

DI04006071: Railway, Harbour & Tunnel Engineering

Lecture 4.25: Inland Water Transportation in India

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Civil Engineering

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Overview of Inland Water Transport (IWT) in India I

India has an extensive network of inland waterways comprising rivers, canals, backwaters, and creeks. The total navigable length is about 14,500 km, out of which about 5,200 km of rivers and 4,000 km of canals can be used by mechanized crafts. Despite this immense potential, IWT historically accounted for a minuscule share of total domestic cargo transport, prompting focused government initiatives in recent years to revitalize this sector.

Key Points

- Total navigable waterways: ~14,500 km.
- Mechanized craft navigable length: ~9,200 km.
- Managed by the Inland Waterways Authority of India (IWAI).
- Highly underutilized compared to road and rail transport.

Importance and Advantages of IWT I

Inland water transport is universally recognized as the most fuel-efficient, cost-effective, and environmentally friendly mode of transport, especially for bulk and over-dimensional cargo. It requires less land acquisition compared to highways and railways and significantly reduces carbon emissions and road congestion.

Key Points

- Cost-effective for bulk goods (coal, cement, fertilizers).
- High fuel efficiency: 1 litre of fuel moves 24 t-km by road, 95 t-km by rail, and 215 t-km by IWT.
- Environmentally friendly with lower greenhouse gas emissions.
- Relieves congestion on traditional road and rail networks.

Major National Waterways in India I

The National Waterways Act, 2016 merged 5 existing NWs and added 106 new ones, making a total of 111 National Waterways. Below is a summary of the most prominent operational ones.

Waterway	River System	Stretch	Length (km)	—	—	—	—
NW-1	Ganga-Bhagirathi-Hooghly	Haldia to Allahabad	1620				NW-2
	Brahmaputra	Dhubri to Sadiya	891				NW-3
		West Coast Canal					
		Kollam to Kottapuram	205				NW-4
		Godavari & Krishna					
		Kakinada to Puducherry	1095				

Key Points

- NW-1 is the longest waterway in India.
- NW-2 serves the crucial northeastern region.
- NW-3 is famous for backwater navigation in Kerala.
- Total declared National Waterways: 111.

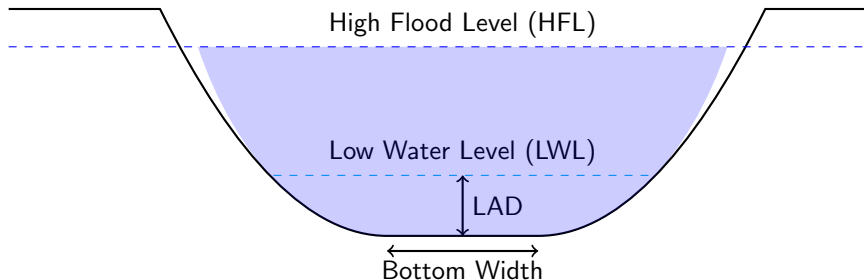
Infrastructure Requirements for IWT I

Developing a robust inland waterway system requires substantial infrastructure. This includes maintaining a navigable channel (fairway) with adequate depth and width throughout the year, constructing multi-modal terminals for cargo handling, and providing navigational aids. Additionally, a modern fleet of inland vessels suited to the specific river conditions is essential.

Key Points

- Fairway development: Dredging and river training works to maintain Least Available Depth (LAD).
- Terminals: Construction of floating and fixed terminals with mechanized cargo handling.
- Navigational Aids: Night navigation facilities, DGPS, and river information systems (RIS).
- Vessels: Shallow draft vessels with high cargo capacity.

Cross-Section of a Navigable Waterway I



Cross-Section of a Navigable Waterway II

Key Points

- Least Available Depth (LAD) is critical for vessel movement.
- Bottom width must accommodate two-way traffic of design vessels.
- Water levels fluctuate significantly between monsoons and dry seasons.
- Dredging is often required to maintain LAD at the low water level.

Challenges and Constraints in Indian IWT I

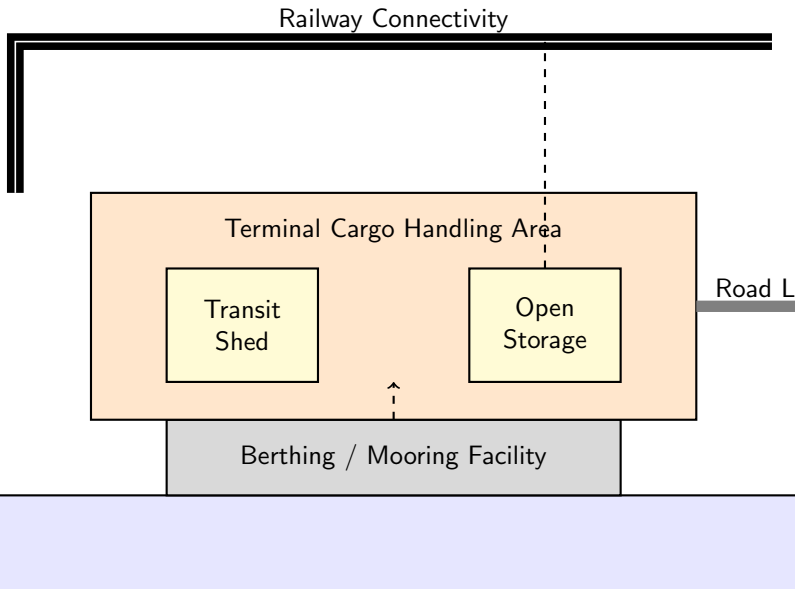
Despite its potential, IWT in India faces significant challenges. The seasonal nature of rivers leads to inadequate water depth during dry seasons. Heavy siltation requires continuous and expensive dredging. Furthermore, low vertical clearance under existing rail and road bridges restricts the size of vessels that can pass, and inadequate first and last-mile connectivity limits end-to-end transport efficiency.

Key Points

- Seasonal flow and severe draft restrictions during summers.
- High rate of siltation necessitating maintenance dredging.
- Navigational hazards: Low bridges, submerged rocks, and shifting channels.
- Lack of multimodal connectivity and modernized terminal infrastructure.

Layout of an Inland Waterway Multimodal Terminal I

Layout of an Inland Waterway Multimodal Terminal II



Jal Marg Vikas Project (JMVP) I

The Jal Marg Vikas Project (JMVP) is a flagship initiative undertaken by IWAI with technical and financial assistance from the World Bank. The primary objective is the capacity augmentation of National Waterway-1 (Ganga-Bhagirathi-Hooghly river system) to enable commercial navigation of vessels with a capacity of 1500-2000 DWT.

Key Points

- Focuses on NW-1 from Haldia to Varanasi (1390 km).
- Target LAD of 3.0 meters to support large vessels.
- Includes construction of multi-modal terminals at Varanasi, Sahibganj, and Haldia.
- Development of River Information System (RIS) and new navigational locks.

Environmental and Economic Impact I

Shifting cargo from road to inland waterways significantly reduces external costs, including air pollution, soil degradation, and noise. Economically, IWT reduces logistics costs which currently stand at about 13-14% of GDP in India, making Indian goods more competitive globally. The socio-economic development of hinterlands along the waterways is an added benefit.

Key Points

- Reduces carbon footprint and greenhouse gas emissions.
- Lowers national logistics costs, boosting global trade competitiveness.
- Creates employment opportunities in terminal operation, vessel construction, and dredging.
- Facilitates Ro-Ro (Roll-on/Roll-off) services, moving loaded trucks across rivers.

Future Prospects and Recent Acts I

The future of IWT in India is closely tied to the Sagarmala Project, which emphasizes port-led development and coastal shipping integrated with inland waterways. Furthermore, the Inland Vessels Act, 2021 has brought uniformity in the application of laws relating to inland vessels across all states, replacing the obsolete 1917 Act and promoting a safer, more regulated IWT ecosystem.

Key Points

- Integration with Sagarmala for coastal-IWT synergy.
- Inland Vessels Act, 2021: Unified national registry and standardized regulations.
- Push towards alternative fuels (LNG/electric) for inland vessels.
- Encouragement of public-private partnerships (PPP) in terminal operations.

Summary I

Inland Water Transport represents a highly potential, yet historically under-leveraged component of India's transport infrastructure. Through systematic development of National Waterways, creation of multi-modal hubs like JMVP, and legislative reforms, India is transforming its rivers into economic lifelines. Overcoming seasonal flow challenges and ensuring sustained dredging will dictate the long-term success of these initiatives.

Key Points

- IWT is fuel-efficient, cost-effective, and eco-friendly.
- India has 111 declared National Waterways; NW-1, NW-2, NW-3 are key.
- Major infrastructure: Terminals, fairway (LAD), and modern vessels.
- Challenges include draft fluctuations, siltation, and bridge clearances.
- Initiatives like JMVP and Sagarmala are accelerating IWT growth.