INLAND WATERWAYS IN INDIA

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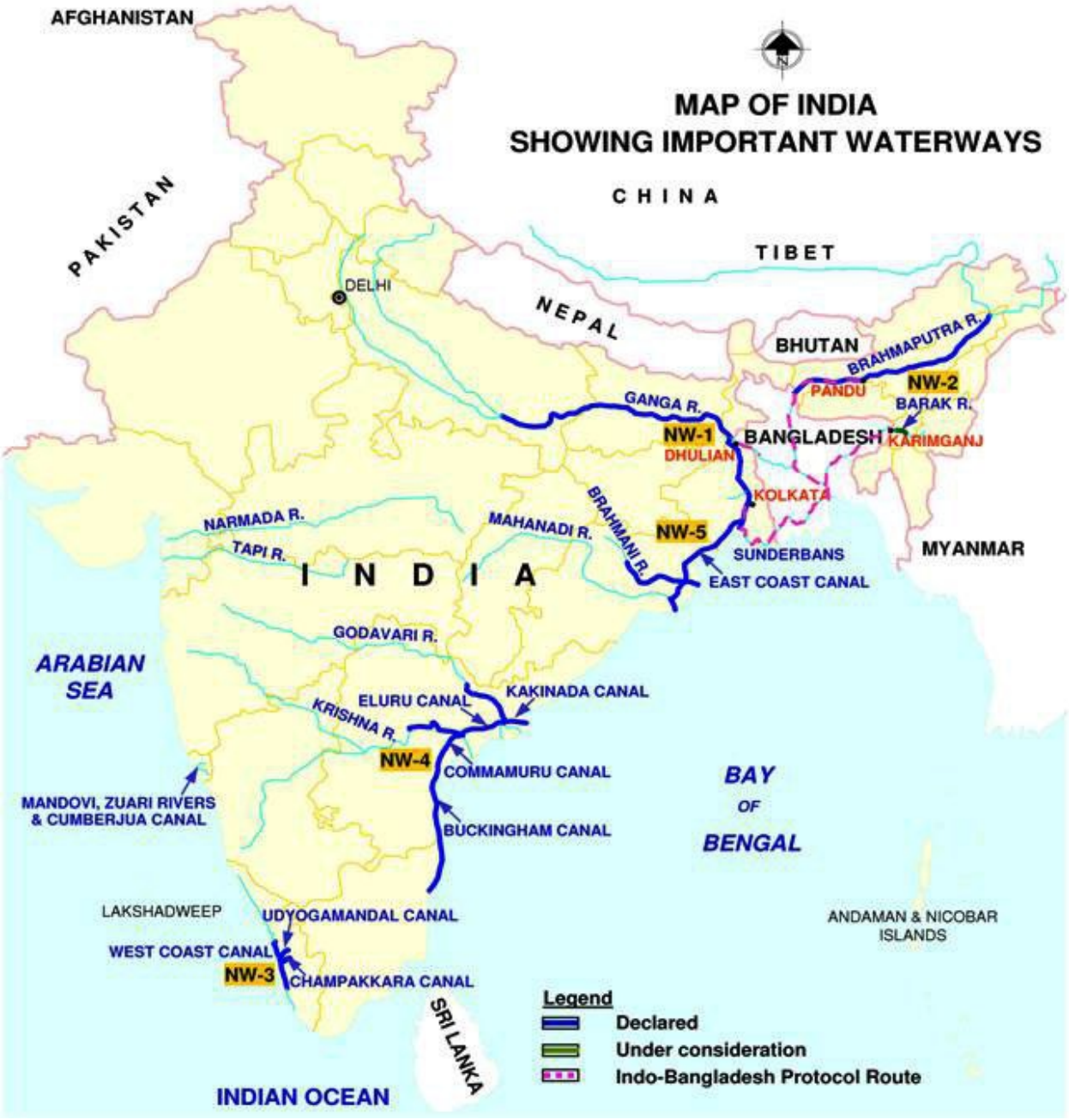

Abstract

Water based transport is effective as generally speaking, operating costs of fuel are low and environmental pollution is lower than for corresponding volumes of movement by road, rail or air. A major advantage is that the main infrastructure – the waterway – is often naturally available, which then has to be "trained", maintained and upgraded. Transport over waterways is especially effective when the source and/or destination are waterfront locations.

This paper attempts to assess the viability of movement of passengers and freight by inland water transport in India. Inland waterways refer to rivers, canals, lakes etc., but there is an overlap of this sector with coastal shipping where tidal rivers are involved. Three waterways in the country have been designated as National Waterways (NW-1, NW-2 and NW-3).

Keywords

Inland Waterways, National Waterways, Technological and Physical viability, Environmental Impact

Introduction

The potential for this mode of transport has been unquestioned over the years and it forms a significant fraction of ton-km of movement in countries across the world. In Germany IWT constitute 20% and in Bangladesh it is 32% . However, in India, it has become a very marginal part (0.15%) of the overall transport movement, both in absolute terms and in terms of share. One of the objectives of this research is to understand the reasons for this.

IWT in India

- Historically, at least on some geographical sectors, it has been a viable mode of freight transport. Currently, three major waterways in the country have been designated as National Waterways: NW-1, the Ganga-Bhagirathi-Hooghly system, from Allahabad to Haldia, NW- 2, the Brahmaputra system in Assam, NW-3, the West Coast canal system in Kerala,NW-4, Kakinada–Pondicherry stretch of canals and the Kaluvelly Tank, Bhadrachalam – Rajahmundry stretch of River Godavari and Wazirabad – Vijayawada stretch of River Krishna,NW-5, Talcher–Dhamra stretch of the Brahmani River, the Geonkhali - Charbatia stretch of the East Coast Canal, the Charbatia–Dhamra stretch of Matai river and the Mangalgadi - Paradip stretch of the Mahanadi River Delta,NW-6, In Assam,Lakhipur to Bhanga of river Barak. Commercially, the most important sector is the small tidal riverine system in Goa, comprising the Zuari and Mandovi rivers and the Cumbarjua canal. A number of possibilities do exist, in terms of in-principle navigable waterways, but the ones that offer some potential (a mix of feasibility and some traffic possibilities) are the riverine inlets along the coast, especially the ones near ports and some of the canal systems as part of larger water resource development projects (Appendix 6). A further possibility can conceivably open up if and when the river interlinking project in the country is found viable. This last possibility is doubtful, at the moment. Numerous have argued that inland waterways are desirable and

environmentally friendly mode of transport. In this research, after a brief look at passenger movements, the bulk of the report discusses freight movements on inland waterways.

Passenger movement

In India, the main passenger movements by inland waterways that are viable are ferry operations across rivers (at numerous locations on all waterways), on short stretches along rivers and tourism based passenger traffic (in Goa, Kerala, Sunderbans and Northern regions).

Some factors that affect passenger movement are discussed below.

Travel time in relation to the alternate land based route: While time by land routes is generally reducing, with more and more bridges being constructed, it is still sometimes quite viable and direct to have ferry based services in many parts. Faster ferries and launches are a possibility to encourage traffic on this node.

Cost: For passengers, the typical costs of ferry, while not high, have to be added to the costs of the subsequent mode of transport which may have to be used to achieve the end to end requirement of transport.

Interchange convenience: The waterway movement should be able to move seamlessly to other modes, e.g. bus and train.

The inland waterways can have a major role to play in the integrated passenger transport planning in an urban area. For example, a study in the Cochin metro area suggests that IWT will be an option that is impossible to ignore in the future growth of the city and calls for integrated investments to increase complementarity with other modes, faster vessels, unified pricing, ticketing and targeted subsidies in the area.

Mumbai has experimented with faster modes of water transport such as hovercrafts (apart from continuing ferry systems), but a sustainable service mix has not been found, as of now.

Inland waterways provide a convenient function in related activities. Some of them are given below.

Carriage of vehicles (preferably in the roll-on-roll-off mode): West Bengal, Kerala and Goa have significant number of these ferry services, but there is potential for much more, with faster boats, proper landing facilities and interchange with other modes.

Tourism, including stay and entertainment: This is a growing activity with economic potential. In Kerala, Alappuzha and to a smaller extent, Kozhikode are centres of this activity, especially for houseboats. Boats that provide music and dining are becoming increasingly common in Mumbai, Goa and Kochi. Long

distance river cruises, both as per schedule and as per a group demand are also available, though they retain an exclusive flavour .

Water sports: This is a new sector that has some possibilities in the rivers in North and East India. White water rafting and trekking on iced mountainous stretches of river are examples .

Cargo movement

Historically, location of industrial activity has been influenced by logistical convenience of riverine transport possibilities, at a time when road and rail networks were not so well developed. This may not be true to the same extent today, although access to water for processing and in some cases effluent treatment is still a consideration in location.

In India, inland water transport on the Ganga may have provided among the earliest organized transport movements over significant distances, well before rail and road networks developed. Although the issue is not examined in detail here, movement and exports of commodities like tea, jute, spices in the eastern sector, connected to the riverine port in Kolkata have been among the early commercial drivers of the pre-independence sub- continent.

It is clear from aggregate statistics that the sector has been growing only very slowly in the National Waterways and other major waterways. The glaring exception is the tidal river- canal system in Goa, which saw unprecedented growth and where some 30 million tons of iron ore moved by barges on the Mandovi-Zuari-Cumbarjua system in 2003-04. This solitary example is enough to demonstrate the economic potential and may provide some learning points in a variety of dimensions.

Technological and physical viability

Water flow: The basic prerequisite for water based transport is the availability of water flow. In the main waterways, this may have decreased over the years because of increased usage arising from habitation, industrial and agricultural needs. The extent of regular flow may also have decreased because of the impact of dams on river streams.

River training, dredging and navigation: The next requirement is that the river is trained and consistently provides a sufficient depth in relation to the draft of the vessels that are expected to ply on it. This is possible for some types of river beds and may require maintenance of banks and dredging of the river bed periodically, to maintain the required depth. Recent cost estimates of river training on Sabarmati river provide a figure of about Rs 10 to 11 crores/km on each bank. In rural areas, the figure could be lower, say Rs 8 to 9 crores/km.

In India, IWAI, in principle, commits to maintaining a year-round draft of 2 m along the National Waterways. This is not found to be the case, in practice. One possibility is that it is strategically justified to provide this draft on appropriate channels, by an assessment of the commercial traffic potential on

each waterway. The other option is for operators to plan for a realistic draft of 1.5 m and see if that is operationally viable.

The requirements for navigation are channel markings, night navigational aids, including the possible deployment of GPS and river maps and charts for navigation. The National Inland Navigation Institute in Patna has been set up to oversee this development by the use of appropriate technology.

Locks: The physical drop of the river channel cannot be too much, or else locks have to be provided to manage the height differential. For example, the planned Three Gorges Dam on the Yangtze will have five locks for descent.

Access of cargo: The cargo has to be accessible to the waterway at both ends, to ensure door to door movement.

Availability of vessels and associated infrastructure: India has a long history of river based water transport. Among operators, the government owned CIWTC (Central Inland Water Transport Corporation) is the largest owner of vessels and barges. Private operators have a substantial fleet, but have not been investing in new vessels in the last decade. In fact, there has been scrapping vessels of late, and all operators may require some help in reviving them and investing in new vessels. The role of the (government owned) shipyards here is important, including the CIWTC owned and operated Rajabagan Dock Yard in Kolkata. CIWTC can provide repair facilities for other operators in the area as well.

There is a well established industry of manufacture, maintenance and repair of barges in Goa, some of which are operated by mining companies which use barges for transport of ore, and some other organizations. IWT is a sustained economic activity in Goa, and there are many support services available in the state.

Commercial potential

From a supply chain perspective, the main reason for using inland waterways as a mode of transport is the fact that it decreases the total cost, when used as part of the end to end logistical requirement of cargo movement.

Geographical advantage of water bridging: This is strongest when the movement is across the river, but can be present in some other movements. Examples of these are passenger ferry services across rivers and transport in the Sundarbans areas in India and Bangladesh.

River based origins/destinations: The next level of advantage is when there is either an origin or a destination, or both, at a river location. This can be classified as follows.

Project based requirements of commodities: This demand is for material relating to a particular project activity. It consists of construction material and transport of equipment related to the project. Where the project is river based (e.g. river bridges, hydro-electric plants), it is most attractive, as the destination is the water site itself. Even otherwise, it may be viable in some cases.

Large customers with regular demands:

Existing traffic: By far the biggest example here is the iron ore export requirement from mines in north and south Goa, which access the Mandovi and Zuari rivers. This movement is expected to continue, along with movement of ore from Karnataka, after blending, for the next five to seven years at least. FACT in Kerala has been a steady customer for most of its input raw materials .

Potential traffic: Oil refineries in the north east: Numaligarh, Dibrugarh and Digboi. Oil refineries elsewhere on river bank locations such as Haldia and Barauni. Thermal power plants, for bringing in coal and carrying away fly-ash at locations like Barh and Bandel.

While many industries are located near water sources for convenience of water use, the potential of using water for transport does not seem to be there. For example, the thermal power plants in Ahmedabad, Bhusaval and other river locations. A major constraint in this is the non-availability of year long draft.

Small customers with regular demand: This is based on agriculture or manufacture of commodities and meant for consumption/processing within the country, or for export. This segment is slowly increasing, from the estimates of CIWTC and other barge operators in NW-1.

Small customers with occasional demand: These could be occasional users of IWT, but could sometimes be high value movements, such as movement of machinery and equipment on river based projects. This has proved to be a viable activity for bridge building.

Export/import traffic through ports: Exports and imports through ocean-going liners are a good candidate for IWT where possible, because of the economic value and impact.

Existing traffic: As discussed above, iron ore from Mormugao and Panaji ports is fed entirely by barge traffic through the Zuari and Mandovi river system in Goa.

Potential traffic: Some traffic through Haldia port is viable from a supply chain principle because the riverine system is connected to the port operation and barges can unload directly on to ocean going vessels, provided customs formalities can be carried out without entering the port. The cost savings are likely to be significant.

Volumes of flow (ton and ton-km): Aggregate assessments of traffic are available in statistical studies of the Ministry of Shipping and the IWAI, as well as the studies made on Inland Waterways as part of the Plan documents for the 10th Five Year plan.

Value of flow and revenue potential: CIWTC operates under a rate schedule proposed by IWAI. Given the service requirements, the main consideration is the volume occupancy of the material and whether the vessel can carry the required volume. The revenue potential is also subject to the charges for loading and unloading, which has to be borne by the user.

Service requirements: The basic requirement of freight demand is physical handling from door to door. In the case of IWT, this involves movement to and from the water mode, including the loading and unloading of material on to and from the vessel and proper storage of the material on docks and in the vessel.

IWT is generally slow in movement, compared to other modes, so very expensive cargo does not move by this mode, unless there are physical constraints to moving by other modes. IWT is a comparatively secure mode of movement.

Competing modes: For IWT, the competing modes of transport are rail and road, and combinations of these . Broadly speaking road offers small load options, faster movement, door to door service, but higher rates. Rail offers large batch economies, quick movement, partly door-to-door service, and medium rates. IWT offers medium batch size possibilities, slow movement, limited door-to-door opportunities and cheap rates.

Operational viability

Costs: IWT is a capital intensive industry, even for operators, as significant investment is required in vessels, for a start. Investments required to provide and maintain the waterway and terminals are of an even higher scale and come under the heading of infrastructure. In today's environment, it is only IWAI which can maintain the waterway and a few large customers (e.g. project based shippers and bulk manufacturers like refineries and steel plants) who can participate in investments for terminals.

Operating costs can be categorized as below.

- Vehicle costs
- Fuel costs
- Crew costs
- Maintenance costs
- Loading Unloading costs

Besides these, there are costs to do with contingencies like running aground and damage to vessels. These are not rare, under current operating conditions of insufficient draft, even in the National Waterways.

Fleet planning: Barge operations rely on economies of scale in movement, as fixed costs of the vessel (barge) and crew are quite high. The tradeoffs here are as follows: Larger barges have more draft and require a larger water depth, but have lower operating costs. For customers, the lower freight costs are offset by higher inventory staging costs. The barge size is also limited by the throughput consideration, as large barges may have operating restrictions and small barges may cause too much congestion in handling the required traffic. This leads to an operating range of sizes and related costs that are incurred and therefore the prices offered to customers.

Scheduling: Two types of schedules are possible in transport operations. Fixed schedule movements (which provide for more certainty for customers, makes vehicle deployment easy and where operational costs are more controlled) and variable schedules (which provide for more responsiveness and can reduce unremunerative runs). CIWTC operates both types of services. In NW-1 and 2, it is the only operator that has a large enough fleet to be able to attempt fixed schedule movements.

Summary of operational viability: From the analysis of operations in NW-1 and the Goa iron ore movements by barge, it becomes clear that barge economics is a capital and scale intensive activity. The preferred barge size in the NW-1 sector seems to be about 750 T, given an optimistic view of the draft that is available (when sufficient draft is not available, the vessel has to be operate below capacity). In Goa, the preferred size is now about 1500 T and 2000 T barges are also operated. This is viable, given the volumes of cargo and also the efficient loading and unloading practices, which allow for good barge utilization. In NW-1, one may have to consider smaller barge sizes with more valuable commodities. Here, since the servicing requirements are likely to be higher than what IWT can offer, a big market is doubtful initially. Agri-export is one possibility and the other is project related activity, both of which have some volume potential.

Other issues

Role of agencies

In India, a number of central and state agencies play a role in the regulation, operation and sustenance of inland water transport. Their smooth functioning is required for IWT to be viable. This is a complex issue and needs to be addressed in the remaining part of this research. Some of the actors in this sector are given below.

- IWAI
- CIWTC and other operators
- Customers
- State governments
- Port authorities
- Transport development agencies

The regulatory-cum-infrastructure provider role that IWAI is supposed to take needs to be sharpened keeping in mind the operational aspects of this sector. IWAI has taken on a limited role in provision of some infrastructure at terminals (for example at Patna, Guwahati and Kerala) and has also commissioned some medium size barges for operation. But the main responsibility of IWAI remains the provision an effective waterway at least on the National Waterway system.

The system of recovering reasonable operational charges for various services and thereby ensuring a level of service on the infrastructure has not yet evolved in inland waterways. In India, the other two

major modes of transport (road and rail) have very different operating and regulatory models and a suitable model needs to be evolved for IWT.

Inland water operations are often interfaced with coastal and deep sea movements. While ocean movements are guided by a mix of international and national laws, coastal shipping is within the ambit of the central government control and an attempt can be made to synergize this activity with IWT where possible. The major issues are those of operating standards, including vessel certification, safety and personnel related concerns.

CIWTC, based in Kolkata is an organization that has been loss making and which has been considered for privatization. It has a large fleet of barges, but not many that are in operation (for both traffic reasons and operability). A complementary asset is Rajabagan Dock Yard, which does have facilities for ship-building and repair of the required range of vessels. Although the Dock Yard has also shown some improvement, neither it nor the River Services Division is close to being financially and operationally viable as of now. Given the declining demand and the large overheads of CIWTC, its continued presence is not critical for IWT. The various services provided by CIWTC would however retain their significance. This includes ship-building and repair, terminal operations, barge operations and warehousing.

The National Inland Navigation Institute is functioning in India. It has limited staff strength and has so far done training and certification and a few focused studies.

Bangladesh: A significant fraction (about 35%) of the freight movement in the country is by IWT because of the geography of the region. Riverine ports are quite well developed and competing modes (rail and road) are not as developed in comparative terms.

Thailand: IWT is next to road in share of freight carried (about 20 million tons). Passenger movement in and around Bangkok is significant, with different types of services, including express services.

North America: Freight movements on the Great Lakes and the Mississippi continue to be important modes. Leisure activities based on water movement are quite common. The Transportation Research Board publishes studies on a variety of aspects of IWT in North America and elsewhere.

Europe: IWT is estimated to carry about 7 per cent (and growing) of freight traffic in those EU states. In the EU states with waterways, this proportion is 12 % overall and it accounts for more than 40% of ton-km in some regions . River training and use of rivers and canals for a variety of purposes has been common for a number of years. IWT is seen as a complementary mode of transport, and offers another option as part of the environmental impacts of different modes of transport and the increasing role of multi- modal transport and containerization. The current challenges are safety and the development of information systems to harmonize IWT traffic across Europe.

China: The navigable inland waterways in China total more than 100,000 kilometers and there are a large number of inland port facilities with berths for large vessels. IWT accounts for almost 10 per cent of the total freight tonnage carried in the country, and of that, two thirds is carried on the Yangtze river (including commodities like coal, steel, cement, containers and LPG). In particular, many steel mills are

located along the Yangtze river and use barges for transport of material. The downstream part of the river carries barges up to 10000 T capacity. Barges move on the river for more than 3000 km, but a shift in priorities is reflected in the construction of the Three Gorges Dam, which is a 370 mile long reservoir and which will now involve a system of locks which barges will have to traverse. The full impact of this on river traffic is not yet clear. In fact, navigability of the river upstream and downstream may actually improve with the controlled flow of water that the dam provides.

Environmental impact

Water is a scarce resource in the country. The use of water for facilitating transport may be sometimes difficult to justify. Related to this is the increased drawing of water for drinking, irrigation, construction and other activity, which reduces the overall flow of water in downstream regions. This makes transport operations difficult. Dams provide another level differential barrier to smooth transport. Given all these constraints, inland water transport is not at all the automatic first choice for movement of goods – a position that it enjoyed for many centuries in the past.

However, where it is physically possible and commercially viable as part of a supply chain for a shipper, it is usually the most appealing environmentally. The basic reason for this is low fuel usage and therefore low pollution from emissions, and ability to carry in bulk, thereby reducing handling related pollution and congestion.

Conclusions

Freight and passenger movement by water is an attractive proposition, being one of the earliest modes of freight transport used world-over. The potential is sufficient to justify a national body such as the IWAI with a sharp role in nurturing the sector. But its sustenance in today's economic context in India needs to be judged contextually in the case of each waterway or waterway system.

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