



EVALUATING THE KEY ISSUES & CHALLENGES OF INLAND WATER TRANSPORT NETWORK ON NW1, INDIA

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Abstract: This study has been undertaken to investigate the determinants of Inland water transportation network on national waterways -1 (NW1). Urbanization has put a huge strain on infrastructure. Therefore, new Ways of dealing with overcrowding in urban areas and the resulting need for more waste and cargo shipping should be explored. Switching from inland water transport as it has many benefits, including less pollution and accidents. Inland water transport (IWT) is recognized as an environmentally friendly and economical mode of transport especially on national highways. However, the implementation of IWT in India faces many issues and challenges that need to be address for effective implementation. In this research an attempt is made to analyze the main primary issues and challenges in water transportation on the national waterways 1 and few important recommendations are discussed to improve the inland waterways network on NW.

Keywords - Inland water, Transportation, National waterways (NW1), Environmental-friendly, Cargo, Infrastructure,

1 INTRODUCTION

Inland water transport (IWT) is considered an economical and environment-friendly mode of transportation. In India, the National Waterway 1 (NW1) along the Ganga-Bhagirathi-Hooghly river system has been identified as a vital artery for IWT. The NW1 project aims to connect Allahabad in the north to Haldia in the east, covering a distance of 1620 km. the NW1 Project was declared a National Waterways on 1986, and it has been developed with the aim of improving the navigability and commercial viability of the waterways. However, despite its potential, the IWT network on NW1 faces several challenges and issues that hinder its efficiency and effective utilization.

Inland Water Transport (IWT) plays an essential role for the Indian economy since it offers an affordable, beneficial, and environmentally friendly way to provide transportation for goods and individuals. IWT offers an affordable alternative to both rail and road transportation, especially to transport bulk shipping, which is essential to the growth of the economy. The efficient movement of goods reduces transit time and helps improve improving the effectiveness of the entire supply chain, hence promoting economic growth. IWT produce lesser greenhouse gases than rail and road transportation, which helps lower India's carbon footprint.

In addition, the growth of IWT infrastructure and operations provides opportunities for employment in informal as well as formal industries, such as cargo handling, vessel operation, and maintenance, so aiding to job creation and economic development. As a result, IWT is crucial for the Indian economy, offering an environmentally friendly and economically viable form of means of transport while additionally boosting India's overall economic development.

In conclusion, this research paper will provide a critical evaluation of the key issues and challenges of the IWT network on NW1 in India. The paper will also provide recommendations for addressing these challenges and unlocking the full potential of the IWT network on NW1.

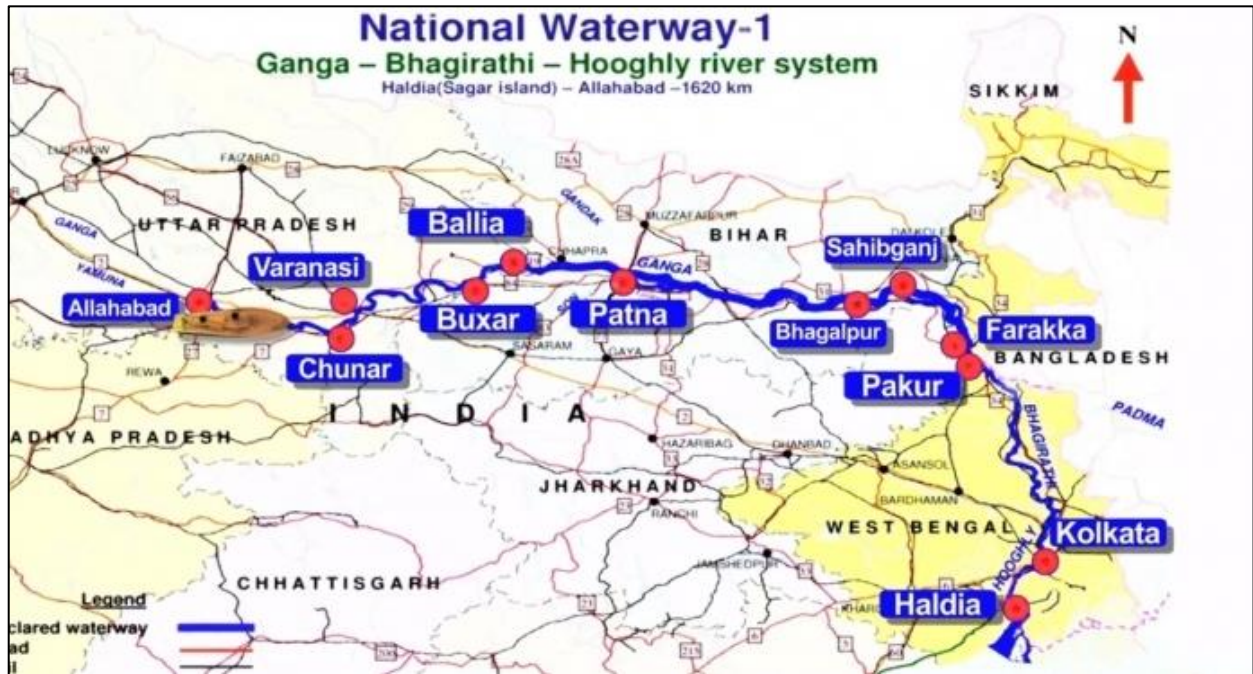


Figure 1-i National waterways-1 stretch
Source i: Maritime gateway

2 LITERATURE REVIEW

Water transport is the most cost-effective and fuel most efficient mode of transport. It is estimated the one liter of fuel can carry 24 tons-km road, 85 tons-km by rail and 105tons-km by water. In addition, government data shows that converting 1 billion tonne-km cargos to water transport will reduce onshore oil by approximately INR 250 and onshore transport by approximately INR 450.

With an increasing price of logistics, inland waterways are on the quest for ways that can boost the bottom line of companies. Inland waterways, in particular, offer an exceptional opportunity for transporting large and hefty supplies such as steel, iron metal, coal, cement, and composts. These supplies are frequently transported in enormous quantities and demand a large capacity for cargo.

The amount of fuel consumed per ton of cargo carried by water is around 15% of that utilized by road and approximately 54% of that consumed by railroads. [Coordinates procedures, National Transport Advancement Arrangement Committee, and September 2011] Fixed costs for transportation per ton can be lowered by 17.1% if goods are handled on one of the ports, by 26.1% if supplies are handled on one of the ports, and by 35.3% both of the ports are mechanized for two-way navigation. [G. Raghuram, 2004].

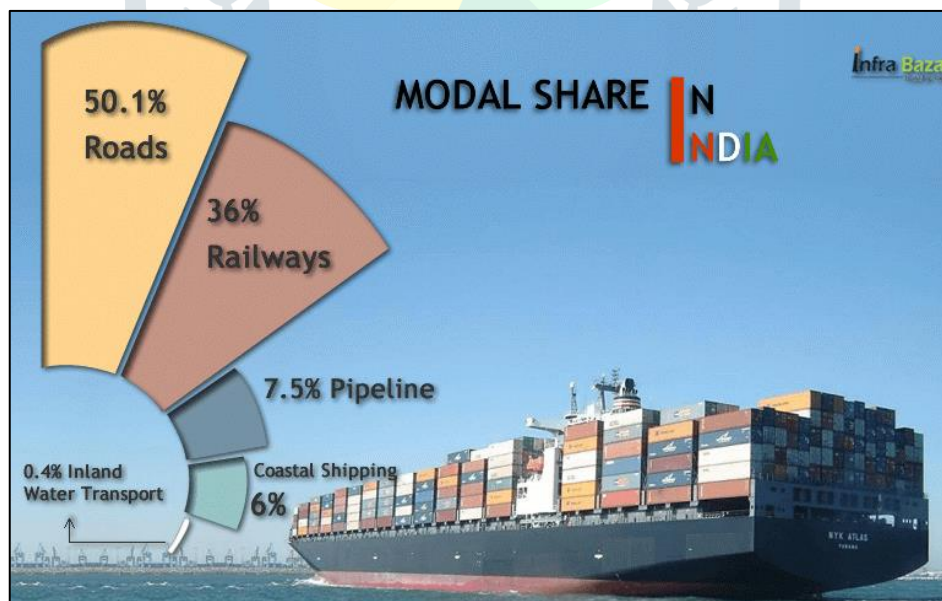


Figure 2-ii Modal share of transport sector

Source ii: <https://www.infrabazaar.com/blog/infrastructure-and-development-of-inland-waterways/249>

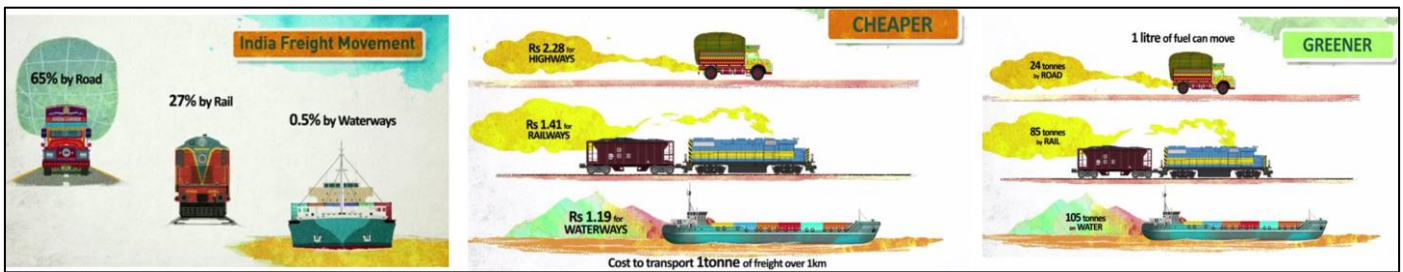


Figure 2-iii Indian Freight movement is cheaper & Greener compared from Road and Rail

Source iii: worldbank.org

Therefore, As a result of this, the energy efficiency of inland waterways transport (IWT) is higher in comparison to that of commuter trains and roadways. In comparison to railways or roadways, inland waterways transport emits a lesser to air pollution, requires less land acquisition, and also less capital to operate.

3 POTENTIAL OF NATIONAL WATERWAYS 1 (NW1)

Until close to 100 years back, the Ganga River was also a busy waterway. However, with the development of railways, this watercourse fell into disuse. The Indian government is presently restoring the Ganga watercourse, named National Waterway 1 or NW1, to transport cargo from the eastern harbor of Haldia to Varanasi, 1,360 kilometers inland. The river has the potential to become the primary logistics corridor for northern India.

Currently, cargo from the Gangetic states of Bihar and Uttar Pradesh is routed via circuitous land routes through the sea ports of Mumbai in Maharashtra and Kandla in Gujarat, rather than the much closer port of Kolkata. The development of NW1 will assist these states in directing some of their freight to the Kolkata-Haldia complex, making freight movement more reliable and drastically lowering logistical costs.

The World Bank is lending \$ 375 million to fund the development of the Ganga waterway. The Capacity Expansion of the National Waterway 1 Project will aid in the development of the infrastructure and services required to guarantee that NW1 develops as an effective transport artery in this vital economic region.

When completed, the waterway will be part of a broader multi-modal transportation network planned for the river. It will connect to the Eastern Dedicated Rail Freight Corridor as well as the area's current highway network. This network of water, road, and rail arteries will allow the region's industries and manufacturing facilities to smoothly transfer between modes of transport as they ship goods to markets in India and internationally. Farmers in the agriculturally rich Gangetic plain will gain as well since the waterway opens up new markets.

3.1 Setting up Navigational Infrastructure

The lack of fundamental facilities such as cargo terminals and jetties is one of the reasons for the region's slow development of water transport, the Project will assist in the establishment of six multi-modal freight terminals in Varanasi, Ghazipur, Kalughat, Sahibgunj, Triveni, and Haldia.

Furthermore, 5 brand-new Roll On-Roll Off (RO-RO) crossings at various locations will assist trucks and other vehicles in transitioning from the road to the river and vice versa. The six new cargo ports have the potential to grow into booming logistical centers, employing thousands of people in one of the country's poorest and most populous regions. The project will also assist in the establishment of a vessel maintenance and repair facility in Doriganj.

The Project will contribute to the modernity of the 40-year-old Farakka lock. At the moment, vessels must frequently wait for as long as six hours to traverse the lock, and two-way traffic is not permitted via its tight gates. To enable faster and smoother transit of boats via the route, not only will the lock be rebuilt, but a new lock will be created, allowing barges to flow upstream as well as downstream at the same time. These enhancements will significantly minimize the time required to cross the lock.

In addition, the Project will assist in the establishment of a cutting-edge River Information System (RIS). Among its many advantages, the RIS will allow barge operators and cargo owners to follow their vessels, locate berths in ports ahead of time, and better organize their logistics. The Project will assist define out the main channel for boats to ply in and provide night navigation facilities to make navigating safe both day and night. Furthermore, detailed protocols for dealing with emergencies, such as oil spillage from boats, are being developed

3.2 Overview of IWT operations on National Waterways 1 (NW1)

The NW1 waterway passes through some of India's most densely populated and industrialized regions, including the major cities of Kolkata, Howrah, Patna, Varanasi, and Allahabad. The river offers enormous possibilities for the movement both goods and the public, and it may also be used as a substitute means of travel to the region's congested road and rail networks.

According to their characteristics and navigational requirements, the NW1 waterway has been divided into three segments:

- The **lower stretch** of the water, from **Haldia to Farakka**, is tidal and has an intense flow rate and commonly used for the transportation of oal, minerals and other bulk materials. Thus, making it ideal for smaller vessels.
- The **Middle Stretch**, from **Farakka to Varanasi**, is non-tidal and has a lower flow rate and commonly used for the transportation of materials such as agricultural, goods, petroleum and cement. Thus, allowing larger vessels to move through.
- The **Higher Stretch**, from **Varanasi to Prayagraj**, also happens to be non-tidal and has a low flow rate and commonly used for the transportation of fertilizers, grains and agricultural goods. Thus, allowing larger vessels to pass through.

To improve the navigability and commercial viability of the NW1 waterway, the Indian government has undertaken several projects and initiatives. The **Jal Marg Vikas Project (JMVP)** is a significant project launched in 2016, which aims to develop NW1 for the movement of large vessels of up to 1,500-2,000 tonnes.

		To												
		Haldia	Kolkata	Pakur	Farakka	Rajmahal	Sahibganj	Bhagalpur	Semaria	Patna	Ballia	Kaithy	Varanasi	Allahabad
From	Haldia	X	105	500	520	560	600	700	875	1000	1105	1300	1350	1585
	Kolkata	105	X	395	415	455	495	595	770	895	1000	1195	1245	1480
	Pakur	500	395	X	20	60	100	200	375	500	605	800	850	1085
	Farakka	520	415	20	X	40	80	180	355	480	585	780	830	1065
	Rajmahal	560	455	60	40	X	40	140	315	440	545	740	790	1025
	Sahibganj	600	495	100	80	40	X	100	275	400	505	700	750	985
	Bhagalpur	700	595	200	180	140	100	X	175	300	405	600	650	885
	Semaria	875	770	375	355	315	275	175	X	125	230	425	475	710
	Patna	1000	895	500	480	440	400	300	125	X	105	300	350	585
	Ballia	1105	1000	605	585	545	505	405	230	105	X	195	245	480
	Kaithy	1300	1195	800	780	740	700	600	425	300	195	X	50	285
	Varanasi	1350	1245	850	830	790	750	650	475	350	245	50	X	235
	Allahabad	1585	1480	1085	1065	1025	985	885	710	585	480	285	235	X

Figure 3-i Inter port distance in Km-NW1

Source iv: AUTHOR, Amit Mishra, National Institute of Industrial Engineering, Mumbai

The project includes the development of three multi-modal terminals at Varanasi, Sahibganj, and Haldia, which will provide facilities for cargo handling, storage, and transshipment. The government has also undertaken various other measures, such as dredging of the riverbed, construction of navigation aids, and provision of financial assistance to the sector, to improve the overall infrastructure and efficiency of the NW1 waterways.

Another current project is the development of a new bridge over the Ganga in Patna, Bihar, which is expected to improve connectivity as well as transport via the NW1 route. In addition, the government of India is working on the creation of new waterways such as NW4 and NW5, which will help to expand India's inland water transport network. These ongoing government projects aim to promote the use of inland waterways for commercial and passenger transit, reduce transportation costs and congestion on highways and trains, and boost the country's overall economic growth.

4 KEY ISSUES AND CHALLENGES OF INLAND WATER TRANSPORT (IWT) ON NATIONAL WATERWAYS 1 (NW1):

The inland water transport (IWT) on National Waterways 1 (NW1) in India faces several issues and challenges. Here are three key issues and challenges:

- **Insufficient Infrastructure and Maintenance:** Inadequate infrastructure & poor maintenance are two major challenges for the IWT network on NW1. The lack of suitable infrastructure, such as jetties, berths, and terminals, as well as navigational aids like buoys and beacons, impedes effective vessel movement. Poor upkeep of existing infrastructure exacerbates the situation, causing regular interruptions in cargo and passenger traffic.
- **Financial Viability:** The IWT network on NW1 struggles with severe financial viability issues. The large initial capital expenditure necessary for infrastructure development and maintenance, along with low demand and insufficient cargo volumes, makes operating the IWT network commercially difficult. The lack of a credible company strategy and a financial sustainability plan exacerbates the situation.
- **Lack of Policy and Regulatory Framework:** The lack of clarity in rules, tariffs, and taxes restricts the sector's growth. Absence of comparable opportunities in terms of competition between road and rail modes complicates the problem. The lack of collaboration among various government organizations in charge of developing and maintaining the IWT network adds to the difficulty.
- **Navigation & Security:** The IWT network on NW1 meets significant navigation and safety challenges. The unpredictable character of the river's flow and variable water levels make safe navigation of the waterways difficult. A lack of proper training and skilled labor also contributes to the situation. The lack of an effective emergency response system raises the possibility of accidents, posing serious risks to the safety of passengers and the surroundings.
- **Environmental problems:** The construction of the IWT network on NW1 raises serious environmental problems. Wastewater discharge from industry and human settlements alongside the river banks negatively impacts the river and endangers aquatic life. Dredging practices essential to keep streams navigable also cause damage to the environment and habitat devastation.

Furthermore, the development of the IWT network on NW1 faces a number of challenges, including inadequate infrastructure and maintenance, navigation and safety, a policy and regulatory framework, financial viability, and environmental concerns. To address these difficulties, a multi-pronged approach requiring collaboration among multiple stakeholders, including the government, commercial sector, and local communities, is required. To realize the full potential of the IWT network on NW1, a comprehensive policy and regulatory framework, investment in infrastructure construction and maintenance, improved navigational safety, and the adoption of sustainable environmental practices are required.

5 CARGO & PASSENGER MOVEMENT OPERATION ON NATIONAL WATERWAYS 1 (NW1)

In recent years, cargo and passenger transportation on India's National Waterway 1 (NW1) has seen significant growth and development; however, there are still several challenges that need to be addressed, such as:

- 5.1 Cargo Movement:** Cargo movement on NW1 has been rising significantly in recent years. As of 2021, the NW1 carried approximately 1.5 million tonnes of cargo, the majority of which were coal, stone chips, and food grains.

The major challenges for the growth of Cargo movement on NW1 are:

- **Lack of suitable infrastructure:** including as terminals, jetties, and navigational aids, is a major impediment to the increase of cargo operations on NW1.
- **Limited connectivity:** Because NW1 is not well connected to other modes of transportation, such as road and rail, it fails to draw in cargo owners who prefer quicker and easier modes of transportation.
- **Seasonal variations:** During the monsoon season, the river's water levels fluctuate substantially, affecting vessel navigation and generating delays and disruptions in freight movement.
- **Competition from other forms of transportation:** Inland water transport has severe competition from road and rail transportation, which are viewed as faster and more reliable.



Figure 5-i Types of Cargo Vessel's on IWT, India

Source v: Iwai.nic.in/

5.2 **Passenger Movement:** Passenger movement on NW1 remains relatively low, with the majority of traffic comprising local commuters and tourists. The key challenges for the growth of passenger mobility on NW1 have a shortage of suitable infrastructure, connectivity, and safety measures, along with a lack of knowledge about the benefits of water-based transportation.

The major challenges for the growth of passenger movement on NW1 are:

- **Limited infrastructure:** A Shortage of jetties, terminals, and vessels for passengers is a significant impediment to the expansion of passenger traffic on NW1.
- **Limited connectivity:** Because the NW1 is not well connected to other forms of transportation, such as road and rail, it struggles to attract passengers who prefer more convenient and rapid ways of transit.
- **Concerns about safety:** Passengers are concerned about their safety, particularly during the monsoon season when river levels rise dramatically. Passengers are at risk due to a lack of sufficient safety precautions, including life jackets and systems for responding to emergencies.
- **Limited awareness:** Local and tourist understanding of the accessibility and advantages of water-based transportation is also limiting the increase of passenger mobility on NW1.



Figure 5-ii For Passenger Movement Ganga Vilas Cruise Flagged off by PM Narendra Modi

Source vi: www.tv9hindi.com

In order to address these issues, the government has taken steps such as building jetties and terminals, improving connectivity, and promoting water-based tourism. The government additionally took steps to increase safety measures, such as making life jackets mandatory and establishing emergency response systems. Water-based transportation awareness is also being raised through various activities such as marketing and advertising campaigns.

6 RECOMMENDATIONS FOR IMPROVING THE IWT NETWORK ON NW1

Several recommendations could be made to improve the efficiency and effectiveness of India's inland water transport (IWT) network on NW1 based on the challenges and issues it faces:

- **Infrastructure Development:** Developing contemporary and effective infrastructure on NW1 is a reasonable recommendation because it will increase the IWT network's operational efficiency. However, significant investment and collaboration between the public and private sectors are required. If properly implemented, it has the potential to increase commercial and passenger flow on the waterways.
- **Integration with Other Forms of Transportation:** Linking IWT with other forms of transportation is a highly practical suggestion because it can provide an effortless and efficient network of transportation across the country. This will necessitate improved coordination among various means of transportation, and it has the potential to dramatically improve the IWT network's link with the hinterland.
- **Vessel Modernization:** Replace old and irrelevant vessels with new and highly technological vessels to boost efficiency and save operational expenses. This will further enhance passenger and cargo safety and security.
- **Regulatory Framework Strengthening:** Create a solid framework for regulation to tackle safety, security, and environmental concerns. It will ensure the entire IWT network meets the highest security requirements while also being environmentally friendly.
- **Encourage Private Sector Participation in the Development and Operation of the IWT Network:** Promote private sector participation in the development and operation of the IWT network. This will result in private investment and skills to boost the network's efficiency.
- **Capacity Building:** Provide IWT personnel with education and training programs to help them improve their abilities and their expertise. This will increase the network's overall efficiency and safety.

By implementing this recommendation, India's IWT network on NW1 can overcome its obstacles and develop as a profitable and efficient means of cargo and passenger transportation.

7 CONCLUSION

Despite these challenges, the IWT sector on NW1 still has significant opportunities. The sector can drastically cut transportation costs and enhance efficiency by expanding infrastructure, increasing navigation facilities, and embracing new technologies. Furthermore, promoting multimodal transportation and developing logistics hubs along the waterway will boost the potential of IWT on NW1.

Furthermore, the government's efforts to promote the IWT sector, such as the Jal Marg Vikas Project, have shown a commitment to the sector's growth and development. The project aims to develop the whole NW1 waterway into a viable transportation route, which will create jobs and support economic development in the region.

In conclusion, the National Waterway 1 (NW1) represents an immense opportunity for India to capitalize on inland water transport (IWT) for commercial and passenger mobility. Yet, the IWT network on NW1 encounters a number of challenges and issues that prevent it from reaching its full potential. The paper suggested multiple approaches to strengthen the IWT network on NW1, including the implementation of better infrastructure, increased stakeholder collaboration, and the development of a thorough regulatory framework. To verify that these proposals are suitable for implementation, their feasibility and efficacy should be assessed.

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