

Analyzing Pakistan's Freight Transportation Infrastructure Using Porter's Framework and Forecasting Future Freight Demand Using Time Series Models

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Abstract:

Logistics play an important role in the development of any country. Transportation is the back-bone of a successful and efficient **LOGISTICS** system [1]. Transportation cost accounts for 39% of the logistics cost (logistics cost accounts for 10% of the sales) [2]. The transport system has direct and indirect linkage with all the important sectors of the economy. The size of transport infrastructure affects the economic development of any country [3]. An efficient and good quality transport system contributes to economic growth by lowering production cost.

Pakistan has several thousand kilometers of land borders with its neighboring countries: Iran, Afghanistan, China and India, with five main entry points but the volume of trade through these routes is very low. Geographically, Pakistan is divided into Eastern and Western corridors and flow of traffic is from North to South as sea ports are located in the South. This paper examines the freight transport industry of Pakistan and forecasts the future freight demand.

The research revealed that freight transport industry in Pakistan is highly fragmented. The relative bargaining power of buyers (logistics service users) is high, while the relative bargaining power of suppliers (logistics service providers) is low. The threat of substitute services is low for the road freight industry, because the road transport is the most commonly used medium in Pakistan. Owing to low barriers to entry, the threat of new entrants is relatively high and this speaks of the fragmented nature of the industry. Industry wide opportunities include construction of "National Logistics/Trade Corridor" that aims to reduce the time to reach Peshawar from Karachi in 36 hours. This corridor would provide a safe route to the Central Asian Republics which would offer unique opportunity to the trucking companies in Pakistan to compete internationally. Development of Gwadar Port also provides opportunities, to be tapped.

Key words: - Freight, Transportation, Pakistan, Forecast

1 Introduction

In developing economies like Brazil, Argentina and Poland the process of logistics is not always so easy or so efficient. Logistics costs can amount to 30% of delivered product costs in less advanced economies. Comparatively, in advanced economies it can be as low as 9.5% [4]. The logistic performance index of Pakistan is 2.5, which is less than Brazil, hence its logistics cost is even higher than 30 % of delivered product cost. In Pakistan, the transport and telecom sector contributes 10% to GDP [5], provides employment to 5.39% of labor force

[6]. This sector contributes over 17 %of the Gross Capital Formation [7] and its share in the investment is 11.5% [8]. The sector consumes 35% energy annually and is recipient of 20 to 25 %of the annual federal sector development program [9].

Roads and Railways are the two main pillars of Pakistan's Inland Transport System. The role of Pakistan Railways in the freight haulage is on the decline from the very outset. In 1950s, its share in freight haulage was over 86% which has now decreased to 4% only [10]. Road freight sector in Pakistan is highly unorganized and informal and is dominated by

drivers cum owners of one to two trucks [11]. The Central Asian Republic countries are rich of energies in the world. The anticipated biggest energy market for these countries is China and India. However it is evident from the location of Pakistan that energy has to be passed through Pakistan (If it is to be economical for both India and China), hence Pakistan by virtue of its location can act as the future energy corridor in the region. Pakistan by providing access of warm water to the Central Asian countries can emerge as regional trade hub. With efficient land transport infrastructure and ports for import/export Pakistan would gain enormously by providing the key access routes to the warm waters of the Indian Ocean and Persian Gulf. The Government is working on the Improvement of National Trade Corridor and linking it further to the Asian highway network. National Logistics board, with Prime Minister as chairman, is the supreme decision making body in the field of logistics. At present, responsibility for transport is divided among four federal ministries (Ministry of Communication responsible for the national road sub sector, Ministry of Railways responsible for railways, Ministry of Defense responsible for airports and civil aviation, and Ministry of Port and Shipping responsible for ports and shipping), four Provincial governments and seven autonomous authorities [12]:

Under these federal ministries there are number of autonomous and semi-autonomous organizations. At the Provincial level, Communications and Works departments of four-provinces (Punjab, Sindh, NWFP and Balochistan) are responsible for the provincial road network.

Recognizing the need for a “National Transport Policy” the Government of Pakistan has taken several initiatives to frame a set of policies. These efforts began in 1991, when National Transport Research Center (NTRC) Islamabad, formulated a draft policy with the help of local technical experts. In 1999, World Bank supported the Transport Sector Development Initiative (TSDI), a platform to conduct workshops among transport sector stakeholders for building consensus on the essential elements of National Transport Policy for Pakistan. This effort resulted in the development of a “Concept

Note”. Since 2003, the Asian Development Bank (ADB) is providing technical assistance to frame a transport policy for the country [13]. However, none of these policy documents have been formally approved. Finally National Transport Policy (Draft Final Report) May 2007 has been floated to all concerned for necessary input.

In Pakistan, the practice of preparing Five-Year Development Plans shows the government priorities for development in different sectors, including transport. The Figure 2.11 shows the percentage of total money allocated to the Transport and Communication sector in the sequence of Five-Year Development Plans [14]. One fifth of the development budget is being allocated to the Transport and Communication sector over the last 60 years. Which leads us to believe that successive governments throughout recent history were serious about the development of the transport network in Pakistan [15]. Despite of the massive spending of resources on the road and railways system, the transport sector budget allocated in different Five-Year Plans spent less than 1% of allocated money on research and institutional capacity building (for instance organizations and skills) throughout the history of Pakistan [16]. The result is that the country still has to rely on foreign technical assistance to formulate transport policies and programs.

2 National Transportation Resources

The government vision for economic growth and poverty reduction requires massive investment and development of infrastructure for sustainable economic growth of any country. The quality, travel time and reliability of transport infrastructure are critical to maintaining growth and competitiveness [17]. In Pakistan, Road, Rail and Air are three major components of transport infrastructure.

2.1 Road infrastructure

At the times of independence, in 1947 the total roads were 50,367 Km, with no motorways /Highways and the road density was 0.06 Km/sq Km while Pakistan now has over 264,853 Km roads with 579 Km motorways and 10906 Km of highways with road density of 0.32 Km/sq Km [18]. Pakistan has 178,423 Kms High Type

roads and 86,430 Kms Low Type roads. Total roads, which were 229,595 Kms in 1996-97, increased to 264,853 Km by 2007-08 — an increase of 15.4 percent. During the out-going fiscal year, the length of the high typed road network increased by 3.2 percent but the length of the low type road network declined by 2.8 percent [19]. Furthermore, extent of high type roads has increased by 41.5 percent since 1996-97. A sizable and continuous improvement of the high type road network can be observed from 2001 to 2007, where the network grew at an average rate of above 3 percent. The 11485 Kms long National Highways and Motorways Network comprises of 4% of the total road network and carries 80% of Pakistan’s total traffic [20]. Road transport is the backbone of Pakistan’s transport system, accounting for 91 % of national passenger traffic and 96 % of freight movement [21]. Over the past ten years, Road Traffic, both passenger and freight, has grown much faster than the country’s economic growth. Pakistan, with 161million people, has a reasonably developed transport infrastructure [22]. However, when compared with other developed and developing countries, the road density (Total length of road/ Total area), of Pakistan is quite low. Pakistan intends to double it from 0.32 Km/sq Km to 0.64 Km/sq Km gradually over the next 10 years. Although Pakistan has been ranked at 69 with 3.5 points[23], which is less than average (3.8 points) but still it has better quality roads in the region except china.

NHA is responsible for the maintenance of the National highways and motorways, while the provincial C& W department and Local District Governments are responsible for the maintenance of Low Type roads [24]. NHA is maintaining Road Maintenance Account (RMA) [25]. Toll revenue is the major fund for maintenance of the national highway network. In addition, the Federal Government provides an annual Maintenance Grant to the NHA.

The motor vehicles on road have been increasing with a reasonable pace especially in the last five years there has been tremendous growth in this sector. In the past five years. Vehicle production, including cars, trucks, motorcycles, tractors, buses and other commercial vehicles, has sky rocketed from 195,791 units in 2001-02

to 998,592 units in 2005-06 (Increase by 410%). Passenger cars and light commercial vehicles have seen substantial growth; from 50,000 units / year have grown, to 200,000 units /year (Increase by 300%) [26]. Motorcycles have the highest growth, increasing from 120,000 to 750,000 units /year (Increase by 525%) [27]. Despite of this rapid growth, Motorization in Pakistan is in the lowest quartile. Actually we are in the pre-motorization stage in Pakistan where 8 people out of a 1000 have cars [28]. The present vehicle composition is given in figure 1.

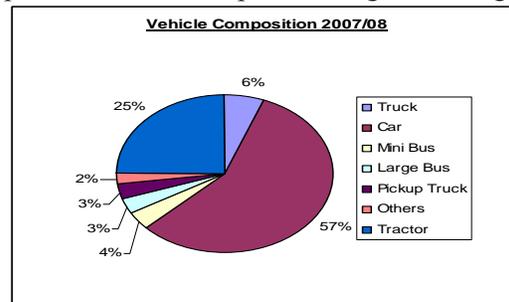


Figure 1. Vehicle composition by percentage
Source: - Data extracted from the Pakistan Economic Survey 2007-08, pg 102

The percentage of cars in 1999/00 was 48.5% and trucks percentage was 7.4%, hence cars are increasing at faster growth rate while the increase in no of trucks is at very slow rate as is evident from figure 2. The number of registered trucks in Pakistan is 201,027 whereas the total trucks on road are 194,000.

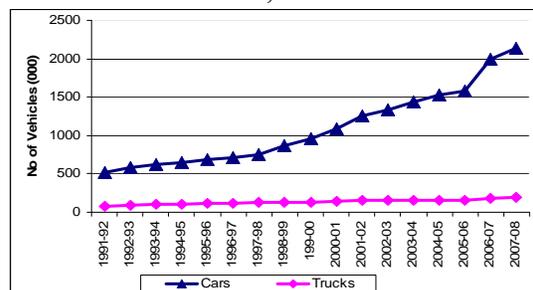


Figure 2. Trend of cars and trucks population of last ten years. Source: - Data extracted from Pakistan Economic Survey 2007-08, pg102

The road freight has been steadily capturing market share from rail transport [29]. The share of road traffic has increased many times, during the 1990 the transport volume by road grew at 5% per year [30] for passengers and 12% per year for freight in terms of passenger-Km and ton-Km, respectively. The share of freight traffic has increased from 86 % to 96%. The trend of road traffic is increasing at higher rate both for

the passenger and the freight, the road traffic for the last ten years is depicted in figure 3.

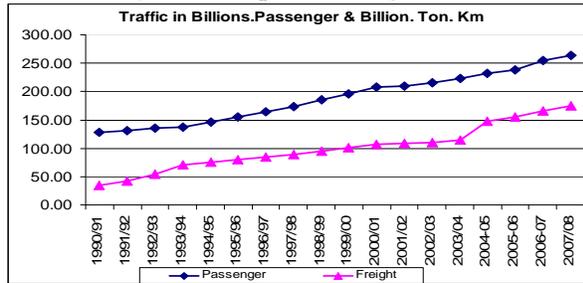


Figure 3. Road traffic for the last ten years
Source: - Data extracted from Medium Term Development Framework, by Planning Commission GoP Anx II, pg 463.

2.2 Pakistan Railway

Railways has a definite edge over roads for long haul and mass scale traffic movement both for passengers and freight in addition to providing a safe, economical, and environment friendly mode of transport [31].

Throughout the world history, rail traffic has played an important part in the development and economic prosperity of nations. Railways are a valuable source of employment while generating large amounts of revenue to the benefit of the economy. Pakistan Railways was the primary mode of transportation in the country till the seventies. However, diversion of already scarce resources towards the expansion of the road network, the performance and condition of Pakistan Railway declined and its share of inland traffic reduced from 41 percent to 10 percent for passenger and 73 percent to 4 percent for freight traffic. Pakistan Railways (PR) is a department of the MOR and is governed by the Railway Act of 1890. The Railway Board is the decision making organ and the Secretary of the MoR serves as its Chairman. The PR comprises two functional units: the Operation Unit and the Manufacturing and Service Unit each headed by a General Manger who is accountable to the Railway Chairman for the performance of the unit.

The Pakistan Railways network is comprised of 7,791 route-kilometers; 7,479 Km of broad gauge and 312 Km of metre gauge. There are 589 stations in the network, 1,043 Km of double-track sections (in total) and 293 Km of electrified sections [32]. The Pakistan Railways have not constructed any new routes since 1982, and have instead abolished light-traffic branch lines since the 1999's [33]. The number of

freight wagons on the Pakistan Railways is 19,538 comprising 9,700 covered wagons, 5,276 opens wagons and 4,662 special type wagons (for carriage of liquids, explosives, machinery, live stock, timber and rails, etc.) [34]. This does not include 629 departmental wagons and 328 brake-vans. A total of 17,863 of those wagons are 4-wheelers, and the rest are mostly 8-wheelers [35]. The number of freight wagons has reduced from 1976, but after 1992 the rate of reduction is more. Most of the wagons are out of date and of low performance. They are only equipped with vacuum brake systems. Some wagons, mainly the 4-wheelers, are restrained to operation speeds less than 55 Km/hr because of their low stability. The only high performance wagons that are currently useful are 130 flat wagons that were purchased from China and are used for container transport. The actual transport time from Karachi to Lahore for the new high performance wagons is 26 hours, whereas that of conventional wagons is about 60 hours because of not only a long running time but also a long waiting time. Thus the existing conventional wagons take 2.5 times longer than new ones [36]. Presently there is not a fixed operation diagram for freight trains. Freight trains are operated in intervals between the running of passenger trains and are frequently forced to stop and wait for the passing and exchanging of passenger trains. In The freight traffic the total number of tons carried and ton-Km have a downward trend since 1965-70 and 1975-80 respectively, and the average distance traveled has been increasing, thereby shifting the Freight traffic from rail to road.

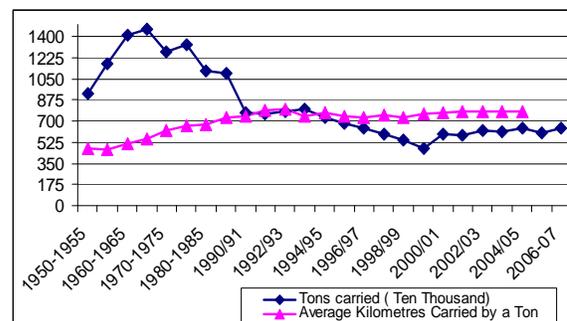


Figure 4, Tons carried and Avg Km carried by a Ton.
Source: - Data extracted from Pakistan Economic Survey and Pakistan Statistical Year Book 2008

2.3 Airports and Air Transport

There are seven international airports, one at Islamabad, four at provincial capitals and one at

Gwadar. Beside this 19 regular airports are located at other major cities [37]. Major airports except Gwadar are operated jointly by the Civil Aviation Authority (CAA) and the Air Force. Air cargo traffic has been increasing slowly and steadily as shown in figure 5.

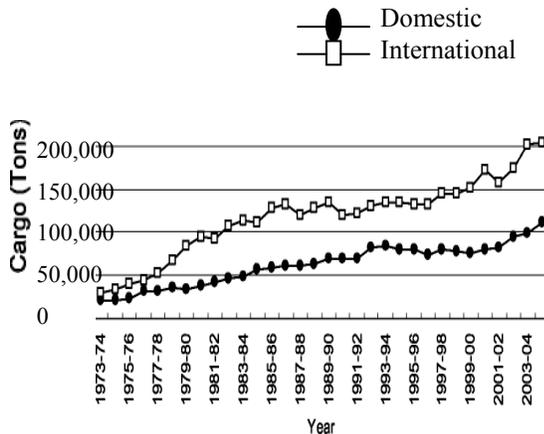


Figure 5, Domestic and International air cargo traffic. Source: CAA Statistics of Pakistan

3 Porter's Analysis of industry

Michael porter provided a framework that models any industry as being influenced by five forces [38]. This model has been used by many authors for analyzing the various industrial manufacturing sectors but its application in the transportation industry is very rare [39]. This model is used to analyze the freight industry. The customized Porter model is given in figure 6. After having discussed the characteristics of the freight industry it is logical to analyze it from various aspects as provided by the framework suggested by Porter.

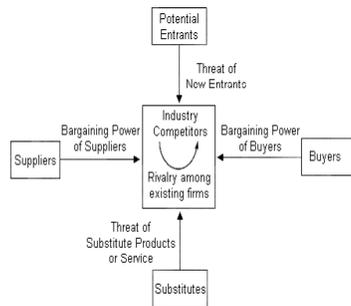


Figure 6, porter's framework customized to transport sector Source: - Porter, Michael E. 1979. How competitive forces shape strategy. Harvard business review, 57(2): 137-145.

The *bargaining power of supplier* basically depends on the relative size of the logistic service provider. Bigger players are able to

secure long-term agreements with their suppliers at much competitive prices. However in Pakistan the railway is not in a position to carry long term contracts, due to its inefficiencies in the freight transportation and the road freight industry is run by a very large number of small haulage operators. The sector generally comprises of very small fleet owners except for a few firms which own more than ten units. The trucking industry mostly constitutes of people who own one or two vehicles. However, there are few who made a fleet controlling 25 to 50 or more vehicles. The industry can be divided into three types of owners, as appended below.

- Corporate Companies with Fleet Size of over 25 vehicles - 1 %
- Haulers/Companies with over 10 vehicles - 20 %
- Owners/Operator that represent only single owner - 79 %

There are no major informal players in road freight sector. Hence the bargaining power of suppliers is very low, that is why Pakistan has lowest the freight tariff rates when compared to other countries [40].

The *bargaining power of buyers* (users of logistic services) is high as compared to the suppliers (service providers) the seasonality effect shifts the balance towards the suppliers for some duration of the year. The informal and fragmented nature of the service providers has a major negative impact on bargaining power of the suppliers.

Although the freight and transport industry is one of the most rough and tough industries in the country yet it entails low *barriers to entry* because of easily available capital and collaboration with the goods carrying agencies ('ADDAs'), which serve as breeding grounds for individual entrepreneurs. The ADDA people safeguard them from the dynamics of the industry like accidents, theft of goods and street fights over petty issues. Hence all what is required is to get money from a bank or a moneylender, buy the truck and collaborate with the ADDA people and operate within the parameters established by the norms of ADDA culture.

The nature of the freight service is such that it presently has no *substitute*. However among the different modes the substitute is possible. The

air being the costly mode and railway not in a position to maintain even its 4 % share, the road freight industry is the only mode of freight transportation. It is commonly observed that during the strike of the road freight service providers, the whole economic activity is affected. Hence, as a primary industry, the substitutes almost do not exist. The fact is also reinforced from NTRC and Economic Survey of Pakistan data that the share of railways in the freight haulage has been reduced from 86% (during 1950s) to less than 4% (Economic Survey of Pakistan 2007-08), where as at present, freight haulage through roads is 96%. As far as *industry competitors*, Pakistan railways is not customer focused and also does not have the required freight infrastructure and willingness to compete with the huge informal trucking sector. As such there is no specific rivalry among the truck operators.

4 Future Freight Demand Forecast

For freight, market forces and government policy are primary influencers of variables that are predominantly of an economic nature [41]. The likely growth of road freight transport demand is 6.2 to 7.2% (assumed if annual GDP growth continues remains 6.0 or above). The forecast for road, rail and the total freight transport demand till 2030 is shown in figure 7. The freight demand is forecasted by using historic trend analysis. The figure reveals that the share of railway is not predicted to be increased beyond 5 % till 2030, until the new reforms are not incorporated including the improvement rail freight infrastructure. The procurement of high performance 8- wheeler, 8000 x freight wagons will be able to transport the predicted railway share. The road freight will remain as the major transportation mode with 95 % share. In order to meet the road freight transportation demand the fleet of trucks will also increase. Population of Trucks is also forecasted by using historic trend analysis and is shown in table 1. The net increase in the number of trucks from 2005 to 2030 is 1,196,000 units. If the average life of a truck is assumed to be 12 years [42], all the existing vehicles (293,000 units) will need to be replaced and in addition, all trucks newly purchased between 2006 and 2013 will also need to be replaced by 2025. In

the same manner, all trucks newly purchased before 2019 will need to be renewed by 2030. Thus, the cumulative number of trucks to be renewed by 2030 becomes 1,055,000 units. The total number of trucks to be procured in 25 years is 2,251,000 units and total cost is approximately Rs.4700 billion. Hence the large amount of investment will be required to meet the required fleet demand as is evident from table 2. Pakistan Truck and Prime Mover assembly sector has been continuously expanding and growing according to the needs of the market. Industry produces a diversified range of Trucks and Prime Movers with sufficient idle capacity yet to be utilized. Total installed capacities for truck / prime mover manufacturing is 28,500 units /annum [43]. Local production of Euro I and Euro II Trucks/ Prime Movers have been started by these units. The domestic truck manufacturing industry produced 5200 trucks in financial year 20006/07.

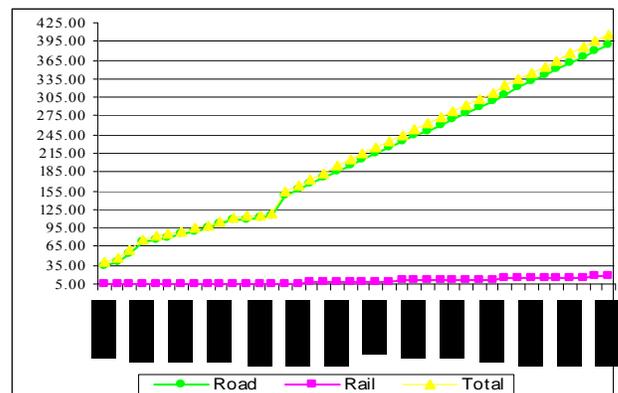


Figure 7, Freight6 demand projections (2008-2030) based on historical data (1990-2008) using time series model.

Table 1:- Freight6 and trucks demand forecast (2008-2030) based on historical data (1990-2008) using time series model.

Year	Million Ton KM	No of Trucks Required
2005-06	135,480	293,000
2010-11	206,430	440,000
2015-16	252,050	628,000
2025-26	349,800	1,152,000
2030-31	388,260	1,490,000
Annual Growth rate		
05/06-10/11	7.79%	
10/11-25/26	5.05%	

Table 2:- Trucks demand forecast (2008-2030) based on historical data (1990-2008)

Period	Truck			Investment (Rs. Billion)
	Required Fleet (1000 unit)			
	New	Renew	Total	
2006-10	146	122	269	570.1
2011-15	189	122	311	660.1
2016-20	236	204	440	934.9
2021-25	287	293	580	1,231.10
2026-30	338	314	652	1,383.50

5 Conclusion

Pakistan Geo-Strategic location dictates that emphasis on the road freight sector in order to extend the facilities at its ports to other countries, especially the Central Asian States, can make it a regional hub for international trade by integrating it with the international transport system. Increasing trade volumes, both at the domestic and regional level, demands this sector to upgrade and equip itself with fleet meeting TIR conventions. Thereby enhancing efficiency by reducing the cost to the economy incurring in the form of road damages, higher fuel costs.

An efficient trucking system is a pre-requisite to become a regional trade hub, for Pakistan. Hence the trucking fleet must be modernized in order to facilitate expanding trade activities and overcome losses arising out of sector inefficiencies.

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