STUDY ON INLAND WATERWAYS OF INDIA

A dissertation submitted to the **School of Maritime Management, Indian Maritime University** in partial fulfilment for the requirements for the award of degree in **MBA- Port & Shipping Management**

Submitted

by

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DECLARATION

I, VISHAL KAUSHIK **(Reg. No. 1903304027)**, student of School of Maritime Management, Indian Maritime University –Chennai Campus, hereby declare that this project report titled **STUDY ON INLAND WATERWAYS OF INDIA** submitted to the fulfilment of the requirement for the degree **Master of Business Administration in Port and Shipping Management** is my work carried under the guidance of my project guide. It has not formed the basis for the award of any Degree/Diploma of any University/Institution. The information submitted here is true to the best of my knowledge.

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ABSTRACT

The aim of the Coordinated NWTG study is to connect all of the NW Ganga from Prayagraj to Haldia (NW1), Brahmaputra from Sadiya to Dhubri (NW2), West Coast Canal from Kottapurama to Kollam with Udyog Mandal and Chama Pakara Canals (NW 2), Kakinadaa – Pondicherry channel extends with Godavari river. With this goal in mind, Phase 1 was completed, which recommended 27 prospective terminal places along 6 NW for the progress of a sustainable Intermodal NWTG. These notable potential terminals must be suitably connected to nearby Highways by two-lane streets, & at very least a single-lane expanded railways must be established up to nearby train heads, when possible.

Individual projects will be produced with thorough projects analysis and finance possibilities relying on directions & discussions on proposed Phase I study of NWG connected Roadways, Rail , and Port. In addition, because its connectivity with hinterland, it advised that four further terminals be added, namely Allahabad and Saheb Ganj on NW1, Dhamara and Kalinga Nagar on NW5, and Allahabad and Saheb Ganj on NW1.

According to this analysis, the Inland Waterways Transportation has big Indian market as it is a cost-effective and environmentally beneficial means of transportation when measured to different modes. The information for this report was gathered secondary source. IWAI will assist the country's economy grow, big and small industry along the rivers' routes. It will aid in increasing cargo movement connections, which will ultimately guide to growth of economy.

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List of Abbreviation

Description
IWAI – Inland Waterways Authority of India
CIWTC – Central Inland Water Transport Corporation Ltd
NW – National Waterways
PPP – Public Private Partnership
IWT – Inland Waterways Transportation
DWT – DEAD Weight Tonnage
JMVP – Jal Marg Vikas Project
GOI – Govt Of India
MMTPA – Million Metric Ton per Annum
NH -- National Highway
MTPA – Million Ton per Annum
IDK – Irrigation department of kerala
LAD – Least Available Depth
SCI - Shipping Corporation of India
NWTG – National Waterways Transportation Grid
NWG – National Waterways Grid
NW – National Waterways

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CHAPTER 1

Introduction

Around 14,500 kilometres of inland conduits run through India. Motorized specialists have access to 4,000 kilometres of waterways. In comparison to other countries in the globe, India's inland streams are underutilised. The entire cargo moved via the inland channel was only 0.5 percent of India's total inland traffic. The IWAI. was established on October 27, 1986, with the goal of developing and establishing guidelines for inland transportation and routes. The company's headquarters are in Noida, Uttar Pradesh. The IWAI has announced five national waterways and has recommended a sixth. Waterways, trenches, and backwaters make up roughly 14,500 kilometres of safe conduits in India. Despite a 7,517-kilometer coastline, inland waterways activity is limited to two or three lengths of the Ganga-Bhagirathi-Hooghly river, the Brahmaputra, the Barak , Goa rivers, the backwaters in Kerala, as well as the inland waters in Mumbai and the Krishna- Godavari Waterway.

The National Waterways Act, 2016, was enacted by Parliament on March 9, 2016, and was enforced into law by the Indian President on 25-3-2017. It took effect on 12-4-2017, as per the Government of India's notification. As a result, 111 rivers, and estuaries have been designated as national waterways. The provision of this directive allows the central government to exert control over these development channels in terms of conveyance, course, and transport via forcefully pushed vessels. There were five national conduits prior to this statute.

The segment of the conduit between Delhi and Kolkata passes through some of India's most densely inhabited areas. According to a World Bank study, a significant 40% of all Indian trade originates in this resource-rich province or is destined for its spillover business sectors. While the region is estimated to produce roughly 370 million tonnes of freight each year, only about 8 million of these are now transported by water. Since October 27, 1986, India's inland waterways have been built and regulated by the Inland Waterways Authority of India.

waterways, such as the Kerala backwater, canals in Gujarat, and various conduits in West Bengal, Goa and Assam, provide a good method for movement over metropolitan networks to towns. In India, cargo transit via conduits is extremely underutilised. In comparison to the 21% figure for the US, the full scale freight moved by the inland conduit was less of the absolute inland traffic in India. Indian water transportation is

getting a lot of attention lately because the cost of coordination in India is quite probably the highest among real countries – according to sources, it's 18% in India compared. 8-10% in China and 10-12% in Europe.

The IWAI is responsible for the progress of these canals. The two main workplaces in the country are this expert and the Central Inland Water Transport Partnership (CIWTC), which serves as the essential chairman. Inland water associations of various States and private administrators strengthen and sustain these affiliations' activities. Out of 26,000 km of navigable waterways in mainland Europe, 17,000 km have a depth of more than 2.75m.

In 2003, European Union promoted a special monitored movement initiative known as "Marco Polo." Out of 119,000 kms of safe conduits in China, 5000 kilometres have a depth more than 2.75 m. In addition, China has 2000 inland ports. Out of 41,000 km of navigable channels in the United States, 24,000 km have a depth of more than 2.75 m. India has 14,500 kilometres of safe conduits, of which approximately 5700 kilometres may be traversed by motorised vessels.

Extent of the Inland waterways

The National Waterways Act of 2016 details the details of each of the 111 public conduits. With a full scale length of 20274 km, these conduits pass through 24 states and two associate domains. Around 138 waterways frameworks, streams, estuaries, and similar channel frameworks in India would be traversed by these conduits.

On April 29, 2015, Shri Nitin Gadkari, Minister of Road Transport, Highways, and Shipping, presented the National Waterways Bill, 2015. The PSC on Transport, Tourism, and Culture was given this bill to study.

Despite having five public conduits, this bill proposed 101 new national conduits. The Standing Board recommended that some new conduits be included, as well as urging the legislature to consider objections from state governments about some national conduits.

Following the consideration of all of Standing Advisory's recommendations, the Bill was updated, with 13 proposed conduits cleared and 18 channels added. Annexures 2 and 3 detail of these. Annexure 3 also lists the alternative conduits offered by the Parliamentary Council. Parliament passed the bill, and 111 conduits were designated as national waterways..

1.1 Inland Waterways Types

Inland navigation channels for the commercial traffic are generally three types: open river waterways, canalized waterways, and canals.

- **Open river navigation**:

  There are few rivers are discharging is adequate throughout the river to provide suitable channel dimensions for year-round commercial navigations of modern vessels and barges. The natural factor which restricts open river navigation particularly, in the freshet reaches include very high-velocity currents, decreased depth in low water period, sediment deposition in the channel and natural hazards I the form of rapids/outcrops. Under such circumstances, engineering measures (river training or rectification and stabilization) include the construction of spurs, dukes, and longitudinal dykes, revetments and so on for the channel regulation to provide and maintain adequate channel dimensions for navigation. The National Waterway 1 (Ganga-Bhagirathi-Hooghly river system) and NW-2 come under open river navigation.

- **Canalized waterways**:

  The construction of a number of locks and dams has transformed a free-flowing river into a series of slack-water pools. Engineering works control the flow in the canalised waterway to some extent. There are no such navigable waterways in India.

- **Canals**: Canals are developed for connecting two or more water bodies. Navigation canals are thus entirely artificial waterways whose water is obtained by diversion from rives/reservoirs. The NW-3, NW-4 and NW-5 come under this classification.

1.3 Inland Waterway of India

• NW 1: the Ganges–Bhagirathi–Hooghly River System stretching in Varanasi–Haldia, 1620 km long, and 4 million tonnes' projected freight traffic.

• NW 2: Sadiya Dhubri river stretch Brahmaputra, 891 km long, with an estimated 2 mn ton freight traffic.

NW3: 205-kilometer long, with a projected freight movement of one million tonnes, Kozhikode-Kollam Canal West Coast, Champakara Canal and Udyog mandal Canal.

• NW 4: Kakinada-Pondicherry Canal section and Kaluvelly Tank, Bhadrachalam - Godavar and Wazirabad river stretch of Rajahmundry - Krishna River section of 1095 KILOMETER in length.

• NW 5: the Brahmansky River Talcher-Dhamra River River, the Mahanady-Mangalgady River Delta Paradip River River 623km long – the Eastern Coast Channel Geonkhali- Charbatia, the Matai–Dhamra River Stretch.

NW 6: Lakhimpur at Assam, with a length of 121 km, to Bhanga on the river Barak.

Map of Inland Waterways

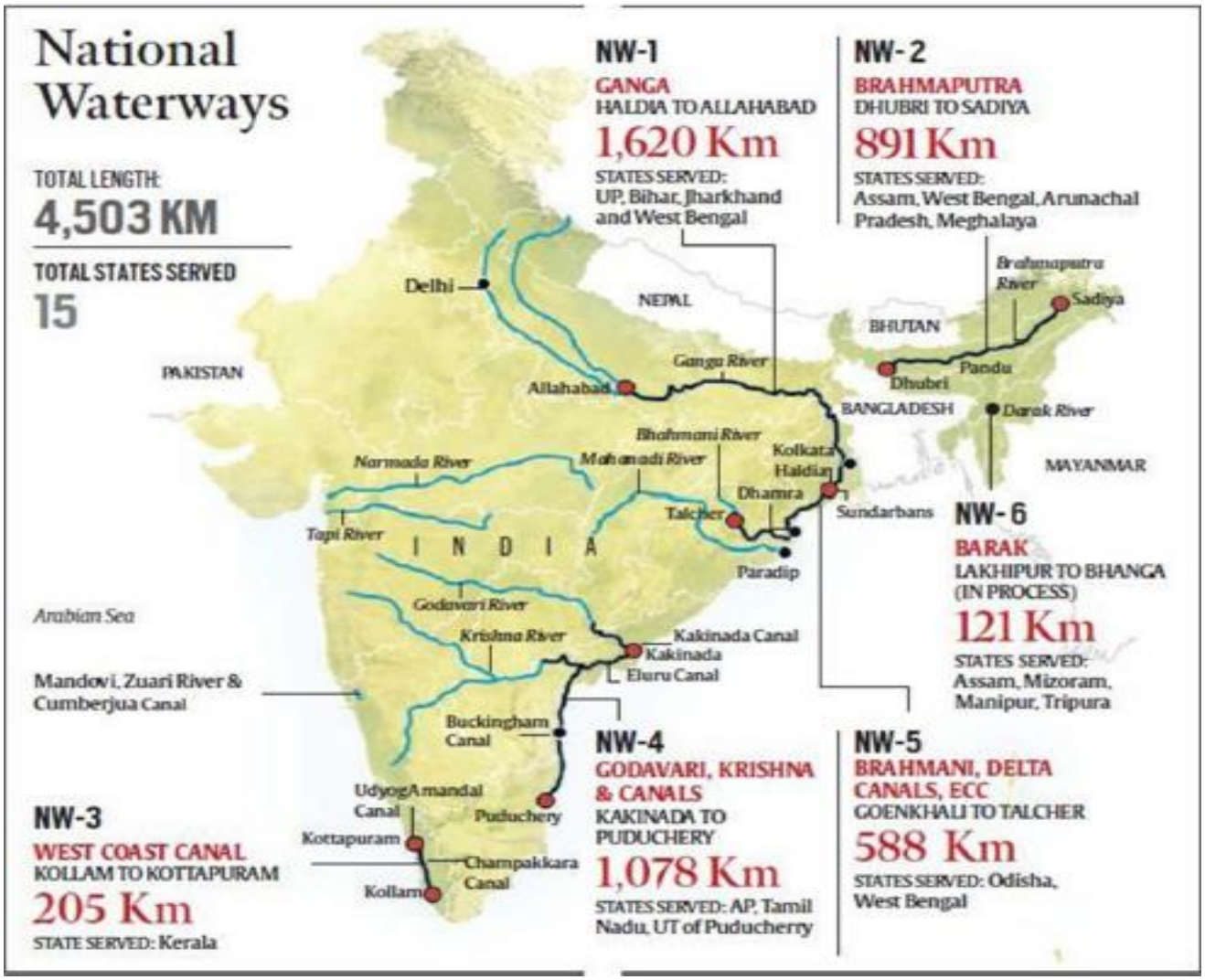


Fig 1. Map of Inland Waterways of India

1.4 Inland Waterways benefits

As space for highways is in shortage and the value of building road, flyover, and bridge rises, the authority is looking into using water for public transit. Water transport isn't just environment-friendly yet additionally less expensive than other modes of transportation.

• In some regions, moving freight by water takes less time, and there are fewer chances of traffic congestion and accidents on roadways.

• Dredging, barge maintenance, terminals, storage, building, operation, and navigation, as well as tourism, are all areas where public-private partnerships have a lot of potential.

- It is envisaged that inland freight, cruise, tourist, and passenger traffic will be transported.
- It will contribute to job creation.

• It will stimulate and increase the states' marine commerce.

• It provides far more versatile support than rail and can be tailored to meet specific needs..

1.5 Study Objectives

- To investigate the impact of IWT on movement of cargo in comparison to other modes of transport.
- To investigate the impact of various modes of transportation on freight transit during the summers.
- To emphasise on how well SCI is equipped for inland waterways transportation in terms of the challenges and opportunities that await IWT.

1.6 Scope of the study

Between Haldia and prayagraj, there is a tremendous opportunity for the vessel making business because to the expansion of NW-1. There are many artesian in Kolkata who build and repair boats and ships, but none of them produce vessels of a displacement of 1500-2000 DWT. Although IWAI boats are now functioning on the Ganga, there is a significant chance for a private social event to invest in the vessel-building industry. It will not only expand the vessel's capacity, but it will also create jobs for the local community. Aside from vessel modernization, the inland water transportation equipment supply, repair, and maintenance industry has promise.

Water transportation is important for both direct work, such as vessel construction and calculating positions, and indirect work, such as enabling depressed individuals to work in urban networks while living in more reasonable places. Extended compactness also helps to boost employment by providing a path for national producers like farmers and fishers to reach their target customers. For example, it is estimated that about 4,000,000 people in Bangladesh earn their living by delivering goods and passengers along the country's

roadways, accounting for nearly 60% of all vehicle activity. Because of the increased fleet size, inland waterways transportation will provide additional opportunities for work for marine floating workers, as well as executive port bosses who can coordinate the association, movement, and support of an inland port.

In terms of encouraging exchange between India and Nepal, National Waterway 1 might be regarded a success. By sharing its limit with Nepal and utilising NW-1, Uttar Pradesh Nepal may be able to expand its trading volume with India. Because Nepal is a landlocked country, the majority of its freight is handled at Haldia port and then transported from there, beginning in one location. Traveling from Haldia to Nepal and vice versa can be sped up by using National Waterway 1.

1.7 problem identification

- Because of the infrastructural limitations and the depth of the canals, there is a limited area of operation
- Vessel needs depth for navigable and river with less depth will require more dredging. So basically for vessel to be navigable river with more depth is needed.
- There is a scarcity of inland waterways transportation vessels because vessel construction needs a significant amount of capital
- Decreased stream because of redirection of water for water system, for example, in the Ganga which makes it troublesome in any event, for liners to handle.
- For night navigation there is very less infrastructure and to improve inland waterways infrastructure growth in night navigation is required.
- There is a scarcity of inland waterways transportation vessels because vessel construction needs a significant amount of capital.

Dissertation Structure

Chapter 1 provides an outline of India's inland waterways as well as other project specifics.

Chapter 2 provides an overview of the benefits of inland waterways.

Chapter 3 Is about the infrastructure of National Waterways

Chapter 4 is the analysis of Inland Waterways

Chapter 5 Is about the challenges and conclusion

CHAPTER 2

Impact of Inland Waterways and Government Initiative

2.1 Inland Waterways – Impact on Economy

Everlasting rivers like Ganga, Yamuna, Narmada, Godavari, Krishna or Cauvery Crisscross India with energy and water colour helping the upbeat approaches to remember billion different ways of living. old epics have praised their quality by sufficient inclusion in abundant measure by depicting the feelings of our saint people while living close to these rivers. While attempting to converge with the globalization of our greatness, the time has come to view at their failed to remember potential as monetary intends to arrive at our put forward objectives.

Inland streams have been agreed a focal job in sea improvement in India. The NW Act 2016, has marked 111 rivers, estuaries in India as NW. Route in streams, lakes and other water bodies by more modest vessels associating places not a long way from one another has been around for quite a long time, and been the pillar of our inland streams. In many cases, particularly close to ports and seaside regions, this has likewise developed to enormous scope, business dispatching. The NW project currently means to make such huge scope, business delivery and route frameworks in 111 streams. These are relied upon to understand the capability of payload and traveler traffic, including the travel industry and voyage, offer consistent network at lower per-unit cost and make transportation more productive. The undertaking, in its whole execution and activity stage, would create a progression of forward and in reverse linkages with possibilities to infiltrate profound into the economy. The multiplier impact of venture and its linkages can bring about an idealistic pattern of all-round development. This likely ethical cycle, notwithstanding, can well be hindered if execution of the organization isn't all around facilitated. Furthermore, there are different difficulties.

The NW Act commands the Government of India to direct these waterways for methodical and precise improvement of delivery and route exercises. Spread across the Eastern, Western, Southern and Central locales of the country, these streams cover almost 15000 kilometers across 24 states. They incorporate the country's 138 waterway frameworks, estuaries and trench frameworks, and can be used as a channel to move travelers and load inside the country and to the adjoining nations.

The streams are likewise suggested to connected toward the eastern and western Dedicated Freight Corridors (DFCs), just as the Sagarmala Project, which means to advance port-drove immediate and roundabout turn of events. The linkages are being arranged in a way to such an extent that products and load can be traded/moved from and to the streams, the DFCs and street transport. The inland stream in its full degree is considered as a component of a desire to interface a few major foundation projects.

Inland stream network has no ceaseless availability. It requires a multimodal network containing water bodies and streets, including ducts. This includes interest in an enormous number of exercises to be done for foundation improvement. A portion of the port/terminals, for example, Varanasi are arranged as multimodal center points which will interface rail, street and streams. Additionally, the Integrated National Waterways Transportation Grid intends to connect a considerable lot of the public streams to one another and furthermore to streets, rail lines and significant ports.

The capital expense of the Grid is assessed at Rs. 22,763 crores with stage I (2015-18) assessed at INR 2,631 crore and stage II (2018-23) at INR 20,132 crore. What's more, setting up of an enormous number of ports/terminals, riverside breakwaters, godowns, boat building workshops, fixing yards and auxiliary businesses, will prod venture openings

2.2 Advantages of Inland Waterways Network

An all around composed inland waterways network could get a principal adjustment the logistics situation of the country. It addresses a prepared fabricated framework organization, which can be used with no further capital speculation. The organization requires no green field speculation, however just capex for development/upgradation. Streams can decongest streets, including roadways by moving load away. Streams don't include difficulties related with land securing, which has consistently been a touchy issue, causing time and cost overwhelms of various tasks. The critical speculation which India needs to fabricate its streets/thruways foundation organization can be moderated through expanded usage of the streams. Client charges can be collected to meet the costs on support of the streams.

Waterways are a less expensive transportation method versus the accessible other options, essentially lessening the highlight point cost of merchandise transportation. According to an examination did by RITES in regard to the Integrated National Waterways Transportation Grid, one liter of fuel will move 24 tons

through one kilometer on road, 95 on railways and 215 kilometers on waterways. The National Waterways Bill 2015, postponed in the Parliament referenced that, "Inland waterway transportation is perceived as eco-friendly, savvy and climate well disposed transportation method, particularly for mass products, unsafe merchandise and over dimensional loads. It additionally diminishes time, cost of transportation of products and freights, just as clog and mishaps on parkways."

They are relied upon to likewise "help make consistent interconnectivity interfacing hinterlands along traversable stream coasts and seaside courses" and "are probably going to assume a significant part in associating the north-eastern states to the terrain."

2.3 Disadvantages of Inland waterways

- Inland waterways have less trasportation speed in this way not reasonable where time is a significant factor
- 2.It has restricted space of activity, depends upon the infrastructural premises and rivers depth
- 3.There are without a doubt, not very many cases in which IWT can offer entryway to doorway transport of cargo
- 4. Operational disruptions due to climate is a significant hindrance

2.4 Market Growth

The Indian subcontinent has a huge coastline of 5,423 km and an extra 2,094 km around the 1,256 islands in the Andaman & Nicobar and Lakshadweep group of islands. With 200 miles of Exclusive Economic Zone the nation has an area of around 100,000 sq km of water surface for economic activities. Various rivers fill these oceans around peninsular India. It has been assessed that around 14,500 kms length of rivers are navigable.

The Inland Water Authority of India has announced 5 National Waterways covering an all 4,434 km of inland waters covering courses on stream Ganga, waterway Brahmaputra, back waters of Kerala, Krishna and Godavari waterway framework alongside the Buckingham Canal and Brahmani Mahanadi waterway framework alongside Eastern Coast Canal. In 2016 the public authority of India announced 106 safe streams as National Waterways moreover.

India and Bangladesh have settled upon a waterway transportation convention of 2,303 nm on the courses of Ganga, Brahmaputra and their feeders across the two nations. Comparative conventions are to be endorsed among India and Bhutan, Nepal and Myanmar.

Movement of cargo like tea, jute, and flavors in the eastern area, associated with the port in Kolkata, was among the early business drivers of pre-independent India. In spite of the fact that cargo development through rivers has lost noticeable quality, lately, the Mandovi-Zuari Cumbarjua framework moved more than 30 million tons of iron metal. cargo growth through inland waterways has commonly been languid in post-independent India, lacked policies, non-accessibility of infrastructure, channel depth, number of vessels, option to proceed and so on with re-established accentuation on waterways transportation, this is required to improve stream of products through national waterways.

Moving goods and passengers through inland streams would require setting up huge number of landing and stacking/dumping focuses. This can possibly open up huge and hinterland for supply of products which can be moved at a lower cost. The hinterland can likewise open up new business sectors. Further, the arrangements of the Indo-Bangladesh and Indo-Myanmar convention allowing transshipment of products through Bangladesh and Myanmar waters – which, much of the time, are a continuum of India's inland streams – gives the fundamental Right of Way, empowering speedier shipments and more profound market infiltration in India's North East.

The Indo-Myanmar convention imagines multimodal network among Kolkata and Mizoram, through Myanmar. The travel route involves dispatching transport from Kolkata to Sittwe port (539 kms), inland waterway transport from Sittwe to Paletwa (River Kaladan – 158 km), Paletwa to Indo-Myanmar line (Myanmar side – 110 km) and from the line to NH 54 at Lawngtlai (India – 100 km). This presents a simpler and quicker travel course than the current 'chicken neck' passageway through Siliguri.

The Indo-Bangladesh convention works with fare and import exchange to and from Bangladesh utilizing both NW-1 and NW-2. The riverine exchange through Bangladesh works with exchange through Assam, as homegrown developments on NW-2 among Assam and Haldia/Kolkata regions go through a critical stretch in Bangladesh and are dependent upon the respective convention. Various inland and river ports in Bangladesh with payload taking care of offices makes the riverine course suitable. The convention currently further allows use of the Chittagong and Mongla port for travel of Indian freight and opens up the inner business sectors in Tripura, which is only a few of hundred kilometers from Bangladesh.

Early indications of achievement in inland waterway transport, proven by an expanding usage of the streams for payload development in North East, is required to speed up with improved offices as far as framework and vessels. In the interim, in a huge turn of events, the initial two arrangements of containerized freight have effectively started from Kolkata port for Varanasi and Patna.

Passenger movement has expanded along the river and furthermore on the coast. New ro-ro vessels, ro-pax vessels, terrain island and inter island vessels and ferries are being ordered all over the country. An aspiring task, Cochin water metro project, is being done by Cochin Metro Rail Limited for simple traveler development consistently between metro rail, water and street in and around Cochin. At least 16 stations on the waterfront have been recognized. Through a global offering measure a request for twenty three 100 pax aluminum sailboat vessels have been requested on Cochin Shipyard Limited at Cochin. The vessels will have measurements 24.8m length, 6.4m broadness with 2.0m demi body width, 1.7m profundity with 0.9m draft having of 8 knots. Somewhat more modest 50 pax aluminum cataaran boats are on the iron block for obtainment.

2.5 Implementation Challenges

Execution of NW network is full of difficulties. The channel draft of the waterway isn't uniform at 2 meters, as is required. A portion of waterway are occasional and don't offer navigable all around the year. Around 20 out of the 111 recognized national waterways have apparently been found unviable. Further, every one of the recognized streams require serious capital and support digging, which could be opposed by the nearby local area on ecological grounds, including removal fears, in this way presenting execution challenges. Water likewise has significant contending utilizes, viz. need for living just as for water system, power age and so on It would not be workable for nearby government/others to neglect these requirements.

The selective ward of the GOI is just as to transportation and route on inland streams proclaimed to be 'public streams' by a demonstration of Parliament. Usage/cruising of vessels, in different streams, is inside the ambit of the simultaneous rundown or is in the purview of the particular state governments.

As each riverine framework is remarkable and presents different difficulties, separate examinations dependent on a definite miniature level survey to evaluate reasonability should be accomplished for each, prior to taking up execution. A successful streams organization would require drawing up a very much

planned system on lines of complementarity between the public organization and different streams, not proclaimed in that capacity, just as among streams and streets/railroads. The said methodology ought to intently investigate the different propensities, including contending utilizes/needs, conceivable nearby obstruction and furthermore work intently and as a team with neighborhood governments for fast and effective execution of this significant public venture.

As each riverine framework is remarkable and presents assorted difficulties, separate investigations based on an itemized miniature level survey to evaluate feasibility should be accomplished for each, previously taking up execution. A viable streams organization would require drawing up an all around composed methodology on lines of complementarity between the public organization what's more, different streams, not announced in that capacity, just as among streams and streets/rail routes. The said technique ought to intently investigate the different inclinations, counting contending utilizes/needs, conceivable nearby obstruction and furthermore work intently and in coordination with nearby governments for speedy and fruitful execution of this significant public venture.

One of the significant setbacks the country had was the absence of a shallow water test office. The Shipping Ministry has endorsed a significant exploration and test office at IIT Kharagpur by setting up a Center of Inland and Coastal Maritime Technology. This will have a testing tank office having measurements 112m x 16m x 4m as a substitution to the current exhausted testing office. The new tank will have an office for shallow water testing at any draft. This will have a CPMC carriage with x, y and ϕ movement capacity. This tank will likewise have a wave producer toward one side and a wave safeguard at the opposite end.

In India countless conventional wooden boats open on top work in the streams conveying travelers and payload and as fishing vessels in waterways, waterway mouths, lakes and close to seaside regions. These are not covered by any standards for wellbeing. So these vessels are perilous, yet additionally the add to neighborhood both as far as CO2 discharge and commotion. Of late there has been a ton of mindfulness concerning this and security rules for such boats might be made instantly. Cochin water metro boats will be driven by battery power. There is an enormous exertion to utilize batteries in any event, for exceptionally little powers and exertion is additionally on for enlarging such force with sun based energy.

2.6 Government initiatives to develop Inland waterways

JMVP focuses on expansion of route on National Waterway-1 (NW-1) The project is being carried out by the G.O.I. with the assistance of experts and is backed by the World Bank..

2. Sagarmala Project: Along with improving shipping channels, the initiative is attempting to enhance the industrial sector by utilizing inland rivers. It plans to lower logistics costs by increasing the domestic use of inland waterways.

3. Interlinking of Rivers Program: The task is required to offer likely advantages to the transportation sector through river route

2.7 Recommendations by NITI Aayog

Streamline governance- National Institution for Transforming India Aayog suggests smoothing out the administration and bringing an all-encompassing body to regulate Inland Water Transport like the Inland Waterway Authority of India to more consistency in the standards and methodology of the area.

Developing measures for navigation-

- Efforts made for deep river stretch.
- Proper maintenance of rivers with continuous dredging.

Easing of laws on river movement- Using a one vessel for both inland waterways and ocean, brings down transport costs. Consequently, by 2020, state specialists should draw up organizes for inland vessel limits under the Inland Vessel Act for their seaside waters.

Developing transport of inland waterways –

- By 2018, state governments ought to start work on dredging and channel to make around 20 new ports in the Brahmaputra and Barak waterways.
- The convention for Inland Waterways among Bangladesh and India ought to be stretched out for in any event 10 years to reduce uncertainity.

2.8 Developing Inland Waterways for reduction of constraints.

- Public-Private Partnership has the critical task to carry development of inland waterway area. Private players can take terminal and develop them, cargo dealing with, and constructing low-draft vessels.
- Steps taken to develop infrastructure, viewing technological congestion.
- Steps taken to guarantee accessibility of consistent, multimodal last-mile availability to and from hinterland to decrease trans-shipment cost and make inland water transport financially more suitable.
- cargo handling through waterways to be boosted. measures to take are
    - Government could boost enterprises nearby to ganga for shipping cargos
    - The authorities can advance modern hallways along rivers and encourage industrialization near rivers.
    - To collect high tolls on movement of coal for big routes.

Chapter 3

National Waterways of India

Transportation plays a significant part in the advancement of a country and is of incredible importance for a developing nation like India. The nation is given with plenty of assorted geology which empowers various types of transportation. India has 14500 kms of navigable waterways including rivers, backwaters, etc.

National Waterways Act became effective in 2016. It proposed 106 extra National Waterways. Subsequently, 106 new waterways were distinguished by IWAI and suggested to Ministry of Shipping. In such manner, the National Waterways Act, 2016 was printed in the Gazette of India, Extraordinary, Part II, Section I dated 26th March, 2016 as an Act No. 17 of 2016

In 1986, the Indian Government made the IWAI for guideline and improvement of Inland Waterways for transportation.

Out of the 111, National Waterways pronounced under the National Waterways Act, 2016, 13 are functioning for shipping

3.1 National Waterways 1

In 1986, the Ganga, Bhagirathi, and Hooghly river systems between Haldia and Prayagraj were designated as National Waterway-1 (NW-1). Since then, IWAI has been executing several formative deals with the waterways in order to improve their safety as well as the improvement and upkeep of other infrastructure. This waterway is India's longest inland channel. It begins at Haldia Port, Hoogly, and continues along the Ganga till it reaches prayagraj. The states of Jharkhand, Bihar West Bengal, and Uttar Pradesh are covered in this course.

3.1.1 Project Overview

- The project's hard and fast estimated cost is Rs 5,369.18 crore, which would be split evenly between the government of India and the World Bank. JMVP proposes to enhance the course of National Wwaterways-1 along the entire 1620-kilometer stretch. The Ganga - Bhagirathi - Hooghly stream system is the first of the national waterways. Various feeders in different regions keep National Waterways-1 afloat. The Gomti, Ghagra, Son, Gandak, Punpun, and Kosi are all important sources of the Ganga in

National Waterways-1 between Haldia and Allahabad. This project spans four states: Uttar Pradesh, Bihar, Jharkhand, and West Bengal. Going with intercessions has been planned and organised under the auspices of JMVP project.

- Proper dredging to give the necessary load in this channel and furthermore for different proposed terminal offices.
- Improvement in Navigation Infrastructure.
- Establishment of five Ro-Ro intersections.
- establishment of six terminals.
- Provision for bank assurance

fig. 2 Map of NW-1

Cargo to be shipped in National Waterways-1 incorporates cement, iron ore, coal, steel, tires, iron fines, and many more. As stated by the study traffic, present traffic moved through rail and street between Haldia and Varanasi is 12.14 mn ton. Traffic projection examines are completed what's more, as per the investigation,

For the year 2045, traffic will be extended 48 mn ton. Six terminals are suggested under National Waterways -1, with the design for three terminals already completed.

3.1.2 Cargo Movements

In 2013, the shipment of coal for the National Thermal Power Corporation was accepted through NW–1 from the Bay of Bengal to Farakka. JITF Limited exported roughly 1.60 lakh tonnes of imported coal by the middle of the financial year 2017-18, utilising vessels ranging from 1500 to 2000 tonnes. Furthermore, around 3 mn tons cargo including fly ash, general cargo moved through NW -1 and Trade Protocol Route between India and Bangladesh. Lately, unprecedented for India's set of experiences, a vessel was used for coordination's transportation on the NW-1 alongside Ganga. The Inland Waterway Authority India ship, Merchant Vessel Rabindranath Tagore, shipped 16 holders of food and came to Varanasi on 12-11-2018**.**

3.1.3 Tourism Development

Passenger vessels – Research Vessel Bengal Ganga, is utilizing on National waterys-1 in WB, Bihar, Jharkhand and UP. The upgrades of these vessels with outside visitors were kept in the middle of 2018-17, and they successfully completed their work excursions as planned. These vessels have completed 107 journeys between Kolkata and Farakka and 6 journeys between Kolkata and Patna. UP cm unveiled a five-star luxury Ganges cruise. The two-story, 2,000-square-foot luxury yacht is maintained by Nordic Cruise Line and can accommodate 125 passengers.

3.1.4 Infrastructure

Framework on National Waterways-1 JMV project include improvement of different parts for limit expansion of National Waterways-1. A portion of these segments are as of now arranged and being executed, some are at introductory phase of preparation and some are yet to be arranged.

Varanasi Terminal

A multimodal terminal is being created at Ramnagar, on Ganga in kashi UP. Space of 5.586 hactare has been gained for advancement of terminal by IWAI and is in control of Inland Waterway Authority of India. Recognized site is open farming area. Notwithstanding, no horticulture action is being done at site as of now. The proposed terminal undertaking site falls in Ramnagar tehsil of Varanasi, space of 1.415 hectare is to be

gained for development of access bar to interface terminal with National Highway-7, terminal land is farming land at present with land cover including crops, mango plantations.

The terminal will be connected to both the road and the railway. A village already connects the site; a one-kilometer road will be developed to connect the terminal site to the NH-7 and NH-2 highways. A rail route will be created to connect the network to the EDFC's terminal facility. Inside the terminal, a 12-meter-wide road will be built. The terminal will deal with around 0.54 MTPA in stage one. Coal, concrete, stone chips, compost, and food grains will be among the material to be handled with.

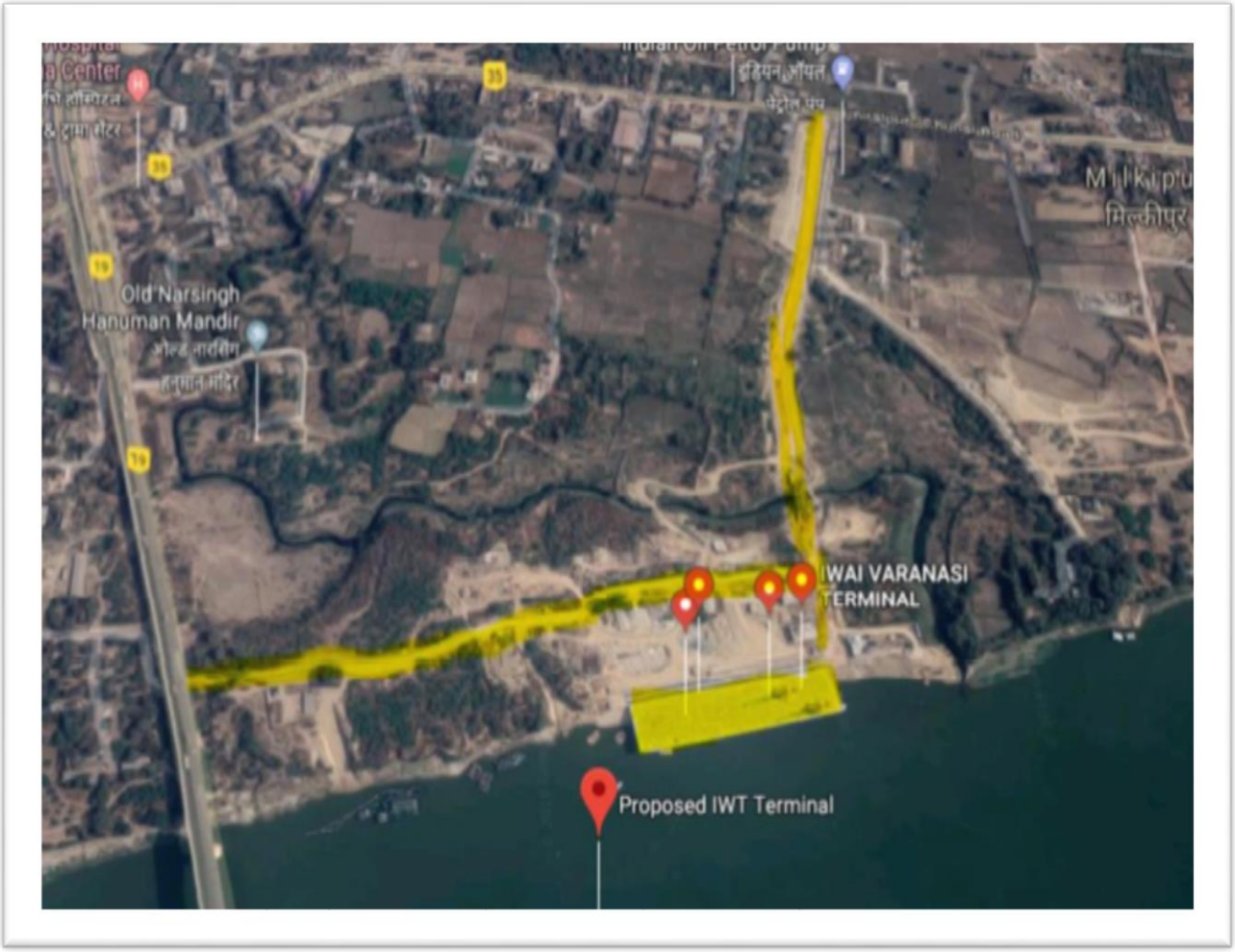


Fig.3 Varanasi Terminal

Proposed Facilities

- 2 cranes for stacking and unstacking
- 2 berths
- Water supply system
- Differential Global Positioning System
- Passenger jetty
- Tank storage

Sahibganj Terminal

It is proposed that the Sahibganj terminal be converted into a multimodal terminal office. The terminal area is currently a farming region with cereals, mango plantations, and a few settlements. The site is quite hilly, with a ground level difference of 30-56 metres. An huge amount of effort is being put into levelling the surface. A total of 14.25 lakh cubic metres of dirt would be dug, with 2.1 square metres being re-used for recording. A total of 12.1 M cubic metre of residual soil will be repurposed for roadway and railroad construction. The completed elevation of the site after cut and fill will be 37 metres above sea level, which is higher than the most notable flood.

This terminal will be connected to the remainder of the city's road and rail networks, according to the plans. At this time, the site is not connected to any road. The Public Welfare Department will construct a one-kilometer road to connect the terminal to NH-80. Rail lines will be used to connect the terminal site to Sakrigali rail station, forming a rail network. Inside the terminal, a road with a width of 12 metres and a total length of 3.6 kilometres will be built to facilitate development.

The terminal in stage 1 should be able to withstand roughly 2.24 mmtpa. Coal, food grains, sugar, and other materials will be handled with. Both inland and seaward offices are expected to be built at the terminal location. Stage 1 inland offices include stockyards for coal (6 reserves), stone chips (8 stores), and 1 covered shed; stacking areas, Administration Building, Workers Amenity Building, Lighting Towers, and other

related facilities such as sewerage, fire station, and water supply, Green belt (15-20mt), Railway Connectivity with arrangement of Railway over bridge, first stage facility includes 2 berths Coal berths and other cargo berths were suggested during the first stage 2 berths.

Fig. 4 Shahibganj terminal

Farakka lock

A navigational lock is a device that is used to raise and lower ships between different levels of water on a stream. The current lock door, which has been in use since 1978, is outdated and inefficient. Because modernising the current lock will require shutting down the lock door for up to 8-10 months, a new lock on the Feeder Canal of the Farakka Barrage adjacent to the current lock at Farakka in Murshidabad, West Bengal, is suggested. The new lock will be located further west than the current lock and will have a right slope toward the current lock's left bank. The site is located in the West Bengal town of Goraipada, near the village of Bewa, in the district of Farakka. The Ganga River flows about 1.2 kilometres east of the planned lock door location. A vessel passing upstream or downstream takes roughly 2 hours or more with the existing

lock. A vessel will be able to pass through the new lock in approximately 38 minutes. If one vessel follows another in the opposite direction, the working time will be 23 minutes.

The enterprise would be established on 14.86 hectares of FBP-owned land. The lock door location is connected by road and rail. Because this road passes through the site, it will be rerouted to the proposed lock door site's western limit. This route is connected to National Highway-80 and is located about 1.6 kilometres west of the proposed Lock entrance site.

The new lock, like the current lock, will facilitate the movement of vessels from the Ganga upstream to the Bhagirathi-Hooghly downstream via a feeder waterway, thereby addressing the significant difference in water levels between the principal Ganga and the feeder channel. The water level in the River Ganga and the feeder trench changes with the flow of the river. The new length and width of the lock are 179 mt and 25.14 mt, respectively, and it can take four 85 mt * 12 mt (L*W) vessels.

Fig. 5 Farakka lock

Future Projects

The construction of the Tribeni terminal is in the works. Arranging is in its early stages, and location selection and conclusion are now underway. For the terminal's development, two options are being studied. The first location is in Tribeni, on the left side of the Hoogly, upstream of the Road Bridge on State Highway-6. The site is heavily linked to highways and rail lines. The nearest train station is Kalyani Samanta. This facility has around 40 hectares of horticultural land designated for terminal advancement. Another location for the terminal is being considered. The site is on the right bank of the river, downstream of the State Highway-6 road connection. This location is near to a densely inhabited area.

Fig. 6 Tribeni terminal

3.2 National Waterways 2

Brahma implies the "Divine force of creation" according to Hindu myths and "putra" alludes to child, so Brahmaputra implies the child of God. It is the solitary stream in India having a male name. The waterway is around 2,900 km long and is considered as perhaps the longest stream on earth. The stream starts in the "Angsi iceberg" of the Himalayas in China and moves through the North East Indian province of Assam to get together with the Ganges and Meghna waterways in Bangladesh prior to exhausting into the Bay of Bengal. Brahmaputra is known by various names during its excursion. It starts as Yarlung Tsangpo in Tibet and becomes River Brahmaputra and Mahabahu Brahmaputra in India lastly comes full circle into being the Jamuna in Bangladesh.

IWAI is answerable for keeping up River Brahmaputra's navigational with the necessary draft. The waterway conveys around 735 mmt of suspended dregs stacks yearly consequently constant dredging is needed to keep the channel safe. The base stream width is around 45 m across NW-2. In request to work with consistent travel during the day and night, Inalnd Waterway Authority of India is chipping away at giving important navigational guides. It has set up terminal offices for stacking and dumping at vital areas like Dhubri, Pandu, and impermanent offices at Jogighopa, Silghat, Neamati and Dibrugarh. Pandu (Guwahati) is being created as a multi modular vehicle center which can serve the whole North East area. A lasting terminal at Dhubri, developed with a surmised cost of Rs. 46 Cr is completely operational at this point. The current Inland Water Transport (IWT) terminal at Jogighopa is proposed to be moved up to a mass load taking care of terminal for items like Meghalaya coal, with rail availability up to the terminal.

he potential freight developments through National Waterway 2 compromise coal from Meghalaya, fly ash from Farakka to different places in the North east, oil based commodities from Numaligarh treatment facility, food grains from Kolkata, manures, building material and bamboo. The other significant freight could be project payload and apparatuses which will emerge from the eager force projects expected on different feeders of the stream Brahmaputra, especially in Arunachal Pradesh.

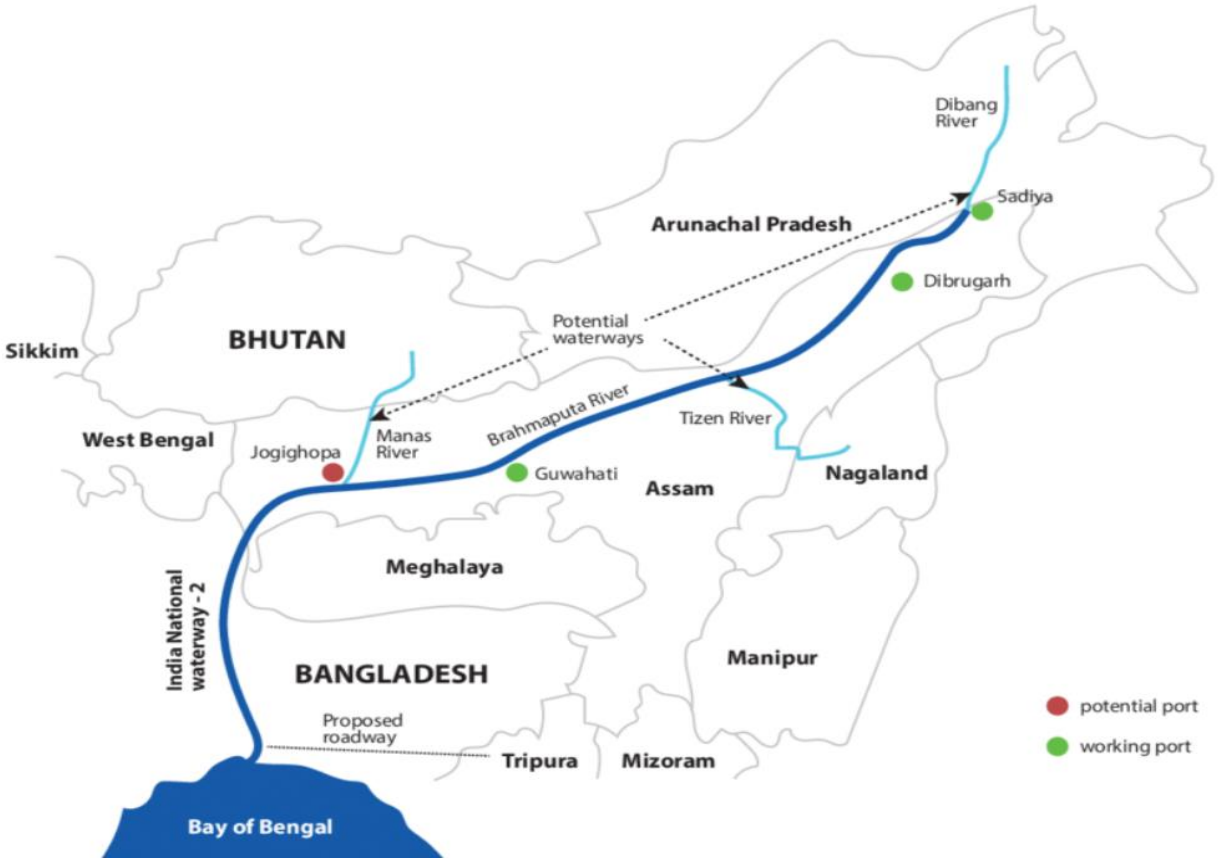


Fig. 7 Map of NW-2

The tourism industry is another key potential region which can immensely add to the economy of the north eastern states. The presence of sancturies at Kaziranga and Orang and spots like Sualkuchi, Sivsagar and Kamalabari along the River Brahmaputra draws in considerable sightseers. The travel industry possibilities of this area can prompt comprehensive turn of events and financial freedoms as it depends intensely on neighborhood common assets, culture, food and craftsmanship. Whenever used successfully it can possibly interface the Bangladesh, Bhutan, India and Nepal which can bring by and large financial thriving for the area.

NW-2 Advantages

- This is the first container cargo transfer on this IWT route
- The goal of this current cargo movement is to help the NorthEast industrial growth by providing an alternate route for the delivery of cargo.
- This 1425-kilometer journey is expected to demonstrate the technical and commercial viability of the Inland Waterways Transportation mode on rivers.

What is the IBP (India-Bangladesh Protocol)?

• The Inland Water Transport and Trade Protocol (IBP was signed by India and Bangladesh. It allowed vessel from india to bangladesh.

• Kolkata-Pandu-Kolkata, Rajshahi-Dhulian-Rajshahi, Pandu-Karimganj-Pandu, and Kolkata-Karimganj-Kolkata are the existing protocol routes between India and Bangladesh. Aside from the aforementioned, India and Bangladesh have recently taken significant steps to increase the use of waterways.

• Both countries have inked an agreement to make it easier to move products from India through Bangladesh's Chittagong and Mongla ports.

3.3 National Waterways 3

The West Coast Canal, also known as NW 3, is a 168-kilometer inland navigational channel that extends from Kollam to Kottapuram in Kerala, India. It was designated as a National Waterway in 1993. The Champakara and Udyogmandal canals, in addition to the main stretch, are navigable and connect Kochi's industrial centres to the port. IWAI, which is part of the Ministry of Shipping, is in charge of developing, monitoring, and administering national waterways. It is the country's first National Waterway with 24-hour navigation amenities along its full length. According to the National Waterways Bill of 2015, it has been expanded to Kozhikode.

History

Kerala has long relied heavily on waterways as a mode of transportation. In Kerala, the total length of navigable routes was 1,900 kilometres, with navigable rivers accounting for around 54% of the waterways. Kerala's inland navigation system includes the 41 west-flowing rivers as well as the backwaters. Inland waterways of the state, such as the West Coast Canal, flow through densely inhabited areas. Traditional businesses like as coir, cashew, brick-making, and fishing employed the bulk of persons who lived in the area. Any attempt to develop the IW will have a positive impact on these people's well-being.

The Kochi Edapallikota (120 km) portion of the main West Coast Canal between Kollam and Kottapuram was opened for freight transport in November 1994 as a result of IWAI upgrade work. The first phase of capital dredging for the widening and deepening of the canal between Kochi and Kollam began in 1997-98. The second phase of capital dredging on the Kochi – Kottapuram line began in September 2002. Dredging in the Kochi-Allapuzha sector has been finished, and dredging in the Kochi-Kottapuram sector (30 km) has been completed except for 4.83 km. However, it was delayed in the remaining reaches due to a variety of concerns including dredging waste disposal, fishing nets, and local concerns leading to some issues.

Terminals

Terminals have already been built in seven locations: Kottapuram, Aluva, Maradu, Viakom, Thaneermukam , Trikkunnapuzha, and Kayamkulam. Under the PDO system, the PDO was tasked with developing a PPP project for the operation and maintenance of these terminals. The PDO had conducted a field tour and gathered pertinent data, and they were currently drafting the project. The CPWD was also working on the construction of the 8th terminal at Kollam. Eight mobile cranes and eight fork lifts were acquired and provided at each terminal to offer mechanical handling facilities.

Fig. 8 Map National waterway 3 terminals

Navigable Fairway

In NW-3, a navigational channel with a width of 38 metres in larger portions and 32 metres in narrower reaches and a depth of 2 metres will be built. Dredging with a total cost of $40 million over an 87-kilometer length was planned to build the navigation channel with the specified proportions. Inland Waterways Authority of India had completed over 36 lakh cubic metres of dredging over an 80-kilometer shoal length as of July 2014. Though the targeted depth of two metres has been achieved throughout the National Waterway-3, the navigation channel must still be widening to the required width of 32 metres over a distance of two kilometres in Alapuzha (Karuvatta and Mullackal villages), 1.50 kilometres in Kayamkulam Kayal, and 2.75 kilometres near Chavara. The remaining shoals, totaling roughly 6 kilometres, are located in

Alappuzha/Kuttanad (2 kilometres), Kayamkulam Kayal region (1.5 kilometres) in Alappuzha District, and Chavara (3.5 kilometres) in Kollam District, where work is currently underway.

The development of National waterway 3 is expected to be finished by December 2014, pending local community cooperation and the removal of leftover fishing nets from the waterway.

National waterways 4

Phase-I of NW-4 development work has been begun at a cost of Rs 96 crore.

In 2008, the Kakinada-Puducherry canals and the Kaluvelly tank, the Bhadrachalam-Rajahmundry section of river Godavari, and the Wazirabad-Vijayawada section of river Krishna were designated as National Waterway-4 (NW-4) with a total length of 1,078 km. Under the National Waterways Act, 2016, the stretch was extended up to Nashik in the case of the Godavari and up to Galagali in the case of the Krishna in the states of Andhra Pradesh, Karnataka, Maharashtra, Tamil Nadu, and Puducherry. The length of NW-4 is 2890 kilometres, and it will be built in three stages:

stage 1: The Krishna River from Vijayawada to Muktyala.

After stage 1, stage II will go from Kakinada to Vijayawada and Rajahmundry to Polavaram.

stage 3: After stage3 and 2 the remaining lengths of National Waterways-4 are completed.

The development of stage 1of National Waterway-4, which will cost Rs 96 cr, has already begun. The following is the current status of work on the development of the fairway and terminals:

- Dredging is now underway from Vijayawada to Muktyala , with completion anticipated for october 2021.
- Establishment of 4 floating terminals at DurgaGhat, Bhavani Island, Amravati, and Vedadri is expected to be finished by March 2019.
- Ibrahimpatnam, Harischandrapuram, and Muktyala Fixed Terminals - Land acquisition for the terminals is underway in consultation with the Andhra Pradesh government.

On the same lines as Dhubri and Hatsingimari, Ro-Ro services between Ibrahimpatnam and Lingayapalam for transportation of construction materials on NW-4 (river Krishna) are already in operation.

National waterway 5

National Waterways-5 encompasses the East Coast Canal, as well as the Brahmani and Mahanadi delta river systems. It includes the canal between Geonkhali and Charbatia (217 km), a section of the Matai River between Charbatia and Dhamra (40 km), a section of the Brahmani, Kharsua, and Dhamra river system between Talcher and Dhamra (265 km), and the Mahanadi delta river system between Mangalgadi and Paradeep (101 km). NW-5 has a total length of 623 kilometres.

IWAI has published River Navigational Charts for the three National Waterways NW-1, NW-2, and NW-3, which are available, in compliance with Section 14(2) of the Inland Waterways Authority of India Act, 1985 (82 of 1985). After that, the maps for NW-4 and NW-5 will be accessible after the nod by government of india.

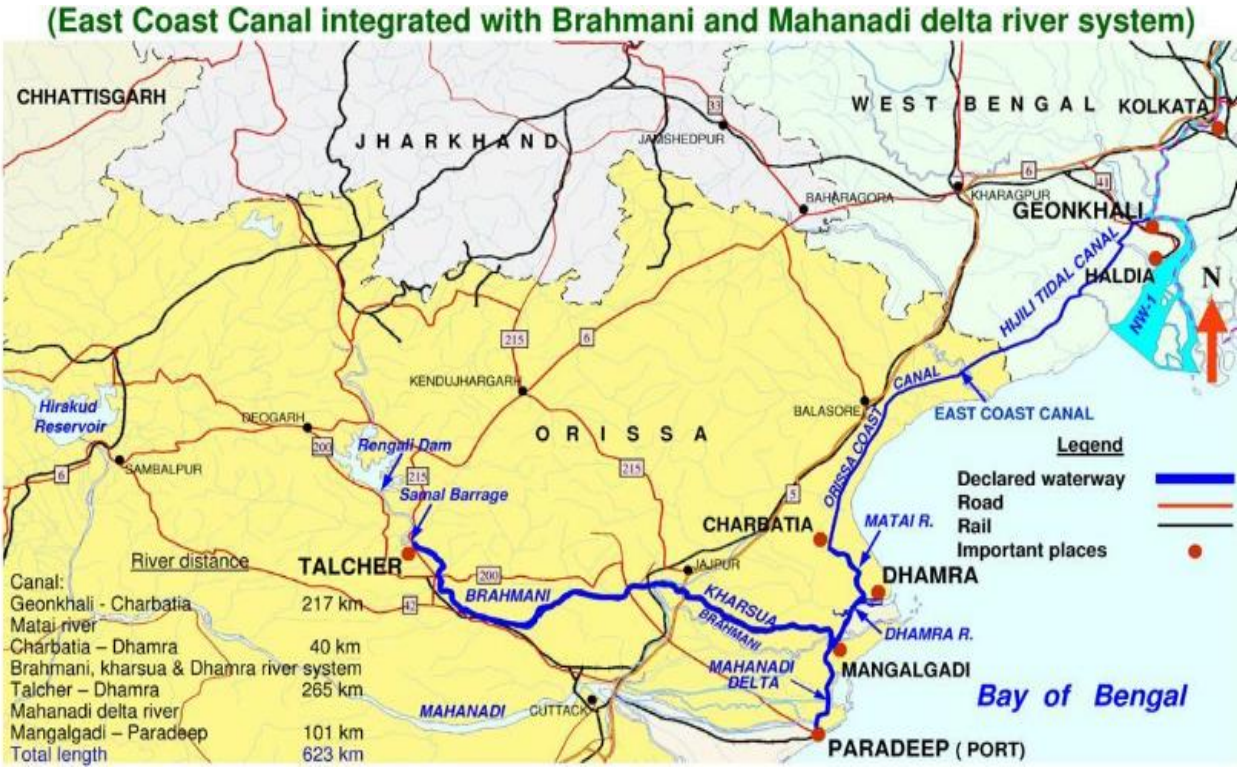


Fig. 9 Map of National waterway 5

Cargo Handling

The most major prospective cargo for this waterway is coal from Talcher to Dhamra and Paradip ports. According to the DPR, approximately 11 million tonne of cargo may be transported each year immediately after the building of the waterway, with the potential to increase to 23 million tonne in the next 15 years or so.

Stage 1

The 120-kilometer-long Detailed Hydrographic Survey (Phase-II) from Talcher to Pankapal is scheduled to be completed in October 2020.Monthly Thalweg Survey (Phase–I) from Pankapal to Dhamra - Paradip through Mangalgadi: 230 LKM every month — Monthly Thalweg Survey completed and LAD report provided on a monthly basis. Consultancy for DPR preparation, including FEED for construction of four weirs and barrages with three navigation locks, two check dams, and one rubber dam with navigation lock (Phase-I) — The DPR is expected to be completed in March 2021.Consultancy for DER incorporating DEDD for Modification/Reconstruction of Existing Bridges on NW-5 (Phase-I) – The DPR should be completed by March 2021.

National waterways 6

In the North Eastern Region, the Barak River is the second largest river. It originates in Nagaland, on the Nagaland-Manipur border, south of Kohima. It splits into two streams at Bhanga, Surma and Kushiyara, after passing through Nagaland, Manipur, and Assam. The river Meghna is named after the confluence of these two streams in Bangladesh's Markuli. The Barak-Meghna river system is 900 kilometres long . 524 kilometres are in India, 31 kilometres are on the Indo-Bangladesh border, and the remainder is in Bangladesh. 403 kilometres u/s of Lakhipur is in steep terrain and is not navigable out of 524 kilometres India.

Chapter 4

Comparative Analysis

4.1 Transportation modes

If we categorize all freight development in India by various modes of transportation, we will discover that the majority of freight movement is completed by the road(60 percent), which includes state and national highways, followed by railways (32 percent), and is the second most widely used mode after street, and finally by Coastal (6.6 percent) (0.4 percent). In the long term, the goal of this "JMVP" is to produce an offer of inland payload development because this mode is less expensive, more secure, environmentally friendly, and advantageous than other modes of transport.

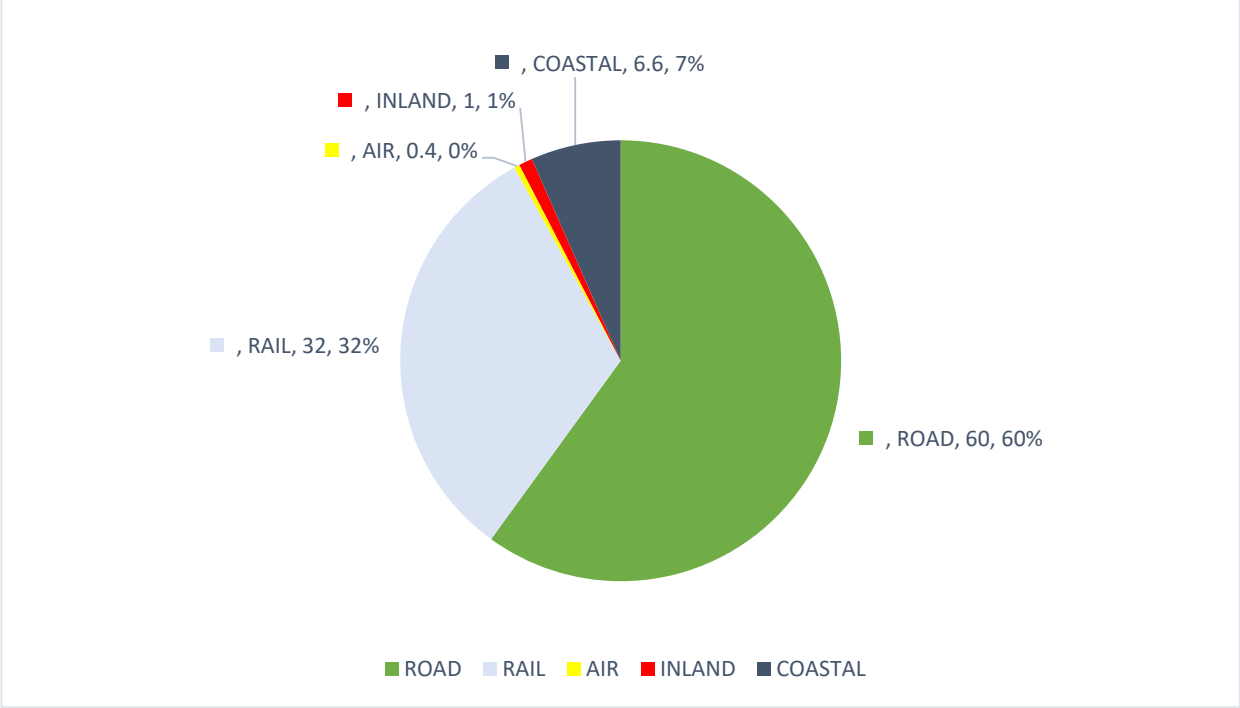


Fig. 10 Share of Cargo Modes

Cargo share by modes of transportation

The above charts show the movement of cargo by different modes of transportation.

4.2 NAVIGATED WATERWAYS AND INFRASTRUCTURE

Waterway length, as well as their length of navigable, is a measure of a state's inland water potential. Uttar Pradesh has the longest waterways, with 6444 kilometres, followed by Bengal with 4741 kilometres and it is followed by Assam with 4267 kilometres.

Total and Navigable Length of Waterways in different States – 2020 (In kms)				
S. No.	**State**	**Total Length- Rivers- Canals/ Lakes in State (Km.)**	**Navigable Length (Km.)**	**Percentage of Navigable Length to Total Length**
1	Andhra Pradesh	3762	1160	30.83
2	Assam	4267	1938	45.42
3	Bihar	3763	1391	36.97
4	Goa	274	249	90.88
5	Karnataka	2902	1215	41.87
6	Kerala	3553.46	1967.25	55.36
7	Maharashtra	631	462	73.22
8	Orissa	1378	1555	-
9	Nagaland	-	276	-
10	Mizoram	790	155	19.62
11	Tamil Nadu	197	26	6.09
12	Uttar Pradesh +	6444	425	6.59
13	West Bengal	4741	4593	96.88
	Total	**32702.46**	**15412.25**	**47.13**

Length of navigable waterways

4.3 Movement of Cargo on Key Waterway

The overall traffic of cargo on waterway, which includes the 3 national waterways as well as waterways in the states of Maharashtra, Gujarat and Goa, was 690.94 lakh ton in 2017-2018, up 17.53 percent from 2016-2017. In terms of tonnage, Maharashtra, Gujarat and Goa accounted for, 54.9 percent, 16.7 percent and 16.1 percent of total in 2017-2018, with the remaining 12.3 percent accounted for by the three national waterways.

The average distance travelled by cargo on Indian Waterways is 62 kilometres (ton/ kilometers). Though Gujrat, Goa, and maharashtra waterways accounts 87.7 percent of overall freight traffic on India's inland waterway, their proportion of ton kms was only 33.4 percent. The significant volume of cargo transportation

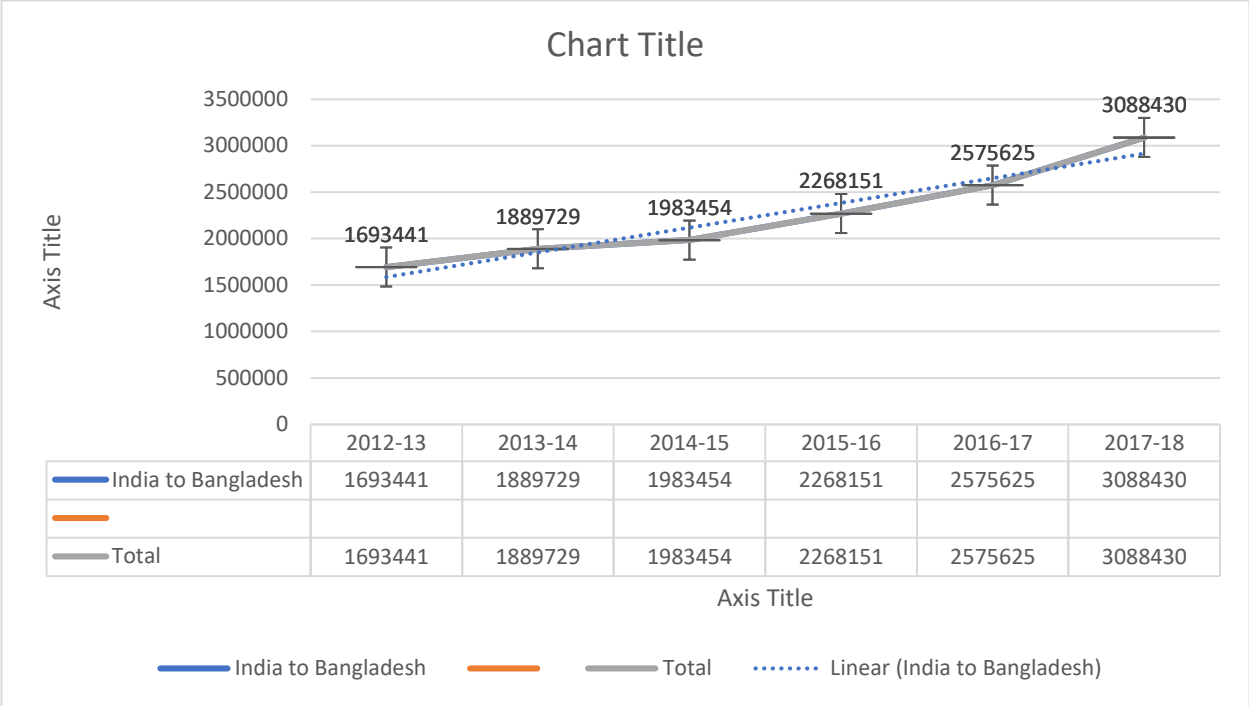
in Maharashtra & Goa was handled over relatively small average distances of roughly 50 km and 18.1 km, respectively, resulting in their heavy utilization.

S. No.	Details of Waterway	Cargo Moved (lakh tonnes)			Tonne Kms (in lakh)		
		2015	2016	2017	2015	2016	2017
1	National Waterway No. I	62.37 (14.3)	45.05 (7.7)	54.79 (7.9)	26995 (78.0)	24598 (62.2)	27773 (65.3)
2	National Waterway No. II	25.84 (5.9)	25.91 (4.4)	26.01 (3.8)	505 (1.5)	503 (1.3)	504.36 (1.2)
3	National Waterway No. III	10.61 (2.4)	10.33 (1.8)	4.28 (0.6)	105 (0.3)	109 (0.3)	81.14 (0.2)
	Sub Total NWs	98.82 (22.6)	81.29 (13.8)	85.08 (12.3)	27605 (79.8)	25210 (63.8)	28358.5 (66.6)
4	Goa Waterways	49.75 (11.4)	157.68 (26.8)	111.62 (16.1)	1987 (5.7)	7884 (19.9)	5581.06 (13.1)
5	Maharashtra Waterways	288.49 (66.0)	348.90 (59.4)	379.04 (54.9)	5005 (14.5)	6428 (16.3)	6882 (16.2)
6	Gujarat Waterways (from October 2017)	-	-	115.2 (16.7)	-	-	1728 (4.1)
	Grand Total	**437.06 (100.0)**	**587.87 (100.0)**	**690.94 (100.0)**	**34597 (100.0)**	**39522 (100.0)**	**42549.56 (100.0)**

Movement of cargo

4.4 Cargo movement at Indo-bangla route

Cargo movement along the Indo-Bangla route of NW-1 by Indian-registered vessels increased by 19.9 percentage in 2017-18 . In 2017-18, the freight handled through this route grew to 3.08 mn ton, up from 2.57 mn ton in 2016-17.



freight movement along indo-bangla route

The cargo and key commodities moved on the India-Bangladesh route are shown in the table.

Cargo Movement (in million Ton) on India- Bangladesh route							
Route	**2012-13**	**2013-14**	**2014-15**	**2015-16**	**2016-17**	**2017-18**	**Commodities**
India to Bangladesh	1.69	1.88	1.98	2.26	2.57	3.08	Dolomite Powder, Cement, Cement Clinker, POL, Wheat, Coal, HSD
Total	**1.69**	**1.88**	**1.98**	**2.26**	**2.57**	**3.08**	

Inland Waterways Transport acts under the Government of State.

Table below shows the deployment of vessels and the volume of cargo transported on inland waterways in the States and Union Territories

Number of Inland Water Vessels and Cargo Carried – State wise								
State/UT	**Number of Vessels**				**Volume of Cargo Carried in (000 ton)**			
	2014-15	**2015-16**	**2016-17**	**2017-18**	**2014-15**	**2015-16**	**2016-17**	**2017-18**
Assam	182	182	187	191	178.73	178.73	3871.07	706066.16
Bihar	138	138	138	138*	2.40	2.40	2.40	2.40*
Goa	225	159	311	266	190.01	429966.0	116600.8	71902.10
Karnataka	66	66	66	66	50.50	50.5	29.98	93.27
Kerala	13819	13819	5556	7656	2912.06	2912.06	326.64	447.98
Maharashtra	743	678	384	1166	27357	28849	34890	37904.70
Orissa	409	199	557	635	…	…	…	…
West Bengal	2032	2106	2155	2216	14728	16730	22654	36719
Tamil Nadu	2	2	2	2	…	…	…	…
TOTAL (reporting states)	**17616**	**17349**	**9356**	**12336**	**45418.70**	**478688.7**	**178374.9**	**853135.61**

In the 2017-18 fiscal year, the total number of vessels in the States was 12336, up from 9356 in the previous year, with kerala having most numbers of vessels.

Engagement of companies in inland waterways

According to data collected from 49 Inland Waterways Transportation businesses, West Bengal has 120 vessels, followed by Sesa Sterlite Ltd with 32. Vedanta Ltd. (Sesa Sterlite Ltd, Goa) carried the most cargo at 4638.64 thousand tonnes, followed by Indo Energy International Ltd. (1041.96 000 ton), VIVADA Inland Waterways Ltd, Kolkata (695.26 000 ton), D. V. Salgaocar, Goa (612 000ton), and S. V. Salgaocar, Goa (612 000ton) (597.60 000ton).

Cargo transported by the 15 private firms.

Companies name	Vessel	Cargo moved (000 ton)
1. Vedanta Limited	32	4638.64
2. Indo Energy International Ltd.	11	1041.96
3. VIVADA Inland Waterways Ltd, Kolkata	16	695.26
4. D. V. Salgaocar, Goa	3	612.00
5. S. V. Salgaocar, Goa	3	597.60
6. Eastern Navigation Pvt. Ltd, Kolkata	30	556.34
7. Jindal ITF Ltd.	28	425.27
8. V.M. Salgaocar Sales International	2	386.40
9. Kerala Shipping & Inland Navigation Co. Ltd.	3	200.66
10. Infrastructure Logistics Pvt. Ltd.	4	199.52
11. Maharshi Shipping	5	184.56
12. Sesa Resources Ltd Goa	2	183.96
13. Lots Shipping Ltd.	4	175.27
14. Timblo Pvt. Ltd.	5	151.20
15. Sohom Shipping Private Ltd.	4	124.21

Budget

In 2016-17, the budget estimate was Rs. 325 crore. The spending for the same year was Rs. 542.04 crore, which includes Rs. 340 cr spent from the Extra Budgetary Resources fund. During the 2017-18 fiscal year, the budget estimate was Rs. 195 crore. The spending for the same year was Rs. 636.59 crore, which includes Rs. 660 crore in expenditure from money raised from Extra Budgetary Resources.

Sl. No.	Budget head/ Waterways	Financial Year (2014-15)			Financial Year (2015-16)			Financial Year (2016-17)			Financial Year (2017-18)		
		B.E	R.E	Exp.	B.E	R.E	Exp.	B.E	R.E	Exp.	B.E	R.E	Exp.
I	**Grants to IWAI**												
1	National Waterway 1	77.29	64.2	64.01			47.89	50.58	50.58	112.94*	54.77	54.77	54.77
2	National Waterway 3	17.85	10.66	10.66			8.32	10.38	10.38	8.33	28.83	29.10	29.09
3	Others **	85.96	3.36	3.36			153.65	189.04	142.04	346.10*	18.4	54.79	85.23
	Sub Total - I (Grants to IWAI)	**181.10**	**78.22**	**78.03**	**205.00**	**216.72**	**209.86**	**250.00**	**203.00**	**467.37***	**102.00**	**138.66**	**169.09**
4	Jal Marg Vikas Project (JMVP)											75.00	348.53

	Sub Total - II (Grants to IWAI including JMVP)	**181.10**	**78.22**	**78.03**	**205.00**	**216.72**	**209.86**	**250.00**	**203.00**	**467.37***	**102.00**	**213.66**	*** 517.62**
II	**North Eastern Area**												
4	National Waterway 2	78.10	37.61	36.02	90.08	77.80	79.39	75.00	93.30	74.67	93.00	109.15	118.97
5	Central Plan scheme for NER	3.20	1.07	1.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	Proposed NW-16 (Barak) ***	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	Development of Indo- Bangladesh protocol for Channel marking, Dredging & Night Navigation etc.	2.60	1.32	1.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Sub total - II (NER)	**84.90**	**40.00**	**38.41**	**90.08**	**77.80**	**79.39**	**75.00**	**93.30**	**74.67**	**93.00**	**109.15**	**118.97**
III	**Interest Subsidy** to Bank, Loan to IWT Enterprenuer for Inland Vessel Subsidy Scheme	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IV	**Tech Studies & R&D**	1.00	0.77	0.77	1.00	1.00	0.99	0.00	0.00	0.00	0.00	0.00	0.00
V	**Central Plan Scheme/ CSS**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Grand Total	**267.00**	**118.99**	**117.21**	**296.08**	**295.52**	**290.24**	**325.00**	**296.30**	**542.04**	**195.00**	**322.81**	**636.59**

Financial outlay of IWAI

Inland Waterways in other Countries

In 2016, the United States had the longest navigable inland waterways in Europe and North America, with 40000 kilometres, followed by Finland with 8,136 kilometres, Germany with 7,675 kilometres, the Netherlands with 6,256 kilometres, France with 4,773 kilometres, and Kazakhstan with 4,151 kilometres. However, the Netherlands had the highest volume of goods carried, with 262 million tonnes, followed by Germany with 221 million tonnes, and Belgium with 192 million tonnes.

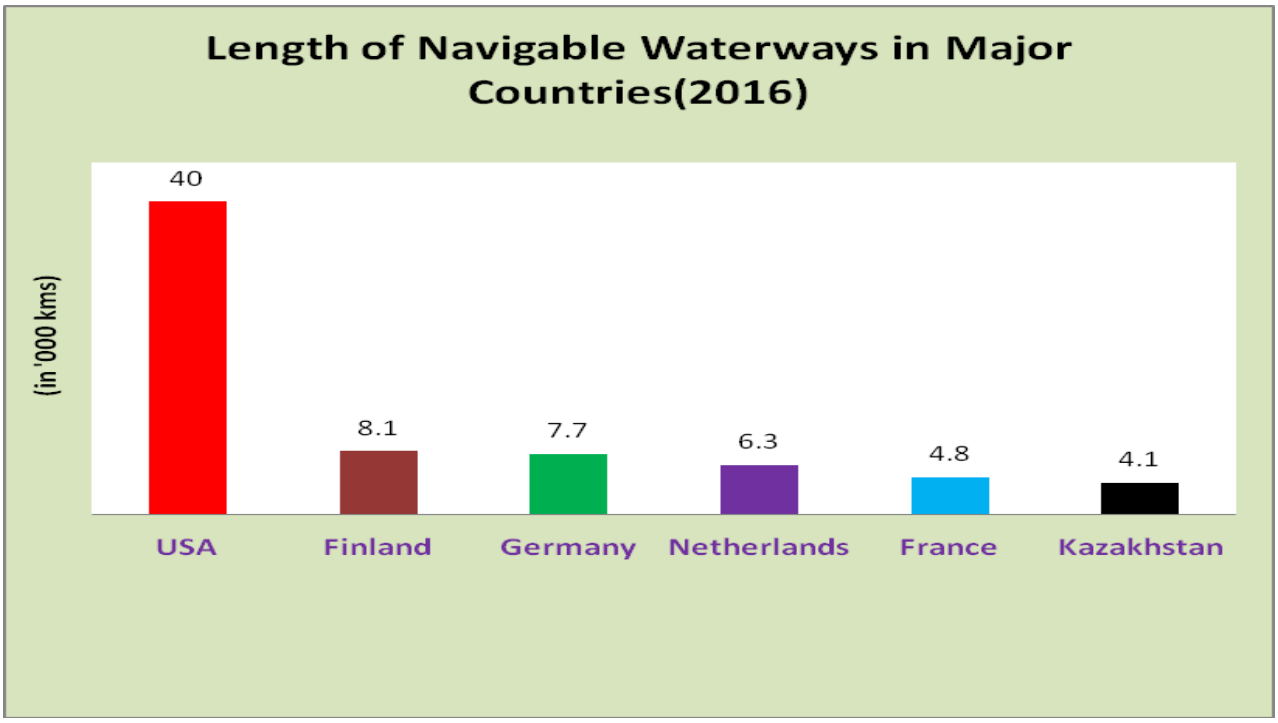


Fig. 11 Navigable length in major countries

Sl. No.	Country	Canals			Rivers and Lakes			Total		
		2014	2015	2016	2014	2015	2016	2014	2015	2016
1	2	3	4	5	6	7	8	9	10	11
1	Austria	_	_	_	351	351	351	351	351	351
2	Bulgaria	_	_	_	470	470	470	470	470	470
3	Belarus	250	250	250	712	733	730	962	983	980
4	Croatia	_	_	_	1017	1017	1017	1017	1017	1017
5	Czechia	39	39	39	648	682	682	687	721	721
6	Estonia	_	_	_	_	_	_	0	0	0
7	Finland	125	125	125	7927	8002	8011	8052	8127	8136
8	France	2775	3136	2798	1943	1686	1975	4718	4822	4773
9	Germany	2000	2027	2027	5675	5648	5648	7675	7675	7675
10	Hungary	173	173	173	1691	1691	1691	1864	1864	1864

11	Italy	950	950	950	612	612	612	1562	1562	1562
12	Kazakhstan	772	772	772	3379	3379	3379	4151	4151	4151
13	Lithuania	1	1	1	451	445	484	452	446	485
14	Netherlands	3510	3510	3497	2741	2751	2759	6251	6261	6256
15	Poland	336	336	336	3319	3319	3319	3655	3655	3655
16	Republic of Moldov	_	_	_	42	42	-	42	42	0
17	Romania	132	132	-	1647	1647	-	1779	1779	0
18	Russian Federation	-	_	_	101668	101662	-	101668	101662	0
19	Serbia	522	522	-	1071	1071	-	1593	1593	0
20	Slovakia	39	39	39	134	134	134	173	173	173
21	Ukraine	1105	1055	1061	508	508	508	1613	1563	1569
22	United Kingdom	159	159	159	891	891	891	1050	1050	1050
23	United States	-	-	-	-	-	-	40000	40000	40000

Chapter 5

Conclusion

5.1 Challenges

Maintaining the minimum depth and permanent channel for navigation in the Ganga and Brahmaputra rivers is one of the authority's principal challenges. Heavy silt in rivers needs river training methods like as dredging, however tish do not provide a long-term solution despite the additional expenditures. The current debate does not place enough emphasis on storage buildings, which are essential for maintaining LAD during lean seasons.

Other modes of transportation, particularly road and rail, compete with the water transportation system. Water transportation would become more appealing if its competitiveness was improved by infrastructure development and night navigation assistance. The construction of a night navigation system in the Brahmaputra is problematic due to the river's tremendous current. Night navigation facilities are currently available up to Silghat. The yacht sails for 14 to 15 hours every day on average. Given that vessel speeds are limited to 30 kilometres per hour, night navigation is essential for saving time and making transportation economically viable.

A major difficulty is the low amount of trade, which calls into question the extent of infrastructure investments. Inland water transport has failed to entice the private sector in terms of its potential to improve trade competitiveness at lower costs, as seen by the sector's lukewarm enthusiasm.

Another obstacle is the regulatory gap between the federal government's national inland waterway acts and state governments' administrative obligations and governing frameworks. Uniform or model norms for inland waterways navigation administration are urgently needed in this context.

Despite the potential for local transit and trade in different areas throughout Bihar and UP, neither state has a designated inland water transport department. Separate agencies would have resulted in proper enforcement of different functions such as boat registration, ferry services, and tax collection, which would have increased state revenue and benefited local residents.

Fig. 12 Key challenges

5.2 Finding

- The Indian Inland Waterways System has approximately 14,500 km of navigable waterways that are well connected with modes of transportation such as roadways and railways.
- The Indian government, as well as government of state, are taking steps to enhance India's trade through inland waterways, which will benefit both macro and micro industries
- The S.C.I. does not have enough vessels to operate on India's inland waterways.
- Among other means of transportation, it has the least environmental impact.
- In comparison to road and rail modes of transportation, this mode of transportation will be the most cost-effective.

5.3 Key Issues

- **A greater emphasis on quicker modes**

Traditional routes of transportation, such as trains and roads, have always gotten more attention from policymakers than waterways. The lack of a policy vision for the segment's development continues to be a source of concern. The situation is steadily shifting.

- **Commitment**

There is currently a scarcity of long-term cargo commitment from potential users. This has an influence on predicted volume and gives vessel operators a negative future.

- **Skilled Manpower Shortage**

There is a shortage of competent labour as well as a lack of technical knowledge base.

- **Concerns about the environment**

The environmental side of the construction of national waterways has gotten a lot of flack from a lot of people. Other major concerns include the danger to aquatic life and seasonal patterns of river flows.

5.4 Opportunity

- IWAI has teamed up with DST, a German organization, to construct vessels that might be used to ferry people down the Ganga. Bulk cargo ships, barges, container ships, and car carriers are among the 13 ship classes designed specifically for the river by the business
- Inland Waterways Authority of India is in the process of purchasing 25 boats, including bulk, break bulk, container vessels, ro-ro, oil tankers, and a push tug fleet, among others. On the waterways, about ten to twelve vessels/barges are already moving. Instead of owning 100 trucks, which cost around 50-60 million each, logistics service providers can invest in one vessel with a capacity of 1,500-2,000 ton, which costs around Rs.98-110 mn.
- Inland Waterways Authority of India is developing fuel bunkering facilities for ships using methanol at intervals of around 500 kilometres along the 1,600-kilometer Haldia-Varanasi route.
- IWAI has started a pilot project to show that methanol can be used as a maritime fuel. It has placed an order with Cochin Shipyard for three work boats with retrofit engines and six low-draft vessels with a capacity of 1,000-2,000 ton, which will run on methanol and be powered by Swedish technology.

5.5 Suggestions

- For these conduits to be operationalized, adequate funding support is required.
- The government should promote passenger terminal development, provide financial assistance to ferry operators to improve safety, and make insurance coverage easier to get in order to increase passenger transportation.
- Connecting waterways and ports to seaports
- Creation of Large Public Discourse

The NW is spread out over a broad area, and its negative effects will affect a significant number of people. However, one thing found was that relatively few individuals in those places were familiar with the waterways system. Before moving forward with these plans, they should hold a big public discussion and debate to address the proposed plans and issues in the project, both in the places where they have planned and also in the areas surrounding rivers and water bodies.

- Using the depth that is naturally available

maintaining the width and depth of rivers has a variety of expenditures, time, and environmental consequences. If waterways can utilise and adapt the natural available depth and width of rivers, not only will costs be reduced, but the environmental impact on rivers will be reduced as well. In order to utilize river's depth and width, technologies such as the Floater idea should be considered.

- Vision

After considering concerns linked to waterways, it is necessary to construct a vision and policy statement for the development of Inland Waterways in India.

- Better berthing facilities, as well as digital GPS and the necessary equipment for night navigation.
- For easy cargo handling, the terminal should be located closest to the mechanical territory.
- Environment impacts

Through suitable revisions to the EIA Notification 2006, the Ministry of Environment, Forest and Climate Change must make the requirement for environmental clearances for waterways mandatory: the entire waterway, as well as each and every component of the waterway, must seek prior environmental clearance. The entire river basin should be adequately examined, and approvals should be granted accordingly.

5.6 Conclusion

From the perspectives of connectivity, trade, tourism, and livelihood, this study can provide an overview of inland navigation along National Waterway. Waterways have the ability to provide a number of benefits in

terms of transportation possibilities. On the other hand, because they need large sums of money, they are likely to have a variety of undesirable social, environmental, and economical consequences. Furthermore, the benefits of rivers vary from one example to the next. Aside from that, the plans for the waterways, such as their advantages and disadvantages, as well as individual difficulties, including social and environmental factors, should be thoroughly investigated.

All of these issues must be addressed in an open and cooperative manner. The National Waterways are expanding year after year, as seen by the volume of traffic they have handled in recent years. However, there are some concerns associated to it, such as maintaining draught and depth, for which the government is taking proactive measures. Various options for National Waterways are emerging, including vessel construction, alternative fuels, and bilateral trade agreements with foreign countries, all of which will increase the volume of traffic on the system.

The NW project is progressing steadily, and it will be a boon to local businesses involved in inland waterways. It will also provide connection and open doors to international markets for local firms.

Annexure

List of National Waterways

Sl. No.	National Waterway No.	Length (km)	Details of Waterways	STATES
1	NW 1	1620	Ganga-Bhagirathi-Hooghly River System (Haldia - Prayagraj)	Uttar Pradesh, Bihar, Jharkhand & West Bengal
2	NW 2	891	Brahmaputra River (Dhubri - Sadiya)	Assam
3	NW 3	205	West Coast Canal (Kottapurama - Kollam), Chamapakara and Udyog Mandal Canal	Kerala
		170	West Coast Canal (Kottapurama - Kozhikode)	
4	NW 4	50	Kakinada Canal (Kakinada to Rajahmundry)	Andhra Pradesh, Telangana, Chhattisgarh, Karnataka, Tamil Nadu, Pondichery and Maharashtra
		157	Krishna river (Wazirabad to Vijayawada)	
		316	North Buckingham Canal (Peddaganjama to Central Station of Chennai)	
5	NW 5	256	East Coast Canal and Matai river	Odisha and West Bengal

Sl. No.	National Waterway No.	Length (km)	Details of Waterways	STATES
		67	Mahanadi delta rivers (Consisting of Hansua river, Nunanala, Gobrinala, Kharnasi river and Mahanadi river)	
6	NW 6	68	Aai River	Assam

Annexure-II

INFRASTRUCTURE FACILITIES ON NATIONAL WATERWAYS 1, 2 & 3

NW 1: The Ganga-Bhagirathi-Hooghly river system, which runs from Prayagraj to Haldia and is 1620 kilometres long:

Fairway

Existing: 2.5 to 3.0 m Least Available Depth (LAD) between Haldia and Farakka (560 km), 2.5 m between Farakka and Barh (396 km) and 2 m between Barh and Ghazipur (294 km), 1.5mt b/w Ghazipur and Varanasi (133 km), and 1.2 m between Kashi/Banaras & Prayagraj (237 km), Departmental dredgers (11), Survey vessels (12)

• A World Bank-funded project (named Jal Marg Vikas- JMVP) is being implemented to improve navigation infrastructure in the NW-1 corridor between Haldia and Varanasi (1390 km).

• 3 m LAD between Haldia and Farakka (560 km), 2.5 m between Farakka and Patna (460 km), 2 m between Patna and Varanasi (363 km), 1.5mt LAD between Varanasi and Allahabad (237 km)

Terminal

- Fixed
  Existing: GR Jetty (Kolkata), Pakur, Farakka, and Patna , Varanasi
  Planned/Underway: Under the JMVP, Multimodal Terminals at Sahibganj and Halida, 5 pairs of Ro-Ro terminals, and intermodal terminals at Kalughat (Saran, Bihar) and Ghazipur (UP).

- Floating
  Haldia-1, Haldia-2, Kolkata ,Semaria, Buxar, Ghazipur, Varanasi, & Allahabad, Downstream Farakka, Upstream Farakka, Rajmahal, Sahibganj, Bateshwarsthan, Bhagalpur, Munger, Shantipur, Swaroopganj, Katwa, Hazardwari.

Infrastructure Facility ON NW-2

NW– 2: Brahmaputra to Sadiya

Fairway

In Dhubri-Neamati, the Least Available Depth is 2.5 metres (630 km) Departmental dredgers (4), 2.0 m LAD in Neamati-Dibrugarh (138 km), 1.5 m in Dibrugarh-Sadiya (123 km), and survey launches

Terminals

Fixed

- Low and high level jetties with BG link at Pandu
- 2. IWT cum Ro-Ro terminal at Dhubri (Assam)

Floating

- Hatsingimari, Jogighopa, Pandu, Tezpur, Silghat, Vishwanathghat, Neamati, Bogibeel, Sengajan, Dibrugarh, and Oriumghat are the existing terminals.
- In the works/planned: Floating terminals can be sent to any site on demand.

NW-3 INFRASTRUCTURE FACILITIES

West Coast Canal from Kottapuram to Kollam, as well as Champakara and Udyogmandal canals, were designated as NW-3, with a total length of 205 kilometres. In the entire stretch of NW-3, IWAI is executing waterway development activities such as developing a fairway channel, building cargo facilities, and providing 24 hour navigation aids.

Fairway

Existing

- West Coast Canal from Kottapuram to Kollam, as well as Champakara and Udyogmandal canals, were designated as NW-3, with a total length of 205 kilometres. In the entire stretch of NW-3, IWAI is executing waterway development activities such as developing a fairway channel, building cargo facilities, and providing 24 hour navigation aids.

- In NW-3, IWAI owns one Cutter Suction Dredger (CSD) and one Amphibian Dredger, as well as one Survey Launch. In addition, the Contractor has deployed one no CSD and one backhoe dredger for dredging and widening work near Chavara.

Planned

- A contract agency is currently dredging and widening a narrow section of waterway (1.50 km) as well as bank protection (0.75 km).

- The IDK government has been entrusted with the construction of a navigation lock at Trikkunnapuzha at a cost of Rs.38 crore, with an 18-month deadline.

Terminals

Existing

- IWAI has built permanent terminals in Kottapuram, and Kollam on NW.3. Furthermore, two terminals, Bolghatty and Willingdon Island, have been established within the Kochi Port container traffic limit via Ro-Ro and Lo-Lo services.

- At terminals, there are eight cranes and eight forklifts available for cargo handling.

Planned

- CPWD is building a new terminal in Alappuzha, which will be ready after the residual works are completed.

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