Maritime Trade Facilitation at Seaports in Pakistan

(Thesis)

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CERTIFICATE

This is to certify that this thesis entitled: **"Maritime Trade Facilitation at Seaports in Pakistan."** submitted by **Mr. Samad Raza Jaffry** is accepted in its present form by the School of Economics, Pakistan Institute of Development Economics (PIDE), Islamabad as satisfying the requirements for partial fulfillment of the degree in Master of Philosophy in Economics.

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Declaration

I **Mr. Samad Raza Jaffry** hereby state that my M.Phil thesis titled **"Maritime Trade Facilitation at Sea Ports of Pakistan"** is my own work and has not been submitted previously by me for taking any degree from Pakistan Institute of Development Economics (PIDE) Islamabad or anywhere else in the country/world. At any time if my statement is found to be incorrect even after my Graduation, the university has the right to withdraw my M.Phil degree.

Samad Raza Jaffry

Acknowledgement Letter

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Abstract

This thesis investigates the multifaceted challenges faced by importers, exporters, and transporters in the transportation of containerized cargo from industrial zones to Karachi Port, with a focus on the prevalent use of trucks over cargo trains and the complexities associated with customs and anti-narcotics clearance. Additionally, the study delves into the underutilization of Pakistan's merchant ship fleet despite its permitted capacity, leading to significant foreign exchange losses.

The first section of the research assesses the challenges encountered during the transportation of containerized cargo, shedding light on logistical hurdles faced by stakeholders. Notably, the preference for trucks over cargo trains is explored, uncovering reasons contributing to congestion at Karachi Port and Port Qasim. The research aims to identify viable alternatives and solutions to mitigate congestion and enhance overall transportation efficiency.

The second segment of the thesis examines the intricate customs and anti-narcotics clearance processes at Karachi Port, emphasizing the cumbersome nature of these procedures and their impact on delays in container freight movement. The study proposes strategies to streamline these clearance processes, fostering an environment conducive to the ease of doing business for transporters.

Lastly, the research investigates the underutilization of Pakistan's merchant ship fleet, despite having a permitted capacity of 40%, resulting in significant foreign exchange losses. Solutions are explored to maximize the efficiency of the maritime transport sector, promoting increased utilization of the fleet and minimizing economic losses.

Through a comprehensive analysis of these challenges and potential solutions, this thesis aims to contribute valuable insights to policymakers, industry stakeholders, and academics, ultimately paving the way for a more efficient and streamlined containerized cargo transportation system in Pakistan.

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CHAPTER 1: INTRODUCTION

1.1 Introduction

Trading between the nations is becoming more prevalent with the growth in economic globalization. Many trade conversations and agreements are being reached to the conclusion over the past ten years of trade development. It is obvious that, during the past ten or so years, the average global trade tariff has decreased significantly due to a major role played by economic globalization (Irshad & Xin, 2014). As per the report of World Bank, the tariff on all products during past ten years were as, 2011-3.53%, 2012-2.89%, 2013-3.04%, 2014-2.87%, 2015-3.06%, 2016-2.98%, 2017-2.59%, 2018-2.38%, 2019-2.65%. However, post COVID 19, shipping costs for the trade through maritime have significantly grown globally. This is mainly due to the disruptions in supply chains caused by lockdowns and restrictions have led to imbalances in container availability, exacerbating container shortages and causing delays. Secondly, increased demand for goods, particularly as economies reopen and consumer spending rises, has further strained shipping capacity. Thirdly, operational challenges such as port congestion and labor shortages have added to the delays and inefficiencies, driving up costs for shipping companies. Finally, geopolitical tensions and the impact of climate change regulations on vessel operations have also contributed to the overall rise in maritime shipping costs.

Organization for Economic Co-operation and Development (OECD), refers trade facilitation as a certain set of procedures that simplify and streamline the legal and technical procedures for the cargo's entry and exit to and from the country for international trade. Further, reforms in global trade facilitation have significantly decreased trading costs across the board. However, the effectiveness of trade facilitation in promoting the foreign trade of Pakistan is not specifically discussed in the international community.

The situation for Pakistan's trade sector is thought to have gotten worse as a result of improper government oversight, which includes ineffective regulations and policies, a subpar infrastructure system, long travelling times, and difficult/complicated custom clearance procedures, particularly at dry ports and seaports. Pakistan also does poorly in international organizations' rankings of trade facilitation (Zhongxiu & Shahzad, 2020).

Pakistan is ideally situated to become into a major international trade and transit hub. Even though it has made significant investments in roads, seaports, and other infrastructures, it still needs to strengthen its trade facilities while also providing Ease of Business to business community. Pakistan also has the extensive coastline of 1000+ km on Arabian due to which it is regarded as the maritime state. Karachi Port, Port Qasim, and the recently opened Gwadar Port holds the 95% share in the total trade of the country. Facilitating maritime trade is therefore should be the top priority of the country.

Efficient international trade centers on a streamlined process for cargo import and export, involving three main stages. In the export phase, cargo moves from manufacturing areas to dry ports and seaports via cargo trains and trucks. Following clearance, containerized cargo is loaded onto vessels for delivery to foreign consignees.

The import process initiates with cargo arriving at Pakistani ports, undergoing clearance, and then being transported to industrial areas. Particularly, despite the higher cost, 96% of total cargo in Pakistan is transported by trucks, revealing an extensive gap in the ease of Business within the railway sector. This preference for trucks has damaging effects on roads, incurring higher repair and maintenance costs. In contrast, India's successful prioritization of cargo trains highlights the potential benefits of reconsidering and strengthening the role of cargo trains in adopting smoother international trade.

1.2 Research Problem

When maritime cargo is transported to and from the industrial areas towards Karachi Port, it faces many barriers and difficulties and vice versa. Currently, 94% of the cargo is handled by trucks and railway is handling only 6% of overall cargo and less than 2% of maritime cargo (Ministry of Planning, 2020). This has caused congestion, deterioration of the roads and source of road accidents. Also, as per the statement quoted by officials from Railway Ministry, the cost of transporting cargo through trucks is almost double to that of trains. Further, there are delays faced by the businessman from the customs and Anti-Narcotics authorities at Karachi Port. In addition to this, exporter and importer are currently using mostly foreign ships for transporting the cargo around the world because there are less Pakistani Flag Carriers. This is causing loss to the

government exchequer. All these problems result in increase of the cost of products and then eventually cost has to be borne by the final user or consumer.

1.3 Research Question

1. What challenges are being faced by the importer and exporter while transporting containerized cargo from industrial zones to Karachi Port?
2. What factors influence the preference of transporters for transporting their cargo via trucks rather than more cost-effective trains, and how do they consider to simplicity in the cargo clearance processes?
3. Despite having a permitted capacity of 40%, Pakistan's fleet of merchant ships only transports 10% of the total cargo. How might these foreign exchange losses be minimized?

1.4 Objectives of the Research

The objective of study is to identify challenges in transporting containerized cargo to and from Karachi Port and Port Qasim, recognizing the factors influencing transporters' preference for trucks over cost-effective trains and optimize cargo clearance processes to reduce delays and explore strategies to increase the share of Pakistan's merchant fleet in cargo transport to minimize foreign exchange losses.

1.5 Units of Data Collection

This study employs qualitative research methodology and scrutinize the relevant primary and secondary sources of data/ information from books, articles, different websites, online journals, and e-books. The experts, pertinent national and international documents, and academics in peer-reviewed publications will be consulted for a variety of pertinent prior assessments and viewpoints. The expert’s analysis technique through an in-house session is done to deduce findings conclusions and to generate recommendations for policy makers, stakeholders and concerned authorities.

1.6 Policy Overview

Pakistan's logistics, freight, and maritime sectors have immense potential due to the country's large domestic market and strategic location. The National Freight and Logistics Policy (NFLP) 2020 addresses inefficiencies in the freight sector, aiming to reform and modernize the maritime freight

and logistics industry to enhance competitiveness, facilitate cross-border trade, and streamline administrative procedures. The National Security Policy 2022 emphasizes the adoption of advanced technologies and digital connectivity to boost exports, while stressing the importance of political stability and continuity in policies for sustainable economic growth. The Strategic Trade Policy 2020-25 focuses on reducing Pakistan's trade deficit by improving trade facilitation, establishing a National Trade Facilitation Portal (NTFP), and implementing effective anti-smuggling measures in collaboration with customs authorities. Lastly, the Pakistan Merchant Marine Policy 2001 aims to develop a competitive shipping industry by incentivizing private sector investment through tax exemptions, reduced port charges, and priority berthing for Pakistani-flagged vessels, ultimately contributing to the country's economic growth and reducing reliance on foreign shipping lines.

1.7 Policy Review

National Freight and Logistics Policy (NFLP) 2020: The NFLP targets inefficiencies in freight and aims to modernize the sector. However, infrastructure delays, bureaucratic challenges, and weak inter-agency coordination are major obstacles. To improve implementation, stronger public-private partnerships and a focus on digitalization, particularly in logistics and trade facilitation, are essential for realizing its goals.

National Security Policy 2022: The emphasis on advanced technologies and political stability is vital for economic growth, but Pakistan’s political instability and slow adoption of technology pose risks. While the focus on digital connectivity can enhance exports, successful implementation will require substantial improvements in infrastructure and workforce skills, particularly in the maritime and logistics sectors.

Strategic Trade Policy 2020-25: Efforts to reduce the trade deficit through the National Trade Facilitation Portal (NTFP) and anti-smuggling measures are crucial, but customs delays and inefficient administrative processes limit their effectiveness. Enhanced inter-agency collaboration between customs and other authorities, alongside institutional reforms to improve transparency, are critical for streamlining trade.

Pakistan Merchant Marine Policy 2001: The policy provides incentives such as tax exemptions and reduced port charges to boost private sector investment, but its success has been limited. Outdated shipping infrastructure and continued reliance on foreign shipping lines persist. Updating the policy to include fleet modernization and improve port facilities would help strengthen the domestic shipping industry.

CHAPTER 2: REVIEW OF LITERATURE

2.1 Literature Review

Trade facilitation examines ways to enhance the processes and controls governing the transportation of cargo beyond the national borders in order to minimize associated costs and boost efficiency while protecting the regulatory goals. Countries' interests have been drawn to the idea of trade facilitation as trade barriers like such as nontariff and tariff, have been reduced as a result of globalization. Trade facilitation aims to enhance the economic environment by reducing the cost of trade and promoting international trade. In order to maximize the advantages of open trade, developing and least developed countries have mainly benefited from trade facilitation, which also boosted their economies and reduced poverty.

The term "trade facilitation" refers to a group of policies that aimed to standardize, simplify, modernize, and harmonize international trade practices. It includes licensing procedures, customs procedures, insurance, logistics, documentation and other financial obligations that enforced upon the entry and exit of cargo from countries (Behar et al., 2013).

World Trade Organization (WTO) defines trade facilitation as “simplifying and harmonizing international trade procedures.” It can also be described as the efforts to improve the "hard" and "soft" infrastructure of a country for enabling the trade and commodity movement. The "hard" infrastructure, which includes roads, railroads, and ports, showcases the nation's complete transportation network. While on the other hand, customs, border controls, trade regulations and laws, institutional change, and management of trade are all referred to as "soft" infrastructure (Portugal-Perez & Wilson, 2008). Trade facilitation involves information technology, regulatory efficiency, physical infrastructure, and customs. That’s why, providing trade facilitation to commerce and trade becomes more complex and difficult for the countries. Additionally, each of these elements is also related to the others.

The growth of imports and exports of those nations participating in the One Belt and One Road (OBOR) programme highly depends on both soft and hard infrastructures. The projects of the Belt and Road Initiative (BRI), particularly CPEC, could be benefitted with the advancement and improvement trade facilitation (Ramasamy & Yeung, 2019). However, the countries were not properly managing and administering the infrastructure of trade built alongside the BRI routes. The ports' infrastructure was not modernized, which prevented them from operating at their full

potential and caused loss in the economy for the nations. It was also noted that the importer or exporter was not supported by the trade regulations and laws in these nations (Bartley Johns et al., 2018).

The study shows the contribution of international trade to the economic growth of Asia. He highlights the importance of hard and soft infrastructure in which governance is considered as vital aspect of soft infrastructure. Governance plays an important part in boosting trade by lowering transaction costs. In order to increase trade, its profitability, and the fair distribution of money, the author places more emphasis on soft infrastructure than physical infrastructure. Further, the authors came to the conclusion that economic integration is a result of regional collaboration in the facilitation of trade (D. H. Brooks, 2008).

The advancement in the IT system of customs' trade and improvement of trade infrastructure entails liberalization, which attempts to reduce trade barriers, particularly from the surge of production (Wilson et al., 2005). Furthermore, strengthening national rules, the business climate, and infrastructural standards can all contribute to increasing a nation's commerce and trade (Buyonge & Kireeva, 2008).

The study examined effect of delays on trade volumes. He used data from the six regional organization of the Pacific, Caribbean, and African Countries with the EU. She discovered that a one-day delay lowered imports by 0.5% and exports by 1%. She also discovered that marginal effects of delays are more pronounced for traded items that already experience lengthy waits (Persson, 2008).

Several steps have been implemented in developing nations to enhance trade facilitation. For instance, Bangladesh has made considerable improvements to its customs / tax clearance procedures by decreasing the amount of signatures needed for container clearance, i.e., from 25 in 1999 to just 5 in 2014 (Rahman et al., 2011).

In the Asian-Pacific region, (Wilson & Mann, 2003) examined the connection between trade flows, trade facilitation, and GDP per capita from the goods perspective. The metrics used for measuring trade facilitation were customs environments, Port efficiency, utilization of electronic commerce and regulatory environments. Through gravity model, the authors discovered that trade will be benefited by increasing port efficiency while regulatory impediments discourage trade. However, customs and adaptability towards technology have less impact on trade flows as compared to ports & regulation.

The study concentrated on the cost, time, and variability-related logistical frictions. The authors examined bilateral trade trends, global logistics and supply chain indicators. According to the conclusions of the augmented gravity model, the frictions are directly related to the amount volume of bilateral trade. The findings also recommended that private and public organizations, that directly or indirectly manage a country's logistic performance, to concentrate their efforts on lowering logistical friction in order to boost their ability to compete (Hausman et al., 2005).

Pre-shipment inspection (PSI) and its effectiveness in lowering customs fraud and tax evasion were both researched (Anson et al., 2006). The results proved that induction of PSI system had a vague effect on fraud in customs. PSI raised the level of frauds in Argentina while it reduced in the Philippines, with no discernible effects on Indonesia.

The study noted that many of the low developed nations have landlocked economies. These nations' approach to the global economy depends on transit system and trade corridors. The findings of this study demonstrated that highly unpredictable travel times and high cost of freight services have a significant negative impact on landlocked economies. In addition to physical limitations, they also addressed rampant rent charging activities and serious defects in the design of the transit system as the primary sources of high cost (Arvis et al., 2007).

According to study, transparent trading culture could be an important tool in lowering tariff & non-tariff obstacles. The authors concentrated on two aspects of transparency: simplification (lowering cost of information) and predictability (lowering uncertainty cost). According to the results of the gravity model, increasing transparency in trade activities of Asia-Pacific Economic Cooperation (APEC) member nations, could dramatically increase intra-APEC trade by US$148 billion, i.e., increasing baseline trade by 7.5% (Helble et al., 2007).

The study analyzed new indexes for trade facilitation and trade restriction. They also contrasted various border-based trade barriers with domestic regulations that have an impact on trade costs. The empirical assessments revealed that tariff and non-tariff trade restrictions remain a substantial cause of trade restriction for low-income nations. The results also indicated that by reducing barriers at border, enhancing logistical performance, and facilitating trade will likely have a significant positive influence on trade in developing countries (Hoekman & Nicita, 2011).

The study examined the developments and key performance indicators of trade facilitation in the members of Association of Southeast Asian Nation (ASEAN) countries. Using gravity model, the authors revealed that trade flows in these countries are highly dependent on

information, communication technology, and transportation infrastructure. The findings also imply that facilitating trade measures would be more advantageous for these nations as compared to bringing reforms in tariffs. Additionally, the findings indicated that upgrading port infrastructure in the area may increase trade by US$ 22 billion (Shepherd & Wilson, 2009).

Trade Facilitation Assessment Index System helps in measuring the measures taken for the facilitation of trade inside a nation. As the importance of trade facilitation has increased, several academics institutions have studied the evolution of this system in greater detail. The Trade Facilitation Assessment Index System was based on the unique circumstances of trade facilitation study (Bagai et al., 2004). (Wilson & Otsuki, 2007) examined South Asian trade integration using the index of trade facilitation. They concluded that certain initiatives aimed at lowering trade barriers and advancing regional objectives may have greatly sped up trade growth in the region of South Asian.

The gravity model of trade and 12 indicators of trade facilitation can be used to analyze trade facilitation. In this context, a review of the South-Eastern European nations was conducted in order to assess the effects of trade facilitation on their economies and trade. The results demonstrated that improving customs procedures and practices as well as putting in place the measures of trade facilitation can aid in encouraging mutual trade while also helping to stimulate exports' growth (Toševska-Trpčevska & Tevdovski, 2016)

Trade among Intra-African nations has increased as a result of efforts to facilitate maritime trade. After improving the nation's port and service facilities, intra-African trade increased far more than it had in the past. Additionally, regional trade agreements had a positive impact on trade flows (Njinkeu et al., 2008). Furthermore, reducing trade costs, abolishing trade obstacles, and enhancing trade facilitation all contributed to the wellbeing of African nations. The welfare benefits could be advantageous for those nations who are largely contributing towards the value chains' suppliers (Hoekman & Shepherd, 2015).

Trade facilitation is regarded as Pakistan's most important contribution towards the expansion of economic corridors of South Asia. This mostly entails upgrading the infrastructure of Pakistan's three major ports—Port Qasim, Gwadar, and Karachi Port. Additionally, this will facilitate the trade activities in the corridors and improve relations between India, Afghanistan, and Pakistan. However, in order to facilitate trade, relevant customs procedures and other border crossing organizations' regulatory frameworks are also required (V. Ahmed & Ghulam, 2011). The

improvement of trade facilities at three major ports also carries significant importance as it demands the standardizing of customs procedures and other government agencies' regulatory frameworks at border crossings (Samad & Ahmed, 2014). It is also reported in a study by (Liaqait et al, 2020) Karachi Port has improved its operational efficiency to compete with neighboring ports. There is a need for the port to undergo modernization of its physical infrastructure and renovations for better positioning itself against emerging ports in the neighborhood.

Export growth as part of the Belt and Road Initiative (BRI) has been positively benefited through the enhancement in trade facilitation facilities which includes the upgradation of port and border management system. Additionally, increased cross-border trade between China and Pakistan could also be helpful for trade facilitation (Mustafa & Amjad, 2020). However, to facilitate effective trading channels between other countries, it is proposed that the Chinese government along with the cooperation and collaboration with government of Pakistan, should improve the services of trade (Ramasamy & Yeung, 2019).

The study used secondary data of 127 nations from the World Development Indicators (WDI) 2020. The results indicated that in comparison to countries of Southern African Development Community (SADC), the countries belonging to the Organization for Economic Cooperation and Development (OECD) scored very well as they focused on enhancing the trade facilitation activities (Qazi et al., 2021).

Dubai Port World (DP World) has been providing state of art trade facilities at all its ports for the uplift of trade activities. These mainly include supply chain and transportation facilities at ports while best financial services for traders. Dubai Ports are also equipped with the latest technology cranes for loading and unloading containers from ships (*DP World*, n.d.).

The study took into account trade facilitation in its traditional definition, which entails customs processes at borders, as well as in context of administering and managing both at borders and beyond them. The authors view information as being the heart of trade facilitation, and they outline who is accountable for what informational component. Therefore, it is necessary to gather this data in a method that would encourage effective output and lower administrative costs. Customers will be satisfied as a result of this procedure, which in return helps the firm realize economies of scale (Harris & Staples, 2009).

The study conducted an empirical analysis of the status and barriers to trade facilitation faced by the members of the Asia-Pacific Economic Cooperation (APEC) countries through

Computable General Equilibrium (CGE) model. The findings demonstrated that trade cost reduction (measures to trade facilitation) increases welfare vis-à-vis GDP in the tested region. Vietnam has the highest GDP, followed by Philippines and Malaysia. If trade costs are cut by 25%, welfare increases by an equivalent amount ranging from $12.4 billion in China to $1.25 billion in the Philippines (D. Brooks & Stone, 2010).

Pakistan's strategic geographical location presents both opportunities and challenges in sea trade and ports development. With Middle Eastern countries handling a significant portion of seaborne trade, Pakistan stands to benefit as a vital economic transit route to landlocked Central Asia and neighboring nations. The China Pakistan Economic Corridor (CPEC) holds promise for enhancing regional connectivity through road and rail networks, while ports along the Arabian Sea offer global access (Afrasiyan Gul, 2021).

Port infrastructure and efficient transportation systems are crucial to port efficiency within supply chain management. Robust infrastructure, including modern equipment and streamlined procedures, reduces delays and costs, while efficient transport links ensure smooth cargo movement. Together, they lower logistics costs and enhance supply chain reliability (Sánchez et al., 2003).

The study confirms that the Turnaround Time (TAT) of ships is the most significant Port Performance Indicator (PPI) at Karachi Port. Port performance has improved due to modernization, better management, and some infrastructure upgrades. At the same time, cargo handling capacity has expanded alongside the increasing trade volume. Overall, the TAT for vessels arriving at Karachi Port has decreased (Shahzad, 2022).

Recent studies highlight the crucial role of transport costs and infrastructure in trade, market access, and income growth. In Latin America, transport costs pose a greater obstacle to accessing U.S. markets than tariffs. Analyzing over 300,000 annual shipment records, the study finds that distance, shipment volume, and product characteristics influence shipping costs, with port efficiency being a key factor. Improving port efficiency from the 25th to the 75th percentile can reduce shipping costs by 12%, with inefficient ports being equivalent to adding 60% more distance to markets (Clark et al., 2004).

The results of the study indicate that for developing countries, continually enhancing port infrastructure is crucial for improving logistics performance, which in turn boosts seaborne trade and drives economic growth (Munim & Schramm, 2018).

2.2 Research Gap

Many studies have been conducted in identifying the importance of providing trade facilitation to country's trade. The results of almost all studies concluded that trade facilitation at ports carries significant importance in enhancing the trade activities for a country. However, no study was conducted to review the procedures & practices to facilitate maritime trade at Pakistani Ports. Businessman faces different types of barriers and difficulties in transporting the goods from the industrial areas to the seaports or dry ports and then exporting it onto merchant fleet to the foreign consignee. Therefore, this study will focus on the same issue that how exporters and importers can be facilitated and provided Ease of Doing Business for smooth handling of containerized cargo.

There is also a research gap in identifying the sludge involved in the process of clearance of cargo which includes customs declaration form, inspection / examination by customs and Anti-narcotics officers, assessment of duty and taxes, etc. The sludge involved in these stages causes the delays in clearance of cargo and transporter has to bear cost which eventually increases the price of goods.

2.3 Geographical Limitation of Transporter Interviews

A significant limitation of this study is the geographical scope of the transporter interviews. The insights gathered from transporters are primarily based on interviews conducted with transporters operating in the Islamabad and Rawalpindi regions. While this provides valuable perspectives on challenges in containerized cargo transportation, the findings may not fully represent the experiences of transporters operating in other regions of Pakistan, particularly those based closer to the seaports, such as Karachi and Port Qasim. Therefore, the conclusions drawn from these interviews may be regionally specific and might not comprehensively reflect the broader national context.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Research Strategy

The research strategy employed in this study adopted a multi-faceted approach to explore the complexities of Pakistan's transportation and logistics landscape. Face-to-face interviews were conducted with key authorities, including representatives from the Ministry of Railway, National Highway Authority (NHA), Ministry of Maritime Affairs, Ministry of Commerce, and the Pakistan Navy, providing firsthand insights on policies, challenges, and priorities. To complement this, a survey captured the operational challenges faced by transporters. A quantitative analysis estimated the additional costs caused by cargo clearance delays by anti-narcotics and customs authorities, alongside the impact of cargo and container handling on port efficiency. This integrated approach enabled a comprehensive understanding of the sector and informed recommendations to enhance Pakistan’s logistics ecosystem.

3.2 Methods of Data Collection

As the study was mostly based on qualitative research, the methods of data collection were also primarily qualitative. Firstly, the discussion points and questions to be asked of the officials were drafted and listed. After summarizing the questions, different types of questionnaires were formed, including open questionnaires and dichotomous questions. Main ideas from the interviews were taken and were rephrased in own wording, focusing on the key points and insights. Furthermore, Codes were generated by marking important parts of the data. Then, these codes were grouped into themes by reviewing and refining them to highlight the key points.

The quantitative research in this study centers on calculating the additional costs transporters incur due to delays in cargo clearance at Karachi Port. Survey data revealed extra expenses from delays, including vehicle idling, storage fees, and demurrage charges, offering a clear estimate of the economic burden on transporters.

3.3 Sample Size

In this study, a purposive sampling method was employed to gather information from key stakeholders in the transportation sector. A total of 10 transporters were randomly selected and interviewed to gain insights into their perspectives on preference of trucks over train in transporting cargo from industrial areas to Port Qasim & Karachi Port and suggestion on how the

delays at cargo clearance process be minimized. Additionally, total of around 20 interviews have been conducted with key informants to capture the viewpoints of different organization / departments that are involved in the process of trade.

- Port Qasim and Karachi Port
- MoMA, Ministry of Railways NHA & Pakistan Navy
- Rawalpindi Chamber of Commerce (RCCI)
- Collector Custom Port Qasim
- Experts of Afghan Transit Trade
- Private Shipping Owner
- Other Maritime Experts

In addition to the insights gained from interviews, valuable information has been gathered from various seminars, workshops, international conferences, and closed-door meetings that were attended over the course of the thesis research. These events provided a platform for in-depth discussions, expert opinions, and the exchange of knowledge on key issues relevant to the study. The closed-door meetings, in particular, offered exclusive access to discussions with senior officials and industry stakeholders, while seminars and workshops facilitated the sharing of best practices and emerging trends.

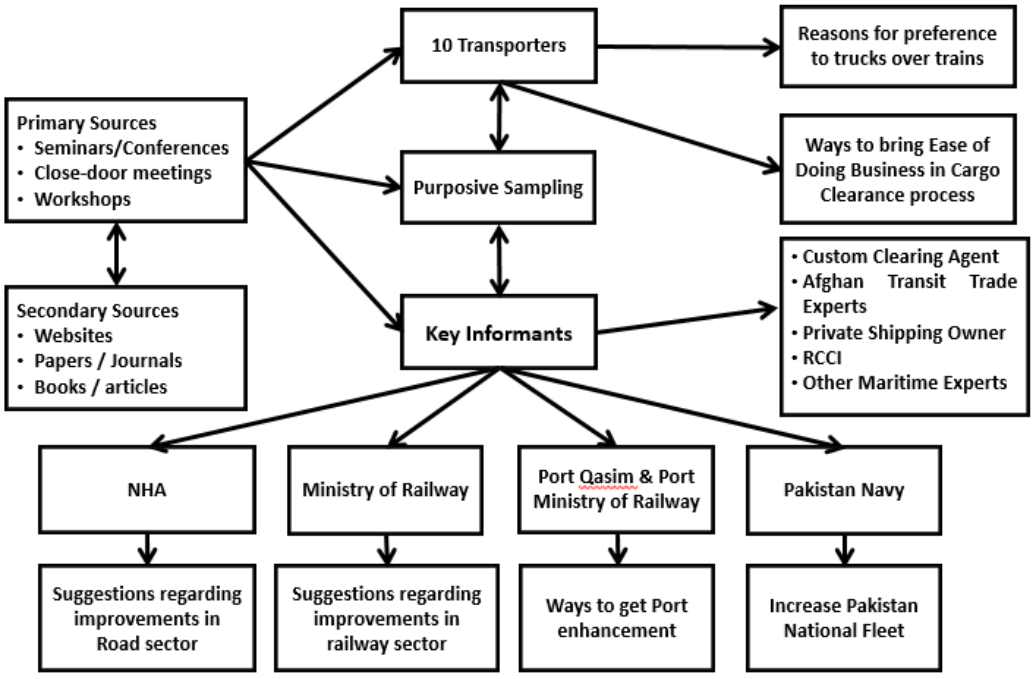

Figure 1: Methodology Flowchart

3.4 Sampling Technique

The sampling technique employed in this study was a combination of random sampling and purposive sampling. The selection of transporters involved a random sampling approach, where 10 transporters from the target population were randomly chosen to participate in the interviews. This method was chosen to ensure a representative sample of transporters within the industry.

Additionally, a purposive sampling strategy was utilized to identify and interview key stakeholders from the governmental sector. Specifically, officials from ministries, ports and relevant dept., were purposefully selected due to their significant roles and expertise in the transportation sector. This purposive sampling approach allowed for the inclusion of participants who could provide valuable insights into the regulatory and policy perspectives related to transport sector.

The combination of random sampling and purposive sampling was deemed appropriate for this study as it facilitated a comprehensive exploration of perspectives from both private transport operators and government officials, contributing to a well-rounded understanding of the maritime sector.

3.5 Analysis

The analysis of the study is based on different types of questions asked by various stakeholders. The issues highlighted and pointed out by the stakeholders are then analyzed to identify hindrances in smooth trade between industrial areas and seaports in Pakistan.

Further, analysis of data is being done through thematic analysis framework. This approach has allowed to identify and interpret patterns and themes within the data collected from senior officials and transporters. The consistency of issues reported by both groups supports the robustness of the analysis.

Moreover, the rigor and trustworthiness of the research are supported by the high level of expertise of the key informants, who are senior officials from relevant ministries. Their insights ensure the reliability of the data. Additionally, first-hand information was gathered from transporters, who were open and consistent in their responses. The alignment between the issues reported by both transporters and ministry officials further reinforces the credibility of the findings.

CHAPTER 4: THEORETICAL FOUNDATION

Supply Chain Management (SCM) theory serves as the central theoretical foundation, guiding the analysis of port facilitation and enhancement at Karachi Port and Port Qasim. Additionally, an economic analysis of port efficiency further illustrate the application of SCM theory within the context of port operations. This combined approach helps to assess the role of supply chain management in improving port performance and contributes to a broader understanding of how ports function as critical nodes within global and regional trade networks. This chapter is based on linkage of theory with SCM and Port Efficiency analysis. However, the analysis has been shown in Chapter 6 (Results and Findings)

4.1 Theory Background

The foundational models of SCM emerged in the 1980s and 1990s, with seminal works like **Michael Porter's "Competitive Advantage" (1985)**, which introduced value chains, and **Eliyahu M. Goldratt's "Theory of Constraints" (1984)**, which focused on managing bottlenecks in supply chains. These early models highlighted the importance of coordination and efficiency in logistics, setting the stage for modern SCM practices that now play a critical role in optimizing port operations and transportation networks.

The findings show that integrating seaports into supply chains enhances both the efficiency and effectiveness of port performance. Additionally, factors influencing this integration are highlighted, indicating that a strong focus on supply chain integration within a port operating company allows the company to develop and execute a strategy that links internal port functions with upstream and downstream organizations. (Woo et al., 2013)

A logistics and supply chain management perspective on ports can significantly highlight their strategic importance and future potential within the context of international business. This approach provides a robust analytical framework that enables an impartial evaluation of port performance measurement and management. (Bichou & Gray, 2004)

Port infrastructure and efficient transportation systems are crucial to port efficiency within supply chain management. Robust infrastructure, including modern equipment and streamlined procedures, reduces delays and costs, while efficient transport links ensure smooth cargo

movement. Together, they lower logistics costs and enhance supply chain reliability (Sánchez et al., 2003).

4.2 Economic Analysis of Port Efficiency: Linking Theory with Practice

To further explore the practical implications of SCM theory, I have conducted an economic analysis comparing the efficiency of Karachi Port and Port Qasim. This analysis complements the SCM theoretical framework by providing empirical insights into the operational performance of the two ports. Specifically, port efficiency is a key indicator of how well supply chain management principles are applied in practice. An efficient port optimizes its logistics processes, reduces cargo handling times, and minimizes costs for stakeholders, all of which are aligned with the goals of SCM theory.

By comparing the efficiency of Karachi Port and Port Qasim, the economic analysis serves to demonstrate how SCM theory can be applied to evaluate and improve port performance. This analysis includes factors such as turnaround times, cargo clearance delays, and transportation preferences, which are all relevant to SCM theory. Through this economic comparison, my study highlights the areas where each port excels and where improvements can be made in line with SCM principles.

4.3 Theoretical Contributions to Port Facilitation and Enhancement

The integration of SCM theory with the economic analysis of port efficiency allows for a holistic understanding of port facilitation and enhancement. SCM theory provides the conceptual basis for understanding the processes and interactions that affect port performance, while the economic analysis offers a data-driven comparison of how these processes play out at Karachi Port and Port Qasim. Together, they form a cohesive framework for assessing port operations and identifying areas for improvement.

The theoretical model based on SCM theory posits that ports can enhance their performance by improving coordination, optimizing processes, and ensuring efficient information flow. The economic analysis of port efficiency provides empirical evidence to support this model by demonstrating the impact of these factors on the operational performance of Karachi Port and Port Qasim.

4.4 Conceptual Framework

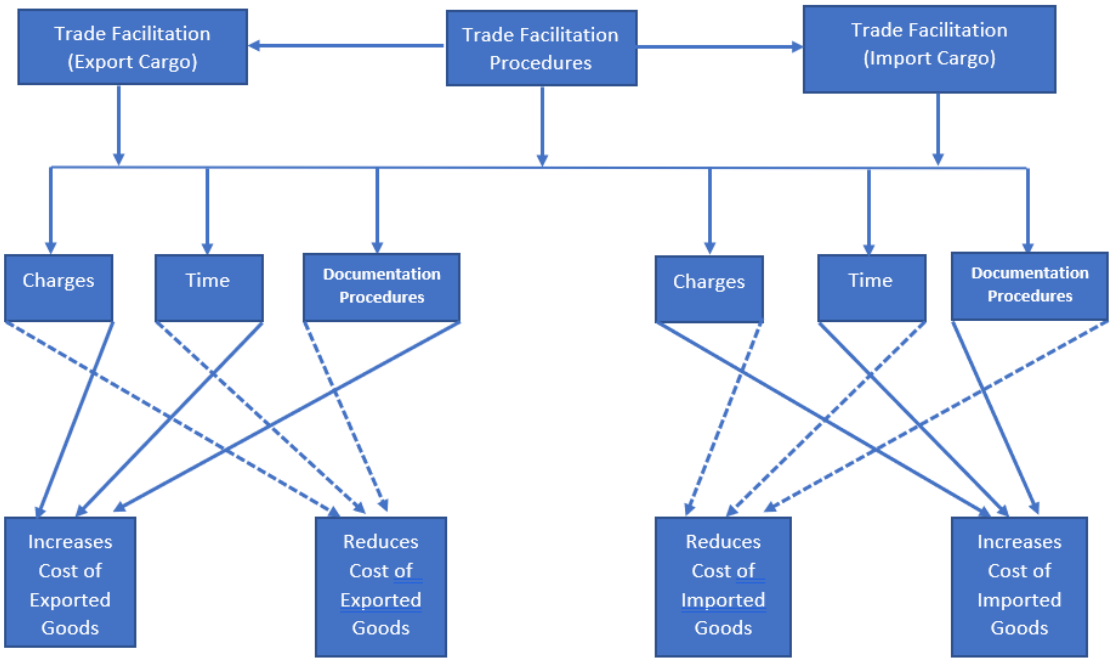

Figure 2: Conceptual Framework: Author's own input

The figure 1 above shows the impact of Trade facilitation on the cost, time and documentation procedures involved in the process of maritime trade. In case of export of cargo, the continuous line is showing the current scenario where the delays and complex documentation /clearance procedures have increased the cost of exported goods. But opposite to that, dotted line shows that if facilitation is provided to reduce the cost and time of transportation of goods and necessary steps be taken to fasten the process of documentation of cargo at dry ports/ seaports, this will eventually reduce the cost of exported goods.

Similar is the case with the import of goods. The continuous line shows the current scenario where the delays and complex documentation / clearance procedures have increased the cost of imported goods. But opposite to that, dotted line shows that if facilitation is provided to imported goods especially to the transportation of goods from seaports/ dry ports towards the industrial / manufacturing areas of the country, this will reduce the cost of imported goods.

Documentation Procedures: The documentation procedures for clearance of cargo at seaports can vary depending on the type of cargo, the country of origin & destination and the regulatory requirements.

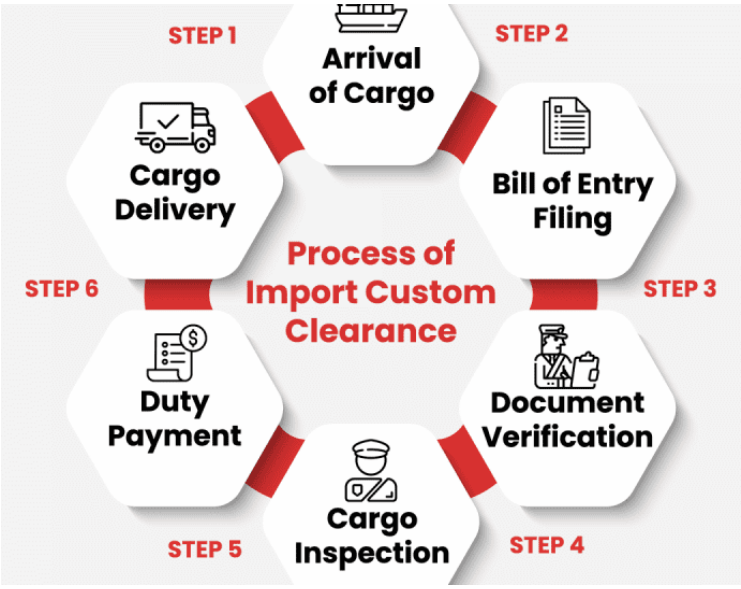

Figure 3: Documentation Procedures

Time: The time taken for the clearance of cargo at Karachi Port can vary depending on several factors, such as the type of cargo, the documentation required, and the efficiency of the customs and regulatory procedures. However, in general, the clearance process can take anywhere from a few days to several weeks.

For example, according to the Karachi Customs Agents Association and Karachi Chamber of Commerce and Industry, the average time taken for the clearance of import shipments at Karachi Port is around 5-6 days whereas the average time taken for the clearance of export shipments at Karachi Port is around 3-4 days. However, this can vary depending on the specific circumstances of the shipment and the documentation required.

Charges: The charges taken by Karachi Port from shipping companies can vary depending on several factors, such as the type of cargo, the size of the vessel, the duration of stay, and the services required. However, following are some approximate figures based on the latest information available:

1. **Basic Berth Hire Charges:** These charges can range from USD 0.50 to USD 1.50 per GRT (Gross Registered Tonnage) per day, depending on the size of the vessel and the duration of stay.

2. **Tug Hire Charges:**

- US $ 970 for each Tug (2 Tugs inward)
- US $ 970 for each Tug (2 Tugs outward)

3. **Pilotage Charges:** Pilotage fee is mandatory for all vessels entering and leaving the harbour and for any shifting within the harbour. Minimum US$ 225 per act (Pilot cancellation US $ 300 per act).

4. **Mooring Charges:** These charges can range from USD 0.20 to USD 0.50 per GRT, depending on the size of the vessel and the duration of stay.

Source: Official website of Karachi Port, http://www.kpt.gov.pk/

It's important to note that these figures are approximate and can vary depending on the specific circumstances of the vessel and the services required. Therefore, it's advisable to check with the relevant authorities and shipping agents for the latest information on berthing charges at Karachi Port.

4.5 Maritime Structure of Pakistan

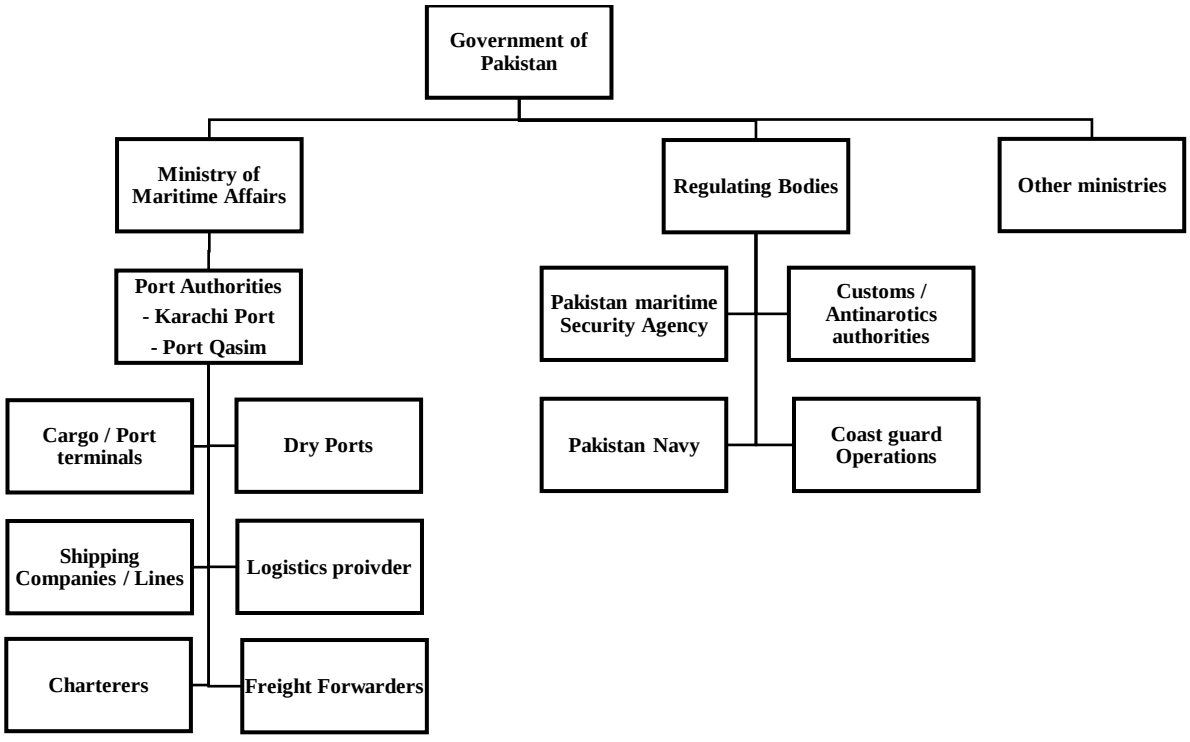

Figure 4: Maritime Structure of Pakistan (Author's Contribution)

CHAPTER 5: DISCUSSION

In this chapter, we will discuss the advantages and disadvantages of transportation of cargo through road and rail. The challenges faced by the transporters from customs and anti-narcotics authorities will also be discussed. Similarly, challenges faced by businessman in setting up a private shipping line will also be highlighted.

5.1 Transport and Logistic Sector

A significant factor in the nation's export competitiveness is an effective and dependable logistics network, together with a uniform and open mechanism for facilitating cross-border trade. It serves as a facilitator for increasing the foreign markets for domestic products.

A robust logistics network is pivotal for enhancing Pakistan's export competitiveness, influencing GDP growth, increased exports, and job opportunities. However, challenges persist as Pakistan ranks 142 out of 160 countries in the World Bank's Logistics Performance Index (LPI) (WorldBank, 2023), reflecting low performance in customs clearance, tracking, and tracing procedures.

Key Figures:

Indicator	**Ranking**
World Bank's Logistics Performance Index (LPI)	142
Global Logistics Industry Contribution to GDP	$4.3 trillion (8-10%)

Source: (WorldBank, 2023)

Logistics Performance Index (LPI) Statistics:

Indicator	**Ranking**
Customs Clearance	Low
Tracking and Tracing	Low
Overall LPI Ranking	142

Source: (WorldBank, 2023)

Challenges in the Logistics Sector:

Challenges	Impact
Outdated Technologies	Non-compliance with international standards
Lack of Driver Training	Performance gaps in contemporary supply chain
Financial Constraints	Inability to upgrade vehicles, affecting roads and increasing maintenance costs

Modernizing the logistics sector is essential to address these challenges and propel Pakistan towards economic growth. A forward-looking government approach is needed to expand the logistic value chain and overcome political, industrial, and financial obstacles.

Benefits associated with Modern Logistic and Transport System:

- The waste generated from the perishable goods should be utilized in some other way. According to estimates, the absence of a cold-chain and a perishable supply chain results in a 33% loss in the current agricultural output.
- 35% of energy in Pakistan is consumed by transportation sector. Therefore, lower bills should be charged for the import of energy
- Up to 5% more GDP can be achieved by enhancing supply chains' efficiency and efficacy through higher tax collection.

5.2 Overview of Containerization on International Trade and Its role on Pakistan Trade

Containerization is the process of transporting goods in standard-sized, sealed containers that are easily transferred between transportation modes, such as ships, trains, and trucks. The use of standardized containers has revolutionized the transportation industry, as it allows for easy loading and unloading of cargo, reduces handling costs, and improves transportation efficiency. Today, over 90% of the world's trade is carried out via container ships.

5.2.1 Challenges of Containerization in International Trade and Pakistan Trade:

Containerization plays a crucial role in international trade and has significant implications for Pakistan's trade as well:

- **Efficient Cargo Handling**
  - **International Trade:** Containerization streamlines the loading and unloading of goods, reducing time and labor costs, facilitating smoother international trade logistics.
  - **Pakistan Trade:** In Pakistan, efficient cargo handling through containerization at ports like Karachi Port and Port Qasim trade efficiency, making the country more competitive.
- **Intermodal Transportation**
  - **International Trade:** Containers can seamlessly move between ships, trucks, and trains, enabling a more efficient and cost-effective intermodal transportation system.
  - **Pakistan Trade:** Pakistan's strategic location with access to seaports like Karachi and the emerging port in Gwadar positions it as a key player in regional and global trade routes facilitated by containerization, as also mentioned by Kalim and Syed (2020).
- **Risk Reduction:**
  - **International Trade:** Containers offer protection to goods from damage during transit, reducing the risk associated with various modes of transportation.
  - **Pakistan Trade:** Minimizing risks during transit is vital for Pakistan's trade, especially for its exports of textiles, rice, and other goods.
- **Global Supply Chains:**
  - **International Trade:** Containerization supports the development of global supply chains by enabling the efficient movement of goods across borders.
  - **Pakistan Trade:** Participation in global supply chains enhances Pakistan's trade competitiveness, allowing it to integrate into international markets more effectively.
- **Trade Facilitation and Competitiveness:**
  - **International Trade:** Containerization contributes to trade facilitation by reducing transit times, lowering costs, and enhancing the overall competitiveness of nations in international trade.

- **Pakistan Trade:** Efficient container handling at ports enhances Pakistan's trade competitiveness, attracting more shipping lines and facilitating smoother trade processes.

- **Infrastructure Development:**
  - **International Trade:** The adoption of containerization necessitates the development of port infrastructure and related facilities, contributing to economic growth.
  - **Pakistan Trade:** Investments in port infrastructure, including container terminals, are essential for Pakistan's trade growth, and containerization plays a pivotal role in driving such developments.

5.3 Issues in Maritime Trade of Pakistan

- **Port Congestion**: Both Karachi Port and Port Qasim experience significant congestion due to inefficient cargo handling and clearance procedures, leading to delays and increased costs for traders and transporters.

- **Inefficient Cargo Clearance**: Delays in cargo clearance arise from cumbersome customs processes, inspections by anti-narcotics authorities, and outdated systems, hindering smooth trade operations.

- **Limited Use of Rail Transport**: Despite rail being a more cost-effective option, transporters prefer trucks for cargo transportation. This adds to road congestion and further delays at the ports.

- **Infrastructure Constraints**: Aging port infrastructure, lack of modern technology, and limited expansion in port facilities prevent efficient management of growing trade volumes.

- **Security Concerns**: Issues such as theft, cargo damage, and safety risks during transit affect the reliability of Pakistan’s maritime trade.

- **Regulatory Challenges**: Frequent changes in trade policies, bureaucratic inefficiencies, and lack of coordination between government agencies create uncertainties and inefficiencies in maritime trade operations.

- **Environmental and Sustainability Issues**: The ports face challenges in managing environmental impacts, such as pollution from ships and cargo operations, which are yet to be effectively addressed.

- **High Losses to Foreign Exchange**: Due to inefficiencies in port operations and delays in trade, Pakistan incurs substantial foreign exchange losses as exporters and importers face increased costs, reduced competitiveness, and delays in shipment handling. This negatively impacts the country's overall trade balance.

5.4 Road & Railway Sector of Pakistan

5.4.1 Roads Sector

Roads are currently carrying 96% of totals cargo handled in Pakistan while only 4% is transported through Railways. This huge load on roads have caused traffic congestion, pollution, and degradation of roads. Transportation by roads costs heavily to the transporter because of imported fuel, and thus it makes the product expensive.

The 96% of freight is transported through 264,000 kilometers of road networks in Pakistan. Currently there are 294,066 registered trucks (Finance Division, 2021), in which mostly are old vintage. Thus, these consume more fuel and have slow speed that eventually results in more time consumption and money. The majority of truck owners operate unlicensed vehicles that violate regulations and are prone to overloading. This raises the chance of a road accident, delays in delivery, deteriorate roads, bridges, and highway infrastructures. Thus cause 2% loss in GDP of the country on average.

Moreover, according to a 2016 National Highway Authority (NHA) report, international regulations governing long-hand traffic stipulates that articulated vehicles account for only 12% of the total fleet in Pakistan. The articulated trucks require huge investment to operate and that's why most of the small and medium size transporters in Pakistan were not able to make it.
Source: (PARCA, 2021)

5.4.2 Railway Sector

Pakistan Railways plays a critical role in the transportation of freight in Pakistan, with over 50% of the country's freight traffic transported by rail. The railway system has a vast network of over

7,000 kilometers of railway lines connecting major cities and towns, making it an essential component of the country's logistics and transportation infrastructure. Pakistan Railways carried 8,213,166 tonnes of freight during 2020-2021 with 7378000 of public freight and 835166 of departmental freight as shown:

Table 1: *Total Freight carried since 2005*

Year (Average)	Public Goods	Departmental	Total
2005-10	5,183	1,308	6,491
2010-15	1,333	700	2,033
2015-16	4,174	827	5,001
2016-17	4,594	1,036	5,630
2017-18	7,427	928	8,355
2018-19	7,442	934	8,376
2019-20	6,511	901	7,412
2020-21	7,378	835	8,213

Source: (Railways, 2021)

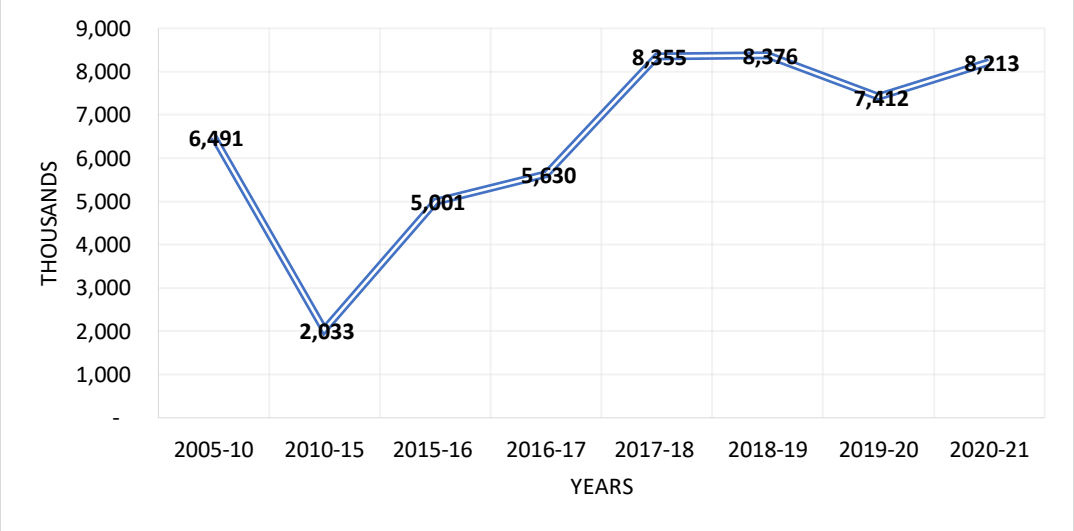

Figure 6: Total Freight Carried since 2005

Rail transportation was a major mean of transportation in Pakistan until the 1970s. But after that the priorities of government titled towards road based maritime freight transportation. This declined the share of railway to just 4% from 73% (Sussman & Bronzini, 2006). Budget

expenditures on railways were barely 45.5 billion PKR between 2005 and 2010, whereas national highway investment was 155 billion PKR (The International Trade, 2012). With the deteriorating infrastructure of railways, an average time a train takes to transport maritime cargo from industrial areas to seaports is between 21 to 28 days with a distance of 1,800 kilometres. During the Financial Year 2020-2021, freight earning of Pakistan Railways amounted to Rs. 20,579,022,068 which is 42.30% of the total Railway earnings as shown in the figure below:

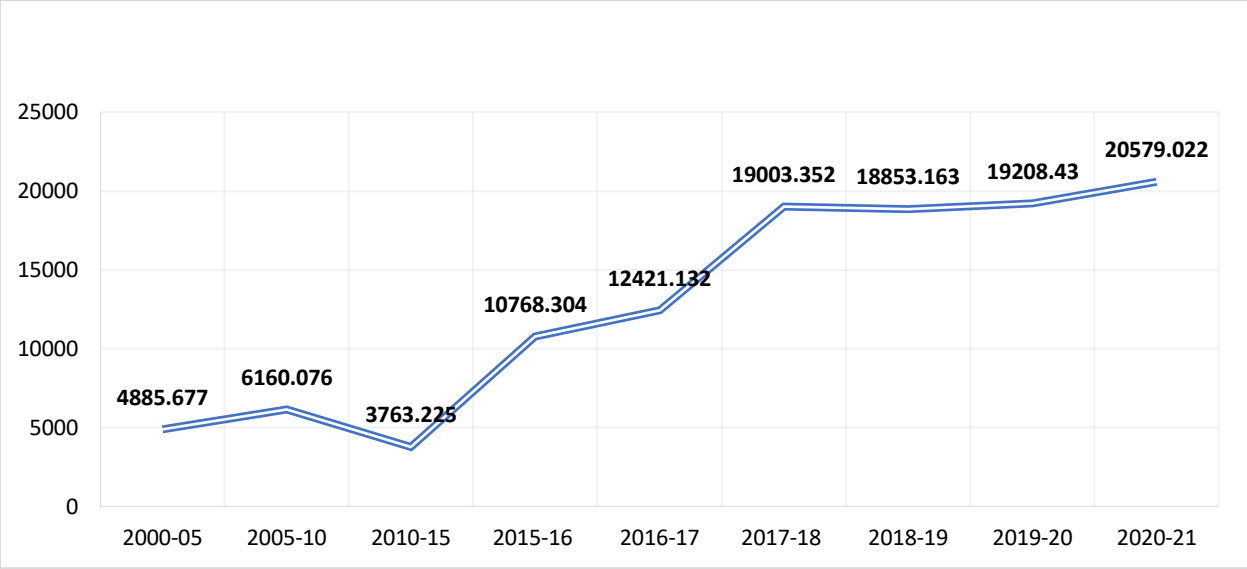

Figure 7: *Freight Earning of Pakistan Railways over the past 20 years*

Blue Line represents actual data while Red Line shows the trend.

Source: (Railways, 2021)

The importance of Rail can be gauged from the fact that the cargo carried by one freight train is equal to the cargo carried by 100 trucks (World Bank). Pakistan Railways is currently running at loss especially because of low percentage of transportation of cargo.

5.5 Significance of Transportation of Cargo by Road and Rail

Cargo transportation from industrial areas to Port Qasim and Karachi Port benefits from both rail and road networks. Rail transport ensures stable, long-distance movement with consistent schedules, while road transport offers flexibility for last-mile deliveries and access to remote areas. The combination enhances accessibility, reliability, and faster delivery. Rail excels in efficiency over long hauls, while road transport is vital for immediate, short-distance deliveries. Both modes contribute to sustainability—rail through electrification and road through advancements in fuel efficiency.

5.5.1 Accessibility

The transportation of cargo through both rail and road networks offers distinct advantages in terms of accessibility. Rail transportation excels in covering long distances efficiently, making it ideal for moving large volumes of cargo between major cities and regions. The dedicated rail infrastructure ensures smooth and uninterrupted transit, reducing the risk of delays due to traffic congestion or road-related issues. Additionally, rail transport is well-suited for carrying heavy and bulk goods, such as minerals and raw materials, due to its high capacity.

On the other hand, road transportation provides unparalleled last-mile accessibility, reaching even the most remote locations and facilitating door-to-door delivery. This flexibility makes road transport indispensable for time-sensitive shipments and small-scale distribution.

5.5.2 Flexibility

Flexibility plays a pivotal role in cargo transportation, and both rail and road networks offer distinct advantages in this regard. Road transportation stands out for its unparalleled adaptability, providing the flexibility to navigate diverse terrains and reach destinations that may be challenging for rail transport. The extensive road network allows for door-to-door delivery, making it highly suitable for time-sensitive shipments and smaller cargo quantities. On the other hand, rail transport excels in accommodating large and bulky goods, providing a stable and efficient means of moving heavy loads over long distances.

5.5.3 Faster Delivery

When it comes to faster delivery of cargo, road transportation and rail transportation each offer unique advantages. Road transport excels in providing swift and direct delivery, particularly for short to medium distances. The extensive road network allows for efficient point-to-point transportation, making it well-suited for time-sensitive shipments and perishable goods. On the other hand, rail transport boasts speed advantages for long-haul journeys, especially when transporting large volumes of cargo. Trains are capable of maintaining consistent speeds over extended distances, reducing transit times for goods traveling across regions.

5.5.4 Reliability

Rail transportation excels in reliability over long distances and for large-volume shipments. The fixed rail infrastructure ensures a stable and consistent route, minimizing the impact of weather

conditions and external factors. On the other hand, road transportation provides reliability in terms of last-mile delivery and accessibility to diverse locations.

5.5.5 Environment Friendly

When considering the environmental impact of cargo transportation, both rail and road networks offer advantages, albeit with distinct features. Rail transportation is generally regarded as more environmentally friendly due to its lower carbon emissions per ton-mile compared to road transport. On the other hand, road transportation has made strides in improving its environmental footprint, especially with the adoption of fuel-efficient technologies and alternative fuels.

5.5.6 Reduce wear and Tear on infrastructure

Rail transportation minimizes infrastructure stress by distributing the weight of cargo across multiple axles, resulting in lower pressure on the tracks. This helps extend the lifespan of rail infrastructure, reducing the frequency of maintenance and repair. However, advancements in road construction materials and engineering have improved durability. Moreover, effective load distribution mechanisms, such as well-designed roads and bridges, can help minimize wear and tear caused by heavy truck traffic.

5.5.7 Less Fuel Consumption

Rail transportation stands out for its efficiency over long distances, as trains can move large volumes of cargo with comparatively lower fuel consumption per ton-mile. In contrast, road transportation, while improving in fuel efficiency with advancements such as fuel-efficient technologies and alternative fuels, generally consumes more fuel per ton-mile than rail transport. Trucks encounter factors like traffic congestion and frequent stops, impacting overall fuel efficiency.

5.6 Challenges in Transportation of Cargo by Road and Rail

5.5.1 High cost of Fuel

In the case of road transportation, trucks heavily rely on diesel fuel, and the volatile nature of fuel prices can lead to substantial operational costs. Given the frequent stops, starts, and idling inherent in road transport, especially in urban areas or congested traffic conditions, trucks can experience lower fuel efficiency, further exacerbating the cost challenge. Similarly, rail transportation is not immune to the effects of fuel price fluctuations. While electrically powered rail systems can offer

a more stable energy cost compared to diesel-powered locomotives, the initial investment in electrification infrastructure can be substantial.

5.5.2 Inefficient Freight Transportation

Road transportation faces inefficiency challenges primarily due to traffic congestion, especially in urban areas. Delays caused by congested roadways, frequent stops, and unpredictable conditions can disrupt delivery schedules, increase transit times, and contribute to higher operational costs. On the other hand, rail transportation, while generally more efficient for long-haul cargo movements, can encounter inefficiencies related to coordination and scheduling.

5.5.3 Inadequate Infrastructure

In the realm of road transportation, varying regulations across regions can lead to inconsistencies in safety standards, licensing requirements, and weight limits, creating a complex landscape for logistics operators. On the rail side, regulatory challenges often manifest in the form of outdated or inconsistent rules governing rail operations, leading to inefficiencies and limitations in the deployment of modern technologies.

5.5.4 Cargo Damage and Loss

In road transportation, the vulnerability of cargo to external factors such as road conditions, weather, and accidents is relatively higher. The constant exposure to potential hazards, especially during last-mile deliveries, increases the likelihood of damage or loss. In contrast, rail transportation offers a more controlled environment for cargo, particularly for long-haul journeys. The fixed rail infrastructure and dedicated freight cars contribute to stability, minimizing the risk of damage due to external factors.

5.5.5 Corruption

In road transportation, the decentralized and often fragmented nature of the industry, with numerous checkpoints and interactions along the supply chain, can create opportunities for corruption at various levels. This may involve issues such as bribery, extortion, and fraudulent practices, leading to delays, inflated costs, and compromised cargo integrity. Similarly, corruption can also manifest in rail transportation, albeit with distinct characteristics. The centralized nature of rail operations may present fewer opportunities for corruption at multiple checkpoints compared to road transport.

5.7 Impact of Road and Rail Transportation on Environment

The maritime cargo transported through trucks causes negative effects on environment as the carbon emitted by trucks is of huge amount. Thus, the amount of carbon can be reduced by shifting the mode of transportation from truck to rail-based maritime cargo transport. Also, rail has a much lower share of the market compared to trucks. So, in this way cargo could be transported in an ecofriendly environment. According to Table 2, freight transportation by train consumes less fuel and carry large number of cargo than freight transited by trucks. The amount of CO_2 emitted from train is also less, i-e., 0.019 million tonnes compared to trucks which emitted 2.534 million ton in 2018-2019.

Table 2: *Estimation of Fuel Consumption and CO2 Emissions from Trucks and Trains in 2018-2019*

Trucks		**Trains**	
Mileage (km/litre)	2	Mileage (km/litre)	0.2
Average load of truck (tonnes/truck)	56	Average load of truck (tonnes/truck)	3200
CO_2 emission factor (kg/litre)	2.65	CO_2 emission factor (kg/litre)	2.65
Average fuel consumption (litre/km)	0.5	Average fuel consumption (litre/km)	5
Litres per ton-km	0.009	Litres per ton-km	0.002
Transport volume (billion tonnes-km)	107.1	Transport volume (billion tonnes-km)	4.52
Annual fuel consumption (billion Litres)	0.956	Annual fuel consumption (billion Litres)	0.007
CO_2 emission (M-tonnes)	2.534	CO_2 emission (M-tonnes)	0.019

Source: (A. Ahmed et al., 2022)

As the share of road-based maritime freight transport through the trucking sector grows, so does the amount of Greenhouse gases and carbon emissions produced by freight transportation, because truck emission per tonne-km is higher compared to train. In the year 2018–2019, the transportation sector was recorded emitting 4.38 million tonnes of CO_2. The continual rise in the proportion of truck-based freight transport is the primary cause of this growth in CO_2 emissions. This increase in CO_2 emissions and other GHG gases has affected the quality of air. It is expected that in the next ten years, roughly 50% of maritime freight volume will be carried by rail, which

will definitely result in considerable reductions of CO_2 emissions. CO_2 emissions are expected to be reduced by roughly 3 million tonnes in the years 2028–2029 (43%) (A. Ahmed et al., 2022).

A significant reduction in CO2 emissions can be achieved by gradually shifting the maritime freight transport from truck-based transportation to rail-based transportation (Sohail et al., 2021). Furthermore, successful legislations are likely to be required to improve the long-term sustainability of freight transportation. Also, institutional framework encompasses the ministries that are in charge of making plans, strategies and policies. Therefore, these policies and institutional barriers must be overcome in order to meet national goals (Arsalan & PAKSTRAN, 2015).

5.8 Social Issues associated with Freight Transportation

Freight transportation can have major societal repercussions, both in positive and negative manner that might undermine freight transportation's long-term viability. These comprises of aesthetics, community interaction, human health effects, mobility disadvantage, livability and inequity impacts (Litman & Burwell, 2006). The main freight transportation route in Pakistan crosses through places with people of widely disparate ethnic and socioeconomic origins.

Karachi Port and Port Qasim are dominated by a specific ethnic group that control the whole trucking system of ports. They have also employed low skilled and untrained workers. If there are any reforms in the freight transportation sector needs to be made, this group will be mostly affected by them. At the national level, the transition to rail-based maritime freight transport may have an impact on migration trends and composition (*TRTA,* 2016).

Furthermore, when compared to rail freight transportation with road freight transportation, the transportation of hazardous cargo such as oil and chemicals, is quite riskier on the roads (Sánchez-Triana et al., 2013).

5.9 How Container Ship Works

It may seem that transporting a container is a simple process but in fact it is a complex system especially when containers pass through the process full of checks and procedures for acquiring clearance certificates from customs and Anti-narcotics authorities.

There are three main stakeholders involved in whole cycle; **Importer** who wants to receive cargo from another country; **Exporter** who wants to sell and send the cargo to the importer and

the **Shipping Companies** who delivers the cargo by receiving it from the exporter and then sending it to the importer. Apart from these stakeholders, there are other services involved which helps to streamline the process, i.e., port trucking companies, shipping agents, clearing agents, freight forwarder etc.

For example, if a Pakistani clothing brand imports goods from China, the exporter selects a shipping company, loads the container at their factory, and seals it with a tracking ID. A freight forwarder arranges intermodal transport to the port, where a shipping agent handles paperwork, inspections, and port dues, obtaining the Bill of Lading and a certificate of origin.

At the port, containers are weighed, documented, and stacked according to vessel schedules. Shipping companies prepare a cargo loading plan based on the ship's condition. Upon a ship's arrival, cranes load containers from trucks or rails as per the plan, ensuring efficient operations and minimizing delays, which can increase port charges.

At the destination port, containers are unloaded and moved to storage. The importer's representative presents shipping documents to retrieve the cargo, which is then transported to the importer's warehouse. Finally, the empty container returns to the shipping line's yard, ready for future bookings. This intricate process connects global trade, enabling seamless business operations across continents. This whole process can be seen in the below figure:

Figure 8: *Container Shipping Process Flowchart*

Source: (Container-xchange, 2022)

5.10 Agents Involved in the process of trade

- **Producers/Manufacturers:** Create goods/services for domestic or international trade.
- **Exporters and Importers:**
  - **Exporters**: Sell goods abroad.
  - **Importers**: Buy goods from foreign markets.
- **Freight Forwarders:** Organize transportation, handle logistics and documentation for trade.
- **Customs Brokers:** Help with customs clearance, documentation, and compliance with trade regulations.
- **Transport Carriers:** Physically transport goods by sea, air, rail, or road.
- **Port Authorities:** Manage loading/unloading, storage, and compliance at ports.
- **Customs Authorities:** Regulate the entry/exit of goods, collect duties, and enforce trade laws.
- **Banks and Financial Institutions:** Provide payment solutions, trade finance, and risk mitigation.

- **Inspection and Certification Agencies:** Ensure goods meet quality, safety, and regulatory standards.
- **Insurance Companies:** Offer protection against risks like damage, theft, or loss during transit.
- **Trade Consultants and Legal Advisors:** Offer expertise on regulations, contracts, and market entry.
- **Regulatory Bodies and Government Agencies:** Ensure compliance with trade policies and standards.
- **Consumers/Buyers:** Purchase goods/services for personal use or resale in domestic markets.

5.11 Karachi Port

Pakistan's 1001 km coastline hosts three commercial ports, with Karachi Port, developed in 1887, managed by the Karachi Port Trust (KPT). Initially, it had two wharves—West and East—featuring 33 berths, including 3 oil piers for liquid cargo, accommodating ships up to 12.5m draught. Five berths on the West Wharf are leased to Karachi International Container Terminal (KICT), operated by Hutchison Ports Pakistan, and six on the East Wharf to Pakistan International Container Terminal (PICT), managed by ICTSI Mauritius, with 30% shares held by Pakistan's Marine Group. The remaining berths handle bulk carriers with draughts up to 10m.

The newly built South Wharf at Kemari offers a 1500m quay wall for container ships up to 16m draught. Leased to South Asia Pakistan Terminal (SAPT), also operated by Hutchison Ports, it boasts modern equipment and can process 3.1 million containers annually, handling the world's largest container ships. Last year, SAPT handled 300 container ships and 1 million containers, with an average 24-hour turnaround. However, the port's location in the city center contributes to Karachi's traffic congestion, affecting port operations.

In the last fiscal year, KPT managed 52 million tons, with capacity to handle more. However, rail lifts only 5% of cargo, requiring improvement. Over the past three years, KPT processed 229,205 containers as transit cargo for Afghanistan, 139 for CAR states, and none for China. Transshipment volumes remain low despite South Wharf's facilities, mainly due to the port's location off major shipping routes. To improve cargo movement and reduce congestion, railway authorities are conducting a feasibility study for a Dedicated Freight Corridor (DFC) from KPT to Pipri under a Public-Private Partnership (PPP), enhancing rail's share in cargo transport.

5.12 Port Qasim

Port Mohammed Bin Qasim, also known as Port Qasim, is a deep-water seaport located in Karachi's Phitti Creek within the Indus Delta on the Arabian Sea. It operates under the Ministry of Maritime Affairs, established by an Act of Parliament on June 29, 1973, and began operations in 1980 to reduce congestion at Karachi Port and serve as Pakistan's energy hub. Currently, it handles 52% of the nation's cargo, managing 55.2 million tons in FY 2021-22.

Spanning 12,000 acres (49 km²), the port hosts numerous industrial zones, including over 80% of Pakistan's automotive sector, the Pakistan Steel Mill (PSM), and KESC Bin Qasim Power Plant. Nearby industrial areas such as the Export Processing Zone (Landhi) and Korangi Industrial Area are directly accessible from the port. Of its 18 terminals, 15 are operated by private companies, while 3 are managed by the Port Qasim Authority. The steel mill terminal, though currently inactive, could be repurposed with modifications.

Strategically located, the port is 15 kilometers from the National Highway and connected to the M-9 Motorway. It operates 24/7, easing traffic on link roads and supporting efficient cargo transport. In contrast, Karachi Port operates on a limited 7-hour nightly schedule due to daytime truck movement restrictions in the city.

Port Qasim connects to the national rail network via a 14-kilometer rail link with six tracks, but rail freight has declined, dropping from 8.7% in 2015-16 to 6.2% in 2019-20, increasing pressure on roads, causing congestion, and raising transportation costs. The overuse of trucks also damages road infrastructure.

The port's 49-kilometer navigation channel, passing through the Indus Delta's mangrove creeks, accommodates ships up to 75,000 DWT. However, high siltation rates and shifting sea-beds complicate navigation and increase maintenance costs. To address future traffic needs and reduce dredging requirements, the Port Qasim Authority plans to deepen and expand the channel while exploring solutions to control siltation.

5.13 Major Issues with Customs and Anti-Narcotics Authorities and supportive measures to overcome the issue

Customs is considered as one of the corrupt government institutes in various developing nations. In contrast to other government organizations, corruption in customs is different in the way that the majority of importers and exporters do not perceive it as a sin. Bribes demanded by customs

agents to speed up the clearance process of products have been usually termed as a transaction expense of trade that is regularly passed on to the customers or consumers (Ferreira et al., 2007).

5.12.1. Corruption and Integrity

In government administration, maintaining employee integrity is crucial to prevent the breakdown of the organization. Upholding a strict code of ethics is integral to this principle, as corruption poses a significant threat to the system. The customs administration is particularly vulnerable to unethical behavior, as acknowledged by the World Customs Organization (WCO), which represents 179 customs administrations globally. Recognizing the susceptibility of customs to corruption, the WCO emphasizes the importance of an efficient, effective, and modern customs administration in combating corruption, protecting integrity, and strengthening good governance measures (World Customs Organisation, 2021).

5.12.2. Automation

Automation is a widely adopted strategy by nations to combat corruption in customs administration. The World Customs Organization's Declaration on integrity and good governance recognizes automation as crucial for enhancing customs efficiency and reducing corruption risks (The Revised Arusha Declaration, 1993). Automated procedures help detect corruption, providing an audit trail for government organizations to review and monitor administrative decisions.

5.12.3 Outsourcing

The measure of introducing Pre-Shipment Inspection (PSI) will strive to remove the chances for doing corrupt acts. Through this practice, the crucial facets of regulatory control are largely outsourced to private corporations. (Anson et al., 2006) contend that customs officers habitually take advantage of ineffective customs methods to stall clearance processes and demand bribes from the business community.

5.13.4 Code of Conduct

A key weapon against corruption is a clear code of conduct, according to the World Customs Organization (WCO). The code should be practical, clearly defined, and include penalties for violations. For effectiveness, officers must trust that issues will be handled impartially, without fear of retaliation. The WCO suggests assessing swift repercussions for violations, legislative protection for whistleblowers, encouragement for reporting violations at all levels, and whether sanctions are sufficient.

5.14 Challenges in Setting up a Private Shipping Line

The government-owned body, Pakistan National Shipping Corporation (PNSC) owns 11 vessels that carries only 10% of all seaborne cargo. Thus, Pakistan's 90% cargo has to depend on foreign vessels for the shipment. When compared to domestic vessels, the exporter makes less money from the cargo transported by foreign vessels. They impose exorbitant costs on the government for the cargo transportation from Pakistan towards the Gulf / European nations and vice versa. However, it is important to note that PNSC had 74 ships in the 1960s, with most of them being owned by private owners. According to the graph below, there have been no private sector-owned ships since the 1980s. Additionally, they had not been given Ease of Business, which eventually caused the private owners to lose faith in investing their wealth for the acquisition of vessels.

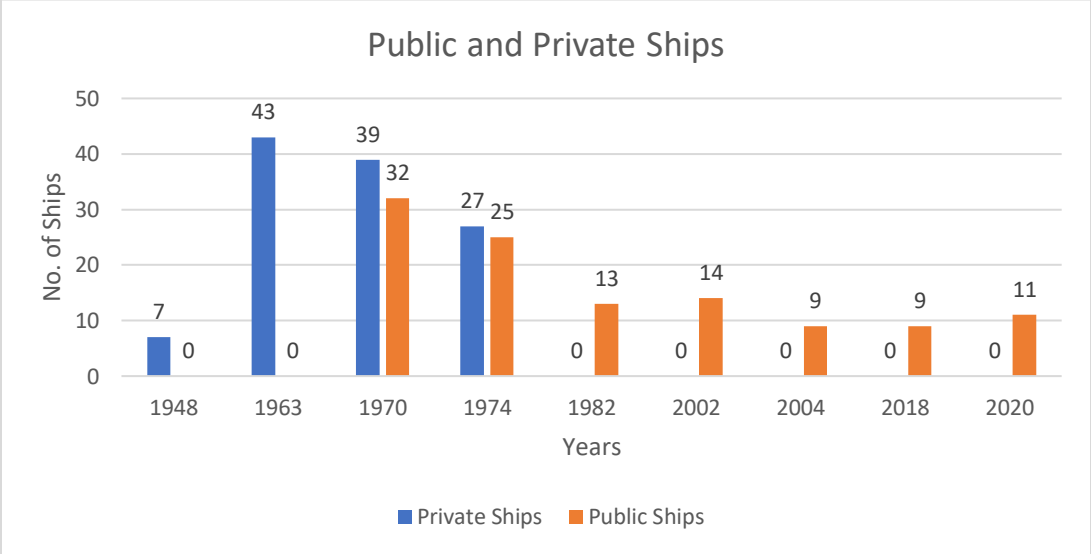

Figure 9: *Total No. of Ships owned by Public and Private sectors since 1947*

Source: (Pakistan National Shipping Corporation, 2022)

Following are some challenges faced by the businessman in setting up a private shipping line in Pakistan.

- **Regulatory Compliance:** Navigating complex regulations and bureaucratic procedures for licenses and approvals from multiple government agencies is time-consuming.
- **Infrastructure Limitations:** Pakistan's maritime infrastructure may have capacity and efficiency limitations, impacting cargo handling and vessel operations.
- **Competition:** The competitive shipping industry in Pakistan poses challenges for new entrants without established reputations.

- **Trade Barriers and Tariffs:** International trade barriers, tariffs, and customs regulations require expertise and efficient processes to ensure smooth operations.
- **Security and Safety Concerns:** Addressing piracy, geopolitical tensions, and safety risks is crucial for vessel, crew, and cargo security.
- **Skilled Workforce:** Finding qualified personnel meeting international standards for seafarers and technical professionals can be challenging.
- **Financial Considerations:** Setting up a shipping line demands significant capital for vessels, infrastructure, and compliance with financial regulations.
- **Technological Advancements:** Embracing modern technologies and digitalization involves upfront investments and a learning curve for the workforce.
- **Environmental Regulations:** Compliance with environmental standards and sustainability initiatives poses challenges and additional costs.
- **Market Volatility:** Adapting to market fluctuations, fuel prices, and economic conditions in the shipping industry requires effective risk management.

5.15 Government policies that influence operations of private shipping lines

The establishment and operation of private shipping lines in Pakistan can be influenced by various government policies and regulations. Here are some key factors that could shape the environment for private shipping lines:

- **Maritime Policy and Regulations:** Government policies should promote a favorable business environment, encourage private investment, and ensure compliance with international standards, covering vessel registration, licensing, safety, and environmental protection.
- **Licensing and Registration:** Transparent, streamlined, and efficient licensing and registration processes are crucial for private shipping lines to establish operations promptly, ensuring compliance with safety and operational standards.
- **Port Infrastructure and Services:** Prioritizing modern port facilities, cargo handling equipment, container terminals, and efficient customs and logistics services is essential for the smooth operations of private shipping lines, reducing delays.
- **Customs and Trade Facilitation:** Implementing streamlined customs procedures, electronic documentation systems, and risk-based inspections enhances efficiency and competitiveness for private shipping lines.

- **Tariffs and Duties:** A favorable tariff structure encouraging trade and investment, along with incentives, exemptions, or reduced tariffs for shipping-related services and infrastructure development, can attract private shipping lines.
- **Cabotage Policy:** A liberalized cabotage policy, allowing foreign shipping lines to participate in domestic transport, promotes competition and potentially expands the operations of private shipping lines.
- **Investment and Financing:** Government incentives such as tax breaks, investment subsidies, or financial support for shipbuilding, vessel acquisition, or infrastructure development can attract private investors to establish shipping lines.
- **Safety and Environmental Regulations:** Enforcing compliance with international safety standards, maritime security requirements, and environmental regulations is crucial for the sustainable operation of private shipping lines.
- **International Agreements and Trade Relations:** Participation in international agreements and trade relations influences private shipping lines, with bilateral and multilateral agreements creating favorable conditions for cross-border trade and market access.
- **Skill Development and Human Resources:** Encouraging vocational training programs, educational institutions, and industry-academia collaborations is essential to meet manpower requirements for skilled seafarers, ship management professionals, and maritime experts in private shipping lines.

5.15 World Trade Organization Agreements

- **General Agreement on Tariffs and Trade (GATT)**
  - Established in 1947 and later integrated into the WTO in 1995.
  - Focuses on the reduction of tariffs, quotas, and other barriers to trade in goods.
  - Provides rules for fair competition and transparency in trade.
- **General Agreement on Trade in Services (GATS)**
  - Covers trade in services such as banking, telecommunications, and transport.
  - Encourages member nations to treat foreign and domestic services equally.
  - Provides a framework for negotiations on services liberalization.
- **Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS)**

- Establishes minimum standards for the protection of intellectual property (IP), including copyrights, trademarks, patents, and trade secrets.
- Aims to reduce trade distortions arising from inconsistent IP protection across countries.

- **Agreement on Agriculture (AoA)**
  - Focuses on the liberalization of trade in agricultural products.
  - Includes commitments by members to reduce domestic subsidies, export subsidies, and barriers to agricultural imports.
- **Agreement on Trade-Related Investment Measures (TRIMS)**
  - Regulates measures that may restrict or distort trade due to investment practices.
  - Prohibits practices such as local content requirements that might hinder free trade.
- **Agreement on Sanitary and Phytosanitary Measures (SPS)**
  - Deals with food safety and animal and plant health regulations.
  - Allows countries to set their own safety standards, but these must be scientifically justified and not arbitrarily restrict trade.
- **Agreement on Technical Barriers to Trade (TBT)**
  - Ensures that technical regulations, standards, and testing procedures do not create unnecessary obstacles to international trade.
  - Encourages transparency in technical standards.
- **Trade Facilitation Agreement (TFA)**
  - Focuses on simplifying and speeding up customs procedures to make trade more efficient.
  - Aims to reduce bureaucracy and enhance cooperation between customs authorities.
- **Dispute Settlement Understanding (DSU)**
  - Provides a mechanism for resolving disputes between WTO members when they believe their rights under a WTO agreement are being violated.
  - Ensures compliance with WTO rules through a process involving consultations, panels, and, if necessary, appeals.

Source: (World Trade Organization, n.d.)

CHAPTER 6: RESULTS AND FINDINGS

This chapter presents the outcomes and discoveries derived from the thesis research. The investigation involved interviews with key informants from the Ministry of Railway and the National Highway Authority (NHA). Additionally, discussions were held with transporters who directly encounter challenges in the transportation process. Their cooperation in sharing perspectives shed light on the challenges and benefits experienced during transportation, and these insights are graphically represented. Calculations were performed to quantify the additional costs incurred by transporters due to delays in cargo clearance, providing a clearer understanding of the financial implications. Moreover, interviews with Pakistan Navy officials were conducted to gather recommendations on enhancing cargo capacity through the Pakistan National Fleet. Furthermore, the port efficiency analysis has also been presented.

6.1 Insight from Key Informants from Ministry of Railway

- **Cargo by volume/ weight or percentage of total cargo carried by Railways from KPT and PQA**

  KPT 5 % and PQA 12 % for the fiscal year 2021-2022. (Port Qasim Authority, 2024), (Karachi Port Trust, 2024)

- **East, West & South wharves of KPT connections by rail**

  The Karachi Port Trust (KPT) has three major wharves—East, West, and South—equipped to handle containerized cargo, each with independent rail connections but not interconnected. These wharves link directly to Karachi's central railway station, enhancing cargo movement and accessibility. This rail network supports efficient operations, facilitates international trade, and promotes regional economic growth. (Karachi Port Trust, 2020)

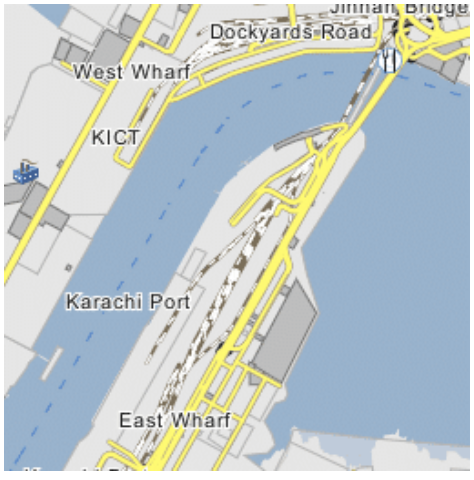

Figure 10: Wharves of KPT

- **PQA terminals connections by rail for containerized cargo**

Port Qasim terminals are connected by rail for carrying containerized cargo. The port has its own railway station, known as the Port Qasim Electric Power Terminal Railway Station, which is operated by Pakistan Railways. The railway station is located within the port area and is directly connected to the terminals. This allows for efficient transportation of cargo between the port and other parts of the country, as well as neighboring countries through cross-border rail links.

- **Impediments to increase railway share of containerized cargo from Karachi port & Port Qasim to Kot Radha Kishan**

  - **Infrastructure Constraints:** The existing rail infrastructure between Karachi port and Kot Radha Kishan is outdated and inadequate. The rail lines are single-track and have several bottlenecks that limit the speed and capacity of trains.

  - **Inadequate Rolling Stock:** The availability of locomotives and wagons is another major impediment to increasing the railway share of containerized cargo. The current fleet of locomotives and wagons is aging and has limited capacity to handle the growing volume of container traffic. (*Freight Train Service from Karachi to Kot Radha Kishan Inaugurated*, 2022)

- **Initiative / Idea of transferring of cargo by trucks from Karachi Port to Pipri and from there onward it is transferred by rail to Kot Radha Kishan**

In the transportation of cargo by road, trucks often face congestion while moving through the main city of Karachi to transport cargo from ports to Pipri. In order to address this issue, the movement of trucks is currently only allowed between 1100 to 0600 in the morning. Although a feasible study was conducted to construct a separate overhead bridge parallel to the Lyari expressway, it was found to be excessively expensive, with an estimated cost of around 62 billion. (Transportation, 2017)

Figure 11: Encroachment

In light of this, it has been deemed more feasible to start operating rails through the already laid-down rail track between the ports and railway station at Pipri. The Pakistan Railway is actively working on removing

encroachments (as shown in figure 9) and planning to double the rail track where it is presently single.

- **Suggestion of lifting cargo from ports (KPT & PQA) to Northward to improve railway track and to meet the shortages of Locomotive**

A joint venture for lifting cargo from Karachi Port Trust (KPT) and Port Qasim Authority (PQA) could be a workable solution to improve the railway track and to address any shortages of locomotives that may exist.

A joint venture between the KPT, PQA, and Pakistan Railway could help address the issue of congestion on roads by shifting cargo transportation to rail. By doing so, not only will the efficiency of cargo transportation improve, but it will also reduce traffic congestion and air pollution in the city.

- **Railway plans to increase their share of lifting cargo from ports**
  - **Development of Dedicated Freight Corridors:** PR is planning to develop dedicated freight corridors, such as the ML-1 project, to improve the capacity and speed of trains, reduce transit times, and enhance connectivity between ports and hinterlands.
  - **Procurement of Modern Rolling Stock:** PR is planning to procure modern rolling stock, including locomotives and wagons, with higher capacity and better performance.
  - **Upgrading Terminal Infrastructure:** PR is planning to upgrade the terminal infrastructure, including the construction of new container terminals and the modernization of existing terminals.
  - **Integration with Other Modes of Transportation:** PR are exploring ways to integrate railways with other modes of transportation, such as road and sea, to provide more comprehensive and integrated transportation solutions.
- **Increasing the Railway Share will solve connectivity issues for Karachi Port**

Karachi's congestion stems from heavy traffic, narrow roads, poor traffic management, and inadequate public transport. While shifting cargo to rail could reduce truck traffic, railways face

capacity constraints, limiting their ability to handle all cargo, especially in the short term. (Railway Pro, 2018)

6.2 Insight from Key Informants from NHA Authorities

- **Importance of seaports for the economic development of Pakistan**
  - **Trade Facilitation:** Pakistan heavily relies on international trade to sustain its economy. Seaports are the primary entry and exit points for a significant portion of the country's imports and exports. The Karachi Port and Port Qasim, the two main seaports in Pakistan, together handle over 90% of the country's cargo. This is consistent with study by Nawaz (2004).
  - **Connectivity:** Seaports connect Pakistan to global markets, allowing the country to trade with countries all over the world. CPEC (China-Pakistan Economic Corridor), which includes the development of the Gwadar Port, has the potential to further enhance Pakistan's connectivity with China and other Central Asian countries, opening up new trade routes and opportunities.
  - **Employment:** Seaports create employment opportunities directly and indirectly. Industries related to shipping and logistics benefit from the presence of seaports. It is estimated that the maritime sector employs over one million people. (Source: Ministry of Maritime Affairs, Pakistan)
- **Steps taken by NHA to improve the transportation of cargo to seaports in Pakistan**
  - **Expansion and Up-gradation of Existing Highways:** The NHA has been working on expanding and upgrading existing highways and road networks that link seaports like Karachi Port and Port Qasim to major cities and industrial areas. For example, the Karachi-Hyderabad Motorway (M-9) has been extended to improve connectivity between Karachi and Port Qasim.
  - **Construction of New Expressways and Motorways:** New expressways and motorways have been planned and constructed to provide efficient transportation of cargo to and from seaports. The Karachi-Lahore Motorway (M-5) and Karachi Northern Bypass (M-10) are examples of such projects. (Musings, 2019)

- **Development of Coastal Highways:** The construction and expansion of coastal highways have been prioritized to connect Gwadar Port to the national road network. The Makran Coastal Highway (N-10) plays a crucial role in this regard, providing connectivity to Gwadar and facilitating trade through the port.

- **Bridges and River Crossings:** The NHA has undertaken projects to construct and improve bridges and river crossings along key cargo transportation routes. These infrastructure enhancements ensure smoother and more efficient movement of goods.

- **Maintenance and Rehabilitation:** Regular maintenance and rehabilitation of highways and roads are essential to ensure their longevity and efficiency. The NHA has been actively involved in maintaining and upgrading roads connecting seaports.

- **Toll Plazas and Electronic Toll Collection (ETC):** Toll plazas have been established at various points on highways to generate revenue for road maintenance and improvements. Additionally, the introduction of Electronic Toll Collection (ETC) systems has made toll payment more convenient and efficient (Business Recorder, 2022).

- **Bypass Roads:** Bypass roads have been constructed to divert through traffic away from congested urban areas, reducing travel time and improving the movement of cargo.

- **Public-Private Partnerships (PPPs):** In some cases, the NHA has collaborated with the private sector through PPPs to fund and manage road projects. These partnerships help accelerate infrastructure development.

- **Role of the NHA in promoting trade facilitation at seaports in Pakistan**
  - **Enhancing Connectivity:** The NHA develops, expands, and maintains Pakistan's national highways and motorways, connecting seaports like Karachi Port and Port Qasim with key industrial and economic hubs. Notably, the Karachi-Lahore Motorway (M-5) ensures fast goods transport between Karachi and Lahore.

  - **Promoting Trade through Ports:** Improved connectivity has led to increased cargo handling capacity at seaports. For example, Port Qasim, which handles a substantial

share of Pakistan's cargo, saw its handling capacity increase to over 22 million tons in the fiscal year 2020-21. (Source: Port Qasim Authority Annual Report 2020-21)

- **Reducing Transportation Costs:** Efficient road networks managed by the NHA help reduce transportation costs, which is crucial for trade competitiveness. Reduced transportation costs benefit both exporters and importers and contribute to the overall growth of the economy.
- **Improving Safety and Reliability:** The NHA also focuses on road safety measures, which are essential for reliable and safe cargo transportation. Investments in safety measures reduce accidents, minimize cargo damage, and ensure the smooth flow of goods.
- **Data and Technology Integration:** The NHA has adopted technology solutions to improve the management and monitoring of road networks, leading to more efficient cargo movement. Electronic Toll Collection (ETC) systems and traffic management systems contribute to smoother traffic flow (Business Recorder, 2022).

- **Challenges in the transportation of cargo to seaports faced by NHA**
  - **Infrastructure Constraints:** The existing infrastructure, including highways and roads connecting industrial areas to seaports, may be inadequate or poorly maintained. This can result in congestion, delays, and increased transportation costs for cargo movement.
  - **Traffic Congestion:** Heavy traffic congestion on key transportation routes can hinder the smooth movement of cargo.
  - **Security Concerns:** Transporting cargo over long distances involves security risks such as theft, hijacking, and vandalism.
  - **Regulatory Issues:** Compliance with regulations related to cargo transportation, such as weight limits, licensing requirements, and customs procedures, can pose logistical challenges for transporters.
  - **Maintenance and Repair Needs:** Inadequate maintenance of roads and transportation infrastructure can lead to frequent breakdowns and disruptions in cargo movement.
- **NHA plans for the future development of road infrastructure**

- **Expansion and Up-gradation of Existing Highways and Motorways:** The NHA continued its efforts to expand and upgrade existing highways and motorways that link seaports like Karachi Port and Port Qasim to major industrial and economic centers. Projects such as the Karachi-Hyderabad Motorway (M-9), Karachi-Lahore Motorway (M-5), and Karachi Northern Bypass (M-10) aimed to improve connectivity, reduce congestion, and enhance cargo transportation routes (National Highway Authority, 2016).

- **Coastal Highway Development:** The development of coastal highways, particularly the Makran Coastal Highway (N-10), is crucial for providing access to Gwadar Port. This project plays a pivotal role in trade facilitation by connecting Gwadar to the national road network.

- **Bypass Roads and Flyovers:** The NHA focused on constructing bypass roads and flyovers to reduce congestion in urban areas and improve the flow of cargo transportation. These projects help expedite the movement of goods to and from seaports.

- **NHA initiatives to promote the use of technology for the tracking and monitoring of cargo in transit to seaports**
  - **Electronic Toll Collection (ETC) System:** The NHA introduced an ETC system at toll plazas on major highways and motorways. This technology allows for electronic payment of tolls, reducing waiting times and congestion at toll booths (Business Recorder, 2022).

  - **Traffic Management Systems:** The NHA implemented traffic management systems that use technology to monitor and control traffic on highways and expressways. These systems include electronic signs, cameras, and sensors.

  - **GPS and Vehicle Tracking:** Many cargo vehicles are equipped with GPS (Global Positioning System) devices and tracking systems. These technologies allow for the real-time tracking of vehicle locations and movements.

- **Digital Platforms and Portals:** The NHA developed digital platforms and portals for information dissemination and communication with stakeholders. These platforms provide updates on road conditions, traffic alerts, and project status.
- **Smart Traffic Signals and Signs:** The NHA has deployed smart traffic signals and signs at strategic locations. These signs can display real-time information, such as traffic conditions, road closures, and safety warnings.
- **Safety Cameras and Surveillance:** Surveillance cameras and safety cameras have been installed along highways and near critical infrastructure. These cameras help monitor traffic and road conditions, aiding in incident response and security.
- **Collaboration with Telecom Operators:** The NHA collaborates with telecom operators to ensure connectivity along highways. This connectivity is crucial for real-time communication, data transmission, and the functioning of tracking and monitoring systems.

- **Steps taken by NHA to ensure compliance with international trade and customs regulations**
  - **Coordination with Customs Authorities:** The NHA collaborates closely with customs authorities, primarily the Federal Board of Revenue (FBR) and the Customs Department. This collaboration ensures that cargo transported on highways complies with all relevant customs regulations and documentation requirements.
  - **Customs Clearance Points:** The NHA works with customs authorities to establish customs clearance points and facilities at or near seaports and key logistics hubs. These facilities allow cargo to undergo customs inspections, documentation checks, and clearance processes efficiently.
  - **Documentation and Manifest Verification:** Cargo carriers are required to submit proper documentation and manifests to customs authorities. The NHA assists in ensuring that cargo carriers comply with these requirements before accessing highways leading to seaports.

- **Customs Kiosks and Facilities:** At toll plazas and rest areas along highways, the NHA may facilitate the setup of customs kiosks and facilities where cargo documents can be checked and verified. This helps expedite the customs clearance process.

6.3 Transporters perspective regarding their preference to trucks (Survey based Results)

- **Reason of preferring trucks over train for transportation of cargo**
  - **Geographical Distribution of Warehouses:** Karachi ports have a diverse network of small and large warehouses situated at different points near KICT at Kemari and QICT near Port Qasim. Trucks offer the flexibility to reach these various warehouse locations directly.
  - **Adaptability to Cargo Types:** Sometimes, the nature of the cargo or the destination requires a shift to smaller vehicles for further transportation. Trucks offer the advantage of being easily transferable to smaller vehicles for the final leg of the journey.
  - **Flexibility in Route Planning:** Trucks provide the flexibility to choose the most efficient routes based on real-time conditions, such as traffic, road closures, or other unexpected obstacles. This adaptability in route planning allows for efficient and reliable transportation, optimizing the overall logistics process.
- **Preference over booking procedures**
  - **Round-the-Clock Availability:** Trucks are known for their high availability, operating 24/7. This is crucial in the logistics industry, especially in a busy port city like Karachi where cargo movements are continuous.
  - **Ease of Booking:** The booking procedures for trucks are generally streamlined and involve minimal hassle. Transporters can often secure a truck with a simple phone call or through online platforms, reducing administrative burdens.
  - **Emergency Situations:** Trucks offer a rapid response in emergency situations. With a single phone call, transporters can arrange for immediate transportation of goods.
- **Return of empty containers to shipping line warehouses**

- **Container Offloading at Shipping Line Warehouses:** Shipping lines typically have designated warehouses strategically located for the offloading of empty containers. These warehouses serve as convenient points for transporters to return empty containers after they have offloaded the cargo at their premises.
- **Flexibility in Offloading Points:** Trucks offer flexibility in choosing offloading points, especially when returning empty containers. Shipping lines' warehouses are often equipped with facilities for efficient container handling, making it a straightforward process for transporters to drop off empty containers. In contrast, trains are limited in terms of offloading points, and containers can typically only be offloaded at the port.

- **Chances of loss or damage to cargo**
  - **Cargo Insurance for Truck Transportation:** When choosing trucks as the medium of transport, cargo insurance is a standard practice to mitigate the risks associated with loss or damage during transit. The insurance coverage for truck transportation is often calculated based on factors such as the type of cargo, its value, and the distance it needs to travel from the port to the pickup area.
  - **Factors Influencing Insurance Premiums:** The distance between the port and the cargo pickup area is a crucial factor in determining insurance premiums. Longer distances or routes with higher perceived risks may result in higher insurance costs.
  - **Cargo Insurance for Train Transportation:** Similar to truck transportation, cargo transported by train is typically insured to cover potential losses or damages. The insurance coverage for train transportation is influenced by factors such as the type of cargo, its value, and the distance it needs to travel from the port to the cargo pickup area.

- **Safer and Secure means of Transportation**
  - **Individual Codes and Passwords for Container Tracing:** Each container is assigned a unique identification code, often referred to as a Container Number or Container ID. This alphanumeric code is prominently displayed on the container itself.

- **Technology for Container Security:** Advanced technologies, such as Radio-Frequency Identification (RFID) and Global Positioning System (GPS) tracking, are often employed to monitor and trace containers throughout the transportation process.
- **Cargo Theft and FIR Registration:** Despite the security measures in place for containers, there is still a risk of cargo theft, where unauthorized individuals may attempt to pilfer the contents of a container during transit or at storage facilities.

- **Challenges faced by transporters due to Customs and Narcotics Authorities**
  - **Time Constraints and Penalties:** Traditionally, ports provided a 7-day ultimatum for the clearance of customs, duties, and other document processes for containers. After the initial 7 days, the port imposes charges of around 4000 PKR or USD $100 per day for delayed clearance.
  - **Inspections and Re-Examinations:** Customs and narcotics authorities now conduct examinations of containers before clearance. This step is essential for security and regulatory compliance but adds time to the overall clearance process.
  - **Unexpected Checks at Exit Points:** Trucks carrying cleared containers may face additional checks at the exit points of ports. This step, though not initially anticipated by freight forwarders, can significantly extend the time it takes to transport goods out of the port.

- **Transportation of cargo through NLC's trucks by private companies**
  - **Security and Confidentiality:** Given the sensitive nature of military operations and government projects, NLC trucks are often used to transport cargo that requires a high level of security and confidentiality.
  - **Specialized Equipment and Training:** NLC trucks are likely equipped and maintained to meet the specific requirements of military and government transportation.
  - **National Security Considerations:** NLC's focus on serving the Army and government aligns with national security considerations. The organization plays a

crucial role in ensuring the timely and secure movement of goods vital to defense and national development.

- **Disparity between container weight capacities and road infrastructure standards**
  - **Impact on Roads and Infrastructure:** Roads designed for a cargo capacity of 50 tons may face accelerated wear and tear when subjected to the weight of containers that can reach up to 80 tons (including the weight of the container itself and its cargo).
  - **Transportation Efficiency and Speed:** The deterioration of roads under excessive cargo weight can result in reduced speeds for trucks transporting containers.

- **Transporters Response w.r.t using trucks for transportation of cargo (Author's Own Findings)**

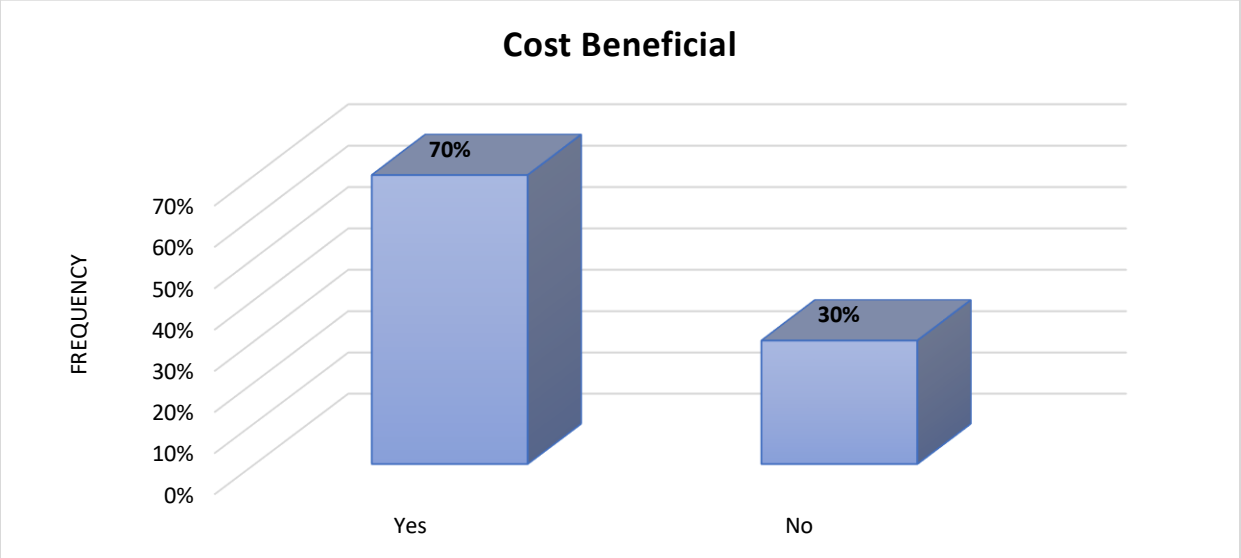

***Figure 12**: Cost Beneficial*

70% of Transporters were in a favor that trucks are more cost beneficial to them due to greater flexibility in reaching remote areas, shorter transit times, and a less complex infrastructure, which can reduce overall logistics costs. Additionally, trucks are suitable for smaller shipments and provide door-to-door delivery, minimizing the need for additional handling and transfers.

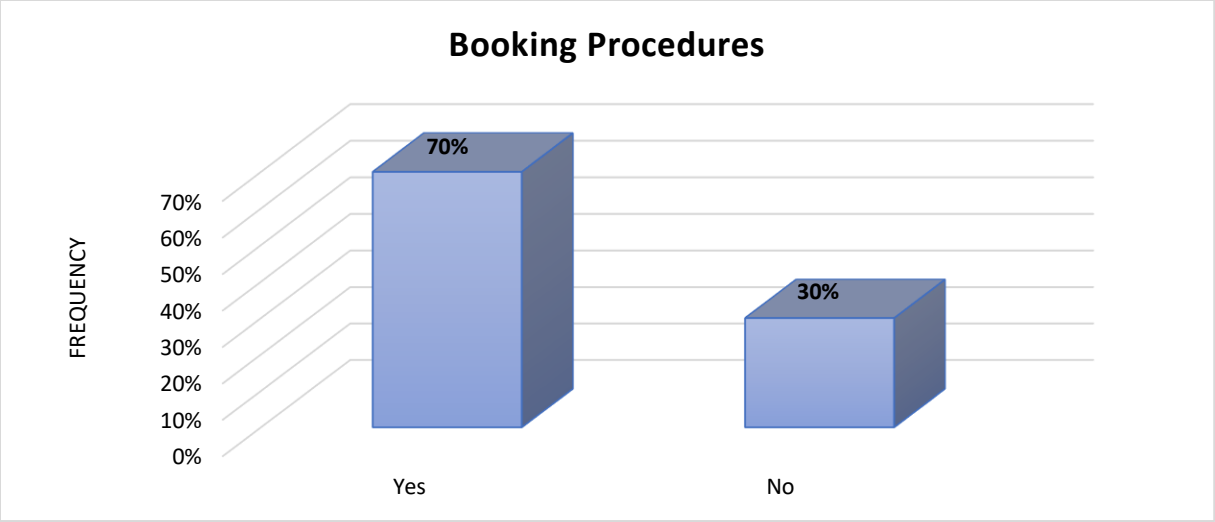

***Figure 13**: Booking Procedures*

70% of transporters were in favor that Booking procedures for trucks are often more convenient for them compared to trains due to the decentralized nature of trucking operations. They told that truck bookings can be arranged directly with individual truck owners or local transport companies, providing greater flexibility and quicker response times.

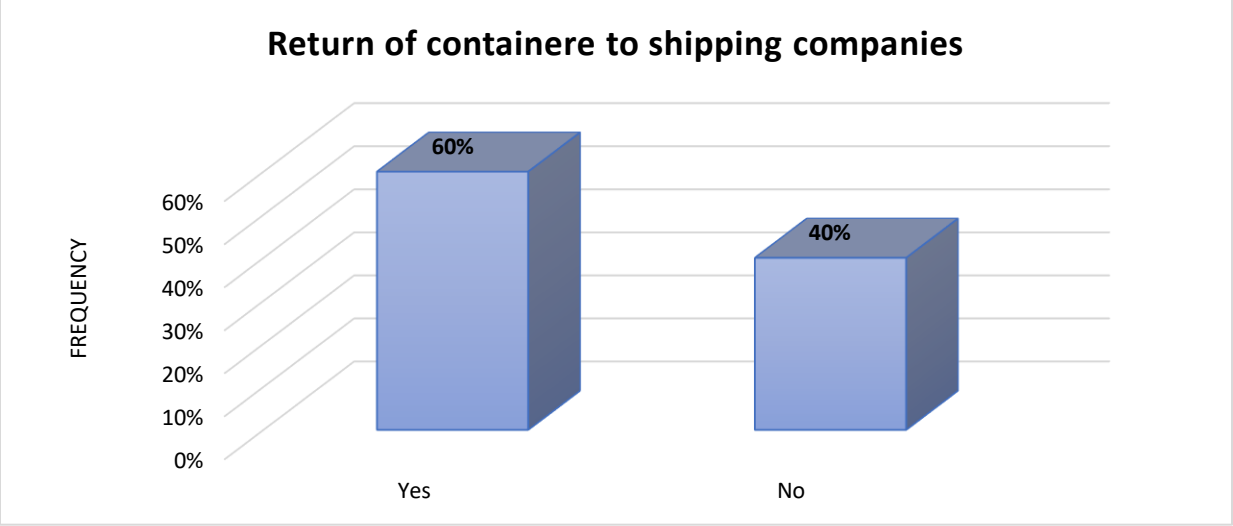

***Figure 14:** Return of Containers to shipping companies*

60% of transporters have the opinion that they choose trucks because trucks allow for flexible drop-off locations, enabling them to return containers at various points rather than specific train terminals. This flexibility reduces deadhead miles and operational costs, contributing to their overall cost-effectiveness compared to the more rigid infrastructure associated with train transportation.

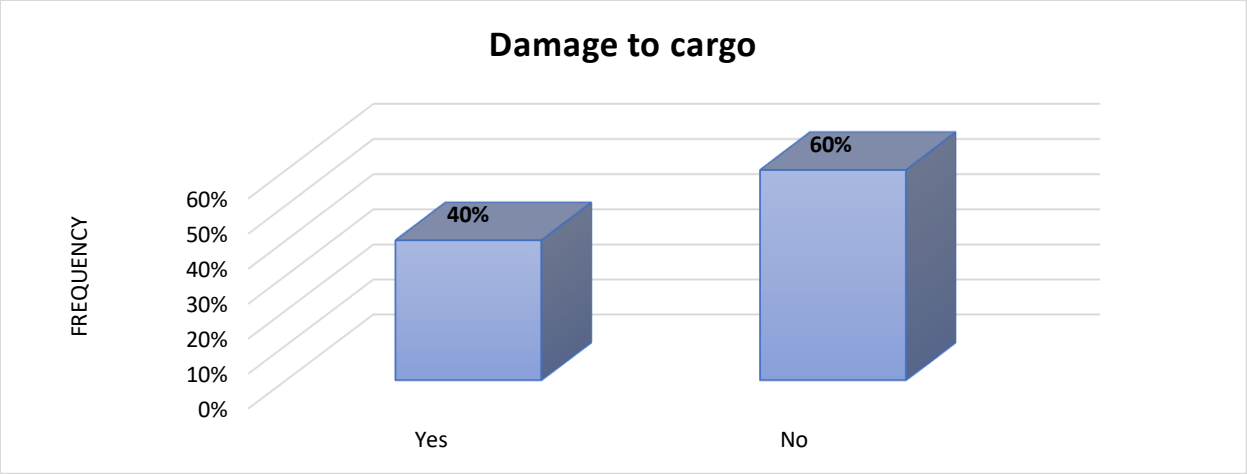

Figure 15: *Damage to Cargo*

Transporters consider trains as more feasible for less damage of cargo because they provide a smoother and more stable ride compared to trucks. The fixed rail infrastructure reduces vibrations and shocks during transportation, leading to less cargo damage, especially for delicate or sensitive goods.

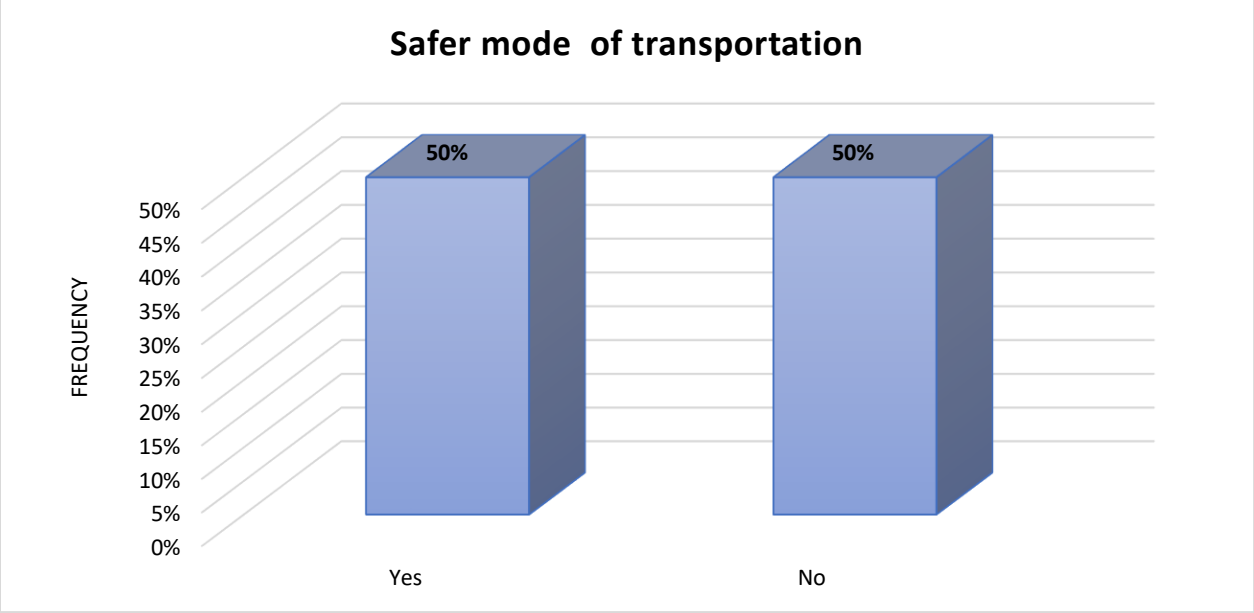

Figure 16: *Safer Mode of Transportation*

In this case, transporters have balanced opinion regarding both trucks and train.

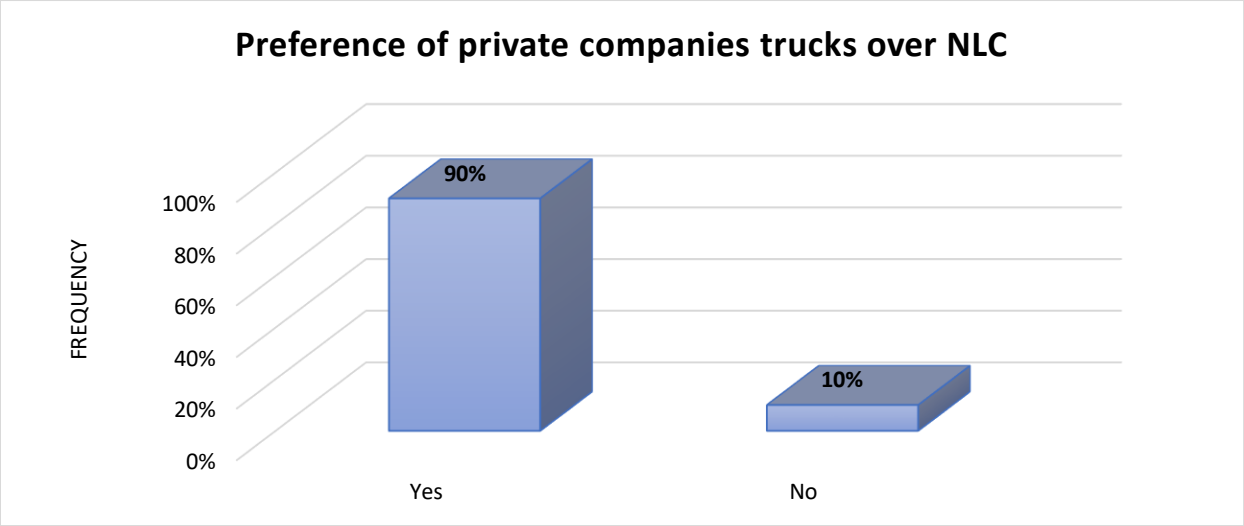

Figure 17: *Preference of Private Companies trucks over NLC*

Transporters prefer private trucks over government operated train as they have to face less government interventions and rules & regulations.

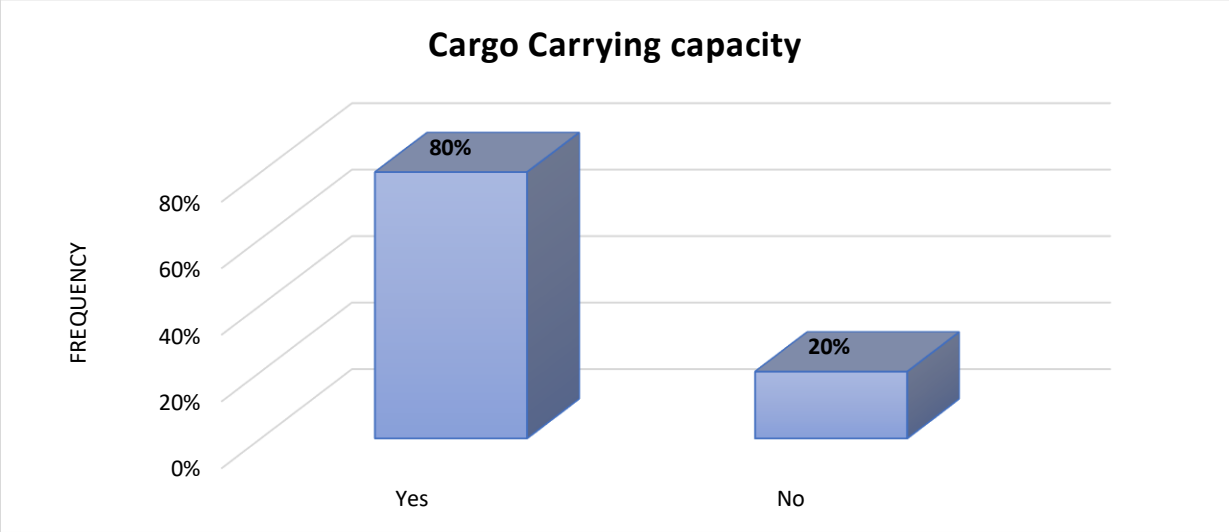

Figure 18: *Cargo Carrying Capacity*

Most of the transporter have the opinion that trucks offer a more flexible and scalable solution. Trucks come in various sizes, and transporters can choose vehicles that match the specific capacity requirements of their cargo. This adaptability allows for efficient utilization of space and resources, especially for smaller or irregularly sized shipments.

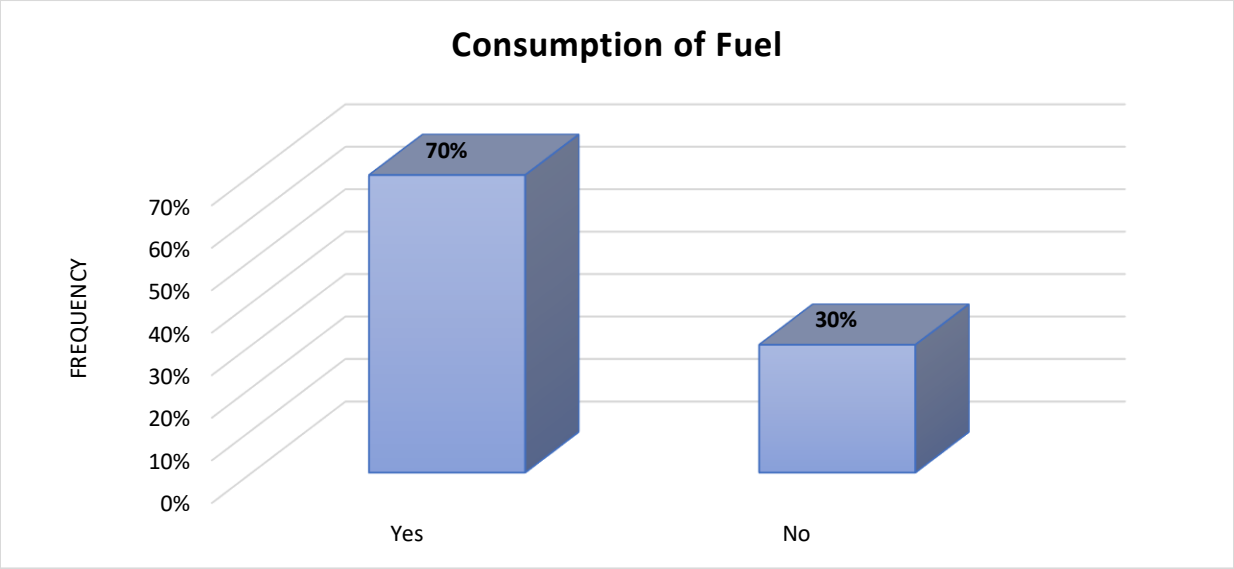

Figure 19: *Consumption of Fuel*

Transporters prefer trucks over trains due to the typically higher fuel efficiency of modern trucks. Trucks are often more fuel-efficient on shorter routes and provide a competitive advantage in terms of cost savings, especially for regional or local transportation where trains may be less economical.

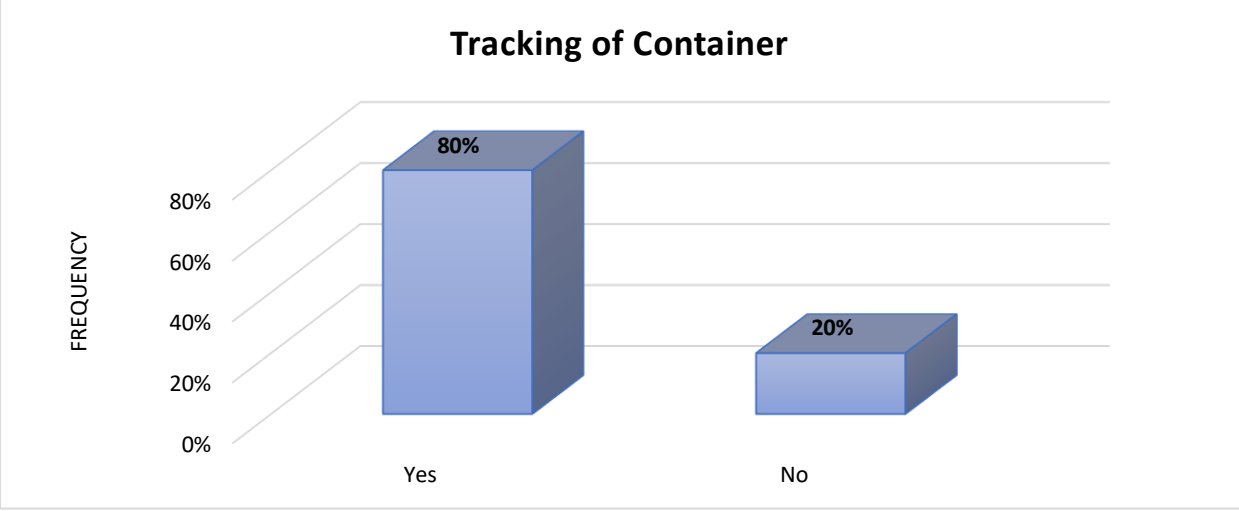

Figure 20: *Tracking of Container*

Trucks offer real-time monitoring and flexibility in updating the cargo's location. Each truck can be equipped with GPS technology, allowing transporters to closely track shipments and respond promptly to any issues or delays. Additionally, the assignment of a unique identification code,

such as a Container Number, facilitates accurate and efficient tracking for each container, enhancing overall logistics management. This level of visibility and control is often more challenging to achieve with trains, making trucks a preferred choice for transporters prioritizing cargo tracking and management in Pakistan.

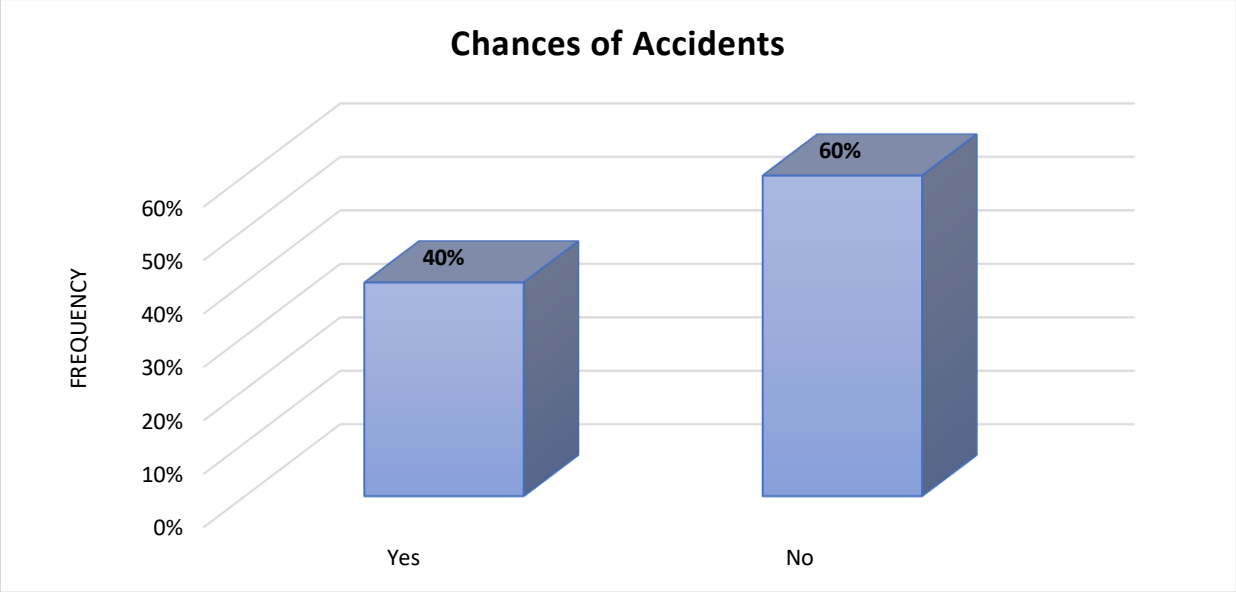

Figure 21: *Chances of Accidents*

Less chance of accidents can be more beneficial for transporters choosing trains over trucks for cargo transportation in Pakistan due to the fixed rail infrastructure, which reduces the risk of road accidents. Trains generally operate on dedicated tracks, eliminating the uncertainties and potential hazards associated with road conditions, traffic, and driver-related factors. This enhanced safety aspect can lead to lower insurance costs, reduced liability, and overall increased reliability for cargo transporters opting for trains.

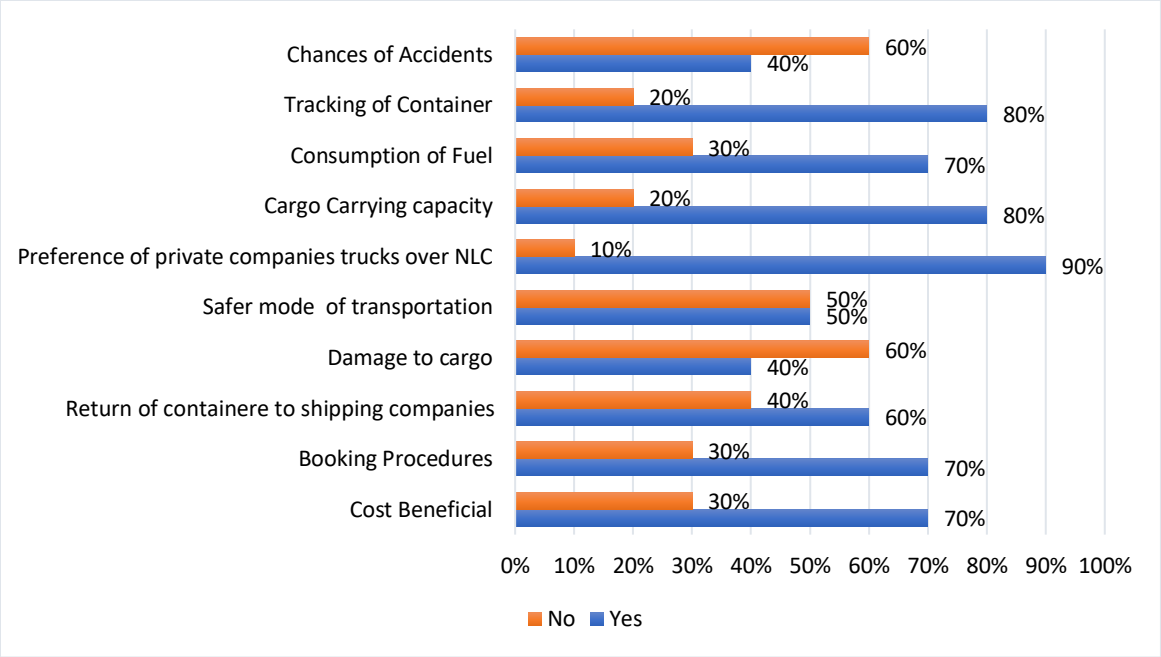

Figure 22: *Overall Responses*

6.4 Cargo Clearance Process – Custom Authorities Perspective

The customs clearance process revolves primarily around two essential documents: the Bill of Lading and the invoice, which contain details about the product type and quantity. However, one of the significant challenges customs authorities encounter is a frequent mismatch between the HS code (Harmonized System code) on the invoice and the actual goods present in the containers. Such discrepancies cause delays, as customs authorities need to verify the contents thoroughly to ensure that they align with the declared information.

- **Automated Clearance System**

The automated cargo clearance system in Pakistan sorts shipments into three zones—green, yellow, and red—based on the type of cargo and risk level:

- **Green Zone:** This is the smoothest category, where around 55% of cargo is cleared. The clearance time in this zone is minimal—approximately one minute.
- **Yellow Zone:** This zone requires additional assessment. If customs officers identify missing or insufficient documentation, importers are asked to provide the necessary paperwork. Clearance in this zone generally takes one to two days.

- **Red Zone:** Cargo marked as hazardous or high-risk falls under this category. Clearance in the red zone typically takes two to three days due to the additional scrutiny required for safety and regulatory compliance.

The interview also revealed that the system used for cargo clearance is digitally monitored at all times, leaving little room for customs officers to create unnecessary delays. The decision to assign cargo to a particular zone is based on an automated scanning system, ensuring transparency and fairness in the process.

- **Manipulation with the System**

Some delays arise due to importers' non-compliance or attempts to manipulate the system. For instance, certain importers deliberately under-declare the quantity of goods to reduce their taxes or avoid other charges such as demurrage fees. When customs authorities detect these discrepancies, the clearance process is halted until the situation is resolved, contributing to the perception of delays.

- **Lack of Awareness of the Documentation Procedures**

The lack of awareness among importers about the required documentation. Many importers are not well-versed in the complex customs procedures, leading them to hire custom clearing agents to manage the process. Unfortunately, some of these agents exploit importers, charging them additional fees under the pretext of fulfilling customs requirements. In reality, these extra charges are fraudulent and end up in the pockets of dishonest agents.

Contrary to the complaints from transporters, customs authorities do not intentionally delay the clearance process. Instead, most delays occur due to errors or non-compliance on the importers' part. If all documentation is in order and the system detects no issues, the customs authorities have no reason to withhold clearance.

6.5 Transporter’s suggestions to bring simplicity in the process of cargo clearance

- **Simplify Booking and Documentation Procedures**

70% of transporters found truck bookings more convenient due to flexible and decentralized systems. They likely favor simplified documentation procedures, where a single point of contact or a straightforward online system could reduce bureaucratic delays during the clearance process.
Suggestion: Customs and anti-narcotics authorities could introduce simplified electronic systems for cargo clearance, similar to how transporters book trucks directly with owners or companies. These could include pre-submitted documents online, automated approvals, and fewer physical interactions, speeding up the overall process (Recorder, 2024).

- **Introduce Flexible Drop-off Points for Customs Clearance**

60% of transporters emphasized that trucks allow flexible drop-off locations, enabling more efficient container returns. They might suggest creating additional, flexible drop-off or clearance points for cargo. These could be satellite customs offices closer to the transport routes, allowing for quicker clearance rather than forcing all shipments to go through central hubs. (Peters, 2014)
Suggestion: By introducing more flexible, remote customs offices or mobile customs clearance units along major trucking routes, transporters could avoid bottlenecks at centralized terminals.
Impact: This could reduce waiting times at ports by 10-15% and improve overall logistical efficiency, allowing for smoother container movement across the supply chain.

- **Enhance Real-time Monitoring and Communication**

80% of transporters expressed that tracking containers via trucks is more convenient due to the use of GPS technology, which allows real-time updates on cargo locations. They might propose that customs and anti-narcotics authorities implement similar real-time monitoring of cargo clearance progress.
Suggestion: Customs authorities could use GPS tracking and real-time communication tools to provide instant updates on cargo clearance status. Transporters could receive notifications on whether their cargo has cleared customs, thus avoiding unnecessary waiting times.

- **Improve Coordination between Agencies**

90% of transporters prefer private trucks over government-operated ones due to fewer regulatory barriers and quicker response times. This suggests that transporters face challenges when multiple agencies are involved, causing delays.
Suggestion: Transporters might recommend that customs, anti-narcotics authorities, and other relevant agencies streamline their communication channels. A single digital platform, where all

relevant authorities could access cargo information and coordinate inspections, would help minimize bureaucratic inefficiencies.

- **Reduce Physical Inspections for Low-risk Shipments**

Transporters value the speed of truck-based transportation and its ability to reach destinations quickly, without the need for extensive checks. Based on this, they might suggest reducing the number of physical inspections for shipments deemed low-risk.

Suggestion: By using risk-based profiling systems, authorities could focus their resources on high-risk shipments while fast-tracking low-risk containers. This could be similar to the automated checks that occur with truck cargo, where certain shipments are automatically cleared based on the documentation submitted beforehand.

- **Faster Turnaround for Container Handling**

60% of transporters favored trucks due to their ability to return containers flexibly, which minimizes waiting times. Transporters might propose quicker turnaround times at customs checkpoints for container inspections and releases, allowing them to swiftly return and pick up new shipments.

Suggestion: Customs should prioritize turnaround at key stages like container check-in and release. By using faster scanning technologies or pre-clearing containers before they arrive at the port, customs could allow for immediate container handovers.

- **Digitize and Automate Clearance Processes**

80% of transporters preferred truck transport because it offers real-time monitoring and tracking capabilities. Transporters may suggest customs and anti-narcotics authorities digitize their processes, including electronic submissions, remote document verification, and automated approvals, thereby removing the need for physical paperwork (Recorder, 2024).

Suggestion: Full digitization of customs clearance processes—similar to the digital tools transporters use to track shipments—could involve online document submission, digital signatures, and AI-based verification of shipments, reducing human errors and processing delays.

6.6 Calculating cost incurred due to delay in Cargo Clearance at Karachi Port

The complications in the clearance procedure have been increased over the past years rather getting transporter friendly. Now let's take an example to further clarify it. If the clearance of cargo is delayed by 5 days beyond the initial 7-day ultimatum provided by the port, the additional cost borne by the transporter can be calculated based on the information provided.

As per the given information, the port charges an additional 4000 PKR or USD $100 per day for delays beyond the initial 7 days. Since the cargo clearance is delayed by 5 days, we can calculate the additional cost as follows:

Additional Cost = (Number of Delayed Days) × (Cost per Day)

Substituting the values:

Additional Cost = 5 days × 4000 PKR/day

Additional Cost = 20,000 PKR

Therefore, if the clearance of customs, duties, and other document clearance of the container is delayed by 5 days, the transporter would incur an additional cost of 20,000 PKR. This represents the financial penalty imposed by the port for exceeding the stipulated clearance timeframe. The same scenario is also explained in the table below:

Table 3: *Additional Cost due to delay in cargo clearance*

Days	**Charges**	**Additional Cost Bored by Transporter due to delay in Cargo Clearance**
	(PKR)	**(PKR)**
Upto 7 days	No charges	Nil
8th day	4,000	4,000
9th day	4,000	8,000
10th day	4,000	12,000
11th day	4,000	16,000
12th day	4,000	20,000

Source: Author's Own Calculation

The presented table 3 delineates a structured framework illustrating the financial repercussions for a transporter confronted with delays in cargo clearance. The time frame is categorized into days, starting with a grace period labeled "Upto 7," during which no charges are levied, reflecting an

allowance for reasonable processing time. However, commencing from the 8th day, a uniform charge of 4,000 PKR is imposed, and this pattern persists through the subsequent days up to the 12th day. This static charge increment is indicative of a systematic approach to penalizing delays, with each day incurring the same financial consequence.

Concurrently, the column denoted as "Additional Cost Bored by Transporter due to delay in Cargo Clearance" provides a nuanced perspective on the compounding financial burden experienced by the transporter as the delay extends. The accrual of this additional cost follows a linear progression, with each passing day contributing an additional 4,000 PKR. On the 8th day, the transporter shoulders an extra cost of 4,000 PKR, intensifying to 8,000 PKR on the 9th day, and so forth. By the 12th day, the cumulative additional cost peaks at 20,000 PKR, underscoring the amplifying consequences of prolonged cargo clearance delays.

In essence, this detailed table encapsulates a comprehensive overview of the financial dynamics associated with delayed cargo clearance, offering a systematic breakdown of charges and additional costs for each day beyond the initial grace period. It provides a valuable reference for understanding the escalating financial impact on the transporter as the delay persists.

6.7 Key Informant Interviews – Increasing the cargo carrying capacity through Pakistan Fleet of Merchant Ships

Improving the utilization of Pakistan's merchant shipping fleet involves addressing various factors that contribute to the current low market share. Here are several remedial measures that could be considered

- **Infrastructure Development**
  - **Ports and Terminals**
    - Conduct a comprehensive audit of existing port infrastructure, identifying areas requiring immediate attention.
    - Prioritize the expansion of berths to accommodate larger vessels, reducing turnaround times and increasing overall port capacity.
  - **Connectivity**
    - Collaborate with transportation experts to design and implement efficient road and rail networks connecting ports to major industrial and commercial hubs.

- ❖ Implement a robust system for real-time tracking of cargo in transit, minimizing delays and providing accurate delivery estimates.

- **Technology Integration**
  - ➢ **Shipping Technology**
    - ❖ Introduce advanced navigation systems and vessel management technologies to optimize shipping routes, reducing fuel consumption and emissions.
    - ❖ Implement predictive maintenance systems to minimize downtime for vessels, ensuring a more reliable and efficient fleet.
  - ➢ **Digital Platforms**
    - ❖ Develop user-friendly, secure, and interoperable digital platforms for end-to-end cargo management.
    - ❖ Integrate data analytics tools to provide valuable insights into shipping patterns, enabling better demand forecasting and resource allocation.
- **Financial Incentives**
  - ➢ **Subsidies**
    - ❖ Conduct a thorough cost-benefit analysis to identify areas where subsidies would have the most significant impact.
    - ❖ Consider a phased approach to subsidies, gradually reducing support as the industry becomes more self-sustainable.
  - ➢ **Low-Interest Loans**
    - ❖ Collaborate with financial institutions to design loan programs with favorable terms for ship-owners investing in fleet modernization.
    - ❖ Establish a revolving fund to ensure a continuous and sustainable flow of funds for ship-owners.
- **Regulatory Reforms**
  - ➢ **Customs Procedures**
    - ❖ Implement a comprehensive digital customs platform to facilitate electronic submission of documentation.
    - ❖ Provide training programs for customs officials to ensure the smooth transition to digital processes.
  - ➢ **Licensing and Compliance**

- ❖ Streamline licensing processes, reducing the time and paperwork required for obtaining necessary permits.
- ❖ Establish a central regulatory body to oversee compliance and enforce industry standards.

- **Skill Development**
  - ➢ **Training Programs**:
    - ❖ Collaborate with maritime training institutes to develop industry-relevant curriculum and practical training programs.
    - ❖ Introduce apprenticeship programs to provide hands-on experience for aspiring maritime professionals.
  - ➢ **Research and Development**
    - ❖ Foster collaboration between universities, research institutions, and industry players to address specific challenges facing the maritime sector.
    - ❖ Encourage the development of sustainable and innovative technologies through research grants and incentives.
- **Promotion and Marketing**
  - ➢ **International Promotion**
    - ❖ Develop a comprehensive marketing strategy highlighting the unique selling points of Pakistani shipping services.
    - ❖ Participate in international events, trade fairs, and exhibitions to showcase the capabilities of the Pakistani shipping industry.
  - ➢ **Partnerships**
    - ❖ Establish joint ventures with reputable global logistics companies to enhance service quality and reliability.
    - ❖ Implement a feedback mechanism to continually assess and improve collaborative efforts.
- **Environmental Sustainability**
  - ➢ **Green Shipping Initiatives**
    - ❖ Introduce tax incentives for the adoption of eco-friendly technologies and practices.
    - ❖ Invest in research and development of green technologies, such as alternative fuels and energy-efficient vessel designs

- **Public-Private Partnerships (PPP)**
  - **Collaboration**
    - Develop a framework for public-private partnerships that clearly outlines roles, responsibilities, and risk-sharing mechanisms.
    - Establish a dedicated PPP unit to facilitate communication and coordination between government entities and private sector stakeholders.
- **Monitoring and Evaluation**
  - Establish a dedicated monitoring and evaluation unit to assess the impact of implemented measures.
  - Develop key performance indicators (KPIs) aligned with industry objectives, such as market share, transit times, and customer satisfaction.

6.8 Port Efficiency Analysis

1. **Cargo Handled per Ship** (Cargo/Ships Handled) – This measures how efficiently each port handles cargo per ship.
2. **Containers Handled per Ship** (Containers/Ships Handled) – This measures the efficiency in container handling per ship.

Port Qasim:

Table 4: Cargo / Ships Handled & Cargo ships at Port Qasim

Year	Cargo Handled (tons)	Ships Handled	Cargo/Ship (tons/ship)
2011	26,099,000	1,228	21,254
2012	23,437,000	1,089	21,531
2013	24,860,000	1,079	23,040
2014	25,780,000	1,076	23,956
2015	30,014,000	1,278	23,486
2016	33,183,000	1,372	24,188
2017	37,356,000	1,409	26,512
2018	45,563,000	1,557	29,269
2019	49,013,000	1,490	32,901
2020	50,985,000	1,520	33,546

Source: (Port Qasim Authority, 2024)

Karachi Port:

Table 5: Cargo / Ships Handled & Cargo ships at Karachi Port

Year	Cargo Handled (tons)	Ships Handled	Cargo/Ship (tons/ship)
2011	41,328,000	1,506	27,442
2012	37,914,000	1,194	31,753
2013	38,830,000	1,478	26,276
2014	41,350,000	1,277	32,383
2015	43,420,000	1,148	37,829
2016	50,035,000	1,007	49,692
2017	52,481,000	967	54,285
2018	54,686,000	892	61,299
2019	46,884,000	536	87,482
2020	41,838,000	1,492	28,041

Source: (Karachi Port Trust, 2024)

- **Calculate Cargo Handled per Ship**

Using the formula:

$$Cargo\ Handled\ per\ Ship = \frac{Cargo\ Handled}{Ships\ Handled}$$

- **Calculate Containers Handled per Ship**

Using the formula:

$$Containers\ Handled\ per\ \ Ship = \frac{Containers\ Handled}{Ships\ Handled}$$

Interpretation

- **Port Qasim Efficiency:**
  - **Cargo Handled per Ship:** The efficiency steadily increased from 21,254 tons/ship in 2011 to 33,546 tons/ship in 2020 (as shown in Table 4). This reflects gradual improvements in the port's ability to handle more cargo per ship.
  - **Containers Handled per Ship:** Container handling efficiency fluctuated, with some increases from 729 containers/ship in 2011 to 902 in 2012, but lower efficiencies in 2013 and 2018, and ending with a slight increase to 711 containers/ship in 2020 (as shown in Table 4).
- **Karachi Port Efficiency:**

- **Cargo Handled per Ship:** Karachi Port shows much higher efficiency, starting at 27,442 tons/ship in 2011, peaking at 87,482 tons/ship in 2019, and then dropping back to 28,041 in 2020 (as shown in Table 5). This suggests a large variation in ship utilization over the years.
- **Containers Handled per Ship:** Karachi Port's container efficiency improved significantly, starting at 1,025 containers/ship in 2011, reaching a peak of 4,035 containers/ship in 2019, before dropping to 1,336 in 2020 (as shown in Table 5). This shows an overall better container handling efficiency than Port Qasim.

CHAPTER 7: CONCLUSION AND RECOMMENDATIONS

7.1 Conclusion

In conclusion, the comprehensive research undertaken to investigate the dynamics of transportation and trade in Pakistan has provided valuable insights into the preferences and challenges faced by transporters, as well as the efficiency of key ports in the country. The face-to-face interviews with relevant authorities from the Ministry of Railway, National Highway Authority (NHA), Ministry of Maritime Affairs, Ministry of Commerce and Trade, Ministry of Communication and Broadcasting, and the Pakistan Navy have enriched the study with authoritative perspectives.

The survey conducted among transporters revealed a prevailing inclination towards trucks as the primary mode of transportation, despite the potentially cost-effective alternative of trains. This preference is attributed to the advantages offered by trucks, including easy access to ports, streamlined booking procedures, lower accident risks, efficient cargo tracking mechanisms, and higher cargo capacities. The calculated additional cost incurred by transporters due to delays in cargo clearance by antinarcotics and customs authorities further underscores the significance of addressing bottlenecks in the logistics chain.

Insights gathered from interviews with Pakistan Navy officials have provided valuable recommendations for enhancing cargo capacity through the Pakistan National Fleet, contributing to the overall discourse on optimizing maritime resources.

In essence, this thesis contributes a holistic understanding of the transportation landscape in Pakistan, emphasizing the need for strategic improvements to capitalize on the inherent advantages of different modes of transportation. Addressing the concerns raised by transporters and optimizing the efficiency of key ports, particularly Karachi Port, are crucial steps towards fostering a more robust and competitive trade environment in the region. The recommendations provided by Pakistan Navy officials offer actionable insights for policymakers and stakeholders to enhance the nation's cargo capacity through strategic utilization of maritime assets.

7.2 Recommendations

- Enhance importer education and awareness programs to ensure they understand the required documentation and customs procedures. This can reduce delays caused by incorrect or missing paperwork and limit their dependence on clearing agents, thereby minimizing the potential for fraud.
- Encouraging collaboration between the government and the private sector is paramount. By encouraging a cooperative environment, policymakers can work closely with transporters and industry stakeholders to address concerns, implement reforms, and develop solutions that align with the needs of the transportation sector.
- There is a significant opportunity to strategically integrate the Pakistan National Fleet into cargo capacity enhancement efforts. Leveraging naval assets can contribute not only to security aspects but also to optimizing maritime logistics and bolstering the country's overall transportation capabilities.

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ANNEXES

Annexure-A

Questionnaire for Transporters (Open-ended Questions)

Q1. Why transporters prefer transportation of cargo through trucks rather than by train even though transportation through train is less costly?

Q2. Whose booking procedure and process is more easier and convenient for transporters; truck or train?

Q3. What are the advantages of utilizing trucks for the return of empty containers to shipping line warehouses compared to trains, and how does this contribute to the efficiency and flexibility of the container logistics process?

Q4. Are there more chances of loss or damage to cargo in case of transportation of cargo through trucks?

Q5. Which is safer & secure mean of transportation for cargo; Truck or Rail?

Q6. How have the intensified examinations by customs and narcotics authorities impacted the efficiency of container clearance at ports, and what challenges do transporters face as a result?

Q7. If you transport cargo by road then whether you prefer NLC trucks or hire trucks from private companies?

Q8. How has the current disparity between container weight capacities and road infrastructure standards affected the efficiency of cargo transportation in Pakistan?

Annexure-B

Questions from Railway Authorities

Q1. How much cargo by volume/ weight or percentage of total cargo is carried by Railways from KPT and PQA?

Q2. Are the East, West and South wharves of KPT connected by rail for carrying containerized cargo?

Q3. Are the PQA terminals connected by rail for containerized cargo?

Q4. What are the impediments to increase railway share of containerised cargo from Karachi port & Port Qasim to Kot Radha Kishan?

Q5. What are the steps being taken by railway authorities to increase railway share of containerised cargo from KPT & PQA to Kot Radha Kishan.

Q6. Is it workable that cargo from Karachi port is transferred by trucks to Pipri

Q7. Is joint venture for lifting cargo from ports (KPT & PQA) to Northward is workable to improve railway track and to meet the shortages of Locomotive if any?

Q8. What are the railways plans to increase their share of lifting cargo from ports?

Q9. Main problem of KPT is connectivity with hinterland. Congestion of traffic. High Court has allowed movements of trucks only from 11 PM to 0600 in the morning (7 Hours). Do you think that by increasing the Railway share, this issue can be resolved?

Annexure-C

Questionnaire / Discussion Points with NHA

Q1. How important do you think seaports are for the economic development of Pakistan?

Q2. What steps has the National Highway Authority taken to improve the transportation of cargo to seaports in Pakistan?

Q3. How do you see the role of the National Highway Authority in promoting trade facilitation at seaports in Pakistan?

Q4. What challenges do you think exist in the transportation of cargo to seaports in Pakistan by road, and how is the National Highway Authority addressing these challenges?

Q5. What plans does the National Highway Authority have for the future development of road infrastructure to support the transportation of cargo to seaports in Pakistan?

Q6. How does the National Highway Authority coordinate with other government agencies and private sector stakeholders to ensure efficient and effective transportation of cargo to seaports in Pakistan?

Q7. What initiatives has the National Highway Authority taken to promote the use of technology for the tracking and monitoring of cargo in transit to seaports in Pakistan?

Q8. How does the National Highway Authority ensure the safety and security of cargo being transported by road to seaports in Pakistan?

Q9. How does the National Highway Authority ensure compliance with international trade and customs regulations for cargo being transported to seaports in Pakistan?