreover, the Dhulian–Rajshahi–Aricha route will have to be dredged to provide a 2 m deep and 45 m wide navigation channel.

Neglect of navigation in favour of road and railway transport by the state and irrigation projects led to the consumptive use of river water; as flow reduced, river-beds started silting up

National water transport policy 1980

The inland water transport sector did not get the attention it deserved until 1980, when a National Transport Policy Committee, headed by B D Pandey, found funding to this sector was grossly inadequate. Moreover, whatever was allotted was not utilised. The reason for the sorry state of affairs? No institution, government or the private sector, was willing to tap the potential. On 27 October 1986, the Inland Waterways Authority of India (IWAI) came into existence to develop and regulate inland waterways for shipping and navigation. IWAI's main office is at NOIDA in UP; it has regional offices in Patna, Kolkata, Guwahati and Kochi and sub-offices in Allahabad, Varanasi, Bhagalpur, Farakka and Kollam. The concept of 'national waterway' was introduced in 1982 to boost inland water transport. At present, there are five stretches declared national waterways (NWs). Given below is a brief sketch of NW 3, 4 and 5, together with some details about NW 1, 2 and 6 (the last two, proposed). We limit discussions to the latter (see Map 1).

National waterway no 3

205 km long, it has three segments. There is the 168-km West Coast canal (Kottapuram-Kollam) segment, the 23-km Udyogmandal canal-Kochi Pathalam bridge portion and the 14-km Champakara canal (Kochi-Ambalamugal) stretch. Declared a national waterway in 1993, this stretch is India's first 24-hour navigable waterway in its entirety.

National waterway no 4

This consists of the Kakinada-Puducherry stretch of canals, the Kaluvelly tank-Bhadrachalam-Rajahmundry stretch of the river Godavari and the Wazirabad-Vijayawada stretch of the river Krishna. This waterway is 1,027 km long, of which the river portion, irrigation canals and salt water canals measure 328 km, 302 km and 397 km respectively. It was declared a national waterway on 25 November, 2008.

National waterway no 5

Declared a national waterway on 25 November 2008, it comprises the 588-km Talcher-Dhamra stretch of the river Brahmani, the Geonkhali- Charbatia stretch of the East Coast canal, the Charbatia-Dhamra stretch of the Matai river and the Mangalgadi-Paradip stretch of the river Mahanadi delta. The river portion of this waterway is 371 km and the canal stretch is 217 km.

National waterway no 1

The Ganga-Bhagirathi-Hooghly river system between Haldia (Sagar) and Allahabad, 1,620 km, was declared national waterway no 1 (NW-1) in October 1986. Till 2010, IWAI had maintained a navigable depth of 2.5 m between Haldia (Sagar) and Farakka (560 km), 2 m in the Farakka-Patna stretch (460 km) and 1.5 m in the Patna-Allahabad portion (600 km). The authority will acquire an additional dredging fleet in 2010. With deployment, along with bandalling, the authority seeks to provide an enhanced minimum depth of 3 m in the Haldia (Sagar)-Farakka stretch, 2.5 m in the Farakka-Patna stretch, 2 m in the Patna-Varanasi stretch and 1.5 m in the Patna-Allahabad sector during 2010-11.

A sub-group appointed in 2005 by the Planning Commission of India, to evaluate the sector's performance in the 10th Five Year Plan and make recommendations for the 11th Plan, commented on the following aspects:

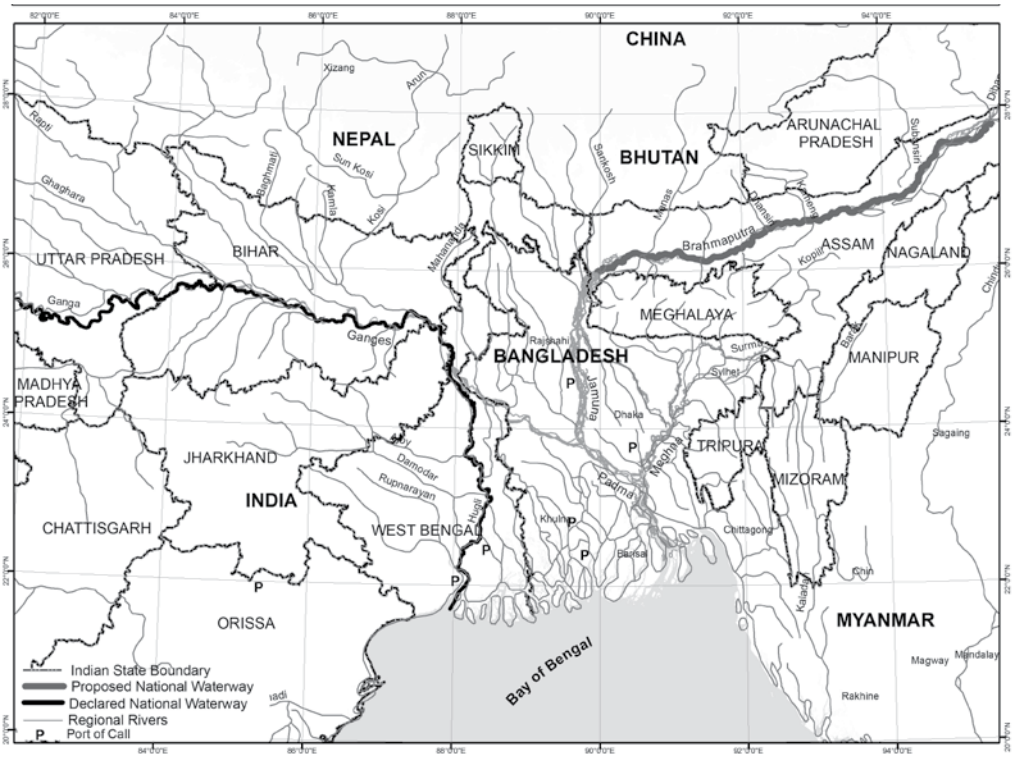
❑ **Fairway Development:** The target was to provide least available depth (LAD) of 2 m between

Haldia and Varanasi and 1.5 m between Varanasi and Allahabad for about 330 days in a year. River conservancy works (bandalling and dredging) to maintain navigable depth were taken up on an year-to-year basis. LAD of 2 m between Haldia and Patna (1,020 km) was maintained for most part of the 10th Plan. Between Patna and Varanasi, 363 km, LAD of 2 m could not be maintained: LAD maintained here was 1.5 m. In the Varanasi-Allahabad 237-km stretch, too, LAD of even 1.5 m could be maintained only for about 4-5 monsoon months in a year. IWAI lacked dredgers in this stretch, which has low discharge. Thus it was not possible to maintain 1.5 m LAD in this stretch in the non-monsoon months.

Projects were identified and implemented in the 10th Plan period to provide a navigational channel of 45 m bottom width and 3 m depth in the Haldia-Farakka stretch, 45 m bottom width and 2 m depth in the Farakka-Varanasi portion and 30 m bottom width and 1.5 m depth in the Varanasi-Allahabad stretch. These included annual fairway development measures such as bandalling and channel marking, dredging, river training measures, hydrographic surveys, procurement of vessels such as dredging units, tug-cum-buoy lying vessels, survey vessels, repair of vessels and constructing regional offices at Haldia, Kolkata and Patna.

In the remaining years of the 11th Plan, it was proposed, a navigational channel of 45 m bottom width and 3 m depth would be maintained for the Haldia-Patna stretch and 45 m bottom width and 2 m depth for Patna-Allahabad stretch by undertaking conservancy works. Besides, study and provision for semi-permanent river training works were proposed at 37 shoal locations. In 12 of these locations, permanent river training works would be constructed 2006-07. Permanent gauge stations would be set up at 20 locations all along the waterway. DGPS stations with HF/MF

Map 1: *National waterway no 1 (active) and no 2 (proposed)*



link at the rate of one station per 100 km river stretch, for better accuracy in position-fixing for survey and navigation, were also proposed. A second navigational lock was envisaged at Farakka, as was construction of a new lock at Jangipur to open the Padma river route. It was proposed to procure three tug-cum-buoy laying vessels and provide for maintenance of existing hardware like CSD units, HSD units and survey launches. Office complexes were proposed at Kolkata, Bhagalpur, Varanasi and Allahabad, 2008-12.

- ❏ **Navigational Aids:** River notices were published fortnightly and pilotage provided to vessels operating on the waterways. Navigational marks for day navigation were provided all round the year. Night navigation aids were provided between Tribeni and Farakka (364 km) during the 10th Plan and these were maintained. A project was also prepared to extend night navigational facilities from Farakka to Patna (460 km). Adequate funds were allocated to provide and extend such facilities in the 11th Plan.
- ❏ **Terminals:** Fixed concrete terminals exist at Kolkata, Pakur and Farakka. The terminals at Kolkata (TT sheds) belong to the Central Inland Water Transport Corporation Ltd (CIWTC) while terminals at Pakur and Farakka belong to the Farakka barrage project authorities. Besides, an important project to construct a permanent terminal capable of handling containers at Patna was also sanctioned. Projects were identified, and were under implementation, to complete the balance work of the permanent terminal or high level jetty at Patna, a low level jetty at Patna, RCC jetty at Haldia, Kolkata (BISN), permanent terminal at Varanasi, construction of road to the existing Pakur jetty and providing floating pontoon facilities at Rajmahal, Sahibganj, Manihari, Bhagalpur, Semaria, Doriganj, Ballia, Ghazipur, Chunar and Allahabad. Provision to set up floating pontoon jetties for manual handling at Haldia, Kolkata (BISN), Diamond Harbour, Katwa, Tribeni, Barhampur and Jangipur was also included.

  It was also proposed that permanent terminals would be built at Diamond Harbour, Farakka, Rajmahal, Sahibganj, Bhagalpur, Semaria, Ballia, Ghazipur and Allahabad. Mechanical handling facilities at the floating terminals—at Chunar, Doriganj, Manihari, Katwa, Triveni, Berhampur and Jangipur—were also proposed.
- ❏ **Vessels:** To dredge shoals, for talweg and detailed surveys, inspection and monitoring field works and demonstrative operation of cargo vessels, different types of vessels are required. Since these vessels are not available on hire, it is necessary for IWAI to have a fleet. In the 10th Plan period, therefore, IWAI acquired different types of vessels for operation on NW-1. It proposed to buy a 600-ton vessel for the Haldia-Patna sector and three 300-ton vessels for the Patna-Allahabad stretch for the purpose of demonstration.
- ❏ **Demonstrative voyages/Fixed schedule sailings:** These have been carried out on NW-1 between Haldia and Patna since January 2004, using vessels of CIWTC. Under this initiative, several types of cargo were transported: stone chips from Pakur to Patna and Pakur to Kolkata, edible oil from Haldia to Patna and iron and silica sand from Patna to Kolkata.

National waterway no 2

The river Brahmaputra, 891 km between the Bangladesh border near Dhubri to Sadiya, was declared national waterway no 2 on 1 September, 1988. Pandu, Nematighat and Dibrugarh are other important points on this route. Till 2010, IWAI maintained a navigable depth of 2 m between Bangladesh border to Dibrugarh (768 km) and 1.5 m in the Dibrugarh-Sadiya stretch (123 km). At present the waterway is used by vessels of the Assam government, CIWTC, Border Security Force, tourism vessels and other private operators. Long cruise tourist vessels voyage between Sivsagar near Dibrugarh and Manas

The 10th Plan envisaged navigational marks for day navigation all round the year. Night navigation aids were also planned for 364 km stretch between Tribeni and Farakka

wild life sanctuary near Jogighopa. It is now planned to raise the depth of flow by 0.5 m all along, except for a 139-km sretch between Nematighat and Dibrugarh, where it will remain 2 m.

- **Fairway Development:** River conservancy works (bandalling and dredging) to maintain navigable depth were taken up on year-to-year basis. LAD of 2 m between Dhubri and Dibrugarh was maintained for most parts of the years during the 10th Plan period. However, between Dibrugarh and Sadiya, LAD of 1.5 m could be maintained only during monsoon months because of low discharge in this upper reach of the waterway and also because dredger numbers were inadequate. Attempts are being made to provide a navigational channel of 45 m bottom width and 2 m depth for the Bangladesh border-Dibrugarh stretch and 30 m bottom width and 1.5 m depth for the Dibrugarh-Sadiya stretch by measures like bandalling and channel marking, dredging, river training measures, hydrographic surveys, procurement of hardware, floating dry dock, survey vessels and repair of vessels. This would also extend to the 11th Plan. Besides study and provision for semi-permanent river training, works were proposed at 36 shoal locations and construction of permanent river training works at 6 locations.
- **Navigational aids:** The target was to provide day navigation aids in the entire waterway and night navigation aids in the Dhubri-Guwahati sector by the end of the 10th Plan. Navigational marks for day navigation were provided in the entire waterway all round the year. Night navigation aids were provided during the 10th Plan between Bangladesh border and Pandu with the help of manned country boats. River notices were published fortnightly and pilotage provided to vessels operating on the waterway. A project was also prepared for extension of night navigation aids from Pandu to Dibrugarh (513 km). Projects to provide 24-hr navigational facilities for the entire stretch of the waterway were identified and allocated for the 11th Plan. There are 201 lighted buoys, 87 shore bacons and 1,162 country crafts fitted with lights on the NW-1 to facilitate night travel. The figures for the NW-2 are 128, 35 and 459 respectively.
- **Terminals:** According to IWAI sources, no fixed terminal exists on this waterway. However, a project to construct a fixed RCC terminal at Pandu (Guwahati), capable of handling containers, was sanctioned during the 10th Plan and this is almost completed. A project to make a high level jetty at this site was also sanctioned and work was entrusted to CPWD on deposit basis. A container handling crane was also procured and deployed at this terminal. Actions were also taken to construct a coal terminal at Jogighopa. Floating terminals available at Dhubri, Jogighopa and Pandu were used extensively. A new floating terminal at Silghat was constructed jointly with Numaligarh Refinery Ltd and it was regularly used by a private operator. There are seven pontoons on NW-2 which can be used as floating jetties at any location. During the 10th Plan, five pontoons and mounted cranes and two shore cranes were also procured. These can be shifted to any location on the waterway.

  It is proposed to construct permanent terminals at Dhubri, Tezpur, Silghat, Dibrugarh, Sadiya and upgrade the terminal at Jogighopa. It is also proposed to provide mechanical handling facilities

at the floating terminals at Jamguri, Bogibil and Saikhowa. Provision for maintenance of permanent terminals and floating terminals are also proposed.

- **Vessels:** As with NW-1, IWAI acquired vessels for NW-2. During the 10th Plan period it was decided to procure more cargo vessels to demonstrate the viability of transportation through the inland waterway transport mode. Under this, one vessel has already been procured and operates under fixed schedule sailing.

National waterway no 6

A proposal to build this waterway in the 121-km reach of the Barak river in the northeast, with terminals proposed at Karimganj, Badarpur, Silchar and Lakhipur, is pending with Parliament. This waterway will have offices at Karimganj and Silchar.

NWs 1 and 2 are typical alluvial rivers, with braiding and meandering, sediment load and high water level fluctuation—horizontal and vertical—during summer and monsoon months. On these rivers, several shallow areas (shoals) come up during the low water season and maintaining 2 m LAD, particularly in upper reaches, becomes difficult. These waterways are un-trained and, therefore, open river navigation techniques or river conservancy works such as dredging and bandalling are employed to maintain the target depth in the navigation channel. Conservancy works are to be repeated every year here. According to IWAI sources, India has got about 14,500 km of navigable waterways which comprise rivers, canals, backwaters and creeks. About 55 million tonnes of cargo (2.50 billion tonne-km, btkm) is moved annually by inland water transport, a fuel-efficient and environment friendly mode. Its operations are currently restricted to a few stretches in the Ganga-Bhagirathi-Hooghly rivers, the river Brahmaputra, rivers in Goa, the backwaters in Kerala, the Barak river and the deltaic regions of the Godavari-Krishna rivers. Besides organised operations by mechanised vessels, country boats of various capacities also operate in various rivers and canals. The responsibility of development of these waterways rests with IWAI. This authority, along with the Central Inland Water Transport Corporation (CIWTC) as the principal operator, are the two Central agencies engaged in the country. The efforts of these organisations are supplemented and supported by inland water organisations of various states and private operators, although considerable emphasis has been laid on development of rail and road.

Planning Commission sub-group studies IWT

The 10th Five Year Plan had an approved outlay of Rs. 6.27 billion (US$112.6 million) IWAI but expenditure was only Rs 2.73 billion (US$49.07 million) till 2006, not a very encouraging figure. But there was a steady rise in the quantum of goods transported by IWAI (see Table 1)

In the inland water transport (IWT) sector, there was an increase in cargo movement from 1.5 btkm in 2000 to 2.82 btkm in 2006. During the period, demonstrative voyages/fixed schedule sailings were carried out on NW-1 between Haldia and Patna since January 2004, using CIWTC's as well as IWAI's own vessels. There have been regular transportations of products of the Numaligarh refinery by the private sector. A passenger vessel of a private company has been successfully running a tourist service in NW-2 for the last two years between various points in the Dhubri-Dibrugarh stretch and two new passenger vessels for river tourism have been constructed for NW-1 and 2.

While national waterways are developed by the Centre through IWAI, for overall IWT development it is necessary state governments also develop waterways. To encourage states to do so, the funding pattern of the Centrally Sponsored Scheme (CSS) was revised in November, 2002. In the

revised pattern, a 100% grant for north-eastern states including Sikkim was sanctioned. Also, a 90% grant for states like Andhra Pradesh, Assam, Bihar, Goa, and Himachal Pradesh, Karnataka, Kerala, Maharashtra, Madhya Pradesh, Orissa, Tripura, Uttar Pradesh and West Bengal was sanctioned. The total cost of these grants was Rs. 0.95 billion (US$17.05 million). A fund of Rs 0.41 billion (US$7.34 million) was also released to these states in the 11th Plan. Besides, the Centre has approved an Inland Vessel Building Subsidy Scheme (IVBSS), under which 30% subsidy is payable to entrepreneurs for construction of inland vessels built in India that can then operate in the national waterways, the Sunderban and the Indo-Bangladesh protocol routes. The government of India-approved Inland Water Transport Policy includes several fiscal concessions, policy guidelines for development of this mode and to encourage private sector participation in development of infrastructure, and ownership and operation of inland vessels. IWAI is also authorised for joint ventures and equity participation in BOT projects. IWAI had prepared proposals of development of nine waterways and forwarded these to the World Bank and the Asian Development Bank (ADB) with a view to obtain external assistance for IWT development in India. Both the World Bank and ADB responded positively to these proposals.

Most waterways, however, suffer from navigational inadequacies such as shallow water, narrow width, siltation and bank erosion. Moreover, vertical and horizontal clearances at overhead structures are not adequate for navigation throughout the year. Consequently, at present about 5,200 km of major rivers and 485 km of canals are suitable for mechanised craft operation. Even these navigable waterways lack the needed infrastructure such as fairways, navigational aids, terminals and communication facilities. The mechanised-vessel operations are confined to only a few locations. Cargo transportation in an organized manner is confined only to Goa, West Bengal, Assam and Kerala.

The report on IWT by the Planning Commission of India, in its 11th Five Year Plan, puts on record some disturbing features about the non-functioning of the IWT sector. It says (1) there is not a single full-fledged river port in the country (Patna terminal is not yet operational); (2) infrastructure facilities (fairway with assured LAD, terminals, cargo handling equipments, night navigation facility, inter-modal linkages) on national waterways are grossly inadequate. As a result, the national waterways aren't fully functional to become an alternate and viable mode of transport; (3) The IWT fleet strength is about 400 only, of which more than 50% is obsolete and non-operational; (4) Low value, high volume cargo like coal and flyash, fertiliser, raw materials, building materials and foodgrains are being carried long distances by road and rail, despite O-D points lying on national waterways, IWT Protocol routes (in case of the north-east) and other developed inland waterways and infrastructure. In short, in successive plans, IWT has been neglected. The planning commission report suggests a paradigm shift in IWT.

Table 1: *Goods transported by IWAI in the 10th Plan (Billion tons kilometer btkm)*

Year	NW-1	NW-2	NW-3
2002-03	0.128	0.004	0.019
2003-04	0.160	0.029	0.022
2004-05	0.312	0.025	0.015
2005-06	0.411	0.032	0.017

Source: The working group report on shipping and inland water transport for the eleventh five year plan

IWT and the 11th Plan

Once the sector develops and reaches a threshold level, private funding/extra-budgetary resources will start flowing automatically. All riverine states should develop waterways as feeder routes to national waterways by adopting the fishbone model of development. Major waterways of states should be identified and classified as 'state waterways' for priority funding. More funds will be required during the 11th Plan (2007-2012), as the response to CSS during the 10th Plan has been encouraging. To achieve higher exports and better connectivity to the north-eastern region, new emphasis on co-operation with Bangladesh is envisaged during the 11th Plan period, by adding more Protocol routes, more ports of call and improved cargo handling facilities on Protocol routes. The Planning Commission hopes the haulage of goods—1.5 billion ton-km at the end of the 9th Plan and improved to 2.82 billion ton-km after the 10th—would move further up to 5 billion ton-km by the end of 11th Plan.

The 11th Plan outlay indicates a requirement of Rs 10 billion (US$179.7 million) for coastal shipping and Rs 55.8 billion (US$1 billion) for inland water transport through general budgetary support. Since both are commercial activities, the possibility of getting investment through Public Private Partnership will be explored. In fact, while formulating the 11th Plan, the Planning Commission had constituted two Sub Groups of the Working Group on Shipping and IWT. Their task was to (1) review the physical and financial performance of IWT in the central and state sectors with particular reference to Tenth Five Year Plan targets and draw lessons from there for the Eleventh Plan; (2) assess IWT's role in achieving optimal inter-modal mix; (3) recommend a policy frame work for development of IWT during 11th Plan, keeping in view the need to relieve pressure on other surface modes of transport; (4) formulate a program for development of IWT for the 11th Plan, keeping in view IWT Vision 2020; (5) assess funds required during the 11th Plan and to identify possible sources of funding; (6) identify IWT constraints and formulate plans for conservancy works including hydrographic surveys, dredging and provision of infrastructural facilities such as terminals; and (7) assess the performance of the Inland Waterways Authority of India (IWAI).

IWAI's performance would be assessed with regard to (1) development, maintenance and management of the national waterways in the country; (2) research and development works, technical studies, hydrographic surveys; (3) assistance given to states in formulation, implementation of CSS relating to improvement of waterways in various states; (4) recommend measures for promoting private sector participation in the development of IWT; and (5) review CSS with particular reference to development of infrastructural facilities for promotion of IWT.

The terms of reference of Sub Group II (IWT) were: (1) to evaluate the utilisation of transit and trade between India and Bangladesh and suggest/recommend measures for maximum utilisation of these routes, in particular for increase in traffic in the north-east; (2) to examine the existing training facilities in IWT, efforts made during the 10th Plan and recommend measures for increasing the human resource potential in this field. Some of the observations of these groups are incorporated in case of the NW-1 and 2 above.

The 10th Five Year Plan had a total approved outlay of Rs 9.03 bilion (US$162.3 million) but the expenditure in its first four years was only Rs 2.75 billion (US$49.4 million) for development, which it felt was not a very satisfactory figure. The sub-groups reflected that although the absorption capacity of IWAI had improved in the 10th Plan, it needed to be substantially enhanced and suggestions were made to improve fairways, terminals and navigation aids. They further felt if improved facilities were provided, the private sector would invest in acquiring and operating inland vessels. To encourage the

private sector, there was IVBSS. The Planning Commission hoped that by March 2008, three national waterways would be fully functional and the goods carried by 2008-09 would rise by 0.924 btkm. The Maritime Agenda (2011-2020) of the Ministry of Shipping suggests the 'present cargo handled by inland waterways is now 4 billion ton kilometer. That has to be raised to 20 billion ton kilometer'. If this has really happened, the performance is encouraging—from 2.5 btkm to nearly 4 btkm in one plan period—because the Maritime Agenda notes further that 'Since this suggested Paradigm shift could not be acted upon due to inadequate funding provided to the sector during the 11th Plan and also since IWAI could not be strengthened as an organization to absorb higher level of funds, it still holds good for perspective planning of development of IWT sector for the decade 2010-2020.'

IWT: A PMO thrust area

Under one of the thrust areas identified by the Prime Minister, it is envisaged to encourage a gradual shift of domestic cargo from rail and road modes to IWT, increasing its share from the present level of less than 1% to at least 2%. The present level of cargo transportation by IWT mode is about 2.82 btkm. Therefore, a modal shift to achieve 20 btkm would mean a growth of about 8 times. That would require well-planned policy measures, modal shift incentives, strengthening of technical manpower in IWAI to increase its capability to implement projects effectively in a time-bound manner and, above all, adequate funds. It is hoped the modal share of 2% in favor of IWT can be achieved in about 20 years, by 2024-25. To achieve this target the PMO proposes to (1) make the existing three national waterways "fully functional" in about two years time; (2) involve the private sector in development, operation and management of IWT infrastructure; (3) sanction a comprehensive package for IWT sector with focus on adequate funds, taxation, incentives, and special package for IWT sector for making it competitive w.r.t. rail and road; (4) declare and develop three new waterways; (5) encourage states to develop their potential waterways through CSS; and (6) make effective the provisions of the Inland Water Transport Policy of January 2001, that gives vast incentive to the private sector's involvement in IWT, including joint ventures.

IWT: trade with Bangladesh and the north-east question

India's north-eastern region consists of 8 states—Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura—with a population of about 39 million (2001 census). With several important and perennial rivers, the drainage line of the region passes through the Brahmaputra and Barak rivers into the Bay of Bengal via Bangladesh. IWT, thus, becomes an important mode of transport to link this region with the rest of India as well as Bangladesh. In the absence of any bilateral agreement between India and Bangladesh for movement of Indian goods through rail or road through Bangladesh, the existing IWT arrangement between the two countries—under which inland vessels can pass between India, the north-eastern region of India and Bangladesh—acquires importance.

It has the advantage that accessing the north-east from Kolkata through the Sunderban and Bangladesh via the NW-2 or via the Meghna-Barak waterway system often follows a shorter route than by the rail or road networks. This mode remains effective even when the road and rail links snap during the rainy season. It is safer and more efficient for transporting industrial goods and raw materials. Passengers and cargo are moved via IWT in both the organised and unorganised sectors. IWT is essential to small or remote locations for the transport of agricultural and commercial

products to and from regional markets and growth centres, especially during the monsoon and flood season. This mode has a potential for generating employment opportunities. Opening the Farakka-Dhulian-Rajshahi-Aricha route will further provide direct link to the mainland through NW-1.

India-Bangladesh protocol: some features

First signed in 1972, the Indo-Bangladesh Protocol on Inland Water Transit and Trade is renewable every two years. However, this pattern has not been followed since 3 October, 2001 and the renewal has been done only in a piecemeal manner. Under this protocol, India and Bangladesh agreed to use inland waterways for passage of goods between two places of one country through the territory of the other and also for inter-country trade. The protocol provides for 50:50 sharing on tonnage basis for inter-country and transit cargo by Indian and Bangladeshi vessels.

Following transit routes are specified in the protocol:

- Kolkata-Haldia-Raimongal-Chalna-Khulna-Mongla-Kaukhali-Barisal-Hizla-Chandpur-Narayanganj-Aricha-Sirajganj-Bahadurabad-Chilmari-Dhubri-Pandu, and vice-versa;
- Kolkata-Haldia-Raimongal-Mongla-Kaukhali-Barisal-Hizla-Chandpur-Narayanganj-Bhairab Bazar-Ajmiriganj-Markuli-Sherpur-Fenchuganj-Zakiganj-Karimganj and vice-versa;
- Rajshahi-Godagari-Dhulian and vice-versa;
- Karimganj-Zakiganj-Fenchuganj-Sherpur-Markuli-Ajmiriganj-BhairabBazar-Narayanganj-Chandpur-Aricha-Sirajganj-Bahadurabad-Chilmari-Dhubri-Pandu and vice-versa.

Under this protocol, following ports of call in each country have been nominated for facilitating inter-country trade:

India: Kolkata, Haldia, Karimganj, Silghat and Pandu;

Bangladesh: Narayanganj, Khulna, Mongla, Ashuganj and Sirajganj.

20 million Bangladeshi Taka (US$0.24 million) are paid by India to Bangladesh annually, for maintenance of routes between Sirajganj and Daikhowa and between Sherpur and Zakiganj. Maintained by Bangladesh, these are primarily for the use of Indian transit traffic. While infrastructure on NW-1, 2 and the Indian portion of the Protocol routes will be upgraded by India, the portion in Bangladesh should be developed by them. But it is not likely. Government of India, therefore, has to step forward to develop waterways of Bangladesh also, at least, for those routes are critical for connectivity to the north-east. The Indian government has already agreed for a line of credit of US$1 billion to Bangladesh for various projects, including development of IWT. With this background, a project for development of IWT of certain stretches of waterways in Bangladesh at a lump-sum

Table 2: Summary of Potential Cargo movement (India)

Year	Million Tones	Btkm
2008 – 09	2.6928	1.0929
2011 – 12	3.9954	2.4796
2016 – 17	6.6006	6.5096
2021 – 22	8.2040	7.2206
2024 – 25	10.2765	8.1121

Source: The working group report on shipping and inland water transport for the eleventh five year plan

provision of Rs 2 billion (US$35.95 million) is proposed under the perspective plan of 2010-20.

There had been a demand from the Northeastern states to add Ashuganj in Bangladesh for designation as a port of call and this has been agreed upon between the two countries recently under the protocol. Inland Waterways Authority of India (IWAI) and Bangladesh Inland Water Transport Authority (BIWTA) have been nominated as 'competent authorities' by the respective governments to deal with protocol-related issues.

The protocol enumerates various operational parameters: conservancy and pilotage, port dues and other charges, handling facilities, supply of bunkers, purchase of essential stores/provisions, repair facilities, assistance to be provided by either country to the vessels of the other in distress, submission of voyage forecast for voyage permission to use waterways, nomination of ports of call on equal basis, recognition of survey certificates and other documents, flying of flags, use of radio telephone, registration and issue of identity cards, sharing of inter country trade and transit cargo, common freight rates, uniform documentation, custom checks and documentation, freight remittance facilities, appointment of agents, arrangement of settlement clearance and remittance and setting up a standing committee.

Cargo moved on the Brahmaputra river system includes fertilisers, POL products, jute, tea, cement, timber and iron and steel. The Barak river system cargo includes fertilisers, food grains, iron, steel, cement, forest products, paper products and coal. (see Table 2)

Protocol routes: the constraints

- **Lack of assured freeways:** Assured fairway with desired depth and width is the key to year-round operation. Unsafe and uncertain fairways restrict speed and cause frequent groundings that result in higher fuel costs; the system becomes expensive and unreliable. Least available depth (LAD) is a function of season. It goes down drastically in the lean season (November to May). Sediment deposition is the other factor that disturbs the river bed and the waterway. Unpredictable shoals appear all along the length of the river bed, to the detriment of the passage of vessels, resulting in grounding of vessels. As per the protocol, India and Bangladesh are supposed to provide desired LAD on their respective protocol routes.
- **Lack of round-the-clock navigation facilities:** Provision of night navigation facility is essential for 24-hour navigation. This has been provided by IWAI between Dhubri and Pandu on NW-2. The waterways within Bangladesh, which are used for trade and transit routes also, reportedly have 24-hour navigational facilities between Chalna and Padma-Meghna confluence and between Padma-Meghna confluence and Bhairab Bazar, covering 387.5 km. However, stretches where night navigation facility exists do not serve to reduce voyage times of Indian vessels, since, reportedly, Bangladesh pilots do not use these aids. Hence, night navigation is practically not done by Indian vessels in Bangladesh.
- **Lack of terminal and cargo-handling facilities:** Terminals or river ports provide berthing facility to IWT vessels, interface of IWT mode with rail and road and other facilities such as storage, bunkering, communication and, most importantly, mechanical cargo-handling. On NW-2, only floating terminals at Dhubri, Jogighopa, Pandu and Silghat have been provided. It is often debated whether terminal facilities be provided first or the number of vessels reaching a port justify such construction. This unnecessary debate has resulted in the total neglect of the sector and the national economy itself has suffered. Now that the realisation has dawned on the planners, some initiatives have been taken develop terminals on NW-2. As a result, one fixed terminal capable of handling containers is being developed at Pandu; a floating terminal at Silghat was also developed

in association with the Numaligarh Refinery Ltd. and is being used by a private operator. At Jogighopa too, a mechanical loading/unloading facility is being created, upgrading the current floating terminal.

It is necessary that terminals with mechanical handling facilities are developed at Dhubri, Jogighopa, Pandu, Tejpur, Silghat, Dibrugarh, Jamguri, Bogibil, Saikhowa and Sadiya. Moreover, for container movement between Kolkata and NW-2, it is necessary terminals being built at Kolkata or Haldia by IWAI should have container-handling facilities. For export cargo to Bangladesh from the north-east, some more terminals should be declared as Ports of Call.

- ❑ **Shortage of IWT vessels:** Eastern and north-eastern India are the only regions IWT has some base and operators to run such services. The Central Inland Water Transport Corporation (CIWTC), the West Bengal Surface Transport Corporation (WBSTC), Vivada Inland Waterways and Eastern Navigation in West Bengal and the Inland Water Transport Directorate of Assam (IWTDA) own vessels, though not enough to cater to proposed needs. Some small operators also own one or two vessels. WBSTC and IWTDA are the other operators. CIWTC, a loss-making organisation since inception, was the main operator on this route. It owned 20 tugs, 16 self-propelled crafts, 3 oil tankers, 58 dumb barges and 4 deck loaders. However, more than 50% of their vessels are out of order. The organisation has leased out 13 of their vessels on 'as is where is' basis to private operators. It was proposed to be disinvested. IWTDA possesses different types of vessels and pontoons, totaling 227 (only 84 are functional: 60 in the Brahmaputra and 24 in the Barak and their tributaries) but their performance is insignificant. WBSTC also have a big fleet of inland vessels but all of these are passenger vessels.
- ❑ **Dominance of Bangladesh in IWT:** The cargo movement from India to Bangladesh has increased manifold in the past few years (see Table 3), mainly on account of enhanced export of fly ash, slag and gypsum for cement factories in Bangladesh. Most of this cargo is, however, transported in Bangladesh vessels and despite provision of 50:50 cargo-sharing in the protocol, share of Indian vessels in the IWT inter-country trade is insignificant. All Bangladeshi vessels come from their private sector and the role of their public sector operator, BIWTC, has practically been 'nil'.

  Table 3 hows the difference of goods carried by Indian and Bangladeshi carriers; the Indian share is abysmally low. Reduction in fleet size of CIWTC vessels due to obsolescence and threat of disinvestment of CIWTC are the main reasons for this difference. Bangladeshi private operators have the advantage of low cost of their vessels/operation because of cheaper diesel cost in Bangladesh, cheaper labour cost and lower capital cost of Bangladeshi vessel vis-à-vis Indian vessels, due to lower construction and safety standards adopted in Bangladesh.

Protocol issues

- The IWT protocol between India and Bangladesh was supposed to be renewed every two years but is renewed in piecemeal manner, dampening the enthusiasm of the private sector to invest in IWT where the protocol is a critical aspect;
- Bangladeshi vessels outnumber Indian vessels. This, again, results in lack of enthusiasm by the Indians operating on the protocol routes;
- Indian operators complain that while Bangladesh vessels are allowed by India to load/unload cargo at various jetties around the designated ports of call, the same facility is not given to Indian vessels;
- The Indo-Bangladesh Protocol on Inland Water Transit and Trade does not provide for any tourism operation involving passenger traffic and the tourism potential of northeast remains untapped;

Table 3: Amount of Goods Carried by India And Bangladesh

Year	Carried by Bangladeshi Vessels (M.Ton)	Carried by Indian Vessels (M.Ton.)	Total Carried (M.ton.)
2004-05	3,76,839	36,993	4,13,832
2005-06	5,38,020		5,38,020
2006-07	8,81,011		8,81,011
2007-08	9,94,345	1,900	9,96,245
2008-09	9,30,094	1,431	9,45,422
2009-10	12,77,436	1,200	12,78,636

Source: Bangladesh Inland Water Transport Authority

- River notices indicating the depth in the protocol route are not shared at present by both countries. The same is required for advance planning of voyage and safe movement of IWT vessels;
- Inter-country trade is forbidden in discharge cargo or passengers in the country through which they are passing. This makes the IWT operation uneconomical, as return trips are under-utilised;
- There is no container-handling terminal in Bangladesh where Indian vessels can load or unload containers, so dissuading the bigger Indian operators to operate inter-country trade.

Programme of development to better utilise Protocol routes

Infrastructure

- Assured fairway of 2 m depth and 45 m width should be provided by India/Bangladesh on all the protocol routes for at least 330 days in a year. In addition, fairway of 45 m width and 2 m depth be provided in NW-2 up to Dibrugarh and that of 1.5 m depth between Dibrugarh and Sadiya. Efforts should also be made to provide fairway of 3 m depth between Haldia and Farakka;
- Formation of shoals can be prevented only by undertaking large-scale river training works which are capital-intensive and are long-term projects involving multiple issues and agencies. A provision of Rs 0.2 billion (US$3.6 million) was made during the 11th Five Year Plan for tackling shoals in the rivers Brahmaputra and Barak;
- Bandalling and dredging are adopted as short-term measures to improve the fairway in rivers but become impractical in case of heavy sediment-carrying rivers like the Brahmaputra and the Barak. Whatever is dredged during the lean season gets totally filled up after the flood and conservancy activities have to start afresh. To provide fairway of 45 m width and considering 1 m average depth of cut between Dhubri and Sadiya, about 725 thousand cu m of dredging is required in NW-2 to be carried out every year;

  For annual dredging of shoals on NW-2, it is therefore necessary that IWAI possess necessary number of dredgers, at desired locations, to tackle shoals during the lean season. With these dredgers, coupled with bandalling to be taken up annually, assured fairway of 2 m depth between Dhubri and Dibrugarh and 1.5 m depth between Dibrugarh and Sadiya can be provided by IWAI;
- Navigational lock at Jangipur: For operationlising the Farakka-Padma route, the protocol route Rajshahi-Godagari-Dhulian must be extended up to Aricha. It is also necessary that construction of navigational lock at Jangipur is taken up along with excavation/de-siltation of channel between Jangipur lock and Padma river as well as between Jangipur lock and Bhagirathi river for round-the-

year operation. Dhulian-Rajshahi-Aricha route to needs to be dredged for a provide 2 m LAD;
- Sunderban waterways: On the Indian side, the inland waterways of Sunderban used for inter-country and transit trade are yet to be declared national waterways. These must be so declared without further delay. Till then, IWAI will take up minimum development in its capacity of 'competent authority' under the protocol;
- Standardize the design of IWT vessel for operation on inter-country trade routes with a view to reduce their capital cost without compromising safety aspects.

Non-technical issues

- Time-frame for IWT protocol needs to be increased to generate confidence in entrepreneurs/ potential investors. There is a demand for raising it to five years against the prevailing two years;
- More ports of call are required along the protocol routes to meet future cargo demand. Ports of call required to be added in the Bangladesh side are Ashuganj, Noapara, Mukhtarpur, Bosirhat, Titagarh, Godagari, Aricha, Chilmari, Bahadurabad and Porabari. On Indian side: Dhulian, Bandel, Katwa, Budge-Budge, Dhubri and Jogighopa;
- The Bangladesh authorities must be impressed upon by the Indian authorities that since Bangladeshi vessels are allowed to load/unload cargo at various locations in and around Kolkata and Haldia (extended ports of call), Indian vessels should also be allowed to operate in the vicinity of Bangladeshi ports of call such as Narayanganj, Khulna, Mongla and Sirajganj;
- Bangladesh authorities must be impressed upon by the Indian authorities to allow passenger transport, too, under the protocol;
- There should be a mechanism of exchange of navigational information by the competent authority of one country to the other. Presently, river notices of Bangladesh waterways do not regularly come to the competent authority of India. The river notices and river charts are required for advanced planning of voyage and safe movement of IWT vessels. Hence this mechanism should be operationalised as early as possible;
- Article 17 of the protocol needs to be modified adequately so that the vessels may take or discharge cargo for the inter-country trade also, while they are passing through the transit route. This will make IWT transportation on protocol routes more viable;
- To facilitate container movement service between Kolkata and Narayanganj by inland waterways, Bangladesh authorities may be requested to provide infrastructural facilities capable of handling containers, as well as crane for handling of containers, at Khanpur jetty.

Navigational aids

Navigational aids for 24-hour navigation may be provided in the entire NW-2 and Sunderban waterways by the Indian authorities. The same is expected on the Bangladesh portions of all the protocol routes by the authorities of Bangladesh. Effective steps must be taken so that night navigation facility provided in Bangladesh is actually used by the Indian vessels.

Safety of navigation depends upon vessel design and crew efficiency. It is imperative to have properly trained manpower to ensure safety of transportation and better vessel utilization

IWT Vessels

There is a wide gap in the number of Indian and Bangladeshi vessels deployed on the protocol routes. Various incentives are suggested for PPP-like concessions in vessel building, freight subsidy, diesel subsidy, joint ventures and making vessels available on lease in this connection. These suggestions should be made effective.

Strengthening of Multimodal Transport

Multimodal transport is a vital sector with considerable growth potential for the country in the 11th Plan. In addition to modifying laws to suit the development of port infrastructural facilities and services for multimodal transport, impetus must be given to coastal shipping and integration of transfer nodes. There must be a policy on rail connectivity: there is an urgent need to dedicate freight corridor between major destinations/ports. There must also be a policy on road infrastructure and connectivity: equally, there is an urgent need to promote hinterland connectivity and better quality of trucks and trailers designed to carry more loads. An active high powered National Co-coordinating Agency must be set up to rationalise and co-ordinate transport policies through a closer relationship between the different players, simplification of customs procedures and formalities and management of supply chain security costs.

Training facilities in respect of IWT

It is projected trained IWT manpower required will be of the order of 50,000 by 2025; at the end of the 11th Plan period, it will be about 12,500. This does not include the manpower required for country boats. There is thus a need for imparting qualitative and standard training.

Safety of navigation depends upon the design of vessel as well as the knowhow of the crew operating the vessel. Therefore it is imperative to have properly trained manpower not only to ensure safety of transportation but also for better vessel utilisation. In West Bengal there is no training institute, though examinations are conducted by the Mercantile and Marine Department (MMD) of DG (Shipping) on behalf of the state government.

At the central level, the National Inland Navigation Institute (NINI) has been set up by the IWAI, in an arrangement with Indian Institute of Port Management, Kolkata (IIPM). NINI trains on aspects like hydrographic survey, river conservancy, river training works, development of navigation channel by construction of spurs/groynes, bandalling or bottom-paneling, navigational aids, construction of jetties/terminals, operation of vessels, transport economics, repair and maintenance of crafts, training to the crews of both deck and engine sides of inland vessels.

Besides, there are training institutes for basic personnel (deck hands/laskars, greasers, drivers, masters) run by IWT Directorate of Assam at Guwahati, the government of Goa at Bardez and the government of Orissa at Chandbali. In West Bengal, although the state is one of the most organised IWT states compared to others, an IWT Crew Training Center was established by the government in 1950. But the premises had to be handed over to the Indian Navy and the functioning of the training institute was stopped in 1985.

NINI-Patna is expected to develop the training program for various groups of professionsls in collaboration with different reputed institutes of the country to train the crew, engineers, CRPF/BSF personnel and civilians and help existing institutes at Assam, Goa and Orissa upgrade to SCTCs. New SCTCs will be set up in Kolkata, Kerala, Varanasi/Allahabad, Andhra Pradesh, Tamilnadu, Karnataka, Maharashtra, Gujarat and Madhya Pradesh through one-time grant by Department of Shipping directly or through CSS for IWT development at different levels.

Centrally sponsored scheme for the north-east

The fish bone model ought to be adopted to develop the 21 tributaries (11 on the north bank and 10 on the south) of the Brahmaputra for navigation, to operate vessels of smaller capacity, ranging 50-150 tons. Besides, some other rivers in the region have potential for development.

This is easier said than done. The tributaries of the Ganga and the Brahmaputra also carry huge amount of sediments; rivers like the Mahananda, the Kosi, the Bagmati also change their course regularly though they are contained within embankments. Attempts to train the river within the existing embankments would require extensive dredging, an operation that would amount to putting up a fresh pair of embankments within the existing embankments. It must be reminded here that areas within the embankments are populated and the number of the inhabitants runs in hundreds (414 villages within the embankments of the Kosi river, 66 in the Mahananda river and 95 in the Bagmati river) and they will be at a greater risk if the waterway of the river is shrunk and the river starts eroding the newer embankments without much of warning. Upon the recommendations of the Special Task Force on Bihar, it seems, the northern tributaries of the Ganga are being made to flow through a narrow stream within the embankments and this move is being resisted vehemently by the villagers living within the embankments.

The ferry ghats on these rivers are manned by private owners in the case of the state of Bihar, cooperatives and individuals in West Bengal and bidders, through auction, in Assam. They are hard nuts to crack; they extract money from the users ruthlessly and provide little facilities to the user. If the fishbone model of IWT is to be developed, the role of the states will become important and decentralized problems would come to the fore and will have to be dealt with. Security of the vessels, the goods loaded on to them and the safety of passengers will have to be carefully worked out.

Conclusion

IWT remains the most cost-effective and eco-friendly mode of transport and if speed is not the compulsive criterion, it is best suited for a riverine region like the eastern and north-eastern states of the country. Since Bangladesh shares most of the major and minor rivers of the region, it becomes imperative to effectively use the common rivers for development of trade, transport, tourism and goodwill. There has been a history of sharing the river routes and it will always be wise to expand the usage for the common good. There are some knots that need to be untied and these are known to all the concerned parties. The need of the hour is to strengthen the mechanism of sorting the differences, in the interest of development. As the economy of the country looks up, this will become a compulsion also. While the governments understand the issues involved more than anyone else, it is the duty of the civil society of the two countries to create pressure on their respective governments for speedy implementation of the projects that will recognizably improve the situation.

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Towards a Bangladesh-India initiative

Syed Monowar Hussain

The use of waterways by mechanised vessels in this part of the world began more than 175 years ago. An inland steamer first propelled in the river Ganga in 1834, informs 'Background and Creation', an article in a 1995 Bangladesh Inland Water Transport Authority (BIWTA) brochure. The steamer was owned by the government. The India General Navigation and Railway Company Ltd (IGNR), the first inland steamer company, was floated on February 6, 1844. After a few years the River Steam Navigation Co Ltd (RSN) was established.

During the nineteenth century these two companies, with their registered offices in London, dominated IWT trade in Bengal, Assam and Bihar. They used to carry 70% of cargo and passenger traffic. The growth of traffic was tremendous. In the last quarter of the nineteenth century (1880-1899) as many as 898 vessels used to ply annually in the route from Kolkata to Khulna through the Sundarbans. In the first quarter of the twentieth century number of vessels rose to 4,803 annually.

During the British period river conservancy works were carried out by IGNR and RSN. As such, improvement and development of the inland water transport (IWT) sector were conditioned by their profit motives. Inland ports, terminal facilities and ancillary services for smooth and safe navigation were adjuncts to commercial requirements. There were no provisions for governmental control and maintenance of waterways. The river conservancy works were carried out at the district level by the companies. Each district was headed by a pilot superintendent comprising a large establishment of pilots and surveyors grouped together and placed along the navigational routes. Each group used to cover a specific length. They used to inspect the channels regularly, using country boats, measured depth with bamboos and other materials and demarcated the deepest part or the shallow area with bamboo sticks. Whenever a vessel arrived at a particular pilot station, a pilot went on board and guided the vessel through a channel.

In the early part of the twentieth century, waterways weren't improved much for navigation, except in the Madaripur Beel route. The first dredger, Foyer, was acquired in 1907. Utilising this dredger the Madhumati river, the Madaripur Beel route, the lower Kumar and the Gopalganj loop were excavated. A second dredger, Alexandra, was procured thereafter. Thus dredging was introduced in river conservancy. At this time the Halifax cut was made. According to 'Navigation dredging in

Bangladesh', also in the 1995 BIWTA brochure, the Gabkhan Khal, a narrow creek between the mighty tidal rivers, was excavated and moderately widened.

The Inland Waterways Bill was passed by the Bengal Legislature in 1934. This would have set up a waterways board. Unfortunately, mentions the 1995 BIWTA brochure, the act was never put into operation. During the early period of East Pakistan several proposals were made to create a competent, statutory organisation to manage, operate and develop IWT. As mentioned in 'Background and Creation', these were:

- United State steel Survey Mission, 1948;
- UN IWT Study Group, 1951;
- UN Report by J. G. Surie on IWT in India and Pakistan, 1953;
- IWT Conferences East Pakistan, 1952 and 1956
- Ad-hoc Committee of IWT of the Central Government, 1955-56
- UN Report by J. J. Krugg on water resources of East Pakistan, 1955-56;
- World Bank Survey Mission, 1957;
- ICA Survey Mission, 1957;
- First Five Year Plan, Government of Pakistan, 1957; and
- IWT Enquiry Committee of the Central Government, 1958.

According to their recommendations, the then government of East Pakistan promulgated the East Pakistan Inland Water Transport Authority Ordinance, 1958. The aim: set up an authority that could develop, maintain and control of inland water transport; certain navigable waterways. According to E.P. Ordinance LXXV of 1958, this authority was first constituted in November 1958 with the appointment of a Chairman and a Member (Engineering) by the government.

Even after the partition, cross-border inland navigation was not affected or stopped. Steamers sailing from Kolkata used to travel to Assam through the territory of East Pakistan and vice versa. But the Indo-Pak war in 1965 halted such operations. After the independence of Bangladesh, trans-boundary navigation was again introduced. Bangladesh and India signed a trade agreement in March 1972. A Protocol on Inland Water Transit and Trade was signed in October 1972 for a term of five years. Since then, the working of the protocol has continued without any interruption. The existing protocol will expire on March 31, 2012. It will again be renewed.

Transport development in IWT

The people of Bangladesh learnt to depend upon waterways not only for drinking water, agriculture, food and shelter but also for passage of goods and passengers. In fact, transportation in this part of the world started with rivers. Inland waterways have become a very important mode for not only

Table 1: IWT passenger and cargo traffic

Year	1993	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Passenger (in million)	89	92	93	94	95	96	97	98	99	101	102
Cargo (million tonnes)	20	22	23	24	24	25	26	27	28	29	30

Source: *Consultancy Services for development of IWT system in Bangladesh*, by Parvez Khan, 2006

Table 2: Passenger and cargo at river ports

Year	Passenger (in million)	Cargo (million tonnes)
2005-2006	166.10	17.60
2006-2007	178.11	20.04
2007-2008	189.80	24.51

Source: BIWTA Year Book 2007-2008

maintaining transport link between the various remote parts of the country but also as a means for transporting import and export cargo. IWT has proved more accessible and cheaper than roads and railways and the poor people use the mode more. *Revival of Inland Water transport: Options and Strategies*, a 2007 World Bank study (henceforth: *Revival*), revealed that 12.3% of the rural population or 50% of all rural households have access to water transport. Due to its natural advantage over roads and railway, IWT can contribute significantly to the government's effort in growth, as also reduction of poverty.

Vessels engaged in transport on inland waterways are of two types: vessels registered under Inland Shipping Ordinance, 1976 and vessels not registered. Currently, a vessel with engine less than 16 BHP does not require registration under said ordinance. Vessel construction and movement today are not regulated by any law and as such data regarding the number of boats or transport output by such engine boats are not available.

But the Engine Boat Owners' Association claims that, during the monsoon, about one million engine boats contribute to passenger and freight movement. The Bangladesh Bureau of Statistics in its year book of 2008 (henceforth: BBS 2008) put the number of engine-operated country craft at 7,45,000. It may be mentioned that country boats installed with shallow engines have emerged as one of the largest transport providers since the 1980s. The total contribution of these informal boats is larger than that of formal boats.

According to a 2006 report, *Consultancy Services for development of IWT system in Bangladesh*, by Parvez Ali Anwar Khan (*'Consultancy'*, further), passenger vessels now operating have an annual transport capacity of 85 million passengers; cargo vessels can carry 20 million tons (see Table 1).

BIWTA has estimated and recorded cargo and passengers handled by private and public sector vessels at 21 river ports they operate. No data, statistics are available about origin-destination, or on the volume of passenger and cargo loaded and unloaded at wayside IWT stations situated mostly in the rural areas (see Table 2). Thus cargo and passengers handled at wayside landing stations, although numbering as many as 1,200, cannot be included in Table 3.

According to BIWTA's yearbook 2007-08, the major commodities transported during the years mentioned in Table 2 were construction material (57%), POL (14%), fertiliser (11%), foodgrains (6%) and others (12%). 65% of the cargo was transported between maritime ports and inland ports and 35% between inland ports. *Revival* provides an indication of the modal share that IWT enjoys in relation to other modes, viz. roads and railways (see Table 3, p 30).

IWT is one of the largest employment sectors in Bangladesh. According to a 2006 report the BIWTA commissioned, about 6.4 million persons are involved in or related to IWT. *Consultancy*, for instance, does not estimate gender participation in the sector. But about 10% of those related to IWT landing stations are women (see Table 4, p 30). Public as well as private bodies related to development, maintenance and operation of IWT exist (see Table 5, p 30).

Economics of IWT

The transport sector incorporates about 8.27% of GDP; the water sector specifically contributes about 0.64% of total GDP, as per Bangladesh Bureau of Statistics 2008 analysis. The total inland navigation transport area is about 24,000 km and it varies in the monsoon (about 5,968 km) and in the dry season (3,865 km). According to *Revival*, in 2005 inland water transport was occupied with 9.8 passenger-km—a passenger modal share of 8%—and 3 ton-km of freight: 16% of national freight modal share. Among the four means of transportation (air, road, rail and water), water transportation is the most efficient, least expensive and most environmentally safe. According to a 2008 TTWDA report, more than 95% of all international trade is done through waterways. In Bangladesh IWT contributes 30% of overall freight transport output and 20% of passenger travel, says the Banglapedia of 2006.

IWT provides transport access to about 25% of rural households in Bangladesh, according to the 2009 *Inland Water Transport Masterplan Study* by the transport sector coordination wing of the country's Planning Commission (*Masterplan*, ahead). Considering economic viability, inland navigation facility is comparatively cheaper than any other available transport system. The external cost is low; IWT requires minimum maintenance and is a safe transport option. Considering developmental issues, IWT is under-developed due to the overwhelming development of the road transportation system. Road network is responsible for the deterioration of many previous navigable routes due to blockage.

The total cost of road accidents is about Tk. 50 billion (US$604 million) in monetary terms, about 2% of national GDP. In roads 2,400 persons die per year; IWT's toll is a mere 148 persons per year, shows *Revival*.

Table 3: Modal share of passenger and cargo

	Passenger Traffic (Billion Pass-Km)						
	Total	Road	%	Rail	%	IWT	%
1975	17.0	9.2	54%	5.1	30%	2.7	16%
1996	66.0	52.0	79%	3.9	6%	10.1	15%
Annual growth 1996 - 2005	7.1%	6.6%		0.7%		1.3%	
2005	111.5	98.4	88%	4.2	4%	8.9	8%

	Cargo Traffic (Billion Ton-Km)						
	Total	Road	%	Rail	%	IWT	%
1975	2.6	0.9	35%	0.7	28%	1.0	37%
1996	10.7	6.9	63%	0.8	7%	3.0	30%
Annual growth 1996 - 2005	6.9%	8.6%		0.8%		0.1%	
2005	19.6	15.7	80%	0.8	4%	3	16%

Source: *Revival of Inland Water transport: Options and Strategies*, a 2007 World Bank study

Table 4: Employment in IWT

IWT Employers	Employed
Public Sector	
Bangladesh Inland Water Transport Authority	4,000
Bangladesh Inland Water Transport Corporation	5,000
Department of Shipping	60
Private Sector	
Landing Stations	668,000
Inland vessels	75,000
Dockyards	101,000
Country boat and Mechanized country boat	5,500,000
Country boat yard	10,000
Total	6,363,000

Source: *Consultancy Services for development of IWT system in Bangladesh*, by Parvez Ali Anwar Khan

Table 5: Public and private bodies in IWT and their responsibilities

Industry bodies	Responsibilities
Public bodies	
Bangladesh Inland Water Transport Authority (BIWTA)	Development, maintenance and control of inland water transport and of inland waterways.
Bangladesh Inland Water Transport Corporation (BIWTC)	Carriage of passenger and goods as a public corporation. Presently only engaged in ferry operative between road-heads and in passenger service, Dhaka-Barisal-Khulna. Cargo vessels, oil tankers and sea-tracks BIWTC owns have been leased out to private operators.
Department of Shipping (DOS)	As a public regulatory body, regulates construction of ships, inland navigation and safety.
Private bodies	
Bangladesh Cargo Vessels Owners' Association (BCVOA)	Carriage of cargo by vessels registered under Inland Shipping Ordinance (ISO), 1976.
Bangladesh Coastal Ship Owners' Association (BCSOA)	Carriage of goods mainly from maritime ports to inland destination by vessels registered under Merchant Shipping Ordinance (MSO), 1976.
Bangladesh oil tanker Owners' Association (BOTOA)	Carriage of Pol and liquit bulk by vessels registered under ISO and MSO.
Bangladesh Inland Water (Passenger carrier) Association (BIWPCA)	Carriage of passengers by vessels under ISO.
Launch Owner' Association Bangladesh (LOA)	Carriage of passengers by vessels under ISO.
Engine and Bulkhead Boat Owners' Association	Carriage of goods, passengers and extraction of sand from the river, mostly by informal boats.
Country Boat Owners Association	Carriage of passenger and goods by informal boats.

Thus, IWT is also a sustainable transport option, with benefits, as follows:

- Natural transport system;
- Balanced and the least cost transport system;
- Low traffic problem;
- Low environmental pollution;
- No requirement of land acquisition for waterway development;
- Supply water for agriculture, households;
- Groundwater recharge; and
- Maintaining ecological balance (flora & biodiversity).

IWT is also very important because it:

- Ensures access to the remote areas where development of other modes is not feasible;
- Attracts new industries to the remote zones;
- Greatly expands markets for a region's resources and products;
- Generates water related recreation and tourism activities; and
- Creates related small business opportunities.

Road, railway and IWT are the significant modes of transportation in Bangladesh. Considering the fare in these modes, 2001-2007, road transportation was higher than IWT and railway, both for passenger and cargo transport (see Figure 1). As can be seen, IWT is the cheapest among the available modes of transportation in Bangladesh.

Transboundary economics

Under the India-Bangladesh protocol, shows a BITWA report of 2008, Indian vessels were dominant in cargo transport, 1972-2001. After 2001, Bangladeshi vessels increased in the protocol routes. Single and roundtrips by Indian vessels reduced significantly; in 2007, it less than 10 Indian vessels crossed the IWT protocol routes (see Figure 2).

Bangladesh is now ahead in using protocol routes in cargo and passenger transportation, 2002 onwards. In 2007, Bangladeshi vessels carried about 994,345 metric tonnes of goods whereas Indian vessels carried about 1,900 metric tonnes of goods over the protocol route (see Figure 3).

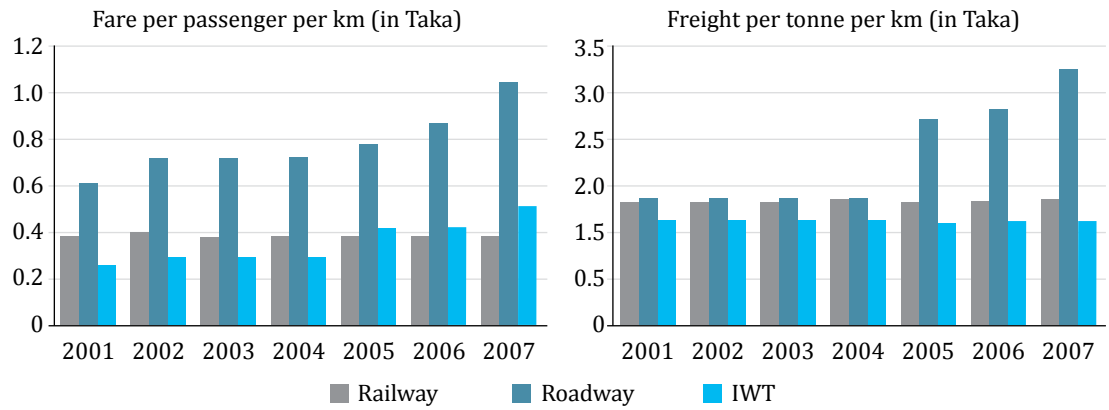
Considering cargo transportation in the defined transits of India-Bangladesh protocol routes, Kolkata-Dhubri (Pandu) and Dhubri (Pandu)-Kolkata was found to be the busy traffic- and revenue-collecting route.

How navigable are waterways?

Navigability of rivers in Bangladesh has been deteriorating for long now. Natural and morphological processes and water withdrawal from rivers beyond and within Bangladesh have resulted in decreased dry season navigability, for channel depths have gradually declined. To determine navigability, rivers are categorised thus:

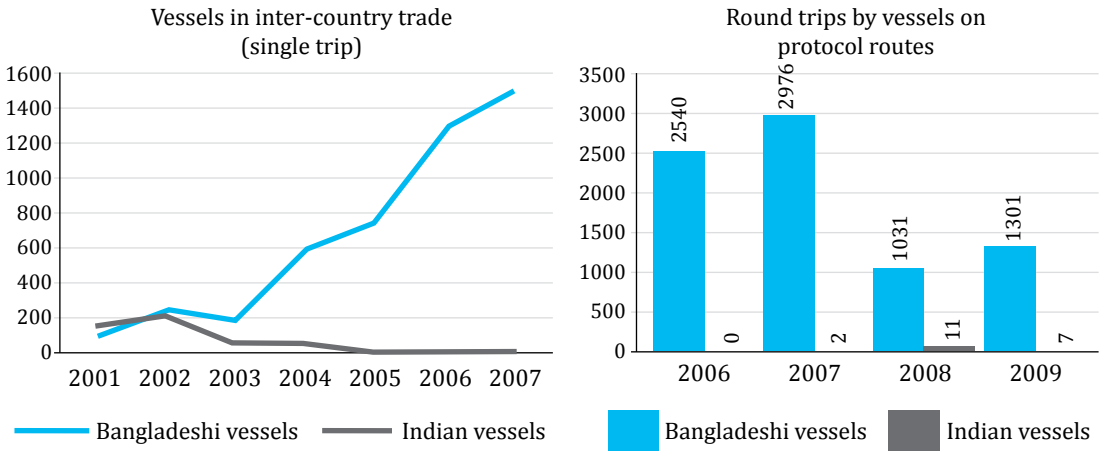
1 The braided rivers: Very large rivers like the Padma, the Jamuna and the lower Meghna fall in this category. During monsoon their discharges cover the entire river bed, often flooding adjacent areas. During the low water period, the reduced discharges cause the rivers to bifurcate into a number of branches that meander within the high water bank.
2 The tributaries: Rivers like the Surma, the Barak and the Atrai perform the task of collecting discharge from the local catchments and feeding the main rivers.
3 The distributaries: These are rivers branching out from larger rivers e.g. the Lakhya and the Arial

Figure 1: Passenger fare and freight cost for different modes of transport



Source: Bangladesh Inland Water Transport Authority, 2008

Figure 2: Vessels on protocol routes



Source: Bangladesh Inland Water Transport Authority, 2008

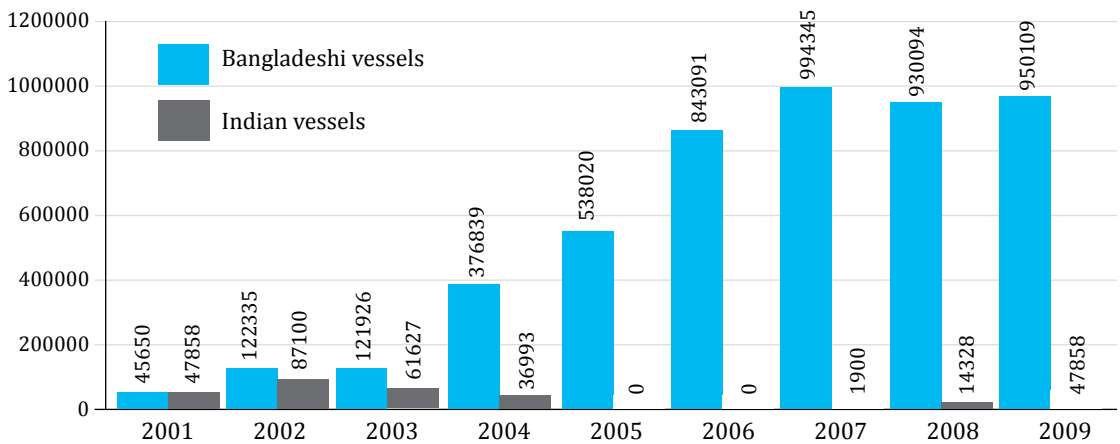
Khan. Their water levels depend upon the discharges received from the mother river.

4 The tidal rivers: These rivers are located mostly in the southern part of the country and are dominantly tidal in character. Examples are the Pussur, the Karnaphuli and the Baleswar.

Classifying waterways: what it reveals

A Dutch consulting firm, the Netherlands Engineering Consultants (NEDECO), introduced a classification system for waterways in the country in 1967. *Surveys on Inland Waterways and Ports* based it principally on the economic value and the navigational quality of the waterways. According to NEDECO, 12,000 km of waterways were navigable during the 1960s, which continued up to the early 1970s. NEDECO defined the economic value of a waterway as a connection between two points

Figure 3: Cargo carried through protocol routes (in milliom metric tonnes)



Source: Bangladesh Inland Water Transport Authority, 2008

where traffic was generated. Navigational quality was defined by the indicated draft of a vessel with which it could safely sail through.

Basing their system mainly on economic importance, they classified the waterways network into three classes. This meant that more than one draft group was included in the same group (see Table 6). NEDECO's survey reveals that the waterways in the south-western region of the country and the entire river Padma were navigable during that time.

The classification now followed was introduced in 1989. The Bangladesh Inland Water Transport Master Plan (BIWTMAS) of 1989 was prepared by another Dutch consultant, DHV. It divides inland waterways into four classes, created according to the Least Available Draft (LAD: the draft of a vessel's hull is the vertical distance between the waterline and the bottom of the hull [keel]. LAD determines the minimum depth of water a vessel can safely negotiate. It can also determine the weight of cargo on board by calculating the displacement of water and then using Archimedes' principle; see also table 7).]

Through a comprehensive hydrographic survey, DHV revealed that in the late 1980s, 2,150-2,500 km of the total 5,968 km of waterways were seasonal routes. According to existing river notices issued fortnightly by BIWTA's conservancy and pilotage department, 3,800 km of waterways are perennially navigable. BIWTA attaches importance to maintaining navigability only in the class-I routes which connect the major consumption and distribution area, Dhaka-Narayanganj, with the

Table 6: NEDECO classification of waterways

Class	Definition
I	These were main arteries of traffic and BIWTA was to guarantee indicated least available draft throughout the year, even by taking up dredging.
II	Important traffic lines; BIWTA was to provide aids to navigation, by draft group.
III	Traffic routes of local importance; BIWTA responsible for channel marking.

Source: NEDECO, 1967

Table 7: Current classification of IWT network

Class	Indicated draft (m)	length (km)	%	Classification criteria
I	3.6	683	11	These are major transport corridors where LAD of 3.6m is required to be maintained round the year.
II	2.1	1,000	17	these link major inland ports or places of economic importance to class-I routes
III	1.5	1,885	32	Being seasonal in nature, it is not feasible to maintain higher LAD throughout the year
IV	<1.5	2,400	40	these are seasonal routes where maintenance of LAD of 1.5m or more in dry season is not feasible
Total		**5,968**	**100**	

Source: Bangladesh Inland Water Transport Master Plan 1989, by DHV, the Netherlands

Table 8: Class-I IWT routes

Route	Description (river/town)	Distance (km)
Dhaka-Chittagong	Buriganga, Dhaleswari, Lower Meghna, Shahbazpur, Hatia Channel, Karnaphuli	306
Shahbupura-Demra	Lakhya River-	22
Shahbupura-Bhairab Bazar	Upper Megna-Ashuganj	85
Chowkishata-Maheswarpasha	Lower Meghna, Arial Khan, Kirtankhola, Gabkhan, Pussur, Bhairab	270
	Total	685

Source: Bangladesh Inland Water Transport Master Plan 1989, by DHV, the Netherlands

two maritime ports of Chittagong and Mongla. But the first priority in maintaining navigability is given to the ferry routes between road-heads Paturia-Daulatdia and Mawa-Char Janajat (see Table 8).

In all, comparing the reports of NEDECO and DHV, we find that in 15 years navigability of the rivers deteriorated such that 50% of the IWT routes were closed (see Map 1, p 36).

Present status of IWT routes

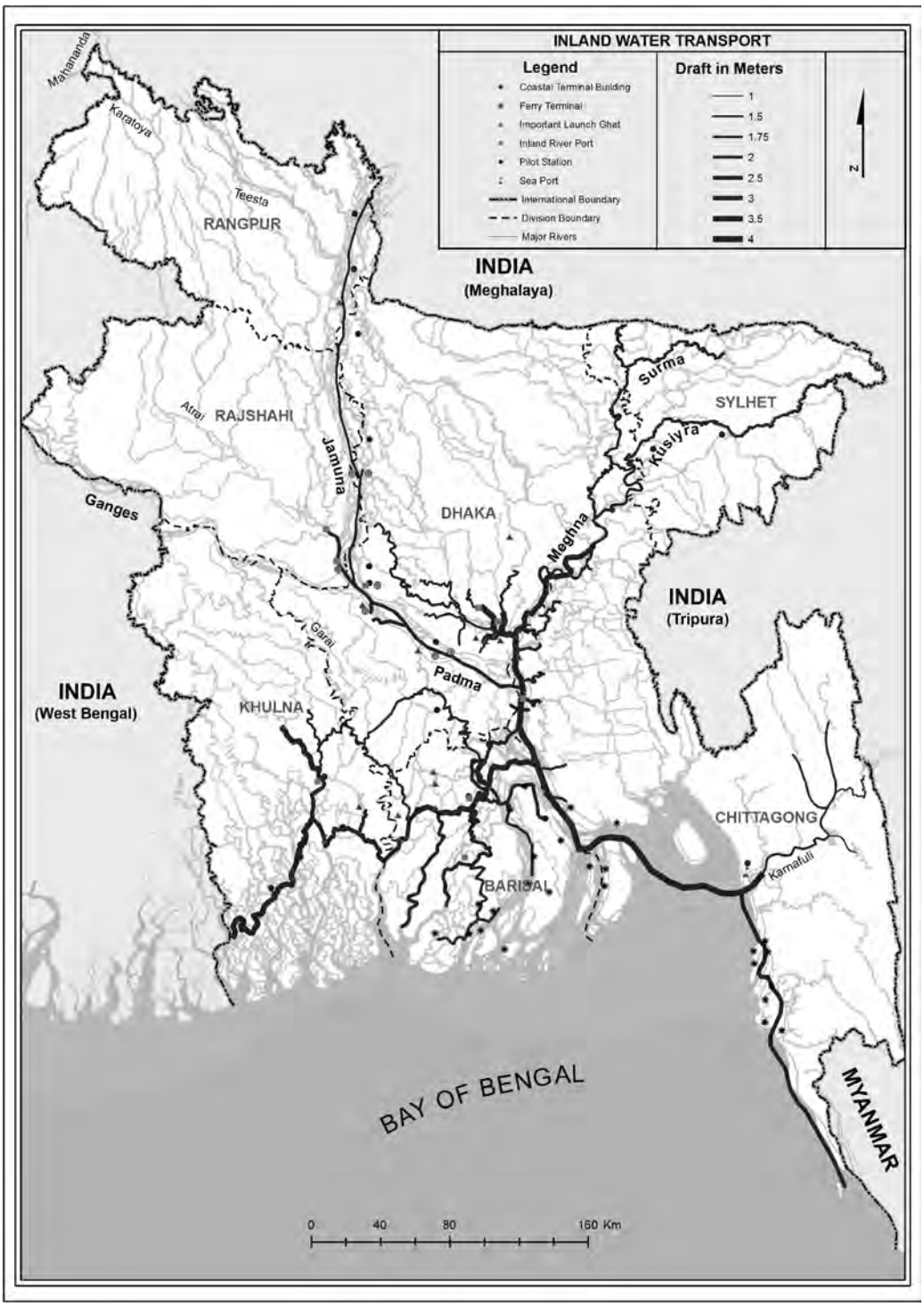
Presently BIWTA performs hydrographic survey only in the routes and areas which require priority attention. Such surveys or other related investigations have not been carried out over a vast portion of the IWT network in recent years. It is, therefore, not prudent to comment on the current conditions of the network. However, information gathered from officials and IWT operators shows navigation during high water period does not usually present a problem. In the low water season, although long stretches of waterways with sufficient depths exist, sedimentation and shoals appear in many places, restricting vessel movement.

The IWT corridor between Dhaka-Narayanganj and the Chittagong maritime port is of prime national importance—it is class-I with a guaranteed LAD of 3.6 m. This waterway has adequate navigational draft for most of its length during the low water period, except for spots where silt deposition takes place. One such chronic problem spot lies near Hizla in the lower Meghna river. Vessels plying between Dhaka-Narayanganj and Chittagong have to wait for the high tide at Chowkighata in the lower Meghna area, operators and owners say.

The next corridor in importance is the waterway Dhaka-Narayanganj-Mongla-Khulna. The route connects the capital to Barisal. Classified as class-I, LAD of 3.6 m is ensured. But the approach to Barisal inland port requires maintenance dredging every year. In this route, CEGIS has identified, the Mongla-Ghasiakhali canal is a chronic problem spot; vessels can only negotiate during the high tide, even in the high water period.

The corridor to the north-eastern part of Bangladesh, especially to Chhatak and Sylhet, is classified as class-I up to Bhairab Bazar; it reduces thereafter to depths 2.1-1.5 m, levels that further decrease during the low water period. Vessel owners are compelled to sail at half or three-quarter of the loading capacity. Baghabari port is of national importance. Much needed fuel and fertiliser are distributed to the northern part of the country through this point. The Baghabari-Paturia route (Jamuna/Baral, Hurasagar river) has been behaving erratically and unpredictably in recent years, posing problems and sometimes even a threat to uninterrupted vessel movement.

Map 1: IWT network today



Source: Department of Hydrography, Bangladesh Inland Water Authority, 2011

Table 9: IWT routes no more navigable in lean water period

Routes	Description(River/town)	Distance (km)
Dhaka-Barisal via nardibazar	Meghna, Jayanti, Arial khan	184
Hizla-Shaistasad	Meghna-Azimpur, Dharmaganj, Arialkhan	30
Dilapur-Markuli-Sherpur	Meghna, Kalni, Kushiyara	168
Kalikapur, Madaripur, Nandibazar	Arial khan, Jayanti	56
Paikgacha-Asasuni-Pratapnagar	Hariakhali, Kholpetua	45
Tekerghat-Lalpur	Baulai	48
Mohonganj-Thakurkona	Kangsa	46
Ghoradiga-Netrokona	Mogra	130
Savar-Nayarhat-Dhaniya	Bansi	10
Total		717

Source: Bangladesh Inland Water Transport Authority, 2008

It also appears from BIWTA information that navigational depths in some 1,000 km of classified routes, mostly class-IV routes, reduce to such an extent during the low water period that they become unsuitable to negotiate, even by a vessel with less than 1.5 m draft. Vessels can hardly negotiate these routes even during the monsoon. After intensive discussions with BIWTA officials and with IWT operators, it appears that quite a few IWT routes listed as perennially navigable routes by DHV consultants in the late 1980s are no more navigable during the low water period today (see Table 9).

BIWTA officials and IWT operators also maintain that comprehensive hydrographic survey will reveal that the total length of navigable waterways during the monsoon will not exceed 4,000-4,500 km; of these only 2,000-2,500 km are navigable during the low water period.

What influences IWT quality today

The current global practice is to make human interactions for overall development by maintaining ecological balance through protection and improvement of the environment. The Bangladesh government's policy conforms to this statement. Regarding inland waterways, there exist regulations without any measure for enforcement.

There are many factors influencing IWT water quality. Department of Shipping, or DOS, is the principal entity responsible for (1) ensuring environmentally sound development and maintenance practice in IWT sector; (2) identifying and regulating activities that pollute and degrade the environment; and (3) ensuring long time use of inland water resources without adversely affecting the eco-system. But DOS is yet to take any step to materialize the above objectives. With the assistance of the World Bank, DOS had procured and developed a testing laboratory to determine water quality. But it seems that after installation those facilities were never utilised. That place is now being used as the office of the ship surveyor.

Make IWT more fuel-efficient

Revival discloses IWT efficiency is such that its average performance is 100-200 ton-km per litre, whereas road transport performance is four to eight times lower (25 ton-km per litre). Therefore CO_2

emission from engines is lower. Since inland water vessels use less fuel than road vehicles, the study states that 155,000 tons of CO_2 was not emitted (avoided) in 2005, thus making a positive impact on the environment.

Conversion of marine engines for consumption of CNG may further contribute to protect the environment. But it is not as easy for IWT vessels as for road vehicles. Presently there exists no such infrastructure. In most cases CNG conversion will influence the stability of the vessel. But in case of large ferries owned and operated by BIWTC it may be feasible, so the government may take an initiative. This will also motivate private operators to shift to CNG when they will construct a new vessel.

Look to pollution control

Waste materials and litter thrown overboard from IWT vessels pollute waterways. Oil bilge discharged by vessels into the river also causes pollution. By the mandate entrusted upon it DOS is in a position to take action in this regard. However its capacity is too poor to effectively monitor and control the extant inland waterways network.

A similar situation exists in inland river ports and landing stations. Litter is thrown from the terminal area by waiting passengers and those on board vessels berthed alongside. From inland ports and landing stations, hubs of economic activity, solid and liquid waste are directly discharged into rivers. No inland ports have so far developed any reception facilities. Vessels, too, throw litter and discharge faecal material overboard. In most cases there are no collecting bins on board.

Fuel spillage pollutes water additionally. Oil spillage from vessels turning on to the side or capsizing in an accident causes concentrated pollution in a limited area. The adverse effect of such spillage can be reduced by bringing about a reduction in accidents, making IWT safer.

Dredging disturbs

Dredging shoals to maintain navigation depths in inland waterways causes disturbances in the natural conditions of the waterways and its surroundings. Fauna and flora are likely to be affected, particularly where recurrent dredging is carried out every year (ferry routes across major rivers). Again, disposal of dredging materials by open discharge method or on-shore dykes may transfer contamination downstream or to collecting areas.

Some decades back, country boats generally plied using sails and oars, with no adverse impact upon the environment. Country boats with colourful sails can hardly be seen now, even in rural areas. The present trend is towards mechanization by fitting shallow pump engines. This requires fuel to be used, with consequent emissions of CO_2 into the atmosphere and possible oil spillage. No study has been made so far to quantify the impact upon the environment.

Country boats some decades back used to ply using colourful sails and oars. The present trend is towards mechanization, using shallow pump engines. This means CO_2 emissions

A factor called climate change

Due to deterioration, the condition of navigable waterways has significantly reduced. When DHV did its study, it estimated the requirements for development and maintenance dredging to be 2.25-7 million cubic metres annually, 1988-2005. The 2009 *Masterplan* estimated total dredging volume was 18 mcm annually.

This discloses the extent of the impact of climate change on river navigability. Most of Bangladesh lies in the delta of the Ganga, the Brahmaputra and the Meghna. These rivers have a combined peak discharge in the flood season of 180,000 cubic metres per second (the second highest in the world after the river Amazon). The Bangladesh Climate Change Strategies and Action Plan of 2009 shows these rivers carry about two billion tonnes of sediment each year. Due to climate change, heavier and more erratic rainfall in the GBM system will result in, among other impacts, higher sedimentation in the riverbeds, leading to drainage congestion. As such dredging demand predicted in the Master Plan in the 1980s has been found to be presently improper.

According to reports from BIWTA, in most cases sustainable navigability could not be achieved by dredging. Deposition of silt hindered navigability in certain stretches immediately after dredging. As such BIWTA has to struggle to maintain navigability. But CEGIS research has shown that shifting of channels due to climate change has become more frequent than ever before. Change of the river course is almost unpredictable. As a result vessels get grounded, causing huge economic loss for the vessel operators.

BIWTA provides aids to navigation along the channel. This equipment is vulnerable to floods. As the BIWTA's conservancy and pilotage department found out, in 2007 cyclone Sidr destroyed, damaged or washed away about 80% of the navigation aid equipment installed in waterways in Barisal and Khulna divisions.

While BIWTA struggles to maintain navigability, at some places vessels struggle to negotiate strong current. In the late monsoon, or due to flash flood, discharge of water and roughness of water increase in some stretches to such an extent that navigation becomes very dangerous. One such example is the confluence of the Meghna and the Dakatia near Chandpur port. A dangerous whirlpool develops there; it has caused at least half a dozen marine accidents in recent years and claimed many lives. Combined flow of the Ganga and the Meghna meet at this point near Chandpur.

BIWTA's 2008 yearbook shows it has, so far, developed 21 river ports and about 380 landing stations on river banks. Ports and landing stations provide marginal facilities to passengers and to load/unload cargo. The general physical appearance of river ports is dictated by the difference in water level between dry season and the wet season, which according to the BITWa's hydrography department varies locally, often as much as 6 m.

In coastal areas the difference in water level is further amplified by tidal action. The banks of the river slope gently towards the centre line of the river, necessitating long jetties to serve river craft in water with sufficient depth.

A further significant factor in shaping the structure of the jetty is the method of cargo handling, done almost exclusively by head-load. Following the benchmark of the Public Works Department, BIWTA developed ports and landing stations facilities after calculating high water and low water variation. But floating pontoons are often shifted to another place due to change of course of river or due to erosion, leaving behind the piles or spuds.

About 43% of the landing stations were developed in the rural areas of Barisal division,

according to the BITWA's engineering department. About 35 are located in the rural areas of the districts of Khulna, Bagerhat and Satkhira. 30% of these landing stations got damaged, pontoons displaced, damaged or capsized during Sidr in 2007. Landing stations located in the coastal area are exposed to saline intrusion. Floating pontoons, jetties or shore connections cannot last long due to salinity of the water. Moreover, UNDP's 2004 report *A Global Report: Reducing Disaster Risk, A Challenge for Development* has identified Bangladesh to be the most vulnerable country in the world to tropical cyclones. Khulna and Barisal divisions, located in low-lying coastal areas, are always susceptible to tidal flooding during storms. And will be more so.

Transboundary inland navigation

After the emergence of Bangladesh, under a trade agreement between Bangladesh and India a Protocol on Inland Water Transit and Trade was signed in 1972 for a mutually beneficial arrangement for commerce between the countries and for passage of goods between two places of one country through the territory of the other. Since then the working of the protocol has continued without any interruption. Governments of both countries regularly renew the protocol for a term of two years. The current protocol was signed in January 2011 and will expire on March 31, 2012. It is expected to be further renewed.

The main features of the protocol are as follows:

- Inter-country trade/cross border trade;
- Transporting cargo between mainland and north-eastern region of India, transiting through the territory of Bangladesh;
- Each country shall ensure smooth navigation in the routes within its geographical jurisdiction and will extend necessary navigational facilities;
- Eight routes are to be used. The main corridors are: Kolkata-Narayanganj (cross border trade); Kolkata-Pandu (transit trade); Kolkata-Karimganj (transit trade) and Pandu-Karimganj (transit trade);
- A total of 10 Ports of Call, five on each side, have been nominated for loading and unloading of inter-country trade (see graphic, p...). On the Indian side, these are: Kolkata, Haldia, Karimganj, Pandu and Silghat. On the Bangladesh side, these are: Narayanganj, Mongla, Khulna, Sirajgonj and Ashuganj;
- The stretch between Sirajgonj and Daikhawa and between Sherpur and Zakigonj in Bangladesh are considered as routes primarily maintained for Indian transit traffic and the India pays an agreed amount of money to Bangladesh toward maintenance cost; and
- Bangladesh trucks may carry cargo trans-shipped from vessels at Ashuganj and Sherpur to the Indian border (Article 23.1).

Traffic statistics put together by the BITWA's traffic department reveal a tremendous growth of inter-country trade in the last ten years. 2009-2010, the volume of inter-country trade cargo carried under the protocol was 1.28 million tons as against 0.1 million tons in 2001-2002. The most important aspect is that Bangladesh vessels carried more than 99% of the total inter-country trade cargo. The total number of voyages by Bangladesh-made vessels were as many as 1,918. Towards freight charge, Bangladesh vessels earned foreign exchange in 2009-2010 to the tune of US$15.32 million. This was only possible due to massive participation of Bangladesh's private sector in the carriage of goods under the protocol.

Let us look at the condition of the protocol routes in Bangladesh (see Table 10, p 42). It is

clear a vessel with 3.5 m draught may navigate from Raimangal up to Narayanganj or Ashuganj; in other words, a single haul of a vessel may transport 1,500 tonnes of cargo. But due to navigational problems at some spots in the protocol routes in India, especially downstream of Namkhana, vessels cannot load cargo more than 700-900 tonnes. On the other hand, vessels destined for Pandu cannot load more than 500-600 tonnes due to the navigational condition in the route between Chandpur and Daikhawa in Bangladesh. The route between Bhairab Bazar and Zakiganj, seasonal, can be used only during the monsoon (April – October).

The present trend of cross-boundary trade is rapidly increasing. With the inclusion of Ashuganj as a trans-shipment point under the protocol it is expected the volume of transit cargo may exceed even the volume of inter-country trade cargo. A report prepared by the Inland Waterways Authority of India estimated a total of 6 million tonnes of cargo will move between Kolkata and Agartala using the protocol route Kolkata-Raimangal-Mongla-Barisal-Ashuganj.

In view of the above, inland navigation in the cross-boundary water region is mutually is mutually beneficial. So it is essential to undertake efforts to develop the IWT. To this end, the key/ core issues may be the following:

- **Improve navigability in the existing protocol route;**
- **Determine new routes for inland navigation (example: Dhulian-Rajshahi-Daulatdia);**
- **Introduce container service in the protocol route; and**
- **Find the most efficient economic transport chain and establishing connections with other modes of transport for the purpose of door to door transport services.**

The following may be priority research areas:

- **Find causes of the deteriorating conditions of the river and so the ways and means for maintaining sustainable navigability;**
- **Find out the impact of climate change on trans-boundary inland navigation and prepare a joint action plan for mitigation and adaptation;**
- **Find out the benefit of the socio-economics;**
- **Find out the benefit on environment;**
- **Find out the appropriate technology to improve the efficiency of inland navigation;**
- **Find out the possibility of introducing passenger service and tourism under the bilateral protocol; and**
- **Find out the requirement for amendment/simplification/waiver of existing regulatory framework.**

Wanted: proper information

Bangladesh and India share a common heritage, tradition and experience in inland navigation. Regulatory frameworks are similar. Still, the current state of knowledge is not enough to further efficiency, for that depends only on experience.

Navigational information is provided in a primitive manner called pilotage service. Public authorities of both the countries engage pilots that are knowledgeable about the changing and unique condition of certain stretches. As Table 12 also shows (see columns marked NA), there exists no updated hydrographic survey. Even survey reports, hydrographic data or charts are hardly used for vessel operation.

The other areas of existing poor state of knowledge are:

- Efficiency of the vessel;

Table 10: Present condition of protocol routes

Route			Shoal			Year of Survey
Name	Class	Distance (km)	Number	Length (km)	Min. depth (m)	
Raimangal - Chandpur route						
Raimangal – Chalna	II	119	2	1.7	1.6 and 2.2	2010
Chalna - Mongla	I	16	1	0.5	2.1	2010
Mongla - Ghasiakhali	I	31	1	20.0	0.5	2010
Ghasiakhali - Chandpur	I	200	-	-	-	2004
Chandpur - Daikhawa route						
Chandpur - Aricha	II	119	-	-	-	2006
Aricha - Sirajganj	II	92	6	6.0	(-)1.3 to (+)1.8	2010
Sirajganj – Bahadurabad	II	88	5	5.0	(-)1.3 to (+)1.0	2010
Bahadurabad - Chilmari	II	62	5	5.0	(-)1.2 to (+)2.2	2010
Chilmari - Daikhawa	II	37	3	3.0	0.1 to 1.5	2010
Chandpur - Zakiganj route						
Chandpur - Bhairab Bazar	I	123	NA-		-	2002, 2006
Bhairab Bazar – Madna	III	63	1	10.0	1.2	2010
Madna - Ajmiriganj	III	47	1	23.0	(-)1.0	2010
Ajmiriganj - Sherpur	III	71	-	-	-	2010
Sherpur - Zakiganj	III	115	1	1.5	1.5	2010

Source: Bangladesh Inland Water Transport Authority, 2008

- Efficiency of the crew; and
- Efficiency in loading and unloading.

In view of the above, joint research may be undertaken in the following areas:

- Digital hydrographic survey of all the routes and electronic dissemination of navigational information, data and charts which may reduce the requirement for pilots;
- Enhancing the efficiency of the vessel;
- Joint effort for human resource development in IWT; and
- Appropriate mechanisation of loading unloading facilities.

India is an emerging economic power. India deserves special attention given its proximity and shared history, culture and geography. If we look at the sub-regional map we see Bangladesh is locked by India while the north-eastern region of India is locked by Bangladesh. Bangladesh has good access to the sea and the north-east has very few options to reach the sea. Its connection to mainland India is expensive in terms of cost and time. Its border with Myanmar remains insecure and undependable.

The Bangladesh-India joint communiqué, published in January 2010 during the visit of Prime Minister of Bangladesh to India, showed that an understanding has been reached to introduce transit trade through Bangladesh to connect mainland India and its northeast. This was considered as a breakthrough attempt to re-align Bangladesh's long term development strategy with this economic power house.

The important questions relate to demand for transit by volume, kind and the most suitable modes of transport (rail, road, waterways). It is very important these questions should be dealt objectively with Bangladesh-India geographical focus.

Regarding modal option, advantages of inland navigation over others are as follows:

- The saturated capacity of the existing road and railway network cannot further accommodate transit or cross-border trade goods;
- The enviable IWT network in Bangladesh can further be utilized with comparatively low investment;
- Environment-friendly and cheap;
- More use of waterways, more saving in carbon emission; and
- No land is required.

Core issues for a joint initiative

Core issues and priority research areas have been discussed. For a mutually beneficial arrangement and for extending the area of cooperation between the countries, the topmost priority may be given on determining new routes under the Protocol on Inland Water Transit and Trade between Bangladesh and India.

According to the records of the recent bilateral meetings, under the protocol improving navigability from Dhulian (India) to Rajshahi-Aricha (Bangladesh) may come first. Both countries agreed to this and decided to conduct a joint hydrographic survey to find out the ways to improve navigability.

Following bilateral meetings, the governments constituted a Joint Technical Committee which visited the Dhulian-Rajshahi-Aricha stretch 18-23 April, 2009 to see the condition of the river Padma. The report they came out with stated the river Ganga originates from the southern slopes of the Himalayas, flows through India and then enters into Bangladesh as river Padma. From Dhulian (downstream of Farakka) to Rajshahi is about 70 km, according to BITWA's hydrography department. The last time a hydrographic survey was carried out here was in 2003, as also on the Aricha-Alaipur (upstream of Paksey Bridge) stretch of 146 km. Hydrographic survey of the remaining waterway could not be done since 1972 because some parts of the river flow into India and some parts in Bangladesh along the border. Analysis of hydrographic survey chart of 2003 indicates most of the places have minimum chartered depth of 1.5 m. The river's width varies 6-8 km. To know the navigability from Alaipur to the border, thus, a hydrographic survey needs to be carried out by a joint hydrographic survey team of Bangladesh and India. The water availability, navigability of this river

Hydrographic surveys of protocol routes and sharing such information are necessary areas of joint research. Human resource development in IWT must be done together

Table 11: Existing navigation routes

Route	Length (km)	Remarks
Alaipur-Raita-Laxmipur	32.00	During lean period the minimum depth remains 1.5m
Paksey-Lauskandi-Ghoramara	07.00	
Talbaria-Shantigram-Sengram	25.00	
Sengam-Habaspur-Stabaria	03.00	
Nazirganj-Durgapur	06.00	
Padma-Jamuna confluence	14.00	
Sub total	87.00	
Alaipur-sarda	14.00	Hydrographic survey never carried out
Sardu-Rajshahi	15.00	
Premtali-Godagari	06.00	
Sub total	35.00	
Total	**122.00**	

Source: Bangladesh Inland Water Transport Authority, 2008

will be improved with due water management in the river.

The distance between Aricha and Godagari is 209 km and Godagari to Dhulian is 58 km. BIWTA survey team could conduct hydrographic survey from Aricha to Alaipur (146 km) back in 2003. The remaining portion could never be surveyed. On the basis of a recent field visit, it is possible to present the Lowest Low Water data gathered from gauge stations at Tarpasha, Mahendrapur, Sengram, Talbaria, Paksey, Sarda, Panka and Rajshahi of the Water Development Board (see Table 11).

Improvement of navigability in the route between Dhulian (India) and Aricha (Bangladesh) and inclusion of this route under the route determined in the protocol will be mutually beneficial because (1) The waterway's connectivity between mainland India and the north-east will be more effective since the distance will be reduced; (2) Transportation time and transportation cost will be substantially reduced; and (3) Bangladesh will be able improve the navigability of the river Padma.

As such, a Bangladesh-India joint initiative may immediately be taken:

- **To conduct a joint hydrographic survey in the route between Dhulian (India) and Aricha (Bangladesh) in the river Ganges/Padma; and**
- **To conduct a joint morphological study to determine the ways and means for sustainable navigability; to undertake dredging, river training and other programs.**

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ECOSYSTEMS FOR LIFE: A BANGLADESH-INDIA INITIATIVE
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