



Hinterland Connectivity to Paradip Port

Project Report

Submitted in Partial fulfilment of the require of degree of

**MASTER OF BUSINESS ADMINISTRATION
INTERNATIONAL TRANSPORTATION AND LOGISTICS MANAGEMENT**

By

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DECLARATION

I **Devi Prasad Parida, Registration No. 1903305014** student of the School of Maritime Management, Indian Maritime University, Chennai Campus pursuing a **Master of Business Administration in International Transportation and Logistics Management**, declare that this report titled "**Hinterland Connectivity in Paradip Port**" has been prepared and submitted by me towards the partial fulfilment of the requirement for the award of degree of "**Master of Business Administration in International Transportation and Logistics Management** " under the guidance of **Dr. Lekha Ravi**, Associate Professor, School of Maritime Management, Indian Maritime University, Chennai Campus.

I also declare that this project report is my original work and has not been copied from any of the report previously submitted for the award of any Degree, Fellowship, or other in similar titles.

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Devi Prasad Parida

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Chapter 1

Introduction

Industry and Sector

The Indian Shipping Industry supports transportation of national and international cargoes, majority of trade by volume which is around 95% and by value almost 70% is done through Maritime Transport this data is according to ministry of shipping. India is the sixteenth-largest maritime country in the world with a huge coastline of about 7,517 kms. In November 2020, our honourable Prime Minister, Mr. Narendra Modi renamed the Ministry of Shipping as the Ministry of Ports, Shipping and Waterways. The Indian Shipping Industry facilitates the transportation of national and international cargoes and also provides other facilities which include shipbuilding, ship repairing, lighthouse facilities, freight forwarding, etc.

India has 12 major ports and 205 minor and intermediate ports. Also, now under Plan for Sagarmala, six new mega ports will be developed in the country. Sustainable Growth in the country's trade and commerce is the key objective of the Indian ports and shipping industry. Even India is one of the world's top 5 ship recycling countries and holds 30% share in the global ship recycling market. The Indian Government plays a very crucial role in supporting the ports sector. It has allowed Foreign Direct Investment (FDI) of up to 100% for the improvement and maintenance of port and harbour construction. Jawaharlal Nehru Port Trust is the largest major port in India, while Mudra is the largest private port.

The growth in international trade in recent times is mainly because of removal of trade barriers, and this has made the developing countries to concentrate more on the development of their infrastructure, like roads, airports, seaports, which will play a vital role in the economy's development. Product movement and product storage, along with the capacity to move large shipments, have placed the shipping industry in a very helpful position. Containerization, multi-modal transport service, advancement of marine engineering technology, specialized systems, and computerization have contributed towards making sea transport as a prime mode for movement of internationally traded goods.

Objective

An analysis on how to improve hinterland connectivity to Paradip port vis-à-vis overall logistics and reducing the traffic congestion at port. Looking from a broader point of view, if logistics cost decrease, then it will improve cargo movement from hinterland which will increase the exports which is helpful for economic development of our country.

About the Topic

Before going to the topic, first the question will be what exactly are dry ports, Dry Port or Inland Port or Multi Modal Logistics centre is an inland terminal directly connected to a seaport by rail or road. It is called dry port because it is very similar to the service it offers as sea ports except is far away from sea. Locations of a dry port are very necessary; it is usually in the places where modes of transportation converge.

Why there is a need for dry port? Sea ports are handling very huge load of cargoes during the recent times. So, chances of occurring congestion at port is very high so to reduce the loads of cargo from sea ports, dry ports are created. As Imports and exports demand are exploding, the importance of dry ports is consequently increasing.



Paradip Port

as we can see in the above image containers in the port seems to be very congested. Which makes the port operation quite complex so for making the port operation smooth dry ports are introduced. Dry ports are situation quite at a distance from seaports mainly near the manufacturing warehouse which will trade their products.



Dry Port

It serves as a transshipment point in transport of export and import goods and consist of facilities like container yards, warehouse, railways siding, cargo handling equipment and administrative service for import and export clearances. In India they are inland container depot (ICDs) from an exporter point of view this reduces the transportation cost by quite a considerable amount. India is having around 300 Dry Ports out of which 40% is owned by Container Corporation of India Limited and Central Warehousing Corporation and others are private owned dry ports which also receive subsidy from government. However, out of there 300 dry ports only 170 are functional. As a result, Government decided on overhauling of dry ports to resolve infrastructural constraints faced by exporters and importers such that it can boost their trading capacities. Among the key drivers Sagarmala and Bharatmala, projects of India top the list.

This hinterland ICDs location is also a enormous issue. A hinterland ICD would need at least 7-10 industrial corridors for its utilisation level to remain strong. The location of ICD

should be such that it is surrounded by an industrial area within a radius of 20-25 km. Only then the business will be viable. So, these dry ports are needed to be moved.

The lack of rail and road connectivity, the backbone for an effective ICD network, is also considered as a problem. Rail and Road connectivity from and to ICD is not sufficient and a lot more is needed to be done in this area rather than reimbursing the dry port which is government's plan.

Involvement of hinterland ICD in supply chain as it helps in cutting quite a good amount from the overall cost. Logistics cost in India is 14%-15% of the manufacturing which is quite huge as compared to other countries where it is on an average only 4%-5% of the manufacturing cost. If this cost reduces by improving the hinterland connectivity, then Indian exports can rise considerably, which would increase India's global economy as well.

The routing of cargo to ship via ICD also saves many days, as it cuts no. of free days in port thus further reducing more cost of manufacturer. For example, if a cargo from its point of origin to ultimate destination is expected to take 5 days, the vessel the cargo will charge for full 5 free days. However, if there is ICD involved in the supply chain, the free days counting will start only when the cargo hits the ICD.

Scope of Study

After reading the project, one can answer

- 1) How good the connectivity of ICDs to Paradip port is;
- 2) How much better the hinterland connectivity with Paradip Port will be in future?
- 3) Things that can be done for the improvement of Hinterland connectivity

Research Methodology

The study uses extensive secondary data supported by interviews conducted with stakeholders.

Secondary Data-

Finding the dominant mode of inland transportation

How well the transportation mode is currently performing?

Gaining their thoughts on what can be done for improvement

Limitation of Study

First the study is confined only to Paradip Port

Chapter 1 Endnotes

<https://www.india.gov.in/official-website-ministry-shipping>

<https://www.metmuseum.org/>

<https://www.youtube.com/watch?v=scb3tL21C78>

<https://www.thehillstimes.in/business-2/paradip-port>

CHAPTER –2

REVIEW OF LITERATURE

The following are the review of various articles on this topic by various authors, various papers are disclosing the issues and various conclusions and recommendation in the study of hinterland connectivity.

2.1- Hinterland Connectivity (By Afaq Hussain, 2018)

This report briefly indicates about the importance of Port Structure Development and quality of infrastructure for trade. Next it states the government initiative that are being done for the improvement of port infrastructure and some of the key challenges that are at the Indian port which restricts the development like infrastructural challenges, Operational and Logistics challenges, Regulatory Challenges. There needs to be a more effective balance between, on the one hand, the role of the market and the private sector and the role of regulation and the public sector. Indian ports need a seamless and fully mechanized system in place for cargo handling and evacuation. Public–private partnerships seem to be the most viable solution to the financial constraints that prevent Indian ports from bringing their facilities and infrastructure up to global standards. Development and streamlining of connectivity infrastructure would augment certain key port operations. Development of dedicated freight corridors connecting ports with industrial clusters would ensure speedy evacuation of cargo, thus easing congestion at the ports. There is potential for structural development of an Inland Waterway Transport (IWT) system or network, which, when operational, could help reduce the substantial cargo evacuation burden that falls on road and rail networks. The development of the IWT can also reduce the average cost of freight, providing a competitive advantage to Indian ports.

2.2 Intermodal Connectivity as a port performance indicator (By Kristina, 2013)

This paper mainly describes the development of two port performance indicators: the intermodal connectivity indicator designed for a specific port and the intermodal connectivity indicator designed for a group of ports. Both measures evaluate the transformations of port. Hinterland network compared to the state of the network. Next, throughout growth may be more related to the economic performance of the port's hinterland than by port performance. For instance, the ports in India grow relatively fast, but according to the 'Quality of Port Infrastructure' indicator from the World Economic Forum, the Indian port industry is not performing well at all. Intermodal connectivity is relevant, as many ports are confronted with growth prospects while the highway infrastructure around many port areas is congested.

2.3 Hinterland Connectivity: Promoting IWT, waterways, RORO and Transshipment

This article is mainly from the Indian prospects and it divides the connectivity sector wise- Rail, Road, Dry Ports & Multimodal Logistics Park, Pipeline, Inland Waterways, Coastal Shipping, Ro Ro & Transshipment sectors. It also gives the information about Sagarmala Project and how it will improve the hinterland connectivity in India. Dedicated freight Corridor Corporation of India (DFCCIL) - Indian Railways point of view dedicated freight corridor is there and there will be further improvement in DFC as it will get a boost through Sagarmala project. Road Connectivity is a primary form of connectivity of hinterland with ports almost about 65% of freight is being transported through road network. There is now a requirement to make freight friendly road corridor for effortless movement of freights. The development of Inland Container Depots (ICD) or Dry Ports or Multimodal Logistics Parks (MMLPs) at strategic locations at key nodes on road and rail network has a critical role to play in improvement of hinterland connectivity. Sagarmala project has identified the need to redistribute supply of in order to reduce regional supply demand imbalances through increased coastal shipping to the south and creation of additional pipelines to move product to the deficit areas in the north. Freight transport by waterways is highly under-utilised in India compared to other economies despite the high potential for Inland waterways. The increase utilization of inland waterway movement can cause substantial savings for Indian economy as

the cost per tonne kilometre of moving cargo by sea or inland waterway routes can be 60 to 80 per cent lower than by road or rail.

2.4 Infrastructure and connectivity in India getting the basics right (Purva Singh and Rajat Kathuria, 2016)

This research report defines the importance of infrastructure and connectivity of ports for India's overall economic development. This report first provides the insights on how the transportation and logistics process are currently running in India. Inadequacies of physical infrastructure and equipment coupled with cumbersome administrative procedures have burdened India's logistics network. These deficiencies manifest themselves in higher transport times and costs, reduced reliability, lower availability of quality services, and a higher risk of damage or pilferage. This report compares how Chinese investment proves effective and gives a comparison with that of Indian Investments. India's ports desperately need to ramp up capacity and efficiency to meet the swelling.

Demand. Port efficiency is critical to the success of any strategy to integrate a country with. The global trade system. Ports' turnaround time in India remains slow by world and regional. Standards and the connections between the wharf and inland transport need to be improved. Next it goes to how the investment in India is currently happening in the trends and challenges Strengthening of bond markets and mobilizing domestic savings to infrastructure. The need for developing the domestic corporate bond market is inevitable. Long-term bonds form a.

Major share of infrastructure finance in developed nations. The Indian corporate bond. Market is less than 5% of GDP. The 12th FYP report states that the market for infrastructure. debt generically belongs to the corporate bond market and without the latter, movement in The former is unlikely. Next the report focussed on the infrastructure development and role of public-private partnerships. The reasons are plain. Many PPP projects in India have suffered from large time and cost overruns and could not meet expectations regarding transparency and accountability. An evaluation of the impact of the PPP infrastructure projects reveals that the major benefit of PPPs has been to speed up infrastructure deployment, provide possible short-term release of fiscal pressures and for India, these partnerships have often offered better value-for-money.

2.5 Hinterland Connectivity and multimodal logistics (2016)

This article starts by highlighting the present scenario where in India the majority of trade is done through railways and road transport and with pipeline carrying the crude oil and petroleum products. Inland waterways are majorly underdeveloped and government is focussing on the improvement of the same. Next, the article focuses on key initiatives which were taken for the improvement of hinterland connectivity. Indian port rail Corporation has started its operation and from the start they were working on 16 detailed project reports and are currently in the ongoing process stage. Rail Vikas Nigam Limited (RVNL) is Special Purpose Vehicle created to undertake project development, mobilization of financial resources and implement projects pertaining to strengthening of the Golden Quadrilateral and Port Connectivity. The Ministry of Railways has undertaken the construction of the Western and Eastern Dedicated Freight Corridor. Development of multimodal logistics parks which is developed by Container Corporation of India Ltd (CONCOR). Convergence of Inland Waterways with railways and roadways, providing a seamless, efficient and cost-effective cargo transportation solution.

2.6 Multi-layered hinterland classification of Indian Ports of containerized cargoes (Claude Hill and Kailas Venkata Subramanian, 2014)

In this report they have developed a multi-layered hinterland classification of major Indian ports for containerized shipments using a novel approach that integrates geographic information system visualizations and data mining methods. They develop a decision tree model of hinterland structure and overlap that explains the nature of inter-port competition from three dimensions: space, commodity types and shipment values. They generate commodity-wise and city-wise statistics as preliminary information. Among commodities, shipments of textiles and related products.

Dominated the freight, both in terms of volume and value. The goal of the analyses is to develop an intuitive and comprehensive picture of the hinterlands of India's major ports, along with revealing the structure of port competition focusing specially on the private ports of India. In decision tree models, they made it by clustering and classification techniques such as hierarchical clustering, k-means or self-organizing maps could also be used. We apply.

Decision tree analysis in this context because of its simplicity and longer reputation of being effective across several domains. There was also origin destination (OD) analysis is a popular transportation research method employed by both researchers and practitioners to study spatial interaction between origins and destinations.

2.7 Indian Ports: Gateway to Economic Development (Rajiv Aserkar, 2005)

Infrastructure is a key factor in a nation's economic development. Alongside China, India is an emerging economic superpower. While China has entered the world market with the help of its world-class infrastructure, India could not develop its world-class infrastructure. Indian ports have been burdened enormously in recent years by increased imports and exports. The result is frequent reports of port congestion, delays in shipping export shipments and the resulting loss of credibility in foreign markets. Ports are an important link in supply chains that connect manufacturers to markets. Efficient and well-equipped ports will help India take its rightful place in the world economy. This document attempts to discuss various challenges and opportunities for Indian ports and underlines their importance for the growth of the Indian economy.

2.8 Market Trend Analysis on Cargo Handling of Indian Port (Subash Mohapatra and Padmanava Mohapatra, 2018)

Ports provide direct access to world markets and a great opportunity to develop trade with a wide variety of countries. Many industrial and agricultural development projects depend on the availability of ports. Ports are therefore the engines of growth and development of economies. Transport is the transportation of goods (freight) and people by sea and other waterways. Ports represent a complex structure in a country's transport system that provides port interface services such as pilotage, dredging, provision of berths, maintenance of navigation. They serve as an interface between sea and land transport; they play an important role in the economic development of a country. Shipping is the backbone of world trade. Therefore, examine the handling and traffic capacity of large ports and unimportant ports. The study tries to show the trends in Indian ports and their growth patterns. To do this, the

study uses descriptive statistics to compare the productivity of large and non-large ports. Queuing theory is used to determine productivity. The data were extracted from secondary sources.

2.9 Port Infrastructure- Synthesis and Significance (V. Palani Singh, Abdul, 2017)

Port infrastructure is one of the important factors that determine the growth of a country's external sector. The sea route is a well-accepted means of transport for foreign trade and is suitable for the export and import of large quantities of cargo. The flight path is not comfortable for the export of bulk goods and also very expensive and expensive for the export of small parts, so that the ports are essential for the export and import of raw materials and capital goods. Towards the port. In this paper a modest attempt has been made to examine India's foreign trade flows, cargo handled in major ports, goods traffic and Sagarmala projects.

2.10 A Contemporary on Recent Development Activities and Challenges in Logistics Sector in India (Aravindaraj K, P. Rajan Chinna, 2019)

With the Internet and wireless technology, all sectors of the world are developing rapidly. Therefore, the logistics industry in India has developed in a big phase. In recent years, the Indian government has invested more in the development of the logistics sector, which has made an improved contribution to the Indian economy around the world. Contributes nearly 8% of GDP to the Indian economy. Supply chain management is moving goods from origin to destination; In this document, we try to highlight the government's initiative and investments in the logistics sector in India in recent years. We also try to outline some challenges that the logistics industry in India is facing. Examining the entire document from the secondary data source, an attempt is made to highlight the key issues, job opportunities, GDP growth and global ranking that have emerged in the logistics sector in recent years. Recently, Indian government initiatives such as Make in India, Skill India, Digital India. will help drive the growth of the logistics sector in India. Because India has the advantage of an enormous population and thus creates a new entrepreneur among the young people.

Chapter 2 Endnotes

1. <https://twin.scihub.do/6233/17d6ee02e3f4fe6193388e4fcf60225c/singh2016.pdf#view=FitH>
2. https://www.oecd-ilibrary.org/transport/port-hinterland-connectivity_5jrvzrm4t724-en;jsessionid=zG84qwLDrW_c4MJSJyQ7Ycm.ip-10-240-5-132
3. <https://maritimeinvest.in/images/pdf/sector-profile-hinterlandconnectivity.pdf>
4. <https://scihub.do/tree/2e/1c/2e1c10265805452f04e0cd112f8221f1.pdf#view=FitH>
5. <https://moscow.scihub.do/2327/eb860da9215e18a4406b3ec90dba7e0e/delangen2013>

Chapter 3

Analysis of Hinterland and its connectivity with Paradip Port

Paradip Port is one of the 12 major ports of India is a natural and deep-water port on the East coast of India. It is in Jagatsinghpur district of Odisha. It is at the junction of the Mahanadi River and the Bay of Bengal Sea. The port is administered by the Paradip Port Trust (PPT), which is an autonomous body and wholly owned by Government of India, which is abbreviated as GOI. Paradip port is strategically at mid-point between two other major ports, i.e., Kolkata and Visakhapatnam, 210 nautical miles south of Kolkata and 260 nautical miles north of Visakhapatnam.

Raw materials such as iron ore, steam coal, coking coal, fertilizers and other bulk goods are currently being handled in the port of Paradip. The port also processes significant quantities of POL via SBM and pipelines. The total area of the port is 6,521 acres and is located south of Atharabanki Creek. The area of the dock, surrounded by a border wall, is around 1,500 hectares. Paradip Harbour is an artificial lagoon-like harbour that is protected by two waves of rubble and connected to the deep water by a dredged canal.

Paradip Port was opened on 12th March 1966, late prime minister of then Jawaharlal Nehru laid the foundation stone of the Port on 3 January 1962 near the junction of the river Mahanadi and the Bay of Bengal. Government of India declared Paradip Port as the Eighth Major Port of India on 18 April 1966, making it the FIRST MAJOR PORT in the East Coast commissioned after independence. Currently, there are 20 berths in Paradip Port and over 750 employees working in Paradip port.



Paradip Lighthouse

The Port is not that well versed in handling containers with cargo support from NALCO, Marine Products Exporters, TISCO, JSL and others. The Port has a container capacity of handling 1000 TEU through container yard, which is served with two railway sidings and 15 reefer plug points. For handling of container there are One 75 MT and Two 20 MT mobile cranes, two spreaders (40 feet & 20 feet). These equipments are supported by 2 (two) Reach stackers & other container handling equipment which are privately owned. Berthing priority is given for container vessels. For the growth of container operation Paradip port offers 50% Concession in both vessel & cargo related charges for container vessels. Siding facility for Rail handling of containers.



Location Plan of Paradip Port

3.1 Infrastructure in Paradip Port Trust

Some of the major infrastructure in Paradip Port which helps Paradip Port connect with various places are: -

Paradip port is having two docks specifically Eastern and Central dock with 14 berths. These docks are at the lee of the Northern Breakwater. The Central Dock has three multipurpose compartments, 1 multipurpose billet and 2 manure compartments, while the Eastern dock has 3 general freight billets, 2 coal billets, 1 iron metal billet and 1 oil compartment on the lee of north embankment. Notwithstanding 14 compartments, the port has three Single Point Moorings which are committed to Indian Oil Company Ltd (IOCL). Figure 2.2 gives subtleties of the multitude of compartments at Paradip Port.

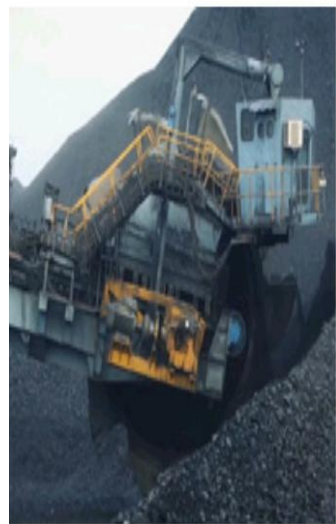
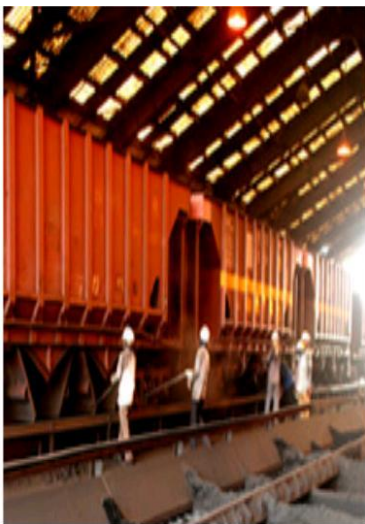


Existing Facilities at Paradip Port

1. Mechanised Coal Handling Plant

Mechanised coal handling plant (MCHP) of Paradip Port Trust which was founded in September 2001 is considered being one of the premier bulk material handling system in whole Asia. The plant is equipped with the latest technologies that serves the purpose of exporting thermal coal, which are then transferred to the power plants in southern India. Since from the start, the plant has achieved many milestones as operational parameters like high berth productivity, minimum turnaround time of vessels which are on par with international standards. MCHP has also created a record of fastest loading of Panamax vessel.

MCHP was a jetty length of 520 m and has a draught of 14.5 m. MCHP has an annual capacity of 21 MT and has stack yard capacity of 6 MT



Coal Handling Plant in Paradip

2. Iron Ore Handling Plant (IOHP)

Iron Ore Handling Plant (IOHP) is the major export hub of Iron Ore in whole India. It is one of the oldest Iron Ore holding plant it is established in on the same day as when the Paradip Port was established i.e., on 12th March 1966. Currently Iron Ore Handling Plant achieved all-time record by unloading an Iron Ore Mines rake in 1 Hr 40 Mins on 28th March 2019 and an Iron Ore Pellet rake in 1 Hr 45 Mins on 11th December 2018. IOHP also achieved an all-

time record also in unloading of 203 No. of Wagons in a Shift on 28th March 2018. IOHP has a jetty length of 210 m and corresponding width of 13.75 m and the max permissible draught is of 13m. The handling rated capacity of plant is almost 3000 MT/hr and an Annual Throughput of around 4.5 MT of Iron Ore with an average daily loading of 20000 tonnes.



Iron Ore Mining and handling Site

3. General Cargo Berths

Port has 08 nos. of General Cargo berths. First General berth cargo was started in the year 1975 and latest one started in 2001. These berths are having multipurpose facilities and used by vessels for loading and unloading various types of commodities Thermal Coal, Chrome Ore, Manganese Ore, Iron Ore, Charge Chrome, Ferro Chrome, Ferro Manganese, Steel Coil, Coking Coal, Hard Coke, Iron Ore Pellet, Limestone, Food - Grain, Fertilizer, DBM, Project Cargo etc. all the 8 berths have different lengths and draughts which is close to around 200 m and around 10 m of draught. Berth 5,6,7 is having 750 m of length and 14 m in draught, so they can handle large vessels.



General Cargo Berth Paradip

4. North Oil Jetty

North oil jetty was established on 29 march 2003. It is operated by Indian Oil Corporation of India limited IOCL. It is hub from oil is transported to various parts of India. North Oil Jetty in Paradip Port has a capacity of 7.5 MT in an annum. It has a length of 300m and a draught of 13.5 m. As majority of oil transportation is done through pipe line so the facilities of pipeline is provided at the terminal.

/ North oil jetty in Paradip Port

5. Port Railways

The Port has its own railway system. As most connectivity with various locations is done majorly through rails so having railways system of ports own provides a good amount of profit. The route length is close to around 7.4 Kms and there is a track length of about 84 Kms. The Port is equipped with 7 locomotives to undertake railway operations which is further supported by 2 Locomotives on hire from RITES. The Port is considered having one of the finest connectivity to the Indian Railways through East Coast Railway for seamless cargo movement by rail. Port can handle 19 full rake length and 11 half rake length railway sidings.



Railways Siding in Paradip Port

6. Storage Warehouse (PSCT)

There are 2 warehouses majorly in Paradip Port warehouse no.1 and warehouse no.2 having a total capacity of 18000 MT from which warehouse no.2 is capable holding a maximum of 14000 MT. the 2 warehouses are spread over area of 7711 sq. m. The total Open Yard is spread over 2 million sq. m.



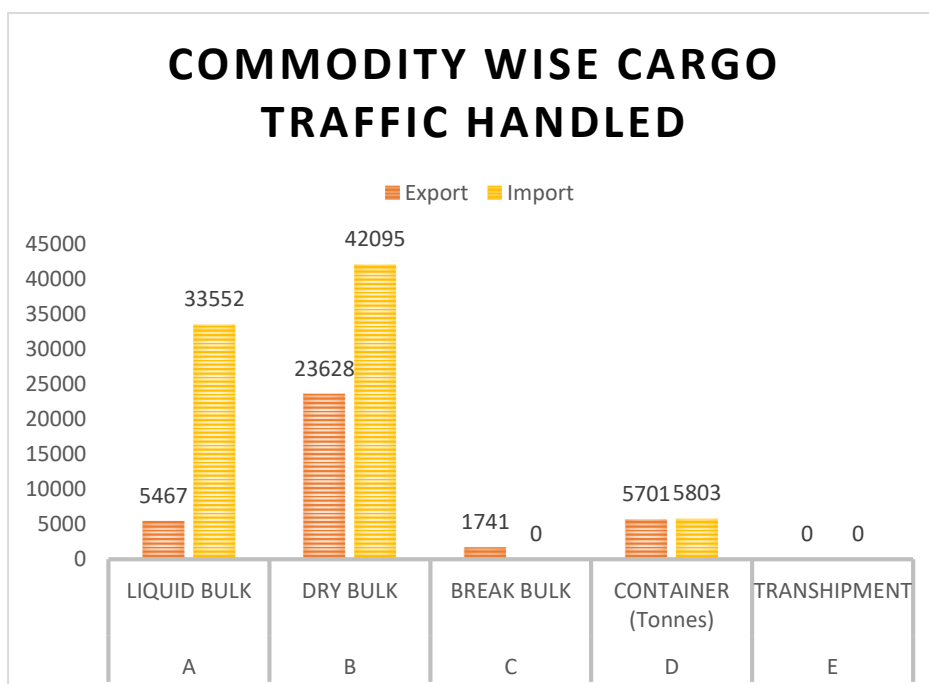
Storage Open yard

3.2 Cargo Handled by Paradip Port

Paradip Port is the largest exporter of iron ore than any other state in India. Paradip major export Iron Ore to China, while having a look the 2019 figures the iron ore exported to China is around 14 MT in the year 2019-20. They also export iron and steel also to China. Talking about Imports, Paradip Port major imports were coal Thermal Coal and Coking Coal and Petroleum, oil, Lubricants POL was also the major Import of Paradip Port. Paradip Port majorly imports Thermal coal from South Africa and Indonesia. And they imported cooking coal mainly from Australia. For Crude Petrol the major Importing Countries are Saudi Arabia, Iraq, United Arab Emirates and from Angola. Paradip Port is quite new to container traffic handling that is why container traffic is not that significant. Paradip Port Container traffic is mostly for coastal regions still it is not made enhancement towards Overseas Trading. For the sake of increasing container traffic Paradip Port offers concessional discounts. Container traffic and handling is the new future so they are trying to improve the same.

Commodity wise Cargo Traffic Handled 2019-20 (value 000' tonnes)

S.no.	Commodity	Export	Import	Total
A	LIQUID BULK	5467	33552	39019
1	POL- Crude	0	31022	31022
2	POL-Products	5058	880	5938
3	FRM-Liquid		1600	1600
4	Others	409	50	459
B	DRY BULK	22955	42095	65050
1	Iron Ore (All)	22955		22955
2	Thermal Coal	0	21196	21196
3	Coking Coal		12000	12000
4	Fertilizer		475	475
5	FRM-Dry		4072	4072
6	Others	673	4352	5025
C	BREAK BULK	1741	0	1741
1	Iron & Steel	1295		1295
2	Others	446		446
D	CONTAINER (Tonnes)	5701	5803	11504
1	Teu s	5701	5803	11504
E	TRANSHIPMENT	0	0	0
1	Container (Tonnes)	0	0	0
2	Others	0	0	0
13	TOTAL	36537	81450	117987



As far as volumes, Paradip is one of the biggest significant ports in the nation dealing with over 121 MTPA of payload. Paradip is deliberately in the mineral-rich province of Odisha. Right now, the significant items dealt with in the port are coal and POL. Around 33 MTPA of coal is traded from the port and is coastally dispatched toward the South and the Western hinterlands of the country. The port imports around 30 MTPA of POL to serve the IOCL treatment facilities at Paradip and Haldia.

Paradip Port Exports

Paradip Exports major Export commodity is Iron Ore, and it is largest Iron Exporting Port in whole India. Now the question where Paradip receives iron ore for exporting majorly to China. In Odisha there are 7 Major Iron Ore Mining sites which are Barbil, Jaipur, Cuttack, Sundergarh, Keonjhar, Joda, Mayurbhanj. Based on the mining location and transportation facility available, the connectivity of these sites to Paradip Port is done. This research majorly focuses on the improvement of this connectivity. From Barbil to Paradip Port is 100 km, and the site is 13 away from National Highway so from Barbil the preferred mode of transportation is through NH. Over 30000 trucks have daily movement to Paradip Export for meeting the Daily Export demands. During the last few years, the lifestyle of people from Keonjhar, Sundergarh, Mayurbhanj, Cuttack, Jaipur and Jagatsinghpur districts has undergone tremendous change. As the small cities are looking at the large profits, they are earning.

Paradip is emerging as a major industrial hub with several upcoming steel plants including a US\$12 billion plant being developed by POSCO from South Korea, which promised to give jobs to almost 30% of the jobless population of Odisha. Paradip has become a hub of industrial activities. Industries like IFCO, PPL CARGILL, IOCL, BPCL, HPCL, Carbon etc. have been established here.

The IOCL Paradip refinery, which is in Paradip, in Jagatsinghpur district of Odisha, India. It is spread over in area of 3,345 acres, the refinery site lies southwest of the Paradip Port which is almost 5 km distant from the major port. The refinery can handle high-sulphur crude oils and it produces a range of refinery products including petrol, diesel, liquified petroleum gas (LPG), aviation turbine fuel, kerosene, sulphur, and petroleum coke.

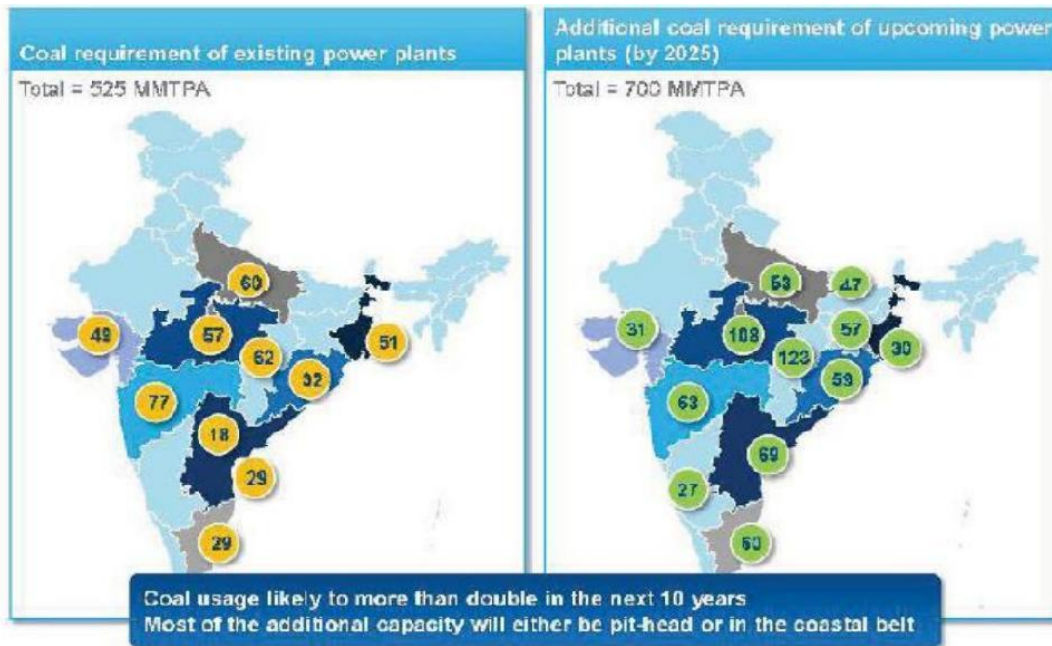
From the container Exports point of view the major Exports are in and around coastal regions only. As it is a growing traffic so it adds to the value. Paradip is in the top 5 list of container traffic handling as considered India data alone. Next to some big names such as JNPT port. Paradip Port is constantly improving its Container traffics handling capacity and in near future will be a container traffic giant. For increasing their container traffic growth, they are only charging 50% of the actual charge.

Paradip Port Imports

India is the world's second largest importer of thermal coal, and has the potential to be an ongoing source of demand growth - a bright light for thermal coal exporters confronted with falling demand in Europe, North America and North East Asia. India's thermal coal consumption is likely to continue to increase next decade, and possibly beyond, in order to meet India's increasing energy requirements. Hence, the pace of India's coal production growth will be the key driver of its future thermal coal import needs. Paradip major imports of thermal coal are mainly from Indonesia and South Africa and the companies which import the coal are Coal India Limited, Eastern Coalfields Limited (ECL), Bharat Coking Coal Limited (BCCL). Adani Enterprises Ltd, Jindal Steel and Power.

Coal stores are principally restricted to eastern and south focal pieces of the country. The conditions of Jharkhand, Odisha, Chhattisgarh, West Bengal, Madhya Pradesh, Andhra Pradesh and Maharashtra represent practically the entire absolute coal holds in the country. The State of Jharkhand is the biggest maker of coal in the country as of March 2014, followed by Odisha and Chhattisgarh. Since one of the key goals of Sagarmala is advancing coordination's proficiency for super wares, the principal centre region is warm coal. The territories of Chhattisgarh and Odisha are the main makers of warm coal in India.

As of now, the force plants in Maharashtra devour the most noteworthy amount of coal-around 77 MTPA, followed by power plants in Chhattisgarh and Uttar Pradesh, at 62 MTPA and 60 MTPA separately. Ten states represent over 80% of current warm coal necessity for power age in In this way, while coal creation is moved mostly in Eastern and Central pieces of India, it is moved for power age to essentially all sides of the nation For instance, 26 MTPA is sent from Odisha to Tamil Nadu. Likewise, volumes of coal additionally move from Chhattisgarh to Maharashtra (19 MTPA) and Gujarat (14 MTPA). Coal imported from Indonesia and South Africa shows up at different ports and afterward moves inland.



Thermal Coal Requirement of Existing and Upcoming Power Plant

India plans to significantly reduce its thermal coal imports in "the next few years" to save foreign exchange and create jobs through the development of existing and new coal blocks. Increasing local coal production would help to improve the economies of states in central India, where most coal mines are located. To boost local output, India in June launched an auction of 41 coal blocks with an annual production capacity of nearly one third of total national output. Another significant product imported in Paradip is cooking coal. To support the interest of impact furnace-based steel creation, around 60 to 65 MTPA of coking coal is shipped in the country, and around 54 MTPA is devoured for the creation of steel. Around 80% of the coking coal devoured is imported because of deficient coking coal holds in India.

Eastern India (West Bengal, Jharkhand, Odisha and Chhattisgarh) is the greatest group of steel creation in the country with 45 MTPA (around 40%) of all out introduced steel limit. For an OD investigation, 14 steel plants are most pertinent since they are the significant makers of steel (around 60% of the aggregate) and burn-through around 80% of the all-out imported coking coal Figure 3.7. These 14 plants need around 45 MTPA of coking coal; imported coking coal satisfies 37 MTPA of this interest.



Steel Plants Relevant for Coking Coal

While the current coking coal clearing is confronting difficulties because of restricted accessibility of rakes at dumping ports and rail line limit at key train courses around 21 MTPA of new steel limit at key steel plants (1 MTPA or more impact heater based) is under development and would require around 18-20 MTPA of coking coal to be cleared on something very similar rail courses which are right now running at over 100% use.

As per gauges, the coking coal interest for steel would stretch around 130-140 MTPA in 2035 dependent on expanded steel interest in the country for programs like Make in India and development stimulus. Likewise, truly the steel development has been becoming quicker than GDP with the multiplier being GDP: 1.14. Subsequently, the clearing ability at the significant dumping ports and the rail route courses should be improved for the ideal departure of coking coal.

Due to lack of adequate petroleum reserves, India has to depend mostly on crude oil imports in near future till its renewable energy resources such as solar, wind, hydro and bio-mass are

exploited adequately to achieve energy security by replacing the petroleum products consumption which are also major contributors to the air pollution. India heavily depends on crude oil and LNG imports, with 82.8% import dependence for crude oil and 45.3% for natural gas/LNG. India generated 35.2 million tons of petroleum products from indigenous crude oil production whereas the consumption of petroleum products is 204.9 million tons, which is quite an enormous amount.

India is the second biggest importer of crude oil and its products after China. India and China being major oil importers, both countries should coordinate for mutual benefit while trading in global oil markets to moderate the crude oil price and nullify the oil pricing power of OPEC, etc. Normally, crude oil pricing and gold pricing exhibit opposite trends in global trading (i.e., while one appreciates the other depreciates). India should also buy crude oil in the futures market.

3.3 Means of Transportation mostly preferred for connectivity with Port

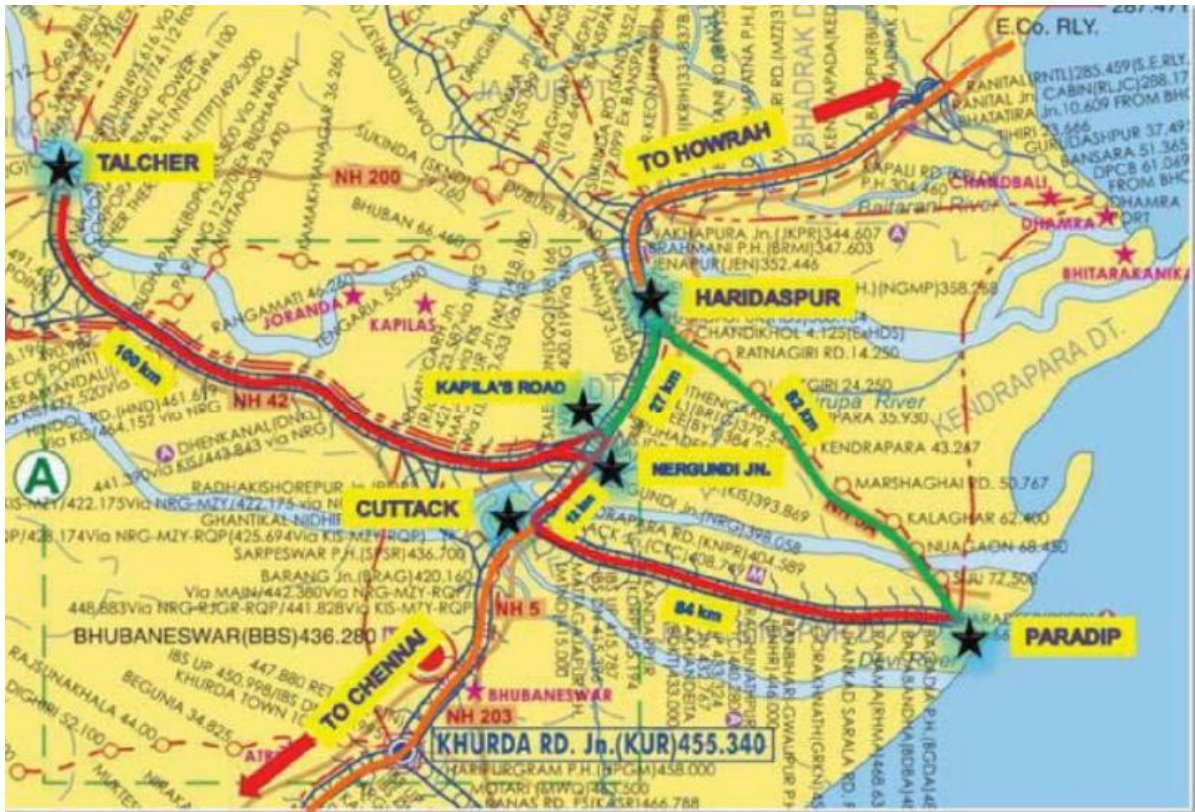
Paradip has basically more sources of transportation media used to maintain its connectivity with the hinterland that are railways, roadways, pipeline and through conveyor. Out of which majority of transportation is being handled by railways. It is even considered that Paradip port has the best railways connectivity among all the eastern ports. Almost 50% of cargo that is being moved in or out of port is done through railways. And most of the which is transportation of imported coal to various companies. As already in the various topic we have the importance of coal in India development of companies.

Next comes in the list is pipeline which almost has 30% of the transportation as POL has considerable share in the total commodities being imported so the transportation of petroleum is mostly done through pipeline.

Existing Railways Connectivity

Paradip Port's rail network is a piece of the East coast railroad framework and is associated with the Hinterland through Cuttack by an expansive check rail interface. Cuttack is around 90 km from Paradip and interfaces Port to Howrah- Chennai fundamental line. Past Cuttack the line interfaces Paradip to Kolkata (course length of around 500 km) on the North and

Chennai on the South (course length of around 1340 km). The current rail network to Paradip Port is displayed in below Figure,



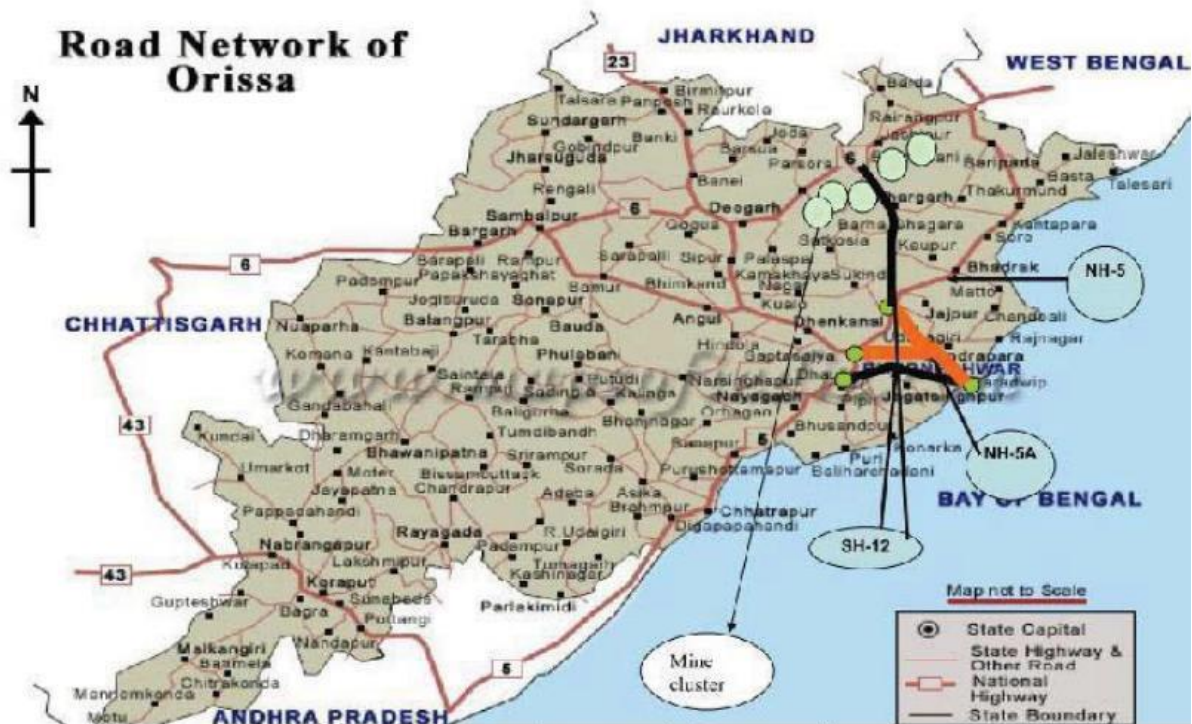
Rail Connectivity to Paradip

Existing Road Connectivity

Paradip Port is associated with all significant National Highways through Cuttack and Chandikhol, which are two of the significant urban areas in Odisha.

- Cuttack and Paradip are associated with NH-5A (4 paths).
- Cuttack and Chandikhol are associated by SH-12 (2 paths).

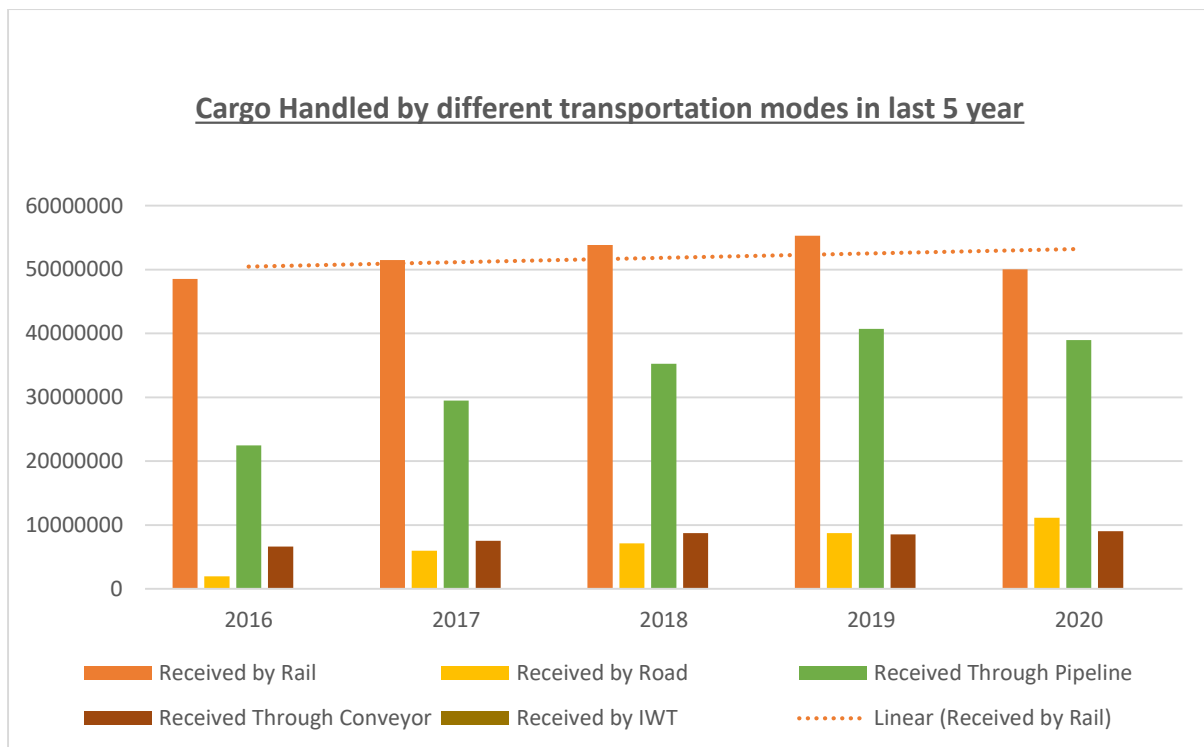
Immeasurably significant objections in India, whether on the North, West or East could be gotten through anybody of the previously mentioned Highways as displayed in below Figure.



Road Connectivity to Paradip

Cargo Handled by different transportation modes in last 5 year

Year of Study	Received by Rail	Received by Road	Received Through Pipeline	Received Through Conveyor	Received by IWT	Total
2016	48513339	1962776	22473518	6639765	0	79589398
2017	51484265	5982531	29510237	7526805	0	94503838
2018	53832531	7145149	35257901	8741787	0	104977368
2019	55314238	8723468	40719249	8543026	0	113299981
2020	50018887	11121706	38950033	9022824	0	109113450



Bar graph of cargo handled by the transportation modes in the last 5 years

After that considering the last years data, we can see through conveyor there is transportation of commodities mainly FRM dry commodity is usually transported through conveyors and also some dry bulk cargoes are transported.

Next in the line is roadways mainly with the use of trucks. Roads mainly national highways roads are used for the transportation of Iron Ore. Around 20000 trucks traffic on daily moves from iron ore mining site to Paradip Port.

Analysing the last 5 years we can say that railways has always been at the top of handling the most cargoes mainly because of the price as the railways price of handling is lower than any other means of transportation. Tonne mile of transportation is lowest in case of railways so railways are the most popular means of transportation. There are very other reasons as well for transportation through railways speed is also the factors for which railways are preferred as in case of roadways there is a possibility of traffic jam which might cause the transportation time to redouble. Even from environment point of view while transporting coal via roadways chances of getting the coal dust influence the lives of human is more than compared with railways. But the biggest reason for the success of railways from other means is the cost, which is quite low as compared with other means.

Pipeline being the second-best mode of transportation the only reason for the success is easy transportation of petroleum crude oil is very easy and convenient in case of liquid cargo. Enormous volume of crude oil is being transported to various locations through pipelines. This mode is cheap when compared with other modes of transportation when transporting the same commodity. Next best thing about this mode of transportation is the speed of transportation of crude oil is very high. Pipeline transportation is an excellent alternative for the transportation of fluidal commodities. Pipelines can be laid anywhere, being underwater or underground. The only disadvantage that can occur is there are chances of leakage, which is very difficult to avoid and proper maintenance over its entire journey.

Conveyor transportation for long distance seems a strange idea but certain commodities are mandatory to go through a conveyor belt. So here the goods which are transported through conveyor belt are FRM Dry product. For long distance the major used belt is long distance belt conveyor can continuously convey Bulk Material through long distance, with large inclined angles and in complex terrain. The single length of each conveyor can reach kilometres or even tens of kilometres whereas belt with ranges from 500mm to 2600mm. long distance Belt conveyor is the ideal bulk material long distance continuously conveying equipment.

Next in the line roadways used for transportation as this seems to be quite a cheap still not that in use mainly because some of the specific reasons like the hinterland location not that well connected with National highways which makes it difficult for the hinterland to connect with port through roadways transportation means. It is even possible that using trucks for transportation can save some cost in logistics. Looking for broader future point of view, it is possible that on the improvement of national highway it is possible such that more of this can be improved. As we are already seeing a steady growth in improvement of roadways being used as the transportation means. The growth percentage if looked carefully then the amount of growth in roadways is much significant as compared with other modes of transportation.

Commodity wise mode of transportation used data for the year 2019-20

	Commodity	Received by Rail	Received by Road	Received Through Pipeline	Received Through Conveyor	Received by IWT	Total
1	POL (Crude)			31022180			31022180
2	POL (Products)			6307021			6307021
3	LPG/LNG						0
4	Other Liquid Bulk			40129			40129
5	Iron Ore	4573160	6738367				11311527
6	Coking Coal	11739224	172058				11911282
7	Thermal Coal	25924595	2135756				28060351
8	Fertilisers Finished	1808686	11				1808697
9	FRM Dry			1580703	4075388		5656091
10	Other Dry Bulk	5973222	1853968		4947436		12774626
11	Steel Products						0
12	Other Break Bulk						0
13	Containers		221546				221546
14	All Commodities	50018887	11121706	38950033	9022824	0	109113450

The above table shows which commodity is transported through which suitable means of transportation. This table can be used in analysis why the mode of transportation currently used is more favourable and it also proves why other means which can be actually used for

transportation are not used because of the demerits of connectivity with the ports of other hinterland.

Starting from the petroleum product crude petroleum to be precise as it is clear from the table that almost 35 MT of crude oil imported is transported through pipeline. Pipelines are systems of large transportation pipes below ground, that serve the purpose of transporting oil and natural gas within extensive distribution networks. These lines vary in diameter depending on their use, and are located underground.



Pipeline transportation for crude oil

Next commodity is iron ore as we have already mentioned that Iron Ore is majorly transported through roadways as the mining sites are well connected with National Highways so they have the liberty to have a flexible mode of transportation and as the roadways are cheaper among all they prefer roadways. But if we analyse table data, it is shown that almost 4 MT of iron ore is transported through railways as well the main reason here is the sites the mining sites in Chhattisgarh are not that well connected with national highways so they prefer using railways as the national highways are far away distance from the mining site and the nearest location is railways that roadways.

Now comes the major importing product for Paradip Port, that is coal both thermal coal and coking coal prefer to being transported through railways. Mainly because railways sidings are there in Paradip port and the railways network to various importing organization are easily connected with the railway network so railways, become the most used transportation medium for transporting the importing coal to the respected location.

While looking at the table the proportion of transporting the thermal coal the roadways and railways used for transporting the good looks quite similar as an when compared with coking coal. The main reason for this thermal coal local requirement is better than coking coal. So for the local transportation purpose for the local companies the demand of transportation through roadways is preferred as this made is quick as when needed it can be send whereas in case of railways only when the demand is sufficient and it would fill all the coaches with the cooking oil then it is allowed the leave the port.



Coal India Limited

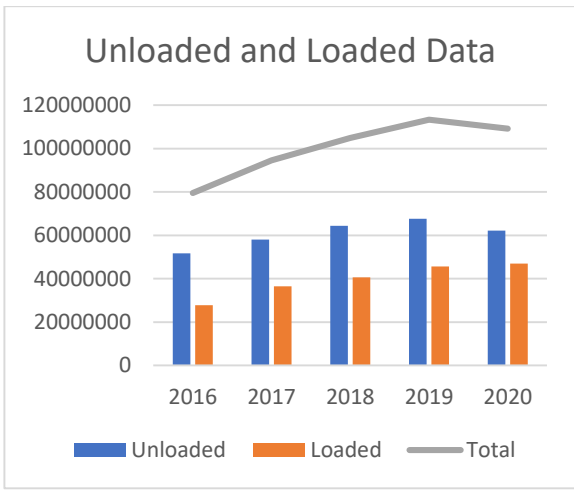
Next commodity is some other dry bulk cargo and FRM dry fertilizer raw material dry is basically transported through conveyor belts.



Conveyor systems used for transportation

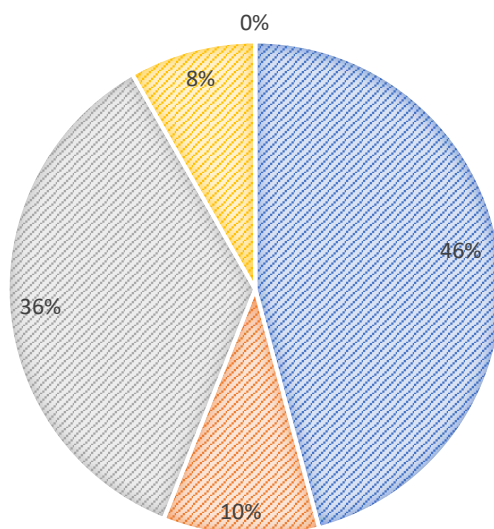
Cargo loaded and unloaded from and to various transportation modes in last 5 years

Year	Unloaded	Loaded	Total
2016	51754304	27835094	79589398
2017	58044692	36459146	94503838
2018	64407642	40570326	104977968
2019	67596703	45703278	113299981
2020	62132493	46980957	109113450



PIECHART OF DIFFERENT TRANSPORTATION MODE (2019)

- Received by Rail
- Received by Road
- Received Through Pipeline
- Received Through Conveyor
- Received by IWT



Hence, from the above tables it is shown that the amount of cargo being loaded and unloaded from the different transportation mode. As we can see, there is a constant increase in the usage of transportation mode since 2016. Unloaded data is the cargo unloaded from the ship basically which means the imported items from other countries which are then transferred to different states or different organisation which imported that good. Bases on the different needs and requirement and also keeping in mind the logistics cost cargo or commodity to be transferred suitable transportation media is being selected. The cost will be borne by the organisation which imported that good. But this does not mean they handle transportation goods. Sometimes ports handle transportation of goods and the logistics charge is what the organization is liable for.

Similarly, the loaded items are those which mostly comes from the mining sites. Iron ore mining sites in different location transfer the commodity of iron ore from different location to Paradip mainly via roadways through trucks and through railways, as Paradip port has railways siding. So directly from the site it reaches the port same while using trucks also the same thing happens. Why the data claims to be loaded data because these items are loaded into the vessel. So loaded can also be called as exported items.

By seeing the last 5 years data we can also come to very interesting conclusion that difference in the exports and imports from Paradip are decreasing as in this data of last year if we compare 2016 data the difference comes out to be 24 MT and now if we check the difference between exports and import of the latest 2020 data, we can find it is to be around 15 MT. which is quite a positive view from the economic point of view as the Country GDP increase when a country does more exports. So Paradip Port is improving the Economy of Country.

Chapter 3 End Notes

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Chapter 4

Improvement in Multimodal Transportation and Rail Road Connectivity

Multimodal transportation incorporates a blend of over one method of development, like rail, street or ocean, for start to finish conveyance of products and this bill targets working with development of merchandise for fares, imports and homegrown exchange too. It would help fix responsibility and liabilities for infringement of its arrangements. On November 2020, in a significant push to fostering an incorporated coordination system in the nation including mechanical parks, cold chains and warehousing offices, the public authority allowed foundation status to the coordination area, empowering the business to get to less expensive accounts.

The association from port to hallway to hinterland should be consistent, and this can be accomplished through coordinated arranging, with ideal street, water, pipelines and rail hinterland associations in the port region. Transport halls to the hinterland ought to be multimodal, containing grew inland coordination zones that are multimodal centre points and have fitting stockrooms and different administrations. With the end goal for exchange to keep filling later on, port-hinterland network should turn into a piece of port system, arranging and the board. In this unique circumstance, the port is important for the more prominent coordination chain where coordination and multimodal transport hallway issues are considered in equal. The all-encompassing entryway gives an extraordinary chance to build port limit and improve transportation of products between the port and the hinterland.

Government speculation impressively affects the turn of events and improvement of the hinterland network with Paradip Port. Under the public viewpoint plan for Sagarmala, six new super ports created in the country. The Indian ports and transportation industry assumes a crucial part in supporting development in the nation's exchange and trade.

Growth in Transportation connectivity to Paradip Port

As it is very much clear from the previous chapter, there are 4 transportation medium that are used for the connectivity of hinterland with Paradip Port. They are Railways, Roadways,

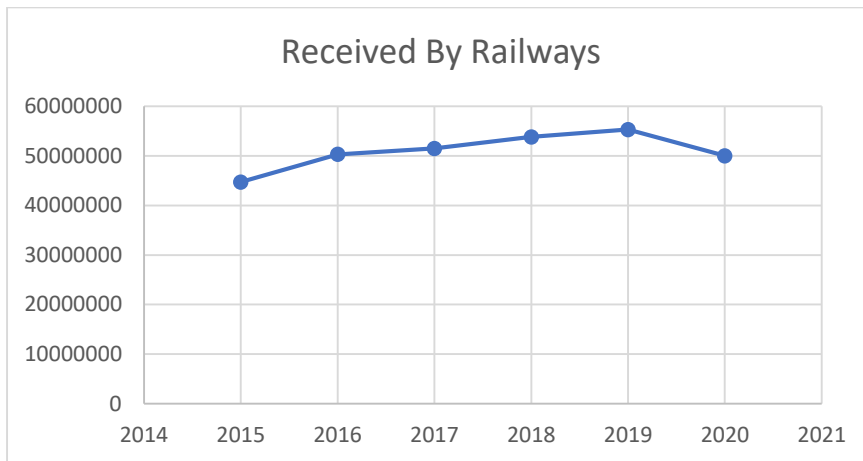
Pipeline and Conveyor. Inland waterways are under development and will activate many options of multi modal transportation once it is developed.

In this section every transportation mode will be studied separately based on the growth of the following transportation medium

4.1 Railways- Transportation mode in Paradip Port

Increase in Railways Transportation mode in last 6 years

Year	Received By Railways
2015	44703305
2016	50313339
2017	51484265
2018	53826531
2019	55314238
2020	50018887
Total	305660565



Railways being the most used transportation mode for connecting the hinterland with Paradip Port. From the data almost every year the commodity handled is over 44 MMT. As when we see the graph it is shown that the value in the consecutive year is gradually increasing but only in the year 2020 it decreased somewhat because of Corona COVID-19 Pandemic and import of coal was less than the other years.

The reasons for the increase in railways connectivity talking from commodity point of view railways are majorly used for transportation of coal commodity both Thermal coal and Coking coal. As and when there is an increase in the demand for coal import, the connectivity automatically has to be improved and hence the load increased. As discussed in chapter 3 the demand of coal will increase in next 10-15 years so there is opportunity to increase the well networked rail connectivity which will be a definite help to tackle the situation in future with greater ease.

Also, there is an improvement in the infrastructure of railways and there are also some ongoing investments which have helped the connectivity to grow further and in future also the growth will have a positive slope for the next decade as well. Some projects which have helped in the growth of Railways connectivity with Paradip Port-

1. Coal Railways Corridor Angul–Chennadipada.

The proposed corridor will meet the transportation needs of 32 coal blocks in the area while also saving money on transportation costs. The Rs 1,240 crore project, which is being conducted by the Odisha Industrial Infrastructure Development Corporation, will require the acquisition of 6,200 acres of land (IDCO). The common corridor will support ten blocks in the Talcher coalfields under Mahanadi Coalfields Ltd's management. It is planned to handle over 100 million tonnes of coal each year. The corridor will be connected to rail heads at Jharpada, Angul and Budhapanka.



Coal Corridor

2. Haridaspur - Paradip New Rail Link

Rail Vikash Nigam Ltd. is constructing this railway link, which is of 82 Kilometres length, at an estimated cost of ` 598.00 crores. There will be considerable reduction of the distance from Bansapani to Paradip and the freight reduction by 50%. The work is nearing completion.

The Paradip-Haridaspur new rail line project in Odisha has as of late arrived at its last phase of consummation and was planned to be introduced in March 2021 when the COVID-19 pandemic hit. The length of the rail line project is 82 km and will go through Jagatsinghpur, Kendra pada and Jajpur locale. The Paradip-Haridaspur new rail line associating Paradip with Odisha's heartland will be a fantastic pathway for advancement of the state. It will diminish the distance between Daitari and Bansapani iron mineral belt and Paradip port significantly. It will likewise serve the significant mining belts of Jajpur and Keonjhar. The new downpour line will give an upper hand to India's great steel centre at Kalinga Nagar and its many related downstream enterprises.



Haridaspur- Paradip Railway Line

3. Development of Rail Connectivity for BOT Berths.

The estimated cost will be around 55 crores. The process is in progress and it is being executed by DCI and it is expected to be completed this year by September.

To investigate and separate this coal, the Government of Odisha along with the Government of India has made this venture to make a Coal Corridor which empowers quicker clearing of coal from the space.

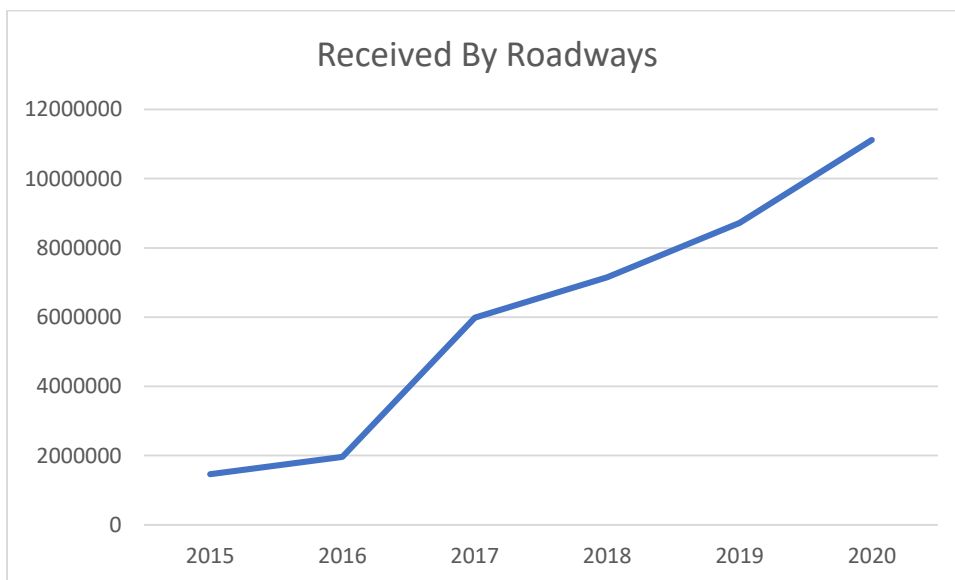
The improvement of the 143-km passageway, with an ability to handle coal over 100 million ton every year, will profit over 50 ventures in areas like steel, aluminium and force.

4.2 Roadways- Transportation mode in Paradip Port

Increase in Roadways Transportation mode in last 6 years

Unlike Railways, Roadways don't handle that much amount of cargo as majorly roadways handle the sites or iron ore mining sites which most of the location are nearby to National Highways so the owner of the mining land prefers to NH 53 for the transportation of Iron ore as there are advantage associated with it such as time of delivery as if railways is used for transportation then until and unless railways coaches full after that only the rail moves where in case of using trucks it can move when the whole truck is full and be ready to move.

Year	Received By Roadways
2015	1465372
2016	1962776
2017	5982531
2018	7145149
2019	8723468
2020	11121706
Total	36401002



By having a look at the last 6 years, the slope of the growth is highest as compared to any other means of transportation. The reason for such nice positive slopes is first will be advantages the exporter or importer receives while using trucks as a means of transportation. Even during the corona pandemic times the slopes have greater positivity, which means the

use of roadways transportation are used and is being preferred than any other mode of transportation.

There are lots of lots of investment are also being made for the improvement of roadways connectivity which has a major role in the usage's improvement of roadways from the last 6 years. These investments are helpful in increasing the logistics cost lower. Some of the investment which were made in past and some projects which were currently running are as follows-

1. Flyover or elevated corridor Near Joda Town.

At a total cost of Rs.228.00 crore, a 3 km long elevated corridor (fly over) near Joda town, including improvements to the road stretch of Joda - Bamberi Section in the district of Keonjhar, was built. The elevated corridor must be constructed. This is quite important for the mining transport activity in the area.

Notably, roads in Joda stay congested and air-polluted all the time because of playing off as many as round 7,000 ore-encumbered trucks. The Department of Economic Affairs (DEA) below the Ministry of Finance has agreed to meet the Viability Gap Funding (VGF) of the challenge. And made it a 3-way lane with addition of flyover which will help In removing all kinds of congestion, the ore encumbered automobiles will pass easily and there might be rarely any congestion and pollutants because of jogging of over vast fleet of industrial automobiles.



Old image of Joda Flyover Design

2. Greenfield Bhubaneswar–Paradip PCPIR Road on Public Private Partnership

Petroleum, Chemicals and Petrochemicals Investment Region (PCPIR) at Paradip with a region of around 250 sq. kilometers planned for the institution of producing facilities for

domestic and export crystal rectifier production in petroleum, chemicals & petrochemicals, beside the associated services and infrastructure.

There two Greenfield Road corridors proposed to improve connectivity to the region. These are:

- i) A 140-kilometer greenfield coastal corridor connecting Paradip PCPIR to the future Dhamra Port in the north and the projected Astranga Port in the south is envisaged. This corridor will include a 100-meter right-of-way (ROW) to support a 6-lane road and a product pipeline corridor with enough width for future expansion.
- ii) There is a green field road proposed from Bhubaneswar to PCPIR which shall provide direct connectivity to the state capital and serve as an immediate link with the existing airport. GoO has already carried out a study for road alignment from Bhubaneswar to Paradip. Directly connecting the port with airport again creates a good multimodal transport opportunity.

3. 4 to 6 laning of NH-53 connecting Paradip port (NHAI)

Total Investment being made is 600 Cr

Current status is DPR is under Preparation

Expected date of completion is March' 2022

The National Highway-53 interfacing Chandikhol with port city Paradip will before long be moved toward a six-path interstate from the current four paths for which the National Highway Authority of India (NHAI) has begun the overview work on the highway.

The stretch of the thruway among Chandikhole and Paradip is of 77 km and frequently witnesses long traffic growls because of customary development of enormous quantities of mineral-loaded vehicles to port. Upwards of 10,000 trucks and hefty vehicles conveying iron minerals, manganese, chromites, and coals from the mines of Keonjhar, Sundergarh and Jajpur locale travel on this course.

Subsequently, the NHAI has moved the current four path roadway toward a six-path parkway to oblige more payload and traveller vehicles on this course. An arrangement cost of Rs 1,200 crore has been endorsed for the task. The matter went to the front after the NHAI specialists began review works for moving the current four-path thruway toward a six-path expressway.



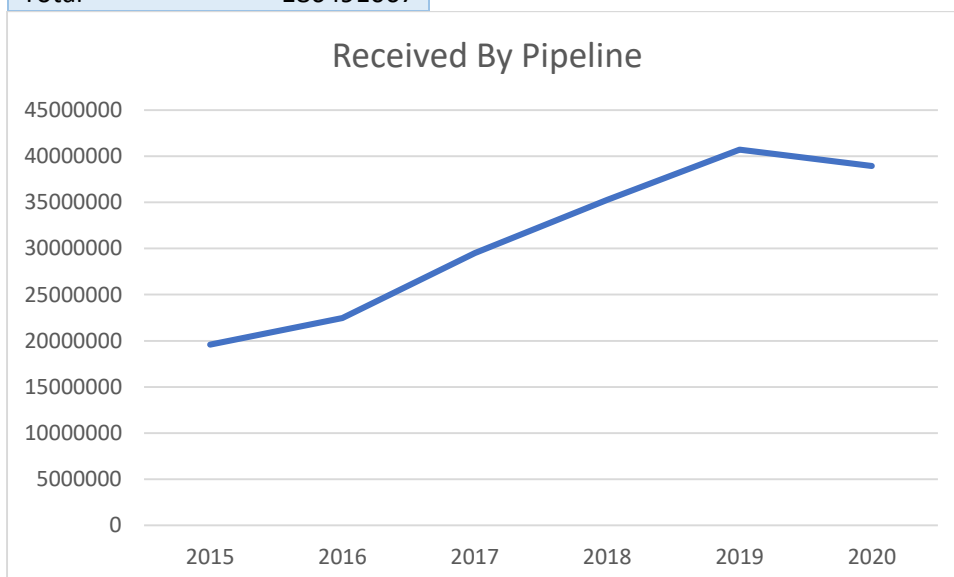
Survey Image of 6 Laning of NH-53

A long time passed, the National Highway went through a name change and became National Highway-53. The 77-km long interstate passes on five major streams for which new extensions will be based on the Mahanadi, the Luna, the Gabari, the Birupa and the Genguti waterways.

4.3 Pipeline- Transportation mode in Paradip Port

Increase in Pipeline Transportation mode in last 6 years

Year	Received By Pipeline
2015	19580129
2016	22473518
2017	29510237
2018	35257901
2019	40719249
2020	38950033
Total	186491067



Pipeline Transportation is the second most used transportation medium in Paradip Port. Most of the transported commodity through pipeline is crude petroleum oil. After looking at the figures of last 6 years, it is quite clear that there is a continuous increase in the transportation commodity volume. Reasons are mainly the rise in import of POL (Petroleum, Oil, Lubricants) which increases the volume of transportation. And the transportation infrastructure which has been made and improved upon. The continuous maintenance of the pipeline and checking of pipeline has a major role to play in the successful transfer of liquid commodity via pipeline systems.

While analysing the data of past years we can see that the slope of the curve increases with a good slope at start and towards the end there is dipped in the line graph which is because of Corona pandemic. Because of that there is dipped in the total imports of petroleum, which decreased transportation of commodity value.

Talking about the ongoing development projects on improving the pipeline network. Most of the work on pipeline network is maintenance of pipeline. As chances of leakage in pipeline, especially if the pipeline is underground, is very troublesome so to avoid this continuous analysis of pipeline is done.

Project- Paradip-Haldia-Durgapur pipeline

The 679km-long Paradip-Haldia-Durgapur pipeline exports LPG from the Paradip refinery, Haldia refinery, and the Indian Oil Petronas (IPPL) import terminal in Haldia, to bottling plants at Balasore, Kalyani, Budge Budge, and Durgapur. The pipeline is currently undergoing augmentation and extension to reach up to Patna and Muzaffarpur.

Two petroleum product pipeline projects, including the 1,212km-long Paradip to Hyderabad pipeline and the 344km-long Paradip-Somnathpur-Haldia pipeline, are also currently under construction and are expected to be completed in 2022.

Paradip- Haldia- Durgapur Pipeline

Paradip-Hyderabad Pipeline project

being executed by the Indian Oil Corporation, the project links Paradip Port refinery in Odisha and the Hyderabad city would facilitate enhanced leverage in terms of fuel supplies.

The pipeline will end at IOC's new petroleum terminal in Malkapur, close here, which will have a storage capacity of 180 thousand kilolitres and would be completed in the next six months at a cost of Rs 611 crores. The Paradip-Hyderabad Pipeline project is nearing completion, except for a few smaller parts that need to be patched up, and a 180 thousand kilo litre capacity terminal will be developed in Malkapur.



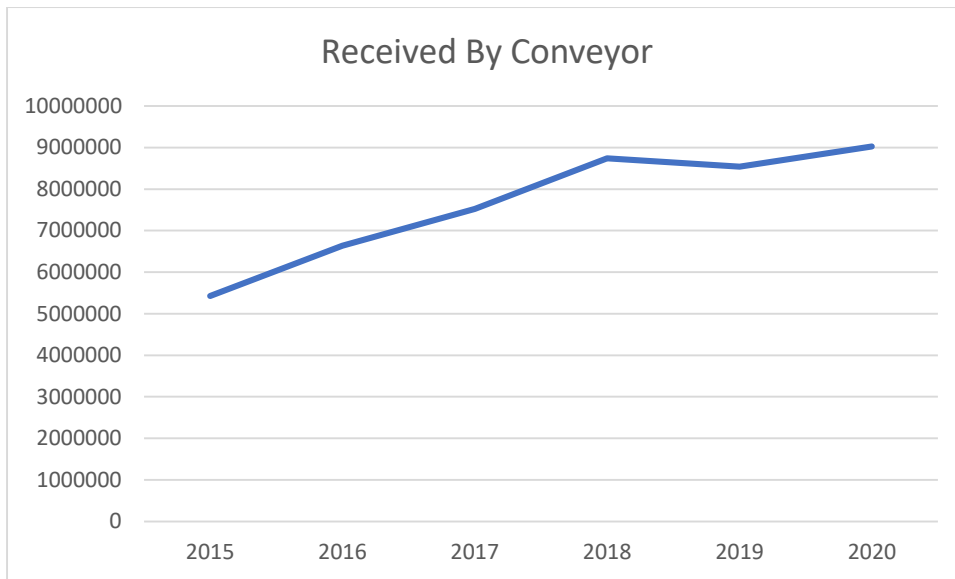
Paradip Hyderabad Pipeline Project

4.4 Conveyor- Transportation mode in Paradip Port

Increase in Conveyor Transportation mode in last 6 years

Year	Received By Conveyor
2015	5425378
2016	6639765
2017	7526805
2018	8741787
2019	8543026
2020	9022824
Total	45899585

Conveyor Transportation of goods is mainly used only for the specialised goods, i.e., FRM Dry Goods. From the above data we can see that the transportation through conveyor system earlier used to be greater than Roadway's connectivity but the growth in the roadways sector surpassed the growth of conveyor mode of transporting commodities.



Analysing the previous year's data, we can see there is a continuous increase in the volume of cargo being handled through conveyor belts. During the Corona pandemic did very fewer effects on the movement of commodity. The main reasons for the continuous increase in the growth of this sector are mainly because of the repetitive operation and maintenance check on the conveyor belts. There are some projects on improving the connectivity of conveyor belt as well which includes-

1) Fully Mechanised Ship Loading System

Esser Ports' 230-meter-long port at Paradip was upgraded and mechanised as part of the project, which included the construction of a fully mechanised ship-loading system with a capacity of 5,000 tonnes per hour. A 9-kilometer-long conveyor system connects the new all-weather terminal, which can handle large ships, to the stockyard. The terminal will aid in improving handling rates, efficiency, and ship turnaround times, all of which will benefit the Paradip Port.



Conveyor System in Paradip Port

4.5 Multimodal Logistics Park

The Government of India's Multi-Modal Logistics Parks (MMLPs) are a crucial policy effort aimed at improving the country's logistics industry by lowering total freight costs, reducing vehicle pollution and congestion, and lowering warehousing expenses. The government's Ministry of Road Transport and Highways (MoRTH) is constructing multimodal logistics parks across the country as part of its Loading Zone Initiative. The Multi-Modal Logistics Parks (MMLPs) created by the Indian government are a critical policy initiative aimed at improving the country's logistics business by cutting total freight costs, reducing automobile pollution and congestion, and lowering warehousing costs. As part of the government's Loading Zone Initiative, the Ministry of Road Transport and Highways (MoRTH) is building multimodal logistics parks across the country.

The port of Paradip has nearly doubled its capacity. While the increase in capacity is considerable, the port will need to increase capacity in the coming years to accommodate increasing traffic. The Ministry of Shipping's Maritime Agenda includes several projects. The number of people using the port of Paradip has surpassed 120 million tonnes by the year 2020. The advent and rapid development of industry in Paradip's hinterland has sped up the demand for Paradip port capacity expansion. In the future, strong industry fundamentals and the government's focus on creating a favourable regulatory environment will lead to the construction of new units and the expansion of existing units.

Some Project in Multimodal Logistics Park in Paradip port and for Paradip Port

There was development of Multimodal Logistics Park at Paradip which was having a budget of over 200 crores. Focusing on the sector of logistics and warehousing Multimodal Logistics has a definite positive impact on the wellbeing of the hinterland connectivity with Paradip port and will have a definite boast in the reduction of the overall logistics cost. Area Development of a 700-acre multimodal logistic park and industrial park as part of a Smart Industrial Port City, as well as mechanisation of existing port berths to increase cargo handling capacity from 93.6 to 144 MTPA on a 2500-acre site. The suggested mechanisation is based on the current cargo handling method, which is mostly manual and takes a long time, reducing the overall efficiency of cargo operations. In order to address these issues and improve current freight handling efficiency, it is important to mechanise the current

operational berths by deploying high-capacity ship unloaders to unload boats carrying imported cargoes such as coking and non-coking coals, limestone, and flux materials, and then transporting the cargo to loading points by conveyor.

Development of Storage and Warehousing Infrastructure under State PEG Scheme, which focuses on logistics and warehouse. Odisha has proposed overall storage potential of 3,65,000 MT below PEG (personal marketers guarantee) Scheme. Around 1,75,200 MT potential might be applied via way of means of Central Warehousing Corporation (CWC) Around 1,27,500 MT potential might be built via way of means of State Warehousing Corporation (SWC) and Private developer can partner with a branch for implementation of the project.



Multimodal Logistic Park in Rourkela

Development of multimodal logistics park Angul, Rourkela, Muniguda, Ganjam. The Approx. Project Cost- INR 200 crore - 250 crore (USD 30 million–37 million) each. This project focuses on Public Private Partnership. Some details of the project in which the tasks are surrounded with the aid of using industrially advanced area and well- mounted presence of providers of uncooked materials, spares, consumers and different related services. The websites are positioned near National Highways Railway sidings about the development Bhubaneswar International Airport is at a distance of approximately 100 -120 kms. relying on location. Paradip port is located 174 - 200 kms relying at the task location Will be advanced in PPP Mode. Development of the constructed infrastructure could be taken up with the aid of using Private Developer Significant downstream and ancillary funding possibilities lay with inside the price introduced merchandise to cater to white goods, car components, creation and different industries.

4.6 Inland Container Depot

A container storage facility in the hinterlands, away from any major port, is known as an inland container depot (ICD). ICDs are used by shipping companies to hold and move containers before and after they are transported to the seaport. Inland Container Depots are also known as "Dry Ports" because they are positioned far from the sea or any important river routes.

ICDs are physical locations where containers are temporarily stored before being transported to the port and loaded onto ships. At an ICD, exporters can also load their cargo onto containers. ICDs can handle export and import customs approvals besides being a storage facility. All the services available at a port are also available at the ICD, which is far away from the port.

Inland Container Depots are on the mainland, near huge industrial complexes and distant from seaports, and provide services such as customs clearance and other export/import procedures. The cargo does not need to go through customs at the port once it has been cleared at the ICD, and it is ready for export. Consolidation facilities for Less Than Container Load (LCL) cargoes in the hinterland are provided by ICDs, which lessen the overall transit of empty containers. By offering all the amenities in the hinterland, ICDs ensure that the costs of exporting and importing goods stay competitive. By constructing feeder infrastructure for ports, CDs help enhance a country's exports.

Talking about Paradip Port there are 4 Internal Container Depot are formed in the location Paradip, Rayagada, Kalinganagar and Dhamra. The budget for the cost of the project is around 600 crores. Which is 150 CR each and allocation of 50-acre land is given. The project comes under PPP project which Public Private Partnership as GOI has got more focus on the infrastructure of port so for funds privatization has been started of Port. In this project Odisha has one Inland Container Depot (ICD) at Balasore and a Domestic Container Terminal (DCT) at Rourkela Odisha has great marine exports and port activities, with the proposed ICDs, it'll lessen the general value of transit shipment and decongest the seaports. Development of the infrastructure could be taken up with the aid of using Private Developer All places are nicely linked with the aid of using National Highways and are about 100–150 km from Bhubaneswar airport The distance from Rayagada to Paradip port is ready 521 km & to Dharma port is ready 618 km. The distance from Kalinga Nagar to Paradip port is ready 360 km & to Dharma port is ready 45 km.

The cargo handling efficiency of Paradip Port has been excellent. It has the potential to

become one of the country's largest ports. We have devised a large expansion strategy based on its possibilities. The development of an inland water transport terminal (costing Rs.300 crore), the expansion of a mechanized stack yard for additional cold storage (costing Rs.150 crore) was implemented. Only when we have a solid network of ICDs, can we completely profit from containerization. When exporting cargo via ICDs, exporters can take advantage of containerization.



ICD in Paradip Port

4.7 Improvement infrastructure at Paradip Port for betterment of Connectivity

In total there are 17 berths in Paradip Port as already all the berths in chapter 3 on this report. A berth is a designated area in a port or harbor where ships can be moored when not at sea. Berths give a vertical front that enables for secure docking, making it easier to unload or load cargo or persons from ships.

These are the following berths in Paradip Port:

Iron ore berth

Coal berth of Mechanized coal handling plant–2 berths

General Cargo Berths- 8 berths

North Oil Jetty

Captive Berths- 3 berths

BOT Berths

Ro-Ro Jetty Berth

In this section the infrastructure improvement which is done for the betterment of the berth will be shown below. Some of the ongoing and future development project for the

improvement of berth in Paradip ports are-

1) Development of New Coal Berth for handling of Coal Imports at Paradip Port on BOT basis.

The development of a new coal berth for the handling of coal imports on a BOT basis (PPP) with a capacity of 10 MTPA is underway and is projected to be finished by August 2021 at a cost of Rs. 655.56 Crores. The newly created Iron Ore (Export) Berth, with a capacity of 10 MTPA, has begun cargo handling operations. Mechanization of EQ-1, EQ-2, and EQ-3 berths, with a capacity of 30 MTPA, to function environmentally efficiently, the entire shipment would be handled by mechanized means and enclosed conveyors.

2) Development of New Iron Berth for handling of Iron Ore exports at Paradip Port on BOT basis.

A new iron ore terminal has been under construction in Paradip port by JSW Infrastructure, a private Indian port operator. The facility, which has 370 metres of berth line and an annual capacity of 18 million tonnes, handled Capesize bulk vessels hauling iron ore and pellet exports. The terminal can load these ships at a rate of 100,000 tonnes per day. JSW Infrastructure has been awarded the right to develop the fully mechanized iron ore terminal on a Build, Operate, and Transfer (BOT) basis for a 30-year period by Paradip Port Trust. The facility should help Indian ports become more competitive by lowering transportation costs. JSW Infrastructure today has a capacity of over 100 million tonnes of cargo per year. They also intend to increase their investment to reach a capacity of 200 million tonnes per year in the following three years.



JSW Infrastructure of Iron Ore Berth

3) Development of Multipurpose Berth to handle clean cargo including containers on BOT basis at Paradip Port.

At Paradip Port, a multipurpose berth will handle clean cargo, including containers, on a BOT basis. On a BOT basis, Paradip Port has created a Multipurpose Berth on its southern side for handling clean cargo, including containers, and diversifying its cargo profile, which had been dominated by bulk cargo such as iron ore and coal. This Clean Cargo/Container Berth will serve the needs of containerized traffic and finished goods resulting from increased industrialization in Odisha and the port's hinterland. The terminal's capacity is 5 MMTPA, and the project's estimated cost is Rs.430.78 crores.

4) Polypropylene (PP) Plant at Paradip Refinery

The 680-KTA Polypropylene (PP) Plant at Paradip Refinery, which cost Rs. 3,150 crores to build, will boost Indian Oil's petrochemicals capacity to 3.15 MMTPA, with many more projects on the way. It will also significantly cut the import of polypropylene grades, saving the government money. Injection Molding Products, BOPP Film, and other PP-based downstream industries exist. Furniture, housewares, material handling crates, flexible packaging, general purpose packaging, textile packaging, sticky tapes, and other products are all made with these grades.

Technological Updates

Dust Suppression System at MCHP

PPT's mechanized coal handling plant processes roughly 25 MT of thermal coal, which is discharged into the Rail Receiving Station, causing dust. As a result, the problems associated with fugitive dust generation have been addressed using a unique design and dual fluid dust suppression technology. This approach produces ultra-fine water droplets as dry fog, which moistens and agglomerates like-sized dust particles as dust plumes, making it difficult to fall back onto the parent material. At a cost of Rs.17.50 crores, this project was finished.



Dust Suppression System

Floating Jetties for Marine Operations & Seaplane Services

Other countries extensively use floating jetties. Compared to conventional jetties, floating jetties offer distinct advantages such as cost-effectiveness, fast construction, minimum environmental impact, flexibility to expand and move, suitability for sites with considerable tidal variation, and so on. The work on developing over 150 floating jetties along the Indian coast is currently underway, according to a detailed project report. The floating jetties will primarily be used for fishing harbors/fish landing centers and seaplane operations. The MoPSW stated that states/UTs are encouraged to consider employing floating jetties/platforms for their projects and that more places for creating floating jetties should be identified. After the request has been approved, projects may be considered for funding from Sagarmala.

Chapter 4 Endnotes

<https://www.steelguru.com/oil-and-gas/gazprom-update-on-kovyktinskoye-chayandinskoye-pipeline>

<https://www.slideshare.net/IPICOLodisha/odisha-compendium-ofinvestmentproject>

<https://www.britannica.com/topic/industrialization>

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Chapter 5

Conclusion

The trade growth in Paradip Port is continuous and in future the growth will remain quite stable as well, so the infrastructure should go hand in hand with the infrastructure improvement. Poor infrastructure at Indian ports raises transport costs by another 20–30 percent, resulting in a reduction in trade volume. Lack of cargo handling equipment, poor mechanization, and manual management of important activities all contribute to underutilization of current capacity. As we have explained chapter 3 how the lack of connectivity in Paradip Port for the mining sites are growing in numbers so the connectivity and the berth infrastructure or additional berth requirement is must. The consequences of which have been felt in important operating areas such as vessel to truck evacuation, rake evacuation, and total vessel turnaround time.

In Paradip Port, as we have seen berth improvement projects in chapter 4 as there is continuous increase in cargo throughout the improvement of berth is necessary as Paradip is known for its fast loading and unloading of cargo so berth infrastructure improvement also holds key role. Infrastructure inadequacy varies by port, with some ports lacking container berths or cargo handling and evacuation equipment such as cranes and silos, while others have inadequate infrastructure with poor cargo handling capacity. Both scenarios result in delayed cargo transportation and low output. The problem of low productivity is exacerbated by the growing share of container freight in the marine commerce, which has resulted in increased demands for highly sophisticated equipment handling and logistics service efficiencies.

The data provided in chapter 3 shows the mode of transportation being used for transportation of commodity in Paradip Port there we have seen there are 4 modes which are majorly used for transportation that are namely Railways, Roadways, Pipeline, and Conveyor belts and in the data the mention Inland waterways is also there but there is zero transportation being handled by inland waterways. Because of insufficient hinterland connectivity and high fuel prices, hinterland transportation is inefficient and slow, affecting port productivity. Road and rail dominate India's present transportation mode mix, accounting for almost 94 percent of freight transit. Waterways only handle 6% of all

traffic, which is far less than other modes of transportation. If we talk about Paradip the value is zero percent of other modes of transportation

As we have seen in chapter 4 development of multimodal logistics park and inland container depot definitely have a very positive impact on the increase of trading of goods in general and logistics cost can be reduced significantly. For effective and speedy freight evacuation, ports require well-developed multimodal logistics networks and hinterland linkages. This results in lower transportation costs, fewer delays, and improved port throughput, all of which help to accelerate the country's economic growth. Improved port productivity necessitates a well-developed and efficient multimodal logistics infrastructure as well as connectivity to the hinterland. The Indian government recognises the need of improving hinterland connection and is taking many initiatives to construct the necessary infrastructure in Sagarmala project there are lots and lots of project which will help the port development in general and from future point of view it will give a proper boost for the betterment of exports and imports of better product.

Currently, Paradip port hinterland connection is primarily focused on surface transportation, such as road and rail, with inland waterways and coastal shipping having a nil small proportion of the market and being in their infancy. Pipelines are mostly used to carry liquid and oil-based products, such as crude oil, refined petroleum products, and natural gas. And the conveyor transportation is majorly used for the commodity like FRM dry cargoes.

In almost all the major ports the role Public Private Partnership (PPP) plays a very role is the development of infrastructure. Same applies for Paradip Port as well as under PPP model there was the inland container depot which helps in significantly reducing the logistics cost for exporting the goods which eventually helps in developing the exports of the country and which in turn would help in increasing the Country Economy. The most plausible answer to the financial constraints that prohibit Indian ports from bringing their facilities and infrastructure up to global standards appears to be public-private partnerships. Although the government promotes private sector participation in port infrastructure construction and operation and has detailed ambitious plans to revitalise the port sector through investment of USD around 11 billion, the implementation of these ambitions would rely heavily on structural and systematic improvements to attain the requisite infrastructure and operational capabilities in line with future trade demands.

Implementation of a landlord model at ports is one way to improve this situation.

Reviewing key policy documents and regulatory frameworks on a regular basis; promoting market-driven tariff regulation; and levelling the playing field in PPP projects for big and minor ports

Some of my findings with respect to improvement of more flexible multimodal transportation will be the development of inland waterways transportation. There is potential for the structural development of an Inland Waterway Transport (IWT) system or network, which, once operational, might help alleviate the significant cargo evacuation burden that currently falls on road and rail networks.

The development of the IWT could potentially lower the average cost of freight, giving Indian ports a competitive advantage. The implementation of these initiatives will rely heavily on structural and systematic improvements in order to attain the necessary infrastructural and operational proficiencies to meet future trade demands.

As and when compared with foreign, India's overall inland waterways transport is overall only 6% of the total transportation used for transportation whereas the Japan Inland waterways transportation is somewhere around 17% which is almost 3 times than that of India. The use of inland water transport (IWT) is predicted to result in significant transportation cost savings. The IWT form of transportation is commonly regarded as an environmentally benign and cost-effective mode of transportation. Its goal is to provide a viable alternative to the two most common modes of transportation, namely, road and rail, for shippers and logistic operators.

Even there is project which happened in the stretch of ganga it can same be done in Paradip as well because of the nice positive slope of cargo b=handling being done through Paradip Port will eventually help the port further. With World Bank technical and financial help, the Inland Waterways Authority of India (IWAI) is undertaking the Jal Marg Vikas Project (JMVP) for capacity augmentation of navigation on the Haldia-Varanasi length of the Ganga (part of NW-1) at an estimated cost of 5369.18 crores.

Chapter 5 endnotes

<https://www.merriam-webster.com/thesaurus/capacity>

<https://www.merriam-webster.com/thesaurus/product>