



## An Overview on Indian Inland Waterways

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### ABSTRACT

*Inland waterways* is a network in the form of rivers, canals, backwaters and creeks that can be used for transportation in place of or in addition to roads and rails. Through the ages, rivers have served as effective waterways, carrying people and goods over long distances. Even today, many countries depend heavily on inland water transport, especially for large and bulky cargo, as it is cheaper, more reliable and less polluting than transporting goods by road or rail.

A vast country like India with a huge network of rivers and interconnecting canals could ordinarily be an ideal place for an efficient inland waterways system as it has multifarious economic advantages and is the cheapest mode of transportation. But this potential could not be tapped as developing inland waterways as means of passenger and cargo transportation, as a result, burden on the road and railways networks went on piling and they became over stressed.

The objective of this paper is to find out the growth and constraints in Inland Water Transportation in India and also find out the major problems faced by institutions involved in this sector in India. This paper presents the detailed insights about the dynamics of Inland Water ways in India. The paper presents past few years growth of Inland Water ways. We also try to analyse the government policies regarding this inland waterways. As per study done in the some countries Inland Water ways has been known as most cost effective and fuel efficient mode of transportation which attracts the attention of scholars to make some efforts relatively to study of growth and challenges of Inland Water ways related to India since attempts has been made in this paper to highlight present status, growth, opportunities and problem of Inland Water ways in India.

**Keywords:** Inland Water ways, Transportation, Road, Railways Government Policies

## I Introduction

India has a total coastline of 7551 km with 13 major ports trust, approximately 200 minor ports. The country has extensive network of inland waterways in the form of rivers, canals, backwaters and creeks. Total Navigable length is 14,500 km, of which about 5200 km of rivers and 4000 km of canals can be used by mechanized craft and cargo moved in financial year 2013-14 and 2014-15 are respectively 322.63 and 365.37lakh tonnes in India.

The country has been divided into 20 river units that include 14 major river basins. The remaining 99 river basins have been grouped into six river units. The poor planning and neglect of this sector over the decades is reflected by the fact that the Ganga-Brahmaputra-Meghna basin which covers 34 per cent of the country's area contributes about 59 per cent of the water resources. The West flowing rivers flowing towards the Indus covering 10 per cent of area account for a mere four per cent of the resources while remaining 56 per cent of area contributes 37 per cent of the runoff.

Clubbed with this geographical picture is also the fact that India has 7,551 kilometer coastline and about 14,500 kilometer of navigable inland waterways. This huge potential has by and large remained unexploited despite the universal acceptance of the fact that waterways transportation is fuel efficient, environment friendly and more economical as compared to rail and road.

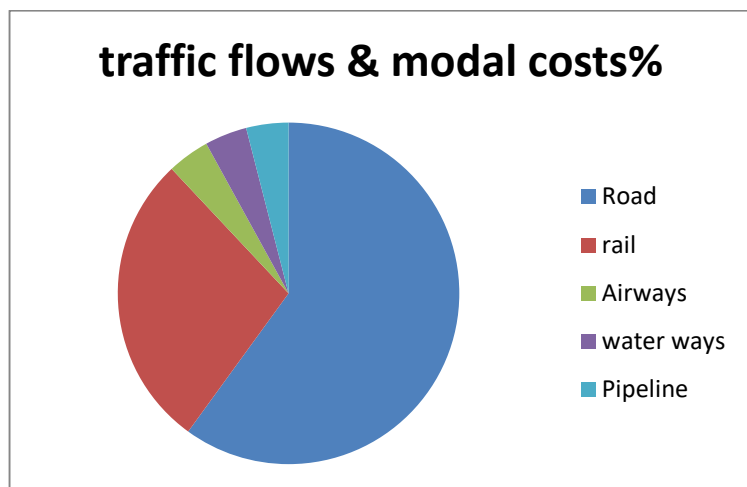
As the current scenario stands, the Inland water transport (IWT) has only less than a 5 per cent share of the total goods transported within the country through various modes such as rail, road and water. This is much less in comparison to other nations which are similarly blessed with such a vast river network.

Let us compare ourselves with our immediate neighbour China with which we tend to compete both on economic and industrial fronts. As against our 14,500 kilometers of navigable inland waterways China has over one lakh kilometers of well honed waterways.

This scenario is significant both from the public and planners point of view when fresh efforts are afoot to develop inland waterways. The idea behind this endeavour is to provide relief from the choked road and railways network with a cheaper option that has the potential to help the economy particularly in the rural sector.

For instance in China, 47 per cent of goods and passenger traffic is on water while in Korea and Japan, 43 and 44 per cent of goods and passenger traffic respectively is on water. In European countries, 40 per cent of goods and passenger traffic is on water. India accounts for just 3.5 per cent goods and passenger traffic through inland waterways.

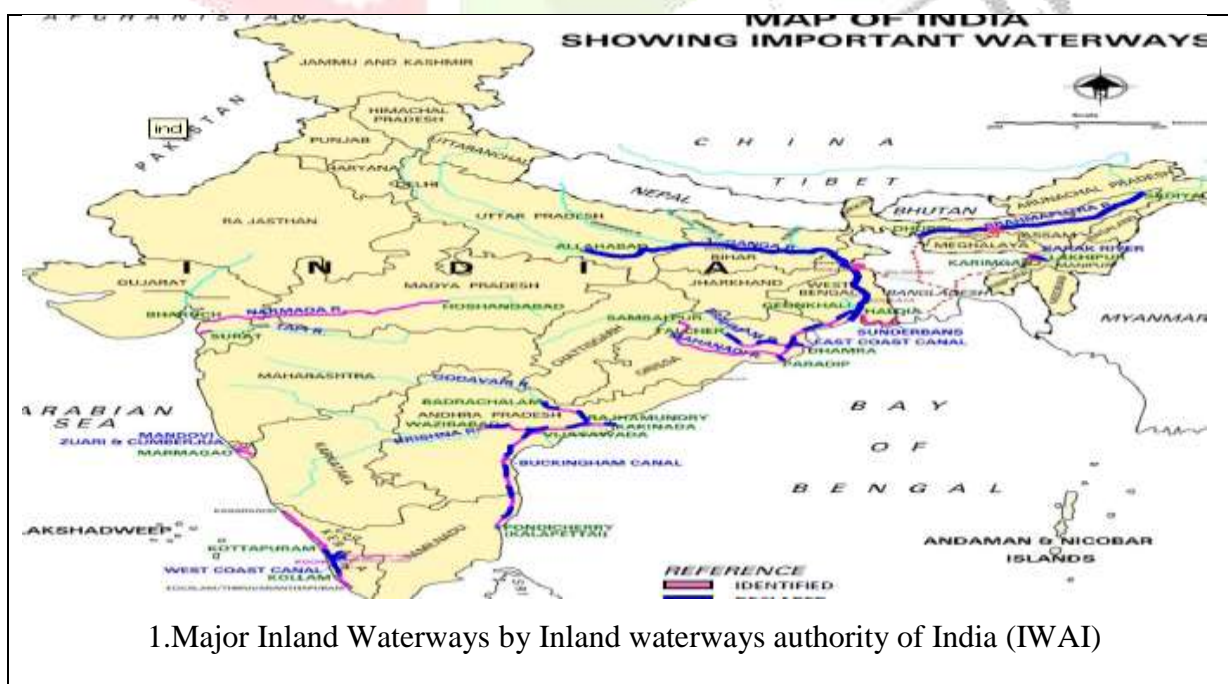
In India around 60 % of the total cargo is carried by road, 28% by rail, 4% by airways, 4% by waterways and 4% by pipeline [Total Transport system study on traffic flows & modal costs, Report for planning commission, RITES].

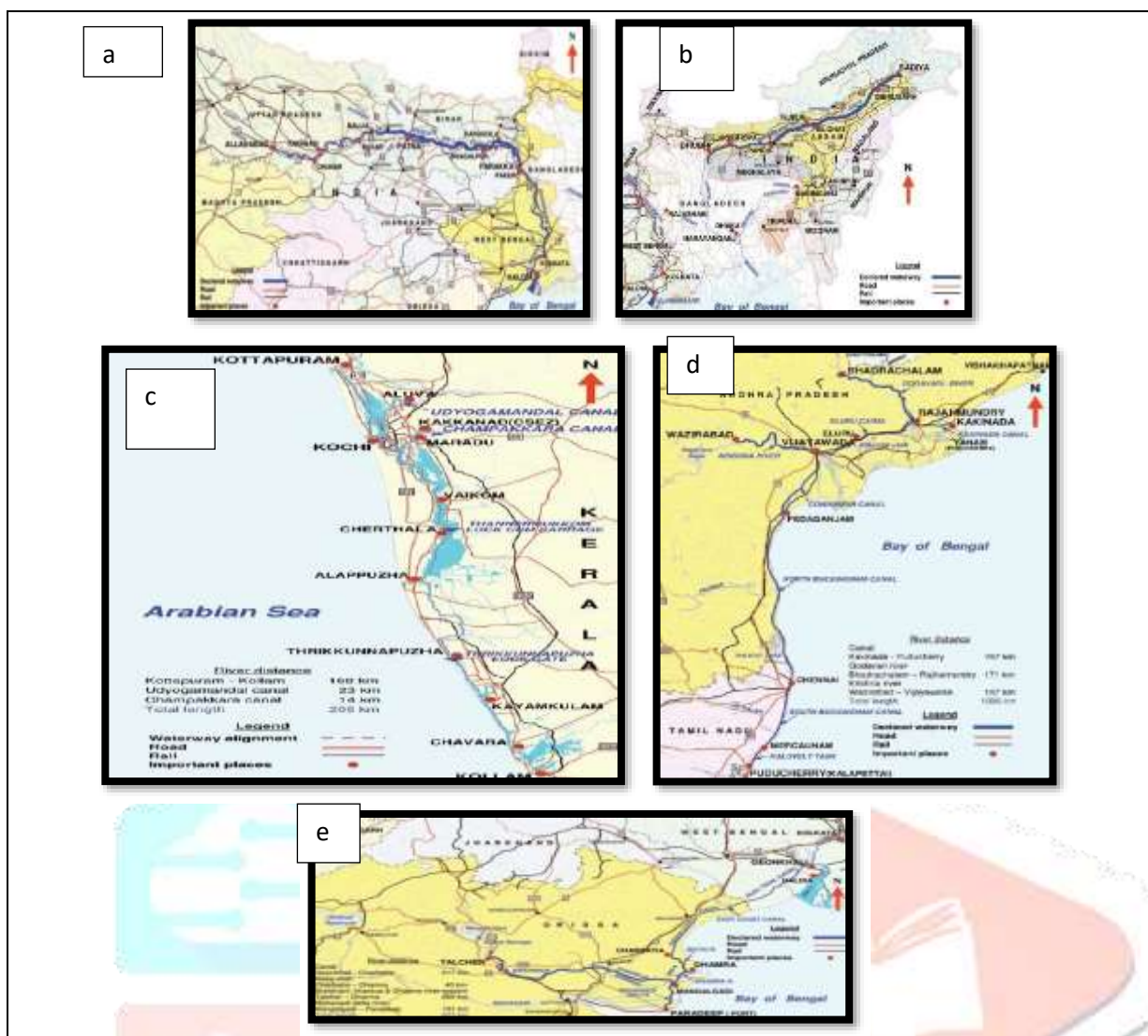


Since Independence many expert committees studied the Inland Water Transport area and advocated systematic development of the mode. National Transport Policy Committee in its report (1980) accordingly recommended for setting up of an Authority for development and regulation of inland waterways. This led to formation of Inland Waterways Authority of India (IWAI) in 1986 for development and regulation of inland waterways.

#### List of water Ways-

These waterways include Ganga -Bhagirathi-Hooghly river system ( Allahabad-Haldia- 1620 kilometers) as NW-1, River Brahmaputra (Dhubri-Sadiya- 891 kilometers) as NW-2, West Coast Canal (Kottapuram-Kollam) along with Udyogmandal and Champakara Canals- 250 kilometers as NW-3, Kakinada-Puducherry canals along with Godavari and Krishna rivers (1078 kilometers) as NW-4. The NW-5 consists of East Coast Canal integrated with Brahmani River and Mahanadi delta Rivers (588 km).





## 2. National Inland Waterways Of India – Maps and Details

Sl no	NW	Stretch	Length
A	1	River Ganga Haldia to Allahabad	<b>1620 km</b>
B	2	River Brahmaputra From Dhubri to Sadiya	<b>891 km</b>
C	3	West Coast Canal From Kottapuram to Kollam with Udyogamandal and Champakara canal	<b>205 km</b>
D	4	Kakkinada-Puducherry stretch of canals with river Godavari and river Krishna	<b>1078 km</b>
E	5	Kakkinada-Puducherry stretch of canals with river Godavari and river Krishna	<b>588 km</b>

Inland Waterways Authority of India (IWAI) has put in place a structured management and monitoring system with competent and experienced professionals, to ensure that the projects on NWs are qualitatively executed in a time bound manner. In addition, the progress of execution of projects is regularly reviewed at various levels within IWAI and the Government.

Inland Water Transport (IWT) mode is widely recognized as environment friendly and cost effective mode of transport. As per RITES Report of 2014 on Integrated National Waterways Transportation Grid, some of

the important benefits of IWT mode compared to rail and road transportation are fuel efficiency and cost savings as given below:

- i. 1 Litre of fuel moves 24 tonne - km on road, 95 tonne-km on rail and 215 tonne-km on IWT.
- ii. Comparative cost for movement of freight.

Mode	Railways	Highways	IWT
Freight (Rs./T.km)	1.36	2.50	1.06

In addition to the economic and environmental benefits, IWT aims to create for the shippers and logistic players, an alternative to the two dominant modes of transport viz. road and rail.

## II. OBJECTIVE OF STUDY

Objective of our study is to

- a. To study the development of waterways in India since the independence.
- b. To analyse the issues and challenges in development of inland water ways in India
- c. To study the various government policy's regarding development of inland water ways.
- d. To outline the steps and solutions for the problems which we found during our study.

## III. REVIEW OF LITERATURE

Water-based transport is highly effective when the source and destination are waterfront locations. Transport based on inland waterways (or inland water transport, IWT)—rivers, canals, lakes, etc. and also overlapping coastal shipping in tidal rivers—consist 20% of the transport sector in Germany (WB 2005) and 32% in Bangladesh (Rahman 1994). In India it has a paltry share of 0.15% (Raghuram 2004).

Sarvana (2015) clearly explains the that development of the inland water ways in the developed countries like America or western european countries are more developed and mature than in india. In previous 9 and 10 five year plan government give stress on development of inland water ways, but due to lack of interest of state governments and other stake holders the share of inland waterways transport in cargo handling become less and less. He clearly emphasis the role of private sector in development of the inland water ways.

The National Waterways Bill, 2015 presents that inland waterways are recognised as a fuel efficient, cost effective and environment friendly mode of transport, it has received lesser investment as compared to roads and railways. Since inland waterways are lagging behind other modes of transport, the central government has evolved a policy for integrated development of inland waterways.

NitiAyogs annual report on logistics MOVE 2018 clearly indicate need of development inland water ways to improve our global ranking in handling the logistics and create a sustainable and cheap alternative of transport across the country.

## IV. METHODOLOGY

In our study we go through various policies regarding inland water ways which was downloaded from IWAI site and also NitiAyog and planning commission site. Data relating transportation and logistics we get from government of India's ministry of shipping data and also government of India's economic survey 2019-20

## V. DISCUSSION AND RESULTS

A vast country like India with a huge network of rivers and interconnecting canals could ordinarily be an ideal place for an efficient inland waterways system as it has multifarious economic advantages and is the cheapest mode of transportation. However, this potential could not be tapped as developing inland waterways as means of passenger and cargo transportation, has never been a part of the planning until recently. As a result, burden on the road and railways networks went on piling and they became over stressed.

Clubbed with this geographical picture is also the fact that India has 7,551 kilometer coastline and about 14,500 kilometer of navigable inland waterways. This huge potential has by and large remained unexploited despite the universal acceptance of the fact that waterways transportation is fuel efficient, environment friendly and more economical as compared to rail and road. As the current scenario stands, the Inland water transport (IWT) has only less than a 1 per cent share of the total goods transported within the country through various modes such as rail, road and water. This is much less in comparison to other nations which are similarly blessed with such a vast river network.

Let us compare ourselves with our immediate neighbour China with which we tend to compete both on economic and industrial fronts. As against our 14,500 kilometers of navigable inland waterways China has over one lakh kilometers of well honed waterways. For instance in China, 47 per cent of goods and passenger traffic is on water while in Korea and Japan, 43 and 44 per cent of goods and passenger traffic respectively is on water. In European countries, 40 per cent of goods and passenger traffic is on water. Where does India stand vis-a-vis these nations which are currently dominating the economic firmament of the world and India wants to play a competing role. India accounts for just 3.5 per cent goods and passenger traffic through inland waterways.

### a. Inland Waterways in India: Current Situation

**Number and Extent:** (National Inland Waterways in India- A Strategic Status Report, 2017)

- As per the National Waterways Act, 2016, 111 have been declared as National Waterways (NW)
- These waterways pass through 24 states and two union territories, with an approximate total length of 20274 km
- These proposed waterways will pass through nearly 138 river systems, creeks, estuaries and related canal systems of India.

**Currently Operational:** According to a PIB release by Ministry of Shipping dated 20<sup>th</sup> July 2018, the following NWs are operational:

National Waterway (NW) No	Stretch	Length (km)	Location (State)
NW1	Ganga-Bhagirathi-Hooghly River System (Haldia - Allahabad)	1620	Uttar Pradesh, Bihar, Jharkhand, West Bengal
NW2	Brahmaputra River (Dhubri - Sadiya)	891	Assam
NW3	West Coast Canal (Kottapuram - Kollam), Champakara and Udyogmandal Canals	205	Kerala
NW4	(Phase-I : Vijaywada to Muktyala)	82	Andhra Pradesh
NW10	Amba River	45	Maharashtra
NW85	Revadanda Creek - Kundalika River System	31	
NW27	Cumberjua – confluence with Zuari to confluence with Mandovi river	17	Goa
NW68	Mandovi– Usgaon Bridge to Arabian Sea	41	
NW111	Zuari– Sanvordem Bridge to Marmugao Port	50	
NW9	Alappuzha – Kottayam – Athirampuzha Canal Boat Jetty, Alappuzha to Athirampuzha	38	Kerala
NW100	Tapi River	173	Gujarat
NW97	Sundarbans Waterways	201	West Bengal (through Indo-Bangladesh Protocol Route)

Of these, NW-1, 2 and 3 are operational in certain stretches and vessels are moving on them. They have developed a fairway of required depth and width, terminals with cargo handling facilities and navigational aids. NW- 4 and 5 are yet to be made operational.

According to the Ministry of Shipping and Surface Transport, the draft National Perspective Plan (NPP), prepared under the Sagarmala Programme, has recommended priority development of National Waterways-1, 2, 4 and 5 to enhance port connectivity to the hinterland. This in turn would enable faster and cheaper movement of key cargo types such as coal, iron ore, food grains etc.

## B. Issues and Problems regarding development of inland waterways in india

**.1. Cost estimation:** In respect to operating costs per ton-km, IWT has lower cost than rail and road transport. However, this cost argument is challengeable. There are two factors which distinguishes how freight moves on land versus on water:

1. A road travels straight while rivers bend and curve; therefore the difference between freight costs for IWT and road/ railways is not much.
2. Cost of loading and unloading freight

**2. Inadequate depth:** To be viable for a navigable inland waterway, river needs enough depth throughout the year. However, in their natural state; many Indian rivers simply do not have that level of water which will necessitate extensive dredging. Moreover, Indian rivers (especially rivers in the northern plains) face severe problems of siltation round the year.

**3. Impact on other activities:** Water in rivers has competing demands, including dams and farming. To maintain the water levels in the river to the degree needed for them to function as inland waterways, the water use for such other activities might get curbed.

**4. Inadequate Air Draft:** Multiple bridges with low vertical clearance obstruct the passage of bigger inland water transport vessels on many inland waterways such as NW 3

**5. Lack of night navigation infrastructure:** Rudimentary night navigational facilities and markings are also a major issue.

**6. Shortage of IWT vessels:** Vessel building is highly capital intensive and faces difficulties in obtaining project finance from banks and financial institutions.

**7. Shortage of MRO facilities:** There is severe shortage of MRO (Maintenance, Repair and Overhaul) facilities for IWT vessels.

**8. Inadequate industries:** Inadequate number of Industrial units on the riverside, especially not along the Brahmaputra is a major discouragement hindering development of inland waterways. At National Policy Dialogue on transboundary cooperation related to the Ganga and the Brahmaputra rivers – states, it was highlighted that due to inadequate industrial units result in no cargo commitments by the private players

**9. Lack of funds:** Dredging as well as infrastructure for IWT requires huge investments. However, both public and private funding in the sector is low.

**10. Environmental Impact:** Dredging operations will damage river bed, and can lead to change in habitats for various aquatic flora and fauna. Dredging may also impact aquifers along the river, damaging the ability of water to percolate underground. In estuaries and creeks of rivers the removal of river bed material during capital dredging can result in the ingress of excess saline water into the creek or rivers. This is one of the reasons why the state of Kerala had opposed many of its proposed waterways. Construction of jetties, river ports will necessitate removal of trees/ mangrove forests in the area.

### **C. Advantages of Inland Waterways in india-**

Inland water transport is recognised as fuel efficient, cost effective and environment-friendly mode of transport, especially for bulk goods, hazardous goods and over dimensional cargos. It also reduces time, cost of transportation of goods and cargos, as well as congestion and accidents on highways. They are expected to also



“help create seamless interconnectivity connecting hinterlands along navigable river coasts and coastal routes” and “are likely to play a crucial role in connecting the north-eastern states to the mainland. Advantages can be summarised as

- A fundamental alteration in the logistics scenario of the country: It represents a ready built infrastructure network, which can be utilised without any further capital investment.
- The network requires no green field investment, but only capex for improvement/upgradation.
- Waterways can decongest roads, including highways by moving cargo away.
- Waterways do not involve challenges associated with land acquisition, which has always been a sensitive issue, causing time and cost overruns of numerous projects.
- The significant investment which India needs to build its roads/highways infrastructure network can be conserved through increased utilisation of the waterways. User charges can be levied to meet the expenses on maintenance of the waterways.
- Waterways are a cheaper mode of transportation vis-à-vis the available alternatives, significantly reducing the point-to-point cost of goods transportation.

#### **D. Disadvantages of Inland waterways in india:**

1. Inland waterways have **low transport speed** thus not suitable where time is an important factor
2. It has **limited area of operation**, depending on the infrastructural premises and depth of the waterways
3. There are only very few cases in which Inland water transport (IWT) can offer **door-to-door transport of cargo**
4. **Operational disruptions due to weather** is a major disadvantage

#### **E. Challenges in construction of inland water ways-**

Implementation of the national waterways network is, however, fraught with challenges.

- The channel draft of the national waterways is not uniform at 2 meters throughout the year, as is required. Some of these rivers are seasonal and do not offer navigability through the year. Around 20 out of the 111 identified national waterways have reportedly been found unviable.
- Further, all the identified waterways require intensive capital and maintenance dredging, which could be resisted by the local community on environmental grounds, including displacement fears, thereby posing implementation challenges. Water also has important competing uses, viz. need for living as well as for irrigation, power generation etc. It would not be possible for local government/others to overlook these needs.
- The exclusive jurisdiction of the Central Government is only in regard to shipping and navigation on inland waterways declared to be ‘national waterways’ by an act of Parliament. Utilisation/sailing of vessels, in other waterways, is within the ambit of the concurrent list or is in the jurisdiction of the respective state governments.

- As every riverine system is unique and presents diverse challenges, separate studies based on a detailed micro-level review to assess viability need to be done for each, before taking up implementation. An effective waterways network would necessitate drawing up a well-coordinated strategy on lines of complementarity between the national network and other waterways, not declared as such, as well as between waterways and roadways/railways. The said strategy should closely look into the various undercurrents, including competing uses/needs, possible local resistance and also work closely and in coordination with local governments for quick and successful implementation of this important national project.

## F. Legal and Policy regime for Inland Waterways in India

### F.1 Legislation: Following government policies-

#### 1. The Inland Waterways Authority of India Act, 1985:

- The Act provides for the constitution of an Authority for the regulation and development of inland waterways for purposes of shipping and navigation and for matters related to it
- The Inland Waterways Authority of India was formed in 1986. It undertakes projects for development and maintenance of IWT infrastructure on national waterways through grant received from Ministry of Shipping.

1. **Indian Vessels Act of 1917 (amended in 2007):** It deals with the survey and registration of inland vessels, removal of obstructions in navigation, carriage of goods and passengers, prevention and control of pollution etc.
2. **Inland Water Transport Policy 2001:** Policy talks about IWT being economic, fuel-efficient and environment friendly mode of transport. It advocates large-scale private sector participation both for creation of infrastructure and for fleet operations.
3. **National Waterways Act 2016**
  - The Act declared 111 rivers or river stretches, creeks, estuaries as National (inland) Waterways.
  - It enables the Central Government to regulate these waterways for development with regard to shipping, navigation and transport through mechanically propelled vessels.

#### 5. Laws related to environmental and other impacts:

- Forest Act 1980,
- Environmental Protection Act 1986 and various notifications under it like EIA Notification 2006, CRZ Notification 2011

### F.2 Government initiatives taken regarding development of Inland water ways:

1. **JalMargVikas Project:** JalMargVikas Project (JMVP) aims at capacity augmentation of navigation on National Waterway-1 (NW-1). The project is being implemented by GOI with technical assistance and investment support of the World Bank.
2. **Sagarmala Project:** Along with development of coast shipping routes, the project seeks to inland waterways to drive industrial development. It aims to reduce the logistics costs by doubling the share of domestic waterways in the modal mix from current 6 per cent (PIB)

3. **Interlinking of Rivers Programme:** The project is expected to offer potential benefits to the transport sector through navigation.

### F.3 NITI Aayog Recommendations (Action Agenda, Three-Year 2017-2020)

**1. Streamline the governance of inland waterways:** NITI Aayog recommends streamlining the regulatory structure and bringing an overarching body to oversee Inland Water Transport such as the IWAI to more consistency in the rules and strategy of the sector.

#### 2. Develop measures for year-round navigation:

- Efforts should be made to develop deeper stretches of the river, i.e., at least 2.5 m to 3 m to achieve year-around navigation
- adequate maintenance of rivers, including continuous dredging to maintain adequate water depth for servicing shipping lines should be ensured

**3. Ease restrictions on river-sea movement:** Utilizing a single vessel for both inland and coastal waters, lowers transport costs and minimizes handling. Thus, by 2020, state authorities should draw up coordinates for inland vessel limits under the Inland Vessel Act for their coastal waters.

#### 4. Develop inland waterways transport to facilitate movement of goods to neighbouring countries and the Northeast:

- By 2018, state governments should commence work on dredging and channel stabilization to create about 20 new ports in the Brahmaputra and Barak rivers.
- The protocol for Inland Waterways between Bangladesh and India should be extended for at least 10 years to reduce uncertainty.

### G. Way Forward:

After complete study we want to present some suggestions and steps to weed out the constraints in development of inland waterways.

1. Strengthening public-private partnership has the key role to play in developing the inland waterways sector. Private players can undertake terminal development, cargo and passenger handling, and building low-draft vessels and related repair facilities.

2. Measures should be taken to develop basic infrastructure, address technological bottlenecks and maintenance of rivers to ensure year-round navigability

3. Measures should be taken to ensure availability of seamless, multimodal last-mile connectivity to and from hinterland to reduce trans-shipment cost and make inland water transport economically more viable

4. Cargo transport through inland waterways should be incentivised. Following measures can be taken:

- The Government can mandate/incentivise industries in the proximity of national waterways to use this mode for a portion of their shipments.
- the government can promote industrial corridors along riverbanks and foster waterways-based industrialisation.
- Higher road taxes can be levied on transportation of coal and inflammable material over longer distances

5.The government should develop passenger terminal development, offer financial support to ferry operators to improve safety, and facilitate insurance coverage to boost passenger transport

6.Measures should be taken to promote river tourism in states like Assam and Kerala

7.Keeping in mind the concerns, it is important to assess the environmental and social impact of development of inland waterways and associated infrastructure to negate potential damage.

## VI. Conclusion-

In the above study we studied the challenges, progress and various government policies regarding development of Inland waterways in india. We found many flaws and many engineering faults in government policies like going by the yardsticks set up by the Inland Waterways Authority of India, a minimum, consistent year-long water depth (water draft)of two meters has to be maintained along the national waterways to ensure uninterrupted transport. This is a daunting task given the present status of river pollution and lack of policy and planning on judicial use of river water. There are various implementation issues regarding engineering, ecological and environment, land use, training of human resources etc are critically analysed and presented. On comparing with international best practices we are still lack behind. Inland water transport in India has only 0.5% modal share; China 8.7%; USA 8.3% and Europe 7% .inland water transport (IWT) accounts for less than 1% of its freight traffic, compared with 35% in Bangladesh and 20% in Germany. We should require a clear approach regarding environment and ecological issues, this is biggest constraint in development of waterways in coastal and north eastern states. The development of inland waterways in india offers a huge potential for the growth and development of the country. However, it should not be done at the cost of the environment and the interest of vulnerable sections. Hence, there should be proper safeguards and measures needed to make the inland water transport more efficient as well as sustainable in the long run. That's why this is the just the beginning of the process of realizing the huge potential of Inland waterways and would go a long way in easing pressure on the over stretched traditional modes of transport.

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