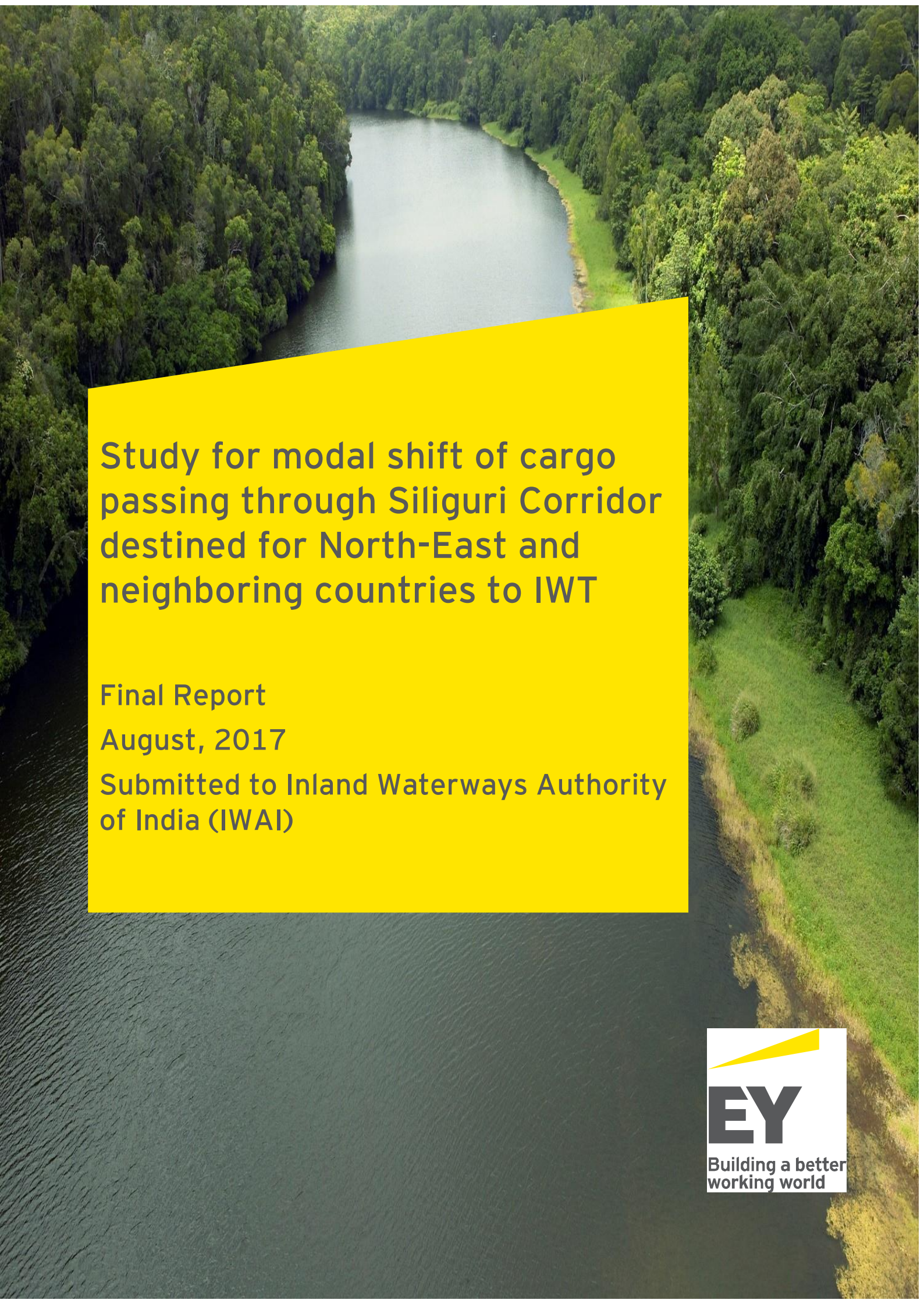

Study for modal shift of cargo passing through Siliguri Corridor destined for North-East and neighboring countries to IWT

Final Report

August, 2017

Submitted to Inland Waterways Authority of India (IWAI)

Building a better working world

Contents

List of Figures

List of Tables

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EXECUTIVE SUMMARY

Executive Summary

Project Overview

In 1985 through the 'Inland Waterways Authority of India Act, 1985', Inland Waterways Authority of India was set up for regulation and development of inland waterways in India. The sector was initially dependent only on budgetary allocation, however, a lateral shift in investments and focus since 2014 has established development of inland waterways as a national priority. Of the 111 waterways notified under the National Waterways Act (2016), the 891 km stretch from Dhubri to Sadiya notified as National waterway-2 holds paramount importance not only in terms of its domestic outreach but also in terms of serving neighboring countries like Bhutan, Bangladesh, Nepal and Myanmar.

At present, the movement of cargo into and out of the North-East is facilitated through the Siliguri Chicken's Neck Corridor. This narrow corridor is geographically located in the state of West Bengal and is the only piece of land to access the 8 states of the region. Moreover, the corridor is strategically placed to serve neighboring countries like Bangladesh, Bhutan, Myanmar and Nepal. There is increasing pressure on the corridor owing to the increase in growth and developmental activities in the North-East. In order to ease the incumbent pressure on the corridor and provide alternative means to access the north-east region, IWAI intends to explore the cargo potential that can be potentially shifted for movement through waterways. National waterway-2 provides an environment friendly and cost effective mode of transportation. At the same time, it enhances accessibility of the region by connecting it to major ports like Kolkata and Haldia via the Indo-Bangladesh Protocol Route.

Project Influence Area (PIA)

The Project Influence Area (PIA) can be defined as the zone of influence where the project can offer maximum benefits to its stakeholders. With reference to National Waterway-2, the PIA is divided into 6 clusters namely Joighopa, Guwahati, Dibrugarh, Shillong, Arunachal Pradesh and Tripura. The influence area is marked with the presence of fertilizers, cement & clinker, paper, bamboo, tea, oil refineries and food processing industries. It is also endowed with minerals like coal, limestone and oil reserves.

The region is well connected via a network of national highways and broad gauge rail network. National Highway 31C connects the region to Jalpaiguri via Cooch Behar district in West Bengal. A broad gauge double line connects the region to Bardhaman in West Bengal. The network extends upto Tripura via single broad gauge railway network.

In terms of waterways connectivity, National Waterway-2 runs across the state of Assam connecting lower to upper Assam. It connects the region to West Bengal via the Indo-Bangladesh Trade Protocol Route. At present, Pandu (Guwahati) is the only inland waterway port in the region.

Market Analysis

The overall market size prevalent in the region was arrived at using a combination of primary interactions and data from secondary sources (reports published by state departments, Planning Commission and research publications on various industry segments). The information collected was validated during interactions with stakeholders including cargo owners, transporters and logistics service providers. Also, site visits in the PIA were undertaken at goodsheds managed by Indian Railways, state border points, waterway terminals and ICDs to understand the overall cargo profile and current service levels offered.

Based on the above approach, total cargo volume moved into and outside the PIA is estimated to be around ~ 49 MTPA. Along with this around 90,000 units of automobiles and two wheelers are also moved into the PIA. Around ~ 30 MTPA of cargo moves within the PIA which essentially includes agricultural & horticultural commodities. The key commodities identified on the basis of their movement:

Movement	Volume (in MTPA)	Key Commodities
Into the PIA	~ 25 MTPA + 90,000 units of automobiles (two and four wheelers)	Household goods, foodgrains, fertilizer raw material, tar coal/ bitumen, imported coal, pharmaceuticals, iron & steel, fly ash, edible oil and other commodities
Outside the PIA	~ 24 MTPA	Limestone, silicon, PoL and crude, tea, fertilizers, agricultural & horticulture commodities
Within the PIA	~ 30 MTPA	Foodgrains, cement & clinker, PoL and crude, domestic coal, fertilizers and other miscellaneous commodities (essentially primary commodities)

Table 1 Project Influence Area - Commodity wise

Market Trends

Subsequent to the assessment of overall market size, the transport supply chain for the key commodities were mapped. Commodities that constitute around 80% of the overall market size have been taken into consideration. The remaining market is extremely fragmented, characterized by small players and moves primarily by road considering their small lot size. The existing transport supply chain is compared with that incorporating inland waterways. The origin and destination terminal was identified based on the origin-destination pairs of the commodity.

Transport supply chain is assessed under three price scenarios. The scenarios were arrived at through interactions with vessel operators and IWAI officials. Based on the comparison of transport supply chains, commodities suitable for diversion to waterways were identified along with the additional services that would be required to attract the cargo. They are further segregated based on the ease with which they can be attracted to inland water transport. The summary is presented in the table below:

Commodity	Volume (in MTPA)	Services Required
Foodgrains	~ 1.5	▶ Transit warehousing facility at proposed Haldia multi-modal terminal for FCI ▶ Point of aggregating cargo for local 'mandi' players ▶ Dedicated warehousing at destination IWT terminal, provision of silo storage (Encouraging private players by way of FCI's Private Entrepreneur Guarantee Scheme)
Tar Coal/ Bitumen	~ 0.6	▶ Transit warehousing facility at proposed Haldia multi-modal terminal for IOCL ▶ Movement of bitumen could be facilitated in bulk form and tinning facilities to be provided at destination terminal as a value add service
Fertilizers & FRM	~ 0.35	▶ Transit warehousing facility at proposed Haldia multi-modal terminal ▶ Storage facility at destination terminal.
Edible Oil	~ 0.3	▶ Transit warehousing facility at proposed Haldia multi-modal terminal for dealers; terminal would also act as a cargo aggregating facility ▶ Movement of edible oil could be facilitated in bulk form and tinning facilities to be provided at destination terminal as a value add service
PoL products	~ 0.15	▶ Transit warehousing facility at proposed Haldia multi-modal terminal

Commodity	Volume (in MTPA)	Services Required
		▶ Storage facilities at destination IWT terminal
Imported Coal	~ 0.05	▶ Transit warehousing facility at proposed Haldia multi-modal terminal
Stone Chips	~ 3-4 MTPA	▶ Facilitating stone chips movement from Jogighopa terminal ▶ Adequate handling requirement to handle specified cargo ▶ Specific terminal design
Cement & Clinker	~ 1 MTPA	▶ Outward movement from North-East towards Bangladesh ▶ Policy intervention by way of relaxing export duties
Fly Ash	~ 1 MTPA	▶ Integration of NW-2 with NW-1 via Indo-Bangladesh Protocol Route ▶ Freight incentives on IWT ▶ Specialized handling at terminals
Automobiles	~ 15,000-18,000 units	▶ Policy intervention by way of freight incentives on coastal movement of automobiles ▶ Freight incentives on IWT ▶ Parking facility at destination terminal ▶ Development of IWT as a local distribution hub for North-East

Table 2 Significance of services- Commodity wise

Need for Inter-Modal Terminals

An assessment of the transport supply chains in the PIA reveals that the modal shift of cargo will not only be governed by cost parameters but also by the additional level of services offered. Change of mode would not only require interventions in terms of ensuring navigability, fairway development and round-the-clock navigation but also upgradation of infrastructure that act like windows to access the waterway channels. Efficient handling facilities specific to cargo streams, services like warehousing, consolidation, distribution, inventory management, delayed packaging, ensuring safety and security of cargo would also be key determining factors governing modal shift.

At present, the overall logistics services and facilities in north-east require significant improvement. This is essentially due to the lack of intra-regional connectivity, fragmented industry and dispersed growth of cargo and associated services. Mapping the connectivity, cargo potential and need for additional services, two locations namely Jogighopa and Silchar are identified to develop as multi-modal hubs. The potential volume of the Multimodal Logistics Parks (MMLP) that need to be developed in these clusters is summarized in the table below:

Terminal Location	Volume (in MTPA)	Clusters Served
Jogighopa	~ 6 MTPA + 11,000-12,000 Automobile units	Upper Assam (Dhubri, Barpeta, Goalpara, Kokrajhar, Udalgiri, Nalbari, Bongaigaon, Chirang, Sibsagar, Jorhat, Golaghat, Lakhimpur, Kamrup, Kamrup Metro, Marigaon, Baksa, Darrang, Dibrugarh, Tinsukia, Dhemaji, Nagaon, Sonitpur, Karbi Anglong), Meghalaya, Arunachal Pradesh, Nagalnd
Silchar	~ 0.9 MTPA + 5,000-6,000 units of Automobiles	Lower Assam (Dima Hasao, Karimganj, Cachar and Halaikandi), Manipur, Mizoram, Tripura

Table 3 Proposed Inland water Terminal -Jogighopa and Silchar

Apart from MMLPs, locations for development of inter-modal terminals were identified. The inter-modal terminals are essential from the stand point of serving the clusters nearest to them. While the MMLPs act as hubs, the inter-modal terminals are the spokes that they serve. The locations identified for inter-modal terminals along with the clusters they would serve is presented as follows:

Cluster served	Terminal Location
Upper Assam- Dhubri, Barpeta, Goalpara, Kokrajhar, Udalgiri, Nalbari, Bongaigaon, Chirang	Jogighopa
Upper Assam- Sibsagar, Jorhat, Golaghat, Lakhimpur	Neamati
Upper Assam- Kamrup, Kamrup Metro, Marigaon, Baksa, Darrang	Pandu
Upper Assam- Dibrugarh, Tinsukia, Dhemaji	Sengajan/Dibrugarh
Upper Assam- Nagaon, Sonitpur, Karbi Anglong	Silghat
Meghalaya	Pandu
Nagaland	Neamati
Arunachal Pradesh	Tezpur

Table 4 Cluster wise terminal location

Market Development

Subsequent to the identification of commodities suitable for movement through waterways and the associated services required to attract them, the future potential was assessed based on their drivers for future growth. Growth drivers for the identified commodities are:

- For foodgrains, population is the key growth driver. Based on the past trends, an anticipated growth rate of 1.8% in population is considered.
- For cement & clinker, infrastructure development is the key demand driver. The growth of this commodity is linked to the national GDP. Therefore, a multiplier of 1.2 based on the data obtained from industry associations was considered.
- For fertilizers & FRM, the reports published by Department of Fertilizers, Government of India was taken into consideration. The report projects anticipated growth till FY 2030, beyond that a CAGR of 2% is considered based on previous trends in growth patterns.
- For tar coal/ bitumen, infrastructure development is the key demand driver. The growth of this commodity is linked to development plans for the region. A multiplier of 1.4 was considered to assess the future potential.
- Fly ash is used as an input in cement industries and its growth is directly linked to the capacity augmentation in the region. Currently, the plants in the region are operating at a capacity utilization of around 70%, based on interactions with local players it is assumed that they would operate at their capacities across the study period.
- For edible oil, population growth was considered as it is a consumable. Based on the past trends, an anticipated growth rate of 1.8% in population is considered.
- Imported coal is used as an input in cement industries and its growth is directly linked to the capacity augmentation in the region. Currently, the plants in the region are operating at a capacity utilization of around 70%, based on interactions with local players it is assumed that they would operate at their capacities across the study period.
- For PoL and Crude, Vision Document 2030 for North-East published by Ministry of petroleum and Natural gas was taken into consideration.
- For stone chips, infrastructure development is the key demand driver. They are supplied by Bhutan to Bangladesh. It is directly linked to national GDP. Thus, an infrastructure multiplier of 1.2 was considered to assess the future potential.
- For automobiles, population growth is taken into consideration. Based on the past trends, an anticipated growth rate of 1.8% in population is considered.

Out of the overall volumes, the divertible potentials follows from the analysis conducted in market trends chapter. This is based on overall logistics cost and O-D pairs of the corresponding commodities. The percentage volumes that could potentially get diverted is considered to be the same across the study period. The potential volumes that could be diverted to waterways are presented as follows:

Volumes	FY 2017	FY 2020	FY 2023	FY 2026	FY 2029	FY 2032	FY 2035	FY 2038	FY 2041
Foodgrains (in MTPA)	1.55	1.56	1.58	1.59	1.61	1.63	1.65	1.67	1.69
Cement & Clinker (in MTPA)	-	1.11	1.33	1.44	1.44	1.44	1.44	1.44	1.44
Fertilizer & FRM (in MTPA)	0.37	0.41	0.46	0.52	0.57	0.64	0.70	0.77	0.85
Bitumen (in MTPA)	0.63	0.81	1.05	1.37	1.81	2.39	3.18	4.25	5.72
Fly Ash (in MTPA)	1.67	1.75	1.82	1.91	2.00	2.09	2.18	2.28	2.39
Edible Oil (in MTPA)	0.26	0.28	0.30	0.31	0.33	0.35	0.37	0.39	0.42
Imported Coal (in MTPA)	0.05	0.05	0.05	0.06	0.06	0.06	0.07	0.07	0.07
PoL products (in MTPA)	0.18	0.21	0.21	0.22	0.20	0.23	0.25	0.27	0.29
Stone Chips (in MTPA)	4.00	5.00	6.00	9.00	12.00	16.00	22.00	30.00	41.00
Automobiles (in units)	17,220	18,007	18,829	19,689	20,589	21,529	22,512	23,541	24,616

Table 5 Commodity projection FY2017- FY 2041

Based on the market assessment it is likely that ~ 8 MTPA of cargo could be attracted to waterways, of which ~ 3 MTPA could be easily attracted while the remaining would need interventions at various levels in terms of freight incentives, service level offerings, effective integration with National Waterway-1 and regulatory interventions. It is essential to note that in order to ensure sustained movement of cargo through waterways, the navigation channel and fairway development would have to be maintained. To make it commercially viable round-the-clock navigation would be required in order to increase the vessel turnaround time. Efficient logistics services not only depend on development of channels but also on accessibility of the same through multi-modal and inter-modal terminals. Through this report, Jogighopa and Silchar are identified as potential locations for development of MMLPs. A pre-feasibility for the two locations would govern its viability which would be addressed in the next submission, subject to contractual agreement with IWAI.

Introduction

Inland Waterways Authority of India (IWAI) was set up under the 'Inland Waterways Authority of India Act, 1985' for regulation and development of Inland Waterways for the purposes of shipping and navigation. IWAI is primarily responsible for development, maintenance and regulation of Inland Water Transport (IWT) in the country and specifically for National Waterways (NW). Since its inception in 1986, around USD 200 million was spent on development on waterways through which 5 river systems namely Bhagirathi-Hooghly, Brahmaputra, West Coast Canal, Kakinada to Puducherry canal and Brahmani & Mahanadi delta along with East Coast Canal could derive the status of National Waterways. This was essentially due to increased focus on development of roadways and railways. However, a shift was observed in 2014 wherein the importance of waterways was soon being realized. This led to the announcement of several marquee projects like the Jal Marg Vikas Project and the National waterway Act (2016) where all the 111 waterways in the country were declared to be National Waterways.

Correspondingly, in 2014 the Look East Policy announced by the government recognized the strategic importance of the North-Eastern region of the country. The region shares its borders with China, Myanmar, Bangladesh, Bhutan and Nepal. Traditionally, it has held extreme importance in terms of facilitating cross-country trade and rivers have played an important role in the same. However, at present almost all land based trade to the North-east takes place through the Siliguri Chicken's Neck Corridor which is located in the state of West Bengal. The corridor has an approximate width of 33 km on the eastern end and 21 km on the western end. Almost all land based trade destined towards North-east is facilitated through this narrow stretch of land. Moreover, the corridor holds extreme importance for trade between India-Bhutan, Bhutan- Bangladesh and India-Nepal. With a view to strengthen trade ties with neighboring countries, increase accessibility to North-Eastern states via alternative routes, reduce logistics roadblocks leading to impediment of industrial development and reduce the existing pressure of traffic on the Chicken's Neck Corridor, efforts are being made to develop NW-2.

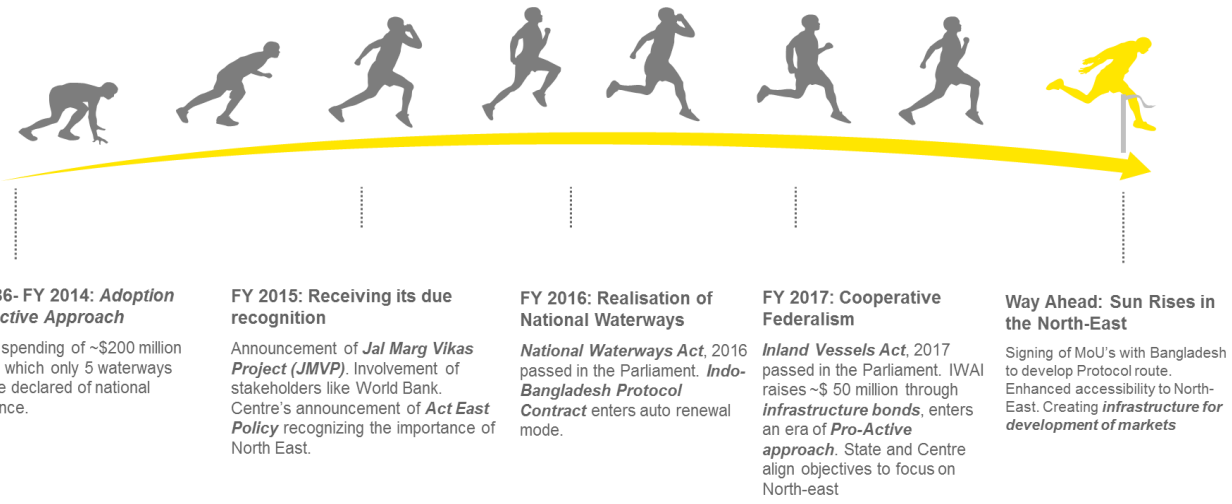

Figure 1 IWAI journey

National Waterway-2 or the stretch from Dhubri to Sadiya of River Brahmaputra flows across the state of Assam. However, it is directly connected to important ports like Haldia and Kolkata on the east coast via the Indo-Bangladesh Protocol route. The protocol route is also important as it reduces the distance between the states located in the eastern coast of the country with those like Tripura, Manipur and Nagaland. In order to make use of the potential of the same, the Government of India has signed multiple MoUs with the Government of Bangladesh to ensure navigability in the stretches to improve trade flows.

In view of understanding the potential of National Waterway-2 (recognized in cognizance with Indo-Bangladesh Protocol Route), IWAI has awarded the study to assess the commodities that can be diverted to IWT mode. The objective of the assignment is as follows:

- Identify existing cargo movement through Siliguri Corridor (Chicken's Neck) in all directions.
- Identification of cargo which can be diverted to IWT & destined for North-East and neighboring countries
- Identify disadvantages / bottlenecks of land based movement which can be a contributing factor for switch to IWT.
- Determine a comparative economics vis-a-vis different cargo transportation modes.
- Based on vicinity to IWT mode of originating/ destination points and viable economics, assessment of cargo which can be shifted to IWT.
- Modalities to promote waterways transportation and road map to effect modal shift.
- Prepare projections for the corresponding cargo stream for the next 25 years

To achieve the objectives of the assignment, Ernst & Young LLP undertook the assessment of the influence zone through a combination of secondary and primary research. This included understanding of the existing freight market prevalent in the region (in terms of cargo profiles, value chain, key stakeholders, current mode of transport etc.), projection of anticipated freight market across the study period of 25 years. This was performed taking into account the future developments and thereby consider shifting the cargo to IWT mode through a combination of various strategies based of the logistics requirements of stakeholders, logistics service offerings and policy implications. A series of stakeholder interactions, site visits and secondary data bases were used to assess the cargo streams.

Subsequent to the kick-off meeting, the inception report was submitted on January, 2017. At this stage, the consultant is submitting the Final Report on the Study of modal shift of cargo passing through the Siliguri Chicken's Neck Corridor. The report covers the following areas:

- Identification of ***Project Influence Area*** for the proposed development, identification of key industries, connectivity analysis.
- ***Market Analysis***- Understanding of the existing domestic and international freight market, existing freight patterns, corresponding freight costs, modal split.
- ***Market Trends***- Conducting transport supply chain analysis for the cargo streams, comparison with modified supply chain incorporating IWT. Identifying the streams suitable for movement through IWT mode.
- ***Market Development***- Identification of key enablers that would lead to the switch from existing mode to IWT. Preparation of Marketing Plan for IWAI, need assessment for multi-modal/inter-modal terminals along the waterway network.

1. Appraisal of the Siliguri (Chicken's Neck) Corridor

Siliguri Corridor, also known as the Chicken's Neck is located in the Indian state of West Bengal, serves as the only land connection between India's north- eastern states to the rest of India. The corridor not only connects the north eastern states to the country but also is a gateway to Bangladesh, Nepal and Bhutan. Since most of the land based transit towards North East from rest of the country is through this corridor, it has significant economic, political, and strategic importance.

In terms of facilitating domestic and international trade, this corridor holds immense importance. It is considered that location of Siliguri Corridor is extremely vital for inbound and outbound freight cargo and for transportation to North East Region, Nepal, Bhutan, Bangladesh and Myanmar. Trade in the region to/ from various locations is primarily through railway and road. Transportation of essential goods like coal and petroleum products from North Eastern Region to all over India mainly by Rail network.

Importance of this region in overall trade and commerce of the country is reflected from the fact that the North-Eastern states have received FDI equity of USD 94 billion in 2015-16 and also that industrial development of all the states indicate the inherent potential to grow. Trade routes like Indo- Bangladesh Trade Protocol routes, East West corridor, Trans- Asian Highway etc. add value to the trade and transportation between supply centres located all over India to Bangladesh, Myanmar, Nepal and Bhutan and surrounding region.

1.1 Geographical reach of the Corridor

As a gateway to the North-east, both rail and road network pass through the Chicken's Neck Corridor. In terms of rail based connectivity, the connectivity of Broad Gauge line from Malda to Jalpaiguri and Siliguri is of significant importance for Siliguri Corridor. The rail connectivity till Dibrugarh passes through central Assam which further connects industrial growth centres of Silchar and Tripura. The national and state highway network complement the other modes and augments connectivity of the region.

In terms of road-based connectivity, NH-31 connects Siliguri to Guwahati in Assam, which is one of the most critical highways in the region. Additionally, 4-lane East West Corridor passes through this corridor and connects Srirampur and Silchar in Assam, covering major industrial centres. The road connectivity map with key national Highways is presented in the figure below:

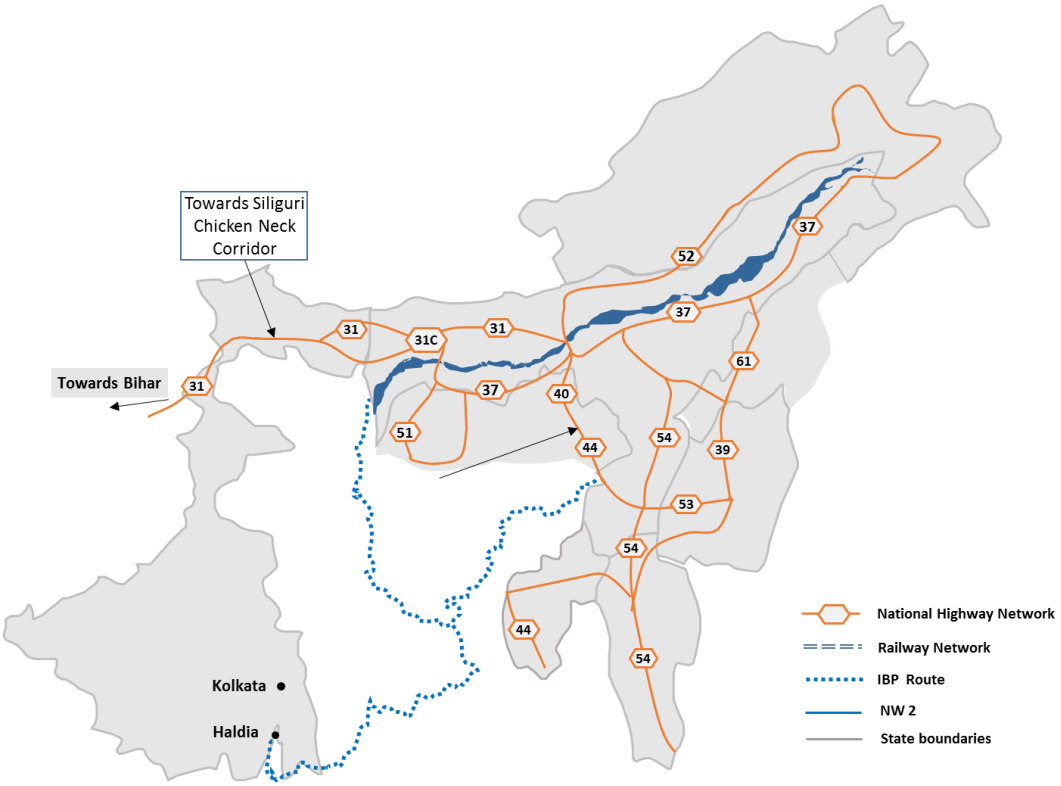

Figure 2 Highway Network in North Eastern Region

In terms of rail connectivity, a double line broad gauge line connects lower Assam to parts of Bengal and other parts of the country. The connectivity within the region is facilitated through a single line broad gauge which extends upto Tripura. The rail network along with the important goodsheds are presented in the figure below:

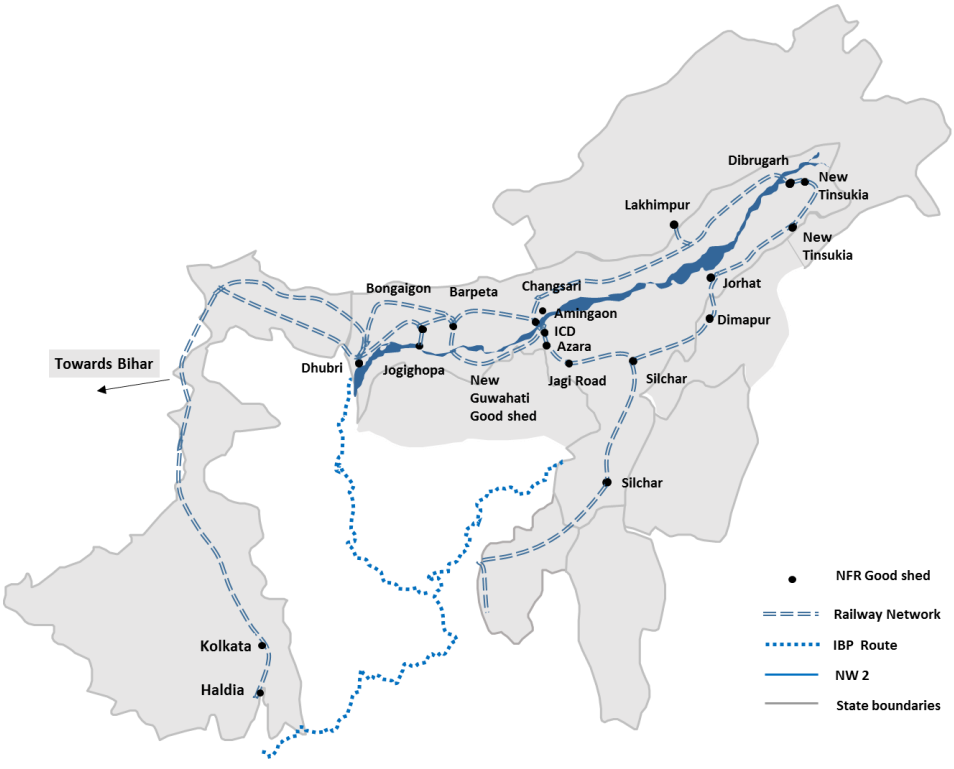

Figure 3 Railway Network in North Eastern Region

2 Project Influence Area (PIA)

The Project Influence Area (PIA) can be defined as the zone of influence where the project can offer maximum benefits to its stakeholders. With reference to National Waterway-2, the production and consumption clusters around the waterways have been taken into consideration. While determining the project influence area, the connectivity facilitated by the Indo-Bangladesh Protocol Route has also been taken into consideration. Accordingly, this chapter aims at identifying potential industries and consumption clusters for the project, by developing an understanding of the Project Influence Area (PIA).

This chapter gives an essence of the PIA profile, highlighting the key cargo streams available in the clusters. The clusters have been identified using the following sources:

- Data collected from various sources including state industry reports available on the respective websites, Indian Brand Equity Foundation, National Transport Development Policy Committee reports, previous studies by Inland Waterways Authority of India amongst various other sources.
- Further to the secondary research, the data/information has been validated by undertaking site visits and interaction with stakeholders/ project beneficiaries including transporters operating in the region (to understand the commodities origin-destination of cargo), cargo handling facilities (to understand the commodities and volumes handled).

Accordingly, the chapter has been organized in the following sections:

- Project Influence Area
- Hinterland Connectivity

2.1 PIA of Proposed Project

As understood based on the previous chapter, the North-Eastern states namely Sikkim, Assam, Meghalaya, Manipur, Nagaland, Arunachal Pradesh, Tripura and Mizoram are connected to the rest of the country via the Siliguri Chicken's Neck Corridor. It is well connected via a network of national and state highways and broad gauge rail network.

The region is rich in its variety of agricultural and horticultural based products. In terms of natural resources, the region is endowed with minerals like coal and limestone which form the backbone of cement & clinker industry. Bamboo which is available in abundance especially in parts of Assam and Tripura is used as a raw material in paper and handicraft industry. Apart from the ones mentioned above, commodities like tea, beetlenut leaves, cashew, ginger and a variety of spices move out of the region. The figure below summarizes the overall industrial profile of the North-East.

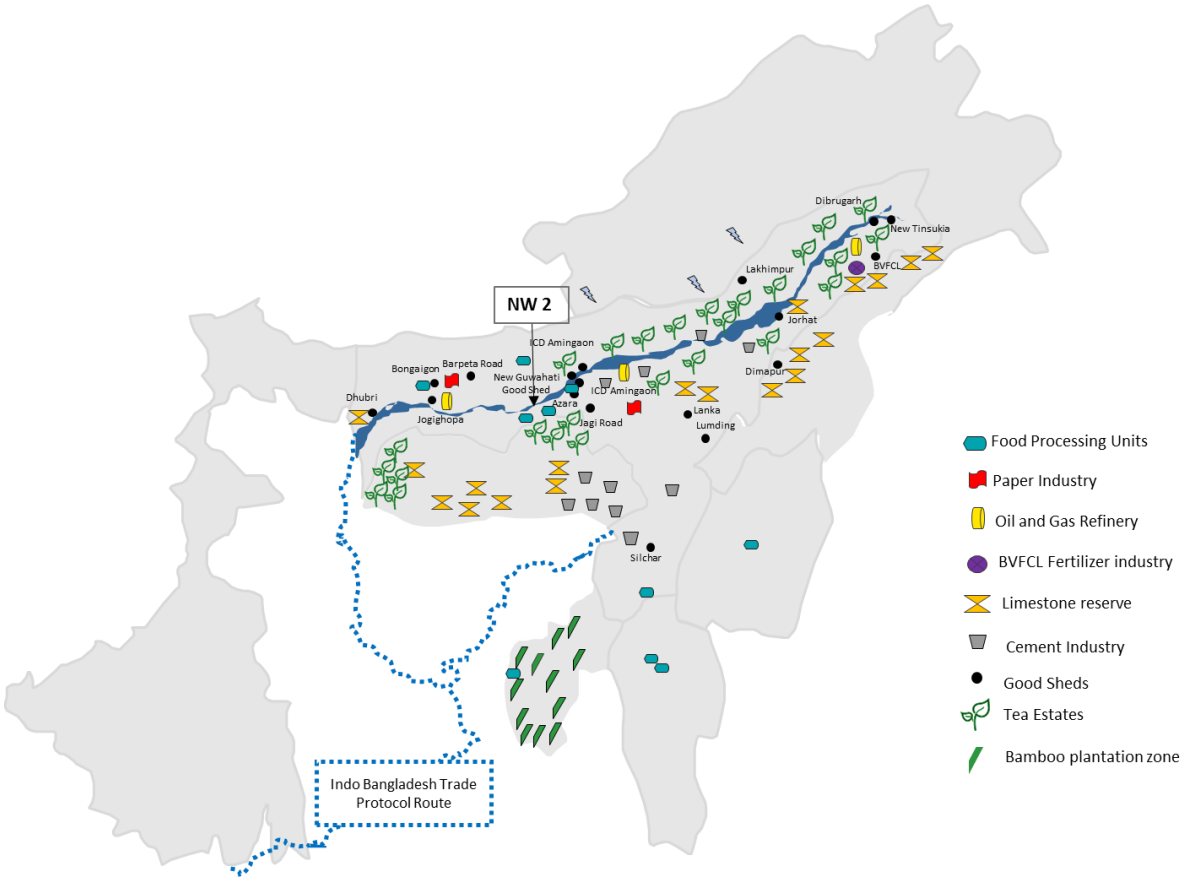

Figure 4 Industrial mapping

The region is strategically important as it shares borders with countries like Bhutan, China, Myanmar and Bangladesh. At present, the region facilitates trade with these countries through various Land Custom Stations spread across the region. Most the trade is informal in nature and is entirely on road.

Owing to its importance both in terms of location and availability of minerals and natural products, the region is thus witnessing a surge of economic activities. Widening of road network, augmentation of railway network, expansion of air connectivity, revitalization of river network, enhancing logistics capabilities by way of planning terminals and activating trade routes are a few measures that are likely to make the region a gateway for facilitating trade with South-East Asia. Out of the various steps mentioned, revitalization of river network is one of the primary focus areas in order to enhance the regions connectivity with other parts of India and other countries.

The river Brahmaputra runs across the North-Eastern region stretching across Assam and Arunachal Pradesh. The identified stretch from Dhubri to Sadiya is declared as National Waterway-2. Based on the industrial profiling of the region and the distances from waterway network and terminals, the region is divided into 6 clusters. The identified clusters and the PIA are represented in the figure below:

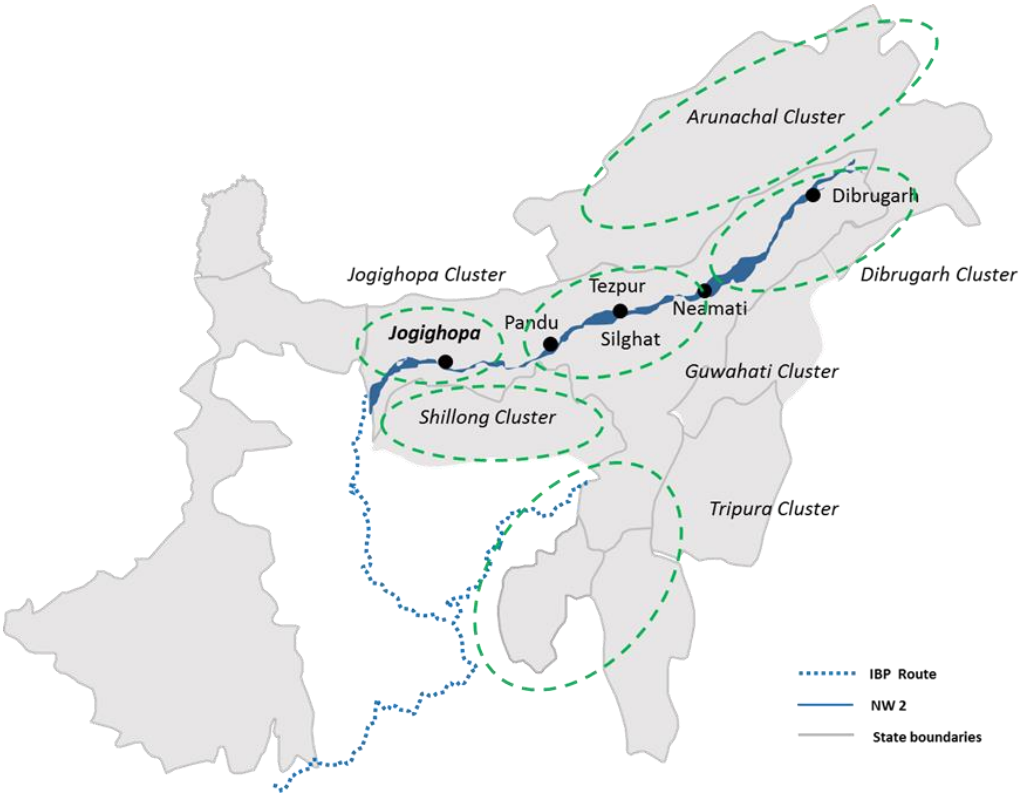

Figure 5 Cluster mapping

As understood based on the above figure, Bongaigaon, Guwahati, Dibrugarh, Shillong, Tripura and Arunachal Pradesh are the 6 clusters. Each of these are discussed individually in the subsequent sub-sections.

2.1.1 Bongaigaon Cluster

Bongaigaon cluster is located in the western part of Assam. The cluster encompasses Bongaigaon, Barpeta and Goalpara districts. In terms of industrial profiling, the cluster is marked by the presence of some food processing units, limestone reserves, LPG bottling plant, paper mill owing to the availability of bamboo and an oil and gas refinery at Bongaigaon.

In terms of connectivity, the cluster is well connected via network of highways, broad gauge railway network and waterways. The detailed connectivity is as follows:

- ***Road Network***- National Highway 31C connects the cluster to Jalpaiguri via Cooch Behar district in West Bengal. National Highway 31 runs through the cluster connecting it with Dhubri and further upto Nalbari, whereas National Highway 37 connects the cluster from Goalpara to Guwahati.
- ***Railway Network***- the cluster falls in the Rangiya division and is connected to Bardhaman in West Bengal via double broad gauge line and to Guwahati via single broad gauge line[1].
- ***Waterways Network***- the cluster is well connected to parts of central Assam, Upper Assam and Haldia via the waterways network. National Waterway-2 passes through the cluster and is marked with the presence of two inland ports namely Dhubri and Jogighopa. It is further connected to Haldia and Kolkata via Indo-Bangladesh protocol route.

The cargo movement to and from the cluster is facilitated on both rail and road. The commodities moved are mostly in bulk form and are handled at various goodsheds along the network managed by Indian Railways; of which the Jogighopa goodshed is the largest.

2.1.2 Guwahati Cluster

The central part of Assam forms the Guwahati cluster. It encompasses the districts of Kamrup, Darrang, Nagaon and Karbi Anglong. In terms of industrial profiling, the cluster is marked by the presence of various food processing units, tea estates, cement producing industry owing to its proximity to limestone reserves,

[1] Source: http://indiarailinfo.com/station/map/guwahati-ghy/546

paper mills owing to its proximity to bamboo plantations and refinery at Namrup. The particulars of the industries are as follows:

- Paper- HPC Paper Mill, Nagaon with a capacity of ~ 1 MTPA
- Bamboo- Bamboo Technology Park, Guwahati
- PoL- Refineries at Guwahati and Numaligarh managed by Indian Oil Corporation Limited (IOCL) with an overall capacity of ~ 4 MTPA
- Cement- Bokajan Cement Plant
- Tea estates spread across the cluster with an overall production capacity ~ 4.8 MTPA

In terms of connectivity, the cluster is well connected via network of highways, broad gauge railway network and waterways. The detailed connectivity is as follows:

- ***Road Network***- National Highway 31C connects the cluster to Bongaigaon and further eastwards to Cooch Behar and Jalipaiguri. National Highway 36 connects it to Dimapur in Nagaland via Nagaon while National Highway 37 connects the cluster to parts of upper Assam (Golaghat). National Highway 52 connects Guwahati cluster to Mangaldoi and Tezpur.
- ***Railway Network***- the cluster falls in Lumding division and is marked by the presence of single broad gauge rail line which connects it to Bongaigaon in lower Assam. The network further extends upto Tripura via Silchar in lower Assam.
- ***Waterways Network***- the cluster is well connected to parts of lower Assam, Upper Assam and Arunachal Pradesh via the waterway network. National Waterway-2 passes through the cluster and is marked with the presence of an inland port at Pandu, two floating terminals at Tezpur and Silghat. It is further connected to Haldia and Kolkata via Indo-Bangladesh protocol route.

The cargo movement to and from the cluster is facilitated on both rail and road. The commodities moved are in both bulk and containerized form handled at various goodsheds along the network managed by Indian Railways; of which the New Guwahati goodshed is the largest. The container cargo is handled at ICD Amingaon which in close proximity to Guwahati. The cluster is the main commercial center of the region and is densely populated.

2.1.3 Dibrugarh Cluster

The upper part of Assam forms the Dibrugarh cluster and encompasses districts of Golaghat, Jorhat, Sibsagar, Dibrugarh, Tinsukia and parts of Nagaland. The cluster is marked by the presence of paper industry, coal deposits, food processing units, tea estates, fertilizer production unit and refineries. The particulars of the industries are as follows:

- Fertilizer- Brahmaputra Valley Fertilizer Corporation Limited with a capacity of ~ 1 MTPA
- Tea estates spread across Jorhat and Tinsukia with overall production capacity of ~ 1.4 MTPA.
- Paper- Nagaland Paper and Pulp Industry with a capacity of ~ 0.33 MTPA
- Coal- Margharita Coal Field in Upper Assam and deposits spread across the region (Mokokchung, Makum, Tipong, Mon, Wokha)
- PoL- Refinery at Digboi managed by Indian Oil Corporation Limited (IOCL) with an overall capacity of ~ 0.65 MTPA

In terms of connectivity, the cluster is well connected via network of highways, broad gauge railway network and waterways. The detailed connectivity is as follows:

- ***Road Network***- the cluster is connected to Guwahati in central Assam and to parts of Upper Assam via National Highway 37. National Highway 38 connects the cluster to parts of Arunachal Pradesh while National Highway 52B provides extensive connectivity within the cluster.
- ***Railway Network***- The cluster falls in Tinsukia division and is connected via single broad gauge line from Dibrugarh to Lumding which further extends upto Tripura.
- ***Waterways Network***- the cluster is well connected to parts of lower Assam, Upper Assam and Arunachal Pradesh via waterway network. National Waterway-2 passes through the cluster and is marked with the presence of floating terminals namely Dibrugarh, Jamuguri, Bogibhil, Saikhowa and Sadiya. It is further connected to Haldia and Kolkata via Indo-Bangladesh protocol route.

The cargo movement to and from the cluster is facilitated on both rail and road. The commodities moved are in mostly bulk form and are handled at various goodsheds along the network managed by Indian Railways; of which Jorhat Town and New Tinsukia goodshed handle majority of the volumes.

2.1.4 Shillong Cluster

The cluster encompasses the state of Meghalaya and shares majority of its border with Bangladesh in the South and with Assam in the North. The state has rich deposits of limestone and coal. The state is known for its horticultural produce and plantation crops like cashews and gingers. In terms of industrial profiling, the cluster is marked by the presence of cement & clinker industry and tea estates. The particulars of the industries are as follows:

- Limestone- Deposits in Jaintia and Khasi Hills
- Coal- Deposits in Jaintia and Khasi Hills
- Cement & Clinker- Dalmia Cement, Star Cement, Hill Cement and various other small and medium sized units with an overall capacity of ~ 13 MTPA.

In terms of connectivity, the cluster is well connected via network of highways. At present the cluster is fraught with connectivity issues owing to the hilly terrain, however, efforts are being made to strengthen the areas connectivity. The detailed connectivity is as follows:

- ***Road Network***- The cluster is well connected to Tripura through National Highway-44, the connectivity further extends to parts of Bangladesh (Karimganj). National Highway-51 connects the cluster to Bongaigaon. National Highway-40 connects the cluster to Dispur-Guwahati and further reaches of Upper Assam. The cluster is connected to parts of Bhutan via National Highway-51 and 62.
- ***Railway Network***- the cluster lacks railway connectivity, however, connectivity till Shillong is proposed for which surveys are underway[2].
- ***Waterways Network***- The state does not have waterway network. It is however, well connected to Pandu inland port and Jogighopa terminal via a network of state and national highways.

The movement of cargo is facilitated entirely on road. The movement of cement on rail is facilitated through the Lanka goodhsed which lies in the Lumding division.

2.1.5 Tripura Cluster

The cluster encompasses the state of Tripura, Nagaland and parts of lower Assam like Karimganj, Hailakandi and Cachar districts. The cluster is known for its bamboo production which are used extensively in the paper, handicrafts and furniture industry. In terms of industrial profiling, the cluster is marked by the presence of food processing units, cement and paper plants. The particulars of the industries are as follows:

- Paper- Nagaland Paper & Pulp Industries and HPC Cachar Mill with a production capacity of ~ 0.1 MTPA
- Cement- Barak Valley Cement with a production capacity of ~ 0.4 MTPA
- Bamboo- Used for the production of Incense sticks, handicrafts, furniture and paper

In terms of connectivity, the cluster is well connected via network of highways, broad gauge railway network and waterways. The detailed connectivity is as follows:

- ***Road Network***- The cluster is connected to Silchar and Imphal through National Highway 53. National Highway 54 connects parts of lower Assam ie Silchar to Aizwal whereas National Highway 44N connects Tripura to Aizwal. National Highway 158 connects Agartala in Tripura to Imphal in Manipur.
- ***Railway Network***- Broad gauge connectivity extends till Udaipur in Southern part of Tripura. Agartala is connected to Guwahati and Karimganj via a single broad gauge.
- ***Waterways Network***- the Indo-Bangladesh Protocol Route provides robust connectivity to the cluster. It connects Tripura to Haldia via Ashuganj, Karimganj in southern Assam is also connected to Haldia and further to Dhubri through the Protocol route. IWAI has signed MoUs with Government of Bangladesh in order to ensure round the year navigability in the Ashuganj-Karimganj stretch.

The movement of cargo is facilitated on both rail and road, though road commands a major share over rail. Waterways holds potential to serve the cluster as it reduces the distance between major ports like Haldia.

[2] Source: http://www.dnaindia.com/india/report-railway-connectivity-will-boost-tourism-in-meghalaya-sangma-2318007

2.1.6 Arunachal Pradesh Cluster

The cluster encompasses the state of Arunachal Pradesh which shares it borders with Assam, Nagaland and China. The cluster is essentially a consumption cluster and is marked by the presence of various hydro-electric power projects, both existing and proposed.

The cluster is fraught with connectivity issues owing to hilly terrain, however, it is connected to parts of Assam and further to other parts of the country via a network of highways and railways. The detailed connectivity is as follows:

- ***Road Network***- Itanagar in Arunachal Pradesh is well connected to Tezpur, Dhemaji, Passighat and Sadiya via National Highways-52.
- ***Railway Network***- Railway network is scanty in the cluster owing to hilly terrain, however, connectivity till Naharlangaon is facilitated via single line broad gauge network.
- ***Waterways Network***- The cluster is connected to National Waterway-2 via highways, with the closest inland terminal at Tezpur.

The cargo movement to the cluster is facilitated entirely on road. Guwahati is the hub from where it is distributed further on to serve the cluster.

2.2 Summary

The Industrial profile and connectivity of clusters is summarized in the table below:

SNo	Cluster	Industrial Profile	Road Connectivity	Railway Connectivity
1	Bongaigaon	Food processing units, Limestone reserves, LPG bottling plant, Paper mill, Bamboo and oil and gas refinery.	NH 31, NH 31C, NH 37	Connected to Bardhaman in West Bengal via double broad gauge line and to Guwahati via single broad gauge line
2	Guwahati	Food processing units, Tea estates, Cement, Limestone reserves, Paper mills, Bamboo plantations and Refinery at Namrup	NH 31, NH 36, NH 37, NH 52	Single broad gauge rail line which connects it to Bongaigaon in lower Assam; network further extends upto Tripura via Silchar in lower Assam.
3	Dibrugarh	Paper industry, Coal deposits, Food processing units, Tea estates, Fertilizer production unit and refineries	NH 37, NH 38, NH 52B	Single broad gauge line from Dibrugarh to Lumding which further extends upto Tripura.
4	Shillong	Limestone, Coal, Horticulture, Cement & Clinker, Tea estates	NH 40, NH 44	Surveys underway for connectivity upto Shillong
5	Tripura	Bamboo, paper mills, Handicrafts and furniture industry, Food processing units, Cement	NH 44N, NH 53, NH 54, NH 158	Single broad gauge line connectivity to Guwahati and Karimganj.

SNo	Cluster	Industrial Profile	Road Connectivity	Railway Connectivity
6	Arunachal Pradesh	Hydro-Power projects	NH 52	Single line broad gauge connectivity till Naharlangaon

Table 6: PIA- Summary Table

Market Analysis

3 Market Analysis- Domestic Cargo

Further to the identification of various agricultural, industrial and consumption clusters in the PIA, this chapter focusses on estimating the market size of the PIA. The activity is carried out based on data and insights collected from a combination of secondary research, primary interactions with stakeholder and site visits. To estimate the potential cargo divertible to IWT, it is essential to understand the market dynamics, factors governing choice of modal share and the key drivers for growth.

The market size has been estimated based on data from the following sources:

- Secondary research was undertaken through various sources such as Planning Commission, Industry Association Reports, reports published by Ministry of Development of North Eastern Region, Petroleum and Natural Gas, Agricultural and Food Processing; Independent research materials available on industry segments were also referred.
- The information gathered through secondary research was triangulated through primary interactions with key stakeholders across various industry segments and logistics players to understand the market dynamics.
- Site visits to various interstate border check points, Indian Railway goodsheds, IWT terminals and industrial clusters were undertaken to understand existing service levels and their impact on factors governing modal choice.

Based on the information gathered, the cargo streams viz movement into the PIA, movement out of the PIA and movement within the PIA were identified. It is understood that ~25 MTPA of cargo related to infrastructure development and household consumption moves into the PIA from various origin points across the country. Commodities like household goods (including FMCG products and electronics like television, fridge etc.), foodgrains, fruits & vegetables, fly ash, tiles etc. move into the PIA from various states like West Bengal, Chhattisgarh, Maharashtra, Rajasthan, Delhi, Haryana, and Madhya Pradesh amongst various other states. Following pie chart represents the key commodities that are moved into the PIA and their respective contribution to the market.

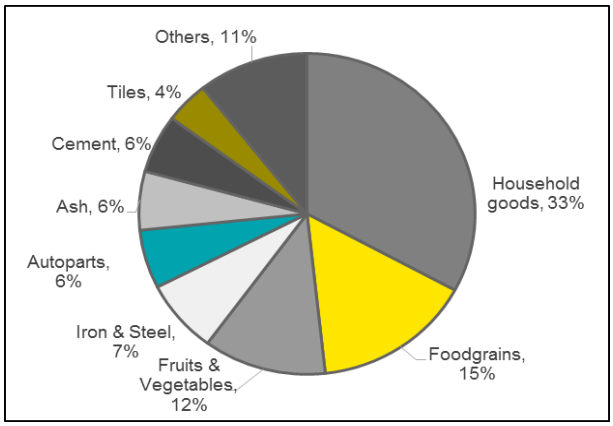

Figure 6 Distribution of cargo- movement into PIA

On the other hand, ~ 24 MTPA of cargo is moved out of the PIA. This is mainly dominated by limestone which is moved into Bangladesh through the Dawki border in Meghalaya, agriculture & plantation crops like tea, ginger, cashew and spices, crude, petroleum products and rubber. The following pie chart represents the key commodities that are moved into the PIA and their respective contribution to the market.

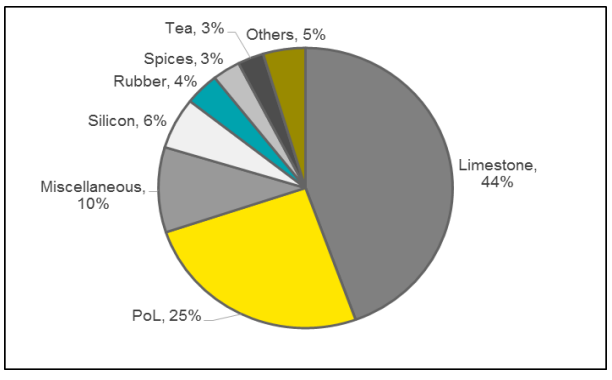

Figure 7 Distribution of cargo- movement out of PIA

Apart from the commodities moving into and outside the PIA, ~ 30 MTPA moves within the PIA. This mostly comprises of horticulture produce, foodgrains, cement and petroleum and other liquid products. The following pie chart represents the key commodities that are moved within the PIA and their respective contribution to the market.

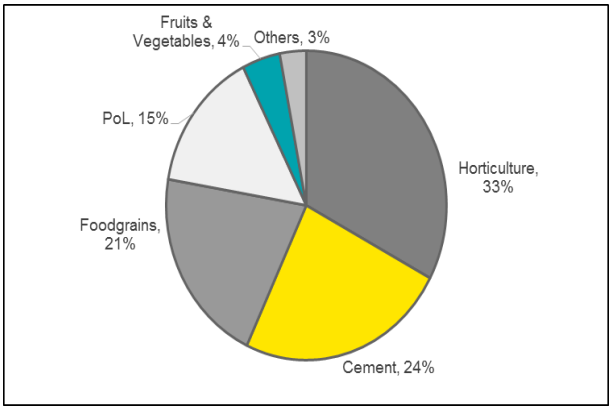

Figure 8 Distribution of cargo- movement within PIA

This chapter details out the commodities, their origin-destination (O-D) pairs, modal share and key logistics drivers for each one of them. A summary table is presented to conclude the chapter.

3.1 Household Goods

This category of goods includes commodities like white goods (like television, refrigerators), parcel consignments, freight forwarder goods (like commodities for general consumption) and other household consumption goods (like FMCG, edible oil, jaggery and sugar). With an overall market size of around 7.8 MTPA, the category constitutes around one-third of the overall commodities that are moved into the PIA.

Transportation of household goods from various parts of the country into the PIA is facilitated on both rail and road. The share of railways is around 42% while that of road is 58%. As can be observed, the railway co-efficient for this category is fairly good despite the need for consolidation of cargo and multiple handlings. This can be attributed to long leads (the origin-destination pairs are discussed in the consequent paragraphs) which makes railways more economically viable over roads.

As understood during primary interactions, white goods (including refrigerators, televisions, washing machines etc.) are to a great degree moved in containerized trucks with a capacity of 13 tonnes per truck. They are brought into the PIA mainly from centers like Mumbai, NCR. Guwahati is the hub providing secondary warehousing to these goods and from there they are further distributed to the other north eastern states. The intra-regional distribution of these goods are facilitated in containerized trucks with a capacity of 9 tonnes. However, currently a small percentage of white goods is also moved in the newly introduced millennium rakes by IR. In terms of modal share, road constitutes 95% while the remaining 5% is rail for movement of white goods. The low share of railways can be attributable to the fact that these commodities are sensitive to multiple handlings and require adequate safety while transportation. Also, the supply chains for household goods need to be highly responsive and transit time reliability is key.

The commercials involved in the movement through trucks is around INR 130-140/tn-km; the high cost is attributed to the non-availability of return load from the region and various other hidden costs as revealed in primary interactions by the stakeholders (these include agent costs at state borders to speed up the clearance process, payments made to local parties to ensure smooth loading and unloading).

Commodities like edible oil (not in tank wagons), freight forwarder goods (includes parcel consignments like toys, daily consumption goods, sundry items), sugar, jaggery and salt move into the PIA by rail. Around 3 MTPA is moved through rakes into the PIA from Delhi, Gujarat, Karnataka, Maharashtra, West Bengal and Rajasthan and are unloaded at IR goodsheds at New Guwahati, New Tinsukia, Jorhat, Salchapara etc.

Commodities wise origin-destination matrix for household goods is presented in the table below:

Commodities	Origin	Destination	Volume
White goods	Delhi, Mumbai, Gurgaon	Guwahati	~ 4.5 MTPA
Freight forwarder goods	Delhi (Kishanganj), Gujarat (Kankaria, Linch, Siddhapur)	Jorhat, New Guwahati, Salchapara, New Tinsukia	~ 0.6 MTPA
Edible Oil	Delhi (Kishanganj), West Bengal (Haldia Dock Complex)	Jorhat, New Guwahati, Salchapara, New Tinsukia	~0.24 MTPA
Sugar	Gujarat (Ankleshwar), Karnataka (Bidar, Haveri, Amravathi Colony), Maharashtra (Karad, Sangli, Satara, Daund, Niphad, Baramati)	Jorhat, New Guwahati, Salchapara, New Tinsukia, Azara, Bihara, Changsari	~ 0.5 MTPA
Salt	Gujarat (Chirai, Kharaghoda, Halvad, Santalpur, Gandhidham, Bhimrana)	Jorhat, New Guwahati, Salchapara, New Tinsukia, Bongaigaon, Changsari, Harmuti	~ 0.2 MTPA
Jaggery	Delhi (Kishanganj)	Jorhat, Tinsukia	~ 0.01 MTPA

Table 7 Household Goods- OD pairs

As the commodities are essentially consumption goods, the key growth driver is population.

In terms of logistics drivers, white goods are sensitive to multiple handlings, require safety and security of cargo along with suppliers control over the supply chain. These commodities are driven by consumption and are transported in volumes based on assessment of demand. On the other hand, parcel consignments and freight forwarder goods need consolidation of cargo and an associated ecosystem to support the same. As the name suggests, FMCG requires fast movement of cargo from origin to consumption point, complex inventory management as every commodity type has a variety of stock keeping units (SKU), high rate of replenishments as the brands face threat of market substitution. Currently, these movements are managed by 3PL players who provide end to end logistics services.

3.2 Foodgrain

The broad category of foodgrain includes rice, wheat and pulses. In terms of production of rice, the states in the PIA produce rice owing to congenial climatic conditions. Assam is one of the major rice producing states in the country and with a production of 4.86 MT in FY 2015[3], it contributed to around 5% of the country's overall rice production. However, it is not sufficient to meet the demand of the population and is thus moved into the PIA. Similarly, wheat is produced in small quantities; the production registered a fall from 0.08 MT in FY 2012 to 0.05 MT in FY 2016. Hence, wheat is also moved into the PIA in order to meet the demand of the north-eastern states. Pulses are also moved into the PIA. The movement is facilitated on both rail and road by Food Corporation of India (FCI) and organized players (local mandis or markets that operate locally).

Movement into the PIA:

As discussed, rice, wheat and pulses are moved into the PIA from various parts of the country. Rice is moved into the PIA from states like Chhattisgarh, Delhi, Haryana, Maharashtra, Punjab, Uttarakhand and West Bengal. The movement of wheat is mostly from the North Indian states of Punjab, Haryana and Madhya Pradesh.

[3] Source: e-book on agricultural statistics, 2015. Department of Agriculture, Government of India

Foodgrains are moved into the PIA on both rail and road. The movement on rail is facilitated by Food Corporation of India (FCI). FCI procures food grains from farmers by providing efficient price support mechanisms and thereon distributes them. It maintains inventories at various locations across the country as a measure of food security and price stabilization.

The trend of movement of rakes by FCI in north-east from various other states like Punjab and Haryana are presented in the figure below[4]:

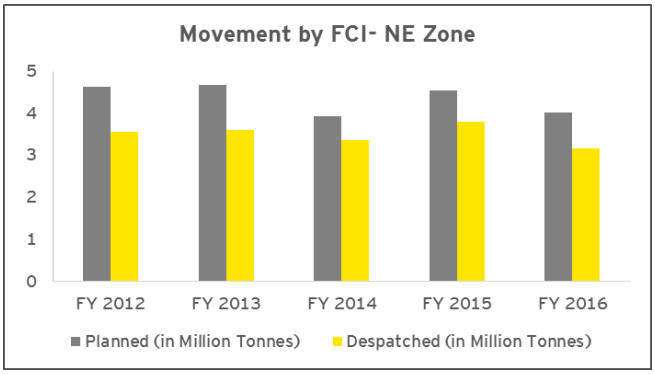

Figure 9 Movement by FCI- NE Zone

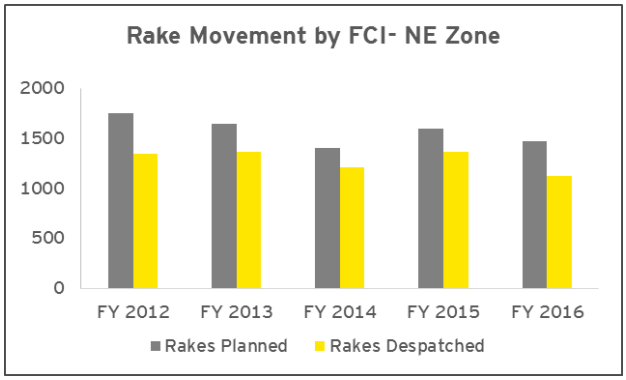

Figure 10 Rail Movement by FCI- NE Zone

The movement of food grains to the north-east remained fairly stable till FY 2013, however, owing to gauge conversion works in certain parts of north-east the dispatch reduced in FY 2014. Overall, the dispatch by FCI to north-eastern states has remained fairly stable at around 3.5 MTPA. The movement by FCI is facilitated primarily on rail thus making the modal share skewed towards it. The total despatch by FCI and the corresponding share of rail is summarized in the table below:

Year	Volume Despatched (MTPA)	Share of Rail
FY 2012	3.56	100% (3.56 MTPA by rail)
FY 2013	3.61	100% (3.61 MTPA by rail)
FY 2014	3.37	97% (3.26 MTPA by rail)
FY 2015	3.80	97% (3.67 MTPA by rail)
FY 2016	3.17	95% (3.02 MTPA by rail)

Table 10 Trend of Rail share

The rakes are received at various FCI sidings and IR good sheds. Out of the total dispatch made by FCI in FY 2016 on rail, around 0.8 MTPA was unloaded at FCI owned sidings in Changsari, Dimapur, Hojai and Guwahati; while the remaining was unloaded at various good sheds managed by the Indian Railways. In FY 2016, FCI directly moved food rains on rail upto Nagaland and Tripura post the completion of broad gauge conversion of lines. The foodgrains unloaded at Changsari siding mostly cater to the demand in Meghalaya wherein the stocks are transported to various depots on road. In terms of storage facilities, FCI has sanctioned around 0.22 MT of additional storage to be created under its Private Entrepreneurs Guarantee (PEG) scheme.

Apart from road and rail, FCI has also resorted to movement via inland waterways on need basis. In FY 2015, it transported around 20,000 tonnes of foodgrains to Tripura via Ashuganj in Bangladesh.

Private players in the region mostly move foodgrains via road. Rice and pulses are moved into the PIA from neighboring states like West Bengal and Bihar. The movement is facilitated on 16 tonne and 20 tonne trucks which cost around INR 3.5/tn-km. The high cost could be attributed to little or no return load from the region. As revealed in primary interactions, around 10-20,000 tonne of pulses and rice is moved to north-east on a monthly basis.

[4] Source: Food corporation of India

In summary, a total of around 3.7 MTPA of food grains is moved into the PIA via rail and road. In terms of modal share, rail caters to 88% of the movement while road accounts for 12%. FCI is the main players that moves foodgrains into the PIA in large quantities and they cover long leads with an average of 1800km thus making railways a preferable mode of transportation.

The table below summarizes the key origin-destination pairs are presented in the table below:

Commodities	Origin	Destination	Volume
Rice	Punjab, Delhi, Chhattisgarh, Haryana, Maharashtra, Punjab, West Bengal, Uttarakhand	FCI sidings, Goodsheds in NER (Jorhat, Barpeta, Guwahati, Dekargaon, Tinsukia, Bihara, Salchapara, Gosaigaon)	~ 2.4 MTPA
Wheat	Punjab, Haryana, Madhya Pradesh	FCI sidings, Goodsheds in NER (Jorhat, Barpeta, Guwahati, Dekargaon, Tinsukia, Bihara, Salchapara, Gosaigaon)	~ 0.82 MTPA
Pulses	Delhi, West Bengal (Haldia Dock Complex)	Tinsukia and Jorhat	~ 0.26 MTPA
Maize	Karnataka (Ranibennur, Gadag)	Bamunigaon	~ 0.03 MTPA
Foodgrain	Maharashtra, Bihar, west Bengal	Azara, Bamunigaon, Bihara	~ 0.04 MTPA

Table 11 Commodities- OD pairs

Movement within the PIA

The foodgrains produced in the north-east are consumed locally. It is believed that the rice and pulses produced within the region is consumed locally and in case of surplus, they are moved to the nearest state in 9 tonne or 15 tonne trucks. Around 6.3 MTPA of rice and pulses are moved within the PIA. The movement is entirely on road. The reason for modal share being skewed towards road is attributable to the scanty rail network in the north-east.

Foodgrain is a consumption commodity, however, the trend in growth is not only governed by population but also by area under cultivation, adequate irrigation facilities and timely monsoon. It is a bulk commodity and is transported in 50 kg bags. The key driver for logistics movement is cost.

3.3 Cement & Clinker

Cement is one of the key raw materials used for the purpose of construction of housings and infrastructure (like roads and bridges). Based on the data available from secondary data sources like Cement manufacturers' Association, around 60-65% of the cement produced is demanded by the housing sector. Thus indicating that the key driver for the industry is an increase in disposable income. The remaining is utilized in development of infrastructure; with increase in infrastructural development activity across tier 2 and tier 3 cities, the demand is likely to grow.

India is self-sufficient in terms of its cement production and the production centers are located all across the country. In terms of regional production and consumption, north-eastern part of the country has witnessed an increase in cement production capacity in the recent years. This can be attributed to:

- Availability of limestone and coal deposits in Meghalaya and parts of Assam.
- North-east industrial and investment promotion policy, 2007[5] which augmented industrial development in the region. The policy with a host of incentives in terms of excise duty exemption, income tax

[5] Source: http://dipp.nic.in/English/Policies/NEIIPP_2007.pdf

exemption, capital investment subsidy, interest subsidy amongst various other benefits led to a spurt in industrial activity.

At present, the installed capacity of cement and clinker plants in north-east is ~ 13 MTPA. As understood based on primary interactions, around 40% of the plants produce clinker while the remaining are cement plants. The 3 key players command over 50% of the market share and are presented in the table below:

Name	Location	Capacity (MTPA)
Gold Stone Cement	Jaintia Hills (Meghalaya)	2.54
Calcom (Dalmia) Cement	Umrangso (Meghalaya)	2.1
CCI- Bokajon	Numaligarh (Assam)	1.98
Others	Parts of Assam & Meghalaya	6.36

Table 12: Cement industries and their capacities

As revealed in primary interactions, the region produces around 8-9 MTPA indicating a capacity utilization of around 69%. The reason for low capacity utilization is attributable to the import of low cost cement from Bangladesh and Bhutan. Amongst the north-eastern states, Assam is the biggest consumer of cement, utilizing around 50% of the cement produced.

The region is fairly self-sufficient in terms of cement production, however, around 1.4 MTPA of cement is moved into the PIA through rail. Around 0.22 MTPA is moved outside the PIA on rail and roughly 9 MTPA moves within the PIA on both rail and road.

Movement into the PIA

The inward movement is facilitated on both road and rail. Big private players with private sidings within their facilities transfer the cement on rail. The rakes are unloaded at goodsheds managed by Indian Railways and are thereon transferred to the respective warehouses by the C&F agents through trucks. On the other hand, small and medium sized units in neighboring states like West Bengal transfer cement on 16 tonne trucks. The charges involved in the movement are around INR 3.5/tn-km. As revealed in primary interactions, around 200-250 trucks loaded with cement move into the PIA on a daily basis. In terms of modal share, around 56% of the movement is facilitated on road while the remaining 44% through rail.

Movement outside the PIA

Cement and clinker movement outside the PIA is facilitated on rail. The cement plants located in Meghalaya do not have rail connectivity. The cement bags are loaded on to the trucks and transferred to the nearest rail head and thereby transferred on rakes. As understood based on data available from DGCIS, the nearest broad gauge connectivity to the units is provided at Lanka goodshed. Similarly, clinker is transferred to plants in states like West Bengal on rakes. Around 0.22 MTPA of cement is moved outside the PIA on rakes.

Movement within the PIA

The poor rail connectivity within the PIA limits the movement on rail and hence the dominant mode of transferring cement is facilitated through 9/15 tonne trucks on roads. As revealed in primary interactions with cement players like Dalmia Cement and Hill Cement, the production within the PIA is around 8-9 MTPA of which 0.02 MTPA moves on rail and the remaining on road. The truck movement within the PIA costs around INR 7/tn-km. the high cost can be attributed to inadequate return load and hilly terrain which makes road movement difficult. Apart from these factors, there are various other hidden costs levied on transporters like border crossing charges and payments made to the local parties which add on to the cost.

The key origin-destination pairs are summarized in the table below:

Origin	Destination	Volume
Movement into the PIA		

Origin	Destination	Volume
Chhattisgarh (Ambuja Cement Siding Bhatapara, Lafarge Cement- Akaltara, Ultratech Cement- Hathbandh). **Gujarat (Tata Chemicals- Bhimrana)** **Jharkhand (ACC Limited- Jhinkapani, Ultratech Cement siding)** **Maharashtra (Associate Cement- Ghugus)** **West Bengal (Ambuja cement Eastern, Sonar Bangla Cement- Gankar)**	Good sheds in Assam (Barpeta, Dekargaon, Haibargaon, Harmuti, Jogighopa, Jorhat, New Guwahati, New Tinsukia, North Lakhimpur, Silapathar)	~ 1.4 MTPA (Rail- 44%, Road- 56%)
Movement Outside the PIA		
Good sheds in Assam (Azara, Tetelia, New Guwahati, Rangiya, Lanka)	Bihar (Waris Aleganj, Katihar, Bapudham Motihari) West Bengal (New Jalpaiguri, New Cooch Behar, Malda)	~ 0.22 MTPA (Rail- 100%)
Movement within the PIA		
Cement plants in Meghalaya, Assam	Bongaigaon cluster, Guwahati cluster, Dibrugarh cluster, Shillong cluster, Arunachal cluster, Tripura cluster	~ 8-9 MTPA (Rail- 2%, Road- 98%)

Table 13 Industry wise- OD Pairs

As already discussed, cement is primarily used in infrastructure creation, thus, the key growth driver for the commodity is anticipated infrastructure augmentation. This in turn has a direct relationship with GDP. It is a bulk commodity and is moved in 50kg bags. Cement is sensitive to price fluctuations and multiple handlings. The key logistics driver for the commodity is cost.

3.4 Iron & Steel

Iron & Steel is used as an input to various industries like automobiles, construction, capital goods etc. Industrial construction, infrastructure and capital goods account for over 50% of the total utilization of iron and steel thus making it a key raw material for infrastructure creation.

In terms of state wise consumption, the 8 states in the north-east consume around 2%[6] of the iron & steel produced. The share has increased from 1%[7] in FY 2012 essentially due to the various initiatives taken by both center and state to boost infrastructure in the region.

Iron & steel is not produced within the PIA and is moved into the PIA using both rail and road. The demand is met by the plants situated in the eastern and south-central part of the country. As understood based on the data available from DGCIS and primary interactions with stakeholders, the overall demand of iron & steel in the PIA is around 1.79 MTPA of which 0.74 MT moves on rail. The rakes are moved into the region from plants in various states like West Bengal, Chhattisgarh, Jharkhand, Karnataka, Odisha and unloaded at the good sheds managed by Indian Railways. Guwahati is the biggest consumer of iron & steel in the PIA and consumes over 50% of the total volume moved. Of the total volume moved on rail, ~80% is unloaded at the Guwahati good shed. The goods unloaded are transferred on to the stockyards around Guwahati and further moved into the other states on 21 tonne trucks.

As revealed in primary interactions, ~ 1 MTPA is moved into the PIA through trailers on road. 100-120 trailers move in from neighboring states like West Bengal and Jharkhand mostly through the Srerampore border.

[6] Source: Primary interactions
[7] Source: Lok Sabha unstarred question no. 660 dated 13.08.2012

With an average weight of 22 tonne, the total logistics costs incurred is INR 85,000-100,000. The high cost is attributed to no availability of return load.

In terms of modal split, road accounts for around 64% of the cargo moved while rail accounts for roughly 36%. The skewed modal share towards road can be attributed to the type of cargo moved. As understood based on primary interactions and site visits, a lot of iron rods and TMT bars used for housing is moved into the PIA. These are unsuitable for rail transportation and are moved on roads in trailers.

The key origin-destination pairs for iron & steel are summarized in the table below:

Origin	Destination	Volume
Chhattisgarh (Bhilai Steel plant)	New Guwahati good shed	~ 0.02 MTPA (Rail-100%)
Karnataka (Yelahanka)	Dibrugarh, New Bongaigaon	~ 0.003 MTPA (Rail-100%)
Odisha (Sukinda Road, Barbil, Bhushan Power & Steel, Private siding of Jindal Stainless Steel)	New Guwahati good shed, Harmuti	~ 0.06 MTPA
Jharkhand (Hindustan Steel Plant Limited, Jindal Steel & Power Limited, Tata Sponge Iron Ltd., Tisco work site Tatanagar)	New Guwahati, Barpeta road, Salchapara	~ 0.66 MTPA (Rail-55%, Road- 45%)
West Bengal (Bokaro Steel Plant, Shalimar, Durgapur, Barachak)	New Guwahati good shed, New Tinsukia	~ 0.89 MT (Rail-17%, Road- 83%)

Table 14: Iron and Steel- OD Pairs

The demand for iron & steel is driven by the demand in infrastructure which is turn linked to GDP. They are bulk commodities and an effective low cost solution is the key driver for its logistics movement.

3.5 Fertilizers & FRM

The economy in the North-Eastern region is driven primarily by agriculture. Based on data available from secondary sources it is understood that around 83 kg of fertilizers is required to serve 1 hectare of cultivable land. This translates into an overall demand of ~ 0.32 MTPA. The demand is served by plants located within and outside the North-Eastern region.

The Dibrugarh cluster in Assam is marked by the presence of Brahmaputra Valley Fertilizer Corporation Limited (BVFCL) which produces urea using natural gas as a basic raw material. The production capacity of the plant is around 0.51 MT of which it produces 0.32 MT annually. The production trend of BVFCL is presented in the figure below[8]:

[8] Source: Annual Report 2015-16 (BVFCL)

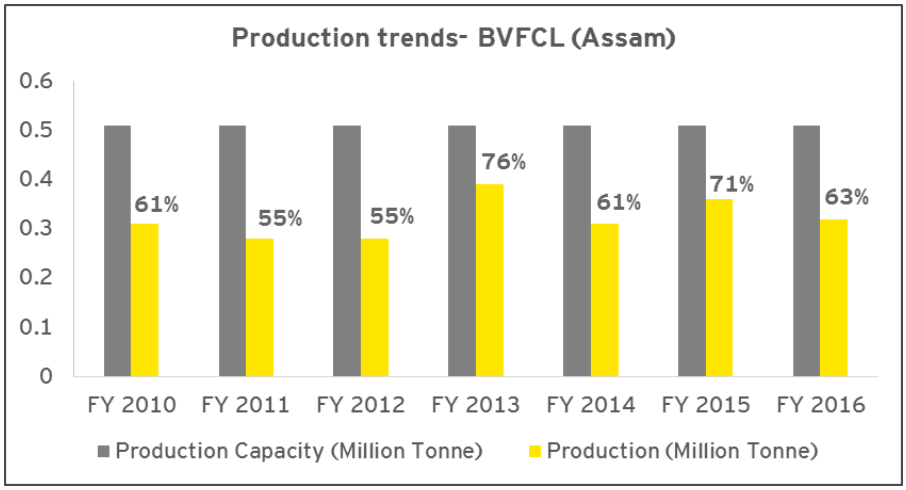

Figure 11: Production Trend- BVFCL

As observed, the plants runs at an average capacity utilization of 63%. The fluctuation in production is essentially due to the availability of natural gas. The production stood at 0.32 MT in FY 2015-16 as opposed to 0.36 MT in FY 2014-15. The reduction is attributed to restrictions in gas supply from Oil India Limited and equipment failures[9].

In terms of movement, a total of 0.74 MTPA of fertilizer raw materials (FRM) and fertilizer moves into, outside and within the PIA. It is facilitated on both rail and road. The modal share is skewed towards rail which has a share of around 70% while that of road is 30%. This can be attributed to the availability of private siding within the facility and movement in large quantities which makes rail economically more viable.

Movement into the PIA

As observed based on the data available through DGCIS, a total of 0.4 MTPA of FRM and fertilizers move into the PIA. Muriate of Potash (MOP) is imported into the country at various ports and moved into the PIA from the port facility on rail. ~0.06 MTPA of MOP moves into the PIA from ports in Andhra Pradesh. Tata Chemicals imports MOP at Haldia Port and further moves it on rakes from its private siding. The rakes are unloaded at various goodsheds and transferred to the facility on trucks.

Rock phosphate is produced both domestically within the country and imported. Earlier it was used as a fertilizer, however, due to lack of supply and low concentration, it is processed and used as a raw material. It is mined in Rajasthan and moves into the PIA on rail. Similarly, the imports from various port facilities is moved on rail. Around 0.07 MTPA of rock phosphate moves on rail and is unloaded at various goodsheds managed by Indian railways.

Apart from FRM, fertilizers and imported fertilizers move into the PIA from other facilities. Around 0.28 MTPA is moved from Uttar Pradesh, Odisha, Andhra Pradesh and West Bengal; the entire movement is facilitated through rail.

Movement outside the PIA

A quantity of ~ 0.03 MTPA moves out of the PIA to neighboring states like West Bengal and Bihar. The rakes are loaded at the facility and transferred to the good sheds managed by Indian Railways.

Movement within the PIA

With an overall demand of about 0.3 MTPA, the fertilizer demand of the region is dominantly catered to by BVFCL. Movement within the PIA is facilitated on both rail and road. The modal share however is skewed towards road with around 90% share. The dominance of road as a modal choice is attributable to the scanty rail network in the hilly terrain of north-east.

The origin destination pairs for fertilizers and FRM is summarized in the table below:

[9] Source: BVFCL

Commodities	Origin	Destination	Volume
Movement into the PIA			
MOP and Imported MOP	Andhra Pradesh (Vishakhapatnam Port, Gangavaram Port) West Bengal (Tata Chemicals- Haldia)	Good sheds in Assam (Barpeta road, Amoni, New Guwahati, New Tinsukia)	~ 0.06 MTPA (Rail-100%)
Rock Phosphate and Imported Rock Phosphate	Andhra Pradesh (Vishakhapatnam Port) Rajasthan (Rana Pratap Nagar)	Good sheds in Assam (Salchapara, Digaru, Jorhat)	~ 0.07 MTPA (Rail-100%)
Fertilizer & Imported Fertilier	Andhra Pradesh (Vishakhapatnam Port, Gangavaram Port) Odisha (IFFCO-Paradip) Rajasthan (Rana Pratap Nagar) Uttar Pradesh (IFFCO- Phulpur) West Bengal (Tata Chemicals- Haldia)	Good sheds in Assam (New Guwahati, Haibargaon, Barpeta, Amoni, Jorhat, New Tinsukia)	~ 0.3 MTPA (Rail-100%)
Movement Outside the PIA			
Fertilizers	Fertilizer Corporation of India, Namrup	Bihar (Khagaria), West Bengal (Rangapani)	~ 0.03 MTPA (Rail-100%)
Movement within the PIA			
Fertilizers	Fertilizer Corporation of India, Namrup; Guwahati good shed	Assam (Guwahati, Haibargaon, Tinsukia, Barpeta, Jorhat); Other 7 states in the NE	~ 0.31 MTPA (Rail-10%, Road- 90%)

Table 15 Commodity wise - OD pairs

Fertilizers and FRM are essential for agricultural purposes and are used to enhance the productivity of crops by protecting them. The demand is thus driven by agrarian demand which is further governed by population, area under cultivation, availability of natural gas and other raw materials used for the preparation of fertilizers and timely monsoons. The key logistics driver for the commodity is cost effective solution. The production of the commodity lies with the government and its movement is prioritized by railways.

3.6 Horticulture

The category includes fruits & vegetables, spices, plantation crops like tea and rubber, aromatics, flowers and honey.

North-east accounts for 5% of the overall horticulture produced in the country. It is rich in terms of plantation crops like tea and rubber, flowers and spices. The production trends and state wise share are presented in the figure below:

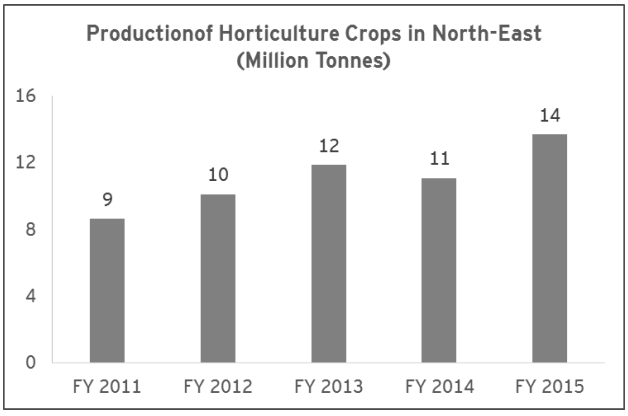

Figure 13: Production of Horticulture Crops in NE

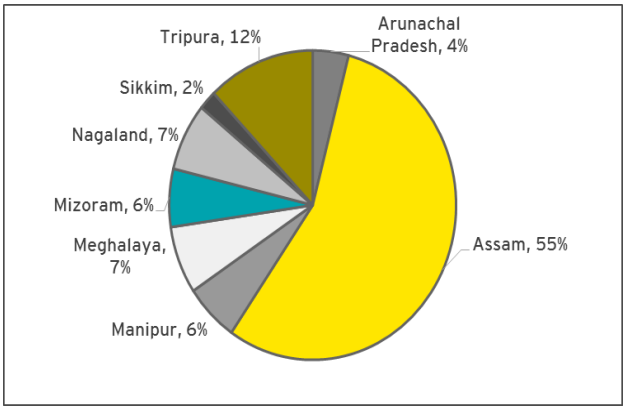

Figure 12: State wise production share

As observed, the production has increased from 9 MT in FY 2011 to 14 MT in FY 2015, exhibiting a CAGR of around 12%. In terms of states, Assam contributes to 55% of the overall produce followed by Tripura (12%) and Meghalaya (7%). The efforts made by the government to enhance horticulture produce has trickled down to the north-eastern states as well in terms of increased output in states like Nagaland, Mizoram and Meghalaya. However, the impact is only restricted to a few pockets leaving the potential of the region untapped. The key issues that fraughts the region are poor connectivity within and with other parts of the country, high transportation cost, low volume of marketable surplus, unavailability of infrastructure like cold storage and poor post-harvest management.

It is essentially due to the reasons stated above that the horticulture produce (including fruits and vegetables) mostly moves into and within the PIA while a small quantum is moved of the PIA. The major commodities produced in the PIA in this category are tea, bamboo, spices, rubber, ginger, cashew and beetlenut. The market for horticultural products is over 16 MTPA and the movement is both on rail and road.

Movement into the PIA

Based on the data available from DGCIS and primary interactions, it is understood that ~ 2.8 MTPA of fruits and vegetables moves into the PIA on both rail and road. The modal share is skewed towards road; which accounts for 90% of the total movement. They are moved in from states like Uttar Pradesh, Maharashtra, Delhi, West Bengal, Himachal Pradesh and Jammu & Kashmir. Despite long leads of over 1000 km, the modal share is skewed towards road instead of rail due to lack of transit time commitment as the goods are perishable. The market is fragmented and hence it gets difficult to get a single rake load from one point and since the prices are driven by market dynamics. The trader commands a hold over the supply chain which is not possible when commodities are transferred on rail. Vegetables like onions and potatoes are however transported on rail.

As revealed based on primary interactions, fruits and vegetables move on 21 tonne open body trucks. The cost pertaining to the movement is around INR 2.5-3/tn-km. ~ 2.5 MTPA moves on road. ~ 0.3 MTPA moves on rail from states like Delhi, Punjab and West Bengal.

Forest products like bamboo chips move into the PIA on rail, they are primarily used for the production of paper. ~ 0.01 MTPA is moved from West Bengal to Hindustan Paper Corporation Limited in Assam.

Movement outside the PIA

Plantation crops like tea, rubber and spices move out of the PIA to various parts of the country. The commodities exhibit seasonality as they are agriculture products. As understood based on primary interactions, the movement is facilitated on road. Total of ~ 2.43 MTPA is moved out of the PIA in 15-21 tonne open body trucks. The quantity moved out of the PIA is comparatively lesser than that moved into; thus making the inward movement commercially more expensive. As observed at the state border check points and visit to facilities, the loadibility of trucks moved out is often less than those moving in.

Apart from plantation crops, forest products like timber and bamboo also moves out of the PIA. The movement is facilitated on both rail and road. The overall modal share is skewed towards road with a share of 90%.

Movement within the PIA

The horticulture produced within the PIA is mostly consumed on a subsistence basis and thus the movement is dominated on road. ~ 11 MTPA is moved within the PIA. A small quantum of forest products, essentially bamboo moves on rail within the PIA. In terms of modal share, road accounts for close to 99% of the movement while the remaining 1% is on rail. Bamboo serves as a key raw material for production of paper. The movement is from the Bongaigaon cluster to Hindustan Paper Corporation Limited in Guwahati cluster. The movement within the PIA is dominantly on 9 tonne open body truck.

The origin destination pairs are presented in the table below:

Origin	Destination	Volume
Movement into the PIA		
Uttar Pradesh, Maharashtra, West Bengal, Delhi, Himachal Pradesh, Jammu & Kashmir	Whole of North East. Guwahati is the main commercial centre.	~ 2.8 MTPA (Rail- 10%, Road- 90%)
Movement outside the PIA		
Assam, Tripura, Meghalaya	Rest of India.	~ 2.43 MTPA (Rail- 10%, Road- 90%)
Movement within the PIA		
Assam, Tripura, Meghalaya, Nagaland, Mizoram, Manipur, Sikkim, Arunachal Pradesh	Assam, Tripura, Meghalaya, Nagaland, Mizoram, Manipur, Sikkim, Arunachal Pradesh	~ 11 MTPA (Rail- 1%, Road- 99%)

Table 18 Horticulture- OD pairs

Key growth drivers for horticulture products are area under cultivation, irrigation, growth in incomes and rate of urbanization. The commodities are perishable in nature and thus transit time, number of handlings are the key logistics drivers. Moreover, the market for the commodities is fragmented in nature; the absence of an aggregator makes road a favorable mode of transportation over other modes.

3.7 PoL & Crude

The North-Eastern states are endowed with abundant natural resources including oil and gas reserves. They are mainly situated in states of Assam, Tripura and Arunachal Pradesh and contribute to 10% of country's total crude oil and natural gas production. Crude oil and natural gas production fields are located in the states of Assam and Arunachal Pradesh. The trends in production of the same are presented in the figures below[10]:

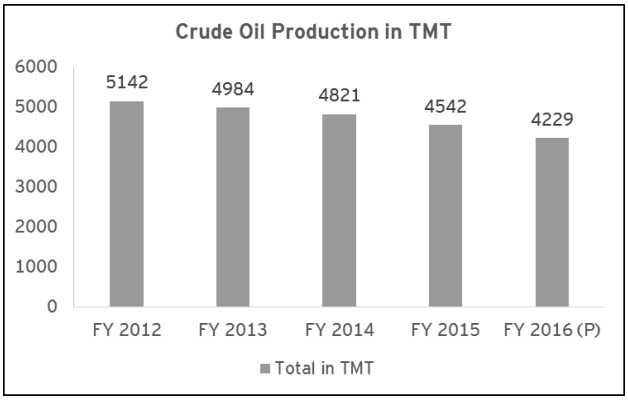

Figure 14 Production trend of Crude Oil

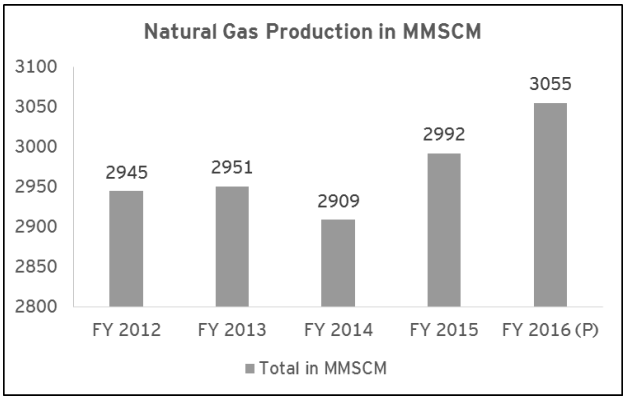

Figure 15 Production trend of Natural Gas

As can be observed, crude oil production has registered a decline over the past 5 years whereas that of natural gas has increased marginally at a CAGR of 0.1%. In terms of demand, the demand for crude oil in the region is around 7 MTPA. Natural gas is primarily used as a raw material in the fertilizer industry and other industrial activities. The region has 4 refineries situated at Digboi, Guwahati, Bongaiagaon and Numaligarh of which the first three are managed by Indian Oil Corporation Ltd. (IOCL). The Numaligarh refinery is the largest

[10] Source: Ministry of Petroleum and Natural Gas Statistics (2015-16)

with a capacity of 3 MTPA. The trends in production of crude oil and PoL products, refinery wise, are presented in the figure below:

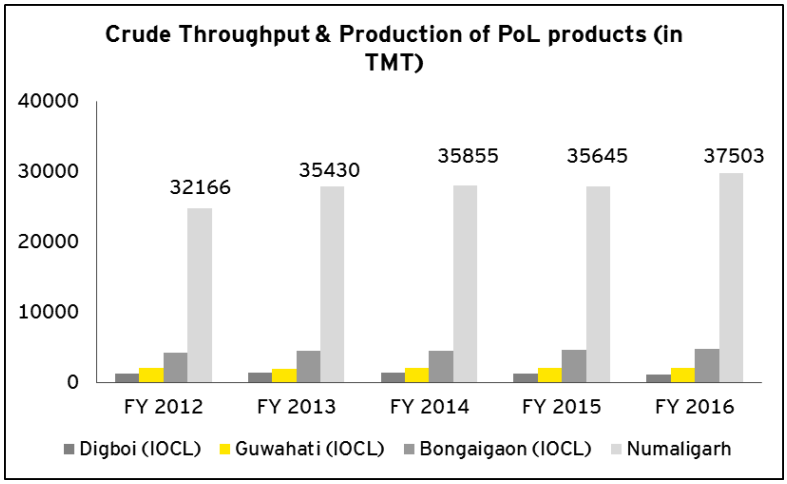

Figure 16 Crude Throughput and production trend of PoL products

As understood based on the above figure, the overall throughput and production has increased at a CAGR of around 3%. The production of PoL products is in excess of consumption and thus is transported outside the region through rail. In terms of logistics, the movement of crude oil, natural gas and LPG is predominantly through pipelines. It caters to the demand of North-East, upper reaches of Bengal and Bihar. The major pipelines in the region are as follows:

- Crude Oil Pipeline
- Geleki-Jorhat Pipeline
  - Lakwa-Moran Pipeline
  - Borholla-Jorhat Pipeline
- Gas Pipeline
  - Assam (Lakwa)
  - Tripura (Agartala)
  - Duliajan- Numaligarh
  - Duliajan- Numaligarh 2
  - Major LPG and PoL products Pipeline
  - Digboi- Tinsukia Pipeline
  - Numaligarh- Siliguri Pipeline

The remaining movement is facilitated through private rail sidings within the refineries and marginal supply is through road. The movement into, outside and within the PIA are explained as follows:

Movement into the PIA

Products like Naptha, HSD Oil, Superior Kerosene Oil and Motor Spirit are moved into the PIA. A total of ~ 1 MTPA moves into the PIA from states like Bihar, Gujarat, Delhi, Uttar Pradesh and West Bengal. The movement is facilitated entirely on rail using private siding facility available in the refineries. Thus, the modal share is skewed towards rail which commands a share of 100% (excluding pipelines) and this is attributed to the fact that the commodity moves in bulk traversing long leads of over 1,500 km, making rail an economically viable option.

Movement outside the PIA

Around 6 MTPA of crude oil and PoL products are moved out of the PIA. In terms of modal share around 20% is on rail whereas the remaining is distributed between road and pipelines. The key destination for the commodities are West Bengal and Bihar.

Movement within the PIA

As already discussed, the refineries and the production in the region largely serves the local demand. Thus, around 4.5 MTPA of crude and PoL products are moved within the PIA. In terms of modal share, around 10% is on rail while the remaining is split between the pipelines and road. Given the extensive pipeline network in

the north-east, it can be assumed that pipeline distribution dominates over the other two modes of transportation.

The origin-destination pairs are presented in the table below:

Origin	Destination	Volume
Movement into the PIA		
Delhi, Gujarat, West Bengal, Bihar, Uttar Pradesh	Assam	~ 1 MTPA (100% Rail; excluding pipelines)
Movement outside the PIA		
Assam	West Bengal, Bihar	~ 6 MTPA (Rail-20%; remaining split between Road & Pipelines)
Movement within the PIA		
Assam	Rest of North-East	~ 4.5 MTPA (Rail-10%, remaining split between Road & Pipelines)

Table 19: PoL products- OD pairs

The growth in this category of commodity is not only driven by demand but also by supply. In terms of supply, extensive efforts to explore new fields and extraction are underway in the region while efforts to augment industrial development in the region are the key growth drivers. Owing to the nature of commodities, pipelines are suited for transportation, however, rail and road is also used.

3.8 Pharmaceuticals

As revealed based on primary interaction, ~ 0.49 MTPA of medicines moves into the PIA from Gujarat (Chandgodar cluster), Uttarakhand (Rudrapur and Haridwar cluster) and Himachal Pradesh (Baddi cluster). The movement is facilitated through trucks on road; wherein road accounts for 100% modal share. Around 200 trucks per day moves into the PIA passing through the chicken's neck corridor. The commodity moves in closed body trucks with an average loadibility of around 7 tonnes. The commercials involved in the movement of pharmaceuticals is around INR 5/tn-km. Guwahati acts as a hub from where it is further distributed to the other north-eastern states periodically.

The growth in pharmaceutical demand is primarily governed by population growth. Key logistics drivers for pharmaceuticals are safety and security of cargo, cost, special arrangements like reefer plugs and customer control over the supply chain. It is primarily due to these reasons that road is preferred over rail. The good sheds managed by Indian railways are fraught with infrastructural issues, moreover, the cargo moves in small quantities which makes aggregation of one full rake difficult.

3.9 Autoparts

As revealed based on primary interaction, ~ 0.49 MTPA of autoparts moves into the PIA from Delhi, Punjab (Ludhiana), Haryana (Gurgaon) and Maharashtra (Pune). The movement is facilitated through trucks on road; making the modal share skewed towards road. Around 300 trucks per day moves into the PIA passing through the chicken's neck corridor. The commodity moves in open body trucks with an average loadibility of around 9 tonnes. The total logistics cost involved in the movement of autoparts is around INR 60-75,000.

The key logistics drivers for autoparts are cost and time. The cargo is fragmented in nature and is picked up from several location. It is difficult to get a rake load at a point in time thus making it unsuitable for rail transport.

3.10 Fly Ash

Fly ash is used as a raw material in cement plants which are present primarily in the Shillong cluster. The commodity is moved into the PIA from neighboring states like Jharkhand and West Bengal. Fly ash is produced as a by-product in thermal power plants. NTPC owned power plants in the neighboring states ie Kahalgaon TPP and Farakka TPP are the sources from which fly ash moves into the PIA. Part of the movement is also facilitated from privately owned power plants in Jharkhand (Jojobera thermal power plant). A total of ~ 1.4 MTPA moves into the PIA. The movement is facilitated on rail wherein the commodity is unloaded at goodsheds managed by Indian railways, namely New Guwahati and Lanka. Last mile connectivity to cement manufacturing plants is done using trucks. The modal share is thus 100% skewed on rail.

3.11 Automobiles

Automobiles includes both two wheelers and four wheelers, moves into the PIA on both rail and road. As understood based on DGCIS data and primary interactions with logistics players, Transport Corporation of India (TCI) and APL Vascor are responsible for the movement. The rakes move in from various parts of the country like Maharashtra, Haryana, Chennai, Rajasthan, Tamil Nadu, Uttarakhand and Andhra Pradesh. They are unloaded at Changsari which is a facility near Guwahati. From there is further distributed to the dealers. The last mile connectivity is facilitated on road using car carriers. An average of 16 rakes per month are received at Changsari, of which 10 are of cars and remaining 6 of two wheelers. Thus a total of 123,000 units of automobiles moves on rail.

The movement on road is facilitated using car carriers which are essentially trailers of 54ft or 75ft. Based on primary interactions, around 30 car carriers enter the PIA on a daily basis. A total of 63,000 units are transported on road. In terms of modal share, rail has a share of 67% vis-à-vis road which has a share of 33%.

3.12 Tar Coal/ Bitumen

Tar coal or bitumen is used for the purpose of road construction. It is mostly imported from countries like Iran and is moved into the PIA on rail and road. Imports are facilitated at major ports like Haldia and Nhava Sheva. As revealed based on primary interactions with logistics players, around 500 tankers with an average weight of 15 tonnes is moved from Haldia into the PIA on a monthly basis. Based on DGCIS data, around 0.1 MTPA moves into the PIA from Maharashtra and West Bengal on rail. It is imported at Nhava Sheva port in Maharashtra and Haldia Port in West Bengal. Thus, a total of ~ 0.2 MTPA moves into the PIA. Based on the development plans envisaged in the North-East, the demand for bitumen is likely to increase to ~0.5 MTPA. At present, the modal share is balanced between both rail and road with a share of 50% each.

3.13 Edible Oil

Around 0.3 MTPA of edible oil moves into the PIA from West Bengal. It is imported at Haldia Dock Complex and transported on both rail and road. The modal share is skewed towards rail commanding a share of around 80%. Rail transportation commands a share of 80% while road of remaining 20%. Rail movement is faciloiatted from Haldia Dock Complex. The rakes are unloaded mostly at New Guwahati goodshed and transferred to warehouses on trucks. It is moved in 50 litre tins and moved into the PIA. As understood based on primary interactions, around 250 trucks of 15 tonne capacity are moved from Haldia Dock Complex into the PIA via Chicken's Neck Corridor. The commercials involved in the movement are around INR 3,000-3,100/tonne. The commodity is demand driven and the movement is controlled by the local dealers who further cater to the distribution in the north-east.

3.14 Imported Coal

Around 0.04 MTPA of imported coal moves into the PIA from Haldia dock complex. They are used a sweetners in thermal power plants and in cement plants. The entire movement is facilitated on rail wherein the rakes are loaded from Haldia Dock Complex and unloaded at Lanka goodshed managed by Indian Railways. The movement from goodshed to the plant facility is managed on trucks.

3.15 Miscellaneous

Various other commodities move into outside and within the PIA. They are discussed as follows according to the directionality of their movement.

Movement into the PIA

Apart from the commodities discussed, other commodities move into the PIA in small quantities. They are mentioned below:

- Containers: ~ 0.39 MTPA of containers moves into the PIA on rail. They are moved from Jharkhand, Odisha, Punjab, Rajasthan and West Bengal from inland container depots and private sidings. They are unloaded at the CONCOR facility at Amingaon and at Harmuti.
- Ballast is used in the track beds between sleepers in railway tracks. As understood based on the DGCIS data, around ~0.7 MTPA moves into the PIA. The movement is facilitated on rail. The cargo moves in from Jharkhand and West Bengal to Bongaigaon cluster, Dibrugarh cluster and Guwahati cluster in the PIA.

Movement outside the PIA

Apart from the commodities discussed, other commodities move into the PIA in small quantities. They are mentioned below:

- Ballast: ~ 0.2 MTPA of ballast moves out of the PIA on rail. It moves from Gosaigaon in Bongaigaon cluster to New Jalpaiguri and New Coochbehar in West Bengal. The modal share is skewed towards rail with a share of 100%.
- Silicon: As revealed based on primary interactions, around 200 trucks of average weight 20 tonnes moves out of the PIA on a daily basis. Total of ~ 1.4 MTPA moves out of the PIA. Meghalaya is rich in silicon and the movement is facilitated from the Shillong cluster to various parts of the country. The movement is entirely on road and thus the modal share of road is 100%.
- Limestone: As revealed based on primary interactions, around 200 trucks of average weight 20 tonnes moves out of the PIA on a daily basis. Total of ~ 1.4 MTPA moves out of the PIA. Meghalaya is rich in silicon and the movement is facilitated from the Shillong cluster to various parts of the country. The movement is entirely on road and thus the modal share of road is 100%.
- Containers: Around 0.1 MTPA of containers move out of the Inland Container Depot at Amingaon and Harmuti to Jharkhand, West Bengal, Odisha, Bihar, Madhya Pradesh and Uttar Pradesh. As understood the movement is mostly of empty containers and is facilitated entirely on rail.

Movement within the PIA

- Coal: ~ 0.08 MTPA of coal moves within the PIA. The movement is facilitated entirely on rail. The movement is from Tirap Siding, Ledo in Dibrugarh cluster to Hindustan Paper Corporation, Bihara and Bokajan in Guwahati and Bongaigaon cluster.
- Ballast: ~ 0.5 MTPA moves within the PIA from Lumding, Furkating, Gosaigaon hat, New Tinsukia, Badarpur to Ledo, Salchapara, Jiribam, Dhubri, Silchar. The movement is facilitated entirely on rail.

3.16 Summary of domestic cargo assessment

The market analysis is chapter based on the nature of movement of the commodity is summarized in the table below:

Commodity	Volume (in MTPA)	Origin	Destination
		Movement into the PIA	
Household Goods	~ 7-8	Delhi, Gujarat, West Bengal, Maharashtra	Assam as the distribution center (Guwahati, Jorhat, Tinsukia). Further distributed to other parts of North-East
Foodgrains	~ 3-4	Punjab, Delhi, West Bengal, Madhya Pradesh, Karnataka, Bihar, Chhattisgarh, Uttarakhand, Maharashtra	FCI sidings across North-East. Mandi players of Guwahati
Cement & Clinker	~ 1- 1.5	Chhattisgarh, Gujarat, Jharkhand, Maharashtra, West Bengal	Assam (Guwahati cluster)

Commodity	Volume (in MTPA)	Origin	Destination
Iron & Steel	~1.8- 2	Chhattisgarh, Karnataka, Odisha, Jharkhand, West Bengal	Guwahati cluster; further distributed to other parts of North-East
Fertilizers & FRM	~ 0.4- 0.5	Andhra Pradesh, West Bengal, Uttar Pradesh, Odisha	Guwahati and Dibrugarh cluster
Horticulture	~ 2.5- 3	Uttar Pradesh, Maharashtra, West Bengal,	Across North-Eastern states
PoL & Crude	~ 1	Delhi, Gujarat, West Bengal, Bihar, Uttar Pradesh	Refineries in Assam (Bongaigaon, Guwahati, Dibrugarh cluster)
Pharmaceuticals	~ 0.5	Uttarakhand, Himachal Pradesh, Gujarat	Guwahati as the main hub; further distributed to other North-eastern states
Autoparts	~ 0.5	Haryana, Maharashtra, Delhi, Punjab	Guwahati as the main hub; further distributed to other North-eastern states
Ballast	~ 0.7	Jharkhand, West Bengal	Bongaigaon, Guwahati and Dibrugarh cluster
Fly Ash	~ 1- 1.5	Power Plants in Bihar, West Bengal, Jharkhand	Guwahati cluster; further moved to serve cement & clinker plants in central Assam and Meghalaya
Tar Coal/Bitumen	~ 0.2	Maharashtra, West Bengal	Guwahati cluster
Automobiles	~ 120,000-130,000 units	Maharashtra, Haryana, Tamil Nadu, Rajasthan, Uttarakhand, Andhra Pradesh	Guwahati cluster
Imported Coal	~ 0.05	West Bengal	Guwahati cluster; further moved to serve cement & clinker plants in central Assam and Meghalaya
Edible Oil	~ 0.3	West Bengal	Guwahati as the main hub; further distributed to other North-eastern states
Containers	~ 0.4	Jharkhand, Odisha, Punjab, Rajasthan West Bengal	CONCOR facility at Amingaon (Guwahati cluster)
Miscellaneous (forest products, chemical products, military items, stone amongst various other commodities moved in small parcel sizes)	~ 4-5	Andhra Pradesh, Delhi, Gujarat, Maharashtra, West Bengal	Across North-Eastern states
TOTAL	~ 25 MTPA + Automobile units		

Commodity	Volume (in MTPA)	Origin	Destination
Movement outside the PIA			
Limestone	~ 10- 11	Shillong cluster	Bangladesh
Cement & Clinker	~ 0.2- 0.3	Shillong & Guwahati cluster	Bihar, West Bengal
Fertilizers & FRM	~ 0.3- 0.4	Dibrugarh cluster	Bihar, West Bengal
Horticulture	~ 2- 2.5	Across North-Eastern states	Distributed across the country
PoL & Crude	~ 6	Dibrugarh, Guwahati, Bongaigaon cluster	Bihar and West Bengal
Ballast	~ 0.2	Bongaigaon cluster	West Bengal
Silicon	~ 1- 1.5	Shillong cluster	Distributed across the country
Tea	~ 0.6- 0.7	Dibrugarh, Guwahati, Shillong cluster	Auctioneers in West Bengal and acroos the country
Miscellaneous (containers, military items, seasonal agricultural commodities)	~ 4- 5	Across North-eastern states	Distributed across the country
TOTAL	**~ 24 MTPA**		
Movement within PIA			
Foodgrains	~ 6- 7	Across North-East	Utilized for self-consumption and surplus sold in nearby markets
Cement & Clinker	~ 8- 9	Guwahati and Shillong cluster	Across North-East
Fertilizers & FRM	~ 0.3 0.4	Dibrugarh cluster	Across North-East
Horticulture	~ 11	Across North-East	Utilized for self-consumption and surplus sold in nearby markets
PoL & Crude	~ 4- 5	Guwahati, Bongaigaon, Dibrugarh cluster	Across North-east
Coal	~ 0.05-1	Dibrugarh cluster (coal fields in upper Assam)	Guwahati cluster
Ballast	~ 0.4- 0.5	Guwahati, Bongaigaon, Dibrugarh cluster	Guwahati, Bongaigaon, Dibrugarh cluster
TOTAL	**~ 30 MTPA**		

Table 20: Summary- Market Analysis; Domestic Cargo

4 Market Analysis- International Cargo

The Chicken's Neck Corridor is not only important to serve the North-East region but acts as an important link to serve the cargo flows in landlocked countries like Bhutan as well. While the trade between North-East and Bangladesh is dominantly through the border points in Meghalaya and Tripura; the exchange of cargo between Bhutan-Bangladesh and Bhutan-Nepal is facilitated through the Chicken's Neck Corridor. This is represented in the figure below:

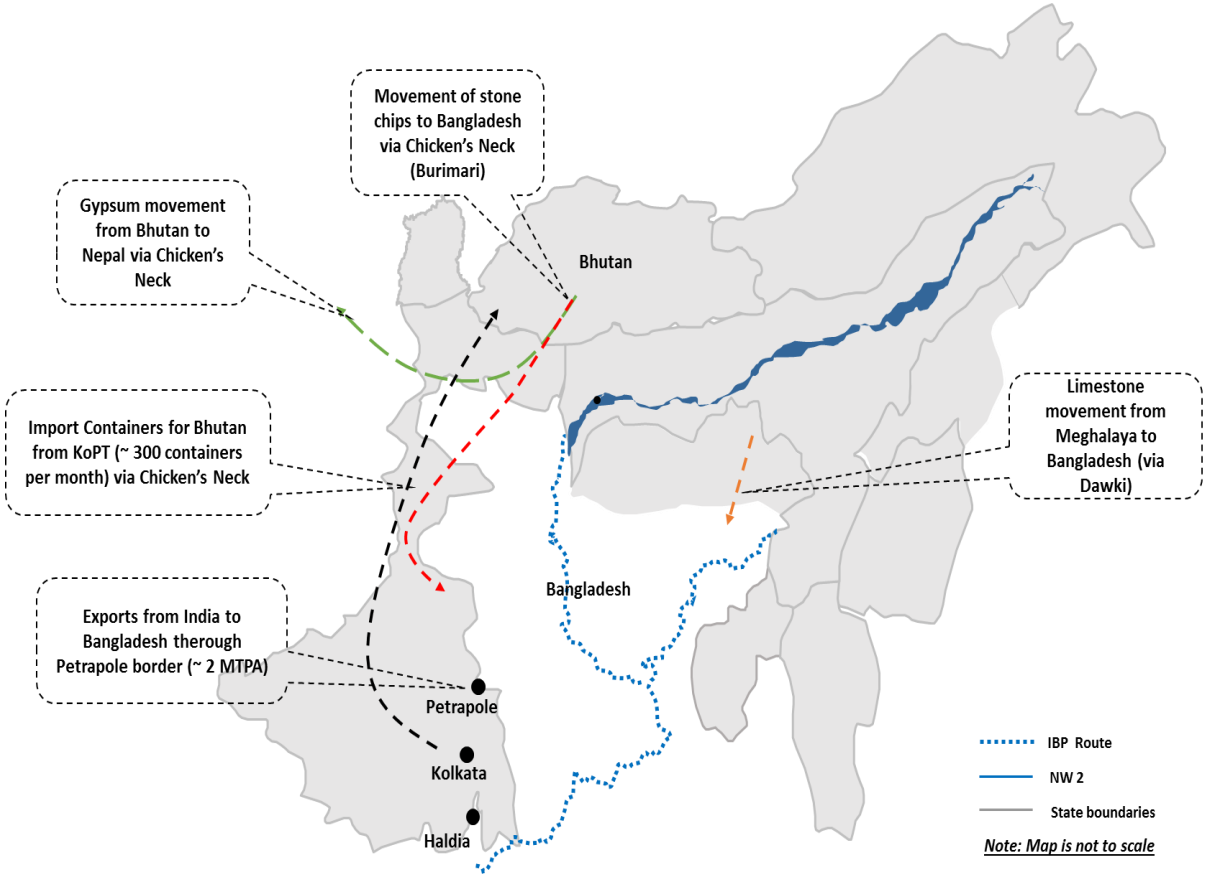

Figure 17 International cargo route through IBP route

As understood from the above figure, the narrow corridor is strategically an important piece of land in terms of facilitating trade between countries. Owing to the limited information available through secondary data sources and primary interactions conducted with officials at border check-points, the chapter summarizes the key findings obtained through the above mentioned sources.

4.1 Bangladesh

Trade with Bangladesh is mostly facilitated from Bennapole-Petrapole border in West Bengal and the Dawki border in Meghalaya. There are multiple Land Custom Stations located along the borders of North-East & Bangladesh through which trade is facilitated. However, it is mostly unaccounted for.

Around 400 trucks daily are moved into Bangladesh from Petrapole check point. On entering Bangladesh, the commodities/cargo are unloaded from Indian trucks and loaded onto local trucks from where they are moved to serve the local hinterland. The average loadibility of the trucks is around 16 tonnes. Commodities like:

- raw fish (moved from Andhra Pradesh)- ~ 0.03 MTPA
- aluminum ingots (moved from NALCO plant in Odisha)- ~ 0.03 MTPA,
- plastic granules (moved pre-dominantly from Haldia)- ~ 0.2 MTPA,

- fruits and vegetables (moved dominantly from West Bengal)- ~ 0.1 MTPA,
- packaged food (Nestle is the key player in terms of packaged food, the cargo is moved in from various production units and brought into Kolkata from where it is distributed)- ~ 6,000 tonnes,
- pharmaceuticals (moved in from Gujarat, Himachal Padesh, Telangana),
- chemicals (excluding the non-restricted ones like muriate and explosives)
- Automobile chesses (TATA is the main player) make up the cargo stream) - ~ 200-250 moved on a daily basis.

The overall traffic movement is around 2 MTPA while the turnaround time for trucks is over 10 days at the border check-post. The time taken is essentially due to the customs processes and lack of truck parking facility at the Bangladeshi side. As understood based on primary interaction, the parking facility at Bennapole (Bangladesh) is of around 250 trucks as opposed to 400 at Petrapole (West Bengal). The area faces traffic congestion issues owing to the two-lane highway leading to the border points.

Limestone is the key commodity that is moved into Bangladesh from the Dawki border in Meghalaya. As understood based on primary interactions, around 10 MTPA of limestone which is equivalent to over 2000 trucks[11] of average loadibility of 15 tonnes in moved into Bangladesh to support cement & clinker production. Apart from this, trade is facilitated through various Land Custom Stations (LCS) situated across the region. At present around 18 out of 30 LCS's in the region are functional.

The Indo-Bangladesh Protocol Route plays an instrumental role in facilitating trade between India and Bangladesh. It was first signed in 1972 and is now under auto-renewal mode. The notified routes are:

- Kolkata-Chandpur-Pandu-Silghat-Kolkata
- Kolkata-Chandpur-Karimganj- Kolkata
- Silghat- Pandu- Ashuganj- Karimganj- Pandu- Silghat
- Rajshahi- Dhulian- Rajshahi

Narayanganj, Khulna, Mongla, Sirajganj and Ashuganj are the 5 ports of call from Bangladesh side while Kolkata, Karimganj, Haldia, Pandu and Silghat are from India's side. Around 2.6 MTPA of cargo is moved using the route. The key commodities moved are fly ash, MS wire rod, jute, Project Cargo, wheat/ food grain, cement and stone chips.

The Chicken's Neck Corridor acts as a link to facilitate trade between Bhutan and Bangladesh. Phuentsholing in Bhutan is the gateway from where trade is facilitated. The cargo is moved into Bangladesh from Changrabandha located in West Bengal (Burimari is the corresponding Bangladeshi point). On entering Bangladesh, the trucks are unloaded and loaded to the Bangladeshi trucks in order to serve the local hinterland. In terms of commercials, the movement from Phuentsholing to Burimari costs around INR 700-800/tonne, while that from Burimari to Dhaka costs around INR 700-750/tonne (USD 9.39 from Burimari to Dhaka and USD 2.8 as tax). The truck change at the border point takes around 3-4 days owing to congestion. As understood based on primary interaction with State Trading Corporation and Export Promotion Council of Bhutan, the potential demand of stone chips is as high as 3-4 MTPA, however owing to congestion issues, lack of availability of truck and increased expenses incurred in terms of road transportation, only 10-20% of the trade is realized.

4.2 Bhutan

Bhutan is a landlocked country sharing its borders with Indian states of Assam, West Bengal, Sikkim and international borders with China. It is largely an import dependent country with 90% of its trade being met through with India and remaining with countries like China, Thailand, Malaysia etc. Imports are containerized in nature which are handled at Kolkata Port, they are moved into Bhutan via Phuentsholing and de-stuffed at the Dry Port facility close to the border check-post. As understood based on primary interactions, around 250-300 containers are moved into the country with an average loadibility of ~ 8 tonnes. Commodities like household goods, electronics, furniture, packaged food items amongst various other goods are moved into Bhutan.

[11] Note: The term equivalent is used as one plant has a conveyer belt from the mine mouth to the plant.

Apart from Phuentsholing, the other two entry points to Bhutan are from Gelephu (south-central Bhutan) and Samdrup Jongkhar which shares its borders with north-eastern state of Assam. As understood based on primary interactions, gypsum, cement and silicon is moved into Assam through this border. The cement plants in Bhutan are located in the southern part, adjoining Assam. Around 1 MTPA of cement is moved into Guwahati through the Samdrup Jongkhar and Siliguri through the Phuentsholing border from where they are further distributed. The movement is entirely on road.

Around 68,000 tonnes of gypsum is moved from Bhutan to Nepal. Currently the movement is on road, wherein the cargo enters Nepal via Chicken's Neck & Raxaul border to enter Nepal. However, as understood based on interactions with officials of Bhutan Chamber of Commerce, there is a proposal to construct a rail yard at Hasimari goodshed (around 20 kms from Phuentsholing) to serve the gypsum demand in Nepal through rail movement. As already discussed previously, stone chips form the key cargo stream for Bhutan-Bangladesh trade facilitated through the Burimari border.

5 Market Analysis- Supply Chain Review

Based on the understanding of cargo flows and the volumes developed in the previous section, suitability for the cargo to move on inland waterway is assessed. Commodities which account for 80% of the overall market are identified and a detailed supply chain assessment of the same is carried out. The remaining cargo market is extremely fragmented and is thus not taken into consideration. The key cargo streams are represented in the figure below:

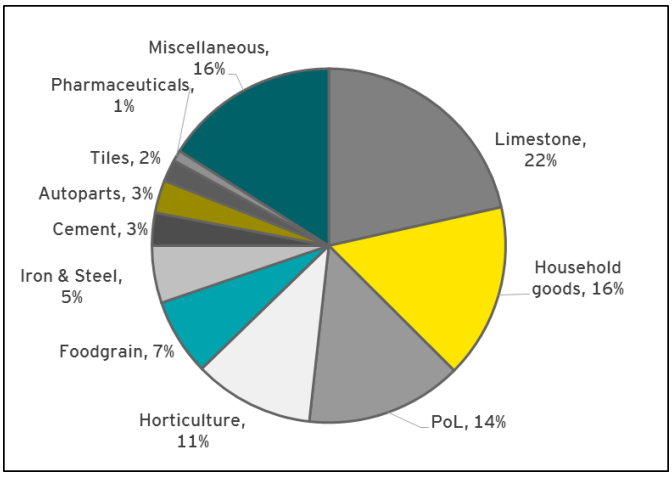

Figure 18 Commodity distribution

As can be observed from the figure, commodities like household goods, horticulture and agricultural products, limestone, PoL products, foodgrain, iron & steel, cement, tiles constitute over 80% of the total market. The miscellaneous category comprises of tar coal/bitumen, edible oil, imported coal, containers, fly ash, silicon etc.

Limestone as understood based on the preceding chapter, moves into Bangladesh through the Dawki border in Meghalaya to serve as an input to the cement & clinker plants located in the northern part of Bangladesh. A detailed assessment of this stream is thus not taken into consideration as the commodity moves over short leads of around 100-150km.

Horticulture commodities (which include fruits, vegetables and cultivation crops) is not included in this analysis essentially because it is perishable in nature and requires a turnaround time of 1-2 days. Given our understanding of the transit time involved in IWT movement, this class of cargo is rendered unsuitable.

To understand whether a commodity is suitable for IWT, the existing supply chain of the commodity is understood in terms of the commercials involved in the movement of cargo and the key logistics determinants which drive the supply chain. The costs involved in various steps is gathered from railway freight tables, interactions with port officials, interactions with IWT officials, logistics players and good sheds. It is then compared with transport supply chain with IWT incorporated into it. The loading terminal is considered to be the nearest IWT terminal from the origination point of the cargo.

Vessel transportation cost of INR 1.2/ton-km applicable for a 1000 tonne vessel is considered for the transport supply chain analysis. The assumptions made for transportation of inland vessels is as follows:

- The vessel is operated for 350 days with a capacity utilization of ~80%.
- As revealed in primary interactions with vessel operators, the existing charge is expected to reduce with provisions of night navigation and increased LAD of 3m.
- An expected reduction of ~25% is anticipated with either of the provisions and ~ 40% when both are facilitated.

Thus, the value chain for the shortlisted commodities is assessed in view of 3 cases.

In this section, the supply chain of 11 commodities are taken into consideration. The following aspects are covered in this chapter:

- Supply chain review and transport cost competitiveness including comparative analysis with road and rail
- Identifying cargo streams which are viable in terms of time, cost, capacity and distance under different scenarios
- Identification of bottlenecks impeding the modal shift to IWT

5.1 Household goods

A total of ~ 7.8 MTPA of household goods move into the PIA from various parts of the country namely Delhi, Gujarat, Maharashtra, Karnataka, West Bengal and Haryana. The modal share is skewed towards rail which has a share of 58% vis-à-vis road which has a share of 42%. The commodities moved on rail are mostly the ones which fall under the freight forwarder scheme which include items for daily consumption like provisions, toys, sundry items etc. They are moved in parcel wagon rakes.

White goods like refrigerator, air-conditioner and TV are on road. The modal share of road is ~95% as the commodities are sensitive to multiple handlings and require adequate safety while transportation. Also, the supply chains for household goods needs to be highly responsive and transit time reliability is the key. They are moved in closed body trucks with loadibility of 13 tonnes per truck. Therefore, the supply chain of these commodities are not assessed for suitability for IWT.

A typical value chain of household goods (essentially freight forwarder goods) is presented in the figure below:

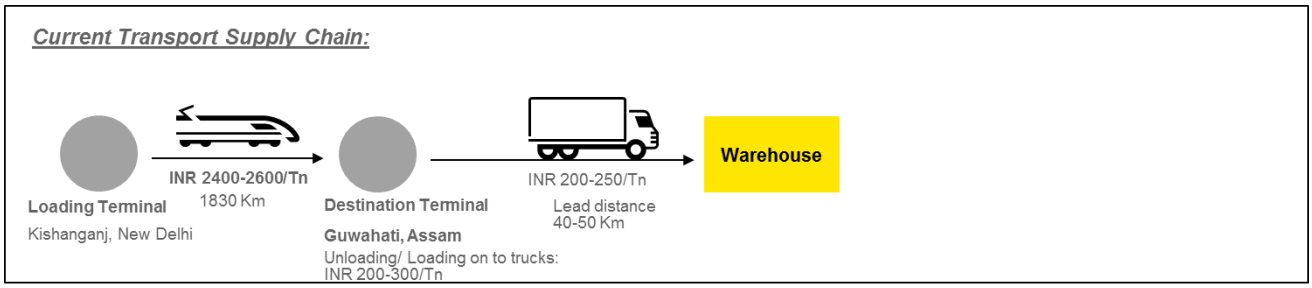

Figure 19 Typical value chain- household goods

At present the commodity is loaded on to the rakes from states like Delhi, Gujarat, and Rajasthan. The average lead is over 2,000km. The transport supply chain originating from Kishanganj is taken into consideration (they are loaded from various other terminals across Northern and Western India, however, given that majority is loaded from Kishanganj the same is considered for the analysis). The goods are then transported to New Guwahati goodshed in Assam covering a distance of 1,830km. The commodity falls under freight class 150 and accordingly the freight cost for rail movement is INR 2,424/tonne. The goods are unloaded at New Guwahati goodshed and loaded on to the trucks from where they are transported to the warehouses. The cost involved in two handlings at the good shed are around INR 150-200/tonne. Last mile connectivity to warehouses on trucks costs around INR 250-300/tonne.

Value chain with IWT incorporated as a mode of transport is presented in the figure below. Two cases have been considered.

Case I: Transport supply chain with IWT (Kolkata to Pandu)

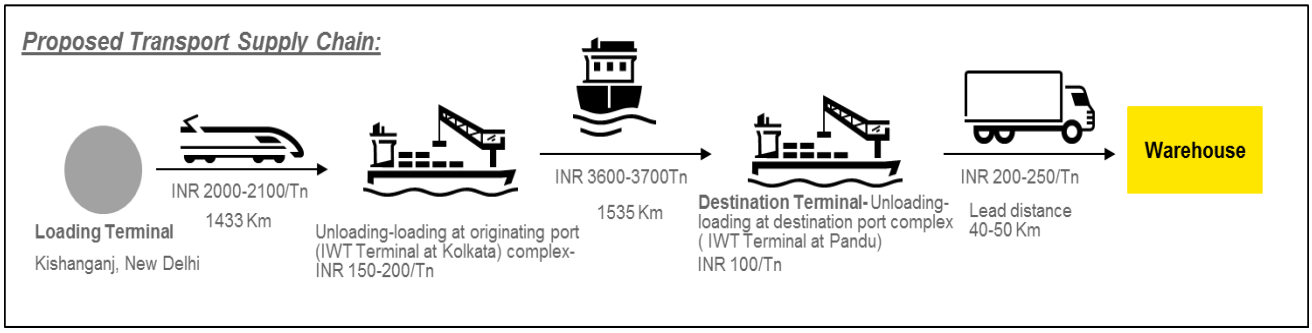

Figure 20 Value chain household goods- IWT movement

The proposed supply chain from Kishanganj to Guwahati using IWT (Kolkata as the loading terminal for IWT movement) is as follows:

- The commodity is loaded on to the rakes at Kishanganj terminal in Delhi (originating terminal). It is transported to Kolkata covering a distance of 1,443 km. The commodity falls under freight class 150 and accordingly the freight cost for rail movement is INR 2060/tonne.
- The goods are unloaded at the Kolkata terminal and loaded on to the vessels from the IWT terminal at Kolkata. The two handlings cost around INR 150-200/tonne.
- As revealed in primary interactions with IWT officials, the average cost of vessel transportation costs around INR 1.2/ton-km and the movement takes 10-14 days. Guwahati is the hub for household goods, hence, IWT transportation from Kolkata to Pandu is taken into consideration. The IWT distance between Kolkata and Pandu terminals is 1535 km, costing around INR 3600-3800/ton.
- The commodity is unloaded at Pandu terminal and loaded on to the trucks from where it is taken to the warehouses. The cost involved in these two handlings at Pandu port cost around INR 100-150/tonne. Last mile connectivity on trucks to warehouses costs INR 200-250/tonne.

Case I: Transport supply chain with IWT (Varanasi to Pandu)

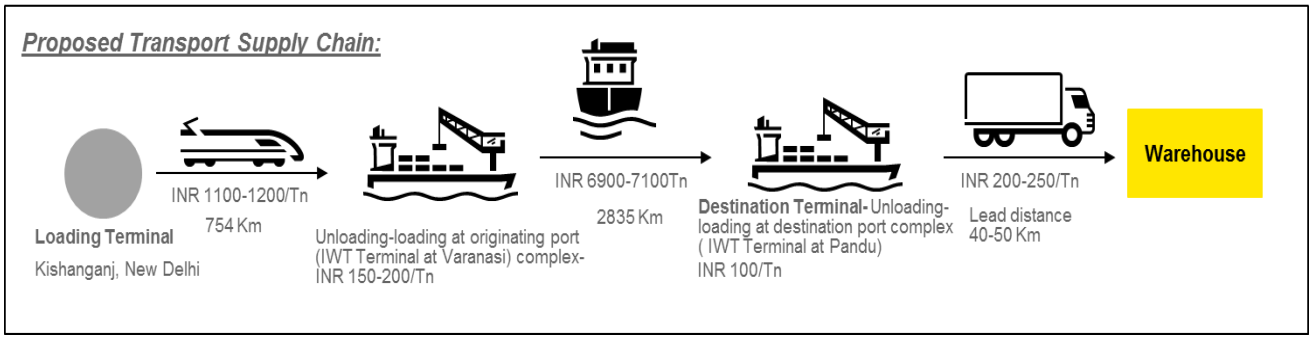

Figure 21 Value chain household goods- Scenario 1 IWT movement

The proposed supply chain from Kishanganj to Guwahati using IWT (Varanasi as the loading terminal for IWT movement) is as follows:

- The commodity is loaded on to the rakes at Kishanganj terminal in Delhi (originating terminal). It is transported to Varanasi covering a distance of 754 km. The commodity falls under freight class 150 and accordingly the freight cost for rail movement is INR 1131/tonne.
- Varanasi falls along the NW 1 corridor and is the site for proposed multi-modal hub. The goods are unloaded at Varanasi terminal and loaded on to the vessels from the proposed IWT terminal. The two handlings cost around INR 150-200/tonne.
- As revealed in primary interactions with IWT officials, the average cost of vessel transportation costs around INR 1.2/ton-km and the movement takes 15-20 days. IWT transportation from Varanasi to Pandu is taken into consideration, as Guwahati is the hub for household goods. The IWT distance between Varanasi and Pandu terminals is 2835 km, costing around INR 6900-7100/ton.
- The commodity is unloaded at Pandu terminal and loaded on to the trucks from where it is taken to the warehouses. The cost involved in these two handlings at Pandu port costs around INR 100-150/tonne. Last mile connectivity on trucks to warehouses costs INR 200-250/tonne.

Two other cases with vessel transportation cost INR 0.9/ton-km (assuming that provision of night navigation or uniform LAD is available) and INR 0.75/ton-km (assuming both are made available) are considered. The results are summarized in the table below:

Scenario	Vessel Transportation Charges (INR/ton-km)	Total Logistics Cost (INR/ton)	
		IWT movement Kolkata-Pandu	IWT movement Varanasi-Pandu
Case I	1.2	6,000-6,200	8,500-8,700
Case II	0.9	5,100-5,300	6,600-6,800
Case III	0.75	4,800-5,000	5,800-6,000

Table 21: Household Goods- logistics cost- IWT movement

Summary: as observed from the existing and proposed transport value chain, the commodity is rendered unsuitable for transportation through IWT. This can be attributed to the following reasons:

- Commercially more expensive
- Multiple handlings which increase the overall logistics cost
- Time taken to transport the commodity- the goods are essential for consumption purpose

5.2 Cement & Clinker

As discussed in the preceding section, ~ 11 MTPA of cement and clinker is moved into, outside and within the PIA. The overall modal share is skewed towards road as the majority of intra-regional cement is moved on road. Currently it is ~20% rail and 80% road. Of the total volume, ~ 1.4 MTPA moves into the PIA from various states like Chhattisgarh, Gujarat, Jharkhand, Maharashtra and West Bengal. ~ 0.22 MTPA moves outside the PIA to Bihar and West Bengal.

Cement moved on rail is loaded on BOXN wagons with an average loadibility of 70 tonnes. On road it is loaded on to 16 tonne trucks and moved into and outside the PIA. However, the movement within the PIA is facilitated on 9/15 tonne trucks.

Of the 1.4 MTPA that moves into the PIA, the average lead of cement on rail is over 1200km. The railway freight is telescopic in nature ie reduction in freight cost with an increase in distance traversed. The cement is loaded on to the rakes from private sidings of the cement players and unloaded at Lanka, Bokajan, New Tinsukia and New Guwahati amongst various other good sheds. The modal share of rail in inward movement is 43% while that of road is 57%. The movement is road is facilitated by small cement players located in the upper reaches of Bengal.

Transport supply chain for three cases viz vessel transportation cost INR 1.2/ton-km, INR 0.9/ton-km and INR 0.75/ton-km is analyzed. The assessment is carried out for IWT terminals at Pandu and Karimganj.

The transport supply chain for West Bengal is taken into consideration as movement from Chhattisgarh, Maharashtra and Jharkhand are not feasible on IWT. This is essentially due to long leads of over 1200km for which rail is economically more viable owing to telescopic nature of freight and multiple handlings involved in IWT movement which makes a price sensitive commodity like cement more expensive. Transport supply chains are explained as follows:

Originating Terminal- West Bengal

Of the 1.41 MT that moves into the PIA, 0.61 MT moves on rail and 0.8 MT on road from West Bengal. The rail movement is from Ambuja Cement Eastern Pvt. Ltd. and Sonar Bangla Cement in Murshidabad. Road movement is from various plants located across the state in Sankrail, Durgapur, Mejia and Kolaghat. It is facilitated on 16 tonne trucks with commercials of INR 2500-2800/tonne. The average lead is 900-1000km.

The existing transport supply chain from West Bengal on rail is presented in the figure below:

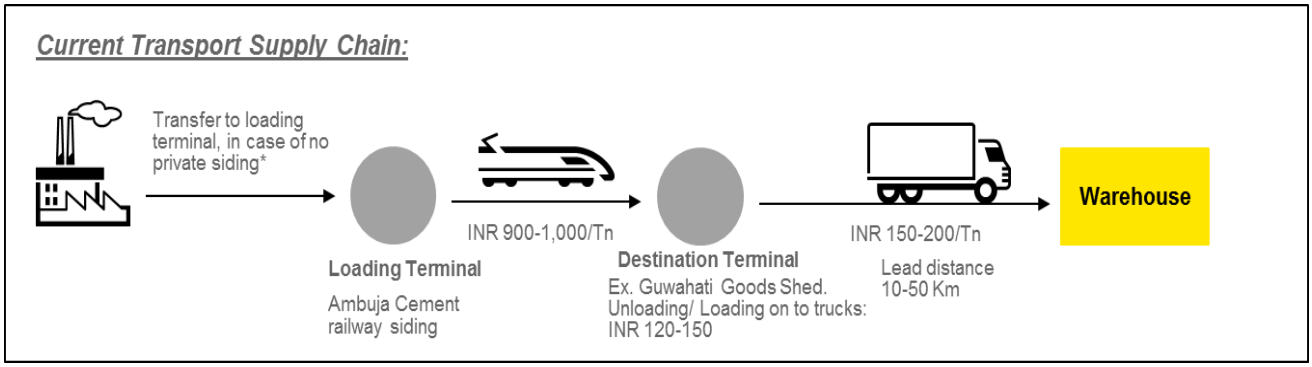

Figure 22 Typical value chain- Cement and clinker

Cement bags are loaded on to the rakes from Ambuja Eastern Cements private siding and moved to the PIA. They are unloaded at various good sheds within the states. The average lead is 650-700 km. The commodity falls under freight class 140, thus, the cost of rail movement is INR 900-1000/tonne. The cement bags are unloaded at the good sheds and loaded on to the trucks. The commercials involved in the two handlings is INR 120-150/tonne. Last mile connectivity is facilitated on road using 9 tonne trucks costing around INR 150-200/tonne.

Guwahati is the main commercial center in the North-East region and hence the IWT movement upto Pandu is taken into consideration. The transport supply chain with IWT incorporated as a mode of transport is presented in the figure below:

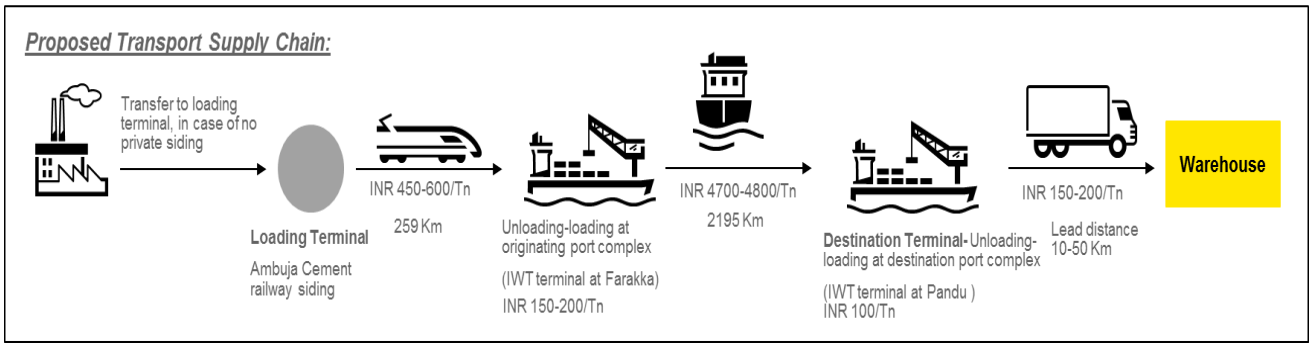

Figure 23 Cement and clinker value chain- IWT movement

The proposed supply chain from West Bengal to Guwahati using IWT (Farakka as the loading terminal for IWT movement) is as follows:

- The cement bags are loaded on to the rakes from Ambuja Eastern Cements private siding and moved to Farakka railway siding. The distance between the two rail nodes is 260 km. Cement falls in freight class 140 and the movement costs INR 460-480/tonne.
- The bags are unloaded at Farakka and moved to the IWT terminal. The cost involved in two handlings and the movement is around INR 250-300/tonne.
- The distance between IWT Farakka terminal and Pandu port is 2195km; assuming vessel transportation cost of INR 1.2/ton-km the total cost involved in the movement is INR 5200-5300/ton-km.
- The bags are unloaded at Pandu port and loaded on to the trucks for last leg connectivity to warehouses. Commercials involved in two handlings at port are INR 150-200/tonne and truck movement costs around INR 150-200/tonne.

The results of the cases discussed above are summarized in the table below:

Scenario	Vessel Transportation Charges (INR/ton-km)	Total Logistics Cost (INR/ton)
		IWT movement Kolkata-Pandu
Case I	1.2	6,100-6,300
Case II	0.9	4,800-5,000
Case III	0.75	4,200-4,400

Table 22 Cement and Clinker logistics cost- IWT movement

As can be understood from transport supply chains discussed above, cement transportation involving a single mode is commercially viable in comparison to a multi-modal arrangement. It is an extremely cost sensitive commodity and the multiple handlings involved in case makes it unviable for transportation via IWT.

5.3 Foodgrain

The category consist of rice, wheat, maize, pulses and food grain. As discussed in the subsequent section, ~3.5 MTPA of food grains move into the PIA from different parts of the country. The modal share is skewed

towards rail with a share of 88% and road is 12%. Rail movement is facilitated by FCI in BOXN wagons with an average loadibility of 65- 70 tonnes. The movement of food grain is given high priority by railways. Moreover, FCI has its own infrastructure in terms of private sidings and loading and unloading points which leads to cost optimization, thus, justifying a high modal share of railways.

The food grains dispatched are procured from states like Madhya Pradesh, Punjab, Haryana, West Bengal, Maharashtra, Delhi and Karnataka. The average lead for the movement is around 2100 km. The food grains are received either at FCI owned sidings or at good sheds managed by Indian Railways and further transported to the FCI storages on 9 tonne trucks.

As understood based on primary interactions, around 18-20,000 tonnes/month of food grains especially pulses and rice are moved into the PIA from West Bengal, particularly from Haldia Dock Complex. The quantum is also inclusive of consignments that are shipped into Haldia via coastal shipping from port along the southern coast of India. The movement into the PIA is facilitated entirely on 16 tonne trucks. The commercials involved in the movement are around INR 4000-4200/tonne.

A typical transport value chain of food grain movement at present and that with IWT incorporated as a mode of transport is presented in the figure below. Vidisha railway siding in Chhattisgarh is considered to be the originating terminal.

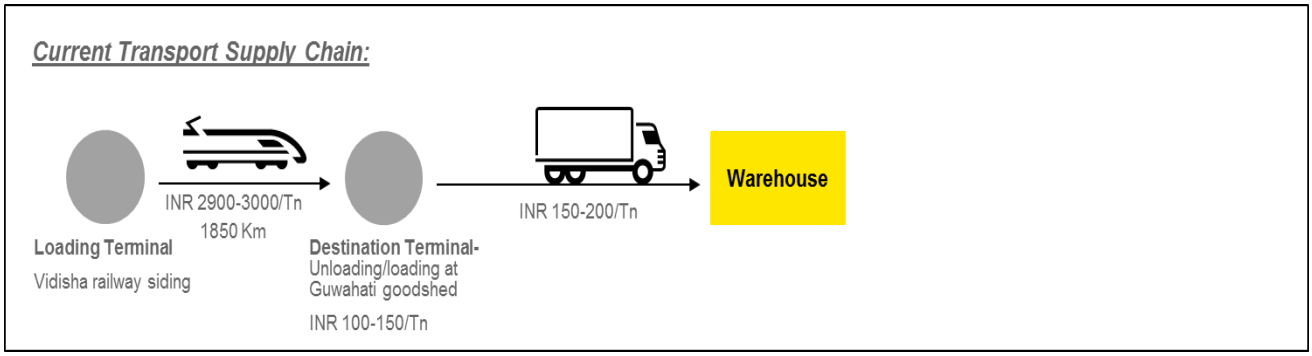

Figure 24 Typical value chain- Foodgrain

Food grains are loaded on to the rakes from Vidisha railway siding and moved into the PIA. It is unloaded at various good sheds and FCI owned sidings. The average lead for the movement is around 1,850 km. Food grain falls in freight class 130 and the cost of transportation corresponding to the lead is INR 2900-3000/tonne. The rakes are unloaded at the goodshed and loaded on to the trucks. The commercials involved in two handlings are INR 100-150/tonne. Last mile connectivity to warehouses is facilitated on 9 tonne trucks which cost around INR 150-200/tonne.

Value chain with IWT incorporated as a mode of transport is presented in the figure below. Vessel transportation from Kolkata to Pandu, Karimganj and Ashuganj is taken into consideration is taken into consideration.

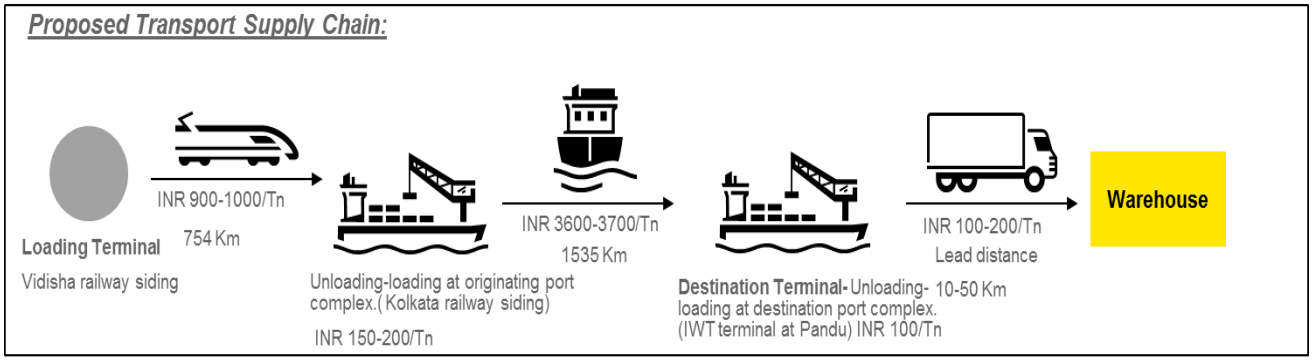

Figure 25 Foodgrain value chain- IWT movement

The proposed supply chain from Vidisha to Guwahati using IWT (Kolkata as the loading terminal for IWT movement) is as follows:

- Food grain is loaded on to the rakes at Vidisha railway siding and moved to Kolkata. The commodity is unloaded at the good shed and handled at the IWT terminal. The two handlings cost around INR 150-200/tonne.
- The inland vessel is loaded and then moved to Pandu port. The waterway distance between the two terminals is 1,535km and assuming a vessel transportation cost of INR 1.2/ton-km, the total cost of vessel movement is around INR 3,600-3,700/tonne.
- The bags are unloaded at the port facility and loaded on to the trucks. The two handlings cost INR 150-160/tonne.
- The last mile connectivity to the warehouses is facilitated through road on 9 tonne trucks. The commercials involved in truck movement is INR 150-200/tonne.

The distance between Kolkata and proposed terminal at Karimganj is 1,318km. It is assumed that all the other costs remain the same, the vessel transportation costs between these terminals is INR 3,100-3,200/tonne.

The distance between Kolkata and proposed terminal at Ashuganj is 998km. It is assumed that all the other costs remain the same, the vessel transportation costs between these terminals is INR 2,350-2,450/tonne.

It can be observed that movement on rail is commercially more viable over IWT mode due to telescopic nature of railway freight and limited handlings. However, the cargo originating at Haldia Dock Complex can be a potential cargo stream for IWT.

As revealed in primary interactions with logistics players, movement on road is facilitated by private players on 16 tonne trucks. Around 18-20,000 tonnes/month is moved into the PIA from West Bengal, particularly from Haldia Dock Complex. The lead for this particular movement is 1,087 km. The commodity is loaded on to the trucks and into the PIA. They are then unloaded at the desired warehouses. The commercials involved in the movement of truck is around INR 4,000-4,200/tonne while that of the handlings (loading and unloading of truck) is INR 150-200/tonne. The high cost pertaining to truck movement can be attributed to the unavailability of return cargo from the North-East.

The transport value chain described is modified with IWT movement incorporated into it with originating terminal being Haldia:

- The cargo originating from HDC is assumed to be handled at the proposed multi modal terminal and loaded on to the inland vessel. The commercials involved in the handling being INR 300-350/tonne.
- The distance between HDC and Pandu port is 1,435km; assuming vessel transportation charges to be INR 1.2/ton-km, the total cost of movement is INR 3,400-3,500/tonne.
- The vessel is unloaded at the Pandu port facility and loaded on to the trucks. The two handlings costs INR 150-200/tonne.
- Last mile connectivity is facilitated on 9 tonne trucks to the warehouses which cost around INR 200-250/tonne.

The distance between Haldia and proposed terminal at Karimganj is 1,218km. It is assumed that all the other costs remain the same, the vessel transportation costs between these terminals is INR 2,900-3,000/tonne.

The distance between Haldia and proposed terminal at Ashuganj is 898km. It is assumed that all the other costs remain the same, the vessel transportation costs between these terminals is INR 2,100-2,200/tonne.

The result for food grains is summarized in the table given below:

Scenario	Vessel Transportation Charges (INR/ton-km)	Total Logistics Cost (INR/ton)		
		IWT movement Kolkata-Pandu	IWT movement Kolkata-Karimganj	IWT movement Kolkata-Ashuganj
Originating Terminal: Vidisha Railway Siding				
Case I	1.2	5,100-5,300	4,600-4,800	3,900-4,100
Case II	0.9	4,100-4,300	3,800-4,000	3,300-3,500

Scenario	Vessel Transportation Charges (INR/ton-km)	Total Logistics Cost (INR/ton)		
		IWT movement Kolkata-Pandu	IWT movement Kolkata-Karimganj	IWT movement Kolkata-Ashuganj
Case III	0.75	3,700-3,800	3,500-3,700	2,800-3,000
Originating Terminal: Haldia Dock Complex				
Case I	1.2	4,000-4,200	3,500,3700	2,700-2,900
Case II	0.9	3,000-3,200	2,700-2,900	2,200-2,400
Case III	0.75	2,700-2,900	24,00-2,600	1,800-2,000

Table 23 : Foodgrain logistics cost - IWT movement

Based on the understanding developed through the transport supply chains, the commodity is suitable for transportation using IWT. However, only the cargo originating from Haldia could be shifted to IWT.

5.4 Fertilizers & FRM

As already discussed in the market analysis section, the PIA receives around 0.4 MTPA of fertilizers & FRM from states like West Bengal, Andhra Pradesh, Odisha, Uttar Pradesh and Rajasthan. ~ 0.32 MTPA is produced in the facility at Namrup and moved within the PIA while ~ 0.02 MTPA is moved out from the facility to West Bengal and Bihar. The urea manufacturing plant at Namrup has a private rail siding through which movement outside PIA is facilitated. Movement into and outside the PIA is facilitated entirely on rail. Movement within the PIA is dominantly on road. The overall modal share of rail is 30% while that of road is 70%. Fertilizers and FRM is moved on BCN or BOXN rakes with average loadibility of 65- 70 tonnes.

The average lead of the commodity group moving on rail is over 1,000km. the railway freight is telescopic in nature ie reduction in freight cost with an increase in distance traversed. The is loaded on to the rakes from private sidings of the cement players and unloaded at Lanka, Bokajan, New Tinsukia and New Guwahati amongst various other good sheds. The modal share of rail in inward movement is 43% while that of road is 57%.

Transport supply chain for three cases viz vessel transportation cost INR 1.2/ton-km, INR 0.9/ton-km and INR 0.75/ton-km is analyzed. The assessment is carried out for IWT terminal at Dibrugarh owing to its proximity to the fertilizer plant at Namrup.

The movement on fertilizer is prioritized on railways as the manufacturing units have private sidings within the facilities. The railways freight is telescopic in nature indicating that longer the lead, lower the freight cost of movement. This justifies the higher modal share of railways in movement of fertilizers. In terms of PIA, FRM and small quantity of fertilizers moves into the PIA on rail while the movement within the PIA is largely on road. The reason for this is scanty network of railways within the PIA.

The transport supply chain for West Bengal is taken into consideration as movement from Chhattisgarh, Maharashtra and Jharkhand are not feasible on IWT; owing to long leads and railways being commercially more viable. This is explained as follows:

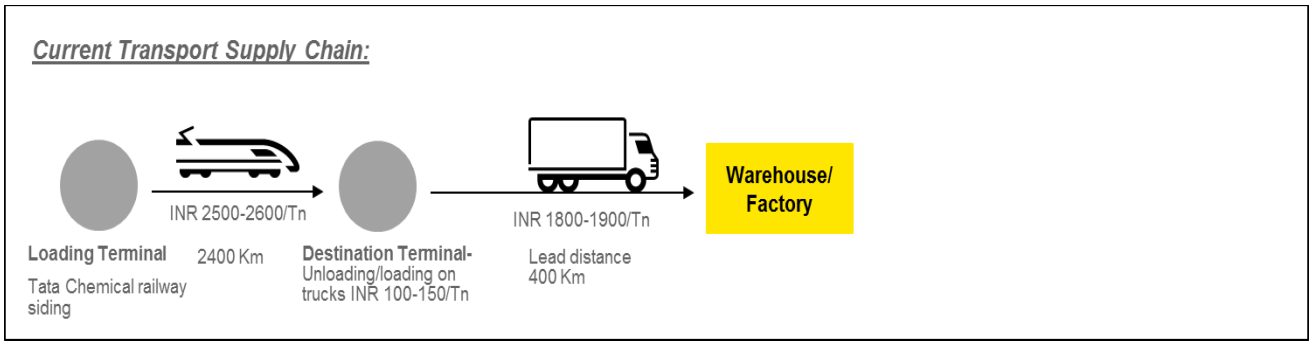

Figure 26 Typical fertilisers value chain

Fertilizer raw material is imported at Haldia Dock Complex by Tata Chemicals and moved into their facility. They are loaded on to the rakes from their private siding and moved into the PIA. The average lead for the movement is around 1,093 km. Fertilizer and fertilizer raw material falls in freight class 130 and the cost of transportation corresponding to the lead is INR 1,300-1,350/tonne. The rakes are unloaded at New Guwahati goodsheds managed by Indian railways and loaded on to the trucks. The commercials involved in two handlings are INR 100-120/tonne. Last mile connectivity to warehouses and thereon to the facility at Namrup is facilitated on 9 tonne trucks. The average cost involved is the movement is around 1,800-1,900/tonne (road distance between Guwahati and Namrup is around 400km).

Value chain with IWT incorporated as a mode of transport is presented in the figure below. Vessel transportation from Haldia to Dibrugarh is taken into consideration is taken into consideration.

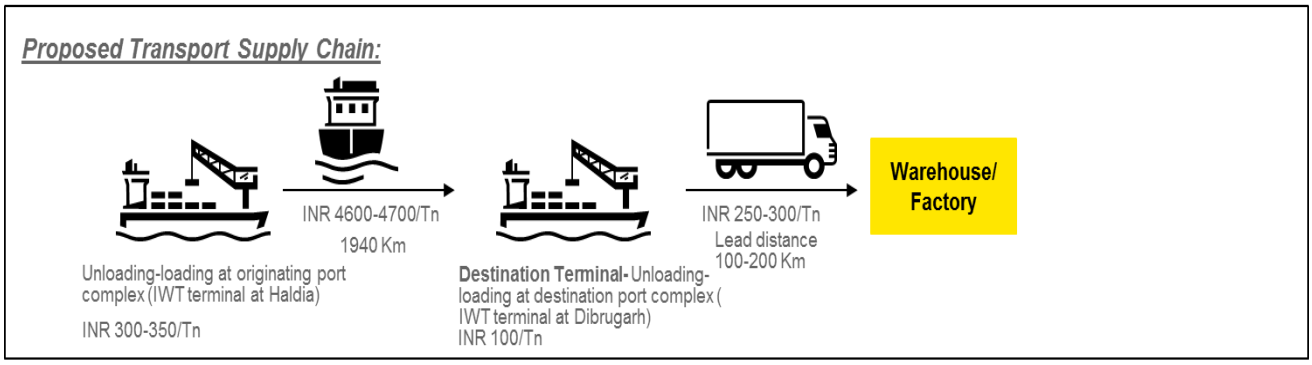

Figure 27 Fertilizers value chain- IWT movement

The proposed supply chain from Haldia to Dibrugarh using IWT (Haldia multi-modal terminal as the loading terminal for IWT movement) is as follows:

- Fertilizer raw material unloaded and Haldia dock is transferred to the multi-modal terminal for loading on to the inland vessels. The two handlings cost around INR 300-350/tonne.
- The inland vessel is moved to Dibrugarh inland port. The waterway distance between the two terminals is 1,940km and assuming a vessel transportation cost of INR 1.2/ton-km, the total cost of vessel movement is around INR 4600-4700/tonne.
- The bags are unloaded at the port facility and loaded on to the trucks. The two handlings cost INR 100-150/tonne.
- The last mile connectivity to the warehouses is facilitated through road on 9 tonne trucks. The commercials involved in truck movement is INR 250-300/tonne.

The result for movement of fertilizers and FRM is summarized in the table below:

Scenario	Vessel Transportation Charges (INR/ton-km)	Total Logistics Cost (INR/ton)
		IWT movement Haldia-Dibrugarh
Case I	1.2	5,300-5,500
Case II	0.9	4,100-4,300
Case III	0.75	3,500-3,700

Table 24 : Fertilizers and FRM logistics cost- IWT movement

Summary: based on the understanding developed through the transport supply chain of fertilizers and FRM, it can be concluded that the cargo originating from Haldia dock complex is suitable for transportation through IWT. However, it is commercially viable with the availability of requisite LAD of atleast 3m and night navigation. Transit warehouse facility at the proposed multi-modal terminal at Haldia as an additional facility to shippers is a plausible option to attract the cargo stream

5.5 Pharmaceuticals

As discussed in the subsequent section, ~0.49 MTPA of pharmaceuticals moves into the PIA from various parts across the country namely Gujarat (Chandgodar cluster), Uttarakhand (Rudrapur and Haridwar cluster) and Himachal Pradesh (Baddi cluster). The inward movement is facilitated on closed body truck with a loadability of 7 tonnes on road. The modal share thus is 100% towards road. The reason for skewed modal share is essentially due to the innate nature of the cargo which requires safety, security, special arrangements like reefer plugs and they are moved in small quantities which is not suitable for movement on rail. The commercials involved in the movement of pharmaceuticals is INR 25-30,000/tonne. The average lead involved in the movement is around 2,000-2,500 km. Guwahati is the main hub from where pharmaceutical is further distributed to the various states in north-east.

Transport supply chain for three cases viz vessel transportation cost INR 1.2/ton-km, INR 0.9/ton-km and INR 0.75/ton-km is analyzed. The assessment is carried out for IWT terminal at Kolkata for cargo originating from Ahmedabad. The non-viability of cargo moving on IWT originating from northern part of the country has been discussed in the case of household goods.

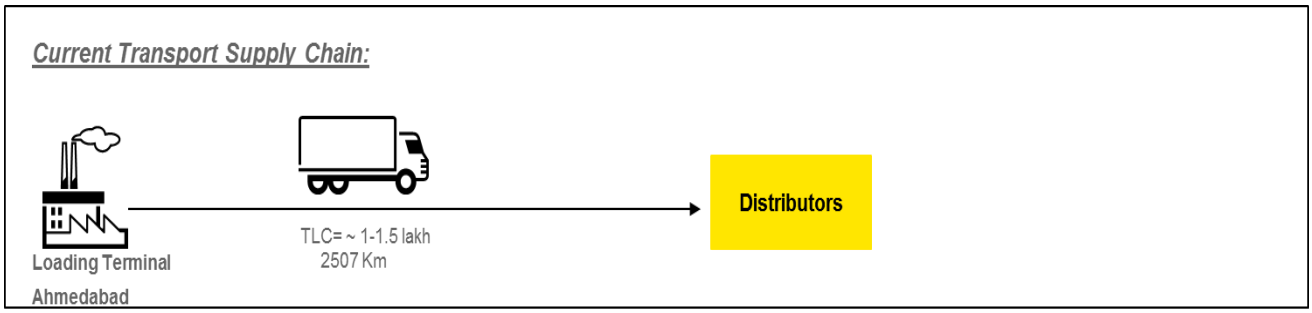

Figure 28 Typical pharmaceuticals value chain

Pharmaceuticals are loaded on to the trucks from the manufacturing units itself and then transported to Guwahati on closed body trucks. The trucks have a carrying capacity of 7 tonnes. The movement on road is facilitated through the Siliguri (Chicken's Neck Corridor) with an average turnaround time of around 5 days. Several hidden costs like state border taxes and payments made to locals are involved in the transport supply chain. The trucks are directly received by the dealers who further distribute it across various cities in the region.

Value chain with IWT incorporated as a mode of transport is presented in the figure below. Vessel transportation from Kolkata IWT to Pandu IWT is taken into consideration is taken into consideration.

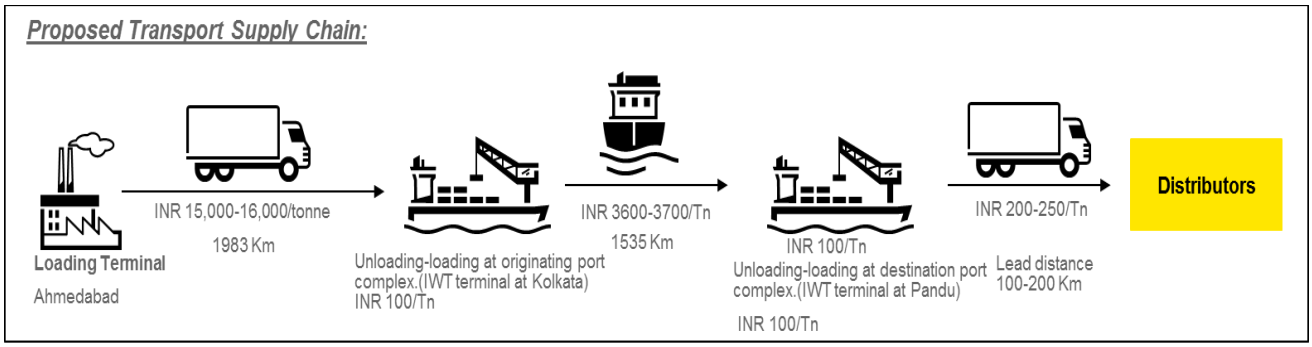

Figure 29 Pharmaceuticals value chain- IWT movement

The proposed supply chain from Kolkata to Pandu using IWT (Kolkata being the loading terminal for IWT movement) is as follows:

- Pharmaceuticals moved from Gujarat are unloaded at Kolkata inland water terminal for loading on to the inland vessels. The commercials involved in the road movement is around INR 15,000-16,000/tonne. The two handlings cost around INR 300-350/tonne.
- The inland vessel is moved to Pandu inland port. The waterway distance between the two terminals is 1,535km and assuming a vessel transportation cost of INR 1.2/ton-km, the total cost of vessel movement is around INR 3,600-3,700/tonne. The time involved in the movement is 13-15 days.
- The consignment is unloaded at the port facility and loaded on to the trucks. The two handlings cost INR 100-150/tonne.
- The last mile connectivity to the warehouses is facilitated through road on 7 tonne trucks. The commercials involved in truck movement is INR 200-250/tonne.

The result for movement of pharmaceuticals is summarized in the table below:

Scenario	Vessel Transportation Charges (INR/ton-km)	Total Logistics Cost (INR/ton)
		IWT movement Haldia-Dibrugarh
Case I	1.2	20,000-22,000
Case II	0.9	19,000-20,000
Case III	0.75	18,000-19,000

Table 25 : Pharmacueticals logistics cost- IWT movement

Summary: based on the understanding developed through the transport supply chains, it is concluded that pharmaceuticals are unsuitable for movement using IWT. This can be attributed to multiple handlings, time involved in the movement of cargo from origin to destination and difficulty in tracking cargo.

5.6 Tar Coal/ Bitumen

Tar coal or bitumen is extensively used for the construction of roads and is thus an important component in the process of infrastructure development. Around 0.2 MTPA is moved into the PIA from West Bengal, Maharashtra, Andhra Pradesh and Uttar Pradesh. It is imported from countries like Iran to ports like Haldia Dock Complex in West Bengal, Nhava Sheva in Maharashtra and Vishakhapatnam port. The movement into PIA is facilitated through both rail and road. The modal share is fairly balanced between the two modes; 50% each. The road movement is from the Indian Oil Corporation Limited at Haldia to the north-east with a lead of around 1,000 km. Bitumen is moved in tins of capacity 50 litres. As understood based on primary interactions, around 500 trucks of approximately 15 tonne capacity move into the PIA on a monthly basis. The commercials involved in the movement of bitumen is INR 4,000-4,500/tonne.

The movement on rail is either from IOCL private sidings in states like Uttar Pradesh or directly from the rail terminals at the major ports mentioned above. The rakes are loaded at various origin points and moved into the PIA. They are unloaded at New Guwahati good shed from where they are distributed across the region.

Bitumen is moved in BOXN rakes with an average loadibility of 65- 70 tonnes. The average lead of movement on rail is over 1,800 km.

As understood based on primary interactions conducted with various stakeholders in the north-east and anticipated infrastructure plans, it is expected that ~0.5 MTPA of bitumen is required to augment infrastructure requirement of the region.

Transport supply chain for three cases viz vessel transportation cost INR 1.2/ton-km, INR 0.9/ton-km and INR 0.75/ton-km is analyzed. The assessment is carried out for IWT terminal at Kolkata and Haldia for cargo originating from Mumbai (Kalyan) and Haldia Dock Complex respectively.

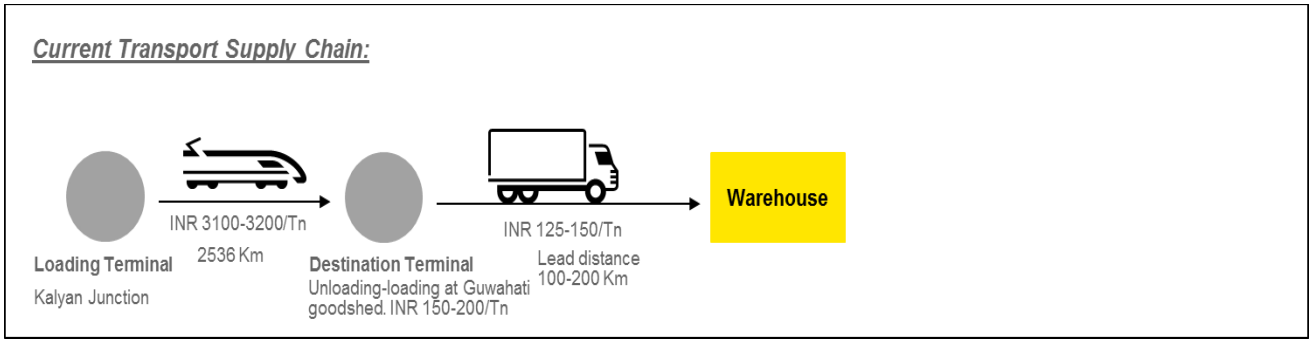

Figure 30 Typical Bitumen value chain

The tar coal/bitumen is loaded on to the rakes from Kalyan Junction in Maharashtra and moved to Guwahati. The commodity falls in freight class 160 and the commercials associated with the movement over the particular lead of around 2,500 km is INR 3,100-3,200/tonne. Rakes of bitumen are received at New Guwahati good shed managed by Indian railways. The rakes are unloaded and the tins are loaded on to the trucks. The cost associated with two handlings are around INR 150-200/tonne. Last mile connectivity to distributor warehouses is facilitated on 9 or 15 tonne trucks. Commercials associated with last mile connectivity is around INR 125-150/tonne.

In case the origin is Haldia dock complex, the loading station and rail freight charges change ceteris paribus.

Value chain with IWT incorporated as a mode of transport is presented in the figure below. Vessel transportation from Kolkata IWT/ Haldia multi-modal terminal to Pandu IWT is taken into consideration.

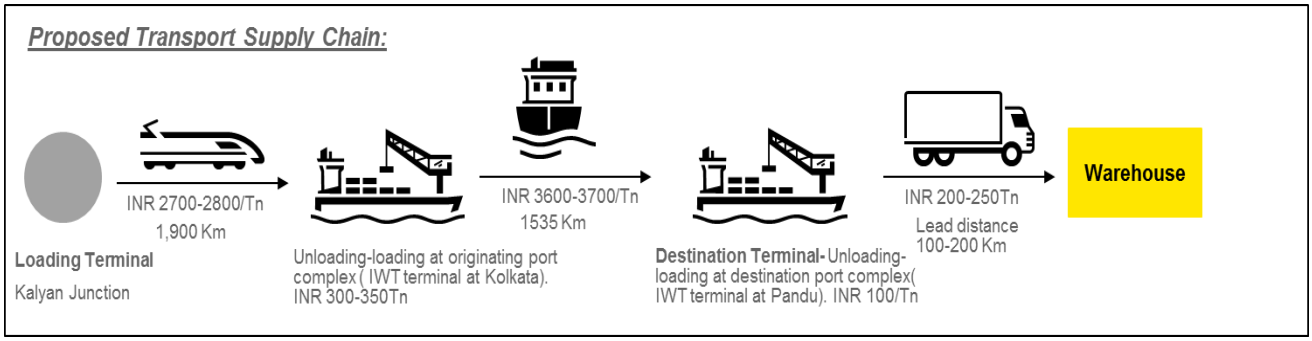

Figure 31 Bitumen value chain- Scenario 1-IWT movement

The proposed supply chain from Kolkata to Pandu using IWT (Kolkata being the loading terminal for IWT movement) is as follows:

- Bitumen is loaded on to the rakes from Kalyan junction and unloaded at Kolkata inland water terminal for loading onto inland vessels. The corresponding cost for traversing an average lead of around 1,900 km is around INR 2,700-2,800/tonne. The two handlings cost around INR 300-350/tonne.
- The inland vessel is moved to Pandu inland port. The waterway distance between the two terminals is 1,535km and assuming a vessel transportation cost of INR 1.2/ton-km, the total cost of vessel movement is around INR 3,600-3,700/tonne. The time involved in the movement is 13-15 days.

- The consignment is unloaded at the port facility and loaded on to the trucks. The two handlings cost INR 100-150/tonne.
- The last mile connectivity to the warehouses is facilitated through road on 9 or 15 tonne trucks. The commercials involved in truck movement are INR 200-250/tonne.

In case, the originating point is Haldia dock complex, the cargo is moved to the proposed multi-modal terminal at Haldia and loaded on to inland vessel for movement to Pandu. The distance between the two ports is 1,435 km with commercials of around INR 3,400-3,500/tonne. The overall handling costs is around INR 300-350/tonne. The following figure represents the same:

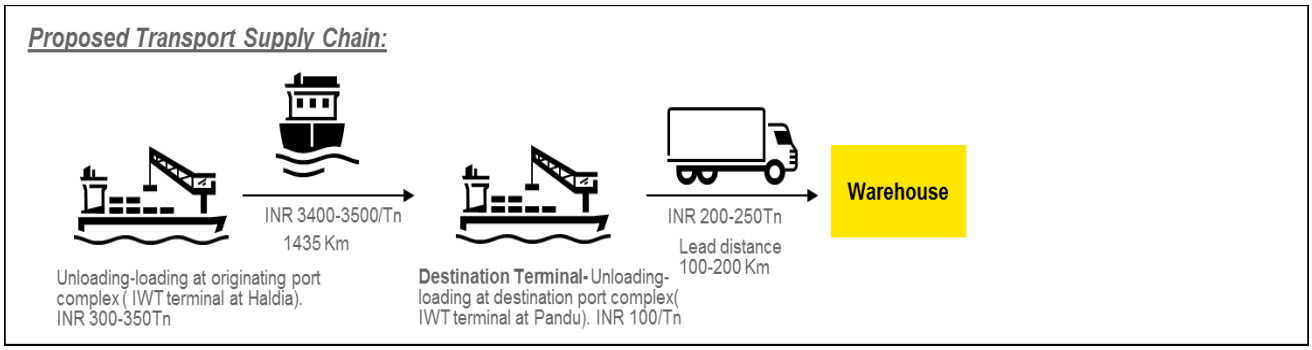

Figure 32 Bitumen value chain- Scenario 2- IWT movement

The result for movement of tar coal/bitumen is summarized in the table below:

Scenario	Vessel Transportation Charges (INR/ton-km)	Total Logistics Cost (INR/ton)
		IWT movement Kolkata-Pandu
Case I	1.2	4,100-4,300
Case II	0.9	3,100-3,300
Case III	0.75	2,700-2,900

Table 26: Tar coal/ Bitumen – IWT movement

Summary: based on the understanding developed through the transport supply chains, it is concluded that tar coal/bitumen is suitable for movement using IWT. The cargo originating from Haldia Dock Complex can be moved to north-east using inland water transport subject to availability of requisite LAD, night navigation and transit warehousing at the multi-modal terminal.

5.7 Iron & Steel

Iron & Steel are the backbone for infrastructure augmentation and are moved into the PIA from various parts of the country. Around 1.8 MTPA of iron & steel moves into the PIA from states like Chhattisgarh, Karnataka, Odisha, Jharkhand and West Bengal. The modal share is skewed towards road which has a share of 60% vis-à-vis road which has a share of 40%. A large part of the inward movement is of long rods/TMT bars which is used for the purpose of construction and building material. Most of the iron and steel plants are equipped with private rail siding within their facility from where rail movement into the PIA is facilitated. The commodity is mostly moved in BCN rakes. Average lead of rail movement is over 1,200 km. The detailed origin-destination pair mapping is discussed in market analysis chapter.

As understood based on primary interactions, around 1.08 MTPA of cargo is moved into the PIA using road. The movement is mostly from the steel plants located in West Bengal (Durgapur area). Around 100-120 trailers with average loadibility of 22 tonnes moves into the PIA on a daily basis. The commercials involved in the road movement are around INR 3,800-4,000/tonne. Most of the steel stockyards are located in Guwahati from where further movement to North-East is facilitated.

Transport supply chain for three cases viz vessel transportation cost INR 1.2/ton-km, INR 0.9/ton-km and INR 0.75/ton-km is analyzed. The assessment is carried out for cargo originating from Jamshedpur for which IWT terminal at Kolkata is taken into consideration.

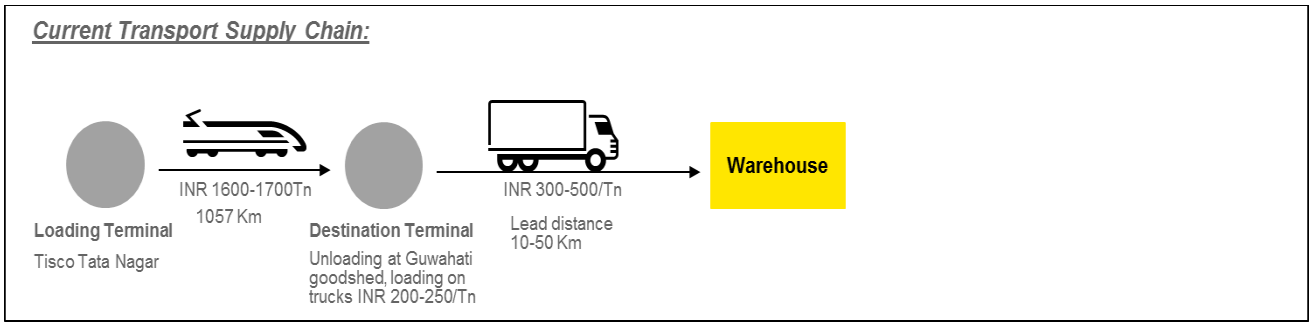

Figure 33 Typical Iron and Steel value chain

Iron & Steel is loaded on to the rakes from TISCO facility at Jamshedpur and moved to Guwahati. The commodity falls in freight class 165 and the commercials associated for its movement over the particular lead of around 1,057 km is INR 1,600-1,700/tonne. Rakes of iron & steel are received at New Guwahati good shed managed by Indian railways. The rakes are unloaded and loaded on to the trucks. The cost associated with two handlings are around INR 200-250/tonne. Last mile connectivity to distributor warehouses is facilitated on 9 or 15 tonne trucks. Commercials associated with last mile connectivity is around INR 300-350/tonne.

Value chain with IWT incorporated as a mode of transport is presented in the figure below. Vessel transportation from Kolkata IWT terminal to Pandu IWT is taken into consideration.

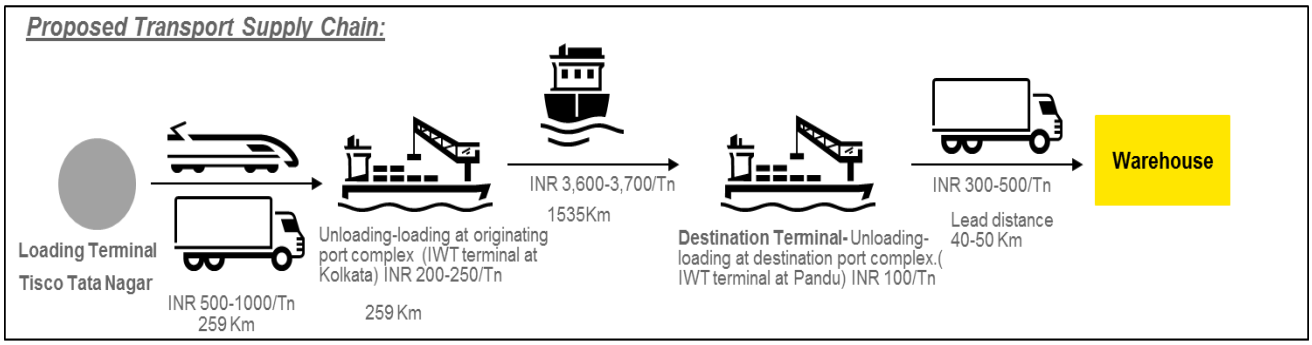

Figure 34 Iron and steel vale chain- IWT movement

The proposed transport supply chain from Kolkata to Pandu using IWT (Kolkata being the loading terminal for IWT movement) is as follows:

- Iron & Steel is loaded on to the rakes from TISCO facility at Jamshedpur and unloaded at Kolkata inland water terminal for loading onto inland vessels. The corresponding cost for traversing an average lead of around 260 km is around INR 460-470/tonne (the cost pertaining to road movement is around INR 800-1,000/tonne). The two handlings cost around INR 300-350/tonne.
- The inland vessel is moved to Pandu inland port. The waterway distance between the two terminals is 1,535km and assuming a vessel transportation cost of INR 1.2/ton-km, the total cost of vessel movement is around INR 3,600-3,700/tonne. The time involved in the movement is 13-15 days.
- The consignment is unloaded at the port facility and loaded on to the trucks. The two handlings cost INR 100-150/tonne.
- The last mile connectivity to the stockyards is facilitated through road on 9 or 15 tonne trucks. The commercials involved in truck movement is INR 200-250/tonne.

The result for movement of iron and steel is summarized in the table below:

Scenario	Vessel Transportation Charges (INR/ton-km)	Total Logistics Cost (INR/ton)
		IWT movement Kolkata- Pandu
Case I	1.2	4,600-4,800
Case II	0.9	3,600-3,800
Case III	0.75	3,200-3,400

Table 27 : Iron and Steel logistics cost- IWT movement

Summary: based on the understanding developed through the transport supply chains, it is concluded that iron & steel is unsuitable for movement using IWT. The cargo is break bulk in nature and in sensitive to multiple handlings. Movement using inland waterways requires multiple handlings thus rendering it commercially unviable.

5.8 Fly Ash

Fly ash is used as an input to the cement & clinker industry in north-east. It is moved into the PIA from power plants located in West Bengal (NTPC Farakka), Bihar (NTPC Kahalgaon) and Jharkhand (Jojobera Thermal Power Plant). They are unloaded at goodsheds managed by Indian Railways namely Lanka and Tetelia and moved into the facilities via road. The modal share is skewed towards rail which commands a share of 100%.

Fly ash is loaded on to the rakes from private siding within the NTPC Kahalgaon facility and moved to Tetelia good shed managed by Indian Railways. The commodity falls in freight class 120 and the commercials associated for its movement over the particular lead of around 880 km is INR 1,000-1,100/tonne. Rakes of fly ash are received at Tetelia good shed. The rakes are unloaded and loaded on to the trucks. The cost associated with two handlings are around INR 120-150/tonne. Last mile connectivity to distributor warehouses is facilitated on 9 or 15 tonne trucks. Commercials associated with last mile connectivity is around INR 150-200/tonne.

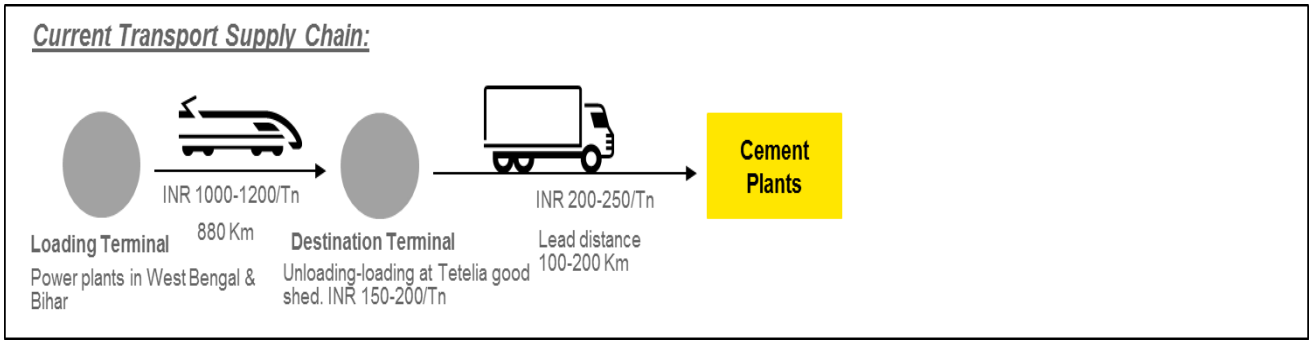

Figure 35 Typical Fly Ash value chain

Value chain with IWT incorporated as a mode of transport is presented in the figure below. Vessel transportation from Farakka IWT terminal to Pandu IWT and Karimganj IWT is taken into consideration.

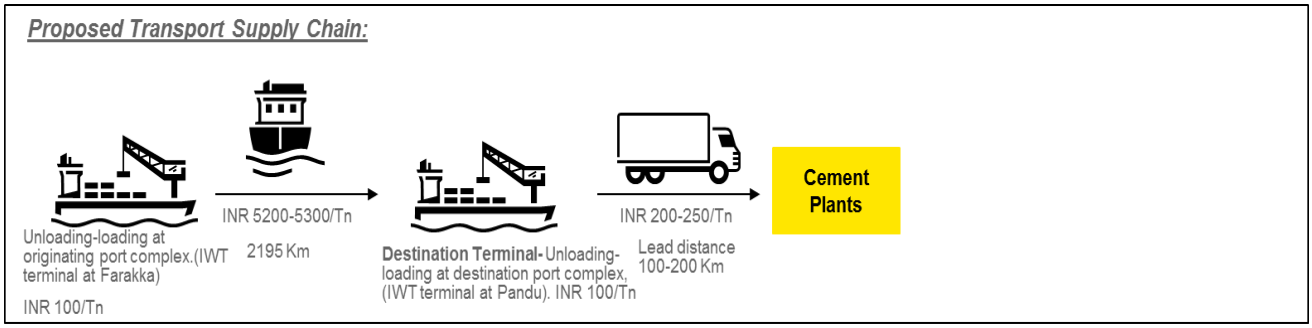

Figure 36 Fly Ash value chain – IWT movement

The proposed transport supply chain from Kolkata to Pandu using IWT (Kolkata being the loading terminal for IWT movement) is as follows:

- Fly ash is loaded on to the rakes from private siding within NTPC Kahalgaon and unloaded at Farakka inland water terminal for loading onto inland vessels. The corresponding cost for traversing an average lead of around 116 km is around INR 170-180/tonne. The two handlings cost around INR 150-200/tonne.
- The inland vessel is moved to Pandu inland port. The waterway distance between the two terminals is 2,195 km and assuming a vessel transportation cost of INR 1.2/ton-km, the total cost of vessel movement is around INR 5,200-5,300/tonne. The time involved in the movement is over 20 days.
- The consignment is unloaded at the port facility and loaded on to the trucks. The two handlings cost INR 100-150/tonne.
- The last mile connectivity to the stockyards is facilitated through road on 9 or 15 tonne trucks. The commercials involved in truck movement is INR 200-250/tonne.

While considering destination terminal as Karimganj, the waterway distance is around between the terminals is 2,498 km. The vessel transportation cost is assumed to be INR 1.2/ton-km and the corresponding commercials is around INR 5,900-6,000/tonne (all the other costs remaining the same).

The result for movement of Fly ash is summarized in the table below:

Scenario	Vessel Transportation Charges (INR/ton-km)	Total Logistics Cost (INR/ton)	
		IWT movement Farakka-Pandu	IWT movement Farakka- Karimganj
Case I	1.2	5,700-5,900	6,500-6,700
Case II	0.9	4,400-4,600	5,000-5,200
Case III	0.75	3,800-4,000	4,300-4,500

Table 28: Fly Ash logistics cost- IWT movement

Summary: based on the understanding developed through the transport supply chains, it is concluded that the movement of fly ash on waterways is commercially unviable. However, as the cargo is bulk in nature it could be diverted to waterways by means of offering freight incentives and value added services like mechanized handling and warehousing facilities.

5.9 Autoparts

Autoparts is moved into the PIA from states like Delhi, Punjab, Haryana and Maharashtra. The entire ~0.49 MTPA of cargo is moved on road. The modal share is skewed towards road essentially due to the innate nature of the cargo which is fragmented in nature and its inability to get a rake load at one point makes it unsuitable for transportation via railways. As understood based on primary interactions, around 300 open body trucks enter the PIA daily through the Chicken's Neck Corridor. The trucks are 9 tonnes in capacity and the commercials involved in the movement are INR 3,500-6,000/tonne (possible origin points are Gurgaon, Pune and Chennai). The movement is relatively expensive compared to other parts of the country due to the absence of return cargo, hidden costs associated in terms of crossing state borders, payments made to local organizations.

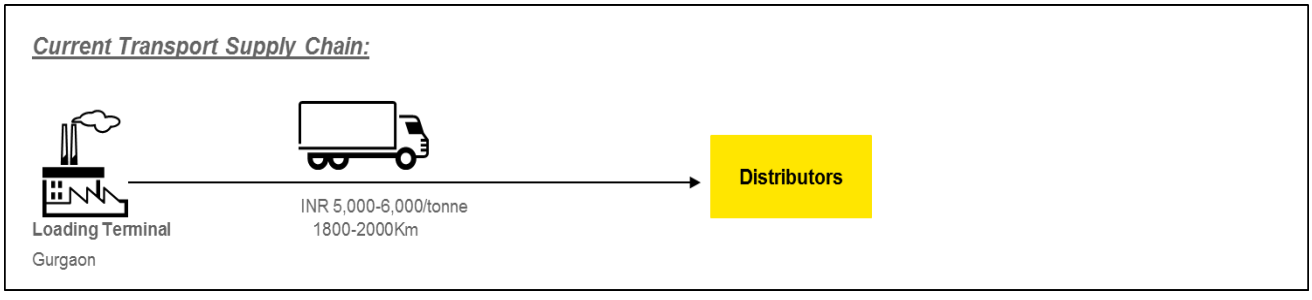

Figure 37 Typical autoparts value chain

Transport supply chain for three cases viz vessel transportation cost INR 1.2/ton-km, INR 0.9/ton-km and INR 0.75/ton-km is analyzed. The assessment is carried out for cargo originating from Gurgaon in Haryana. In terms of originating terminal for IWT transport, both Varanasi and Kolkata are considered. For destination terminal, Pandu is taken into consideration.

The autoparts are loaded on to the trucks from the manufacturing units itself and then transported to Guwahati in open body trucks. The trucks have a carrying capacity of 9 tonnes. The movement on road is facilitated through the Siliguri (Chicken's Neck Corridor) with an average turnaround time of around 5-7 days. The trucks are directly received by the dealers who further distribute it across various cities in the region.

Value chain with IWT incorporated as a mode of transport is presented in the figure below. Vessel transportation from Kolkata IWT to Pandu IWT and Varanasi to Pandu IWT is taken into consideration.

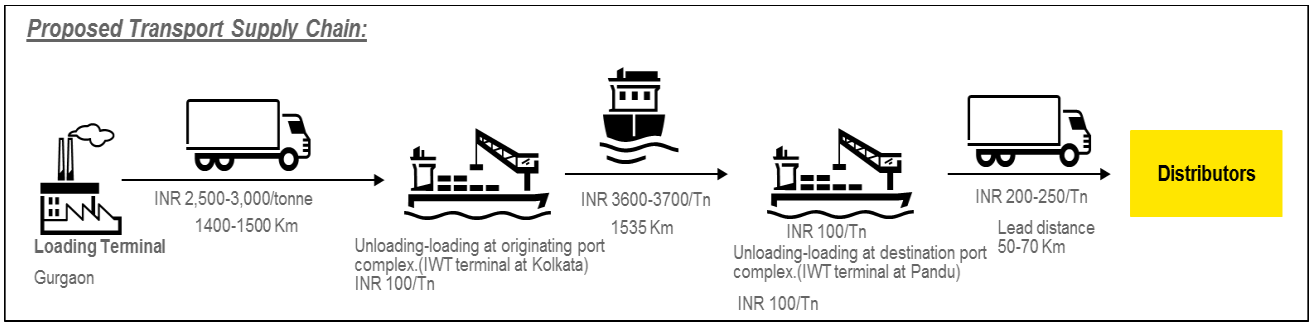

Figure 38 Autoparts value chain- Scenario 1- IWT movement

The proposed supply chain from Kolkata to Pandu using IWT (Kolkata being the loading terminal for IWT movement) is as follows:

- Autoparts moved from Gurgaon (Haryana) are unloaded at Kolkata inland water terminal for loading on to the inland vessels. The commercials involved in the road movement is around INR 2,500-3,000/tonne. The two handlings cost around INR 300-350/tonne.
- The inland vessel is moved to Pandu inland port. The waterway distance between the two terminals is 1,535km and assuming a vessel transportation cost of INR 1.2/ton-km, the total cost of vessel movement is around INR 3,600-3,700/tonne. The time involved in the movement is 13-15 days.
- The consignment is unloaded at the port facility and loaded on to the trucks. The two handlings cost INR 100-150/tonne.
- The last mile connectivity to the warehouses is facilitated through road on 9 tonne trucks. The commercials involved in truck movement is INR 200-250/tonne.

The proposed supply chain from Varanasi to Pandu is shown in the figure below: (Varanasi being the loading terminal for IWT movement) is as follows:

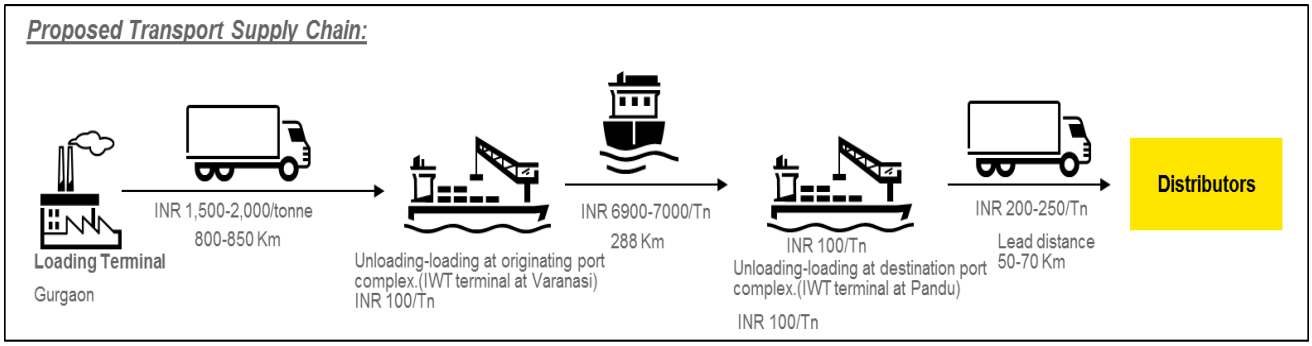

Figure 39 Autoparts valu chain – Scenario 2- IWT movement

The proposed supply chain from Varanasi to Pandu (Varanasi being the loading terminal for IWT movement) is as follows:

- Autoparts moved from Gurgaon (Haryana) are unloaded at proposed Varanasi multi modal terminal for loading on to the inland vessels. The commercials involved in the road movement traversing a distance of 825 km is around INR 1,500-2,000/tonne. The two handlings cost around INR 300-350/tonne.
- The inland vessel is moved to Pandu inland port. The waterway distance between the two terminals is 2,885 km and assuming a vessel transportation cost of INR 1.2/ton-km, the total cost of vessel movement is around INR 6,900-7,000/tonne. The time involved in the movement is over 45 days.
- The consignment is unloaded at the port facility and loaded on to the trucks. The two handlings cost INR 100-150/tonne.
- Last mile connectivity to the warehouses is facilitated through road on 9 tonne trucks. The commercials involved in truck movement is INR 200-250/tonne.

The result for movement of autoparts is summarized in the table below:

Scenario	Vessel Transportation Charges (INR/ton-km)	Total Logistics Cost (INR/ton)	
		IWT movement Kolkata-Pandu	IWT movement Varanasi-Pandu
Case I	1.2	6,100-6,300	8,500-8,700
Case II	0.9	5,100-5,300	6,600-6,800
Case III	0.75	4,700-4,900	5,900-6,100

Table 29: Autoparts logistics cost- IWT movement

Summary: based on the understanding developed through the transport supply chains, it is concluded that autoparts are unsuitable for movement using IWT. This can be attributed to multiple handlings, time involved in the movement of cargo from origin to destination and difficulty in terms of aggregating the cargo.

5.10 Edible Oil

Around ~ 0.3 MTPA of edible oil moves into the PIA mostly from West Bengal. They are imported at Haldia Dock Complex and transported through both rail and road. The modal share is skewed towards rail as the commodity is moved in bulk into the north-east. Rail transportation commands a share of 80% while road of remaining 20%. Edible oil is moved in tins and loaded on BCN rakes with an average loadibility of 65- 70 tonnes. As understood based on primary interactions, around 250 trucks of 15 tonne capacity are moved from Haldia Dock Complex into the PIA via Chicken's Neck Corridor. The commercials involved in the movement are around INR 3,000-3,100/tonne. The commodity is demand driven and the movement is controlled by the local dealers who further cater to the distribution in north-east.

Transport supply chain for three cases viz vessel transportation cost INR 1.2/ton-km, INR 0.9/ton-km and INR 0.75/ton-km is analyzed. The assessment is carried out for cargo originating from Haldia Dock Complex. For destination terminal, Pandu is taken into consideration.

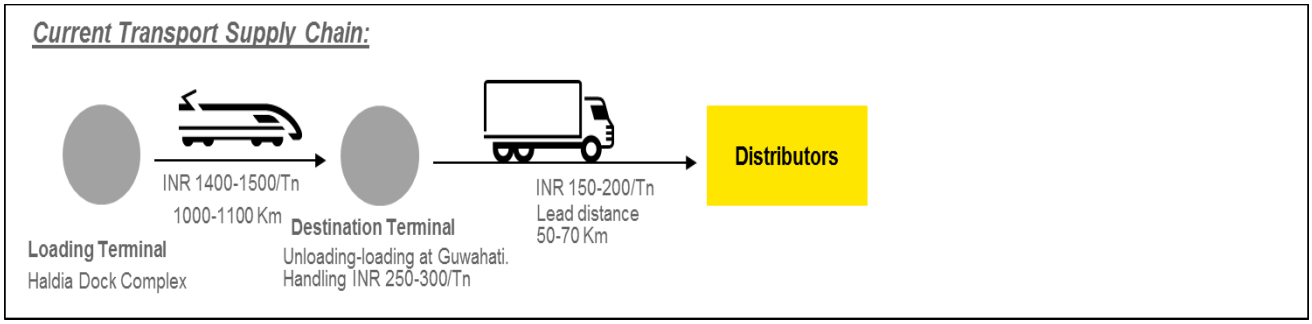

Figure 40 Typical Edible oil value chain

Edible oil is loaded on to the rakes from Haldia Dock Complex and moved to New Guwahati good shed managed by Indian Railways. The commodity falls in freight class 140 and the commercials associated for its movement over the particular lead of around 1,099 km is INR 1,400-1,500/tonne. Rakes of edible oil are received at New Guwahati good shed. The rakes are unloaded and loaded on to the trucks. The cost associated with two handlings are around INR 250-300/tonne. Last mile connectivity to distributor warehouses is facilitated on 9 or 15 tonne trucks. Commercials associated with last mile connectivity is around INR 150-200/tonne.

Value chain with IWT incorporated as a mode of transport is presented in the figure below. Vessel transportation from Haldia multi modal terminal to Pandu IWT is taken into consideration.

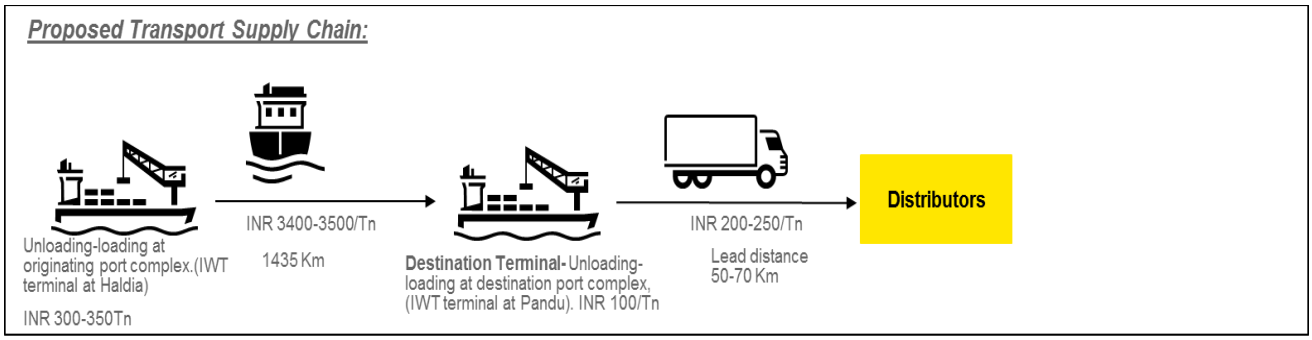

Figure 41 Edible oil value chain- IWT movement

The proposed supply chain from Kolkata to Pandu using IWT (Kolkata being the loading terminal for IWT movement) is as follows:

- Edible oil is imported at Haldia Dock Complex and transferred to the proposed multi modal terminal at Haldia for loading on to the inland vessels. The two handlings cost around INR 300-350/tonne.
- The inland vessel is moved to Pandu inland port. The waterway distance between the two terminals is 1,435 km and assuming a vessel transportation cost of INR 1.2/ton-km, the total cost of vessel movement is around INR 3,400-3,500/tonne. The time involved in the movement is 10-15 days.
- The consignment is unloaded at the port facility and loaded on to the trucks. The two handlings cost INR 100-150/tonne.
- The last mile connectivity to the stockyards is facilitated through road on 9 or 15 tonne trucks. The commercials involved in truck movement is INR 200-250/tonne.

The result for movement of edible oil is summarized in the table below:

Scenario	Vessel Transportation Charges (INR/ton-km)	Total Logistics Cost (INR/ton)
		IWT movement Haldia- Pandu
Case I	1.2	4,000-4,200
Case II	0.9	3,000-3,200
Case III	0.75	2,600-2,800

Table 30 : Edible oil logistics cost- IWT movement

Summary: Based on the understanding developed through the transport supply chains, it can be concluded that edible oil is suitable for movement through inland waterways with the availability of requisite LAD and night navigation. Additional facilities lie transit warehousing and tinning could be provided to attract the cargo.

5.11 Imported Coal

Around 0.04 MTPA of imported coal moves into the PIA from West Bengal. The imported coal is used in cement plants and sweeteners in thermal power plants. The entire movement is facilitated on railways as it is a bulk commodity. It is moved in BCN rakes with an average loadibility of 65- 70 tonnes. The cargo is unloaded at Lanka goodshed owing to its proximity to the cement producing clusters.

Transport supply chain for three cases viz vessel transportation cost INR 1.2/ton-km, INR 0.9/ton-km and INR 0.75/ton-km is analyzed. The assessment is carried out for cargo originating from Haldia Dock Complex. For destination terminal, Pandu is taken into consideration.

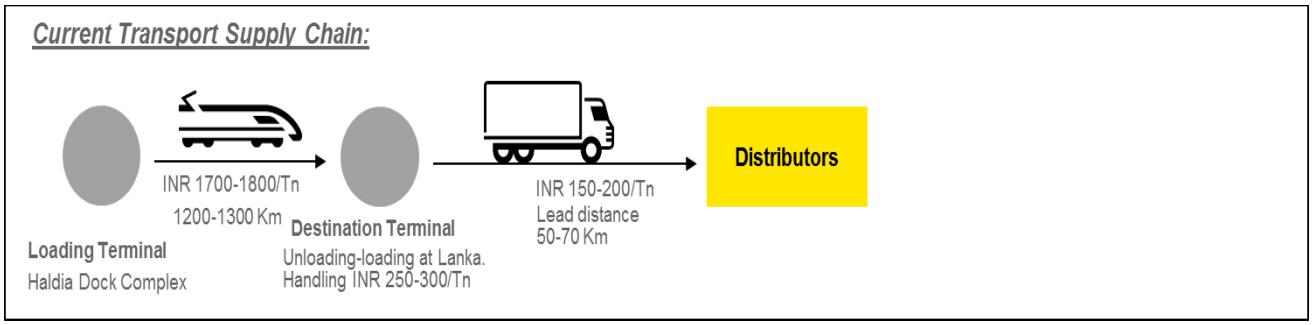

Figure 42 Typical value chain- imported coal

Imported coal is loaded on to the rakes from Haldia Dock Complex and moved to Lanka good shed managed by Indian Railways. The commodity falls in freight class 145 and the commercials associated with the movement over the particular lead of around 1,245 km is INR 1,700-1,800/tonne. Rakes of imported coal are received at Lanka good shed. The rakes are unloaded and loaded on to the trucks. The cost associated with two handlings are around INR 250-300/tonne. Last mile connectivity to distributor warehouses is facilitated on 9 trucks. Commercials associated with last mile connectivity is around INR 150-200/tonne.

Value chain with IWT incorporated as a mode of transport is presented in the figure below. Vessel transportation from Haldia multi modal terminal to Pandu IWT is taken into consideration.

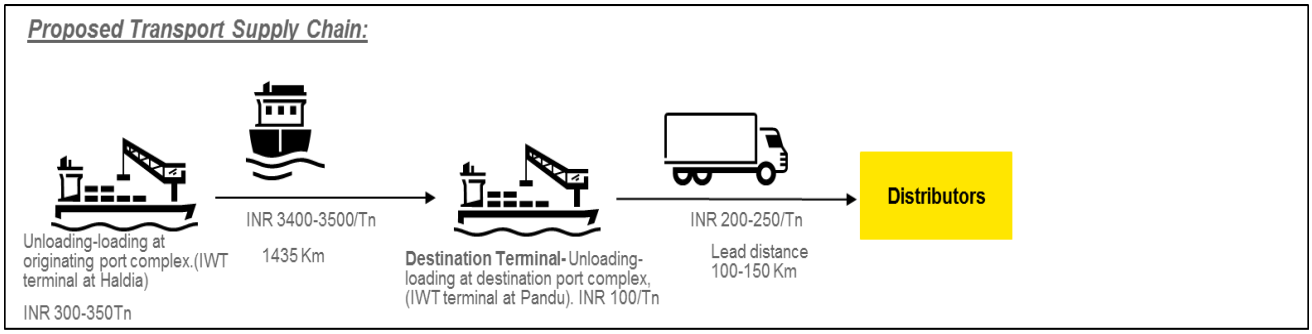

Figure 43 Imported coal value chain- IWT movement

The proposed supply chain from Haldia to Pandu using IWT (Haldia multi-modal terminal being the loading terminal for IWT movement) is as follows:

- Imported coal is imported at Haldia Dock Complex and transferred to the multi modal terminal for loading on to the inland vessels. The two handlings cost around INR 300-350/tonne.
- The inland vessel is moved to Pandu inland port. The waterway distance between the two terminals is 1,435 km and assuming a vessel transportation cost of INR 1.2/ton-km, the total cost of vessel movement is around INR 3,400-3,500/tonne. The time involved in the movement is 10-15 days.
- The consignment is unloaded at the port facility and loaded on to the trucks. The two handlings cost INR 100-150/tonne.
- The last mile connectivity to the stockyards is facilitated through road on 9 or 15 tonne trucks. The commercials involved in truck movement is INR 200-250/tonne.

The result for movement of imported coal is summarized in the table below:

Scenario	Vessel Transportation Charges (INR/ton-km)	Total Logistics Cost (INR/ton)
		IWT movement Haldia- Pandu
Case I	1.2	4,000-4,200

Scenario	Vessel Transportation Charges (INR/ton-km)	Total Logistics Cost (INR/ton)
		IWT movement Haldia- Pandu
Case II	0.9	3,000-3,200
Case III	0.75	2,600-2,800

Table 31 : Imported coal logistics cost- IWT movement

Summary: Based on the understanding developed through the transport supply chains, it can be concluded that imported coal is suitable for movement through inland waterways with the availability of requisite LAD and night navigation. Additional facilities like transit warehousing could be provided to attract the cargo.

5.12 Automobiles

Automobiles are moved into the PIA from manufacturing units located in states like Haryana, Tamil Nadu and Andhra Pradesh. As understood based on primary interactions and data available through secondary sources, around 123,000 units of automobiles (two wheelers and four wheelers) are moved into the PIA annually. An average of 16 rakes per month are received at Changsari (TCI facility), of which 10 are of cars and remaining 6 of two wheelers. The movement on road is facilitated using car carriers which are essentially trailers of 54ft or 75ft. Based on primary interactions, around 30 car carriers enter the PIA on a daily basis. A total of 63,000 units are transported on road. In terms of modal share, rail has a share of 67% vis-à-vis road which has a share of 33%.

Transport supply chain for cars manufactured and transported from Chennai are taken into consideration as movement from other parts of the country are rendered economically non-viable on waterways owing to first mile connectivity from factory units and long leads which make rail transportation viable.

The units are directly loaded on to the trailers from the manufacturing units and moved into PIA. They are received at the regional hubs from where they distributed locally. The movement involves two handlings and the overall commercials involved are around INR 25,000 per car. BCACN rakes are used for automobile movement.

In terms of rail movement, the units are transported to the nearest rail terminal. The cars are unloaded from the rakes and loaded on to trailers from where they are moved into the PIA. As understood based on interactions with logistics players specializing in automobile movements, the players pay and upright terminal charge to the logistics player. In this case it costs around INR 500-600 per car. The rail movement from the terminal to Guwahati costs around INR 15,000 per car. The units are unloaded at destination terminal and distributed further using trailers. The first and last mile connectivity on road costs around INR 3,000-3,500 per car. The overall cost involved in the movement is around INR 18,000-19,000 per car.

The proposed transport supply chain for automobile involves coastal shipping movement from Chennai to Haldia. Haldia acting as a trans-shipment port. The units are then loaded onto specialized car carrying inland vessels and moved to Pandu port. The key assumptions involved are as follows:

- Ocean freight for cars is assumed to be 3.5 times that of IWT freight per ton-km.
- IWT freight for cars is assumed to be 3 times that of IWT freight per ton-km.
- Return voyage is 100% empty and cost of empty voyage is assumed to be 75% of loaded voyage.

Based on the assumptions the transport supply chain following the inclusion of coastal and IWT is explained as follows:

- The units are loaded onto trailers and moved to the loading port terminal facility.
- The terminal handling charges include wharfage at Chennai port (loading), trans-shipment charges at Haldia and unloading at Pandu (wharfage and handling). The overall commercials involved in the movement are around INR 1,000-1,500 per car.
- The ocean freight movement from Chennai to Haldia, traversing a distance of 1,330 km costs around INR 9,000-10,000 per car.
- IWT freight cost movement from Haldia to Guwahati traversing a distance of 1,435 km is around INR 9,000-9,100 per car. The cost involves empty return voyage as well.

- The cars are unloaded at Pandu and distributed thereon. The overall cost involved in first and last mile movement is around INR 3,000 per car.

As can be observed, the cost involved in the movement of cars using coastal and IWT is around INR 18,000-19,000 per car. This is competitive as compared to rail, however, is commercially unviable in comparison to road. On offering a freight incentive of around INR 3,000-3,500 per car, the movement is viable in comparison to both rail and road. The graph representing the cost comparison is presented in the figure below:

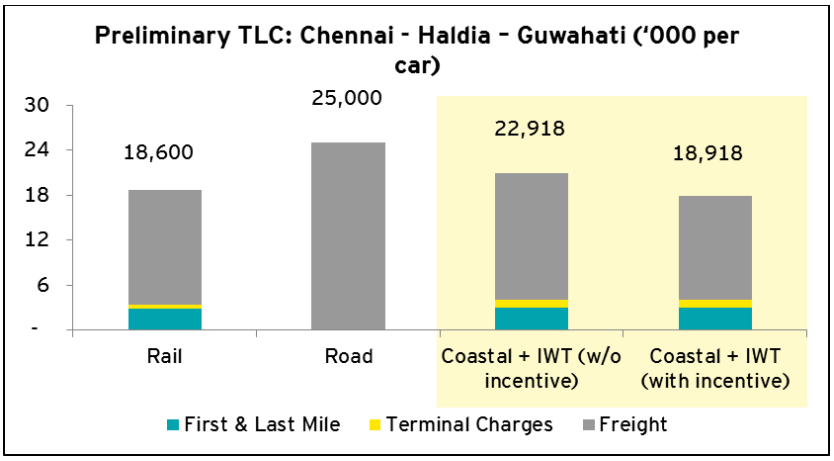

Figure 44 Automobiles Total logistics cost – Haldia - Guwahati

Summary: As understood based on the above analysis, the movement of cars using coastal and waterways is rendered viable on offering of freight incentives. However, it is also contingent upon value added service offerings like car parking facilities at inland port terminals, safety and security of cargo.

Market Development

6 Market Development- Attractiveness for IWT

Based on the understanding developed in the previous chapter in terms of understanding the overall market and further identifying the commodities that are suitable for transportation using IWT, this chapter aims to identify the following:

- Cargo Suitability Matrix- the corresponding volumes are plotted against the ease with which they can get attracted to IWT. This flows from the understanding developed from the transport value chain.
- Market development plan- identification of various interventions in terms of terminal development, infrastructure augmentation, service offerings and policies that are required to attract the cargo.
- Need to develop multi-modal/inter-modal terminals in view of the cargo streams that show potential for IWT traffic.

6.1 Cargo flows for IWT

The overall cargo traffic is categorized in terms of its ease of getting attracted to IWT. This matrix developed is based on the understanding of the transport supply chain and specific requirement of the cargo that is moved into and outside the PIA in terms of handling and warehousing. The matrix is presented as follows:

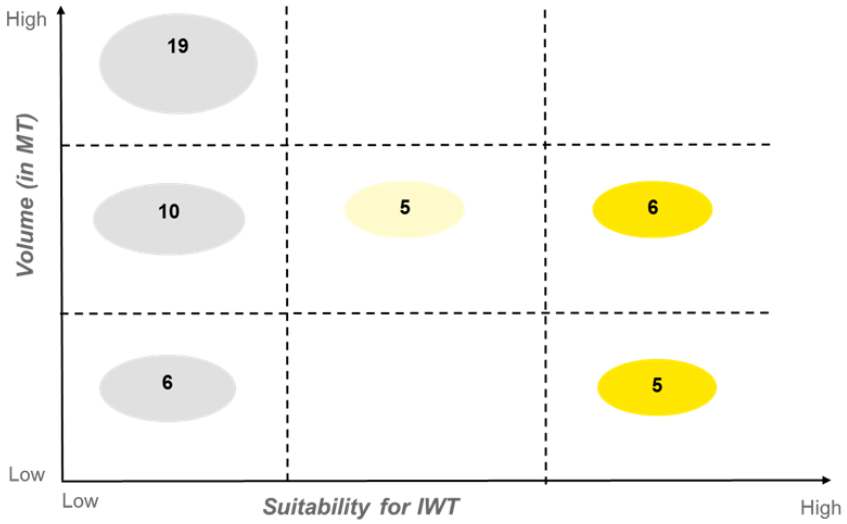

Figure 45 Suitability matrix for cargo flow

The cargo streams are categorized as follows:

Parameters	Low Suitability for IWT	Medium Suitability for IWT	High Suitability for IWT
Commodities	Horticulture products, Household Goods, Autoparts, Limestone, Pharmaceuticals, Iron & Steel, Ballast, Containers	Cement & clinker, Fly ash, Automobiles, Stone Chips	Food grains, Tar Coal/ Bitumen, Edible Oil, Imported Coal, Fertilizers & FRM, PoL products
Volumes	~ 30 MTPA	~ 7 MTPA + Automobiles is ~ 123,000 units	~ 12 MTPA

Table 32 : Suitability Matrix

As can be observed, bulk commodities form the potential cargo stream for IWT. For the commodities that show high suitability for IWT, of the ~ 12 MTPA of cargo, around 3 MTPA can be easily attracted to IWT. For those showing medium suitability, ~ 5 MTPA can be attracted to IWT. However, in order to attract the cargo various interventions are required in terms of:

- **Operational interventions**- availability of requisite LAD, night navigation facilities and measures to ensure safety and security and cargo
- **Infrastructural interventions**- facilitation of warehousing facilities, facilitation of transit warehousing facilities, catering to handling requirements for specific cargo streams, terminal design and facilitating allied infrastructure (road connectivity with IWT terminals for smooth evacuation, trucking facilities, fuel stations etc.)
- **Policy interventions**- freight incentives and integration of NW-1 with NW-2 via Indo-Bangladesh Protocol route

Cargo stream wise traffic and corresponding marketing plan to attract the same is explained in the following section.

6.2 Marketing Plan & Key stakeholders

The focus of the marketing plan is to enable diversion of cargo traffic from existing modes of transport to waterways. A marketing plan is directional and strategic. The objectives of a marketing plan are to:

- ***Market Opportunity***- Identify the target cargo stream and the associated traffic volumes. This is a result of the understanding that is developed through the study of transport supply chains. The cargo streams which can be diverted on IWT are identified along with their needs, challenges and the value proposition that IWT intends to offer.
- ***Key Customers***- Identify target cargo owners who need to be approached with the devised marketing plan. In order to prepare a robust plan, it is pertinent to triangulate findings of the study through primary interactions with stakeholders. The information gathered there on enables in the preparation of stakeholder database
- ***Need Assessment***- Post the identification of cargo streams and interactions with stakeholders, a market strategy is created to enhance the portfolio of services that IWT intend to offer. This includes various interventions in terms of operational efficiency enhancement, infrastructure augmentation and policy interventions required to address the needs of stakeholders.

The marketing strategy prepared for IWT is thought from two key perspectives- customer and services. It is aligned with current and future market needs. Strategies are created to integrate and bundle services based on customer needs. The marketing plan for IWT is presented in the following table:

SN	Target Cargo Stream	Volume (MTPA)	Target Customer Group	Key Logistics Drivers	Value Proposition
'LOW HANGING FRUITS'					
1	**Food grains**	~ 1.5	Food Corporation of India (FCI) and Local 'mandi' players	▶ Bulk commodity ▶ Total logistics cost ▶ Warehousing facilities ▶ Transit warehousing facilities	▶ The cargo originating from Haldia Dock Complex is diverted to IWT ▶ Transit warehousing facility at proposed Haldia multi-modal terminal for FCI ▶ Point of aggregating cargo for local 'mandi' players ▶ Dedicated warehousing at destination IWT terminal, provision of silo storage (Encouraging private players by way of FCI's Private Entrepreneur Guarantee Scheme)
2	**Tar Coal/ Bitumen**	~ 0.6	Indian Oil Corporation Limited	▶ Bulk Commodity ▶ Total logistics cost ▶ Transit handling	▶ The cargo originating from Haldia Dock Complex is diverted to IWT ▶ Transit warehousing facility at proposed Haldia multi-modal terminal for IOCL ▶ Movement of bitumen could be facilitated in bulk form and tinning facilities could be provided at destination terminal as a value add service
3	**Fertilizers & FRM**	~ 0.35	Local dealers (BVFCL Namrup awards tenders to supply FRM)	▶ Bulk Commodity ▶ Total logistics cost ▶ Warehousing facilities	▶ The FRM imported at Haldia Dock Complex is diverted to IWT ▶ Transit warehousing facility at proposed Haldia multi-modal terminal ▶ Storage facility at destination terminal.
3	**Edible Oil**	~ 0.3	Local dealers	▶ Bulk Commodity ▶ Total logistics cost ▶ Warehousing facilities	▶ The cargo originating from Haldia Dock Complex is diverted to IWT ▶ Transit warehousing facility at proposed Haldia multi-modal terminal for dealers; terminal would also act as a cargo aggregating facility

					▶ Movement of edible oil could be facilitated in bulk form and tinning facilities to be provided at destination terminal as a value add service
4	**PoL products**	~ 0.15	Indian Oil Corporation Limited and local dealers	▶ Bulk Commodity ▶ Total logistics cost ▶ Warehousing facilities	▶ The cargo originating from Haldia Dock Complex is diverted to IWT (motor spirit and superior kerosene oil) ▶ Transit warehousing facility at proposed Haldia multi-modal terminal ▶ Storage facilities at destination IWT terminal
5	**Imported Coal**	~ 0.05	Cement players	▶ Bulk commodity ▶ Total logistics cost	▶ The cargo originating from Haldia Dock Complex is diverted to IWT (motor spirit and superior kerosene oil) ▶ Transit warehousing facility at proposed Haldia multi-modal terminal
ADDITIONAL CARGO POTENTIAL					
6	**Stone Chips**	~ 3-4 MTPA	Stone chips traders in Bhutan	▶ Bulk Commodity ▶ Total logistics cost ▶ Specialized handling	▶ Facilitating stone chips movement from Jogighopa terminal ▶ Adequate handling requirement to handle specified cargo ▶ Specific terminal design
7	**Cement & Clinker**	~ 1 MTPA	Local Cement players	▶ Bulk commodity ▶ Total logistics cost ▶ Warehousing facility	▶ Outward movement from North-East towards Bangladesh ▶ Policy intervention by way of relaxing export duties
8	**Fly Ash**	~ 1 MTPA	Local dealers	▶ Bulk Commodity ▶ Total logistics cost ▶ Specialized handling	▶ Integration of NW-2 with NW-1 via Indo-Bangladesh Protocol Route ▶ Freight incentives on IWT ▶ Specialized handling at terminals
9	**Automobiles**	~ 15,000-18,000 units	Hyundai, Ford	▶ Safety and security of cargo ▶ Total logistics cost	▶ Policy intervention by way of freight incentives on coastal movement of automobiles ▶ Freight incentives on IWT ▶ Parking facility at destination terminal

					▶ Development of IWT as a local distribution hub for North-East

Table 33:Marketing Plan for IWT

6.3 Need for Inter-Modal Terminals

The North-Eastern region of the country is connected via rail and road. However, based on primary interactions with stakeholders it is understood that significant improvement is required in terms of augmenting the existing logistics infrastructure. At present, the commodities moved by rail are unloaded at goodsheds managed by Indian Railways which are fraught with infrastructural constraints like unavailability of round-the-clock services in terms of handling, inadequate warehousing facilities and issues pertaining to safety and security of cargo. The overall logistics facilities and services are poor in the region in comparison to other parts of the country. One of the key reasons for same is fragmented nature of cargo and cargo players.

There is a need in the region for consolidating cargo, provide modal exchange points, value added services like warehousing, specialized handling for certain commodities like fly ash, tinning facilities etc. In such a scenario it is pertinent not only to have navigable channels and fairway development but also have windows to access the waterway channels. It is thus suggested that terminals along the National waterway-2 network be developed as inter-modal or multi-modal terminals for becoming focal points for cargo centric services.

As understood based on the preceding section, cargo like foodgrains, tar coal/bitumen, coal, edible oil, PoL products, fertilizers & FRM, automobiles etc. can be potentially moved using waterways in light of certain value added services.

Based on interactions with state authorities and officials at IWAI, it is understood that locations like Jogighopa and Silchar in Assam could be used for developing multi-modal logistics park (MMLP). A preliminary assessment of the same is done in the subsequent paragraphs. The divertible cargo to waterways would be split amongst the two terminals based on the hinterland they would serve. Accordingly, the bouquet of services required to serve the commodities would be obtained. The locations and their influence areas is presented in the map below:

Figure 46 Intermodal terminal

6.3.1 Jogighopa

Jogighopa is located on western side of Assam, on the banks of river Brahmaputra. It is a notified terminal by IWAI and is pre-dominantly used for handling project cargo like turbines and heavy machineries. The terminal is marked by the presence of a floating pontoon. It is connected to major ports like Haldia and Kolkata via the Indo-Bangladesh Protocol Route (Kolkata- Mongla- Sirajganj- Daikhowa route). It is 1330 kms away from Haldia Port.

Jogighopa is well placed in terms in terms of its connectivity to other parts of Assam and the nearby industry areas. Bongaigaon is the nearest industrial area which is known for the presence of an IOCL refinery; also the largest in the region. As understood, the proposed terminal would serve the hinterlands of Upper Assam, Arunachal Pradesh and Nagaland. The terminal could be developed as a hub for cargo with the provision of value added services. It could potentially act as a transshipment terminal from where the cargo is further distributed to serve the hinterland via inter-modal terminals along the waterway network. The last mile connectivity to the destination being facilitated by road.

The hinterland served by Jogighopa is presented in the table below:

Terminal	State/District	Nearest IWT terminal
Jogighopa	Upper Assam- Dhubri, Barpeta, Goalpara, Kokrajhar, Udalgiri, Nalbari, Bongaigaon, Chirang	Jogighopa
	Upper Assam- Sibsagar, Jorhat, Golaghat, Lakhimpur	Neamati
	Upper Assam- Kamrup, Kamrup Metro, Marigaon, Baksa, Darrang	Pandu
	Upper Assam- Dibrugarh, Tinsukia, Dhemaji	Sengajan/Dibrugarh
	Upper Assam- Nagaon, Sonitpur, Karbi Anglong	Silghat
	Meghalaya	Pandu
	Nagaland	Neamati
	Arunachal Pradesh	Tezpur

Table 34: Jogighopa- Preliminary Analysis

The division of cargo between the two terminals is based on their drivers. They are listed as follows:

- Foodgrains, edible oil and automobiles cargo is segregated based on population
- Fly ash and imported coal is segregated based on location of cement plants
- Fertilizer raw material would be used by the production unit at BVFCL
- Tar coal is segregated based on road development plan as published by MDoNER
- Cement and stone chips movement as understood based on interaction with players is destined to Bangladesh
- PoL segregation would be based on industrial utilization

Based on the drivers for each commodity, the potential volume that could be attracted to Jogighopa is presented in the table below:

Commodity	Volumes (in MTPA)	Value Added Services
Foodgrains	~ 1.12	Warehousing/ Provision for Silo facility

Commodity	Volumes (in MTPA)	Value Added Services
Fertilizers & FRM	~ 0.35	Warehousing at Jogighopa and then further movement to Dibrugarh terminal
Tar Coal/ Bitumen	~ 0.5	Warehousing facility
PoL & Crude	~ 0.11	Specialized storage in tanker form
Edible Oil	~ 0.23	Tinning facility in case of bulk movement otherwise warehousing facility. Jogighopa could potentially act as a distribution facility
Fly Ash	~ 0.75	Specialized handling and storage
Imported Coal	~ 0.05	Separate berth would be needed for handling coal. Warehousing facilities
Stone Chips	~ 3	Warehousing facilities
Automobiles	~ 11,000- 12,000 units	Car park area. Jogighopa could potentially act as a distribution centre to cater to the PIA for the MMLP
TOTAL	**~ 6 MTPA + Automobile Units**	

Table 35 : Jogighopa Commodity wise traffic and value addition

The assessment of divertible volumes for the proposed MMLP at Jogighopa is based on both primary interactions with transporters and logistics service providers and the Consultants understanding of cargo dynamics prevalent in the region. However, a detailed assessment of volumes and services that could potentially be offered at the MMLP would require a separate study.

6.3.2 Silchar

Silchar is located in lower Assam on the banks of river Barak. The 121 km stretch from Lakhipur to Bhanga is notified as National Waterway-16 under the National waterways Act (2016). The river is strategically placed to serve areas of lower Assam and Manipur. It is connected to major like Haldia and Kolkata via the Indo-Bangladesh Protocol Route. The notified stretch under the protocol route is Kolkata- Mongla- Ashuganj-Zakiganj which further meets Barak River and flows into India.

Silchar is located in Cachar district of Assam and is the second largest city after Guwahati in terms of area and population. It is well placed in terms of connectivity to other parts of North-East. In terms of road connectivity it is connected to Imphal via National Highway 53. National Highway 54 connects Silchar to Aizawl while National Highway 37 connects it to Imphal. In terms of rail connectivity it falls in Lumding division and is connected to the rest of the state via single broad gauge railway line. The connection was extended upto Agartala in May 2016. In terms of industrial profiling, the state is around 30kms away from Badarpur which is marked by the presence of a gas power plant and paper manufacturing unit. The city is a trade processing center for tea, rice and other agricultural products. In other words, it is strategically placed to serve the hinterlands of lower parts of north-eastern region.

The hinterland served by the proposed MMLP at Silchar is presented in the table below:

Terminal	State/District	Mode of Connectivity
Silchar	Lower Assam- Dima Hasao, Karimganj, Cachar and Halaikandi	Road connectivity via state and national highways and rail connectivity to upper Assam

Terminal	State/District	Mode of Connectivity
	Manipur	Road connectivity via NH- 37
	Mizoram	Road connectivity via NH 54
	Tripura	Road connectivity via NH- 53 and single broad gauge connectivity upto Agartala

Table 36: Silchar- Preliminary Analysis

The division of cargo between the two terminals is based on their drivers. They are listed as follows:

- Foodgrains, edible oil and automobiles cargo is segregated based on population
- Fly ash and imported coal is segregated based on location of cement plants
- Tar coal is segregated based on road development plan as published by MDoNER
- PoL segregation would be based on industrial utilization

Based on the drivers for each commodity, the potential volume that could be attracted to Jogighopa is presented in the table below:

Commodity	Volumes (in MTPA)	Value Added Services
Foodgrains	~ 0.4	Warehousing/ Provision for Silo facility
Tar Coal/ Bitumen	~ 0.1	Warehousing facility
PoL & Crude	~ 0.04	Specialized storage in tanker form
Edible Oil	~ 0.07	Tinning facility in case of bulk movement otherwise warehousing facility. Silchar could potentially act as a distribution facility
Fly Ash	~ 0.25	Specialized handling and storage
Automobiles	~ 5,000- 6,000 units	Car park area. Silchar could potentially act as a distribution centre to cater to the PIA for the MMLP
TOTAL	**~ 0.9 MTPA + Automobile Units**	

Table 37: Silchar- Commodity wise traffic and value addition

The assessment of divertible volumes for the proposed MMLP at Silchar is based on both primary interactions with transporters and logistics service providers and the Consultants understanding of cargo dynamics prevalent in the region. However, a detailed assessment of volumes and services that could potentially be offered at the MMLP would require a separate study.

Market Trends

7 Market Trends and Projections

Based on the understanding gathered from the previous sections in terms of assessing the overall market size, identifying the commodities suitable for IWT and the corresponding interventions required to attract the same; this chapter aims at identifying the growth drivers and anticipated volumes of the cargo streams divertible on IWT.

7.1 Foodgrains

Based on the findings of the preceding sections, it is understood that movement of food grains to north-east is viable using IWT. The cargo originating from Haldia Dock Complex can be moved to the multi modal terminal and loaded on to inland vessel for movement to north-east via Indo-Bangladesh protocol route. Transit warehousing at Haldia multi modal terminal and provision of warehousing facilities at destination port terminal could be additionally provided to attract the cargo. At present around 1.5 MTPA of foodgrains is divertible on IWT and projections are made to assess the anticipated volume that could be diverted across the study period.

The projections for foodgrains is based on the underlying assumption that there is a correlation between population growth and foodgrain production/imports. While foodgrain production is dependent on various factors like land available for agricultural production, land productivity and monsoon; it is essential to note that in order to ensure food security in the country the governments would take steps to feed the entire populace. Thus, foodgrain consumption is positively correlated to the population growth and the divertible cargo on IWT is computed using regression technique. The assumptions ad methodology are as follows:

- The CAGR of population growth is around 1.8%. The figure is computed based on the census data for years FY 2001 and FY 2011. It is expected that the population growth is likely to remain the same across the study period.
- The share of north-east population in all India population is around 3.7% and it is assumed that the share is likely to remain unchanged across study period.
- Based on the regression results, food grain demand in north-east is projected across the study period. At present, of the overall demand of food grain in the region around 11% of the demand is met by inward movement from other parts of the country. In other words, ~4 MTPA is moved into the PIA from states like West Bengal, Madhya Pradesh, Punjab and Haryana. Assuming that the share would remain unchanged, the anticipated inward movement for the study period is deducted from the overall demand projections.
- Of the total cargo moved inwards, the cargo originating from Haldia Dock Complex is divertible on waterways. Divertible cargo accounts for 39% of the overall inward movement and it is anticipated that the share is likely to remain the same. Based on this assumption the anticipated traffic for NW-2 is as follows:

Volumes (in MTPA)	FY 2017	FY 2020	FY 2023	FY 2026	FY 2029	FY 2032	FY 2035	FY 2038	FY 2041
Foodgrain Demand in North-East	35.40	35.72	36.06	36.42	36.80	37.20	37.62	38.07	38.54
Divertible Cargo on IWT	1.55	1.56	1.58	1.59	1.61	1.63	1.65	1.67	1.69

Table 38: Foodgrain projection - Demand and Divertible cargo

7.2 Cement & Clinker

As discussed in the previous chapter, cement is sensitive to multiple handlings and the movement to north-east is found to be unviable using waterways. However, based on primary interactions with cement players in

the region, it is understood that waterways has the potential to facilitate ~1 MTPA of cement movement from the region to Bangladesh with the relaxation of export duties which is currently levied on exports of domestically (India) produced cement.

The divertible cargo is estimated based on the following assumptions:

- Cement consumption has a direct relation with GDP of a country. The GDP multiplier for cement is 1.2. All India cement consumption is projected across the study period using the multiplier.
- The existing share of North-East in the consumption of cement is around 3.7%. It is assumed that the share is likely to remain same over the years. Using this share, the consumption of cement in North-East is computed across the study period.
- The divertible cargo accounts for 11% of the overall cement production in the region. Assuming that the share is likely to vary, the anticipated traffic for NW-2 is as follows:

Volumes (in MTPA)	FY 2017	FY 2020	FY 2023	FY 2026	FY 2029	FY 2032	FY 2035	FY 2038	FY 2041
All India Cement Consumption	303	371	456	559	683	830	998	1,187	1,398
Divertible Cargo on IWT	-	1.11	1.33	1.44	1.44	1.44	1.44	1.44	1.44

Table 39: Cement Projection- Demand and Divertible cargo

7.3 Fertilizers & FRM

As discussed in the previous chapter fertilizers & FRM are suitable for transportation using IWT. The FRM originating from Haldia Dock Complex is divertible using the Haldia multi modal terminal with provision of requisite LAD, night navigation and transit warehousing facilities. Currently ~ 0.35 MTPA of cargo can be attracted to waterways. The anticipated traffic for NW-2 (via Indo-Bangladesh protocol route) is estimated based on the following assumptions:

- Fertilizer demand for north-east is based on studies commissioned by Department of Fertilizers, Government of India. The demand is projected upto FY 2025, assuming the same CAGR of around 2% the demand projections are made across the study period.
- Based on the production capacity of fertilizers within the PIA, the anticipated inward movement of cargo is computed.
- It is anticipated that the share of divertible cargo in the stream of inward movement is likely to remain unchanged. Thus, traffic stream for the same is deducted from the likely inward movement across the study period and is as follows:

Volumes (in MTPA)	FY 2017	FY 2020	FY 2023	FY 2026	FY 2029	FY 2032	FY 2035	FY 2038	FY 2041
Fertilizer Demand for North-east	0.77	0.82	0.88	0.94	1.01	1.08	1.16	1.24	1.33
Divertible Cargo on IWT	0.37	0.41	0.46	0.52	0.57	0.64	0.70	0.77	0.85

Table 40: Fertiliser projection- demand and divertible cargo

7.4 Tar Coal/ Bitumen

Bitumen is imported at various major ports in the country and moved into the PIA on both rail and road. Currently, ~ 0.2 MTPA of bitumen is moved into the PIA, however, based on primary interactions it is

anticipated that ~ 0.5-~0.6 MTPA is required to augment infrastructure development in the region. The entire traffic is divertible on waterways and it can be attracted by means of various service offerings discussed in the previous chapter.

Projections for divertible cargo on NW-2 is based on the following assumptions:

- The construction of roads or infrastructure augmentation has direct relationship with GDP growth of a country. The infrastructure multiplier is 1.4.
- With increase in developmental activities in the North-East it is anticipated that the GDP is likely to increase from current levels of 6%[12] to 8% across the study period. Based on the infrastructure multiplier and anticipated GDP levels the demand for bitumen is projected and is as follows:

Volumes (in MTPA)	FY 2017	FY 2020	FY 2023	FY 2026	FY 2029	FY 2032	FY 2035	FY 2038	FY 2041
Bitumen Demand for North-East	0.63	0.81	1.05	1.37	1.81	2.39	3.18	4.25	5.72
Divertible Cargo on IWT	0.63	0.81	1.05	1.37	1.81	2.39	3.18	4.25	5.72

Table 41: Bitumen projection- demand versus divertible cargo

7.5 Fly Ash

Fly ash is required as an input in cement production. As discussed in preceding chapter, the entire movement which is currently facilitated on rail exhibits potential to get diverted on waterways with requisite service offerings and freight incentives. The anticipated demand is linked to the augmentation of cement production plans in the region which exhibits a CAGR of 1.5% across the study period. The divertible traffic on NW-2 is as follows:

Volumes (in MTPA)	FY 2017	FY 2020	FY 2023	FY 2026	FY 2029	FY 2032	FY 2035	FY 2038	FY 2041
Fly Ash Demand Projection	1.67	1.75	1.82	1.91	2.00	2.09	2.18	2.28	2.39
Divertible Cargo on IWT	1.67	1.75	1.82	1.91	2.00	2.09	2.18	2.28	2.39

Table 42: Fly Ash projection- demand and divertible cargo

7.6 Edible Oil

As discussed in the previous chapter, edible oil forms a potential cargo stream for waterways subject to service offerings and navigational support. The demand is directly linked to the rate of growth of population which is roughly 1.8%[13]. Based on the assumption, the divertible traffic on NW-2 is as follows:

[12] Source: Data available on India stat

[13] Source: Population data available from census conducted in FY 2001 and FY 2011 is taken into consideration. The CAGR across the horizon is 1.8%. It is assumed that the anticipated growth in the future would follow similar trend.

Volumes (in MTPA)	FY 2017	FY 2020	FY 2023	FY 2026	FY 2029	FY 2032	FY 2035	FY 2038	FY 2041
Edible Oil Demand Projection	0.35	0.37	0.39	0.41	0.44	0.47	0.50	0.53	0.56
Divertible Cargo on IWT	0.26	0.28	0.30	0.31	0.33	0.35	0.37	0.39	0.42

Table 43 : Edible oil projection- demand and divertible cargo

7.7 Imported Coal

Imported coal is required as an input in cement production. As discussed in subsequent chapters, the entire movement which is currently facilitated on rail exhibits potential to get diverted on waterways with requisite service offerings and freight incentives. The anticipated demand is linked to the augmentation of cement production plans in the region which exhibits a CAGR of 1.5% across the study period. The divertible traffic on NW-2 is as follows:

Volumes (in MTPA)	FY 2017	FY 2020	FY 2023	FY 2026	FY 2029	FY 2032	FY 2035	FY 2038	FY 2041
Coal Demand Projection	0.05	0.05	0.05	0.06	0.06	0.06	0.07	0.07	0.07
Divertible Cargo on IWT	0.05	0.05	0.05	0.06	0.06	0.06	0.07	0.07	0.07

Table 44: Imported Coal projection- demand and divertible cargo

7.8 PoL Products

As discussed in the previous chapter, PoL products imported at Haldia Dock Complex form potential cargo stream for waterways. The products that are likely to get diverted are superior kerosene oil and motor spirit. Divertible traffic accounts for nearly 1% of the total volumes that moves into, outside and within the PIA. The crude and natural gas production forecasts are obtained from secondary data sources[14]. The forecasts are available upto FY 2030; assuming that the growth pattern is likely to remain unchanged, similar CAGR is used for projections till FY 2041. With the share of divertible traffic remaining the same, the projected traffic on NW-2 is as follows:

Volumes (in MTPA)	FY 2017	FY 2020	FY 2023	FY 2026	FY 2029	FY 2032	FY 2035	FY 2038	FY 2041
PoL products Projection	13.47	15.09	15.58	15.85	14.45	16.84	18.25	19.79	21.48
Divertible Cargo on IWT	0.18	0.21	0.21	0.22	0.20	0.23	0.25	0.27	0.29

Table 45 : PoL product projection- demand and divertible cargo

[14] Source: Ministry of Petroleum and Natural Gas Statistics

7.9 Stone Chips

Stone chips are used for the purpose of infrastructure development as it is used as an input in road construction and building material. At present the demand of stone chips in north-east is met locally as the region is marked with the presence of several stone crushing units in Meghalaya. The demand in Bangladesh, however, is met through imports from India and Bhutan. As understood based on primary interactions, the imports from Bhutan form a potential cargo stream for IWT subject to freight incentives. The current demand is ~3 MTPA and the projected traffic is based on the following assumptions:

- The anticipated GDP growth of Bangladesh is based on World Bank estimates. A CAGR of 5% is used to project GDP across the study period.
- Requirement of stone chips is directly linked to anticipated infrastructure development which is directly related to GDP. The infrastructure multiplier is 1.2 and based on this the divertible traffic on NW-2 is as follows:

Volumes (in MTPA)	FY 2017	FY 2020	FY 2023	FY 2026	FY 2029	FY 2032	FY 2035	FY 2038	FY 2041
Stone Chips Demand Projection	4.00	5.00	6.00	9.00	12.00	16.00	22.00	30.00	41.00
Divertible Cargo on IWT	4.00	5.00	6.00	9.00	12.00	16.00	22.00	30.00	41.00

Table 46 : Stone Chips projection- demand and divertible cargo

7.10 Automobiles

As discussed in previous chapter, around 14% of the overall automobile traffic exhibits potential to get diverted on waterways owing to incentives extended on coastal shipping, freight incentives on waterways, car parking facilities at waterway terminals and measures to ensure safety and security of cargo. The anticipated demand is based on rate of growth of population which is roughly 1.8%. Assuming that the share of divertible traffic is likely to remain the same, the projections are as follows:

Volumes (in units)	FY 2017	FY 2020	FY 2023	FY 2026	FY 2029	FY 2032	FY 2035	FY 2038	FY 2041
Automobile Demand Projection	123,000	128,618	134,494	140,637	147,061	153,779	160,803	168,148	175,829
Divertible Cargo on IWT	17,220	18,007	18,829	19,689	20,589	21,529	22,512	23,541	24,616

Table 47 : Automobile projection- demand and divertible cargo

7.11 Summary

The divertible cargo and their respective volumes are summarized in the following table:

Volumes	FY 2017	FY 2020	FY 2023	FY 2026	FY 2029	FY 2032	FY 2035	FY 2038	FY 2041
Foodgrains (in MTPA)	1.55	1.56	1.58	1.59	1.61	1.63	1.65	1.67	1.69

Volumes	FY 2017	FY 2020	FY 2023	FY 2026	FY 2029	FY 2032	FY 2035	FY 2038	FY 2041
Cement & Clinker (in MTPA)	-	1.11	1.33	1.44	1.44	1.44	1.44	1.44	1.44
Fertilizer & FRM (in MTPA)	0.37	0.41	0.46	0.52	0.57	0.64	0.70	0.77	0.85
Bitumen (in MTPA)	0.63	0.81	1.05	1.37	1.81	2.39	3.18	4.25	5.72
Fly Ash (in MTPA)	1.67	1.75	1.82	1.91	2.00	2.09	2.18	2.28	2.39
Edible Oil (in MTPA)	0.26	0.28	0.30	0.31	0.33	0.35	0.37	0.39	0.42
Imported Coal (in MTPA)	0.05	0.05	0.05	0.06	0.06	0.06	0.07	0.07	0.07
PoL products (in MTPA)	0.18	0.21	0.21	0.22	0.20	0.23	0.25	0.27	0.29
Stone Chips (in MTPA)	4.00	5.00	6.00	9.00	12.00	16.00	22.00	30.00	41.00
Automobiles (in units)	17,220	18,007	18,829	19,689	20,589	21,529	22,512	23,541	24,616

Table 48 Commodity wise divertible cargo projection – FY2017- FY2041

It is important to note that realization of anticipated cargo volumes for the identified streams will be governed by various other factors. Some of the major ones are mentioned below:

- Competitive environment like development or other facilities in the region
- Dynamics in implementation of plans pertaining to development of waterways
- Industry dynamics like change in demand for imported coal or unavailability of natural gas impacting fertilizer production
- Social & political environment in the region
- Regulatory environment like restrictions on coal imports

Based on the assessment it appears highly likely that our assessment and future projections are reasonable. However, any significant unexpected changes in the above mentioned factors can impact the divertible volumes both positively or negatively.

8 Way Forward

Based on the assessment it is likely that ~ 8 MTPA of cargo volumes could be attracted to inland waterway transport, of which ~ 3 MTPA of cargo could be easily attracted while the remaining volumes would require significant interventions from the Authorities side. The measures required to ensure the development of inland water transport as a continuous and sustained mode are as follows:

- **Maintenance of fairways and navigation channels**- The Indo-Bangladesh protocol route plays a significant role in connecting National Waterway-2 to major ports like Kolkata and Haldia, which are also the origin points for cargo classified as 'low hanging fruits'. It is understood that MoUs have been signed with relavant authorities in Bangladesh to ensure year round navigability along the Sirajganj- Daikhowa stretch and Ashuganj- Karimganj stretch.
- **Inducing market confidence amongst players by running dedicated services**- to decongest Chittagong port, the Chittagong Port Authority had invested in setting up a terminal at Pangaon located in the vicinity of Dhaka. Inland vessel with a carrying capacity of 300 containers would ply on the Chittagong-Pangaon route. Starting with low volumes it is now believed that the cargo volumes have picked up on the route. It is important to note that a dedicated service was started on a weekly basis despite low volumes in the beginning. However, with sustained vessel movement the volumes have picked up.
- Creation of a **national operator** like CONCOR which would focus entirely on vessel movement
- Measures to streamline movement of cargo along international protocol route
- Safety and security of cargo
- Round the clock navigability to increase vessel turnaround time
- Creation of terminals along waterway network which would act as cargo exchange points, consolidation centers along with value added services like warehousing, specialized handling etc.

Annexures

Annexure I: Interaction with DARCL

- Need of the customer is reduction in transit times, reduction in cost, security of cargo and efficient handling.
- Indo-Bangladesh Protocol Route is operative owing to vessel availability
- ONGC Tripura project cargo movement happened through Ashuganj. Road was made by the Indian authorities to facilitate cargo movement.
- Road dominates as a mode in North-Eastern region
- FCI is a key player in moving foodgrains. It is now sending foodgrains upto Agartala via rake movement
- Foodgrain is the key commodity that moves into the region. Haldia facilitates imports of pulses. Bardhaman area for rice. From areas like Punjab and Haryana rail is preferred essentially due to long leads
- Demurrage and shortage of rakes is the key deterrent for rail movement
- For foodgrains moving from West Bengal, road is preferred as it is difficult to aggregate single rake load. Fragmented demand by local mandi players of Guwahati city
- Around 20,000-25,000 tonnes of foodgrains goes per month from West Bengal area through trucks (Bardhaman, upper reaches of Bengal, Malda, Haldia Dock Complex). Goes to Guwahati and then distributed further through traders network
- Iron & steel is the next category in terms of movement. 3,000-4,000 tonnes per month on a regular basis. Beyond this it is intermittent in nature. TMT bars used for construction is moved in. origin are Durgapur, Bokaro, Jamshedpur.
- For Pandu/Guwahati, waterway distance is more than road distance. Thus, we find it unviable.
- Srerampore and Buxirhat borders are the main entry points to the state. Custom clearance happens from there. Entry point for 7 sisters
- Freight varies however average is INR 3,000/tonne for underload. In case of overloading, 15 tonne truck carries upto 40 tonne cargo for a rate of INR 2,000/tonne (overloading attracts penalty owing to strict norms but still is practiced)
- Trucks from Morbi (Gujarat) move with 30% overload to North-East (they carry tiles)
- There are leakages in the system when it comes to booking and delivery of cargo
- Mumbai and Delhi are hubs for white goods and FMCG products
- Tata moves salt to Guwahati via rakes. It placed a proposal to move salt in vessels from ports of Gujarat to Haldia, Transship them to small vessels and move to Ashuganj. However it is expensive owing to distance traversed. Road turns out to be viable commercially.
- Inventory cost and handling cost is less in road.
- Labour issues in North-east deter industrial growth (eg Steel plant in Tripura, Paper mill at Jagiroad)
- Coal movement from North-East has been restricted since past 2-3 years
- Little or no return load from north-east. Return freight is INR 1,000-1,500/tonne. Maximum is tea during season
- Project cargo has immense potential in terms of commercial returns for logistics players
- Bhutan movement- Punatsangchu hydro project, equipments contract to L&T and one part of contract to China. Using axle trailer, ODC movement is facilitated from L&Ts assembling units (Chennai, Vadodara, Haridwar etc)

- Within two years around 40-42 trailers have been moved to Bhutan for Punatsangchu (around 4,000-5,000 tonnes). Restricted movement in night owing to size of cargo.
- Transit fees charged by Government of Bangladesh (INR 300/tonne) is deterring logistics players from using IWT. Night navigation is needed. Kolkata-Guwahati time taken is 10-14 days. Coastal movement to Pangaon port takes around 72 hours only. Kidderpore to Narayanganj takes 7 days.
- Millennium rakes from Delhi to Guwahati. Capacity is 22 tonne passing, 70 ft length, 8 ft width, 9 ft height for trucks. IR passing is 60 tonne.

Annexure II: Interaction with EFC Logistics

- Plastic granules from Haldia
- P&G products from Madhya Pradesh (Bhopal)
- Cable drum from all over India. They are conductors moved in drums (Pune, Silvassa, Gwalior, Kolkata)
- Fruits from Jammu, Himachal Pradesh, Maharashtra. Seasonal in nature
- Sundry consignments are dominant- mixed cargo from Delhi, Kolkata, Indore, and Gujarat (via Indore). Indore is the hub for consolidation.
- Grapes from Nashik, oranges from Nagpur, Onions from Maharashtra belt are coming in full truck load
- Tiles from Morbi (Somani, NITCO, Kajaria re main players)
- Major items-
    - tiles from Gujarat and Rajasthan,
    - textiles from Ludhiana (woolens essentially),
    - raw fish from Andhra Pradesh (Vishakhapatnam mostly)
- Tyre from Baroda, Chennai, Cochin (Apollo and MRF), Aurangabad, Gurgaon- moved in full truck load
- Car carriers from Gurgaon and Chennai. Maximum movement is through road. TATA and Mahindra movement from Pune. 15-20 car carriers per day move into Guwahati. Around 8 cars on an average in one car carrier.
- Potatoes from Uttar Pradesh
- Foodgrains from Punjab, Haryana, Varanasi is the transshipment hub, Kolkata, Haldia Dock Complex
- FMCG from Kolkata, Mumbai, delhi
- Telephone tower and tyres from Goa. Some amount of food products as well (Nestle)
- Varanasi is a transshipment hub for fragmented cargo from Madhya Pradesh
- Pulses from Jabalpur (matar)
- Granite and marble from Rajasthan (Udaipur belt)
- Cement is both moved inwards and outwards (Dalmia cement, Star cement, Topcem cement are key players in north-east). Siliguri is the key distribution centre. 90% movement through rail. Destination as West Bengal and Bihar (Chhapra and Muzzafarpur)
- Number of trucks passing through Srerampore and Buxirhat is the same. They are at a distance of 60-70 kms from each other. They both meet with National Highway 31 ie Chicken's Neck corridor.
- Return load- main product is tea, coal (Meghalaya, Goalpara, Tinsukia which is seasonal in nature). Goes mostly to Madhya Pradesh, Punjab, Haryana, and Uttar Pradesh. Minimum 200 trucks per day would move out, however, movement was banned, it has started again though very less in comparison. Maximum trucks are more than 20 tonnes in terms of loadibility
- Tea- minimum 100 trucks per day, 15-20 tonnes loadibility (seasonal)
- Towards other states from Guwahati, FCI runs around 20-25 trucks per day. Movement within NER takes around 5-7 days owing to hilly terrain
- Meghalaya receives more than 50 trucks per day. Same could be applied to other states. Loadibility is 9-16 tonnes.
- White goods (television, washing machine) mostly from respective factory units- Haryana, Gujarat, Maharashtra, Goa (IFB)
- Daily 5-6 trucks of tyres
- From Buxirhat around 1,000-1,500 trucks pass per day. Similar number for Srerampore as well. The latter is mostly used for trailers and bigger trucks. From both borders it is on an average 2,500 trucks. Similar number of trucks move out with 50% return load
- Steel rods from Durgapur, Bokaro. Stockyards are in Guwahati.
- Plywood moves out of North-East

- Tea is consolidated in Guwahati (from Tinsukia, Dibrugarh, Jorhat)
- Daily basis around 500 trucks move out of Guwahati for further distribution
- Same share of closed and open body trucks. Containerized trucks are also used for cargo with high commercial value
- Bulk cargo in open body trucks with average loadibility of 16-21 tonnes. Packaged food in containerized trucks with average loadibility of 15-16 tonnes
- Warehousing for FMCG in Guwahati. Distributed based on demand.
- Return load- ayurvedic medicines, tea leaves, bamboo products (furniture), spices. Waiting period is around 1-2 days.

Annexure III: Interaction with Coastal Roadways

- Buxirhat average 1,000 trucks daily. Srerampore numbers are similar.
- Maximum food items are brought in.
- Outgoing is mostly tea. New industry are coming up like units of emami and godrej. Cement moves out.
- West Bengal- consumer products, wheat flour
- Delhi- electronics, white goods (television, refrigerators). Minimum 20-30 trucks per day
- Maharashtra- white goods
- Silicon stones moves out of north-east
- Bihar- wheat, poultry feed
- Fruits- Nashik, Jammu & Kashmir, Himachal Pradesh
- Guwahati is distribution hub. Many trucks are transshipped at Guwahati. Daily 400-500 trucks move out to serve other states in NER. Average loadibility of 9-16 tonnes
- Currently there is a lot of control on overloading. Levied heavy fines at border points.
- Time taken to reach Tripura/Nagaland/Mizoram/Manipur is around 5-7 days. Meghalaya takes around 1 days. Arunachal Pradesh requires 4-5 days.
- Freight rates:
    - Agartala- INR 34,000-35,000 (9 MT); INR 55,000-60,000 (16-21 MT)
    - Shillong- INR 10,000-11,000 (9 MT); INR 20,000-22,000 (16-21 MT)
    - Silchar- INR 19,000 (9 MT)
    - Dimapur- INR 20,000-23,000 (9 MT); INR 40,000-45,000 (16-21 MT)
    - Dibrugarh- INR 17,000-18,000 (9 MT); INR 30,000-35,000 (21 MT)
    - Itanagar- INR 20,000-21,000 (9 MT); 35,000-40,000 (21 MT)
- Return load from other states of NER is sparse and thus justifying high rates for movement
- Paper mill at Panchgram.
- For 400-500 incoming trucks, around 20-30 get return load. No waiting time as there is no return load.
- Waiting time in Guwahati for further distribution is around 2-4 days. This varies as per demand.
- Freight from Gujarat/Maharashtra- INR 1,00,000-1,20,000 (average 16 MT)
- Kolkata to Guwahati- INR 55,000-60,000 (16 MT). Return freight is only around INR 25,000-26,000 due to no return load.
- Percentage composition:
    - 10 wheeler trucks carry 15 MT (40%),
    - 12 wheeler carry 20 MT (30%),
    - 14 wheeler carry 24 MT (20%) and trailers passing capacity is 35 MT
    - Around 10% is 6 wheelers (9 MT).
- Waiting time on border is around 4-5 days. There are custom agent tie ups who speed up work for logistics players. There are commercial leakages at entry points.
- GST likely to reduce logistics cost with uniform tax.
- With railways in Tripura, road movement has reduced by around 10%. Mostly foodgrains are moved.
- Modal share is skewed towards road.
- Railway preferred for bulk commodities with long leads.
- Labour cost in north-east is high. 10 wheeler truck loading and unloading will cost INR 2,000 on an average.
- Union system at goodsheds which charge INR 5,000-6,000 for handling

Annexure IV: Interaction with TCI

- Vegetables like onions and potatoes do come in railway
- Millennium rakes are used for movement of consumer durable items
- Cars and motorcycles also come by train
- Automobile logistics is handled by TCI itself at Changsari terminal
- Motorparts, vegetables, foodgrains, iron and steel are main commodity moved through roads
- White goods mostly from Delhi and Maharashtra.
- Hoseiry from Kolkata, Ludhiana, Gujarat
- 1,000-1,200 trucks per month moved by TCI
- Military consignments are also high owing to base presence
- Medicines from Gujarat, Himachal Pradesh, Uttarakhand
- Hyundai comes from Chennai and Bajaj from Pune
- Car around 12-13 rakes per month. Motorcycle and auto around 10 rakes. Dealers directly take them to their distribution hubs. However TCI has their car park yard. Parking capacity
- Car rakes carry on an average 125 cars. Two wheelers around 1500 in one rake.
- Waterway development will have to be complemented with overall infrastructure development.

Annexure V: Interaction with Brahmaputra Cargo Carriers

- They are responsible for movement of fruits and vegetables from Delhi to Guwahati.
- In terms of demand, Assam accounts for 60-70% of the overall demand in North-East. Remaining is split between the other states.
- In terms of return load, rubber is one of the main commodity which is moved from Tripura. Bamboo mainly from Mizoram and Meghalaya.
- Limestone from Meghalaya moves to Bangladesh from Dawki border to serve the cement plants present in northern part of the country. Stone crushers are mainly in Barapani.
- Lafarge plant in Surma Valley of Bangladesh is served by a conveyer belt system for feeding limestone from Cherrapunji
- Around 1,500-2,000 trucks of limestone with average loadbility of 15 tonnes moves into Bangladesh
- Other agricultural commodities moving out of north-east:
    - Beetlenut- 150 trucks with average loadibility of 15-17 tonnes (around 6 months)
    - Silicon- 200 trucks with average loadibility of 20 tonnes daily
    - Tea- 150 trucks daily with average loadibility of 15 tonnes (seasonal cargo)
    - Brooms- 150- 200 trucks daily with average loadibility of 15 tonnes (seasonal cargo)
    - Ginger- 40 trucks daily with average loadibility of 9 tonnes
    - Cashew- 10 trucks daily with average loadibility of 15-17 tonnes (seasonal cargo)
    - Rubber- 150 trucks daily with average loadibility of 15-20 tonnes
    - Bayleaf- 40-50 trucks daily with average loadibility of 9-12 tonnes
- Average freight computation for road movement- for trucks with average loadibility of 9- 16 tonnes it is INR 45/km and for those more than 16 tonnes it is INR 55/tonne

Annexure VI: North-East Food Park

- Inland waterways is more cost effective than road or rail however there is no supporting infrastructure
- For horticulture products, reefer banks are required. ICD Amingaon has no reefer banks. They are DG gensets and cannot be plugged in.
- Ginger goes out of north-east and can move on waterways but plug in systems are needed for charging reefer banks
- Railways does not have reefer vans for north-east
- 3 food parks have been announced in Tripura, Nagaland and Mizoram each
- A food park can generate volumes upto 3-4 MTPA
- North-east park has 3 investors, one for confectionary, one for mustard oil and one for local spices
- Lack of availability of raw material to make food park successful
- Dehydration plant with capacity 800kg/day does not even run for 100 days due to lack of raw materials
- As per NEIIP there are excise benefits/income tax benefits for 10 years, capital subsidy, INR 5 cr as grant and 50% on capex (machinery, building etc.) under this scheme Dabur and Patanjali have entered the state of Assam
- For cold storage as well, there is lack of raw material. In Sonapur there is a 3,000 tonne cold storage, of which only 30-40% is occupied.
- Most of the companies have tie ups with 3PL players to facilitate movement of cargo
- Recommendation: IWAI should tie up with reliable 3 PL players to ensure efficient movement of cargo
- Pineapple in North-east cannot be used to make pulp. It is good for canning as both juice and pulp content is high

Annexure VII: Interaction with DS Group

- Plant to produce corrugated steel sheets in Tripura.
- Raw material is steel rolls which was to be procured from SAIL plants across thje country
- Planned capacity is 150,000 TPA with a plan of selling 70% of the produce in Bangladesh. Movement facilitated through Chittagong Port
- Plant is not in operating condition due to partnering and local issues
- Have food processing units across the country. For logistics pertaining to same, the finished product should reach the farthest market from 7 days from its manufacturing

Annexure VIII: Interaction with Dalmia Cement

- Located in the state of Meghalaya. Plant has captive limestone mines, they are crushed- blended and moved to raw mill. Then to silos, ceiling operations to obtain the final product.
- Around 5% gypsum and 20-25% fly ash is required as an input to produce cement. Gypsum is moved from Bhutan.
- The cement plants in Meghalaya do not have railway siding inside the facility. To use waterways the proposed plan was to move the finished product to Lanka goodshed. From Lanka load it on to rakes and moved to Pandu inland terminal for further movement to Bangladesh. However, import duty in order of 25% is levied on cement produced by India making it commercially unviable in Bangladeshi market.
- The logistics cost in north-east is high due to:
    - Scanty rail connectivity
    - Poor infrastructure
    - Extra expenditure (leakages in the value chain)
    - Distances are far off
- With regulatory intervention ie relaxation of import duties, around 1 MTPA of cement could be moved to Bangladesh
- Assam is the key consumption state accounting for over 60-70% of the cement produced

Annexure IX: Interactions at Petrapole (Customs and Lee & Muirhead)

- India-Bangladesh trade is Open General Licence 3 (OGL3). Restricted items cannot move like Muriate of Potash and a few chemicals
- There is insufficient warehousing on Bangladeshi side
- Around 400-450 could go but at present only 100-150 goes as the warehouse at Bangladesh side caught fire
- Chesses movement is very high; around 200-250 (TATA, Eicher, Mahindra)
- Rice, machinery items, medicines, raw fish, food items, fabrics, sponge iron, MS Bar, TMT Bar are key items
- Leakages in the system in terms of under invoicing and under reporting of tonnage
- No parking restrictions on Petrapole side
- Acids mostly from Madhya Pradesh and West Bengal
- Kolkata is the consolidation center from where cargo is loaded on local trucks. Bongaon is a transporters hub for Bangladesh. At Petrapole clearance of trucks takes a minimum of 10 days.
- Return cargo is jute, jute bag, tiles in small quantities
- Tiles are imported at EPZ from China. They process sit further and then export it further
- Around 200 trucks come from Bangladesh
- Sponge iron mostly from Jharkhand and Dankuni
- Aluminium ingots from Hindalco and NALCO plants- 5 trucks per day with average loadibility of 16 tonnes
- Nestle baby food- 30-40 trucks per months with average loadibility of 16 tonnes
- Plastic granules and polymers rom Haldia- 30 trucks per day with average loadibility of 16 tonnes
- Raw fish- 5-10 trucks per days with average loadibility of 16-18 trucks
- Vegetables- 10-20 trucks daily with average loadibility of 16 tonnes

Annexure X: State Trading Corporation of Bhutan

- They deal primarily in stone chips which are exported to Bangladesh. Current movement is entirely on road.
- STCBL moves around 3000 tonnes per month and have own fleet of around 10 trucks. Phuentsholing is the gateway trade Centre for Bhutan
- The trucks are sent through Bhurimari border which is 102 kms from Phuentsholing.
- Stone chip crushers are in southern part of Bhutan, they are exported to Dhaka. Movement takes around 7 days.
- Takes 3-4 days to reach Burimari, across the border truck change happens and it takes another 3-4 days to reach Dhaka
- Phuentsholing to Burimari commercials are INR 700-800/tonne.
- Burimari to Dhaka commercials are USD 9.39 plus USD 2.8 per tonne as customs charge
- Bhutan exports gypsum to Nepal. Sends around 2 rakes per months through Siliguri-Raxaul-Nepal.
- Dungsam cement, Penden cementin southern part of Bhutan export cement to India. Siliguri is the warehousing centre from where it is distributed further.
- Bhutan's imports are channeled through Kolkata Port. They receive around 300 containers per month.
- 90% of EXIM trade happens with India.

Our offices

Ahmedabad
2nd floor, Shivalik Ishaan
Near C.N. Vidhyalaya
Ambawadi
Ahmedabad - 380 015
Tel: + 91 79 6608 3800
Fax: + 91 79 6608 3900

Bengaluru
6th, 12th & 13th floor
"UB City", Canberra Block
No.24 Vittal Mallya Road
Bengaluru - 560 001
Tel: + 91 80 4027 5000
+ 91 80 6727 5000
+ 91 80 2224 0696
Fax: + 91 80 2210 6000

Ground Floor, 'A' wing
Divyasree Chambers
11, O'Shaughnessy Road
Langford Gardens
Bengaluru - 560 025
Tel: +91 80 6727 5000
Fax: +91 80 2222 9914

Chandigarh
1st Floor, SCO: 166-167
Sector 9-C, Madhya Marg
Chandigarh - 160 009
Tel: +91 172 331 7800
Fax: +91 172 331 7888

Chennai
Tidel Park, 6th & 7th Floor
A Block (Module 601,701-702)
No.4, Rajiv Gandhi Salai
Taramani, Chennai - 600 113
Tel: + 91 44 6654 8100
Fax: + 91 44 2254 0120

Delhi NCR
Golf View Corporate Tower B
Sector 42, Sector Road
Gurgaon - 122 002
Tel: + 91 124 464 4000
Fax: + 91 124 464 4050

3rd & 6th Floor, Worldmark-1
IGI Airport Hospitality District
Aerocity, New Delhi - 110 037
Tel: + 91 11 6671 8000
Fax + 91 11 6671 9999

4th & 5th Floor, Plot No 2B
Tower 2, Sector 126
NOIDA - 201 304
Gautam Budh Nagar, U.P.
Tel: + 91 120 671 7000
Fax: + 91 120 671 7171

Hyderabad
Oval Office, 18, iLabs Centre
Hitech City, Madhapur
Hyderabad - 500 081
Tel: + 91 40 6736 2000
Fax: + 91 40 6736 2200

Jamshedpur
1st Floor, Shantiniketan Building
Holding No. 1, SB Shop Area
Bistupur, Jamshedpur – 831 001
Tel: +91 657 663 1000
BSNL: +91 657 223 0441

Kochi
9th Floor, ABAD Nucleus
NH-49, Maradu PO
Kochi - 682 304
Tel: + 91 484 304 4000
Fax: + 91 484 270 5393

Kolkata
22 Camac Street
3rd Floor, Block 'C'
Kolkata - 700 016
Tel: + 91 33 6615 3400
Fax: + 91 33 2281 7750

Mumbai
14th Floor, The Ruby
29 Senapati Bapat Marg
Dadar (W), Mumbai - 400 028
Tel: + 91 22 6192 0000
Fax: + 91 22 6192 1000

5th Floor, Block B-2
Nirlon Knowledge Park
Off. Western Express Highway
Goregaon (E)
Mumbai - 400 063
Tel: + 91 22 6192 0000
Fax: + 91 22 6192 3000

Pune
C-401, 4th floor
Panchshil Tech Park
Yerwada
(Near Don Bosco School)
Pune - 411 006
Tel: + 91 20 6603 6000
Fax: + 91 20 6601 5900

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