

Focal Theme: - India and the Indian Ocean: Past, Present and Future.

Sub Theme: - Maritime Trade

Title of paper: - *Establishment of Maritime Trade in National Waterway corridor of India i.e. (Haldia-Allahabad stretch on Ganga Bhagirathi- Hooghly river system) and (Dhubri-Sadiya stretch on river Brahmaputra)*

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1. Abstract

The paper deals with the conceptual and comparative study of NW-1 and NW-2. It will rise as indispensable mode of transport for oversized technological units. It combines advantage such as providing water balance and stability of territory , offsetting potential impacts of global climate change, flood protection , water management regimes for overcoming long term drought,



Environmental protection , use of renewable Energy , increased stability of energy system, the diversification of supply of strategic and thus increase energy and transport security.

2. Keywords

Inland waterways = IW

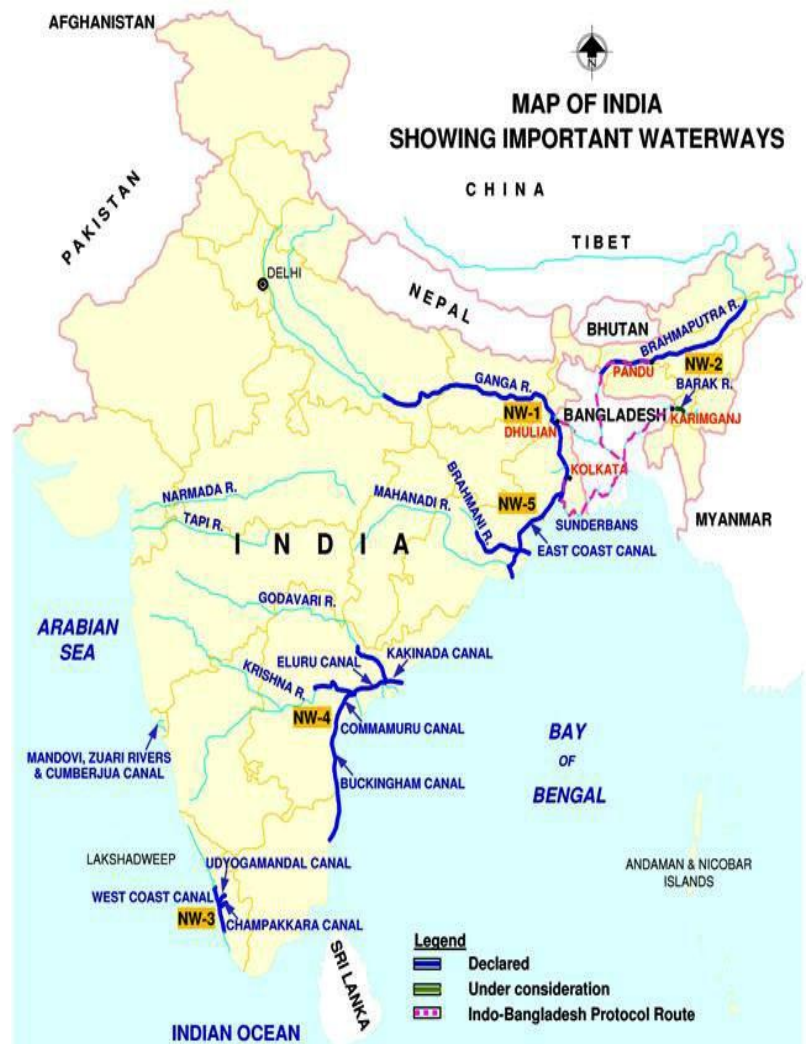
Haldia-Allahabad stretch on Ganga Bhagirathi- Hooghly river system = NW-1

Dhubri-Sadiya stretch on river Brahmaputra = NW-2

West Bengal=WB, Terminal=Term

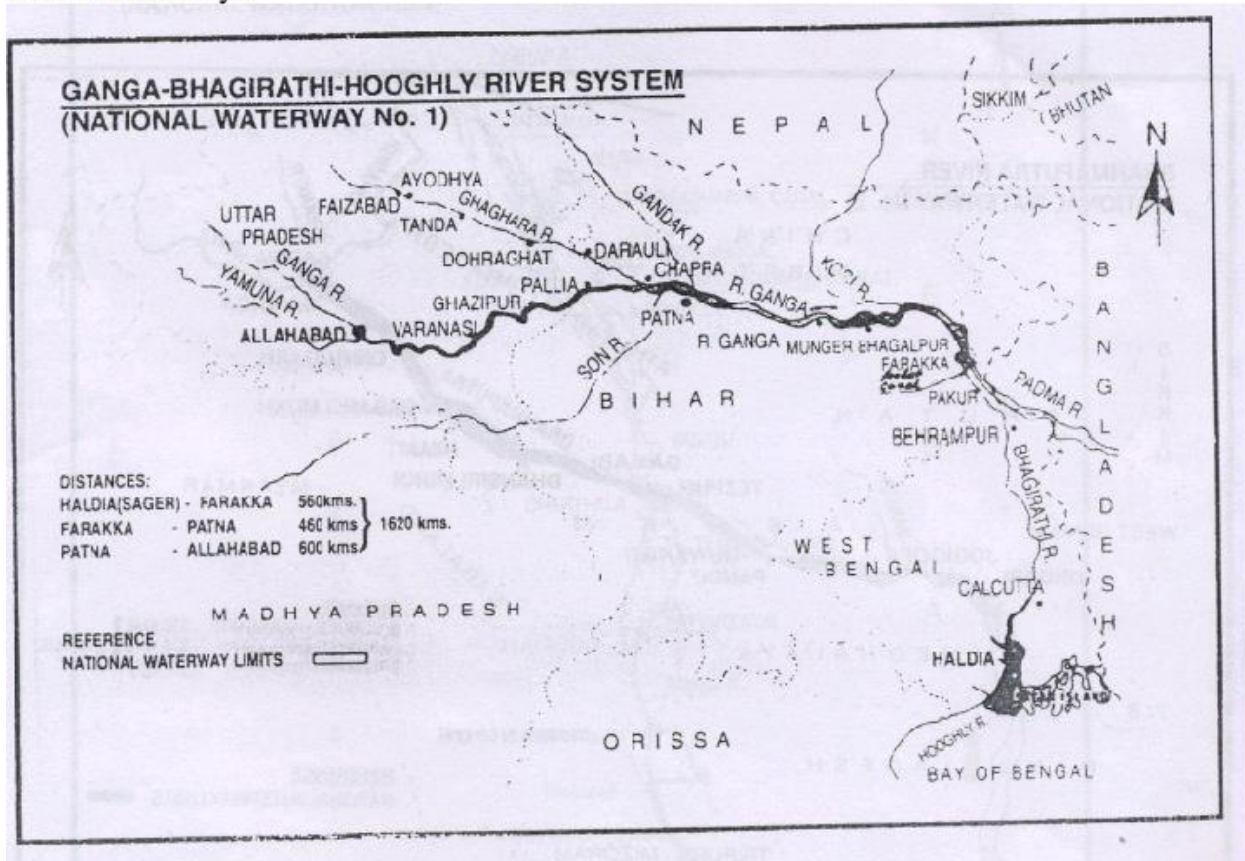
3. Introduction

In this Modern Era, majority or we may say 90% imports and exports are carried out by shipping industry. As, India has an extensive network of inland waterways, canals, backwaters and creek. The total Navigable length is 14500 km out of which about 500 km is the river and 4000 km of canal can be used by Mechanical Crafts. Freight transportation by waterways are highly underutilized in India compared to other large countries and geographic areas like United States, China and European union. The total cargo moved (in tones km) by the inland waterways was just 0.1% of total inland traffic in India compared to 21% figure for United States. Therefore, I consider this route as most efficient way for trading the goods that are coming from all around the globe.



National Waterway -1

National Waterway 1

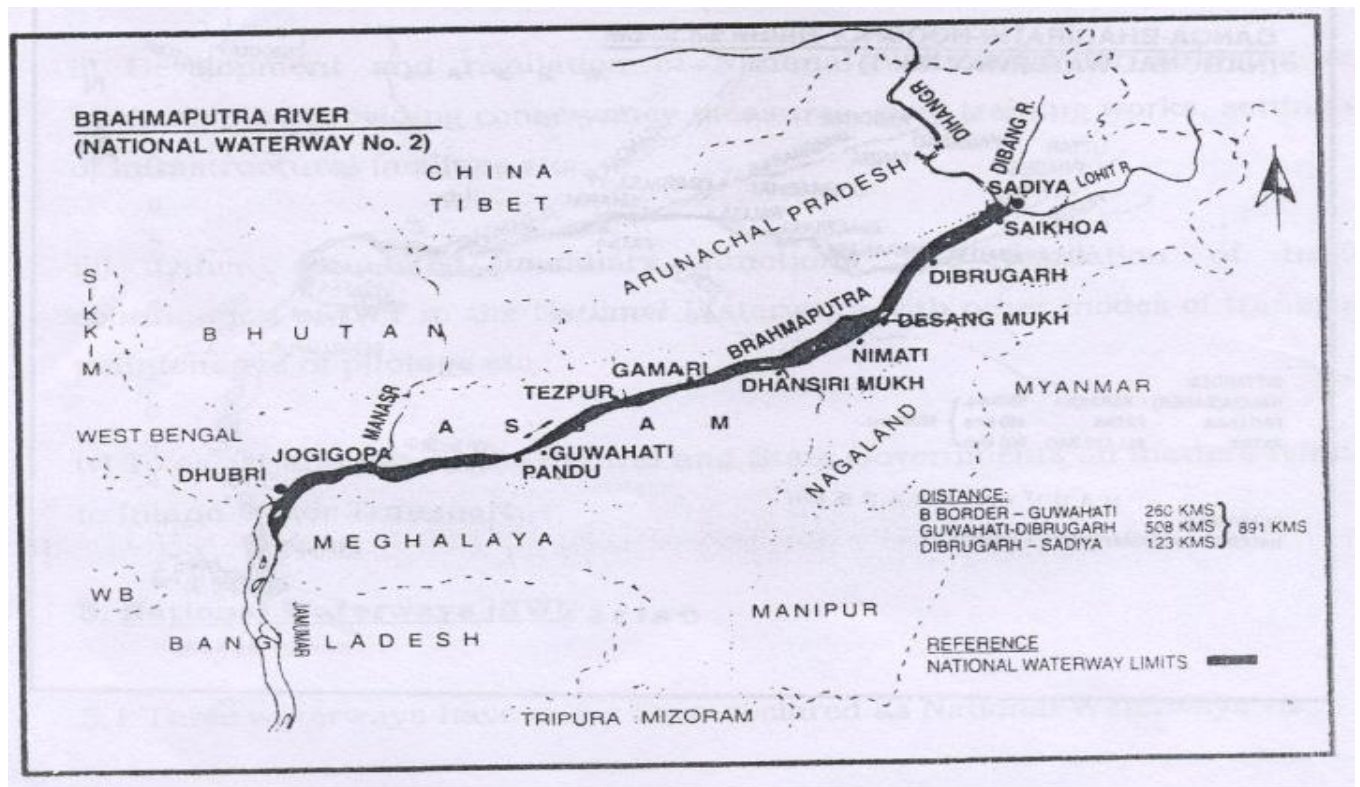


Source: IWAI, 2004

- ❖ **National Waterway No. 1** – The Ganga (North India) The Ganga – Bhagirathi –Hooghly River System –[NW-1] connecting Haldia –Kolkata(Calcutta)-Farraka-Munger-Patna-Varanasi-Allahabad.

The NW-1 stretches to more than 1620 kms of potentially navigable waterways. River conservancy works, dredging day channel marking and marking and bandalling are carried out on a year to year basis. Provisions for 1.5-2m depth channels, right navigational facilities are in the process of implementation

National Waterway -2



Source: IWAI, 2004

❖ National Waterways No. 2 – The Brahmaputra(North –East India).

The river Brahmaputra connecting Dhubri – Sadiya /pandu(Guwahati)–[NW-2] – Tezpur – Neamati – Dibrugarh – Sadiya stretching to about 891 kms was declared a National Waterway in the year 1988. River conservancy works, dredging, day channel making and bandalling are carried out on a year to year basis. Provisions for 2m depth channels, night Navigational facilities are under consideration. An inland water transport transit and trade protocol exists between India and Bangladesh. The NW-2 connects the North East region with Calcutta and Haldia ports through Bangladesh and Sunderbans Waterways.

4. Objectives and Scope of Study

Project Objectives:-

The project objectives, as specified in the Terms of Reference, are to

1. Undertake a full evaluation of existing literature on the tidal and non-tidal IW , including Non peered – reviewed and grey literature ;
2. Establish the range of potential analogues (i.e. transferable values and approaches to measurement) for different beneficiaries and receptors.
3. Identify the likely median and upper and lower bounds of the analogues(transferable values) taking into account the double counting issues which often arise ;
4. Identify more areas where more data may be needed to augment what is currently available ; and
5. Establish a BT- based valuation framework, taking into account the Social, Environmental and Economic benefits of the IW.

Project Scope:-

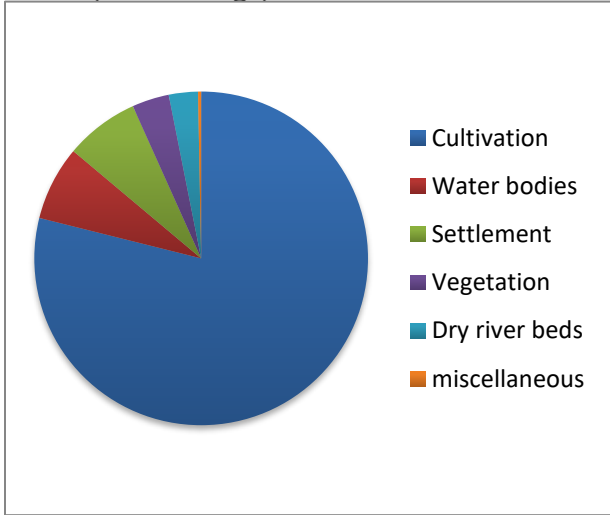
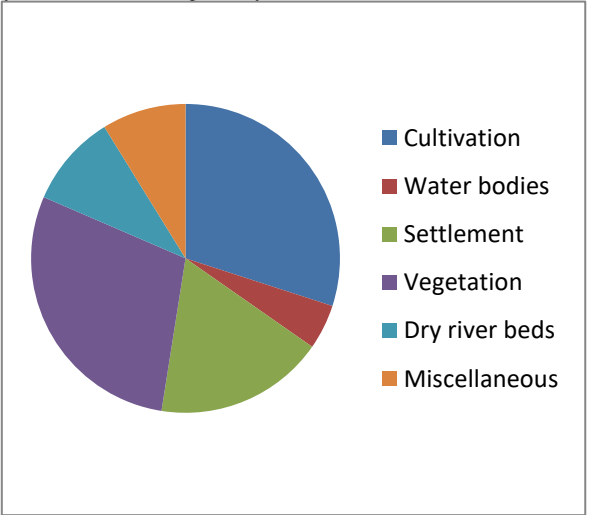
IW are defined for the purpose of this study as ‘Navigable tidal and non-tidal IW’ while the vast majority of IW in India are non - tidal , estuaries and other tidal stretches of IW represent an important element of the network. They provide significant benefits, in particular the international trading opportunities they offer.

1. Programme time is to generate a national value for the IW sector. The project however is focused on determining the best available transfer value.
2. The project is focused on collating and analyzing the current evidence rather than information on trends.
3. The project is also focused on the identification of unit monetary values for use in valuation and not on the collation of physical data which is required to aggregate these unit values up to estimate the full benefits of a project.
4. Importantly, this project is not expected to answer all the questions posed, but to set out a framework which can be used and developed by a range of stakeholder overtime. An important contribution of the project is therefore the framework, which provides a comprehensive list of benefits, an indication of the limitations on the use of available data and data gaps.

5. Report Outline

4.1 Details and costing of construction of NW-1 and NW-2 :-

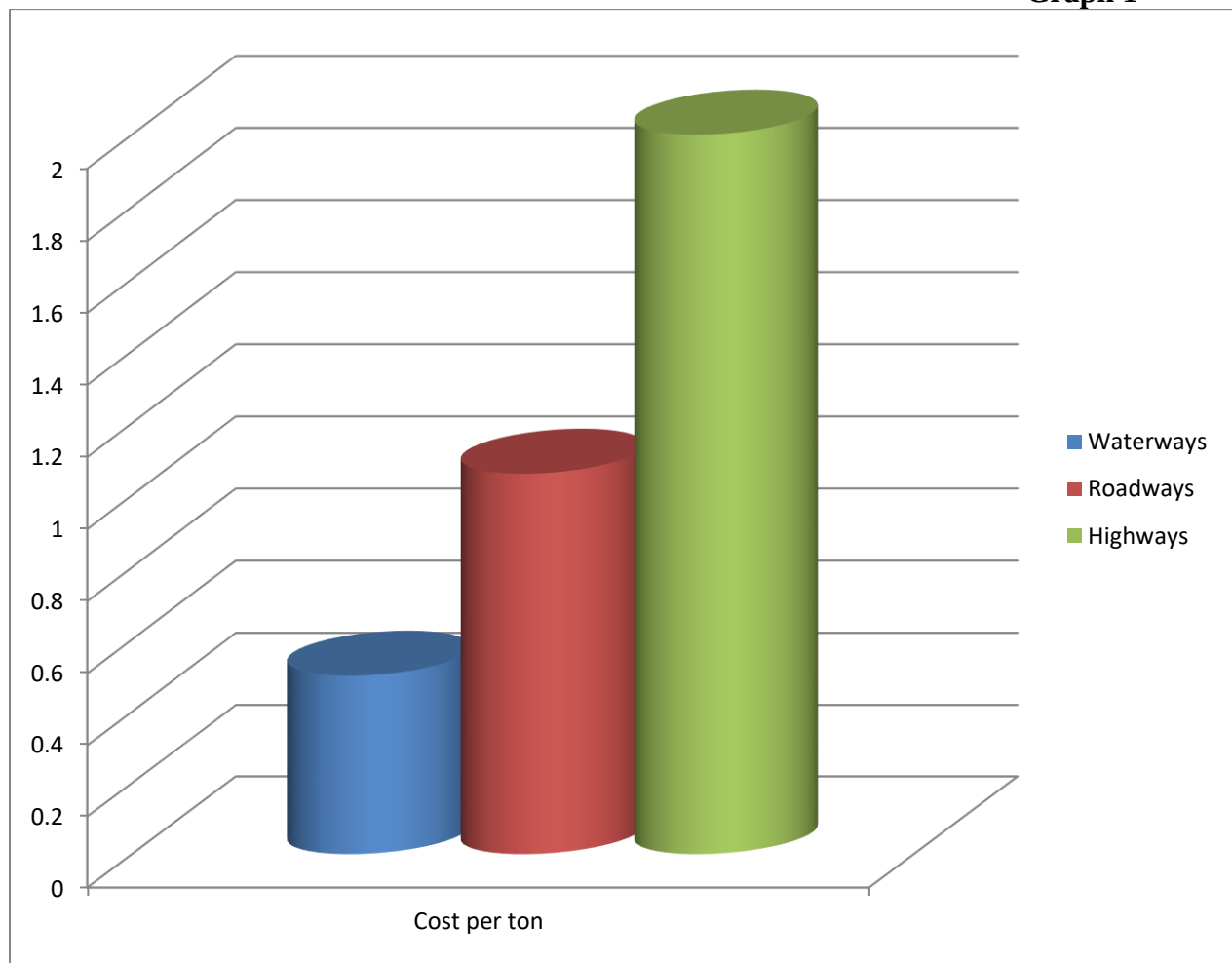
Table 1

NW-1	NW-2
1. Varanasi- Haldia stretch of the Ganges – Bhagirathi – Hooghly river system	1. Sadiya – Dhubri stretch of Bhrahamaputra river
2. Length = 1620 km (1010 mi)	2.Length= 891 km (554 mi)
3. Fixed terminals: - Haldia , BISN(Kolkata), Pakur , Farraka, Patna.	3.Fixed terminals :- Pandu
4. Floating terminals :- Haldia, Kolkata, diamond harbor , katwa , tribeni , baharampur m sumaria , doriganj , Ballia , Ghazipur ,Varanasi , Chunar and Allahabad	4. Floating terminals :- Dhubri , Jogighopa , Tezpur , Silghat , Dibrugarh , Jamgurhi ,Bogibil , saikhow, and Sadiya.
5. States interconnected :- • West Bengal • Bihar • Uttar Pradesh • Nearly Capital Regions [Delhi]	5. States interconnected :- • Assam • Meghalaya • Outer Regions of Arunachal Pradesh • Bangladesh Border
6. Cargo movement expected :- 4 million tonnes	6. Cargo movement expected :- 2 million tonnes
7. Cost: - Rs. 42,000 crores . (US \$650 million)	7. Cost :- Rs. 2590 crores (US \$ 210 million)
8. Land use within the influential area of NW-1 (River Ganga) :- 	8. Land use within the influential area of NW-2 (River Brahmaputra) :- 

5.2 Comparison with other mode of transport

According to survey data of ministry of Shipping of India, the cost of water transportation in India is barely 50 paise per ton per km for movement of cargo as compared to Rs. 1.06 by railways and Rs. 2.58 by roads. Hence, water transport is receiving significant attention in recent times since logistics cost of India is one of the highest among major countries. It is 18% in India verses 8-10% in China and 10-12% in European Union.

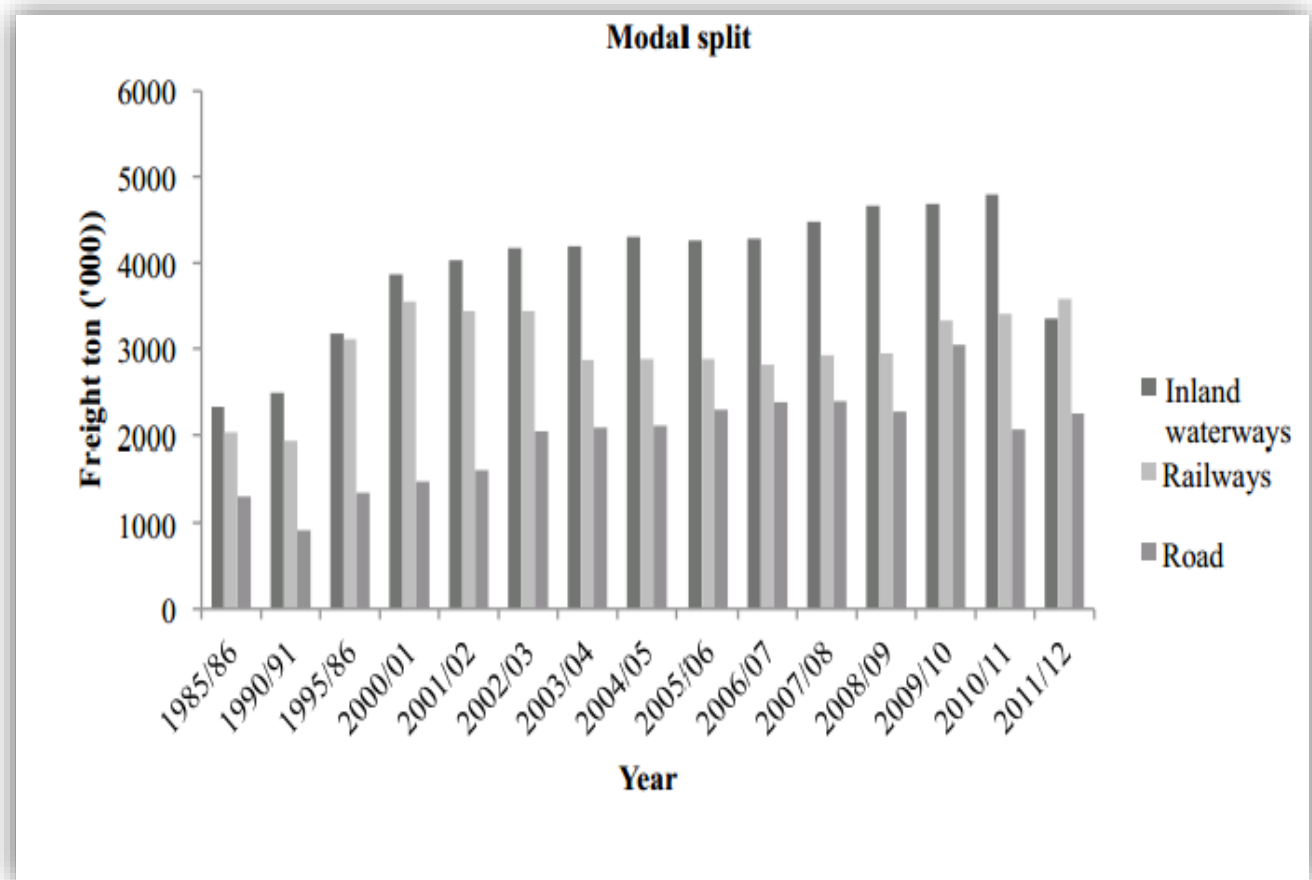
Graph 1



Recently, Modi government presented legislation in May that would grant the government rights to regulate and develop 101 channels across 24 states for shipping and navigation, in addition to the existing 4,382 km of five main waterways.

The Bill is likely to pass in the session of parliament starting in late November and minister spokesperson said his organization is preparing to kick off with feasibility studies and other Engineering aspects for the projects.

5.3 Year wise data variation



5.4 Comparison of distance transported for one tone of freight given the same energy input :-

Graph 2

Comparison of distances transported for one tonne of freight given the same energy input



Source: Federal Waterways and Shipping Administration

5.4 Comparison with roadways from inland waterways (NW-1 and NW-2):-

Table 2

Factors	Road		Inland Waterways	
	NW-1	NW-2	NW-1	NW-2
Distance	780 km	824.4km	1620 km	891km
Speed	60 km/hr	50 km/hr	10 knots (expected)	6 knots (expected)
Travel time	15 hrs	18hr 36 min	3 days	1.5 days

5.5 Least Available depth on NW-1:-

Table 3

Stretch	Distance	Least Available Depth
Allahabad to Ghazipur	370 km	1.2 to 1.5m (3.9 to 4.9 ft)
Ghazipur to Barh	290 km	2m (6.6 ft)
Barh to Farakka	400 km	2.5m (8.2ft)
Farakka to Haldia	560 km	3m (9.8 ft)

5.6 Least Available depth on NW-2:-

Table 3

Stretch	Distance	Least Available Depth
Dhubri - Dibrugarh	721.1 km	2m (6ft)
Dibrugarh - Sadiya	824.4 km	1.5m (4.9 ft)

5.7 Major challenges on NW-1:-

One of the major changes to development of NW-1 is braiding and meandering characteristics of River Ganga and the large fluctuation of water volume during the summer and monsoon months. The major challenges are:-

- Large fluctuation of water level from 16.5m (54 ft) at Allahabad to 2m (6.6 ft) at Farraka.
- Fluctuation of water velocity from 4m/s (8.9 mph) during flood session to 0.2 m/s (0.45 mph) during dry seasons.
- High silt load: - Ganga carries around 1600 million tones of silt manually.
- Shoal of island formation leading to splitting of main channel.
- Change of Navigation line due to lateral migration of river.
- Existence of power line pylons at varies locations.
- Existences of pontoon bridge are at significant threats to navigation about 7 pontoon bridge are present between Buxor and Allahabad which are in use.
- Existence of critical bridges with horizontal clearance less than 70m (230 ft) and vertical clearance less than 9m (30 ft).



5.8 Major challenges on NW-2:-

- **Poor visibility:-** Poor visibility owing to heavy rains and fog is a common problem faced by all Navigators in this region on the Brahmaputra on additional cause of poor visibility is the occurrence of storms owing to extensive and banks bared during the dry season which may be whipped up by strong winds from march.



- **Debris and Snags:-** The higher reaches of Brahmaputra, from (beyond) Sadiya to Dibrugarh and further downstream pose an additional problem of floating tree trunks and associated with flooding debris during seasons. It is understood that this is owing to trees uprooted from the Banks of tributaries being carried down by the flood water into Brahmaputra. These tree trunks and snags may be visible or partially submerged and thus can constitute a hazard to vessels through collisions and fouling of propellers. Similarly such debris on the bed and thus cause unexpected obstruction and danger to navigation.

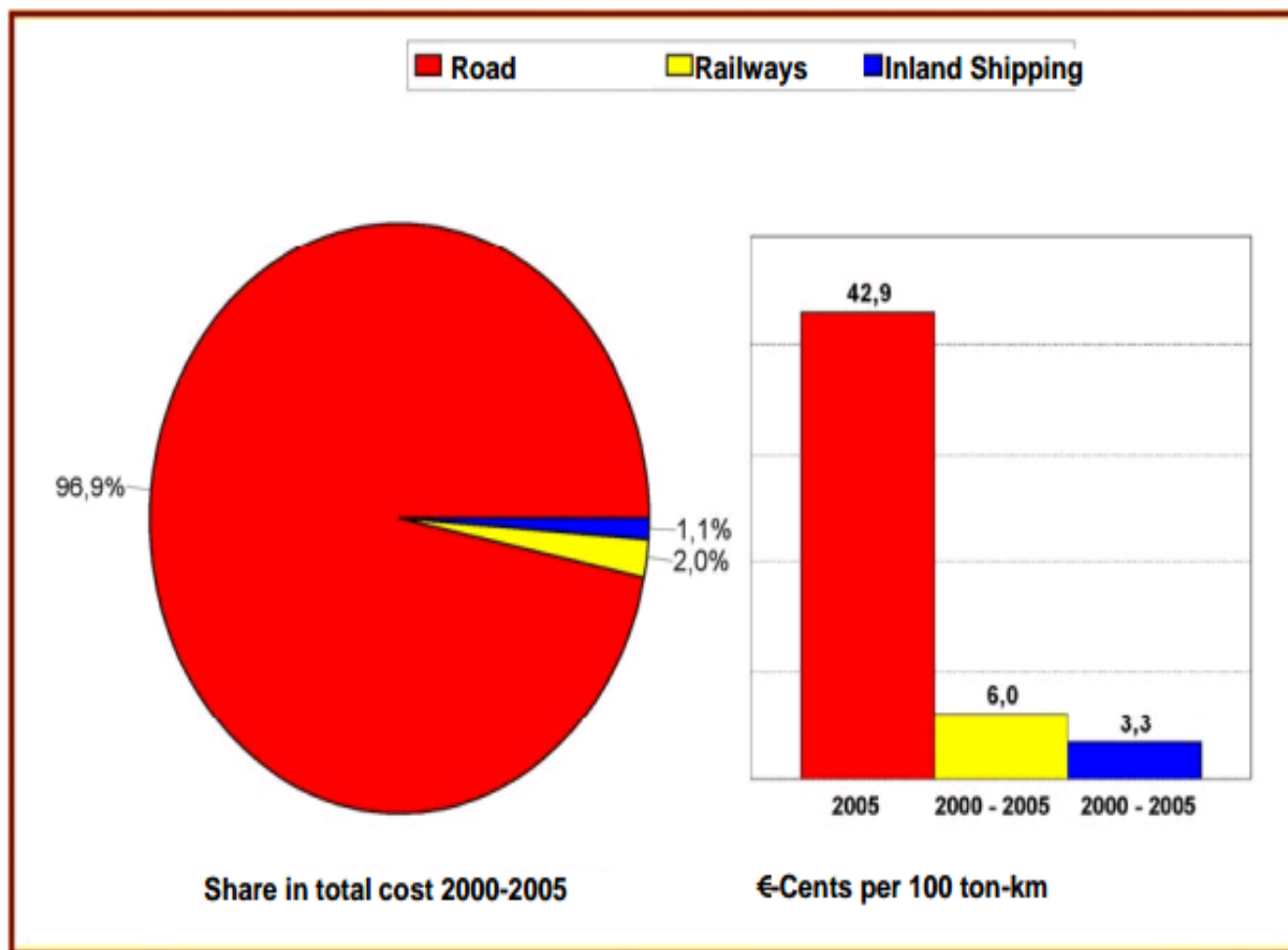
- **Velocity :-** The water current attains quite high velocities in Brahmaputra, especially in the monsoons quite high velocities, i.e. 3.5 to 4 m/s occur for a few hours or days at a time almost every year in the month of June to August as observed by different agencies at various locations and seasons. Sometimes high velocities may occur in late May or early September. These velocities are indeed too high for a vessel to navigate productively / safely whether proceeding down or upstream.

- **Wave Action:-** Normally, waves of any significant size (height and period) do not build up in inland waters because wave size is a function of many factors such as fetch, wind direction, velocity and duration etc. on a river, the fetch is rarely long enough owing to the turns and twists that its courses take as well as to the relative narrowness of the water course. However, in the case of Brahmaputra in flood or at high stages, there may be an extensive area of water which may facilitate the building of waves particularly during gales and cyclones, sufficient in size to endanger the inland vessels which are required to have relatively small free board (compared to coastal or sea going vessels). Obviously, little can be done to mitigate wave actions on the river.

5.9 Transport Safety:-

Current discussion on the comparison of external costs in freight transport often neglect the social cost of traffic accident fully. The calculations present in this study are based on significantly improved data, i.e. (2000-2005)

Graph 3



5.9 Present status of Indian inland waterways corridor (NW-1, 2)

- There is the inland water authority located in Noida, (NCR) which looks at policy and technical expertise. Then there are the Assam state inland water transport corporations in Assam, the Kolkata port trust, the container corporation of India and Central inland water Transport Corporation. All of them fulfil different roles but there is no single policy to ensure that they work in tandem and not in conflict with each other.
- Traffic has been steadily dropping: - The inter country level has gone down from 100,000 tons per year in 1995-96 was barely 40,000 tons in 2015. In addition of the 230 listed vessels in pandu(Guwahati) only 50 are in working conditions similar cases, had been reported in NW-1 region also. These factors have to be reviewed for the Brahmaputra and Ganga is a natural 365 day highway which needs for less maintenance expenses and running costs than either the road or the rail factors.

For transporting food grains, it costs

Rs 1.50 per ton / per km carried on the Railway.

Rs 1.20 per ton / per km carried on the Roads.

Rs. 0.90 per ton / per km carried on the Waterways.

In addition, IWT is extremely Energy friendly.

- A 10 ton truck needs 550-600 litres of diesel to drive from Kolkata to Allahabad; this to a 1500 ton barge which can carry the equivalent of 150 such trucks and consumes 35 litres of diesel for every km (70,000 litres of diesel for same distance). If 150 trucks were to travel this distance, they would consume the equivalent of 90,000 litres of diesel. This is substantial saving and IWT should be promoted for this one reason.
- The inland water transport authority, the pre-eminent national level authority for waterways does the Navigation routes marked on maps, which uses a survey vessel for the purpose. However, the state level counterpart of the IWTA does not have adequate vessels or equipment to conduct similar or at least supportive studies.
- Route maps are not available with most vessels, whether they are playing either over long or short distances.
- A proposal has been made by ministry of transport , to connect NW-1 , corridor i.e. (Allahabad – Varanasi) stretch to national capital region by effective transport mode so that cargo can be reached effectively to capital and nearby region which is most consumable area of goods.
- An advisory board committee has been made which regulates inspection and mandatory research about the entire rain catchment / river drainage area of the river and its tributaries and make specific proposals for tapping the energy level and reducing the floods.

6. Benefits of Inland Waterways

- It will be recognized as a fuel efficient, cost effective and environment friendly mode of transport.
- The statutory status to the inland waterways would pave the investments in inland waterways transportation sector which has been neglected in the past.
- It would provide a cheaper mode of transport and reducing traffic burden and congestion on the roads and railways.
- It would play pivotal role in reducing logistics cost of transportation of goods and ultimately lead to reduction in their price in the market benefiting trade , industry , farmers , fisherman.
- It will provide a significantly boost to our honorable Prime minister Narendra Modi dream's project "*Namami Ganga Yojana* ". Being clean mode of transport ion ,it will also help in reducing pollution.
- It will generate employment in the dense populated state areas like Bihar, UP,WB,Assam etc this will cause development of youth and indirectly gain in GDP of country

7. Specific aspects of these Inland Waterways corridors

The dominate use of waterways is for transport of people or freight at low cost and without delay while roads and railways have no important other functions , waterways also serve other purposes : -Flood abatement , portable water supply , wastewater disposal , irrigation , cooling water for power plants , fishery , support of ecological biotopes , recreation.

- **Biotope Functions:** - In contrast to asphalt bands of road or permanent ways of Railways, Waterways can be habitat of multiple and valuable Natural life, depending on their level of technical sophistication. This is substantiated by high number of waterside registered FFH and EV bird protection areas , Different from load and railway lines , waterways are among the last retreats for protected and enlargement species.
- **Water tourism , water sports , recreation , fishery :-**
Waterways played an important role for the development of industry still today waterways have a positive impact on regional development. This is also due to manifold potential of waterways to be used for water tourism and recreation.
In view of growing domestic tourism (with a recent growth of 2%) and of an increasing tendency to activate port and other war side areas for recreational purposes, water tourisms (especially boat tourism and passenger shipping) has become an important factor for regional development.
- **Water management :-**
Water management deals with water distribution and supply, waste water treatment, water quality control, construction and maintenance of water bodies and flood protection of societies. A technical task comprises construction works and operation, while water management is based on natural and socio – economic sciences.
- **Climate change and flood protection :-**
Rivers and water basins as well as coastal regions are the object of multiple and conflicting uses. The use of waterways by the shipping industry is only one of these. This use requires reliable conditions for a safe, smooth and economical operation of vessels.

This includes fairways which are as stable as possible and which offer sufficient depth and width at only moderate currents.

The impact from any physical change of waterways on hydraulic and morphological conditions for flood discharge is analyzed scientifically in order to find solutions which maintain the existing level of flood protection.

8. Recommendations:-

The study therefore recommends the following to Government of India and the various governing authorities for NW-1 and NW-2 corridor:-

- Improvement and modernization of vessels with installation of basic, equipment required for safe travel, such as better engines and better designed crafts, sonar, wireless communications, life jackets and life insurance for crew members. It is not within the competence of this group to make exact technical assessments but we come to some basic conclusions based on discussion in the area, in Kolkata and New Delhi as well as document from different parts of the world.
- The setting up basic facilities on shore. This study has focused on two major parts and their developments and makes specific proposals for Hooghly, Allahabad and Dibrugarh ports, as their main discharge and receiving ports.
- The majority of the traffic on NW-1 is centered on the inland water port of Kolkata. The traditional base of commercial operations, the barge owners, the CIWTC and the major shipyards and repair facilities are all based in Kolkata. Therefore, some potential project required for project based movement of construction material on the stretches of the Ganga upstream. There is also a major problem of non-availability of draft to operate vessels of sufficient size in economical manner. Therefore, traffic appears to be a secondary concern although because of years of decline in the sector. So, some investment required by organizations as well as the improvement in existing facilities in the sector including the performance of Rajabagaon dockyard and introduction of fixed schedule operation to gain the confidence of shippers and customers and some new potential traffic including international trade with Bangladesh.
- As per the survey data of ministry of shipping, the area of tourism related IWT has seen growth in recent years with cruises and other types of launches on Brahmaputra. Therefore, government authorities should run charter vessels in this area to increase revenue.
- It will also provide boost to the programme run by Hon'ble PM Narendra Modi dream project "*Namami Ganga Yojana*" by achieving their goals and perspectives.

9. Conclusion:-

This paper presents a comparative study of inland waterways corridor [NW-1, NW-2] with other mode of transport as well as their impact on the employment of that area which is directly correlated with the development of country.

In this paper, the competitiveness has been explored for the cost perspective of the operators and has focused only on the main routes of NW-1 and NW-2. Further study can be done from the total cost perspective of the shippers which will capture the full picture of competitiveness among road and inland water transport mode and transit time for door to door delivery. Moreover, as rail network as also in the similar with road network, a comparison between rail and road will give more comprehensive information beneficial for transportation planning of the country.

10. Acknowledgment

We also extend our sincere thanks to our worthy Mentors **Prof. Mr. Arun. O. Mahajan** and **Cdt. Milind Basson** for their guidance and support and for putting their precious time and efforts for the successful completion of paper.

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