Traffic and Capacity Analytics for Major Ports

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Abstract

The purpose of this project is to improve the railway market share in some commodities and overcome the challenges and maintain sustainable growth in all its commodities. We also try to reduce the congestion on rail corridors and improving port connectivity. And lastly help in the development of dedicated freight corridor across Key ports. All of this is done by analysing already existing data or new data on Railway traffic and data on amount of capacity of passenger and goods a train carries from each port.

Background

Despite the fact that there are several different published port capacity definitions, based on different computational approaches, such as terminal capacity (Ligteringen and Velsink, 2012) and bottleneck approach (Fan and Cao, 2000), there is no standard, broadly accepted, definition of the capacity of a port as a waterway network. In general, the network capacity cannot be defined by the most critical part or element (bottleneck approach), because each element in the network is dependent on the rest of the infrastructure. In the context of port capacity, this dependency includes also factors related to demand and the composition of the fleet. Because of these considerations, port capacity was defined as "the maximum average vessel flow that can be handled by a port, with its specific infrastructure layout, vessel fleet, traffic composition and demand, satisfying the required safety and service level". Two issues were reviewed during the development of the current metric for PNTC: (A) previous Xavier Bellsolà Olba, Winnie Daamen, Tiedo Vellinga, Serge P. Hoogendoorn 46 Scientific Journals of the Maritime University of Szczecin 42 (114) evaluations of port performance and its primary determinants, and (B) metrics developed to estimate the capacity of highway networks. Highway networks were studied because of the obvious similarities between networks of roads and waterways, and because waterway networks had received so little

Literature Review

The importance of the efficiency and performance of a port has been recognized for many years. The performance of ports has been measured by two types of indicators, financial and operational. This study focuses on operational indicators of port performance. One of the first studies addressing this topic defined two metrics from the field of traffic engineering: “occupancy,” the percentage of time that all berths are occupied (“berth occupancy rate”); and “congestion,” the percentage of time that the number of ships in port exceeds the number of available berths (Nicolaou, 1967). The first indicator has the drawback of not describing how occupancy is distributed over time. For example, 50% berth occupancy is as true of a situation in which half of the berths are always occupied and half are always empty, as it is of all berths being occupied half of the time. These clearly different scenarios point out the need for an additional indicator. The second indicator described above, congestion, does not quite meet the need because large ports encompassing long sailing distances can accommodate more sailing vessels than berths without technically being congested. Another study proposed different operational indicators, most of which were related to the productivity of cranes and tons of cargo loaded/unloaded hour. Others, such as waiting time, service time and turn-around time, are more directly and comprehensively related to the operational performance of the port (UNCTAD, 1976). The ratio of waiting time to service time has proven to be an appropriate measure of timeliness of service of the terminal. Generally, acceptable values for this ratio are 30% and below (UNCTAD, 1985). The significance of this ratio is, however, determined by specific rules, and by the costs associated with waiting. Moreover, the use of this indicator alone can result in misleading information if a very low wait-to-service ratio is caused by a very inefficient service team. Other indicators related to throughput from, for example, berths or cranes are useful

from some perspectives, but they are related to terminal performance, and not specifically to port traffic performance.

Existing Solutions

IPRCL:

INDIAN PORT RAIL & ROPEWAY CORPORATION LIMITED (IPRCL) is a first of its kind Joint Venture Company (JVC) between 11 Major Ports under the Ministry of Ports, Shipping and Waterways (Formerly Ministry of Shipping) holding 90% of equity capital and Rail Vikas Nigam Limited (RVNL) under Ministry of Railways holding 10% of equity capital, incorporated with the objective to provide efficient rail evacuation systems to Major Ports and for enhancing their capacity and throughput. The company was registered on 10th July 2015 as a Public Limited Company under the Companies Act, 2013. The Company is under the Ministry of Ports, Shipping and Waterways (Formerly Ministry of Shipping), Government of India.

- IPRCL will play a strategic role and position itself to act as mentor & coordinator for Major Ports Railway systems.
- Interface with Government departments/ agencies and autonomous bodies on strategic issues and also work with consultants for removing bottlenecks.
- Act as a consultant for bringing in best practices in areas of IT, processes, systems, and other areas related to evacuation of Cargo.
- Develop technical and financial competence for undertaking DPR/PMC work.
- IPRCL can leverage the experience, expertise, and linkages to various organizations (Ministry of Ports, Shipping and Waterways (Formerly

Ministry of Shipping), Major Ports, RVNL) to build a strong base in the initial years of its existence.

- Contribute to the role of a Think-tank to develop scalable, workable models in port infrastructure for evacuation of cargo.
- Effectively interface with the Indian Railways for addressing issues such as the supply of rakes, pre-project approvals, and post-project certifications.
- Attract investors and financial resources for port evacuation infrastructure projects.

Fast Tracking Freight in India: A Roadmap for Clean and Cost-effective Goods Transport:

Freight transportation plays a crucial role in supporting the economic development of a nation, boosting its logistics and industrial competitiveness, and satisfying the daily needs of its citizens. Due to the rising demand for goods and services, India's freight transport demand has been growing at 5 percent since 2015 and is expected to grow rapidly over the next three decades. Although freight transport is an important pillar of the Indian economy, it can also have negative consequences such as high logistics costs, rising CO_2 emissions, and worsening air quality leading to poor public health.

India can address these negative impacts through three main opportunity areas:

1. Improve share of rail freight transport
2. Optimise truck use
3. Increase the uptake of zero-emissions vehicles and fuel economy improvement technologies

In this report, NITI Aayog and RMI outline solutions for the opportunity areas mentioned above. These solutions can enable the freight transport ecosystem in India to become more cost-effective, optimised, and cleaner.

Together, these opportunities can unlock 10 gigatons of cumulative CO_2 emission savings between 2020 and 2050. This can help India achieve its goal of reducing the logistics costs from 14 percent of GDP to 10 percent, and will reduce nitrogen oxide and particulate matter emissions by 35 percent and 28 percent respectively until 2050.

Reference

1. Estimating Port Network Traffic Capacity by Xavier Bellsolà Olba1 , Winnie Daamen1 , Tiedo Vellinga2 , Serge P. Hoogendoorn1
2. IPRC
3. RMI India - Fast Tracking Freight in India: A Roadmap for Clean and Cost-effective Goods Transport: