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# India-Bangladesh Inland waterways connectivity

## Adapting to climate change

Although inland waterways are considered a cheaper and environment-friendly option, climate-induced challenges can afflict this mode of transport, reduce its reliability and thereby add to the costs of operation and maintenance.

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Historically, waterways used to play a significant role in transportation in the Indian subcontinent. The wide network of rivers facilitated cargo movement between Kolkata port and East Bengal and northeast India. The movement got stalled after the Indo-Pakistan war of 1965. The trade routes through waterways were revived in 1972 soon after the independence of Bangladesh from Pakistan by signing the Protocol on Inland Water Trade and Transit (PIWTT) under Article VIII of the Trade Agreement between India and Bangladesh. Even then, the priorities of the subsequent governments in both countries have been to develop road and railway connectivity, not waterways.

A boost to this sector happened in 2015 when both countries decided to revive the agreement with a provision for auto-renewal every five years. Since then, several developments occurred in India, including the promulgation of the National

Waterways Act (2016) that designated 111 Indian rivers, river stretches, creeks, and estuaries as National Waterways (NW)[1]. The NW-1 stretches between Allahabad and Haldia in the Ganges, Bhagirathi and Hooghly river system for about 1620 km. The NW-2 extends for 891 km from Sadiya to Dhubri in Assam. The NW-1 and NW-2 are also part of the India-Bangladesh Protocol Route-1, which connects Kolkata to Silghat in Assam via Bangladesh.

The development of intermodal and multimodal terminals along NW-1 and NW-2 also cater to the connectivity needs of Nepal and Bhutan wherein they can access the riverine routes of India to trade with Bangladesh thereby enabling subregional connectivity. For instance, Bhutan is accessing the inland waterways of India in Dhubri (Assam) as a trade route for its export to Bangladesh. A similar development has materialized between India and Nepal within the framework of Protocol to the Treaty of Transit, wherein India has allowed the country to access three routes, namely, Kolkata-Kalughat, Raxaul; Kolkata-Sahebgunj, Biratnagar and Kolkata-Varanasi-Raxaul[2].

## Climate change and inland navigation

Inland water transport (IWT) is known to be an environment-friendly mode of transportation. At a time when air pollution by vehicle traffic is a growing concern, waterborne goods/freight and passenger transportation, particularly by inland waterways, has great promise for energy-efficient and cheap mode of transportation for bulky goods. IWT also helps reduce stress on the already congested railway and road networks.

IWT is considered to be environment-friendly as it is the most fuel-efficient mode of transportation. As per estimates done by Rail India Technical and Economic Service (RITES), in 2013, one litre of fuel can move 105-tonne km by waterways in comparison to 85-tonne km by railways and 24-tonne km by road; thus making one vessel equivalent to 15 rail wagons and 60 trucks for transportation purposes. The freight rate per tonne-km will be around INR 1.41 by railways, INR 2.58 by road and INR 1.06 by inland waterways to transport the same cargo on the same route.[3] An inland transport water vessel emits less than 50 percent of the carbon a truck emits.

However, it is to be noted that NW 1 and 2 are being developed in the glacier-fed Himalayan rivers, namely, the Ganges and the Brahmaputra, which are prone to floods annually. The lean season water flow in these rivers during winter months is low, challenging inland navigation.

Inland waterways could be more vulnerable to the effects of climate change than other means of transportation. Fluctuations in the least available depth (LAD) required for safe navigation and their impact on the overall cost of transportation and its reliability raise questions about the dependability of this mode of transportation. This would hurt the competitiveness of industries that depend on the efficient movement of cargo, particularly bulk and containerized cargo, through waterways.

## Climate change impact on inland navigation

Climate change is the ultimate negative externality affecting IWT. Extreme weather events such as floods, droughts and cyclones impact inland navigation through several means.

For IWT, it is impossible to determine whether a severe weather situation is negatively influencing the system by using a single generic meteorological indicator (such as the amount of precipitation during a given period). The intensity and duration of precipitation alter the discharge, water levels, and flow velocities that determine the navigation conditions of inland waterways. Large streams can sustain significant amounts of precipitation without flooding, whereas small waterways are more susceptible to changes in precipitation.

Heavy rains also cause river bank erosion, resulting in the reallocation of ferry terminals. Higher precipitation can affect sediment supply and sediment transportation, and hence channel maintenance activities, including dredging will be required. Changes in water level and velocity can also impact manoeuvrability. In Bangladesh, heavy siltation in waterways has led to the closure of river routes for longer periods and the stopping of business activities.

Prolonged dry spells exacerbated by high temperatures and evaporation lower water levels and flow rates, leading to poor navigability and increased fuel consumption. IWT may be adversely affected for weeks or even months if water levels remain low. If water levels fall significantly below the LAD, the cargo-carrying capacity of the vessel may be restricted.

Poor visibility caused by fog, rainfall, and haze can lead to speed reduction (to ensure safe navigation) or even navigation interruption, which may cause delays. Poor visibility is not a major constraint for modern vessels equipped with radar even though such conditions make it impossible for other modes of transportation, including road and rail, to function. However, the mechanized boats and barges in the unorganized sector are not equipped with radar technology. Apart from the delay in transportation, collisions with navigational aids (which may be damaged) and fishing gears are likely consequences of decreased visibility.

Heavy storms and cyclones can adversely impact navigation and cause accidents. The incidence of cyclones in Bangladesh has increased in the past few years and has caused accidents and the sinking of ships. Bangladesh experiences such incidents frequently due to the proximity of Bangladeshi waterways to the sea and tidal influence. Heavy storms have destroyed shelters and landing stations, too.[4] Other than the loss of lives, the sinking of ships causes major safety hazards for ship traffic, escalating the costs.

Strong winds can interrupt navigation affecting a vessel's manoeuvrability, which adds to time and causes delays in operations. Steering forces need to be exerted to maintain the vessel on course, which could result in

higher roll amplitudes than those of a vessel allowed to drift freely.

Sea level rise can lead to an increase in seawater intrusion and consequently a higher salinity in inland waterways. A rise in sea level allows diffusion of wave energy to the coastline and into ports, causing increased coastal erosion in areas with a soft coastline.[5] Steel structures in waters with high salinity corrode quicker, causing higher maintenance costs. It has been reported that an increase in salinity increases the number of shells growing on ship hulls, which decreases the speed of ships, raising fuel costs.[6]

## Steps ahead

While climate change-induced challenges for IWT in India mostly include floods, siltation, bank erosion, lean season navigability and visibility concerns, the intensity of these challenges is higher in Bangladesh where accidents induced by storms/cyclones and seawater intrusion/salinity are also experienced.

The sensitivity of the IWT sector to climate change can be lessened by using multipronged strategies. Robust policy planning, technological interventions, investments and operating measures need to be adopted for safe navigation. The following are some suggestions for better preparedness against the impact of climate change on the IWT sector.

- One of the drawbacks of inland navigation is that it lacks last-mile connectivity. That is why the discussion on multimodal connectivity has been integral to IWT. Not just for the last-mile connectivity, but during unfavourable conditions for inland navigation, other modes like railways and roadways can be resorted to.
- The provision of navigational aids, including updated maps, radar, night navigation aids, electronic charts, signals and other navigational services would enable safe navigation and enhance its reliability.
- Standardization of fleet, vessel and control procedures; adopting new craft designs suitable for low draft conditions could help IWT operations become more robust in climate extremes.
- Fleet capacity has to be enhanced with newly constructed vessels of different loading capacities.
- Weather forecasting systems need to be strengthened to reduce accidents and proper enforcement of regulations to guard against plying under bad weather conditions is required.
- Before building terminals, river bank stabilization needs to be undertaken.
- Minimum water depths need to be maintained through dredging wherever necessary.
- Nature-based solutions for flood and erosion control, including afforestation in the upper catchment areas to reduce siltation, have to be adopted.
- Long-term hydro-morphological studies need to be undertaken to generate data for better management of water flow and sedimentation.
- Skills and capacities of the pilot and crew have to be enhanced to navigate safely and safeguard human lives, property and environment during extreme weather events.

## Conclusion

Out of the 111 NW declared in India, feasibility studies classify 25 as viable for cargo/passenger movement. Of these 25 NW, 13 are operational at present. Year-round navigation is a challenge even in those 13 waterways. However, all of the identified canals need extensive capital and maintenance dredging, which could face opposition due to environmental concerns.

IWT is the most viable means of transport for bulk and over-dimensional cargo. Although it is considered a cheaper and environment-friendly option, climate-induced challenges can delay transportation, reduce its reliability and thereby add to the costs of operation and maintenance. To ensure seamless connectivity, multimodal connectivity seems to be ideal but coordinated efforts from various line departments are a prerequisite. Regarding investments in resilient infrastructure development, public-private partnership models can be explored. Technological upgradation concerning fleet vessels, navigational aids and channel maintenance need to be adopted. Standardization of technical and safety requirements of inland navigation along the India-Bangladesh Protocol Routes and constitution of disaster management cells are required to reduce the incidence of accidents and to render immediate action when they occur. ■

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## Notes


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