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FINAL REPORT

NTRC Study on Freight Transport (Trucking) in Pakistan

NTRC-338, June,2022

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Table of Contents

List of Figures

List of Tables

Executive Summary

The objective of this study is to reform and promote an integrated, enduring, and sustainable modernization of the trucking sector in Pakistan with a holistic approach, instead of dealing with each subject in isolation.

The proposed policy framework will provide for the encouragement of fleet operations through incentives, which will improve the scale of operations, and equipment and ensure better returns to the operators.

A checklist of the new and emerging challenges of the sector has been made to summarize a set of new and emerging challenges which must find their due place in the present and/or future trucking policies of the government.

Table E-1: List of New and Emerging Challenges of the Trucking Sector

Sr. No.	Challenges	Enablers and Facilitation
1	Long-term planning of the sector with clear institutional responsibilities	Designation of the lead agency in the government, improved statistics on trucks and road freight movement trends
2	Create and expand domestic demand for heavy freight vehicles	Appropriate tariffs, improved product quality, improved affordability of consumers
3	Encourage manufacturing and export of heavy commercial vehicles	The paradigm shift from assembling to manufacturing, competitive prices for entry to the new market
4	Rationalize fiscal and monetary measures for the promotion of the truck freight transport sector	Reduced GST rates and minimum taxes on the export of the vehicles.
5	Remove sector externalities and inefficiencies and encourage fleet modernization	Promote vehicles safety and performance standards, limit the import of second-hand and under-performing vehicles
6	Attract investments in all modes of land freight transport	Encourage investments in railways to reduce the burden on the road freight transport
7	Improve efficiency and environmental performance of road freight vehicles within the country and across the region	Develop and implement fuel improvement program in the country, enhanced vehicle emission standards
8	Extend credit facilities and financial services at concessional rates to the road freight transport sector	Encourage fresh entry into the sector and promotion of employment opportunities, multiplier effects on the economy

Sr. No.	Challenges	Enablers and Facilitation
9	Ensure long-term stability of the government policies in the sector	The time horizon of the policy should be 3-5 years with normal annual reviews
10	Improved and effective coordination at all levels in the government for efficient operations of the road freight transport	Functions falling outside the jurisdiction of the federal government should be financially supported for the policy to be successful

Developing the trucking industry is essentially a task for the benefit of the private sector. The government needs to create appropriate framework conditions. The industry's role in developing transport logistics and the government's role in creating an appropriate framework for modernizing trucking require continued cooperation and dialogue between the parties.

Transport, especially road transport, tends to create negative externalities in the form of environmental impact, safety hazards, and damage to infrastructure. Inherent to the nature of externalities, the ensuing costs are not shouldered by those who have caused them and are not easily recouped by a pricing mechanism. While this may not affect competitiveness in the short run, the long-term effects will be reflected in the increase of cost items that affect overall competitiveness (for instance, the cost of road accidents on average costs for 1% of a developing country).

While non-compliance with existing regulations – especially safety regulations – may create short-term benefits in the form of lower transport costs and prices, lax enforcement is not a policy option. The government's role in the trucking industry is to make a longer perspective to ensure sustainability and long-run cost efficiency.

It is recommended that action to support the development of the trucking industry be non-intrusive and focused on measures to enforce existing legislation for drivers' training and licenses, and road safety requirements. Registration of trucking firms by a Federal Authority is recommended to mainstream those operating on the verges of legality if any.

The major drivers of transport costs are vehicle capacity (economy of scale) and utilization. Larger vehicles are cheaper to operate on a per-ton basis as compared to small trucks. They are more efficient in terms of fuel consumption and fewer emissions per ton than small trucks.

The country needs new trucks and specific semi-trailers as a priority. New full-size semi-trailers can consume less than half the fuel on basis of a ton-kilometer. Until Pakistan can upgrade its trucking fleet, it will be a comparative disadvantage in transport costs from the farm gate to processing or export. A move to semi-trailers is

a critical factor in achieving economy of scale and reducing unit costs, especially in the agriculture sector. Recognition of semi-trailers as transport vehicles is urgently needed.

Import duties on new trucks need to be minimized to encourage fleet renewal. The Federal Board of Revenue is responsible for fixing duties and taxes; the duty structure needs to be such that the ability to purchase an efficient truck with a high payload is not being prevented by taxes.

It is observed that forwarders do not consider roads as a constraint, particularly not on the main corridor. In contrast, roads linking to the corridor are generally considered to be in poor condition. Operators expressed a preference for national highways, rather than motorways. Motorways are avoided because of toll charges and strict enforcement of legislation concerning drivers' licenses and axle load limits. The financial advantages of using national highways instead of the faster motorways, while contributing to short-term logistics efficiencies, may not be sustainable in the long run.

Tolls and congestion taxes (and bans on freight transport on particular roads) can be for all times or just for some times of the day or week, or there can be higher charges in busier periods. If tolls are to be imposed, electronic toll collection can avoid the generation of additional emissions that would otherwise result from stop-start traffic and vehicle idling when traffic banks up before manual toll collection points and such technology can be financed out of the tolls.

Access to formal finance especially for the informal part of the industry is a very important aspect that needs to be looked at if the industry has to reshape and cope with the emerging situation that demands a modernized and adequately powered fleet. Incentives, special schemes, and investment injections from the government in this sphere are essential. Competition aspect in this area would mean ensuring access to every eligible company without any preferential treatment tilted towards any specific company.

1 Introduction

1.1 Transport Sector of Pakistan

A well-functioning transport sector is a prerequisite for a country's development. Transport is a key driver of socioeconomic development. Transport allows people to access jobs, markets approach social interaction, education, and other services, enabling people to rise out of poverty and overcome social exclusion. Transport adds value to goods brought to markets, links rural areas to cities and global supply chains, driving national and regional economic development.

An efficient and well-maintained transportation system serves as the backbone for all economic activities in a country as it moves goods and people throughout local, provincial, national, regional, and international economies in a safe, timely, and reliable manner.

National integration of the country enhances as transport links rural areas to cities and global supply chains add value to goods brought to markets, provide direct employment driving economic development. In Pakistan, the following transport sub-sectors are recognized[1]: -

i. **Road transport** includes the federal, provincial, and district road infrastructure (including passenger and freight terminals), road transport vehicles, transport operators (owners, operators, and drivers), and road users. Road transport services are classified into public transport and private transport.
ii. **Rail transport**, which is primarily provided by Pakistan Railways and increasingly through dedicated companies, includes the rail network and associated infrastructure, rolling stock, manufacturing and maintenance facilities, dry ports, and other assets and services.
iii. **Air transport**, which includes all civil airports in Pakistan, domestic and international airlines (including the national flag carrier Pakistan International Airlines), terminal service providers, airways, and airport traffic control.
iv. **Maritime transport**, which includes the general port and maritime infrastructure and specialized terminals, as well as shipping lines (including Pakistan National Shipping Corporation).
v. **Pipeline transport**, which includes mainline pipeline infrastructure, including storage terminals and operations.
vi. **Inland waterway transport** includes the terminal and navigation infrastructure, the waterway, ferry, and freight services.
vii. **Urban Transport and Multi-modal logistics** are identified as cross-cutting sub-sectors, where several modes of transport need to cooperate to provide mobility for passengers and movement of freight. Urban transport covers all transportation in towns and cities in Pakistan, including transport infrastructure, public transport

[1] *National Transport Policy of Pakistan 2018, Government of Pakistan, Ministry of Planning, Development & Reform, Islamabad*

(operators), private sector transport, non-motorized transport, and transport management. Multi-modal logistics covers the trade and transportation facilitation services to move goods utilizing supply chains, including transportation and warehousing services, for both domestic and cross-border freight movement.

Gross Domestic Product (GDP) is an important indicator of a country's economic power. In 2020, Pakistan's gross domestic product amounted to around 262.8 billion U.S. dollars. The transport sector contributes 13% of the GDP and accounts for 5.4% of the nation's total employment. This highlights the importance of the transport sector in Pakistan's economy[2].

The literature review reveals that issues hampering the transport sector in Pakistan can broadly be defined as follows:

- Fragmentation of the transport sector; responsibilities for planning and development of transport infrastructure are divided among several ministries in the federal government, thus lacking coordination.
- Development of the transport sector has been unbalanced; Pakistan has a significant railway network but has not been successful in capitalizing on its role as part of an integrated national transport network. The railway network totals 7,791 km. Rail has a 2% market share of the freight market, and 5% of the passenger market. This is primarily due to underinvestment in railway infrastructure, operations, and human capital.
- Investments are allocated to projects in the transport sector without attention to long-term strategic goals.
- The poor condition of safety for all road users; lack of a coherent institutional framework, and legislation such as the Motor Vehicles Ordinance 1965 and National Highway and Safety Ordinance 2000, are outdated and need up-to-date legislation.
- The local logistics industry is underdeveloped and does not provide cost-effective and integrated modern logistics services. The World Bank's Logistics Performance Index for 2018 ranks Pakistan at 121 among 160 countries for the quality of trade, transport infrastructure, and quality of logistics service providers.
- Poor hinterland connectivity limits the potential of Pakistan's ports. Karachi Port handles approximately 60% of all of Pakistan's seaborne traffic, with 39 million tons of cargo in 2016-17, including nearly 2 million TEU (Twenty-foot equivalent unit) container traffic. Port Qasim handled 27 million tons of cargo, including approximately 1.2 million TEU in 2016-17. While infrastructure and operations at the seaports are generally satisfactory or are being improved, poor hinterland connectivity causes long delays.

[2] *Pakistan Economic Survey 2020-21, Ministry of Finance, Islamabad*

In view of the challenges faced by the transport sector, a comprehensive national transport policy was required to guide the overall development of the transport sector in the mid to long-term. A National Transport Master Plan was also needed for the implementation and delivery of the transport policy.

The Government of Pakistan approved Pakistan's Vision 2025 in 2014, a framework to set the direction for the development of the country. Vision 2025 divides its challenges and goals into a set of seven pillars identified as the key drivers of growth. Pillar-VII relates to the Modernization of Transportation Infrastructure & Greater Regional Connectivity. Under its mandate, the Ministry of Communications had a leading role in achieving the goals set in Pillar-VII of the vision. The goals set for the road transport sector were the establishment of an efficient / well-integrated transport system, reduction in transport costs, enhancement of road density from 0.32 to 0.64 Km / $Km^{2,}$ and development of Pakistan as the hub of sub-regional connectivity[3].

The Federal Cabinet approved the National Transport Policy in November 2018. The National Transport Policy covered railways, roads, ports & shipping, aviation, and logistics services and attempt to create a safe, efficient, and sustainable transport system to realize Pakistan's Vision 2025. The Policy provides a vision, governance principles, policy objectives, directions for each subsector, and implementation arrangements. Other than this a "National Freight and Logistics Policy (NFLP)" has also been recently approved by ECC in principle for implementation[4].

1.2 Population

The principal indicator that drives the demand for transport in any country is population. Pakistan's population currently stands at just over 216 million and is expected to grow to over 300 million by 2040. This immediately will increase the travel demand. In addition, currently, 37% of Pakistan's population lives in urban areas, but according to United Nations World Urbanization Prospects published in 2019, indicated that by 2040, 46% of Pakistan's population will live in urban areas, with nearly 75 million living in the 10 largest cities. Figure 1.1 and Figure 1.2 present the projections of Pakistan's urban and rural areas, including the relative size of Pakistan's top 10 cities[5].

[3] *VISION 2025, Ministry of Planning, Development & Reforms, 2014, Islamabad*
[4] *National Freight and Logistic Policy, Ministry of Communications, April 2020, Islamabad*
[5] *United Nations World Urbanization Prospects 2019*

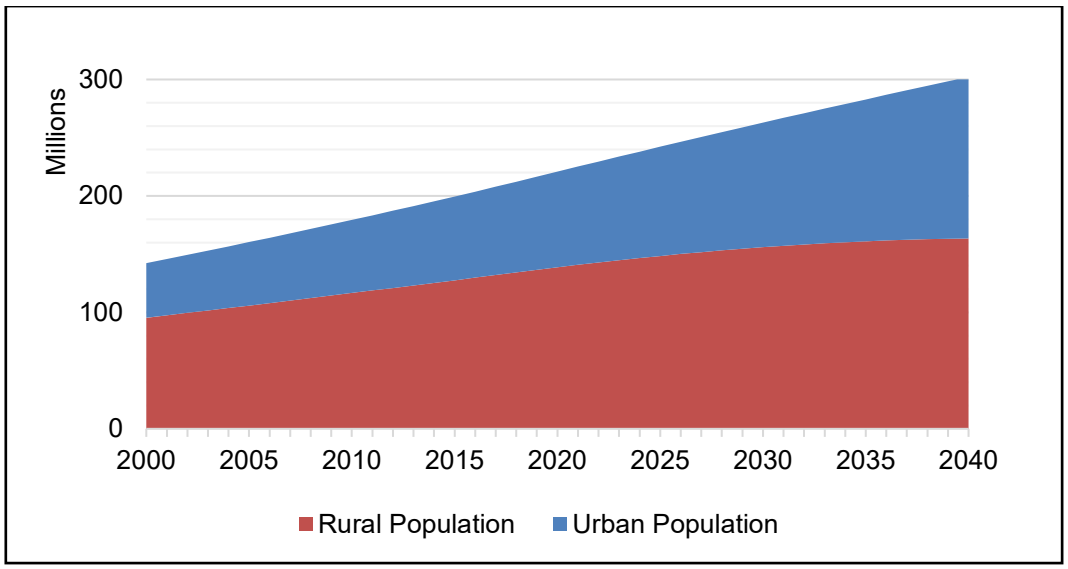


Figure 1.1: Urban, Rural, and Total Population Growth up to 2040

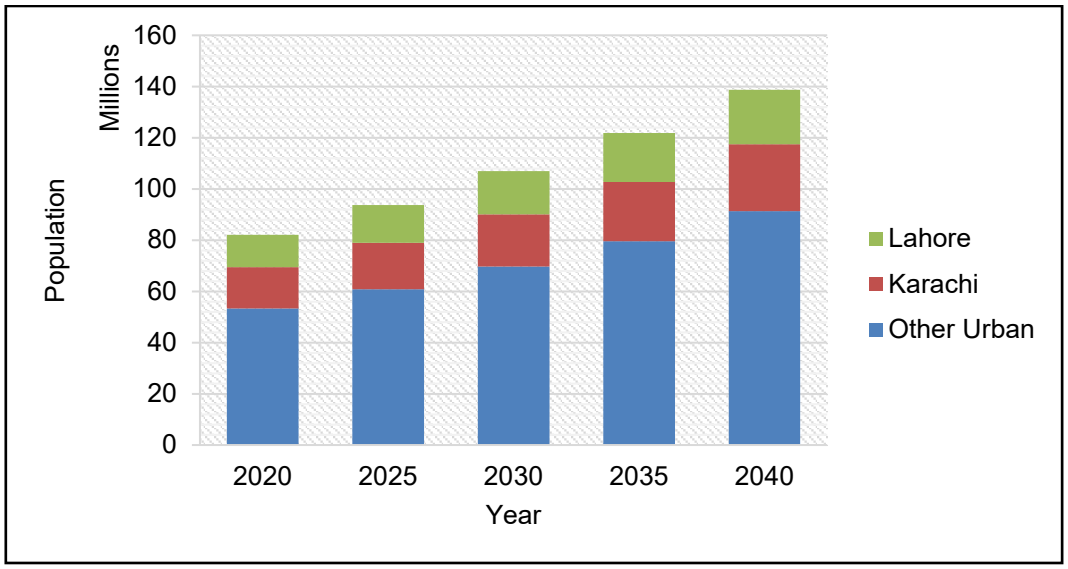


Figure 1.2: Urban Population Projections up to 2040

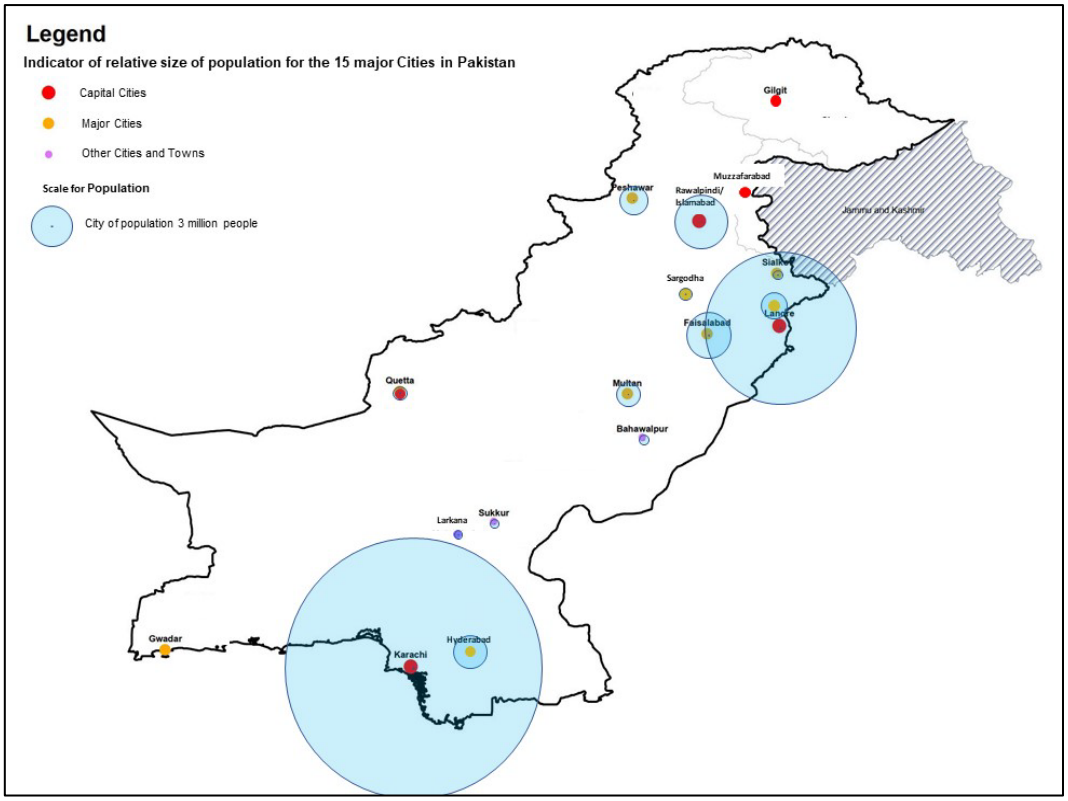


Figure 1.3: Relative Size of Population of 15 Major Cities and Gwadar

1.3 Economy

The second driving factor for transport is the economy. Since 2000, Pakistan's GDP has grown at an average of around 4.5% per annum, peaking at 9% growth in 2005.

The IMF has forecasted Pakistan's annual GDP growth to 2023 when it is expected to grow at 5% per annum nationally. In the current FY 2021-2022, however, a significant slowdown is anticipated due to the COVID-19 impact on the economy. A contraction of 1.5% for 2020 and 0.1% growth is considered for 2021 with a forecasted uptake of the growth to 4.9% in 2022-2025. Considering the GDP per capita forecasts of the World Bank, with appropriate reforms taking place, Pakistan will be able to embark on a growth path not too dissimilar to what China experienced from 1981 to 2011 or the Republic of Korea and Malaysia from 1960 to 1990. This would set a very significant growth path for the whole of the economy, with a large impact on the transport sector[6].

Annual GDP Growth

Year	Annual Growth
2020-22	0.0%
2022-25	4.9%
2025-30	4.7%
2030-35	4.5%

Source: IMF and estimated on historic data

[6] *Pakistan Overview: Development news, research, data, the World Bank*

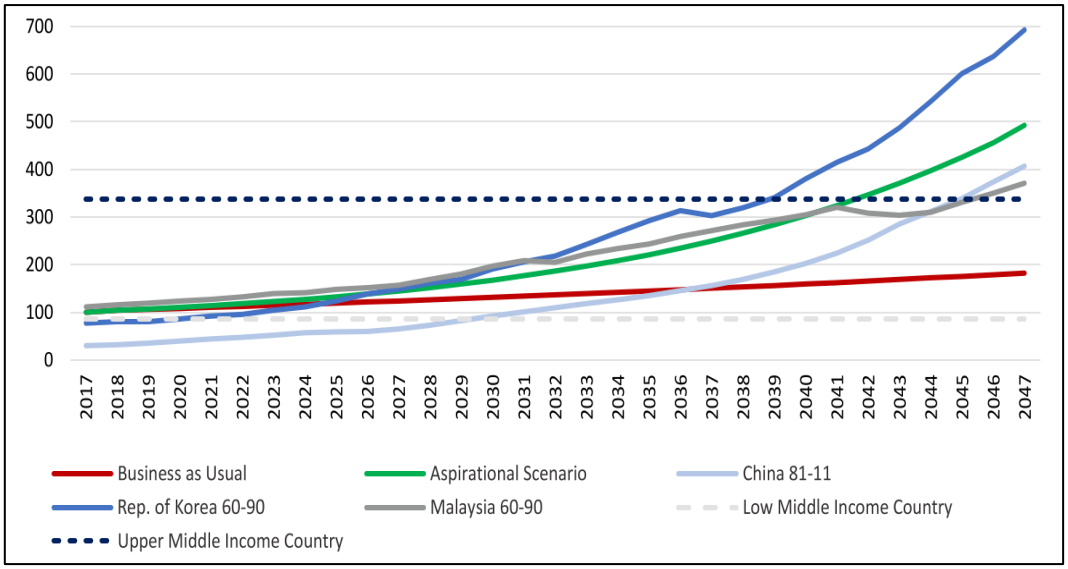
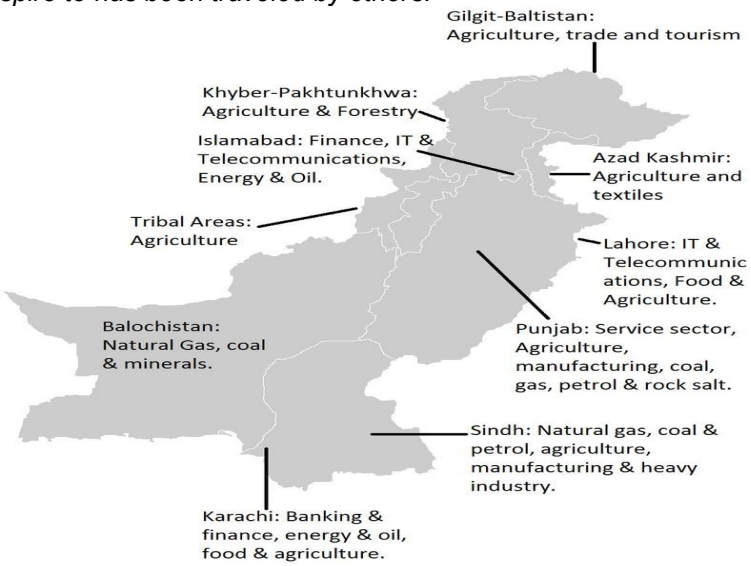


Figure 1.4: GDP per Capita Relative to Other Countries Historic Growth

Source: World Bank. 2019. Pakistan@100: Shaping the Future. The path of high and sustained growth that Pakistan can aspire to has been traveled by others.



1.4 International Context for Regional Transport

Pakistan is strategically placed in the Central and South Asia context and contains several key corridors defined by ECO, CAREC, the UNESCAP, and most recently by the specific China Pakistan Economic Corridor (CPEC) initiative. These are best illustrated with diagrammatic representations of the internationally (Asian Highways) defined links into and through Pakistan. Figure 1.5 and Figure 1.6 present a graphical representation of the commonalities and the differences defined in these international corridors. These international corridors indicate the actual potential for regional travel along these key routes and form part of the national corridor definition.

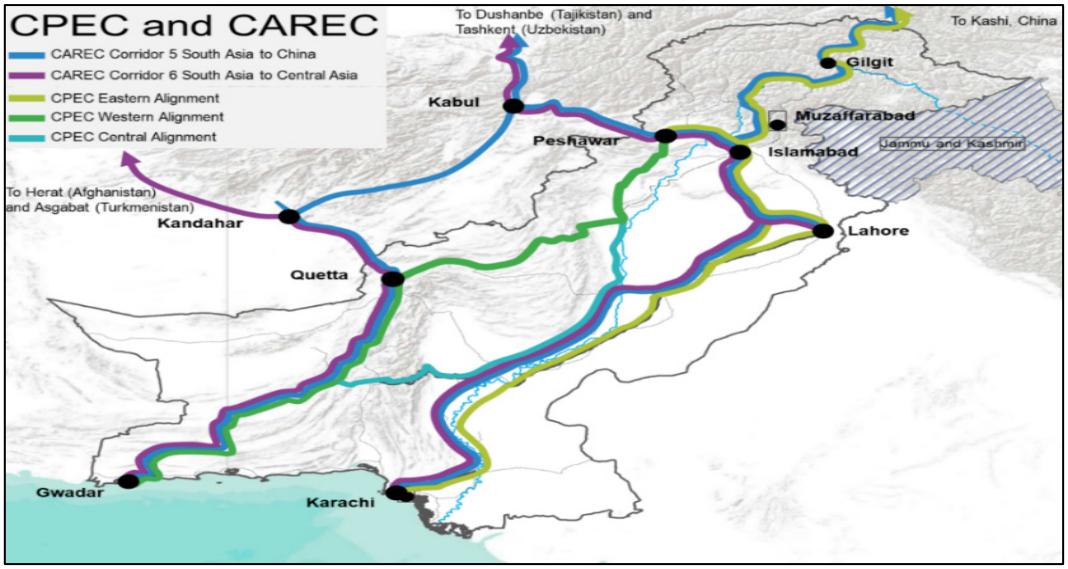


Figure 1.5: CPEC & CAREC Corridors

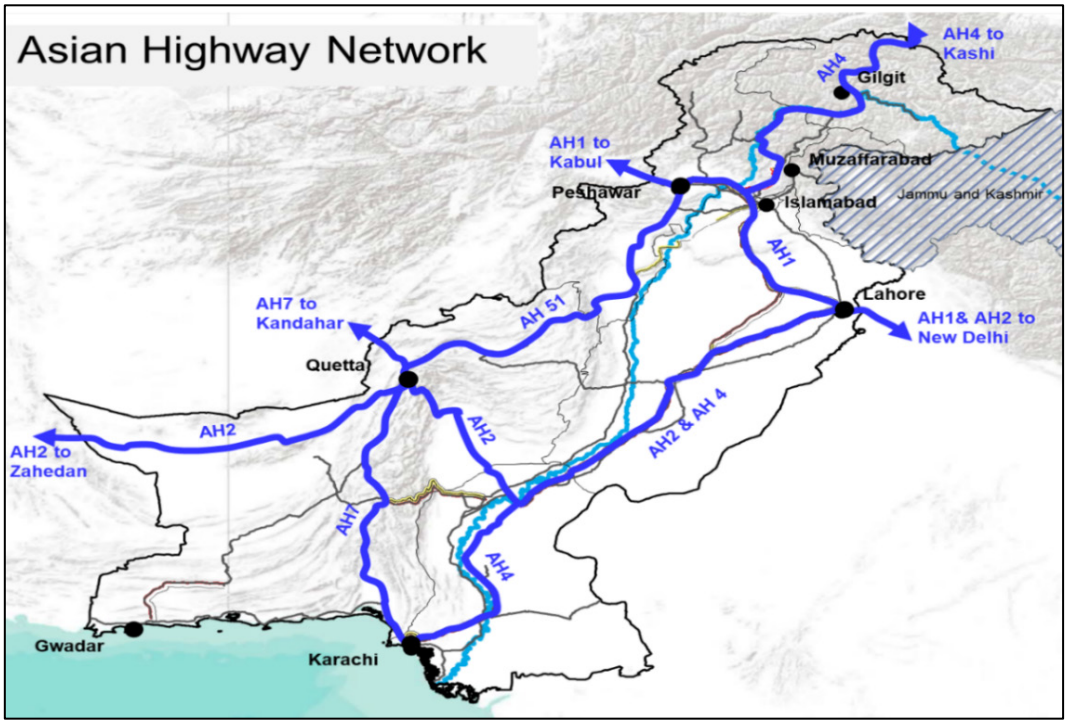


Figure 1.6: Asian Highway Network

1.5 Road Infrastructure

The geography of Pakistan leads to four levels of road transport flows. International transport through international gateways (Cross Border Points). Inter-city via the strategic federal and provincial network, and intra-city urban and rural transport. Inter-city passenger and freight transport in Pakistan are primarily via road which accounts for 94% of all passenger kilometers (pkm) and 95% of freight ton kilometers (tkm). Urban transport is also dominated by the road sector. Lahore, Islamabad-Rawalpindi,

Multan, and Peshawar have developed Bus Rapid Transit (BRT) systems, whereas in Karachi it will be operational by 2022[7].

Road infrastructure is the backbone of Pakistan's transport system. The 12,000 km long national highways and motorways network, amounts to a mere 2.4 percent of the country's total road network. From only around 50,000 km in 1947, Pakistan's current road network is now more than 500,000 km. Road density is often depicted as an indicator of a country's prosperity and development level. With the up-gradation of road inventory by the National Transport Research Centre (NTRC), the current road density in Pakistan is 0.63 km/km^2. Road infrastructure has become the most important segment of the transport sector in Pakistan. Over the past ten years, road traffic (both passenger and freight) has grown significantly faster than the national economy[8].

Pakistan has succeeded in establishing a comprehensive network of national highways that provide primary mobility between cities and to most points of economic development. These highways are supplemented by motorways and expressways to provide a high level of service to long-distance road traffic in an efficient and delay-free manner on routes with high traffic flows. Influencers of current policy in the roads sector have been the CPEC and CAREC initiatives to encourage intra-regional trade and transport, as well as the recent initiatives to define economic corridors internally as well as internationally. Figure 1.7 shows the National Highway and Motorway network as well as the more important links of the Provincial and Territory networks.

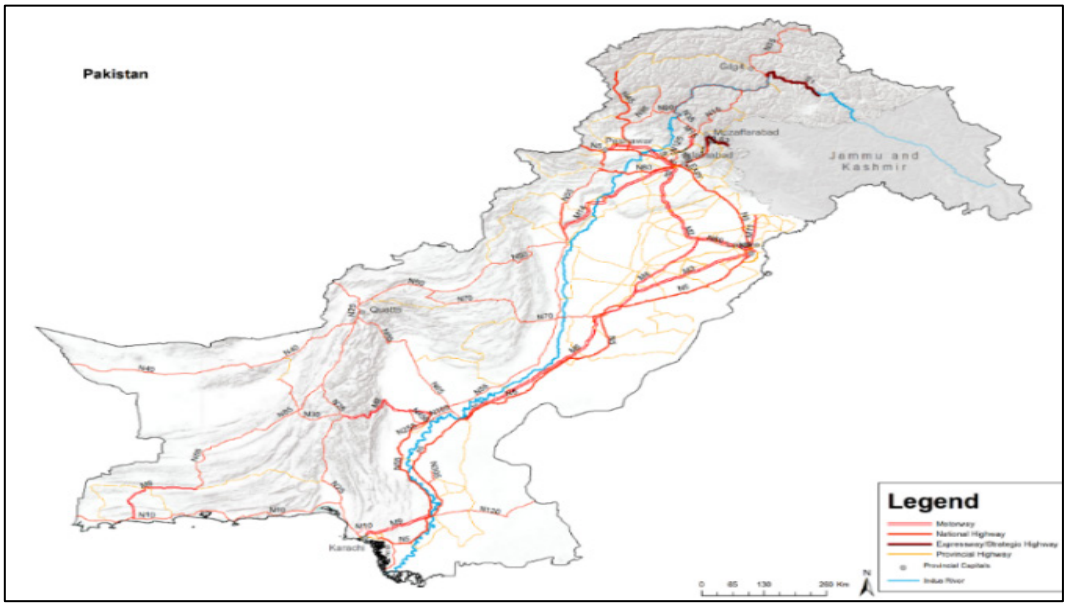


Figure 1.7: National Highways and Motorways Network

Road transport (passenger & freight) is generally acknowledged as key to economic development in any country, supporting all socio-economic development by enabling

[7] *Draft National Transport Plan 2020, Ministry of Planning, Development & Special Initiatives, Islamabad*
[8] *Digitalization of Roads Directory of Pakistan, December 2020, NTRC Pub. No. 333, Islamabad*

mobility and access for people, goods, and services from the local level within the rural context, through inter-town and intercity links within the country up to the major links internationally.

1.6 Freight Transport

Transport demand figures worked out under the National Transport Plan 2020 show that the existing freight demand of the country is 195 billion ton-kms in 2020, out of which 95% i.e., 185.25 billion ton-kms of freight moved through roads in trucks of different types. In the previous planning periods, road freight transport has increased its percentage in the freight transport market as no significant growth was found in rail freight transport.

The role of Pakistan Railways (PR) in freight haulage is on the decline from the very outset. One of the major factors for this decline is the cross-subsidization of passenger traffic from freight. In 2009-10, PR carried 58.97 million passengers and only 4.6 million tons of freight (Government of Pakistan, 2011). The priority is given to passenger service rather than freight which has resulted in a decline in freight volumes. In the 1950s, its share in freight haulage was over 86% which has now decreased to 4% only (PBS, 2008). From 2005 to 2010 Pakistan Railway carried around 6.2 million tons of freight. Figure 1.8 shows the average tonnage carried by Pakistan Railway.

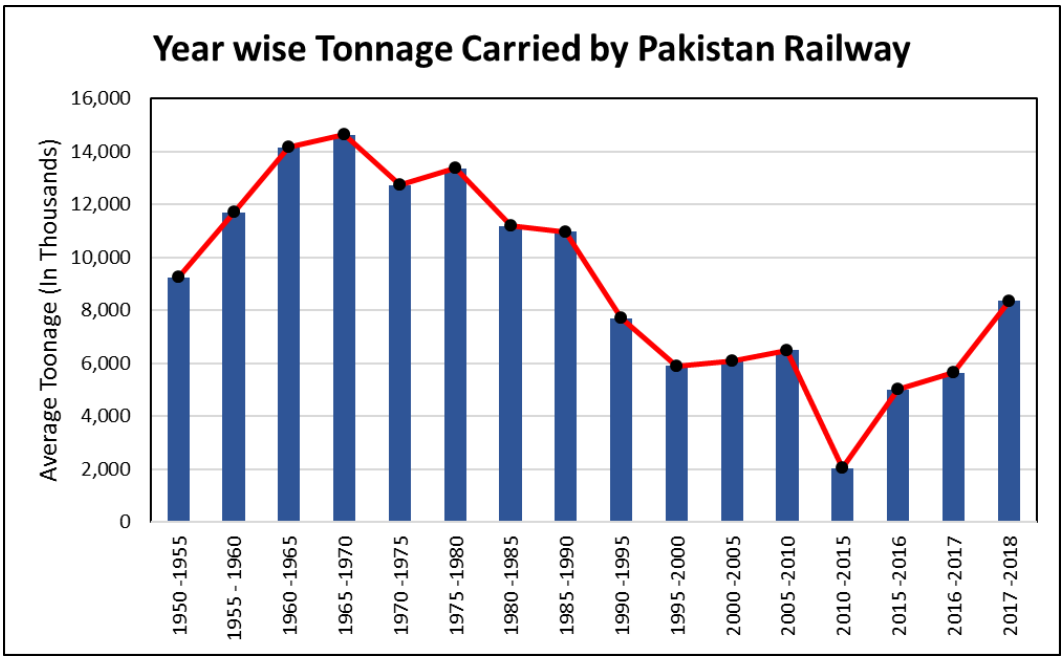


Figure 1.8: Average Tonnage carried by Pakistan Railway

It should be noted that till the late 80s railway freight carried major tonnage, however, its service deteriorated, and tonnage carried by railway decreased. According to the Planning Commission (Government of Pakistan, 2011), the productivity of Pakistan Railways freight operations was only one-eighth and one-third of China and India,

respectively. This is mainly due to the failure and inefficiency of railway freight operations.

1.7 Road Freight Industry

At present, the road freight industry is operated by privately-owned companies and individual owners and operators. It has some organized representative organizations such as the Fleet Operators Association of Pakistan, United Goods Transport Alliance Pakistan, Karachi Goods Carriers Association, the Punjab Goods Transport Association, and the Pakistan International Freight Forwarders Association. These associations represent well-capitalized professionally oriented truck operators.

However, still, there are many small operators consisting of a family or a small group of people operating a single truck. This portion of the market tends to be less well-capitalized, with the truck used often of advanced age, which may be adapted to carry loads well above the manufacturer's rating and the legal limit for the vehicle concerned.

Road freight vehicles are required to apply to the relevant Road Transport Authority for a permit, which is generally granted if the board is satisfied with the potential for safe operation by the applicant. The flexibility of door-to-door services makes freight transport by roads attractive for all shorter distances and even for long-distance transport of certain non-bulk commodities, although rail services could be quicker and cheaper over longer intercity distances.

1.8 Background of Road Freight Industry (Trucking) in Pakistan

In the 1970s and 1980s, the trucking industry of Pakistan was dominated by Bedford trucks which has two axles, ninety-eight horsepower (HP) engine, and a payload capacity of seven tons. Later, Bedford trucks began to decline, and demand for new trucks such as Hino, Nissan, Isuzu, and Mercedes-Benz, with two and three axles, increased. However, the demand for road freight transport constantly increased in Pakistan in the nineties which has been complimented by the increase in freight transport vehicles and the practice of overloading these vehicles[9].

An assessment of Pakistan’s road freight sector in the early nineties confirmed that it is domestically operating in a highly competitive environment; the overall structure is informal and unorganized. The sector comprises very small fleet owners except for a few organizations that own fleets of more than ten vehicles[10].

A “Trucking Policy” was developed in 2009 to promote the formalization of the trucking sector as an industry and to encourage improvement in several practical and administrative aspects relating to vehicles and drivers, as well as compliance with

[9] *Pakistan road freight industry: An overview, J L Hine and A S Chilver, TRRL Research Report 314, UK 1991*
[10] *Road freight industry Tariffs: NTRC – 127 by Alwyn Chilver, TRRL UK 1991*

loading limits and other safety legislation. These aspects have never been implemented[11].

The World Bank 2013 mentioned that over the past 20 years, revenues per kilometer have decreased in real terms by 1.4 percent on average per year. Many trucks operate long hours and carry excessive loads while traveling at low speeds of 20–25 kilometers per hour compared to 80–90 kilometers per hour in Europe. Road freight takes an average of 3–4 days between ports and the north of the country (1,400–1,800 kilometers), which is twice what it takes in some other countries of Asia and Europe. The Pakistan trucking industry is extremely fragmented, with a large number of small operators and very few large and medium-sized operators. Freight rates are one of the lowest in the world. To maximize profits in this background, the truckers resolve to overload which in turn has a high cost because of the infrastructure's rapid degradation[12].

According to the PILER, the regulatory and governance mechanisms of road freight transportation have not been brought under a unified, central authority. Vehicles are registered by provincial Excise and Taxation Departments, authority for license issuance and renewal lies with provincial Home Departments, while grant/renewal of route permits and vehicle fitness certificates are issued by provincial Transport Departments that work under provincial Transport Authorities. The provincial Transport Authorities are responsible for the administration and enforcement of the Motor Vehicles Ordinance, 1965 & Motor Vehicles Rules, 1969 and their functions include planning and issuance of route permits[13].

Another study conducted in 2016 referred that an overwhelming majority of firms form the informal part of the trucking industry in Pakistan. This segment gives the trucking industry its fragmented shape and it faces a lot of problems and unhealthy competition to survive. One of the major problems faced by this informal part of the sector is access to formal finance. These small operators are unable to secure finance for increasing the number and capacity of their fleet from formal financial institutes and have to opt for the informal market for finance. The industry does not face any competition issue in terms of barrier to entry as there is no barrier to entry or exit. There is no limit on the number of vehicles or type of vehicles in a fleet to operate in the market. The fragmented nature of the industry has made the trucking companies price takers in the market rather than price givers, this argument is supported by the fact that freight rates in Pakistan are amongst the lowest in the region.

However, it is an evolving industry that is and will experience change. The number of middle size companies and large companies is growing suggesting a trend for the

[11] "Trucking Policy 2009", developed by MoIP&SI and the Engineering Development Board, 2009 Ministry of Industries, Production and Special Initiatives
[12] Greening Growth in Pakistan through Transport Sector Reforms • http://dx.doi.org/10.1596/978-0-8213-9929-3, Ernesto Sánchez-Triana, Javaid Afzal, Dan Biller, and Sohail Malik, 2013, the World Bank
[13] Road Transport Workers in Pakistan, 2006, Zeenat Hisam, Pakistan Institute of Labour Education and Research, Karachi

future and with it some possible competition concerns that may arise. The presence of a dominant government sector player i.e., NLC, and the alleged preferential treatment, exemptions in form of taxes, etc. received by it create an anti-competitive environment for the private sector companies and hamper their growth. A level playing field shall be created for all players of the market by ensuring competition is exercised in letter and spirit in the bidding process.

Most of the vehicles are not insured as insurance companies charge high premiums for individually owned public transport vehicles due to rising incidences of arson and looting. The informal employment contract is based on the residual income principle, with the worker retaining whatever amount is left after paying a contractually fixed amount to the vehicle owner and gasoline charges. In addition, it has been reported that the governance issues are compounded as the provincial/regional transport authorities plan, devise and enforce rules/legislation independent of each other and do not function under a unified federal policy-making body[14].

The trucking sector in Pakistan is still a semi-formal sector and credible information on the sector is hard to find. There is a discrepancy in the number of total trucks in Pakistan with different studies quoting different figures. There was a total of 223,152 registered trucks as of 2011, it was estimated that only 93% of these are plying on the roads of Pakistan, the rest of the 7% being inactive due to poor condition. Another study quotes that Pakistan has 293,000 commercial cargo trucks in operation. The discrepancy in figures is reflective of the fact that there is a lack of accuracy in the available data due to the informal nature of the trucking sector. There is also a lack of research on the road freight transport sector of the country[15.]

Another issue that is hampering the performance of the road freight sector is the overloading of trucks. The recent study published by NTRC mentioned that overloaded trucks have almost doubled during the 1995-2020 period. Now around 80% of the trucks plying on National Highways are overloaded compared to the legal load limits prescribed in NHSO-2000, Schedule-VI. The average load carried by trucks of a particular category (axle configuration) on National Highways is much higher than allowable legal load limits, ensuing high damage factors, causing rapid deterioration/failure of roads, much before the completion of design life. 3-axle rear tandem trucks are the most overloaded type with 91% of them being found to be above the permissible load limit. Whereas overloaded trucks are not allowed on the motorways due to strict enforcement of relevant laws and thus only around 10% were found to be overloaded[16].

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[14] "Study on assessment of axle load management system in context of cross border trade (CPEC, Pak-Afghan border, Pak-Iran etc.)" a report for CIU – Trucking PAKSTRAN, 2016, Islamabad

[15] Road Freight Transport Sector & Emerging Competitive Dynamics report 2016, United Nations Industrial Development Organization (UNIDO) in collaboration with the International Trade Centre (ITC) and World Intellectual Property Organization (WIPO). Islamabad, Pakistan

[16] NTRC Axle Load Survey on National Highway & Motorway network of Pakistan, NTRC Publication No. 334, December, 2020, Islamabad

The literature review concludes that the present fleet of trucks and road freight sector is not in a tune with the increasing domestic and international demand. To draw maximum benefit from the geographical location of Pakistan and for becoming a regional trade hub, it is essential to put in place a sustainable policy for the road freight sector of Pakistan taking care of economic, social, and environmental issues relating to this sector.

1.9 Stakeholders

An overview of the stakeholders involved with freight transport in Pakistan is presented in Table 1.1. These stakeholders are identified through experience and research by NTRC for the local scenario dealing with the subject for the last 30 years.

Freight transport in Pakistan has been divided into five (05) sectors and each sector has its unique set of stakeholders ranging from public sector entities to private sector organizations, businesses, and the local community.

Table 1.1: Freight Transport Stakeholders

Sector	Stakeholders
Ports	Port Authorities at Karachi, Gwadar, and Qasim Ports
	Pakistan Customs
	International and local terminal operators
	Federal Board of Revenue
	Karachi Dock Labour Board (working at Karachi Port) and other employee associations in the port
	Private-sector stevedoring companies
	Logistics and Freight forwarding companies as well as cleaning agents
	Exporters and importers, in addition to the business community in general
	Fishing communities
Highways and Trucking	National Highway Authority & Provincial C&W Departments
	Owners and employees of trucking companies (many are sole proprietorships)
	Owners and employees of auxiliary services
	Families and communities where the road transport sector is a major employer
	Logistics and freight forwarding companies as well as clearing agents
	Trucking manufacturing industry
	Pakistan Standards and Quality Control Authority (PS&QC)
Railways	Pakistan Railways

Sector	Stakeholders
	Railways Workers Union
	Dry Ports
	Logistics and freight forwarding companies as well as clearing agents
	Exporters and importers, in addition to the business community in general
Aviation	Civil Aviation Authority
	Pakistan International Airlines
	Management of at least one private airline
Traders	Exporters and Importers, in addition to the business community in general
	Chambers of Commerce & Industry
Cross-cutting	Communities living along the main trade corridor
	Families of those employed in the trade and transport sector (including women and children)

2 The Study

2.1 Requirements of the Study

The objective of the study is to provide a comprehensive overview of the freight industry, particularly road freight (trucking) in Pakistan including its operational and financial aspects. Data collection coverage spread all over Pakistan, comprising main hubs and local / feeder hubs in all provinces, Gilgit Baltistan and Azad Jammu & Kashmir. Detailed requirements of the study are enumerated below:

1) Determine truck fleet population by (a) data collection from registration/excise agencies (b) by make (Bedford, Hino, Nissan, Isuzu) (c) by axle configuration (d) by field surveys and interviews from stakeholders (owners, companies, oil companies (OMCs), bonded operators, etc.) and then analyze the gaps in the gathered data.
2) Determine composition type of fleet based on formal and informal local manufacturing/ assembling (formal - Hino, Isuzu, Nissan and informal like Bedford. Army auctions, etc) as well as directly and indirectly imported and adapted ones. Also, determine fleet modification and renewal (refurbishing) rates (Nos. & %) and costs.
3) Determine fleet characteristics like, (a) ownership type (single, joint, company), (b) acquisition mode (outright purchase, installment, sharing, lease, loan, contract, hired for a period, any other), (c) make (Bedford, Hino, Isuzu, Nissan, etc., separating trucks and truck/tractor-trailers), (d) age (years, kilometrage done, used/ second hand) and (e) any other relevant feature.
4) Analyze investment characteristics, like, capital investment in fleet, body modification, installment/ interest payments, insurance, depreciation, etc. as well as returns on investment (profit) and assign weight to each characteristic. Depreciation shall be based on actual cost (resale/salvage value) accounting for rupee devaluation over time, etc.
5) Carry out financial analysis of operational cost, separating all costs like fuel, wages, maintenance, tolls, taxes, handling cost (loading & unloading/waiting), cargo insurance, and any other and duly assign weight to these costs. Comparative analysis of makes (Bedford, Hino, etc.) as well as per model (age/year) is required.
6) Analyze operational characteristics in terms of usage of the truck by axle type (2, 3 & multi-axle) and make for cargo load/ volume carried, average lead, trip length, turnaround time, annual usage, empty travel, handling time (loading& unloading), the geographic area covered, preferred routes, commodities carried (including preferences), supply of containers, etc.
7) Documentation carried out from registration to operation (including for cargo transportation, bilty, etc.), insurance coverage (for truck, cargo), special freight services, etc.

8) Identify each actor and action in the chain of freight-trucking business and define their role and cost, also, in a matrix form (e.g. consignor, consignee, shipper, freight forwarder, broker/ agent, loader, etc.)
9) Carry out a SWOT analysis of the demand-supply mechanism of the truck freight industry in terms of load surges-declines, fleet availability & suitability and cost functions, etc.
10) Analyze tariff structure, make regional comparison (Iran, India, and China) fare mechanism of the sector, and suggest /develop a competitiveness model on modern lines based on benchmarking criteria.
11) Determine ease of doing business, access to capital for investment, and operation of trucking fleet from private and public sectors (Banks & others). Also, analyze any impact on the industry after trucking was declared an industry in 2007.
12) Identify and analyze key performance indicators (KPI) in the truck freight industry.
13) Evaluate and establish relationships amongst KPIs by assigning weight/ value. Make a comparison with international best practices. Also, determine the adoption of information technology by industry.
14) Based on the data and surveys, evaluate the physical (fleet size, primary & secondary employment) and financial size of the trucking industry.
15) Evaluate the significant role played by the tractor trolleys in the movement of agricultural produce in terms of physical and financial contribution to the freight industry.
16) Analyze legal and regulatory frameworks pertaining to the industry. For example, Federal Motor Carrier Safety Administration is mandated with managing the law and regulations to control trucking in the USA.
17) Comprehensive/ Final Report of the study both in hard and soft form, along with collected data.

2.2 Study Tasks and Methodology

This section of the report discusses the methodology for carrying out the study. The basic approach is to first determine the main objectives of the study and accordingly identify different tasks in order to achieve those objectives. The scope of work is categorized into a total of 13 tasks as specified in Figure 2.1. The methodology adopted for each task is discussed in detail in the proceeding paragraphs of this section.

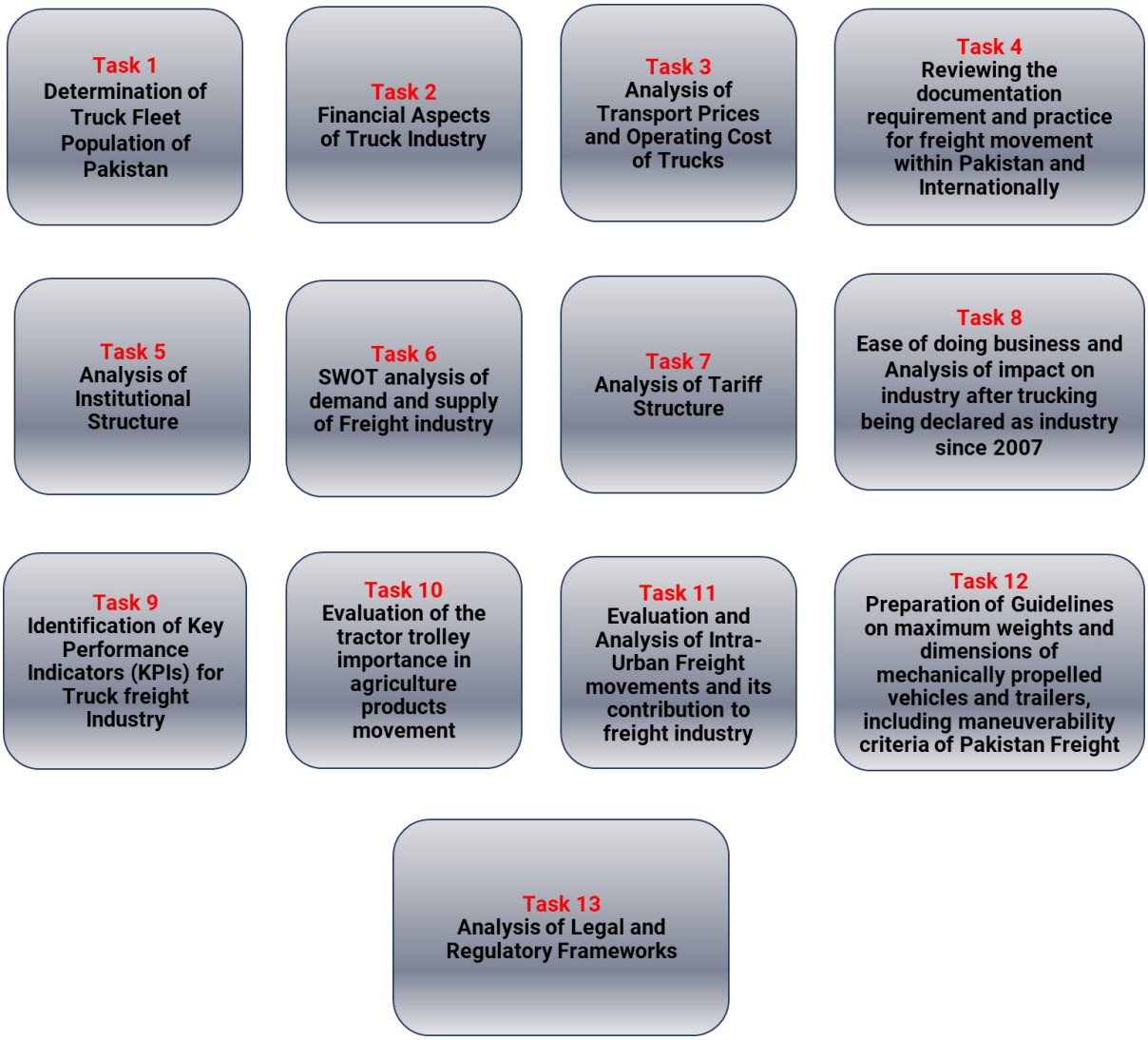


Figure 2.1: Different Tasks for carrying out the Study

2.2.1 Task 1: Determination of Truck Fleet Population of Pakistan

The main objective of this task is to determine the truck population and trucks operating on roads in Pakistan. This task is achieved by extensive data collection and comprehensive field surveys. The data is available with respect to the fleet composition and its characteristics were determined. Figure 2.2 shows the activities for this task.

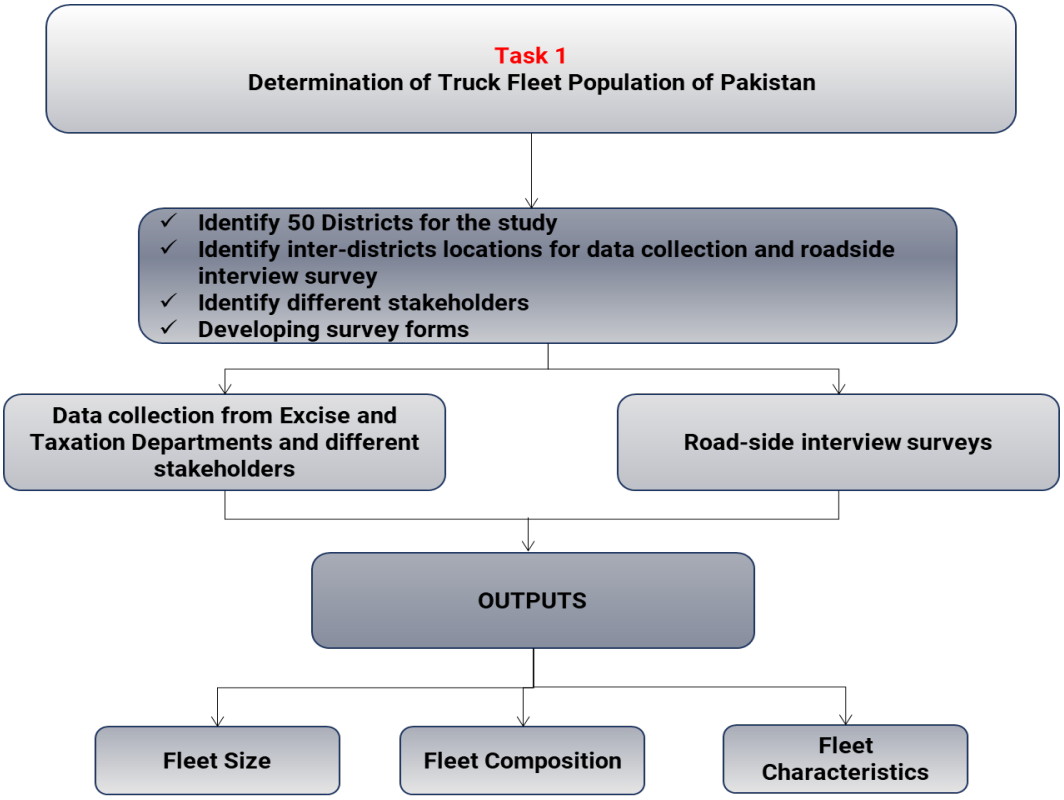


Figure 2.2: Methodology and Flow of Activities for Task 1

50 districts from all provinces, including Gilgit Baltistan and Azad Jammu & Kashmir were selected to ensure that reliable and representative data was collected. The districts were selected in such a way that the districts with the highest trucking movement and far-flung areas with minimum trucks were selected. The proposed 50 districts for the study are presented graphically shown in Figure 2.3.

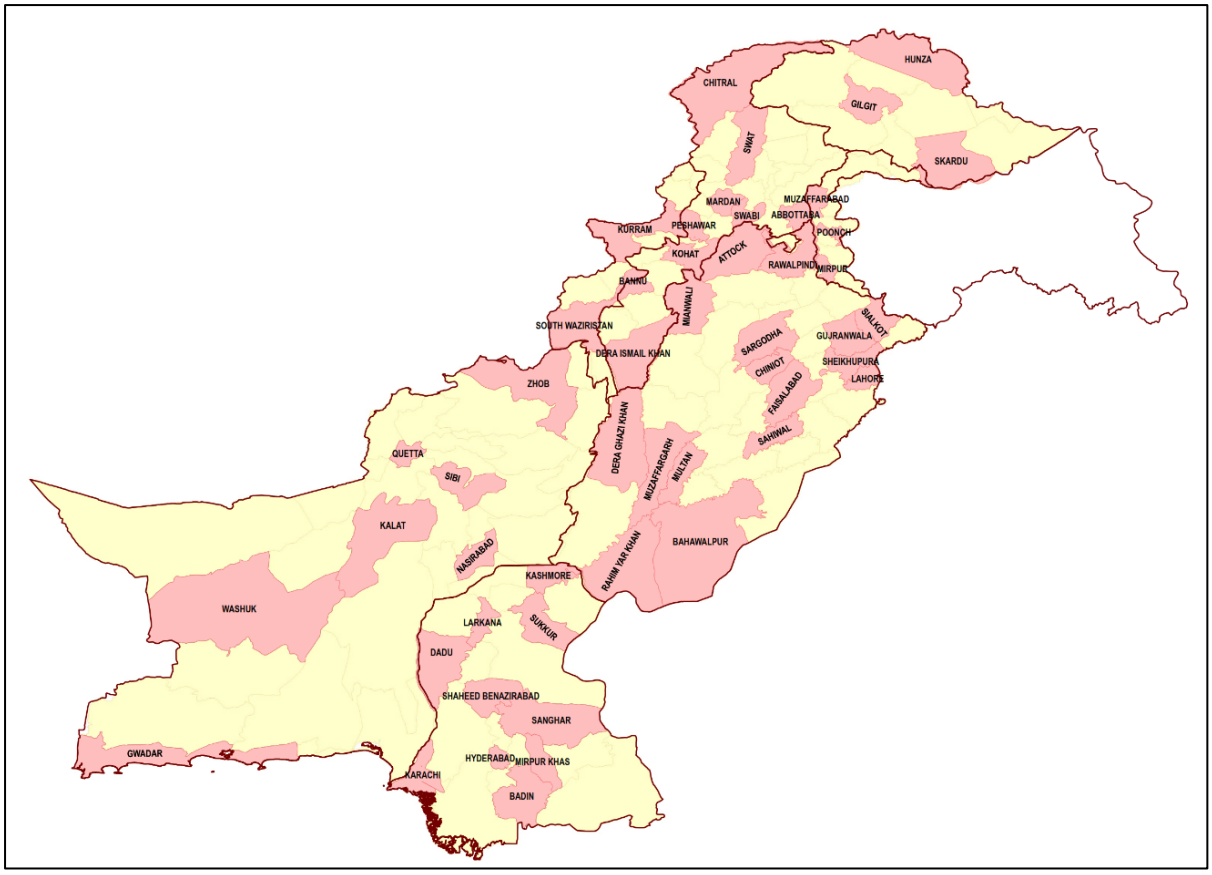


Figure 2.3: Map Highlighting the Suggested Study Districts

After the selection of districts for data collection, the next step was to determine the survey locations for roadside interviews. The locations of the stations were strategically selected in such a way that inter-districts trucking movements can be recorded. In order to achieve that, the routes typically followed by the truck drivers were identified. A pilot survey was performed for Rawalpindi and Islamabad that helped to refine the data collection process for the full-scale study protocol. Based on the feedback from the pilot test, the questionnaire was refined, and a revised final questionnaire was developed. The main objectives of this task were to determine, truck fleet population, fleet composition, and fleet characteristics.

The truck fleet population was also determined by data collection from Excise and Taxation departments in each district. Field surveys and interviews with different stakeholders such as owners/drivers, banks, fleet management companies, bonded operators, importers, manufacturers, and assemblers were conducted. Figure 2.4 shows the sample questionnaire for the Excise and Taxation department.

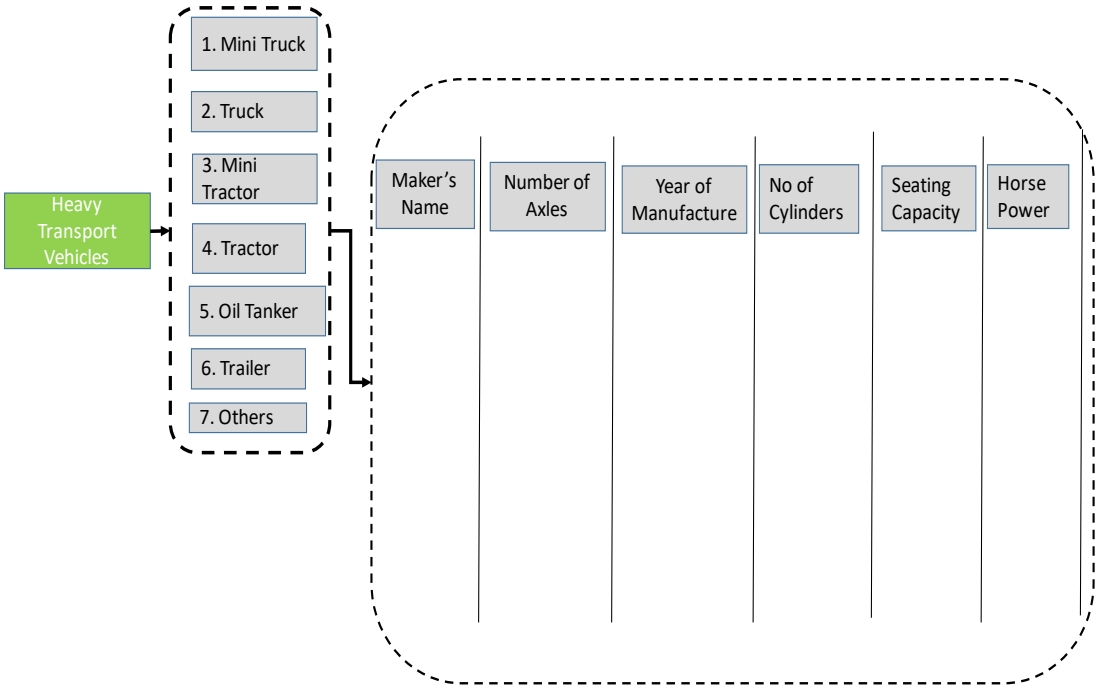


Figure 2.4: Sample Data Form for Excise Department

Data were collected from other sources such as importers, manufacturers, assemblers, banks, and fleet managing companies. A separate set of questionnaires was prepared to gather the data from different stakeholders. The questionnaire was prepared for the owner/driver of the vehicle, trucking companies managing freight on a large scale and companies manufacturing/assembling the trucks. Most truck manufacturers are a member of the Pakistan Automotive Manufactures Association (PAMA). The latest production and sale data of trucks was collected from PAMA. In order to firm up the trucks plying on Motorways, National Highways, and provincial highways, NTRC's Axle Load Survey 2020 data and Country wide Origin – Destination Survey data were analyzed.

2.2.2 Task 2: Financial Aspects of Trucking Industry

The financial aspects of the trucking industry involve the determination of the financial size of the trucking industry and investment characteristics. The financial aspects include the costs associated with the ownership of trucks such as purchase costs, insurance, depreciation, etc. The roadside interviews survey was the main source of data for this task in which a number of questions were asked on the purchase and finance of the trucks. In order to achieve it, data was collected from different agencies such as companies managing fleets on a large scale, banks, and local truck manufacturers and importers. Figure 2.5 shows the flow of activities for task 2.

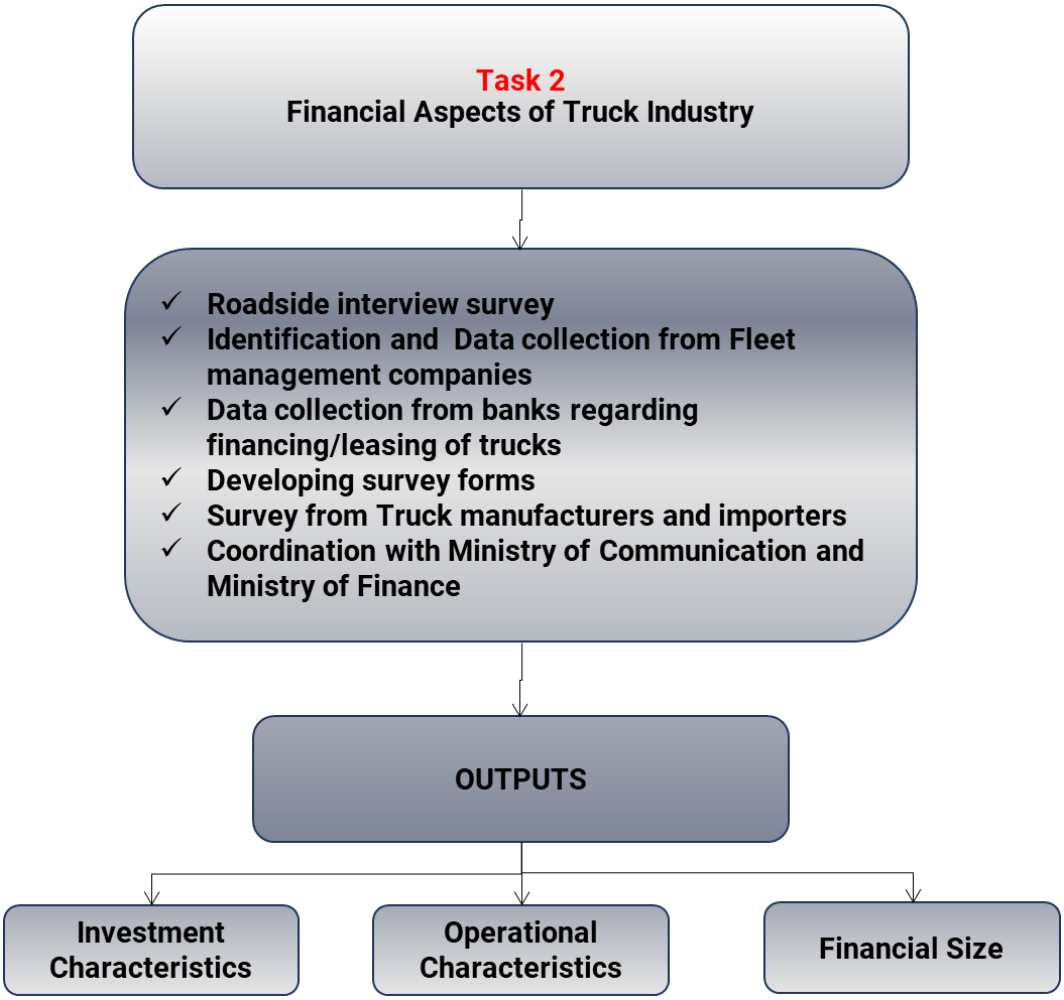


Figure 2.5: Flow Chart for Task 2

Determination of Investment characteristics is one of the main objectives of this task. It includes characteristics such as capital investment in fleet, body modification, installment/ interest payments, insurance, depreciation, and returns on investment (profit). Determination of operational performance and characteristics of freight vehicles is the second main objective of this task. Operational characteristics such as usage of the truck by axle type (2, 3 & multi-axle), annual volume carried, average lead, trip length, turnaround time, annual usage, empty travel, handling time, the geographic area covered, preferred routes, and commodities carried determined in this task.

To determine the characteristics of the empty running of trucks, the drivers were asked not only about their current trip but also about any empty running undertaken during the time between the last loaded trip and the current one.

2.2.3 Task 3: Operating Cost of Trucks

The consumer expenditure survey method was performed to determine the cost of operating trucks. There is a number of variables that affect the cost of vehicle

operations; broadly divided as Fixed Cost Parameters and Variable Cost Parameters. Fixed Cost means the cost of owning the vehicle that includes the cost of purchase, leasing, taxing, registration, insurance, etc. Whereas, Variable Cost is a cost of operating the vehicle such as the cost of fuel, engine oil, tires, tolls, depreciation, maintenance, repairs, etc. The variable cost depends upon several factors. Figure 2.7 shows the factors affecting vehicle operating costs. Ownership and operating costs vary by vehicle size, class, and other characteristics. Trucks typically have much higher vehicle costs than passenger cars. The factors and parameters identified for VOC were collected and analyzed. The data was collected from different resources, and field visits were done to collect the latest data. The latest market rates for different parameters were collected by contacting vehicle makers, engine oil brands, spare-parts dealers, maintenance workshops, tire dealers, and others. The information gathered was used to develop the models to estimate the VOC. The latest rates and information were also compared with the previous studies.

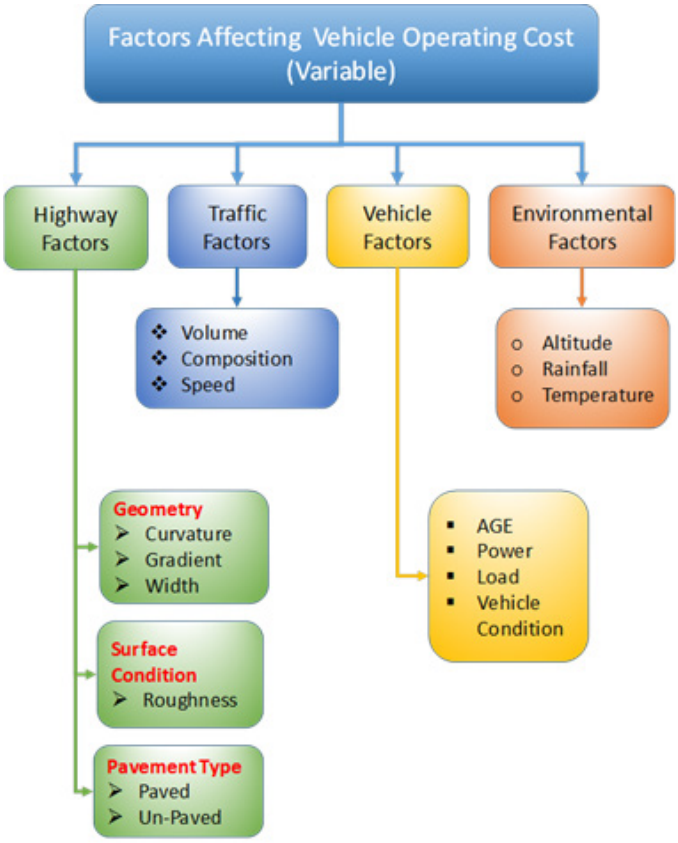


Figure 2.6: Factors affecting Vehicle Operating Cost (VOC)

2.2.4 Task 4: Review of the Documentation Requirement and Practice for Freight Movement within Pakistan and Internationally

There is little direct interference from the government in the trucking industry. The registration requirement for the new entrants is easy and cheap. The licensing system is relatively relaxing with little enforcement on regulation use. Anyone with a licensed truck driver and a registered truck can operate; rates are determined by the market.

As per international practices, a standard package of commercial documentation is required when you ship your goods internationally by truck, like air freight or ocean freight shipments.

Some of the common documents used for transport in global supply chain management are Commercial Invoice; Packing List; Certificates of Origin; Export/Import Permit; Bills of Lading.

The key document for truck transport is the Truck Bill of Lading. The proposed methodology was to visit different facilities to understand the freight movement practices followed by industries. The consultant visited major production units such as cement factories, oil refineries, oil distributors, and other industries. The shortcomings were identified, and a systematic process was suggested to ease and optimize the documentation process. The process defined by the customs and border control agencies for international freight movement was also reviewed.

2.2.5 Task 5: Analysis of the Institutional Structure

The trucking sector in Pakistan is dominated by large numbers of individual owners who provide services on a “hire and reward” (contracting) basis. They are also coordinated by numerous small-scale transport agents. Overall, the institutional structure is fragmented. In this task, the main objective was the determination of key personnel involved in the freight-trucking business. Some of the key personnel include consignor, consignee, shipper, freight forwarder, carrier, broker, agent, loader, etc. Agents play an important role in the operations of the trucking industry in Pakistan. They sometimes act as a middleman in hire-purchase agreements. Agents help in booking loads, placing consignments, and often run warehouses.

2.2.6 Task 6: SWOT Analysis of Demand and Supply of Road Freight Industry

The SWOT analysis is a strategic planning technique used to identify strengths, weaknesses, opportunities, and threats related. The strength and weaknesses are internal factors that can be controlled directly. The weakness can also be termed as Area of Improvements. Whereas the Opportunities and Threats are external factors and cannot be influenced directly.

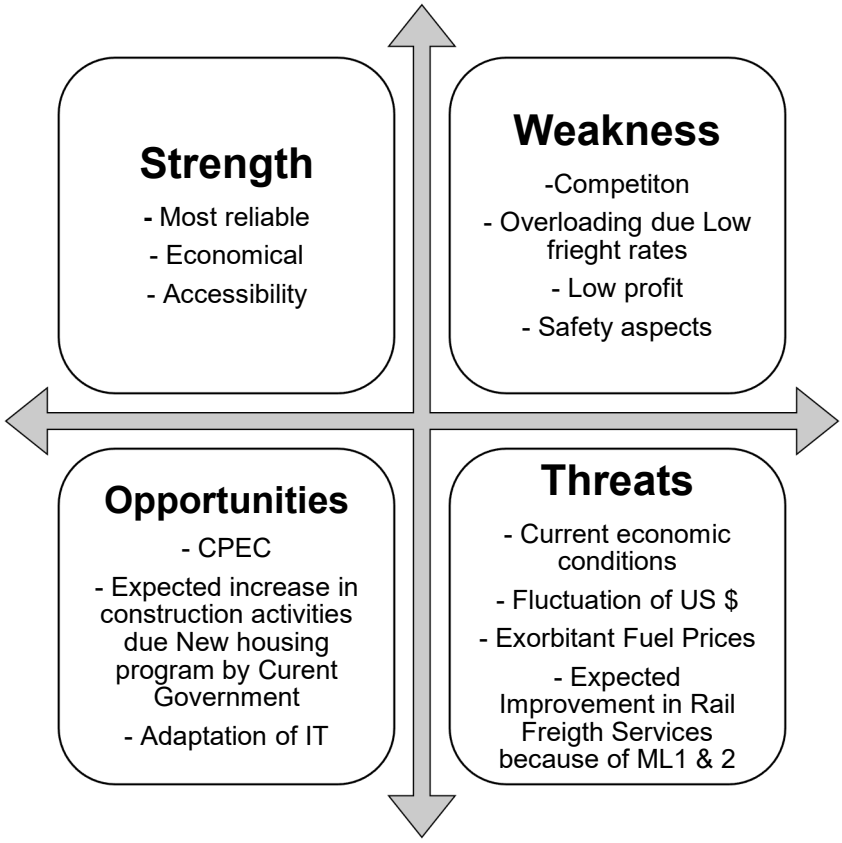


Figure 2.7: Sample SWOT Analysis

2.2.7 Task 7: Analysis of Tariff Structure

Normally the freight rates are dependent only on the load and journey distance. One study reports that the increase in weight is not proportionally accompanied by an increase in freight rate. Therefore, the freight rates analyzed were depending on the direction of travel i.e., upcountry. A detailed analysis of tariffs between major origin and destination pairs was performed. For example, the tariff determined for “from Karachi” and ‘to Karachi” freight. The freight rates in Pakistan also depend upon seasonality. The effects of seasonality were also determined in this task. Finally, a comparison of traveled distance with the cost per ton kilometer was made.

2.2.8 Task 8: Ease of Doing Business and Analysis of Impact on Industry after Trucking was declared as an Industry since 2007

Ease of doing business is an index published by the World Bank. It is an aggregate figure that includes different parameters which define the ease of doing business in a country. The Ease of doing business index ranks countries against each other based on how the regulatory environment is conducive to business operations. It is a measure of regulations directly affecting businesses.

Economies are ranked on their ease of doing business, from 1-190. The consultant will analyze the value added by the transportation industry as a percentage of GDP since 2007.

2.2.9 Task 9: Identification of Key Performance Indicators (KPIs) for the Truck Freight Industry

Performance indicators are the ways to analyze the improvement of a system. Key performance indicators (KPIs) are the critical factors by which the performance of a process or a system can be tracked. Selecting the appropriate KPIs is important to evaluate the performance of the Truck Freight Industry. To be effective, a KPI must be; well-defined, quantifiable, and vital for achieving set targets.

2.2.10 Task 10: Evaluation of the Tractor Trollies Importance in Agriculture Products Movement

A tractor is usually termed as a farmer's best friend. In a country like Pakistan where agriculture and farming are major occupations, tractor trollies are used as the main mode for movement of agricultural and other products by the farmer. The main objective of this task is to evaluate the role of tractor trollies in the freight movement. The critical step is to identify the industries producing agricultural products in each of the 50 districts. Agro-based industries such as sugar mills, wheat, flour and rice mills, cotton mills, and fertilizer manufacturers will be identified during this process.

2.2.11 Task 11: Evaluation and Analysis of Intra-urban Movements and their contribution to the Freight Industry

The critical aspect of this task is to determine the movement of freight within the district. The roadside interview surveys conducted during task 1 provided a rich source of data for this task. Survey stations at the district's boundaries were developed during task 1, however, for this task intermediate survey stations were developed to record the movement of the fleet within the district. The intermediate stations were developed at the commercial hub of districts where most of the commercial activities happen. This allowed observing the freight movement towards and away from the location.

2.2.12 Task 12: Preparation of guidelines on maximum weights and dimensions of mechanically propelled vehicles and trailers, including maneuverability criteria of Pakistan Freight

"Guidelines on Maximum Weights and Dimensions of Mechanically Propelled Vehicles and Trailers, Including Maneuverability Criteria" is a leaflet provided by the client that contains general guidelines regarding heavy vehicle operations and has been used as a guide for the preparation of the document in this task.

In order to prepare the guidelines for Pakistan, sample data related to the dimension of different types of trucks was collected during the field surveys. The vehicle

specifications obtained from the truck and tractor manufacturers which provided the information regarding the maximum weight capacity of the trucks. However, in Pakistan, most trucks are strengthened to take heavier loads. The common types of modifications include strengthening of chassis or frame, axle springs, and engine compartments. These modifications are carried out by local workshops. Therefore, the guidelines for standard and modified vehicles will be prepared.

2.2.13 Task 13: Analysis of Legal and Regulatory Framework

The legal and regulatory mechanism of road transport is not under central authority in Pakistan. The provincial Excise and Taxation department is responsible for the registration of vehicles, but the licensing (issuance and renewal) lies under the jurisdiction of provincial home departments. The grant or renewal of route permits and vehicle fitness certificates are issued by provincial transport departments. These transport departments work under provincial transport authorities. The provincial and regional transport authorities are responsible for the administration and enforcement of the Motor Vehicles Ordinance.

The main objective of this task will be to develop a platform that will allow different agencies to engage in communication with each other with minimum effort. For example, Federal Motor Carrier Safety Administration (FMCSA) is the authority in the US that is mandated with managing the law and regulations to control trucking movements. FMCSA's main mission is to reduce accidents involving large fleet traffic.

3 The Fleet

3.1 Truck Fleet Population

The trucking sector in Pakistan is semiformal, therefore credible information related to the sector is always hard to find. There was a discrepancy in the number of available trucks in the country as different studies quoted different figures in the past. Therefore, the population of goods vehicles in the country is needed to be established.

3.2 Data Collection from Excise and Taxation Departments

Excise and Taxation departments across different districts are responsible for registration but the licensing (issuance and renewal) lie under the jurisdiction of provincial home departments. To determine the truck fleet population in Pakistan it is necessary to gain information on the registered number of trucks. Provincial Excise and Taxation departments are the official sources of such data. A flowchart of the process of obtaining the data on the registered trucks fleet is illustrated in Figure 3.1 whereas, the details of collected data are provided in the proceeding sections of the report.

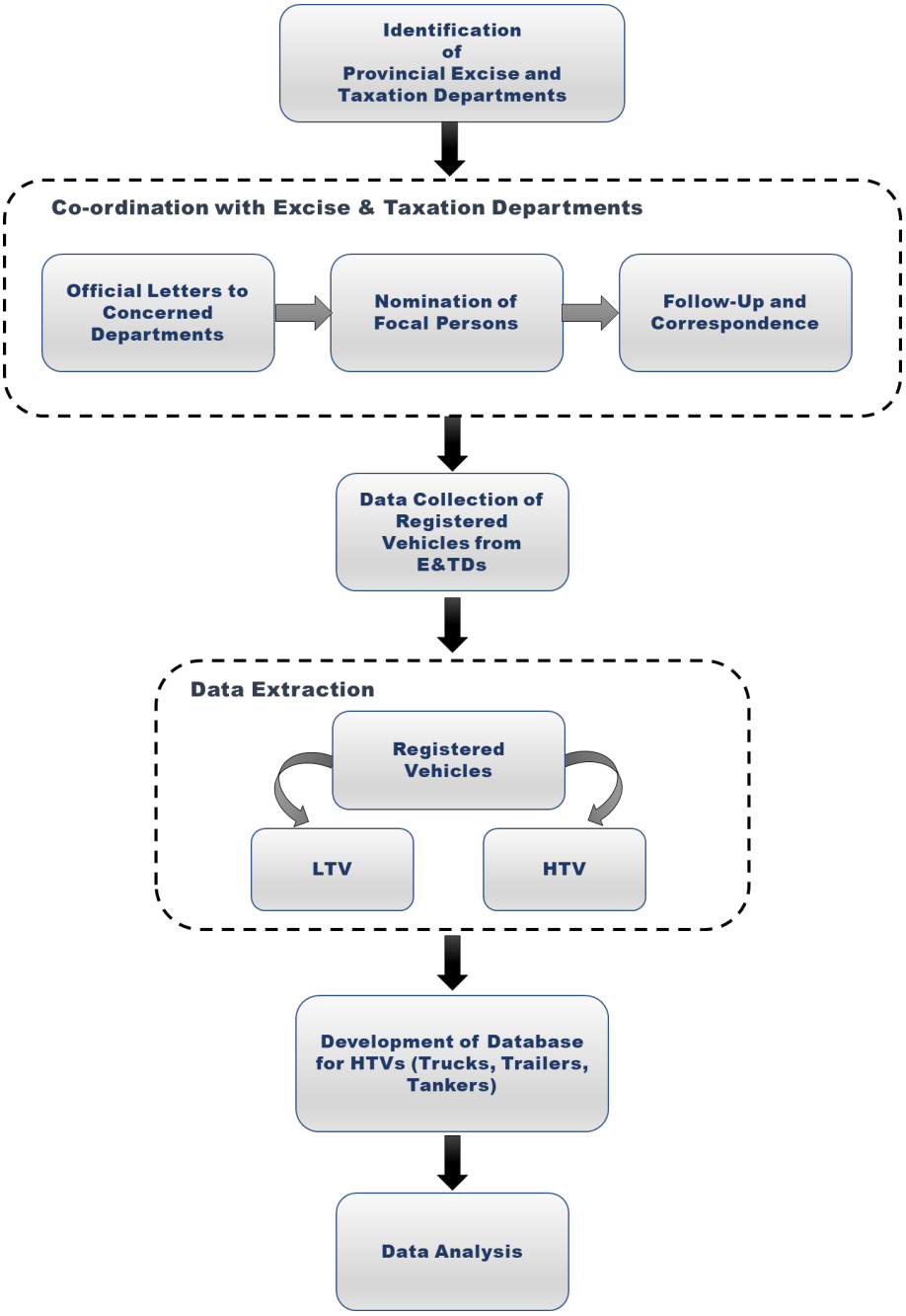


Figure 3.1: Process Flowchart of Obtaining Registered Vehicles Data

NTRC patronized and facilitated the appointed Consultant through correspondence/official letters, and telephone calls to the concerned Provincial Excise and Taxation departments. These authorities were requested to designate a focal person to facilitate the data collection from all districts. The consultant team then coordinated with the focal persons of each province to obtain the relevant data. The consultant also visited the Islamabad Excise and Taxation, Islamabad to collect the data and understand the vehicle registration process.

The list of focal persons nominated by different departments is presented in Table 3.1. The Consultant acknowledges the efforts made by the NTRC for facilitating the process.

Table 3.1: List of Nominated Focal Persons from Different Departments

Province	Focal Person	Designation
Balochistan	Mehmood Khan	Senior Database Administrator
KPK	Tahir Khan	Database Manager
Punjab	Muhammad Saleem	Database Administrator
Sindh	Mehran Khan	Deputy Director - System Analyst
Islamabad (ICT)	Zeeshan Ali	Database Manager
Azad Jammu & Kashmir (AJ&K)	Faiz Ullah	Deputy Director (MIS), Mirpur Division
	Asad Ullah	Deputy Director (MIS), Muzaffarabad and Poonch Division
Gilgit Baltistan	Abubakar	Deputy Director

It is pertinent to mention here that most of the departments do not record the axle-wise classification of vehicles as they register the vehicles based on the horsepower rating or engine capacity. Some departments iterated that recording of such data is planned for the future. For instance, the Excise, Taxation & Anti-Narcotics Department of Balochistan is maintaining the axle configuration of registering vehicles in two categories i.e., up to 10-wheelers and up to 22-wheelers vehicles. However, the complete axle-wise classification of vehicles is in the process of updating. Figure 3.2 shows the screenshot of the database maintained by the Excise, Taxation & Anti-Narcotics Department, Government of Balochistan.

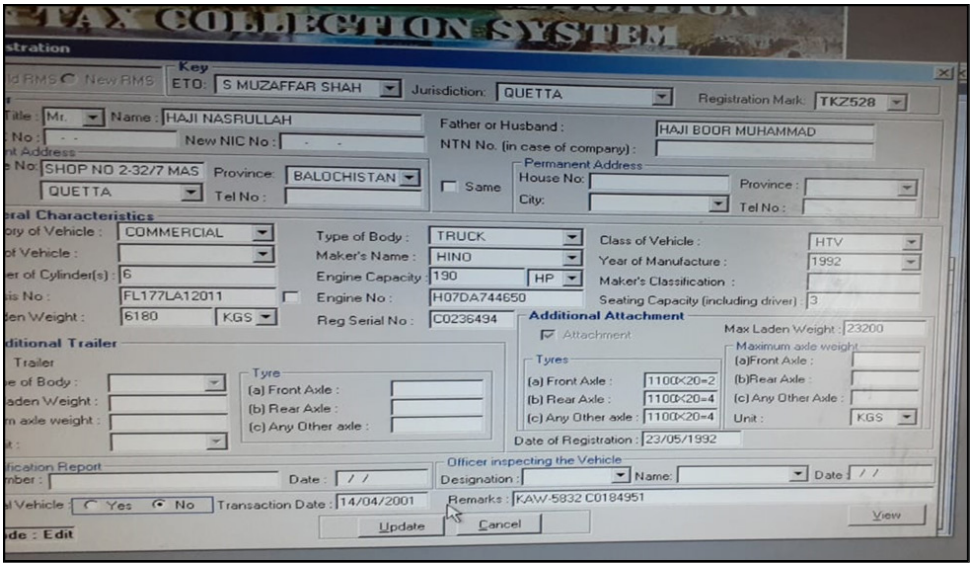


Figure 3.2: Database of the Excise, Taxation & Anti-Narcotics Department of Balochistan

3.3 Registered Goods Vehicles in Balochistan

Excise, Taxation, and Anti-Narcotics department, Balochistan has maintained comprehensive data of registered heavy vehicles (mini trucks, rigid trucks, trailers, and tankers). The data of registered heavy vehicles of thirteen (13) districts of Balochistan were obtained and compiled to prepare the database. The data included information such as make, model (manufacture year), body type, registration year horsepower rating, and engine capacity. Figure 3.3 presents the detail of different types of registered heavy vehicles in Balochistan. The total number of registered trucks in Balochistan is 104,277. About 41.6% of the registered trucks are articulated (multi-axle trailer units). About 35.4% of the registered trucks are rigid (2-Axle and 3-Axle) whereas, about 17.4% of the registered trucks are oil tankers.

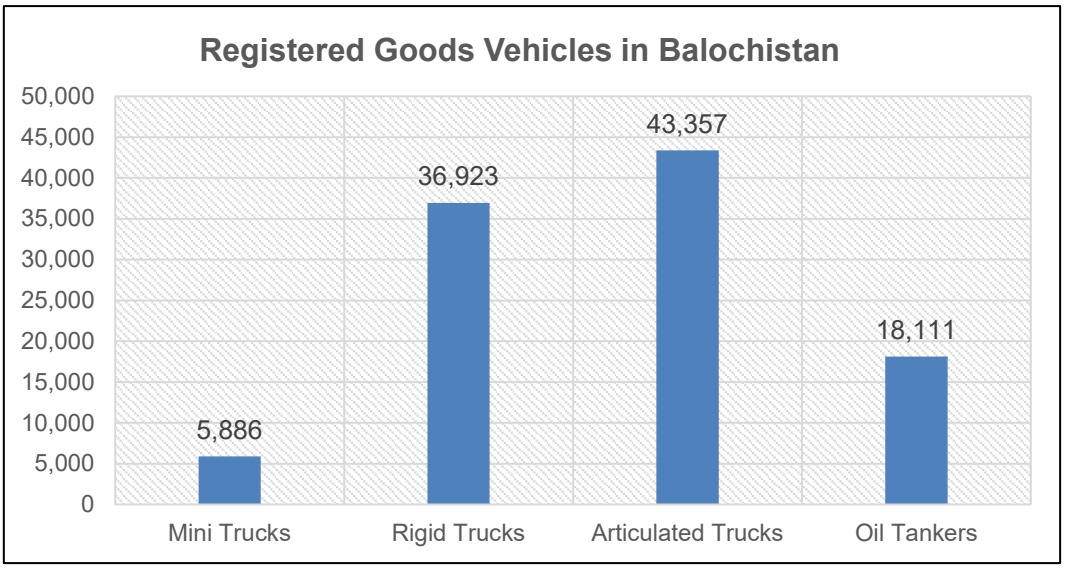


Figure 3.3: Registered Goods Vehicles in Balochistan

3.3.1 Make Wise Classification

Table 3.2 provides the make-wise classification of registered heavy vehicles in Balochistan. The most common trucks are Hino made across each category. The data shows that Hino trucks are about half (50.8%) of the total rigid trucks registered in Balochistan. Hino trucks are also the most common multi-axle trucks, followed by Nissan trucks. A few numbers of old Bedford trailer units are also registered in Balochistan. About 39.8% of the oil tankers registered are Hino-made.

Table 3.2: Make Wise Classification of Registered Goods Vehicles in Balochistan

Description	Bed Ford	Hino	Isuzu	Mercedes-Benz	Nissan	Others	Total
Mini Trucks	40	1,567	319	55	27	3,878	5,886
Rigid Trucks	8,827	18,773	3,062	713	3,204	2,344	36,923

Description	Bed Ford	Hino	Isuzu	Mercedes-Benz	Nissan	Others	Total
Articulated Trucks	1,035	20,554	2,400	1,041	15,014	3,313	43,357
Oil Tankers	860	7,211	1,816	75	4,364	3,785	18,111
***Total* =**	**10,762**	**48,105**	**7,597**	**1,884**	**22,609**	**13,320**	**104,277**

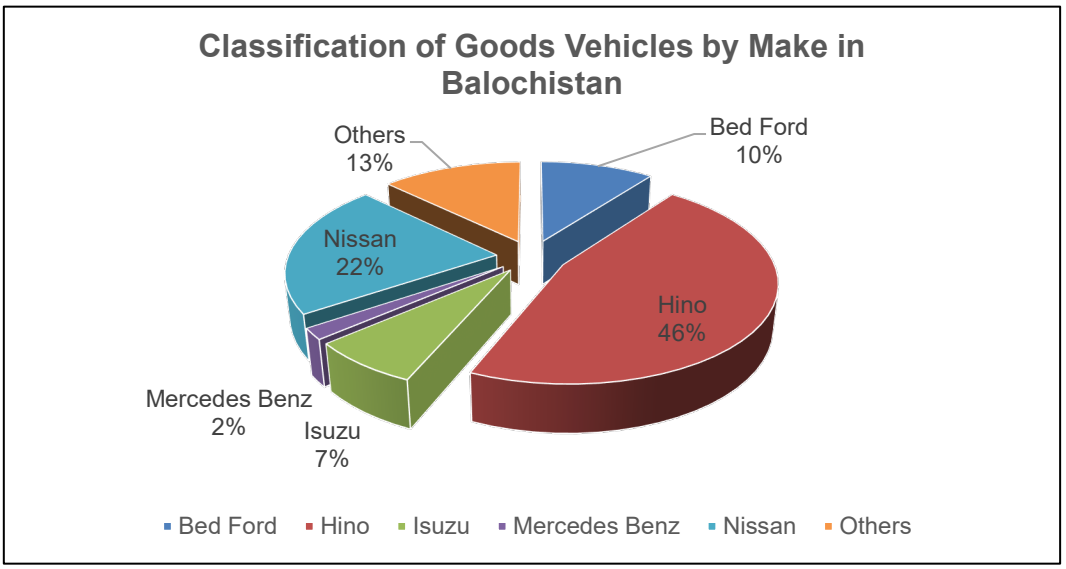


Figure 3.4: Percentages of Registered Goods Vehicles by Make in Balochistan

3.3.2 Model Wise Classification

Model-wise classification provides an overview of the age structure of trucks currently registered in Balochistan. The age structure of different types of trucks has been determined. The analysis shows that a large number of old vehicles are still operational. The current fleet mostly consists of trucks that are about three to four decades old. Such a fleet is largely hindering the efficiency of the freight movements.

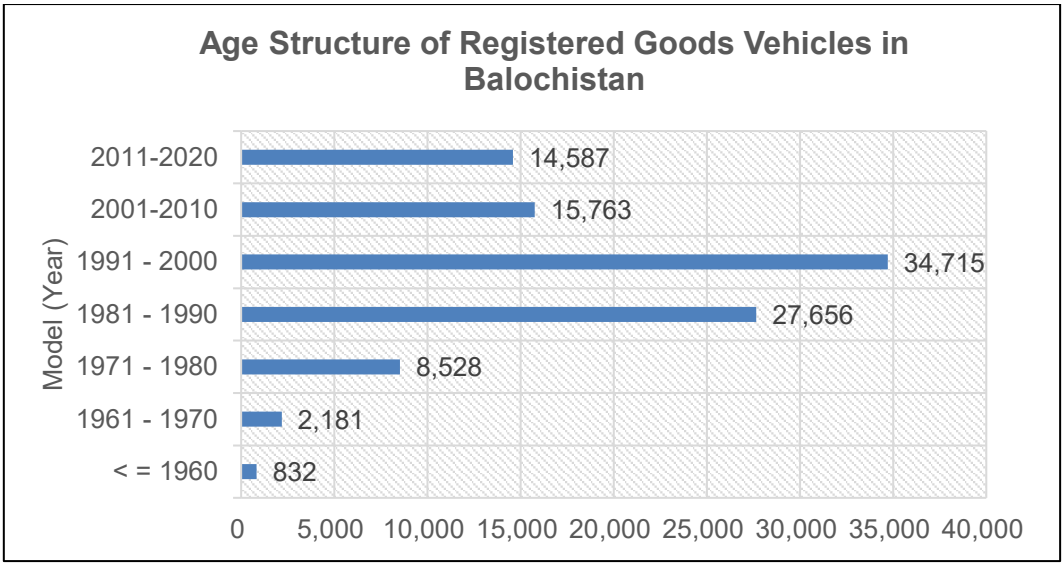


Figure 3.5: Model Wise Classification of Registered Goods Vehicles in Balochistan

Trucks manufactured in 1991-2000 are the most common. The analysis shows that this category consists of about 33.3% (exactly one-third) of the total fleet. Trucks manufactured about three-four decades ago consist of more than half the fleet. About 59.8% percentage of trucks are 1980-2000 model.

3.4 Registered Goods Vehicles in Khyber Pakhtunkhwa

Excise, Taxation, and Narcotics Control Department, Khyber Pakhtunkhwa has maintained comprehensive data of registered heavy vehicles. The data of registered heavy vehicles of different districts of Khyber Pakhtunkhwa (KPK) was obtained and compiled to prepare the database. The data included information such as make, model (manufacture year), body type, registration year, horsepower rating, and engine capacity.

The graph in Figure 3.6 provides the detail of registered heavy vehicles in Khyber Pakhtunkhwa. The total number of registered trucks in Khyber Pakhtunkhwa is 58,908. Mostly rigid (2-Axle and 3-Axle) trucks are registered in KPK. Nearly three-forth (about 73%) of the registered vehicles are 2-axle and 3-axle trucks. About 11% of the vehicles are multi-axle trailer units. Mini trucks and oil tankers are about 6.2% and 9.7% of the total registered truck fleet in KPK.

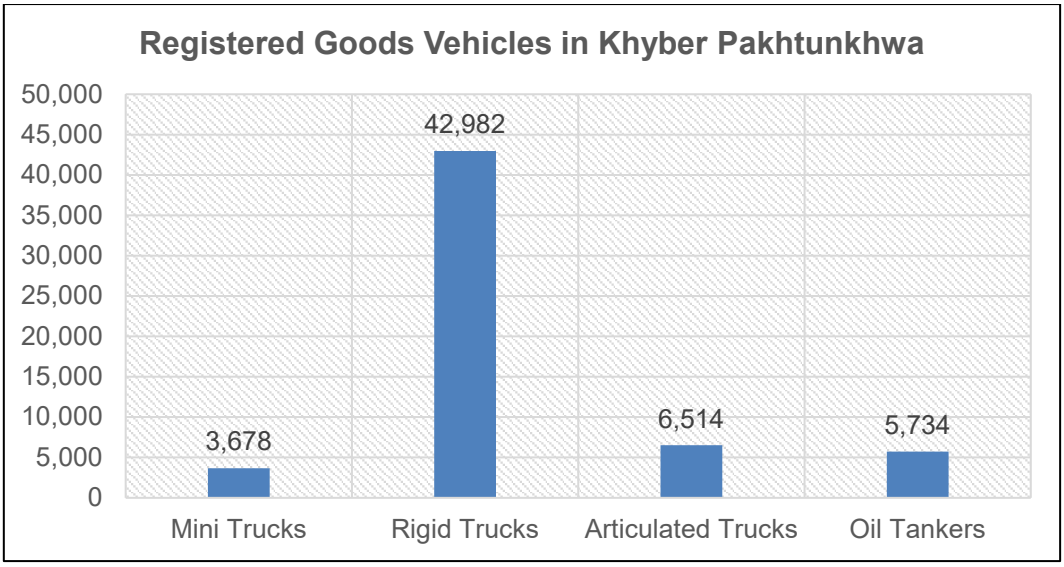


Figure 3.6: Registered Goods Vehicles in Khyber Pakhtunkhwa

3.4.1 Make Wise Classification

Table 3.3 provides the make-wise classification of registered heavy trucks in Khyber Pakhtunkhwa. Overall, Hino trucks are the most common. Nissan multi-axle trailer units and oil tankers are the most common.

Table 3.3: Make Wise Classification of Registered Goods Vehicles in Khyber Pakhtunkhwa

Description	Bed Ford	Hino	Isuzu	Mercedes-Benz	Nissan	Others	Total
Mini Trucks	15	568	298	297	33	2,467	3,678
Rigid Trucks	20,045	15,928	1,967	389	3,346	1,307	42,982
Articulated Trucks	1	2,274	316	840	2,669	414	6,514
Oil Tankers	206	1,975	511	47	2,723	272	5,734
***Total* =**	**20,267**	**20,745**	**3,092**	**1,573**	**8,771**	**4,460**	**58,908**

Figure 3.7 provides the percentages of registered trucks by make in Khyber Pakhtunkhwa. The analysis shows that about 34.4% of registered trucks are Bedford trucks. About 15% of the trucks are Nissan made whereas, just 5.2% of the trucks are Isuzu-made.

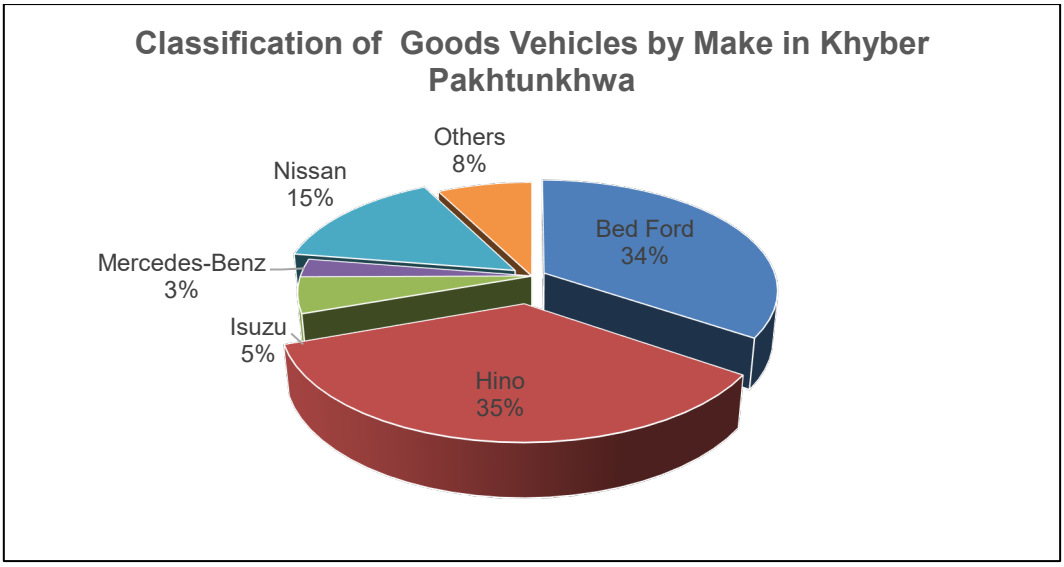


Figure 3.7: Percentages of Registered Goods Vehicles by Make in Khyber Pakhtunkhwa

3.4.2 Model Wise Classification

Model-wise classification analysis shows that a large number of old vehicles are still operational. The current fleet mostly consists of trucks that are about three to four decades old. Figure 3.8 provides the model-wise classification of the registered heavy vehicles in Khyber Pakhtunkhwa.

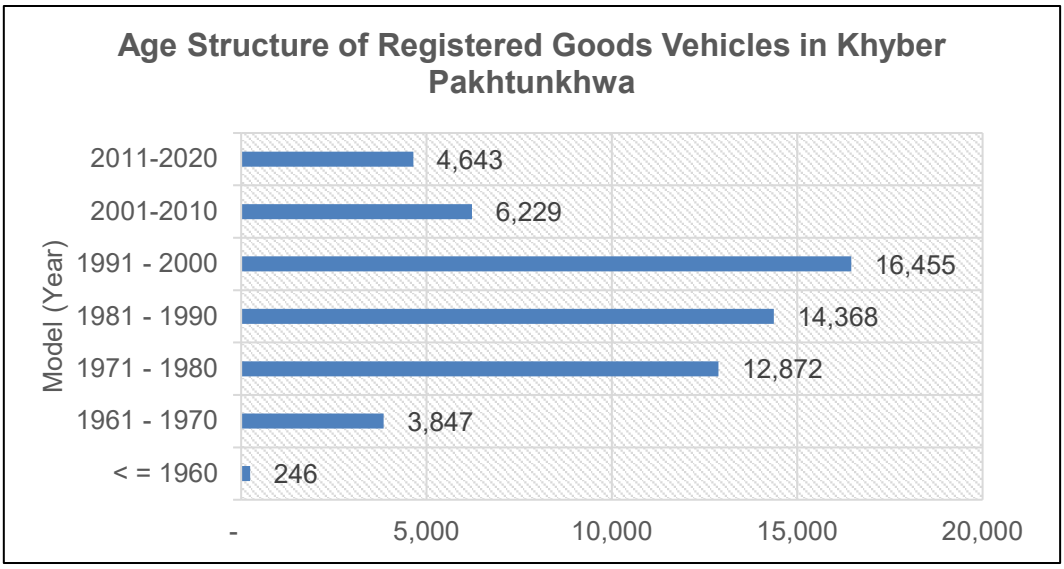


Figure 3.8: Age Structure of Registered Goods Vehicles in Khyber Pakhtunkhwa

Trucks manufactured in 1991-2000 are the most common. The analysis shows that this category consists of about 28.04% of the total registered trucks. Trucks manufactured about three-four decades ago consist of more than half the fleet. About 52.5% of the trucks are 1980-2000 models.

3.5 Registered Goods Vehicles in Punjab

Excise and Taxation Department and Narcotics Control Department, Punjab has maintained comprehensive data of registered heavy vehicles. The data included information such as make, model (manufacture year), body type, registration year, horsepower rating, and engine capacity. However, district-wise data was not available.

The graph in Figure 3.9 provides the detail of registered trucks in Punjab. The total number of the registered truck fleet is 140,283. Mostly mini trucks are registered in Punjab which comprises more than half (about 57.8%) of the total fleet. About 36.7% of the registered trucks are 2-Axle and 3-Axle trucks having rigid suspension. A few numbers (about 3.6%) of the trucks are multi-axle trailer units. Only 1.9% of the registered truck fleet are oil tankers.

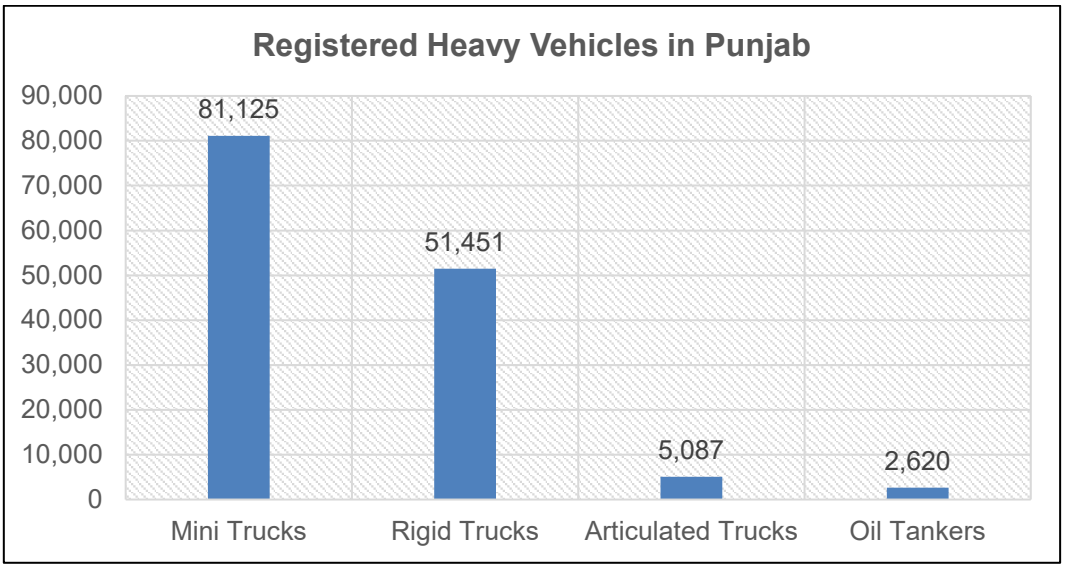


Figure 3.9: Registered Goods Vehicles in Punjab

3.5.1 Make Wise Classification

Table 3.4 provides the make-wise classification of registered vehicles in Punjab. The most common trucks are Bedford. Hino trucks are the second most common type of rigid truck in Punjab.

Table 3.4: Make Wise Classification of Registered Goods Vehicles in Punjab

Description	Bed Ford	Hino	Isuzu	Mercedes-Benz	Nissan	Others	Total
Mini Trucks	36	5,011	7,927	222	861	67,068	81,125
Rigid Trucks	35,210	6,992	72	1,780	1,900	5,497	51,451
Articulated Trucks	-	1,906	1,664	173	689	655	5,087
Oil Tankers	920	927	298	23	249	203	2,620
***Total* =**	**36,166**	**14,836**	**9,961**	**2,198**	**3,699**	**73,423**	**140,283**

Figure 3.10 provides the percentages of registered trucks by make in Punjab. It shows that about one-fourth (25.8%) of trucks are old Bedford trucks. Hino trucks comprise about 10.6% of total registered trucks.

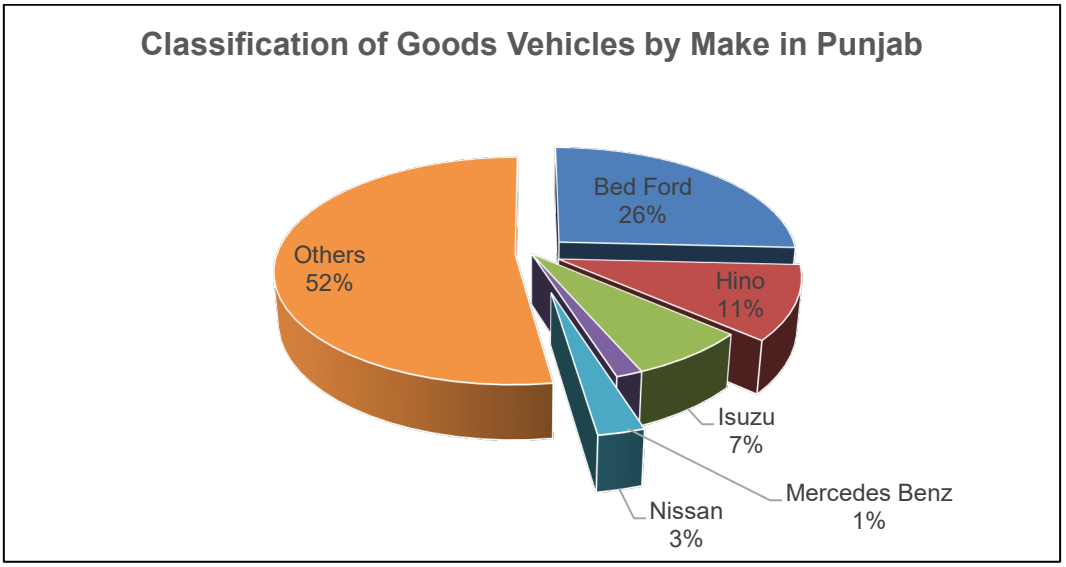


Figure 3.10: Percentages of Registered Goods Vehicles by Make in Punjab

3.5.2 Model Wise Classification

Model-wise classification analysis shows that a large number of old vehicles are still operational. The current fleet mostly consists of trucks that are about three to four decades old. Figure 3.11 provides the model-wise classification of the registered heavy vehicles in Punjab.

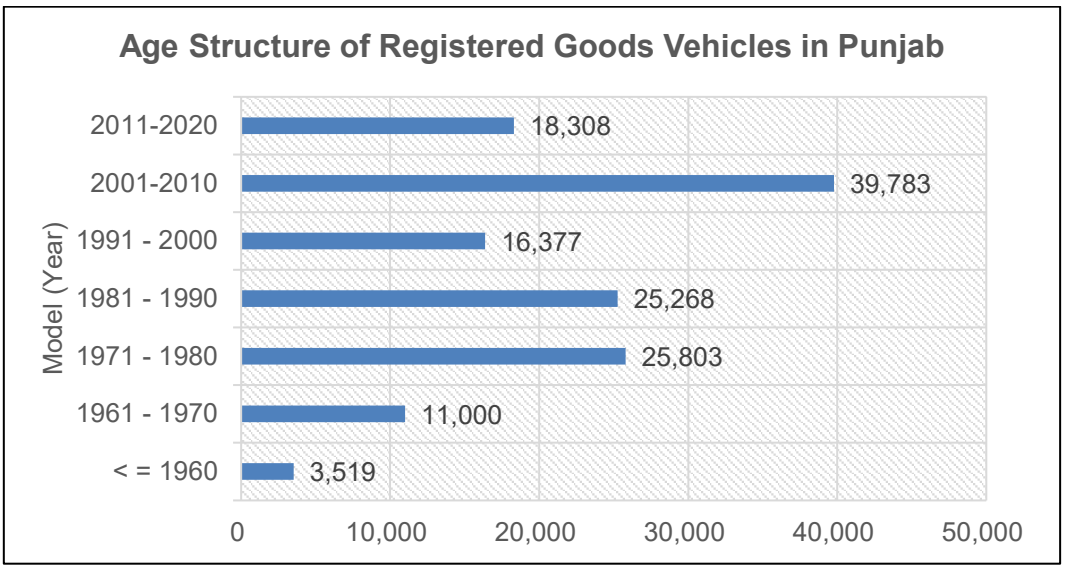


Figure 3.11: Age Structure of Registered Goods Vehicles in Punjab

Trucks registered in 2001-2010 have the highest number. The analysis shows that this category consists of about 28.4% of the total registered trucks. Trucks manufactured

in 1991-2000 are just more than one-tenth (11.67%) of the total truck fleet registered in Punjab.

3.6 Registered Goods Vehicles in Sindh

Excise, Taxation, and Narcotics Control Department, Sindh has maintained comprehensive data of registered goods vehicles. The data included information such as make, model (manufacture year), body type, registration year, horsepower rating, and engine capacity. However, district-wise data was not available. The graph in Figure 3.12 provides the detail of registered heavy vehicles in Sindh. The total number of registered trucks is 34,411. Mostly rigid trucks and Mini Trucks are registered in Sindh. More than half (53%) of the registered trucks are 2-Axle and 3-Axle rigid trucks. About 12.3% of the trucks are multi-axle trailer units. Only 5.1% of registered vehicles are oil tankers in Sindh.

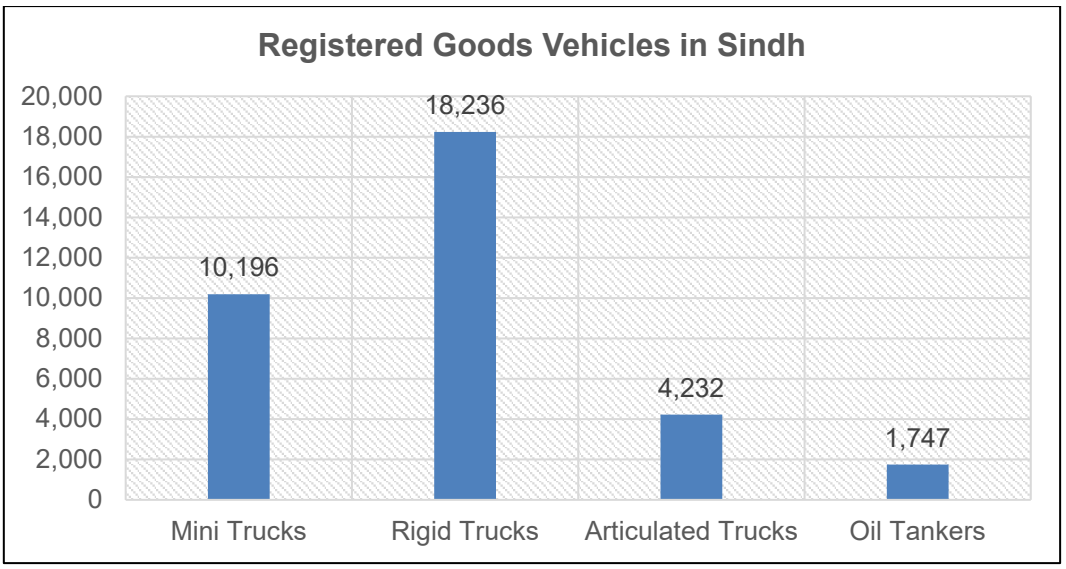


Figure 3.12: Registered Goods Vehicles in Sindh

3.6.1 Make Wise Classification

Table 3.5 provides the make-wise classification of registered heavy vehicles in Sindh. The most common trucks are Hino and Bedford. Nissan trucks are the third most common registered trucks in Sindh.

Table 3.5: Make Wise Classification of Registered Goods Vehicles in Sindh

Description	Bed Ford	Hino	Isuzu	Mercedes-Benz	Nissan	Others	Total
Mini Trucks	28	171	544	240	149	9,064	10,196
Rigid Trucks	5,863	5,053	1,835	111	1,646	3,728	18,236
Articulated Trucks	6	1,219	524	50	1,611	822	4,232
Oil Tankers	400	470	131	21	245	480	1,747

Total =	**6,297**	**6,913**	**3,034**	**422**	**3,651**	**14,094**	**34,411**

Figure 3.13 provides the percentages of registered trucks by make in Sindh. It shows that about 18% of trucks are old Bedford trucks. Hino trucks are comprised about one-fifth (20%) of the total fleet. Nissan trucks are about 11% of the total registered trucks in Sindh.

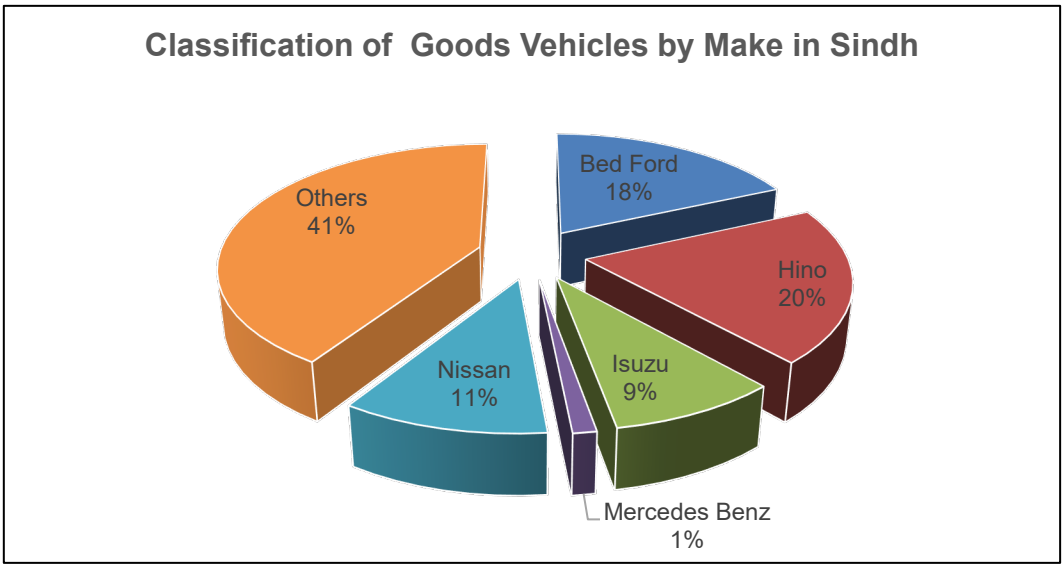


Figure 3.13: Percentages of Registered Goods Vehicles by Make in Sindh

3.6.2 Model Wise Classification

Model-wise classification analysis shows that a large number of old vehicles are still operational. The current fleet mostly consists of trucks that are about three to four decades old. Figure 3.14 provides the model-wise classification of the registered heavy vehicles in Sindh.

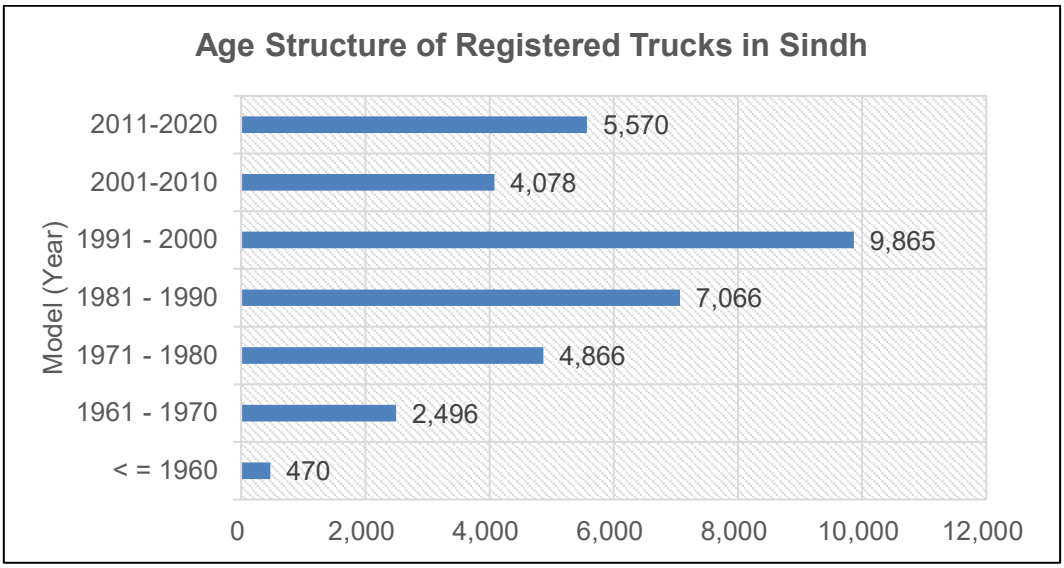


Figure 3.14: Age Structure of Registered Goods Vehicles in Sindh

Trucks manufactured in 1991-2000 have the highest number. The analysis shows that this category consists of about 28.67% of the total registered trucks. Trucks manufactured in 1981-1990 are about one-fifth (20.53%) of the registered trucking fleet. About 28% of trucks are 2001 onwards model.

3.7 Registered Goods Vehicles in Islamabad Capital Territory

Excise and Taxation Department, Islamabad has maintained comprehensive data of registered heavy vehicles. The data included information such as make, model (manufacture year), body type, registration year, horsepower rating, and engine capacity. Only a few numbers of trucks were registered in the ICT Excise and Taxation department.

The graph in Figure 3.15 provides the detail of registered heavy vehicles in Islamabad. The total number of registered vehicles is 2,709. Less than truckload (mini trucks) vehicles are the most registered heavy vehicles category. About 71% of the registered vehicles are mini trucks. A very few numbers of heavy vehicles are registered in ICT due to the high amount of taxes.

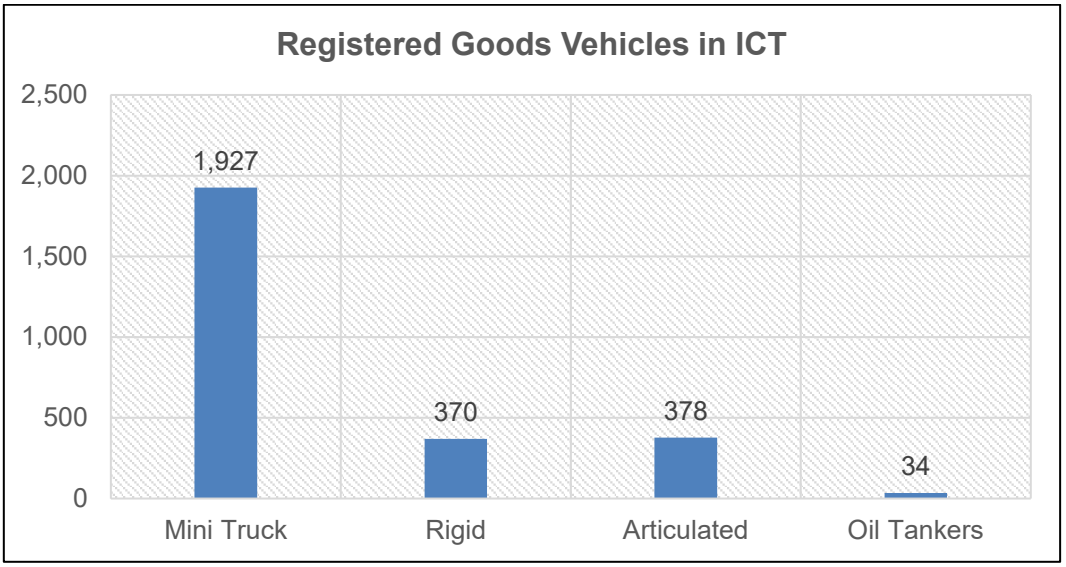


Figure 3.15: Registered Goods Vehicles in ICT

3.7.1 Make Wise Classification

Table 3.6 provides the make-wise classification of registered heavy vehicles in ICT. The most common trucks are Hino and Bedford. Nissan trucks are the third most common registered trucks in ICT.

Table 3.6: Make Wise Classification of Registered Goods Vehicles in ICT

Description	Bed Ford	Hino	Isuzu	Mercedes-Benz	Nissan	Others	Total
Mini Trucks	9	555	311	15	47	990	1,927
Rigid Trucks	205	-	38	14	56	57	370
Articulated Trucks	20	169	63	5	58	63	378
Oil Tankers	-	9	4	-	15	6	34
***Total* =**	**234**	**733**	**416**	**34**	**176**	**1,116**	**2,709**

Figure 3.16 provides the make-wise classification of registered trucks in Islamabad. Hino trucks are the most common with about 27% of the trucks belonging to this make. The second most popular make is Isuzu with 15% of the registered fleet belonging to this category.

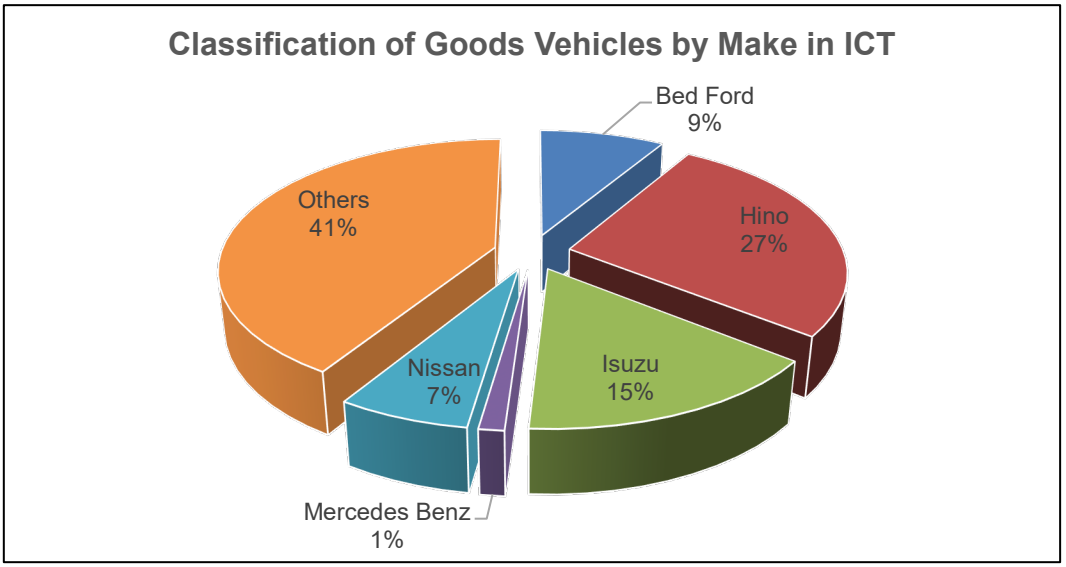


Figure 3.16: Percentages of Registered Goods Vehicles by Make in ICT

3.7.2 Model Wise Classification

Figure 3.17 provides the age structure of registered trucks in Islamabad. Trucks manufactured in the year 2001-2010 are the most common.

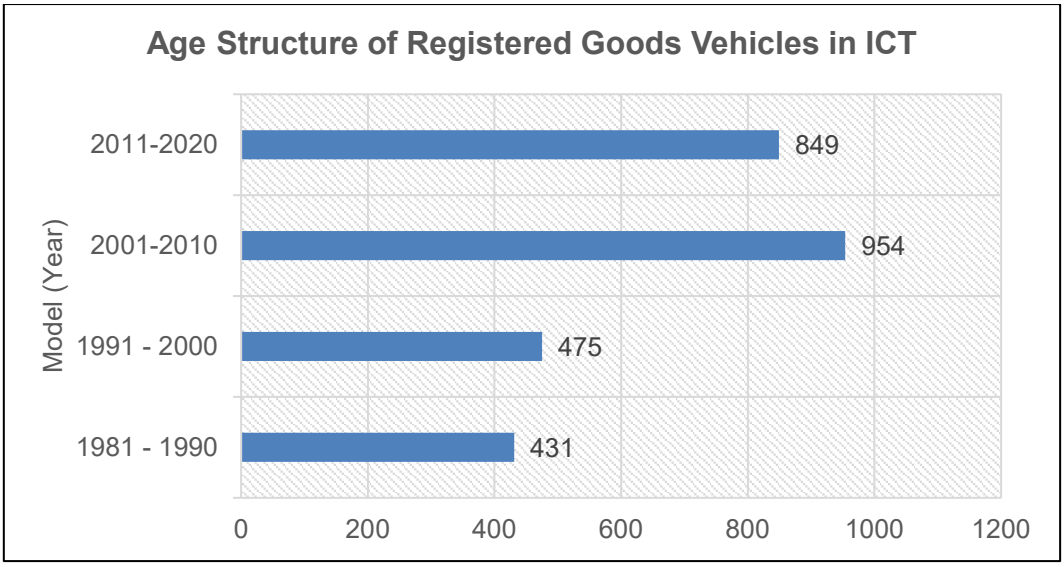


Figure 3.17: Age Structure of Registered Goods Vehicles in ICT

3.8 Registered Goods Vehicles in Azad Jammu and Kashmir (AJ&K)

Excise and Taxation department, AJ&K has maintained comprehensive data of registered goods vehicles. The data included information such as make, model (manufacture year), body type, registration year, horsepower rating, and engine capacity. The graph in Figure 3.18 provides the detail of registered heavy vehicles in AJ&K. The total number of registered vehicles is 2,696. Most 2-axles and 3-axles rigid trucks are registered in AJ&K. Nearly 80% of the registered trucks belong to such category. Only 2.1 % of the vehicles are multi-axle trailer units. About 4.7% of registered vehicles are oil tankers.

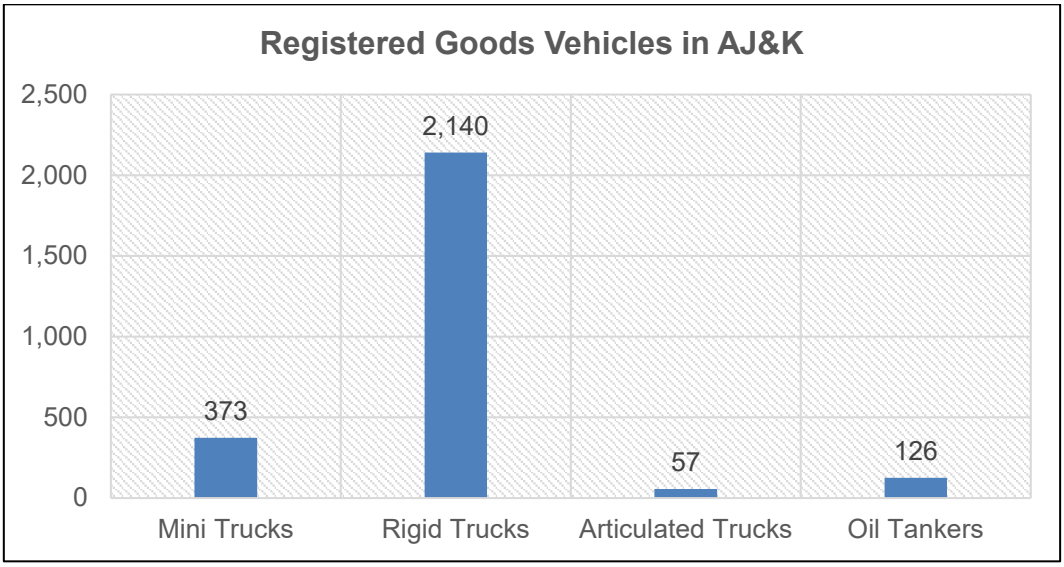


Figure 3.18: Registered Goods Vehicles in AJ&K

3.8.1 Make Wise Classification

Table 3.7 provides the make-wise classification of registered heavy vehicles in Sindh. The most common trucks are old technology Bedford trucks. About 55.6% of the total registered trucks are Bedford trucks.

Table 3.7: Make Wise Classification of Registered Heavy Vehicles in AJ&K

Description	Bed Ford	Hino	Isuzu	Merce des-Benz	Nissan	Others	Total
Mini Trucks	14	26	19	1	2	311	373
Rigid Trucks	1,425	323	85	36	227	44	2,140
Articulated Trucks	-	9	7	4	36	1	57
Oil Tankers	61	19	10	-	35	1	126
Total =	**1,500**	**377**	**121**	**41**	**300**	**357**	**2,696**

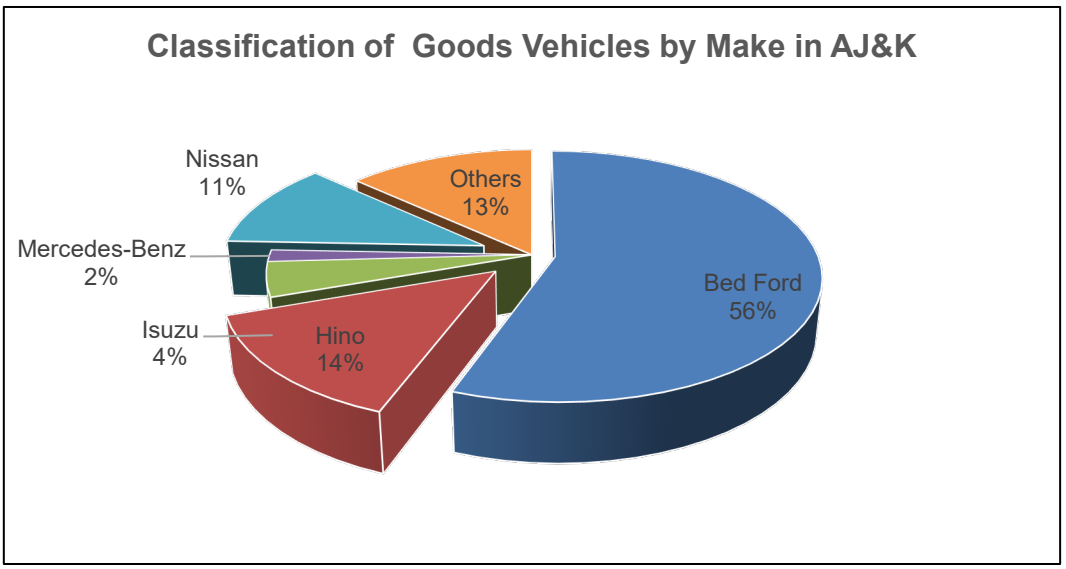


Figure 3.19: Make Wise Classification of Registered Goods Vehicles in AJ&K

3.8.2 Model Wise Classification

Model-wise classification analysis shows that a large number of old vehicles are still operational. The current fleet mostly consists of trucks that are about three to four decades old. Figure 3.20 provides the age structure of registered trucks in AJ&K.

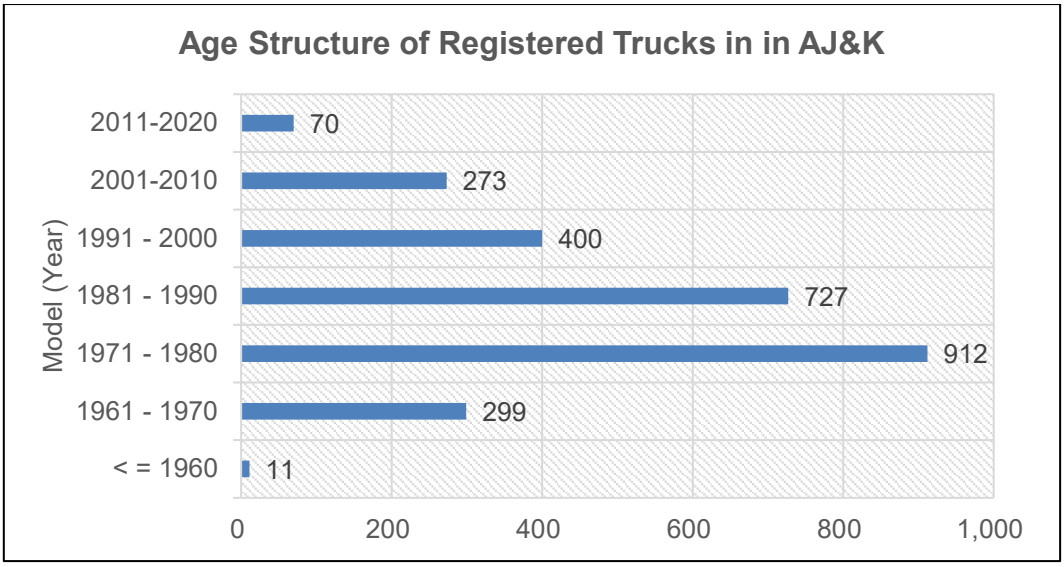


Figure 3.20: Age Structure of Registered Goods Vehicles in AJ&K

Old Trucks (1971–1980) have the highest number. The analysis shows that this category consists of about one-third (33.83%) of the total registered trucks. Trucks manufactured in 1981-1990 are about 26.97% of the registered truck fleet. About 12% of trucks are 2001 onwards model.

3.9 Registered Goods Vehicles in Gilgit Baltistan

Excise and Taxation Department, Gilgit Baltistan (GB) has maintained comprehensive data of registered heavy vehicles. The data included information such as make, model (manufacture year), body type, registration year, horsepower rating, and engine capacity. However, district-wise data was not available. The graph in Figure 3.21 provides the detail of registered heavy vehicles in Gilgit Baltistan. The total number of registered heavy vehicles is 10,936. Mostly rigid trucks are registered in Gilgit Baltistan. Nearly 89% of the registered heavy vehicles are 2-axles and 3-axles trucks. Only 3 % of the vehicles are multi-axle trailer units. About 7% of the registered trucks are oil tankers.

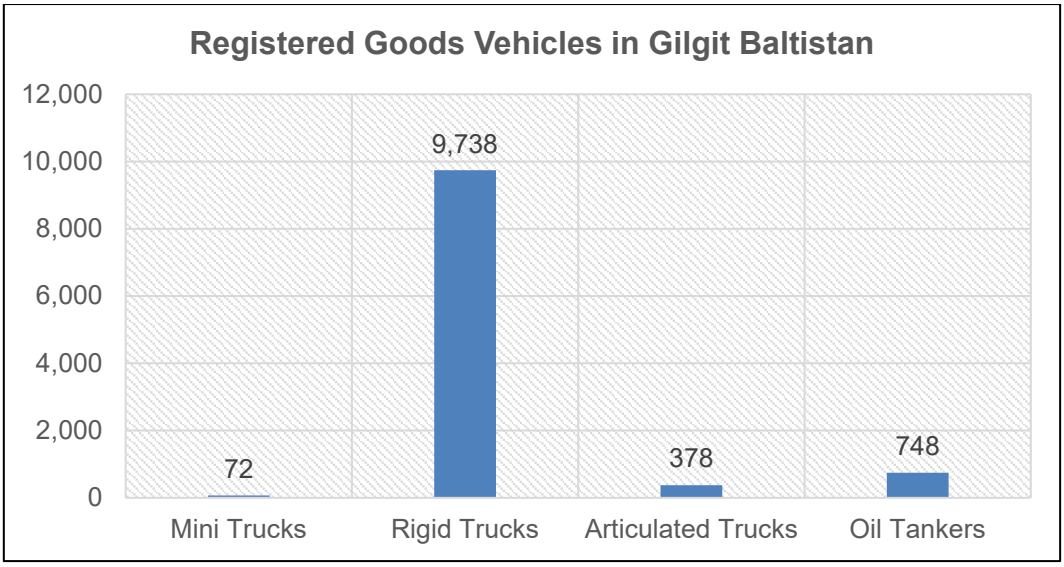


Figure 3.21: Registered Goods Vehicles in Gilgit Baltistan

3.9.1 Make Wise Classification

Table 3.8 provides the make-wise classification of registered heavy vehicles in Gilgit Baltistan. The most common trucks are Hino and Bedford. Nissan trucks are the third most common registered trucks in Gilgit Baltistan.

Table 3.8: Make Wise Classification of Registered Heavy Vehicles in Gilgit Baltistan

Description	Bed Ford	Hino	Isuzu	Mercedes-Benz	Nissan	Others	Total
Mini Trucks	-	8	4	-	1	59	72
Rigid Trucks	5,058	1,618	249	176	1,355	1,282	9,738
Articulated Trucks	4	92	43	9	115	115	378
Oil Tankers	180	182	100	7	209	70	748
Total =	**5,242**	**1,900**	**396**	**192**	**1,680**	**1,526**	**10,936**

Figure 3.22 provides the make-wise classification of registered trucks in Gilgit Baltistan. Bedford trucks are the most common with about 47.9% of the trucks belonging to this make. Hino make comprises about 17.4% of trucks whereas, 15.4% of trucks are Nissan made.

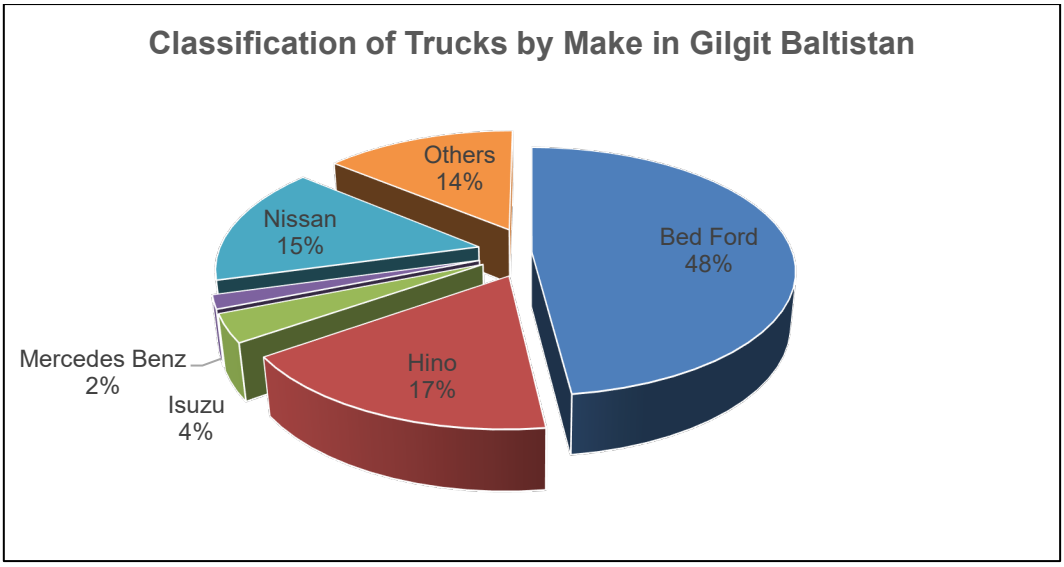


Figure 3.22: Percentages of Registered Goods Vehicles by Make in Gilgit Baltistan

3.9.2 Model Wise Classification

Model-wise classification analysis shows that a large number of old vehicles are still operational. The current fleet mostly consists of trucks that are about three to four decades old. Figure 3.23 provides the age structure of registered trucks in Gilgit Baltistan. Old trucks (1981-1990) are the most common. About 42.1% of the trucks are 1981-1990 model. Trucks manufactured in 1981-2000 comprise about 66% of the total registered trucks in Gilgit Baltistan.

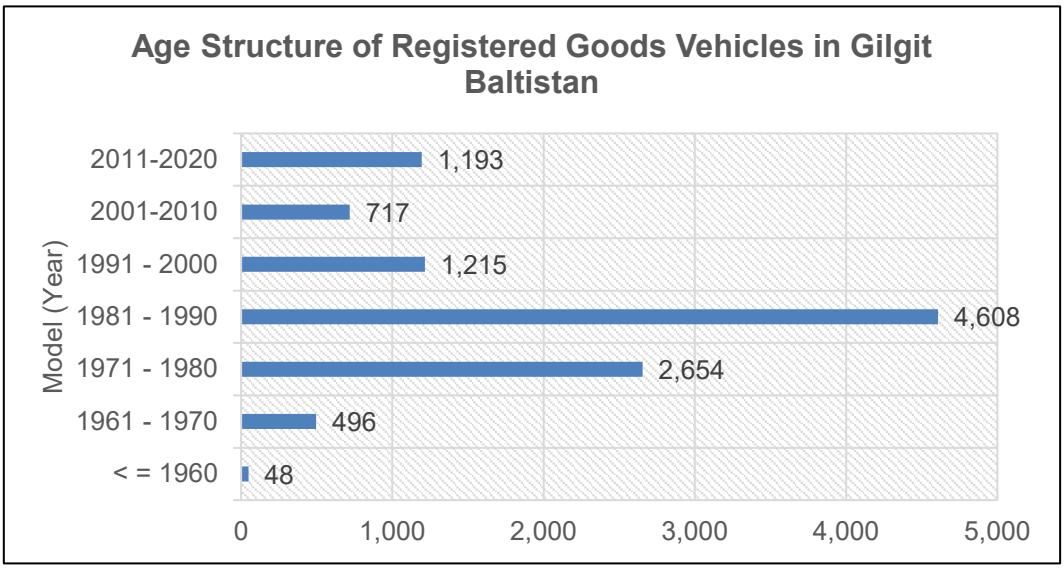


Figure 3.23: Age Structure of Registered Trucks in Gilgit Baltistan

3.10 Combined Record of Registered Goods Vehicles from Excise and Taxation Departments

Table 3.9 presents the overview of the total numbers of registered goods vehicles of each class in different provinces.

Table 3.9: Total Number of Registered Goods Vehicles in Pakistan

Description	Balochistan	KPK	Punjab	Sindh	ICT	AJ&K	GB	Total
Mini Trucks	5,886	3,678	81,125	10,196	1,927	373	72	103,257
Rigid Trucks	36,923	42,982	51,451	18,236	370	2,140	9,738	161,840
Articulated Trucks	43,357	6,514	5,087	4,232	378	57	378	60,003
Oil Tankers	18,111	5,734	2,620	1,747	34	126	748	29,120
Total	**104,277**	**58,908**	**140,283**	**34,411**	**2,709**	**2,696**	**10,936**	**354,220**

Mini trucks represent the light commercial vehicles (LCV) which are mainly used for the local distribution of goods in urban and rural areas. Mazda T-3500, JAC X200, FAW Carrier, and JW Forland C-19 are some common types of mini trucks in Pakistan. Rigid Trucks are 2-Axle (6-wheelers) and 3-Axle (10-wheelers) trucks whereas, articulated trucks represent multi-axle trailer units such as 4-Axle (14-wheeler), 5-Axle (18-wheeler), and 6-Axle (22-wheeler) trucks. Figure 3.24 illustrates the registered goods vehicles in different provinces of Pakistan.

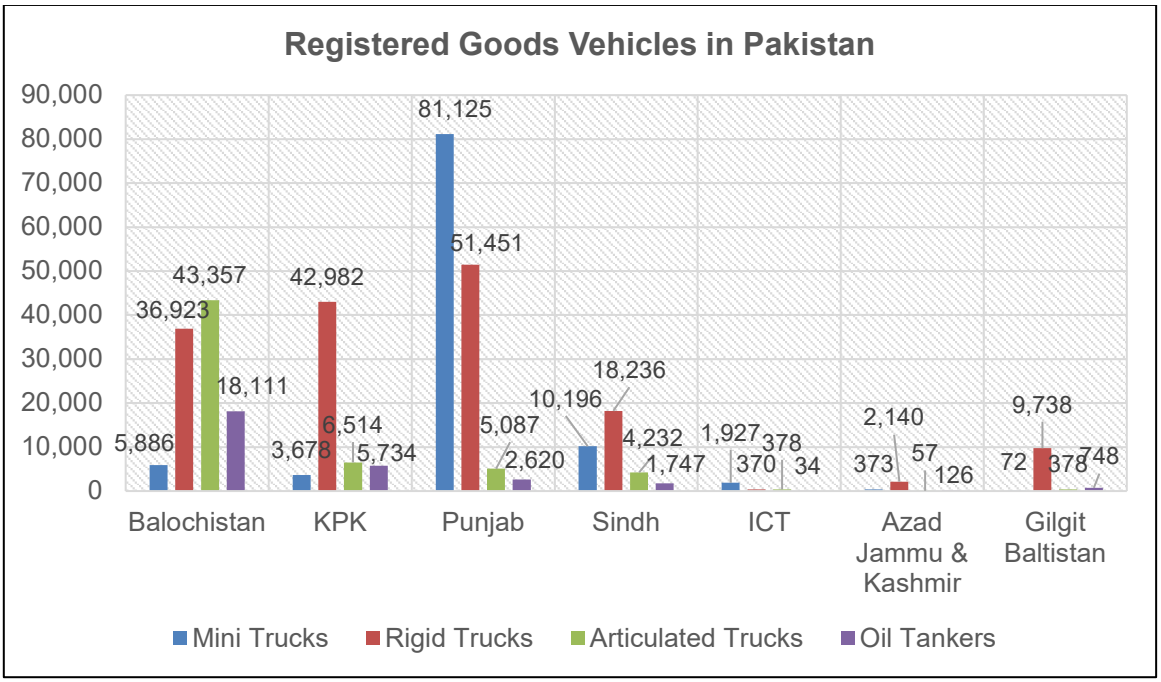


Figure 3.24: Provincial Registration Data of Goods Vehicles in Pakistan

Figure 3.25 illustrates the registered goods vehicles in different provinces of Pakistan by type of truck.

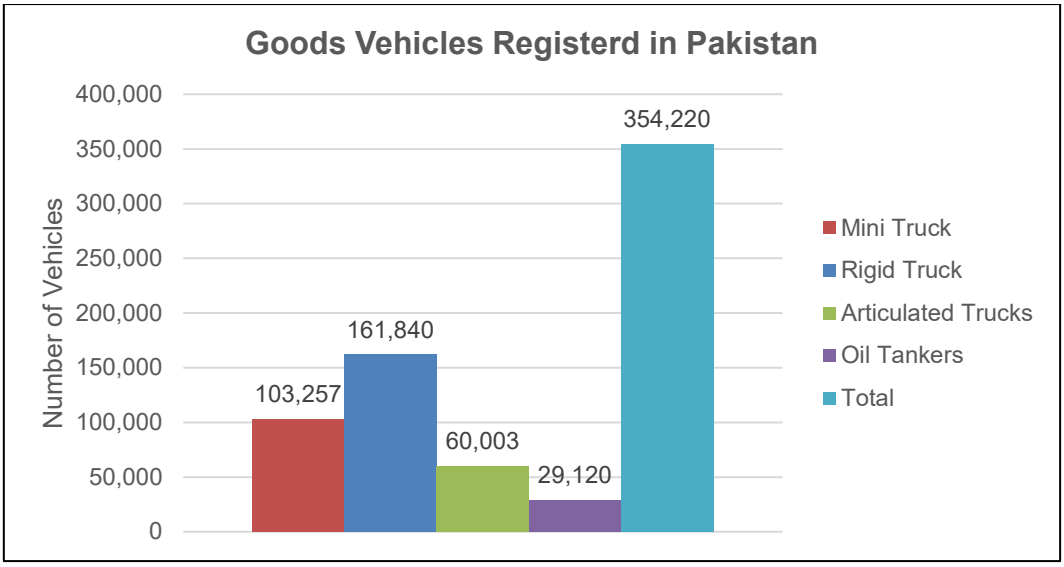


Figure 3.25: Registration of Goods Vehicles by Type in Pakistan

A composition of heavy vehicles by truck type is presented in Figure 3.26. It illustrates that about 45.7% of the trucking fleet in Pakistan has rigid suspension technology whereas, about 16.9% of the trucks are articulated. Mini trucks are about 29.2% of the total fleet and oil tankers are just 8.2% of the total number of registered trucks in Pakistan.

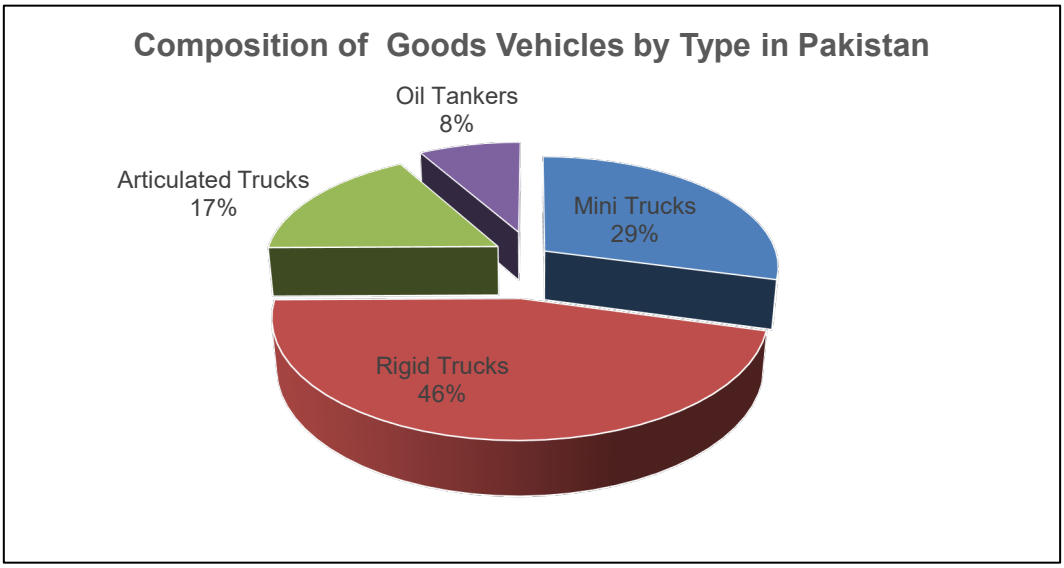


Figure 3.26: Composition of Goods Vehicles by Type in Pakistan

3.10.1 Make Wise Classification

Table 3.10 and Figure 3.27 provide the make-wise classification of registered heavy vehicles in Pakistan. The most common heavy vehicle made is Hino. The data analysis shows that rigid suspension (2-Axle and 3-Axle) trucks comprise about 45.7% of the total registered trucks in Pakistan. Bedford trucks are the most common rigid trucks, and this make comprises nearly half (47.4%) of the rigid trucks in Pakistan. Hino-made

2-Axle and 3-Axle trucks are the second most popular category, and these trucks comprise about 30.1% of the total rigid trucks. Hino trucks are also the most common multi-axle trucks, followed by Nissan trucks. About 43.7% of the total multi-axle articulated trucks are Hino-made, whereas about 33.7% of the articulated trucks are Nissan-made. A few numbers (about 1.8%) of old Bedford trailer units are also registered in registered. About 37.1% of the oil tankers registered are Hino made whereas, most of the mini trucks in Pakistan are Mazda, exactly 19% of total registered mini trucks.

Table 3.10: Make Wise Classification of Registered Heavy Vehicles in Pakistan

Description	Bed Ford	Hino	Isuzu	Mercedes-Benz	Nissan	Others	Total
Mini Trucks	142	7,906	9,422	830	1,120	83,837	103,257
Rigid Trucks	76,633	48,687	7,308	3,219	11,734	14,259	161,840
Articulated Trucks	1,066	26,223	5,017	2,122	20,192	5,383	60,003
Oil Tankers	2,627	10,793	2,870	173	7,840	4,817	29,120
***Total* =**	**80,468**	**93,609**	**24,617**	**6,344**	**40,886**	**108,296**	**354,220**

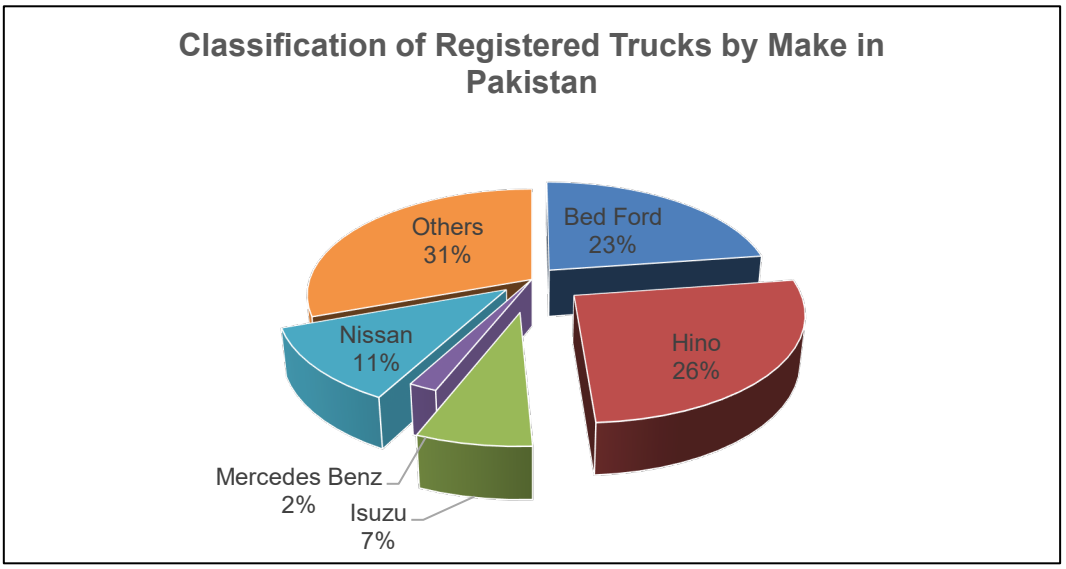


Figure 3.27: Percentages of Registered Trucks by Make in Pakistan

3.10.2 Model Wise Classification

Model-wise classification provides an overview of the age structure of trucks currently plying on the roads of Pakistan. The age structure of different types of trucks has been determined. The analysis shows that a large number of old vehicles are still operational. The current fleet mostly consists of trucks that are about three to four decades old. Such a fleet is largely hindering the efficiency of the freight movements. Figure 3.28 and Figure 3.29 provide the model-wise classification of the registered trucks in Pakistan.

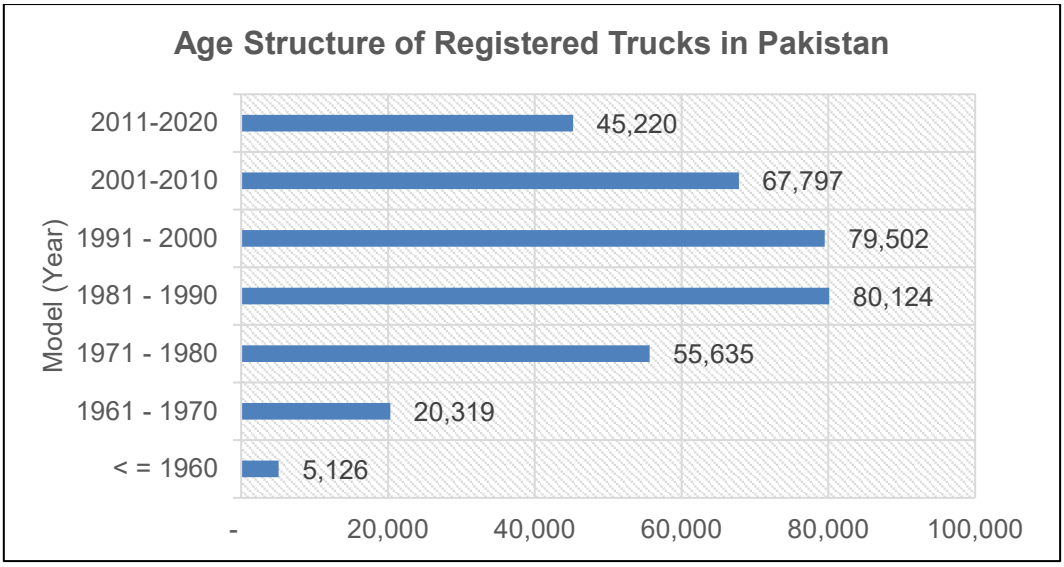


Figure 3.28: Age Structure of Registered Trucks in Pakistan (By Number)

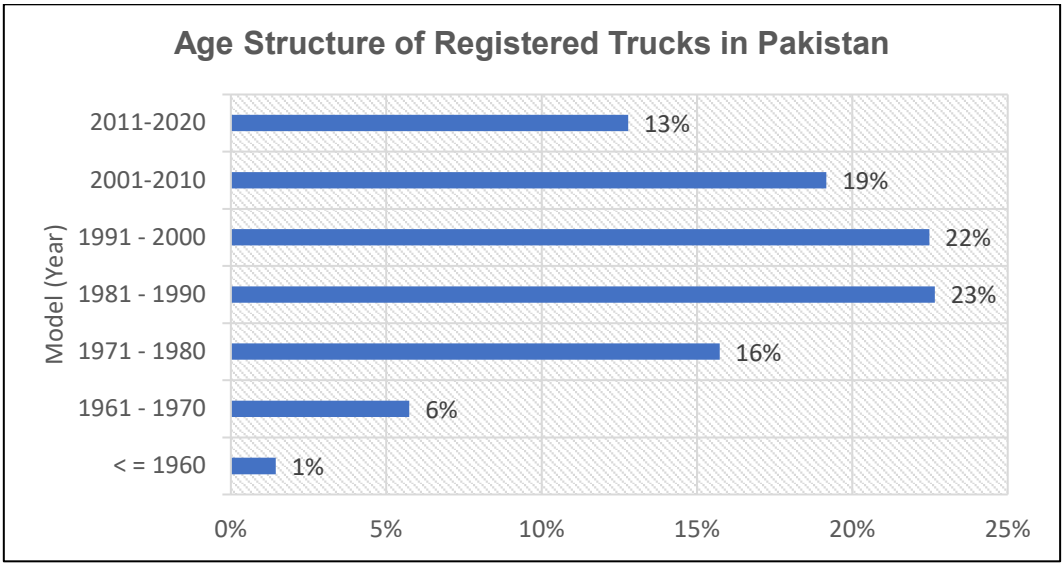


Figure 3.29: Structure of Registered Trucks in Pakistan (By Percentage)

3.10.3 Registration Data Analysis

The data analysis shows that trucks manufactured in 1981-1990 are the most common. This category comprises more than one-fifth (22.6%) of the total fleet. Trucks manufactured in 1991-2000 are about 22.5% of the total trucks plying on the roads of Pakistan. Therefore, trucks manufactured about three-four decades ago make up about half the fleet (45.1%) of the total registered fleet. Trucks manufactured in 2001-2010 comprise about 19.2% of the total truck fleet, whereas trucks manufactured in 2011-2020 comprise about 12.8% of the total truck fleet in Pakistan. This analysis concludes that the sector is not ready for reaping the opportunities knocking on Pakistan's door in the form of the Pak-China Economic Corridor and integration with other international trade routes. Pakistan's reliance on an obsolete and inefficient fleet

has consequences on the road infrastructure as well. A major challenge in the road freight sector is the existing fleet composition. There is a parallel informal manufacturing sector operating in Pakistan. A manufacturer in the informal sector costs PKR 1 to 1.5 million using second-hand materials while second-hand imported trucks that meet Euro II specifications cost about PKR 7 to 8 million.

3.11 Goods Vehicles Manufacturing in Pakistan

According to Pakistan Automobile Manufacturers Association (PAMA) historical data, the total number of trucks manufactured from 1995-96 till 2014-15 was 5,346. The data of total trucks produced show an increasing trend post-2012-13. A total of 9,326 trucks were produced in 2017-18, which is the highest number of trucks produced in a calendar year. Till now a total of 88,952 trucks have been produced. Figure 3.30 shows the trend of total trucks produced in Pakistan.

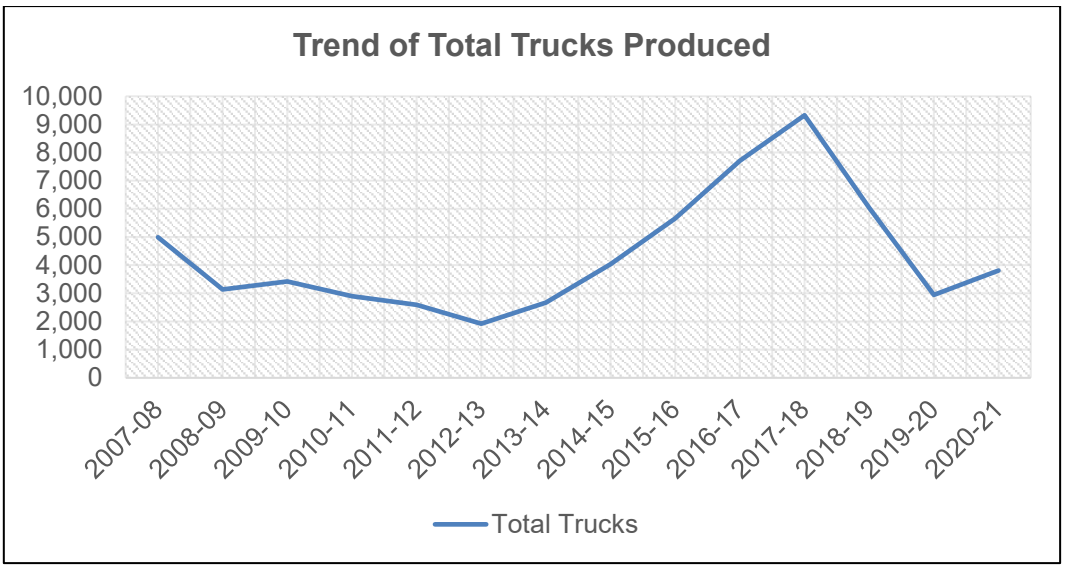


Figure 3.30: Goods Vehicles Manufacturing in Pakistan

A breakdown of the trucks produced by make is depicted in Figure 3.31.

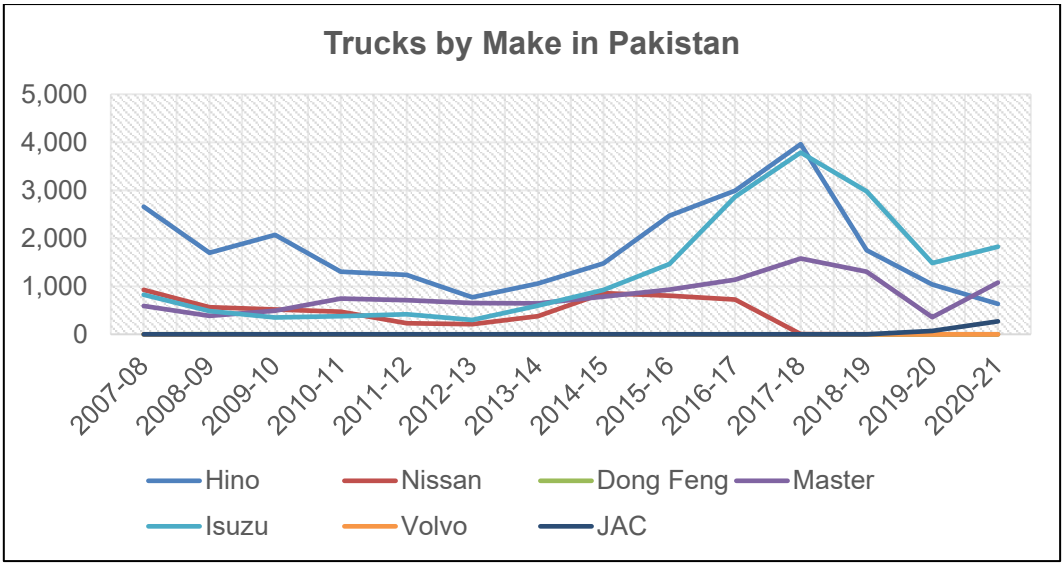


Figure 3.31: Goods Vehicles by Make Manufactured in Pakistan

The PAMA historical data leads to the witness the emergence of major market players on the manufacturing side in the following order: Hino, Nissan, and Master. Hino is the market leader while some of the market players like Volvo and Dong-Feng ceased production respectively in 1999 and 2009. JAC started production in 2019. PAMA record of trucks produced is provided in Table 3.11.

Table 3.11: Trucks Production Record (Source: PAMA)

Year	Hino	Nissan	Dong Feng	Master	Isuzu	Volvo	JAC	Total
2007-08	2,655	926	0	590	822	0	0	4,993
2008-09	1,700	567	3	384	481	0	0	3,135
2009-10	2,070	515	0	490	350	0	0	3,425
2010-11	1,307	469	0	746	379	0	0	2,901
2011-12	1,237	228	0	712	420	0	0	2,597
2012-13	768	208	0	648	299	0	0	1,923
2013-14	1,058	378	0	641	597	0	0	2,674
2014-15	1,476	857	0	784	922	0	0	4,039
2015-16	2,468	804	0	929	1,465	0	0	5,666
2016-17	2,988	722	0	1,140	2,862	0	0	7,712
2017-18	3,960	1	0	1,579	3,786	0	0	9,326
2018-19	1,752	0	0	1,302	2,981	0	0	6,035
2019-20	1,036	0	0	356	1,481	0	72	2,945
2020-21	633	0	0	1,078	1,827	0	270	3,808
***Total* =**	**25,108**	**5,675**	**3**	**11,379**	**18,672**	**0**	**342**	**61,179**

Figure 3.32 shows the market share of key manufacturers during the last five years (2016-17 to 2021-21.

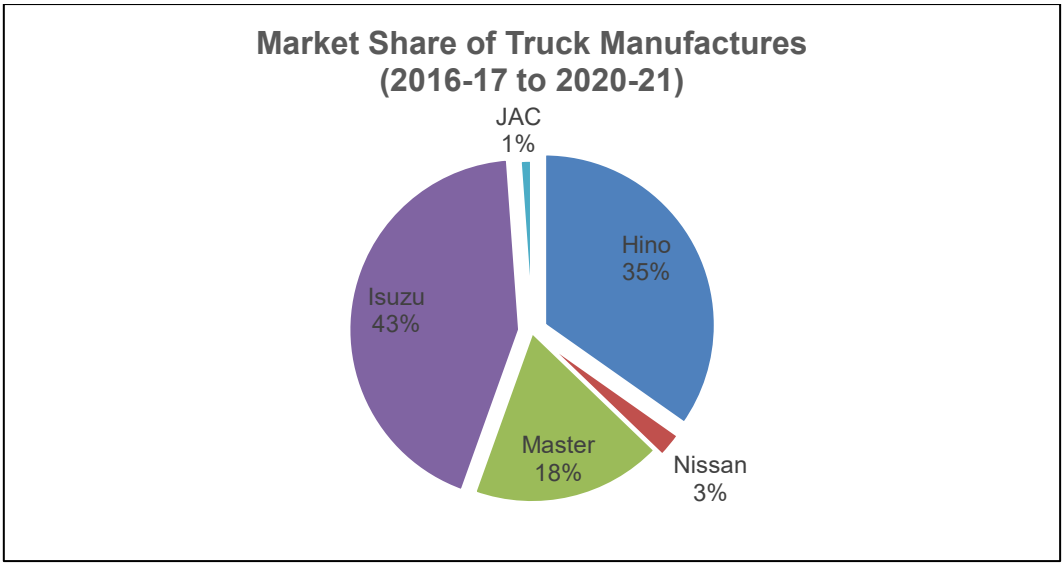


Figure 3.32: Market Share of Truck Manufactures (Source: PAMA)

3.11.1 Light Commercial Vehicles

According to PAMA historical data, the total number of Light Commercial Vehicles (also known as Less than Truck Load) manufactured in Pakistan from 1995-96 to 2014-15 was 255,936. The production of Light Commercial Vehicles gradually decreased after 2015-16. A total of 35,836 LCVs were produced in 2015-16, which is the highest number of LCVs produced in a calendar year. Till now a total of 401,716 LCVs have been produced. Figure 3.33 shows the trend of total LCVs produced in Pakistan.

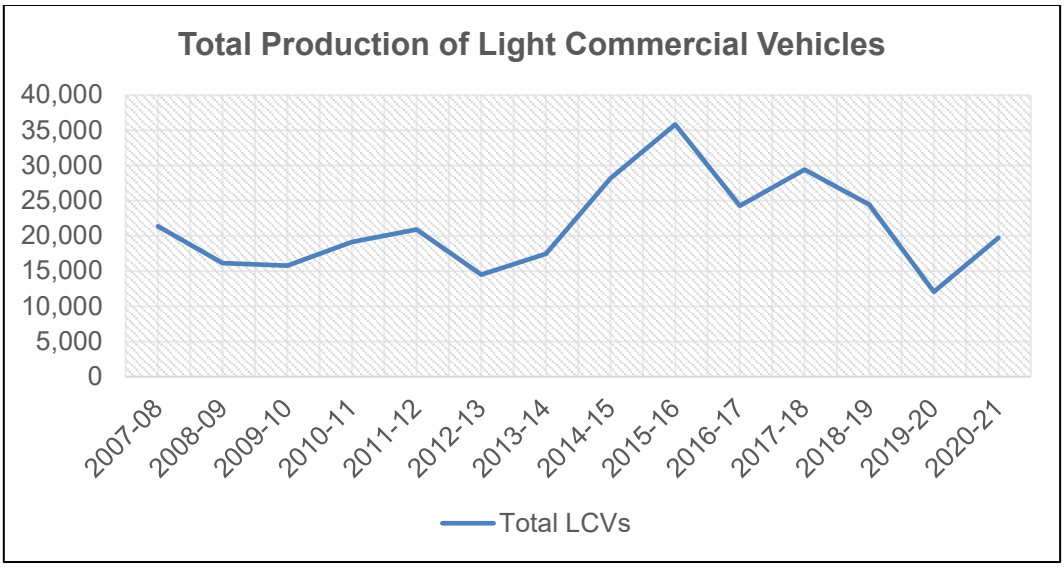


Figure 3.33: Total Production of Light Commercial Vehicles in Pakistan (Source: PAMA)

The data by making shows that Suzuki (Ravi) is the clear market leader followed by Toyota Hilux and Hyundai Shehzore. The production of Hyundai Shehzore stopped after 2013-14 as depicted in Figure 3.34.

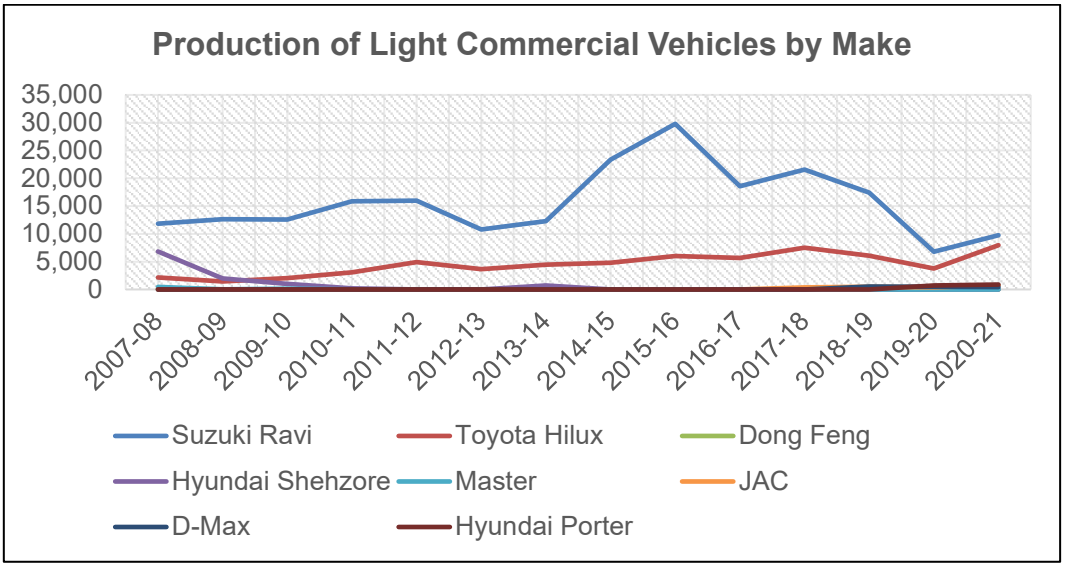


Figure 3.34: Production of Light Commercial Vehicles by Make in Pakistan (Source: PAMA)

4 Analysis of Data Collected from Field Surveys

The major fleet characteristics include operational and financial characteristics. Operational characteristics involve the determination of operations-related aspects of different types of trucks. Such characteristics define the operational structure of the trucking industry in Pakistan. The financial aspects of the trucking industry involve the determination of the financial size of the trucking industry and investment characteristics. The financial aspects include the costs associated with the ownership of trucks such as purchase costs, insurance, depreciation, etc.

The roadside interview surveys are the main source of data for the determination of characteristics of the fleet plying on the roads of Pakistan. The major objective is to get answers to a number of questions related to the purchase and finance of the trucks. It was found out that even though most drivers are employees, they were still acquainted with the financial details of their operation. The owners of the truck usually tell their employees about the finance of the truck and what repayments are needed to be made. The principal driver is then in charge of the operation and is responsible for finding the cargo, making deliveries, keeping accounts, and maintenance of the truck. The following section discusses the financial, investment, and operational characteristics of the trucking industry in Pakistan.

4.1 Fleet Characteristics

To overview the operational characteristics of the industry, it is essential to get firsthand information from the drivers, truck owners, and transport operators. The consultant performed the roadside interviews (RSI) survey to collect the data from truck drivers. This section of the report discusses the findings of the roadside interviews survey performed by the consultant.

4.1.1 Make Wise Classification

Table 4.1 shows the classification of trucks based on their make as per the data collected during the roadside interview survey. Trucks manufactured by Hino contribute more in numbers to the trucking industry of Pakistan as per the roadside interviews survey.

Table 4.1: Vehicle Numbers w.r.t Make Wise Classification

Vehicle Make	Vehicles Count
Bedford	635
Hino	1,686
Isuzu	132
Mercedes	30
Nissan	531
Others	268
Total =	**3,282**

Figure 4.1 shows that make-wise Hino contributes 52% which is more than half of the total trucks surveyed.

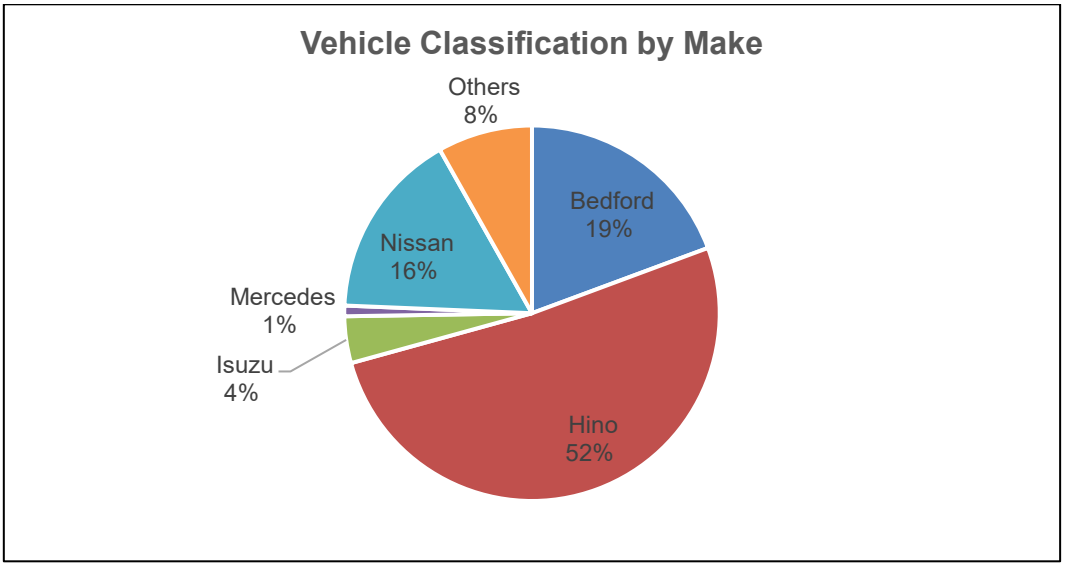


Figure 4.1: Percentages of Trucks by Make (RSI Survey)

4.1.2 Axle Wise Classification

Table 4.2 presents the axle-wise classification of the total number of trucks surveyed during the roadside interviews survey. The table shows that rigid (2-Axle & 3-Axle) trucks contribute more than 60% of the total trucks surveyed. This shows that trucks plying on roads mostly consist of 2-Axle and 3-Axle trucks.

Table 4.2: Vehicle Numbers w.r.t Axle Wise Classification (RSI Survey)

Vehicle Type	Vehicle Count
2-Axle Truck	1,062
3-Axle Truck	1,138
4-Axle Truck	520
5-Axle Truck	220
6-Axle Truck	342
Total =	**3,282**

Figure 4.2 shows the percentage contributions of different trucks by their axle configurations. 2-Axle trucks contribute 35% while 3-Axle trucks contribute 32% to the total trucks surveyed as per the roadside interviews survey.

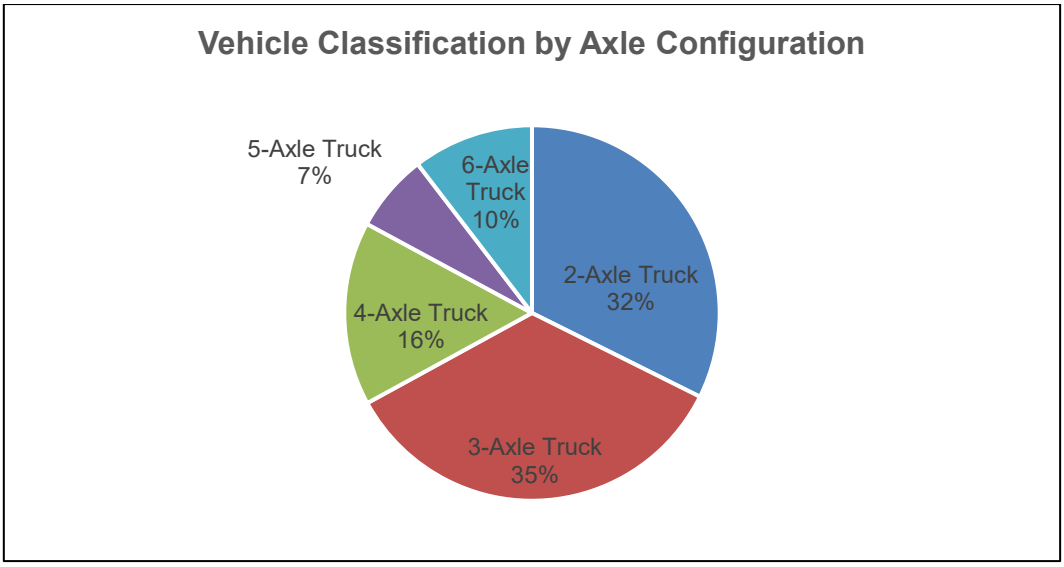


Figure 4.2: Percentages of Trucks by Axle Configuration (RSI Survey)

4.1.3 Model Wise Classification

Figure 4.3 shows the age structure of the trucks surveyed during the roadside interviews survey. Most trucks have an age structure between 2001-2020 i.e., more than 60% of trucks as per the roadside interviews survey.

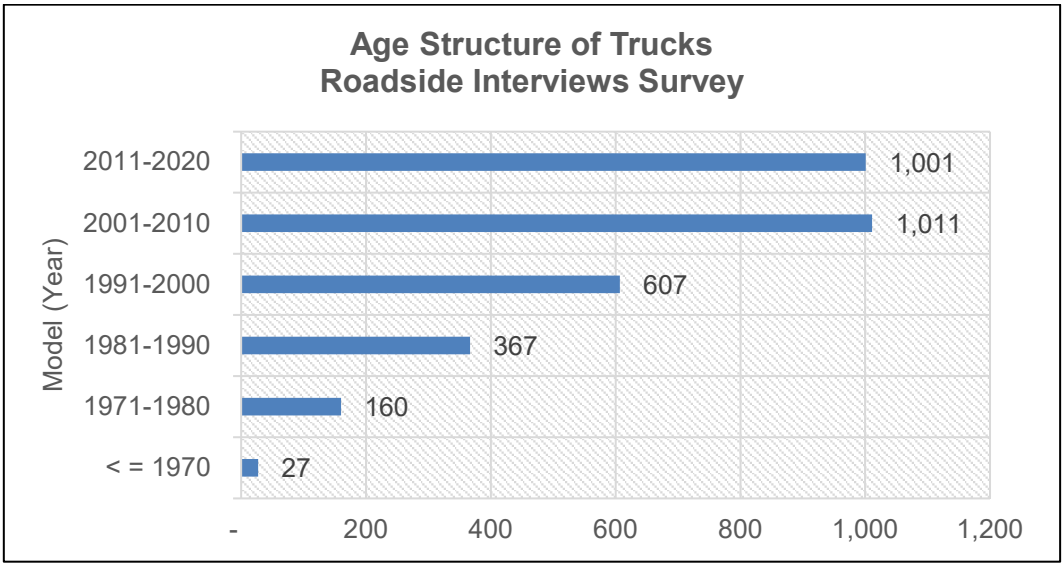


Figure 4.3: Model Wise Classification of Trucks (RSI Survey)

Figure 4.4 shows the age structure of 2-Axle trucks surveyed during the roadside interviews survey. The figure shows that maximum trucks show the age structure from the year 1981 to 2020.

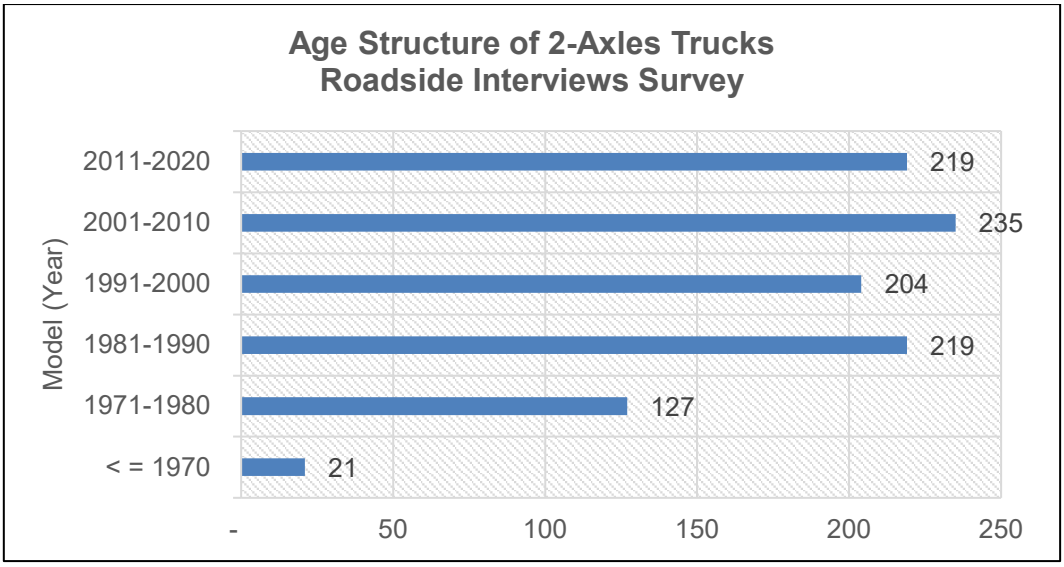


Figure 4.4: Age Structure of 2-Axles Trucks (RSI Survey)

Figure 4.5 shows the age structure of 3-Axle trucks surveyed during the roadside interviews survey. The figure shows that maximum 3-Axle trucks show the age structure from the year 2001 to 2010.

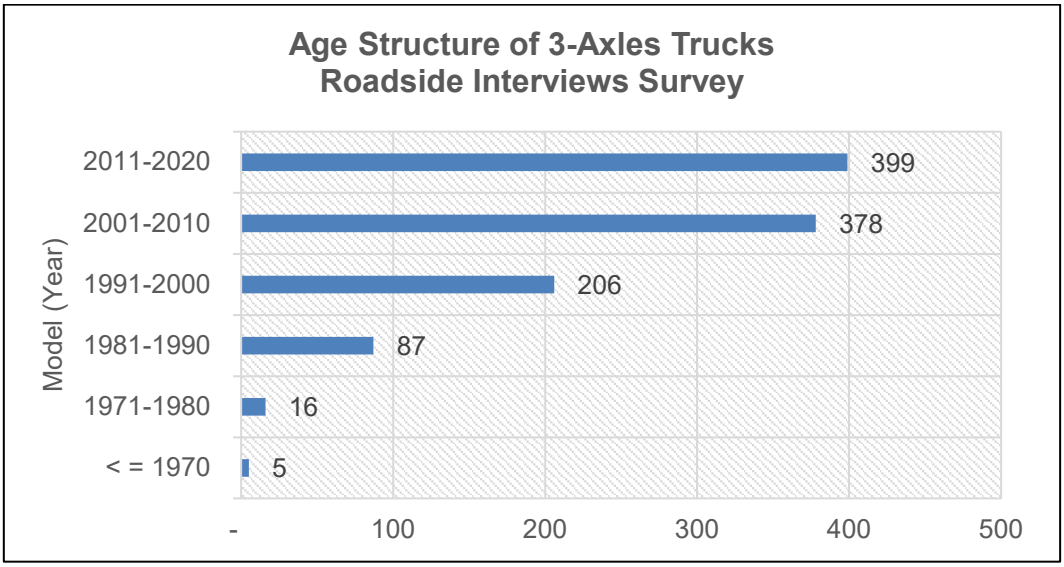


Figure 4.5: Age Structure of 3-Axles Trucks (RSI Survey)

Figure 4.6 shows the age structure of 4-Axle trucks surveyed during the roadside interviews survey. The figure shows that maximum 4-Axle trucks show the age structure from the year 1991 to 2010.

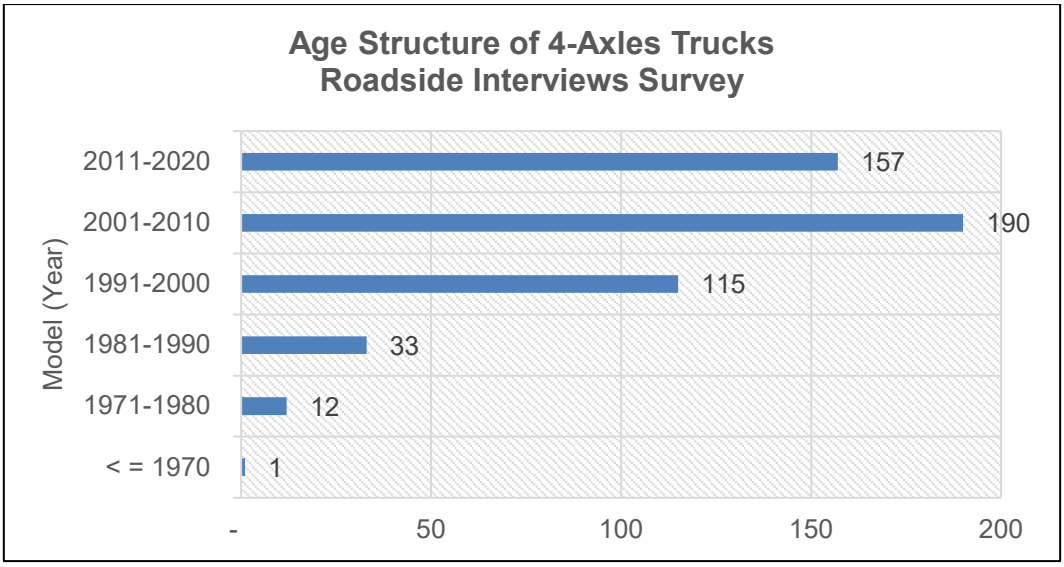


Figure 4.6: Age Structure of 4-Axles Trucks (RSI Survey)

Figure 4.7 shows the age structure of 5-Axle trucks surveyed during the roadside interviews survey. The figure shows that maximum 5-Axle trucks show the age structure from the year 2001 to 2020.

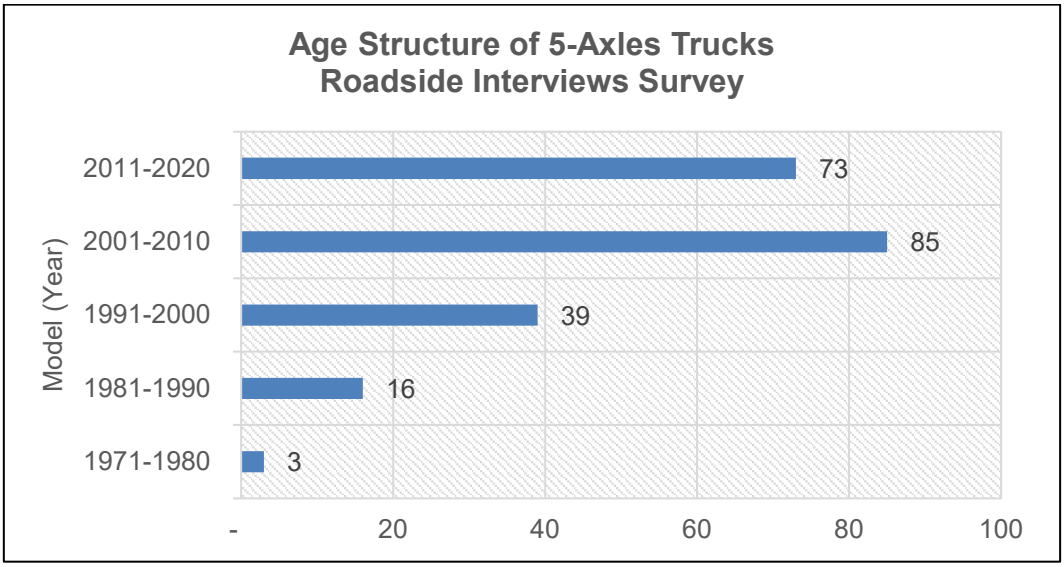


Figure 4.7: Age Structure of 5-Axles Trucks (RSI Survey)

Figure 4.8 shows the age structure of 6-Axle trucks surveyed during the roadside interviews survey. The graph shows that maximum 6-Axle trucks show the age structure from the year 2001 to 2020.

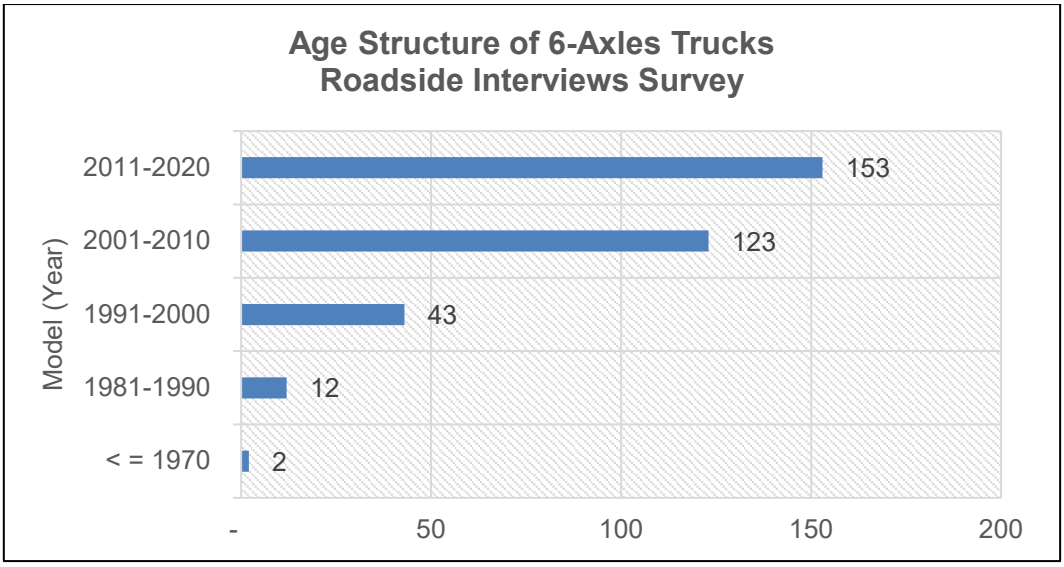


Figure 4.8: Age Structure of 6-Axles Trucks (RSI Survey)

Table 4.3 shows the make-wise, axle-wise, and age structure-wise distribution of the trucks surveyed during the roadside interviews survey. The table shows that the age structure of maximum trucks lies from the year 2001-2020. It can also be seen that Hino contributes more than all other types with respect to the make of the trucks.

Table 4.3: Make, Vehicle Type, and Age Spectrum for Trucks

Description	Bedford	Hino	Isuzu	Mercedes	Nissan	Others
< = 1970						
2-Axle	31	9	1	-	-	17
3-Axle	8	21	1	-	7	15
4-Axle	-	5	3	-	2	3
5-Axle	-	1	-	-	1	2
6-Axle	-	2	-	-	1	6
1971-1980						
2-Axle	115	7	2	-	2	1
3-Axle	4	6	1	-	4	1
4-Axle	1	6	-	-	3	2
5-Axle	-	2	-	1	-	-
6-Axle	-	2	-	-	-	-
1981-1990						
2-Axle	139	51	2	1	5	21
3-Axle	24	37	3	1	12	10
4-Axle	2	17	-	-	12	2
5-Axle	1	10	-	1	3	1
6-Axle	1	4	4	1	2	-
1991-2000						
2-Axle	46	111	1	3	19	24
3-Axle	12	153	9	1	24	7

Description	Bedford	Hino	Isuzu	Mercedes	Nissan	Others
4-Axle	1	71	6	-	31	6
5-Axle	-	23	4	1	5	6
6-Axle	-	25	-	7	9	2
2001-2010						
2-Axle	73	90	9	1	29	33
3-Axle	40	226	11	-	77	24
4-Axle	6	121	14	1	43	5
5-Axle	2	59	8	-	12	4
6-Axle	1	78	10	6	18	10
2011-2020						
2-Axle	87	66	8	1	34	23
3-Axle	28	221	8	1	114	27
4-Axle	11	109	10	-	25	2
5-Axle	-	49	5	1	16	2
6-Axle	2	104	12	2	21	12
Total =	**635**	**1686**	**132**	**30**	**531**	**268**

4.1.4 Vehicle Modifications

Pakistan's fleet is predominately outdated by several decades of run-on underpowered engines that have implications on logistic performance (World Bank, 2006). High import tariffs on high-capacity multi-axle imported trucks protect the local manufacturers producing low-capacity and low-powered trucks. Another factor contributing to the plight of the trucking sector is the informal manufacturing and enhancements of second-hand trucks. Their low price makes them the preferred choice for the sector stakeholders despite compromises on safety and quality standards. Table 4.4 shows the distribution of different types of modifications made in the structure of the trucks. It is concluded from the table that “Extra Axle added” and “Engine” was the major modifications made in the structure of trucks.

Table 4.4: Vehicle Modifications in the Trucks (RSI Survey)

Modification Type	Truck Counts
Chassis	9
Extra Axle Added	149
Engine	288
Don’t know	512
No Modification	2,264
Total =	**3,222**

Figure 4.9 shows the distribution of different types of modifications made to the structure of the trucks. The maximum response (i.e., 70%) received from the roadside interviews survey is that there were no modifications made to the structure of trucks.

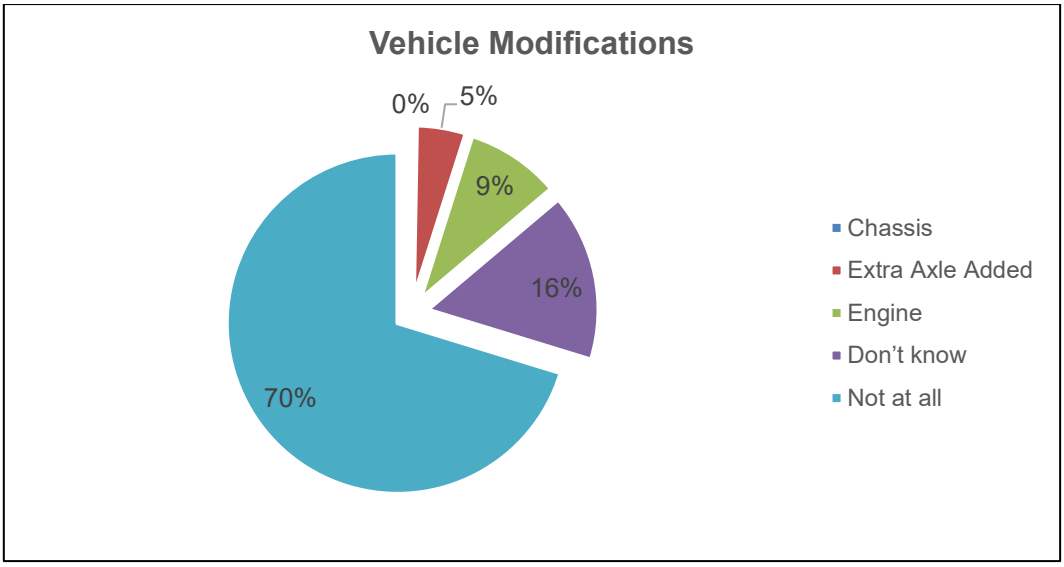


Figure 4.9: Percentage of Vehicle Modifications (RSI Survey)

Table 4.5 shows the vehicle modifications with respect to the make of the truck. Maximum modifications made in "Engine" and "Extra Axle Added" were that of Hino trucks.

Table 4.5: Vehicle Modifications w.r.t Make (RSI Survey)

Description	Chassis	Engine	Extra Axle Added	Total
Hino	4	212	67	**283**
Bedford	2	25	41	**68**
Nissan	1	44	23	**68**
Isuzu	-	1	12	**13**
Others	2	5	5	**12**
Mercedes	-	1	1	**2**
Total =	**9**	**288**	**149**	**446**

Figure 4.10 shows the modification made to the trucks with respect to the make. Maximum modifications made in "Engine" and "Extra Axle Added" were that of Hino trucks.

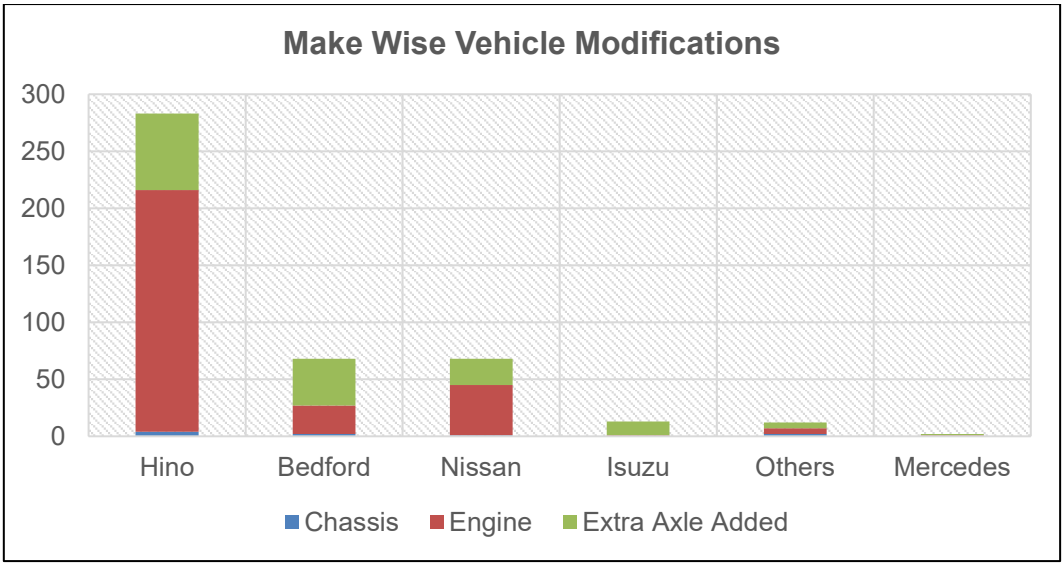


Figure 4.10: Modifications Made in Vehicles w.r.t Make

Table 4.6 shows the vehicle modification with respect to axle configuration. 2-Axle and 3-Axle trucks are the truck types having maximum modifications concerning “Engine” and “Extra Axle Added”.

Table 4.6: Vehicle Modifications in different Truck Types (RSI Survey)

Description	Chassis	Engine	Extra Axle Added	Total
2-Axle	6	92	53	**151**
3-Axle	3	100	52	**155**
4-Axle	-	47	35	**82**
5-Axle	-	23	9	**32**
6-Axle	-	26	-	**26**
Total =	**9**	**288**	**149**	**446**

The graph in Figure 4.11 shows that maximum modifications were made to 3-Axle trucks. These modifications are made to strengthen the vehicle which typically travels to hilly areas to deliver goods.

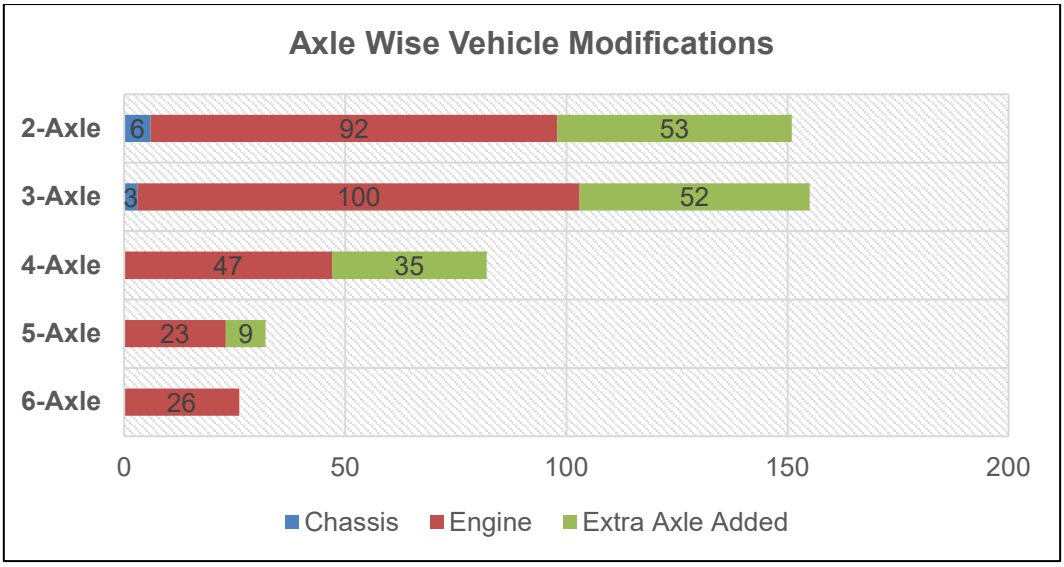


Figure 4.11: Modifications Made in Vehicles w.r.t Axle Configuration

4.2 Financial Characteristics

4.2.1 Ownership Type

The trucking industry in Pakistan operates on a "hire and reward" basis. The freight industry is a free market in which individual truck owners provide their services on a contractual basis. The industry is largely dominated by sole owners who employ drivers for major trucking operations. It shows a pattern of small-scale entrepreneurship, which is a feature of many aspects of the freight industry in Pakistan.

Data on ownership and management of the industry was collected in the roadside interview surveys. Table 4.7 provides the data on the ownership type of trucks. More than half of the trucks (53%) surveys belonged to the sole owner. In Pakistan, it is usual for an owner to employ the main driver and task him with the operations of the vehicle. Partnership accounted for about 21% of the total. A very few numbers of vehicles belonged to commercial companies.

Table 4.7:Ownership Type of Trucks (RSI Survey)

Description	Ownership Type
Sole Owner	1,759
Joint Owner	680
Driver (self)	533
Don't know	240
Commercial Company	70
Total Responses =	**3,282**

In the surveys, about 16.2% of the drivers were owners of the trucks. However, only 5 percent of the driver's owned trucks belonged to others. Figure 4.12 provides data on the ownership type of the fleet. The data elaborates that largely self-employed drivers are operating in the industry. These drivers are usually owners of 2-Axle and 3-Axle trucks. Tractor-trailer vehicles are mostly owned by large fleet management commercial companies.

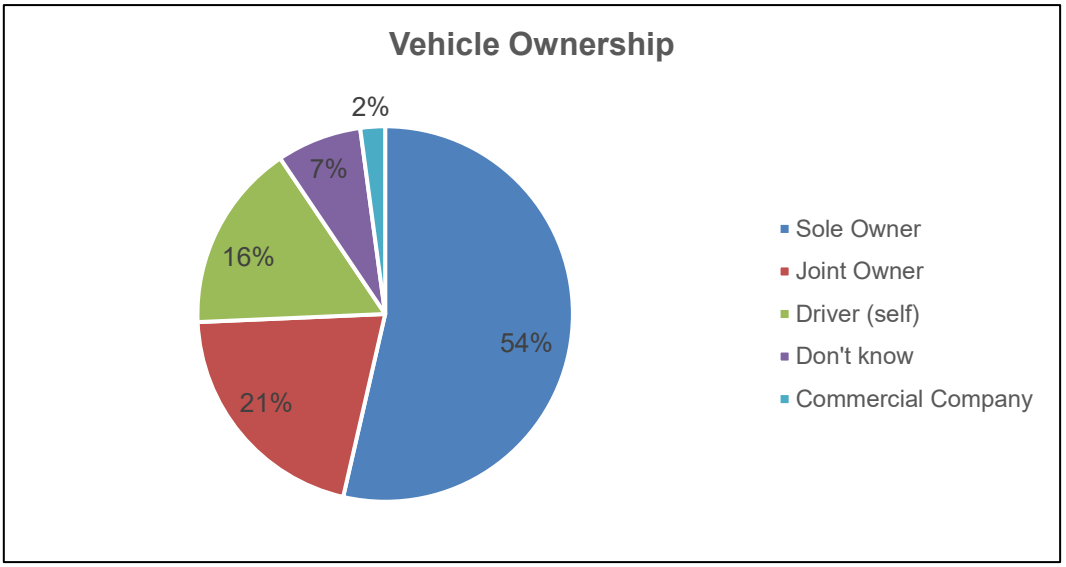


Figure 4.12: Vehicle Ownership of Trucks (RSI Survey)

4.2.2 Acquisition Mode

In the roadside interviews survey, drivers were asked a number of questions regarding the finance and purchase of the trucks. Most of the drivers were well acquainted with such information. Table 4.8 provides the data on how trucks were purchased by their current owners. The table shows that more than 50 percent (about 52%) of the privately-owned fleet was purchased on an installment basis. About 21% of the trucks were purchased by a single payment. A very few numbers of trucks were acquired on a loan and rent basis.

Table 4.8: Details regarding Acquisition Mode of Trucks (RSI Survey)

Description	Acquisition Mode
Several payments / Instalments	1,708
Single payment purchase	693
Loan	47
Rent	23
Lease	3
Don't know	808
Total Replies =	**3,282**

Figure 4.13 provides the percentages of various modes by which trucks are acquired.

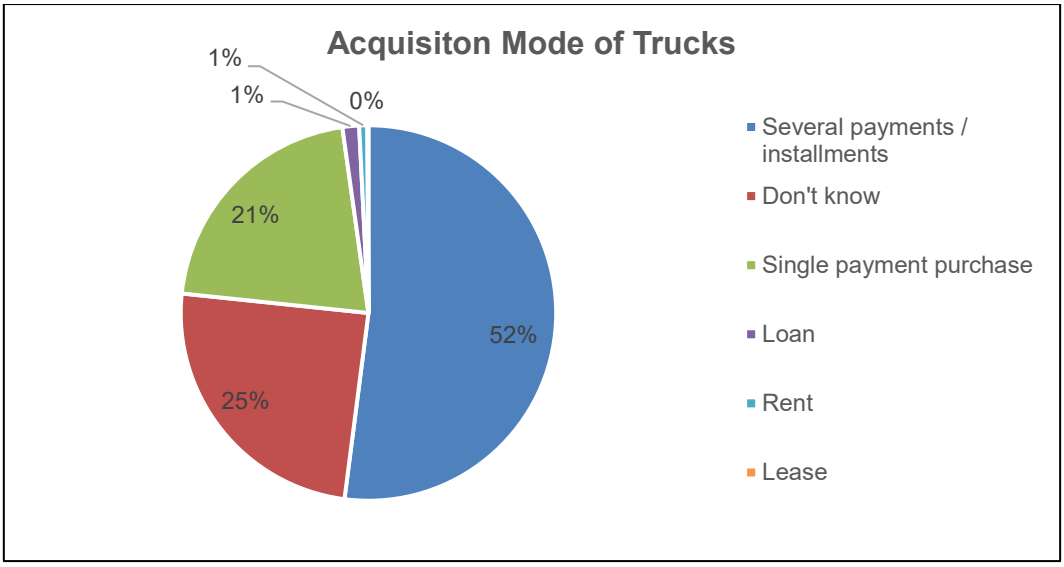


Figure 4.13: Acquisition Mode of Trucks (RSI Survey)

4.2.3 Insurance Type

Insurance provides financial benefits against physical damage to the vehicle. Insurance cover risks such as accidents, theft, third-party liability, and other damages. However, in Pakistan, the trend of insurance of vehicles is very uncommon. Table 4.9 provides the details of the insurance type of vehicles surveyed.

Table 4.9: Insurance Types of Vehicles (RSI Survey)

Insurance Type	Vehicles Count
Third-Party Act	479
Other	495
Don't know	567
None	1,741
Total Replies =	**3,282**

Figure 4.14 provides numbers on how many trucks surveyed during the roadside interviews survey were insured. It shows that less than one-third (29.6%) of the total trucks were insured.

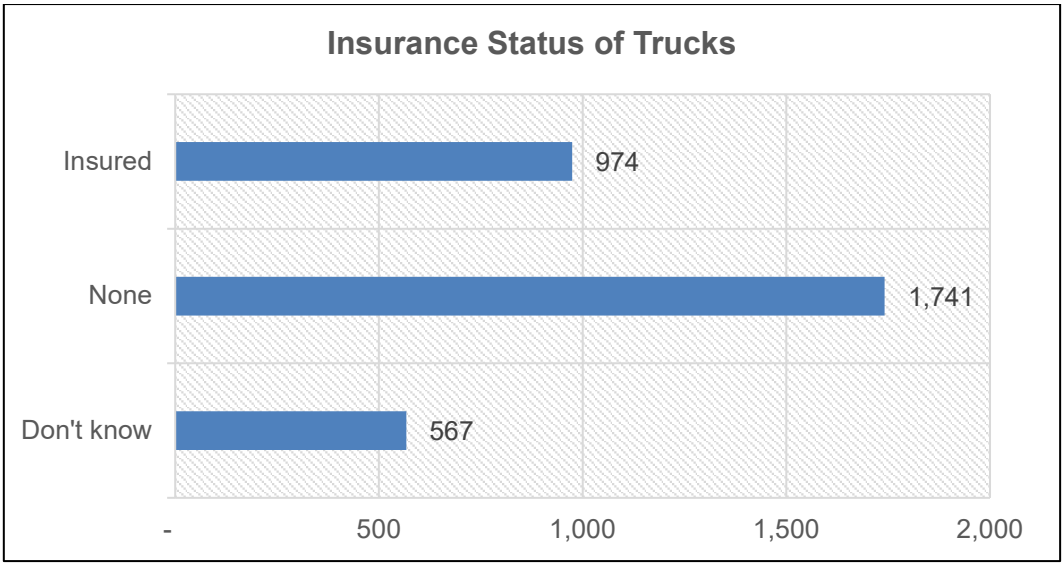


Figure 4.14: Insured Vehicles Numbers (RSI Survey)

Table 4.10 provides the details of insured vehicles with respect to the axle-wise configuration of trucks. It shows articulated trucks are mostly insured. 6-Axle trucks are the most common truck type that is insured. About 35% of 6-axle trucks surveyed were insured. 2-Axle trucks are the least insured truck type. It illustrates a pattern; that individual owners usually do not bother to get their trucks insured. In most cases, the owners are also not satisfied with the insurance system.

Table 4.10: Insured Trucks w.r.t Axle Configuration (RSI Survey)

Description	Don't know	None	Insured	% Insured
2-Axle Truck	220	570	272	**25.61%**
3-Axle Truck	178	589	371	**32.60%**
4-Axle Truck	74	309	137	**26.35%**
5-Axle Truck	41	109	74	**33.04%**
6-Axle Truck	54	164	120	**35.50%**
Total =	**567**	**1,741**	**974**	**29.68%**

4.3 Investment Characteristics

4.3.1 Vehicle Purchase and Finance / Capital Investment

Truck Owners' Survey is the main source of data regarding the finance and vehicle purchase-related characteristics. Table 4.11 provides the purchase cost of different types of trucks.

Table 4.11: Purchase Cost (000' PKR) of Trucks (Truck Owners' Survey)

Model	2-Axle	3-Axle	6-Axle
1971	2,500	3,500	4,000
2001	3,420	5,250	7,400
2010	4,800	5,750	8,125
2021	5,071	6,750	11,167

Figure 4.15 provides the details of the purchase status of trucks by the truck owners; mostly second-hand trucks were purchased by the current owners of trucks.

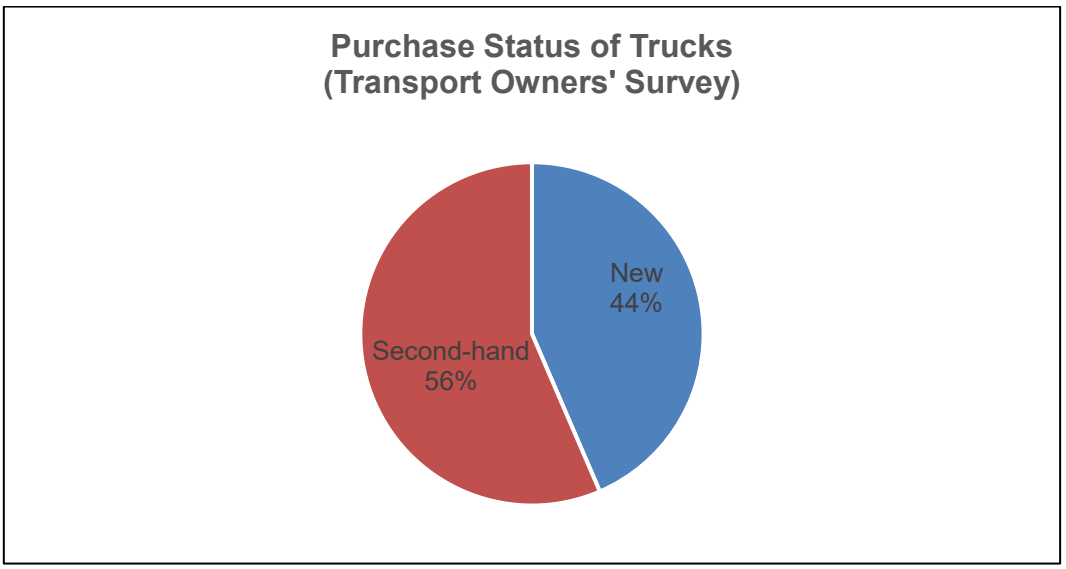


Figure 4.15: Purchase Status of Trucks (Transport Owners' Survey)

Figure 4.16 provides the estimates of the average purchase cost with vehicle age for a 6-Axle truck. Purchase cost has gradually increased over the years however, interestingly, there is variation in prices, for instance, the 2000 model truck has a higher purchase cost than its latest model.

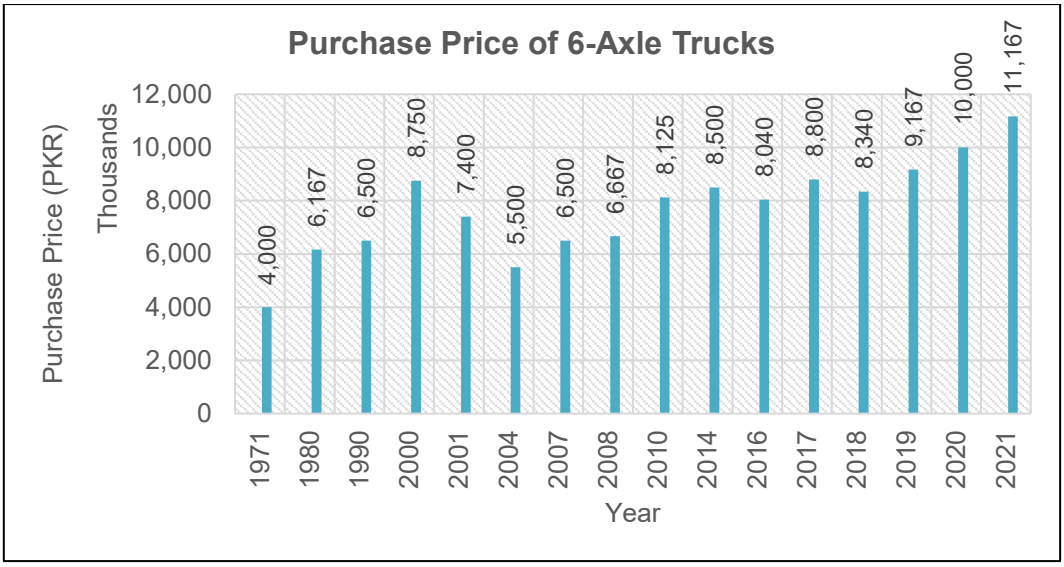


Figure 4.16: Estimates of Purchase Cost and Vehicle Age for 6-Axle Trucks (Transport Owners' Survey)

4.3.2 Body Modifications and Related Costs

In Pakistan, body modification of trucks is common. Most trucks are strengthened to take heavier loads. The common types of modifications include strengthening of chassis or frame, axle springs, and engine compartments. These modifications are carried out by local workshops. Figure 4.17 shows a comparison of the Hino Ranger truck with a standard body and the same truck with a modified body.

Hino Ranger with Standard Body

Same Truck in Pakistan

Figure 4.17: Body comparison of Hino Ranger Truck

Figure 4.18 shows the percentage of trucks that were altered and strengthened. Body modifications are made to strengthen the vehicle to carry heavy loads. In about 28% of the total trucks, engines were strengthened. Such modifications are done in local workshops. Most of these local workshops are located in District Sahiwal.

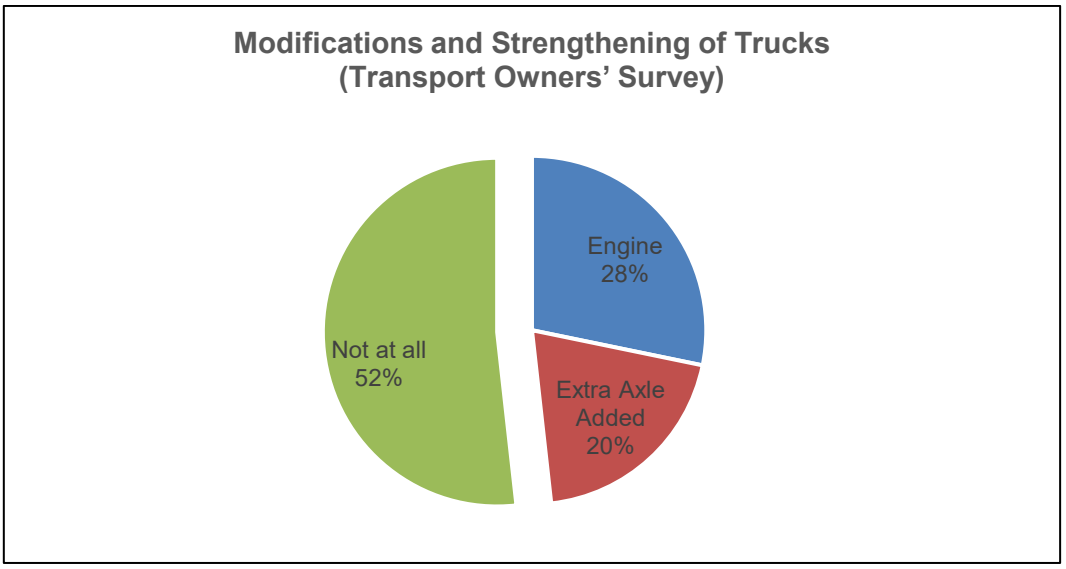


Figure 4.18: Percentage of Altered Vehicles (Transport Owners' Survey)

4.4 Other Characteristics

Characteristics such as annual usage of the truck by axle type (2, 3 & multi-axles), annual volume carried, average lead, trip length, turnaround time, annual usage, empty travel, handling time, the geographic area covered, preferred routes, and commodities carried are to be determined. 2-Axle trucks are mainly used for shorter routes. Whereas, 3-Axle trucks are used for shorter as well as longer routes and are preferred for operations in hilly areas. The main cargo is mainly handled by 4-Axle, 5-Axle (18-wheeler), and 6-Axle (22-wheeler) trucks. The following section of the report provides detail on the operation characteristics of the fleet operating in Pakistan.

4.4.1 Commodities Carried & Truck Types for Major Commodities

Figure 4.19 shows the percentages of different types of cargo transported by the trucks.

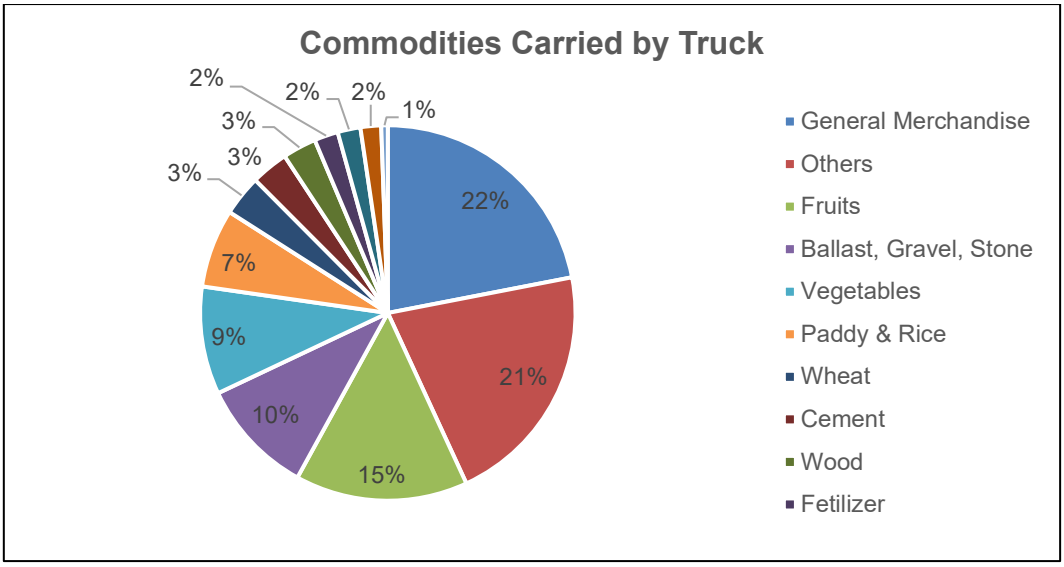


Figure 4.19: Major Commodities Carried by Truck (RSI Survey)

According to the roadside interviews survey, the major commodities in terms of tons carried by trucks are: 1) general merchandise; 2) ballast, gravel, and stone 3) fruit; 4) paddy and rice; and 5) vegetables as shown in Figure 4.20.

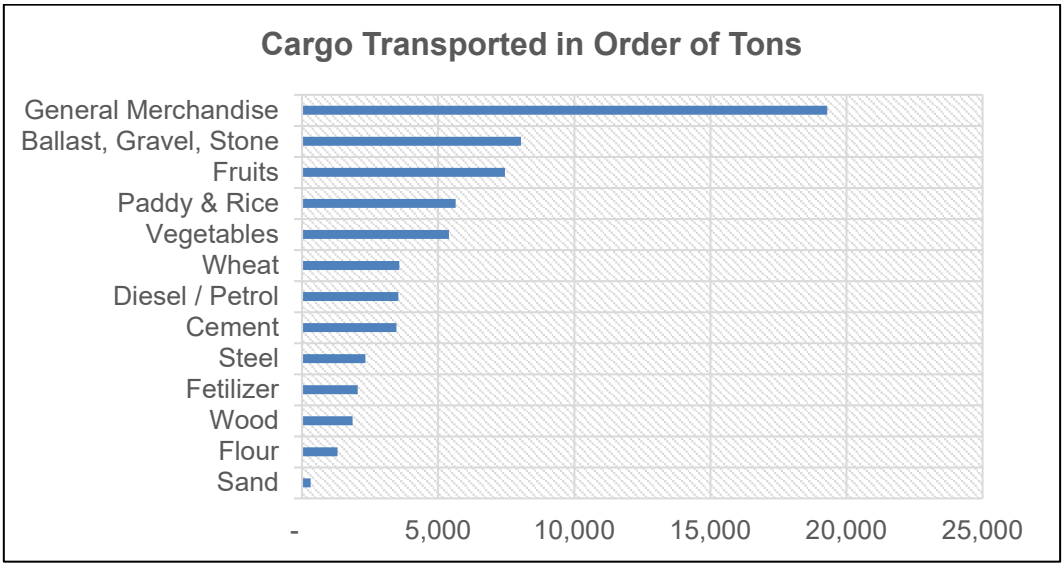


Figure 4.20: Cargo Transported in Order of Tons (RSI Survey)

Fruits are perishable goods and are desirable not to be carried for a long distance without temperature control. Small trucks, that is, 2 & 3-Axle trucks are mostly used for transporting such types of goods. Table 4.12 provides the details of different truck types used for the transportation of major commodities. As can be seen in the table, a greater percentage of trailer units are used for the transportation of heavy cargo such as steel, fertilizer, and cement.

Table 4.12: Truck Types for Major Commodities (RSI Survey)

Description	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle
General Merchandise	204	214	216	81	90
Fruits	245	178	31	13	10
Other	139	134	79	33	84
Ballast, Gravel, Stone	103	179	16	10	11
Vegetables	128	104	42	12	12
Paddy & Rice	54	94	45	16	8
Wheat	31	40	13	5	23
Diesel / Petrol	18	20	26	18	28
Cement	28	41	12	5	17
Wood	42	22	15	9	5
Fertilizer	10	20	10	8	18
Steel	10	21	5	8	19
Flour	19	22	7	3	6
Sand	7	9	1	1	-

4.4.2 Preferred Routes & Average Turnaround Time for Major Routes

One of the objectives of this study is to determine the characteristics of long-distance freight travel. Most of the freight destinations in Pakistan are over the 500 km mark. Truck drivers usually make a round trip. Table 4.13 provides the approximate distance from Karachi to other major destinations; the average turnaround time is also provided.

Table 4.13: Approximate Distance and Turnaround Time for Major Routes

Route	Distance (Kms)	Average Turnaround Time
Karachi to Lahore	1260	5 days 12 hours
Karachi to Peshawar	1700	7 days
Karachi to Quetta	690	6 days 12 hours
Karachi to Faisalabad	1110	5 days 12 hours

4.4.3 Mean Period for Returning to Base

Unlike the pattern of freight operations in other countries where a firm's office is responsible for finding work, scheduling vehicles, and collecting revenues, in Pakistan these duties are performed by the principal driver. Truck owners usually put the main driver in charge of the trucking operations such as seeking transport work, maintaining the truck, and returning profit to the owner. Due to such work activities, drivers are usually away from the base. Table 4.14 provides the driver's responsibility for the number of days after which they return to base. It shows that about 90% of the drivers are with the truck for its operations and do not return home on daily basis.

Table 4.14: Drivers' Response on Mean Period for Returning to Base (RSI Survey)

Description	Responses
After - days	2,943
Daily	26
Don't know	313
Total Responses =	**3,282**

Truck Drivers

Figure 4.21 shows the mean period for returning to base. It shows that about 19% of the drivers return to base within a week of freight operation. Most drivers return home between a period of one to two weeks. It is interesting to note that some drivers return to base after a period of longer than a month. The mean period for drivers returning to the base is found to be 14 days.

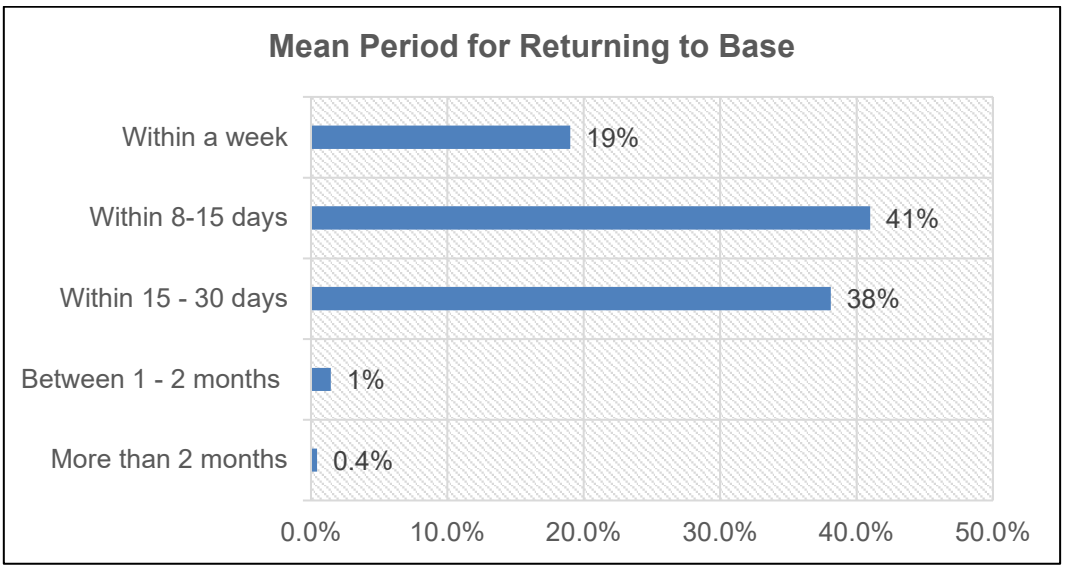


Figure 4.21: Mean Period for Returning to Base (RSI Survey)

4.4.4 Total Number of Days Spent by Truck on Road

In Pakistan, freight vehicles can achieve a high degree of utilization by working long hours, night and day. Most trucks have two drivers; when one is working the other can rest and sleep making use of the wooden compartment above the cab. In practice, the vehicles are often away from the base for longer periods of up to more than three weeks. Table 4.15 provides the total number of days spent by various types of trucks on road / in fleet operation.

Table 4.15: Total Number of Days Spent by Truck on Road (in Days)

Description	2-Axle Truck	3-Axle Truck	4-Axle Truck	5-Axle Truck	6-Axle Truck
Less than 7 days	**4**	**2**	**1**	**-**	**1**
1	1	1	-	-	-
3	2	1	-	-	-
6	1	-	-	-	-
7	-	-	1		1
Between 7 - 14 days	**52**	**55**	**29**	**10**	**31**
8	3	1	1	-	-
10	9	5	6	2	7
11	2	2	-	-	1
12	9	6	10	3	14
13	1	3	2	1	-
14	28	38	10	4	9
Between 14 - 20 days	**255**	**209**	**154**	**47**	**55**
15	60	62	29	14	24
16	-	3	4	-	3
17	6	5	2	3	2
18	33	18	18	11	10
19	1	5	2	-	1
20	155	116	99	19	15
Between 20 - 25 days	**200**	**173**	**61**	**33**	**39**
21	41	30	14	3	3
22	14	13	6	4	-
23	12	24	10	5	12
24	35	32	9	4	5
25	98	74	22	17	19
More than 25 days	**523**	**669**	**264**	**125**	**201**
26	58	50	8	8	8
27	14	15	4	6	6
28	54	63	27	6	12

Description	2-Axle Truck	3-Axle Truck	4-Axle Truck	5-Axle Truck	6-Axle Truck
29	3	3	1	-	-
30	394	538	224	105	175
Total =	**1,034**	**1,108**	**509**	**215**	**327**

Table 4.16 provides the percentage of trucks with respect to time spent on roads seeking work throughout the country.

Table 4.16: Number of Days Spent by Truck on Road in Travel (RSI Survey)

No. of Days in Travel	Drivers' Response	Percentage of Trucks
Less than 7 days	8	**0.3%**
Between 7 - 14 days	177	**5.5%**
Between 14 - 20 days	720	**22.5%**
Between 20 - 25 days	506	**15.8%**
More than 25 days	1,782	**55.8%**
Total Replies =	**3,193**	

Table 4.17 provides the details of various truck types spending time in freight operations. It can be seen that more than half of the total trucks across each category spent more than four weeks in freight operations (seeking load and unloading). Trailer units are used for transporting cargo on long routes and usually make a round trip across the country and therefore, spent the most time on the road. About 60% of the prime movers (6-Axle trailer-unit) spend more than 25 days on road.

Table 4.17: Percentage of Truck Types w.r.t Time Spent in Travel (RSI Survey)

Description	2-Axle Truck	3-Axle Truck	4-Axle Truck	5-Axle Truck	6-Axle Truck
Less than 7 days	0.4%	0.2%	0.2%	-	0.3%
Between 7 - 14 days	5%	5%	6%	5%	9%
Between 14 - 20 days	25%	19%	30%	22%	17%
Between 20 - 25 days	19%	16%	12%	15%	12%
More than 25 days	51%	60%	52%	58%	61%

Figure 4.22 graphically shows that most trucks spend more than 25 days on road. The second-largest period for trucks spending time in operation is between two-three weeks.

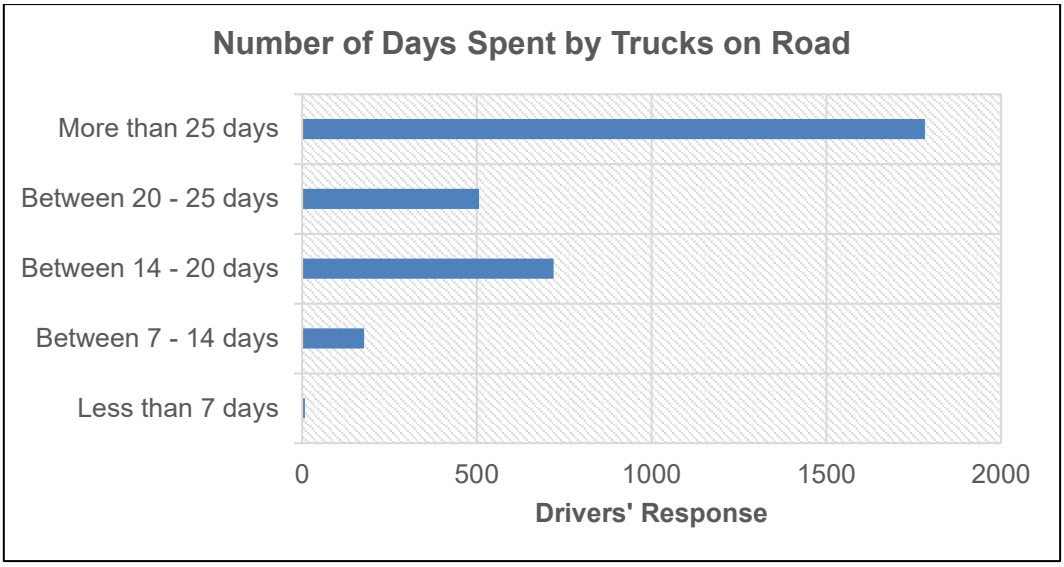


Figure 4.22: Number of Days Spent by Trucks on Road (RSI Survey)

4.4.5 Method of Finding Loads

To analyze the truck freight industry in Pakistan you need to be familiar with four stakeholders: **shippers** that want their goods to be transported to a destination within or outside a city in Pakistan; **transporters** that these shippers have to reach out to deliver these goods**; brokers** that transporters reach out to get them these delivery orders in case they don't have direct arrangements with shippers; and **truck drivers** that execute the deliveries.

The hauling is year-round, and these truckers are moving freight within the city and outside, doing short hauls and long hauls. "There is a fragmented ownership market. The way the demand side works is that the big companies like Unilever, Packages Group, or different industrial groups like Nishat, all have a criterion that small truckers will not be able to walk through the door and offer their services to them," says Abid Butt, founder of TruckSher, a start-up working on removing inefficiencies in the freight industry.

Corporates are more likely to work with big fleet owners and transporters, leaving smaller ones in the lurch, and the industry predicament is that big transporters do not represent the entire market. They have a bigger fleet because small truckers join these transporters for work.

In local parlance, brokers are essentially truck addas. If you have ever had a chance of moving goods within a city, and by goods, we mean ones that are sizable enough to require a large vehicle, it is very unlikely that you would find them standing somewhere isolated on roads. They are usually concentrated at locations that we call addas. And it is here that they get the bulk of their work, through brokers.

This works well for big transporters. They have bigger fleets that now help them sign up with corporates and the double-whammy is that the small trucker has to give the transporter a cut for providing him loads. All this happens because small truckers do not have access to the big companies.

Brokers work in an informal arrangement. There are brutal negotiations over rates that result in time delays," says Umair Atta, founder, and CEO of Freightix. "We encountered numerous problems, one of which was that the brokers would be giving transporters fewer amounts to the transporters for delivering a full load, whereas the price decided with the shipper would be higher, simultaneously deducting the commission from the transporter as well.

The trucking sector in Pakistan is dominated by a large number of individual owners who provide services on a "hire and reward" (contracting) basis. They are also coordinated by numerous small-scale transport agents. Agents play an important role in the operations of the trucking industry in Pakistan. They sometimes act as a middleman in hire-purchase agreements. Agents help in booking loads, placing consignments, and often run warehouses.

The level of service received by the consignee is generally commensurate with the amount they are willing to pay. Large private bulk shippers such as cement manufacturers generally secure a contract will the local broker (addas) to avoid supply shortages. They demand low-quality but powerful trucks.

In transport operators' survey, it is revealed that small and medium-sized fleet operators usually have contracts with major customers to provide trucks to ship cargo at a fixed / lump-sum rate. They usually secure a two to three months contract, agreeing to provide a specific number of trucks on a daily basis for the distribution of goods. Figure 4.23 provides the detail of the proportion of business obtained by operators from different types of sources.

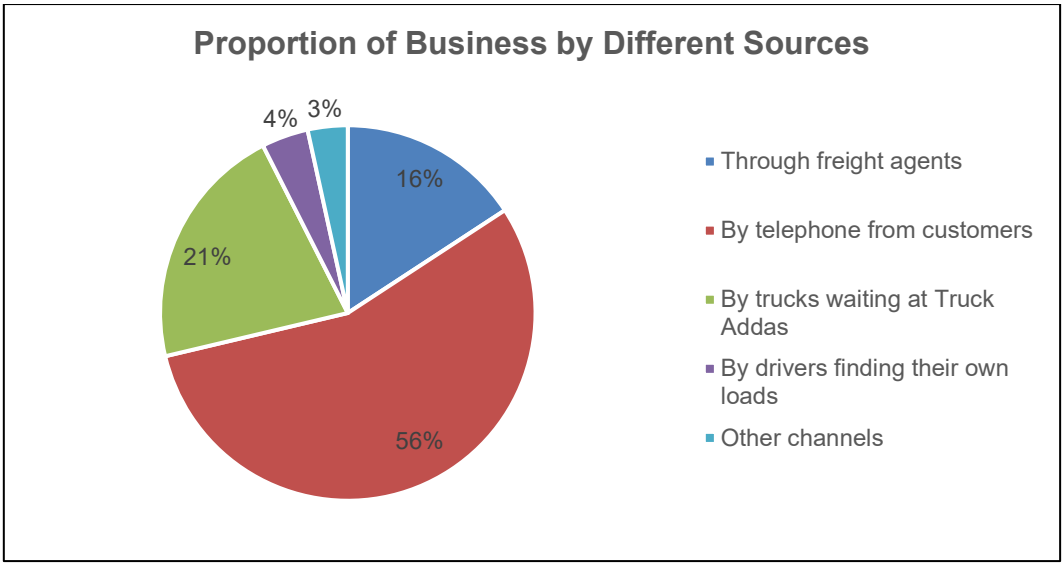


Figure 4.23: Proportion of Business by Different Sources (Transport Operators' Survey)

According to estimates, there is also a North-South trade imbalance in Pakistan that results in 70% of the freight moving from the South of Pakistan, mainly Karachi, to the North, and only 30% of the volume moving southwards from upcountry. Consequently, the trucks that go North to deliver loads run the risk of returning without any load. It is for this reason that reverse loads would be less expensive for a transporter to deliver. For instance, if an alone trucker in Karachi, not affiliated with the fleet of a big transporter, manages to run a delivery for a small business to Lahore, might be returning to Karachi empty because he did not simply have a reverse load booked. "It is a hit and miss for them if they get the reverse loads or not because on returning, there is less load and the supply is more and what rate trucker gets to deliver the load matters significantly for him,".

4.4.6 Services, Maintenance, and Repairs

Truck owners are usually responsible for any damage incurred during a freight operation. They are the ones who usually bear the entire loss. Table 4.18 provides the details on drivers' responses in case of emergency during a freight operation.

Table 4.18: Drivers' Response in case of Emergency (RSI Survey)

Response	No. of Responses
Calls the Mechanic	1,345
Calls the Owner	1,730
Calls the Police	48
Other	159
Total Replies =	**3,282**

Figure 4.24 provides the detail on the percentage of drivers' response in case of emergency during a fright operation. More than half the drivers call the truck owners

when they encounter an emergency. About 41% of the drivers contact their local mechanic; this is usually the case when a vehicle breaks down. It is interesting to note that only 1.5% of the drivers contact the police in case of emergency. Drivers do not contact the police due to the practice of payment of gratuities to the police.

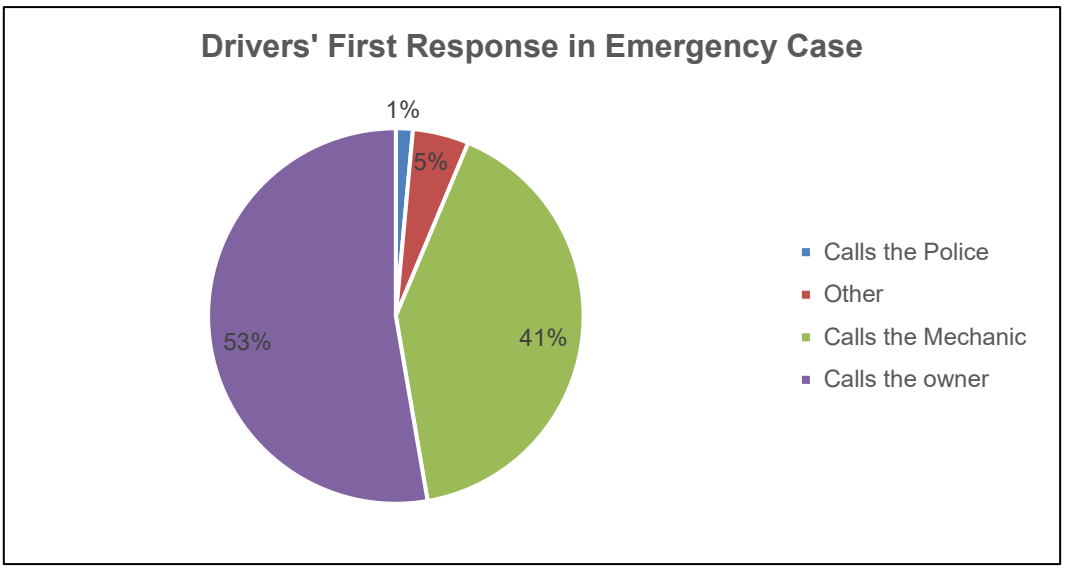


Figure 4.24: Drivers' Response in case of Emergency (RSI Survey)

Figure 4.25 shows the details of how repair and services are carried out by transport operators. Most repairs are carried out by a local mechanic. Only large fleet operators have their workshop facilities.

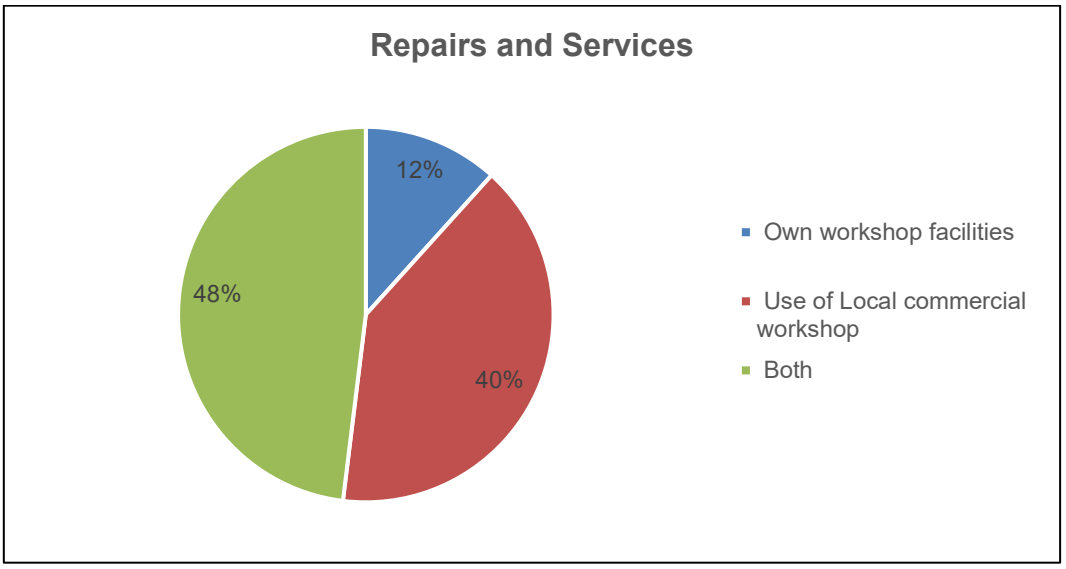


Figure 4.25: Services and Repair carried out by Transport Operators

4.4.7 Major Problems Faced by Drivers

During the roadside interviews survey, drivers were asked to state major problems encountered in the course of the trucking operations. The results are shown in Table 4.19.

Table 4.19: Drivers' Main Problems (RSI Survey)

Description	Number of Answers	Percent of Drivers
Police Harassment	2,971	90.5%
Poor Roads	2,223	67.7%
High Running Cost	2,045	62.3%
Low Salary	1,609	49.0%
Difficulty to get HTV License	1,450	44.2%
Toll Taxes	1,437	43.8%
Fear of Robbers	1,189	36.2%
Other Problems	496	15.1%
Finding Loads	272	8.3%
Competition	188	5.7%
Total Answers =	**3,282**	

The most important problem identified is police harassment which is connected with the payment of gratitude to police on traffic duty; this practice is very common. According to a freight operators' survey, a vehicle pays about PKR 10,000 to the police on a round trip from Karachi to Lahore. Figure 4.26 shows the comparison of the most important problems faced during trucking operations.

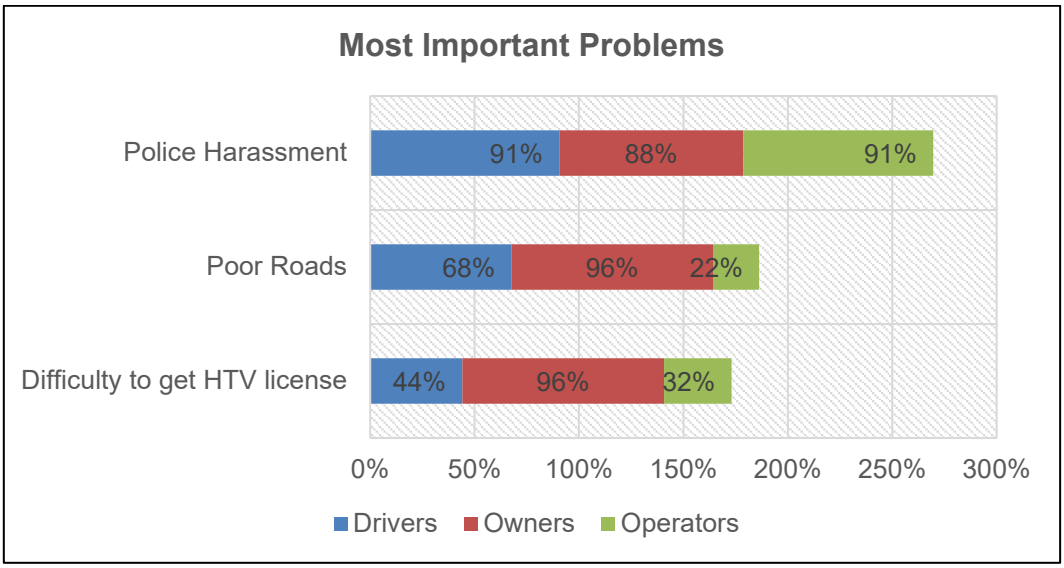


Figure 4.26: Most Important Problems Faced

Table 4.20 provides the comparison of various problems reported by truck drivers, vehicle owners, and fleet operators.

Table 4.20: Comparison of Reported Problems by Drivers, Owners, and Operators

Description	Drivers	Owners	Operators
Police Harassment	91%	88%	91%
Poor Roads	68%	96%	22%
Difficulty to get HTV License	44%	96%	32%
Toll Taxes	44%	95%	6%
Fear of Robbers	36%	81%	8%
High Running Cost	62%	33%	5%
Other Problems	15%	19%	62%
Low Salary	49%	0%	3%
Finding Loads	8%	1%	30%
Competition	6%	16%	5%

This chapter provided a general description and presented data on a wide range of subjects relating to the industry. Topics covered include vehicle age, vehicle value and fleet composition, freight consigning and the role of freight forwarding agents, costs and tariffs, productivity and profitability, and the ownership, finance, and management of the industry. More detailed analyses of freight tariffs, operating costs, and vehicle time utilization will be presented in subsequent chapters of this report.

The roadside interviews survey was the main data collection exercise of the whole study. In total 3,282 truck drivers (equivalent to around 1.5% of the total fleet excluding mini trucks) were stopped and interviewed in 13 districts throughout Pakistan. The survey stations are listed, and a breakdown of the survey details is presented in Tables in **Appendix - I**. Besides the roadside interviews survey, other surveys such as transport operators' survey and owners survey were conducted under this study.

5 Strategic National Corridors for Road Transport

For the determination of freight charges and vehicle operating costs of the movement of goods across the country, it is essential to consider the entire road network from door to door. Therefore, in the study, eight strategic national corridors are identified that facilitate the majority of all road freight traffic in the transport system of the country. These cover all major cities and are aligned to the Asian Highways, CPEC, and CAREC networks. The details of the national corridors considered in this study are provided in Figure 5.1.

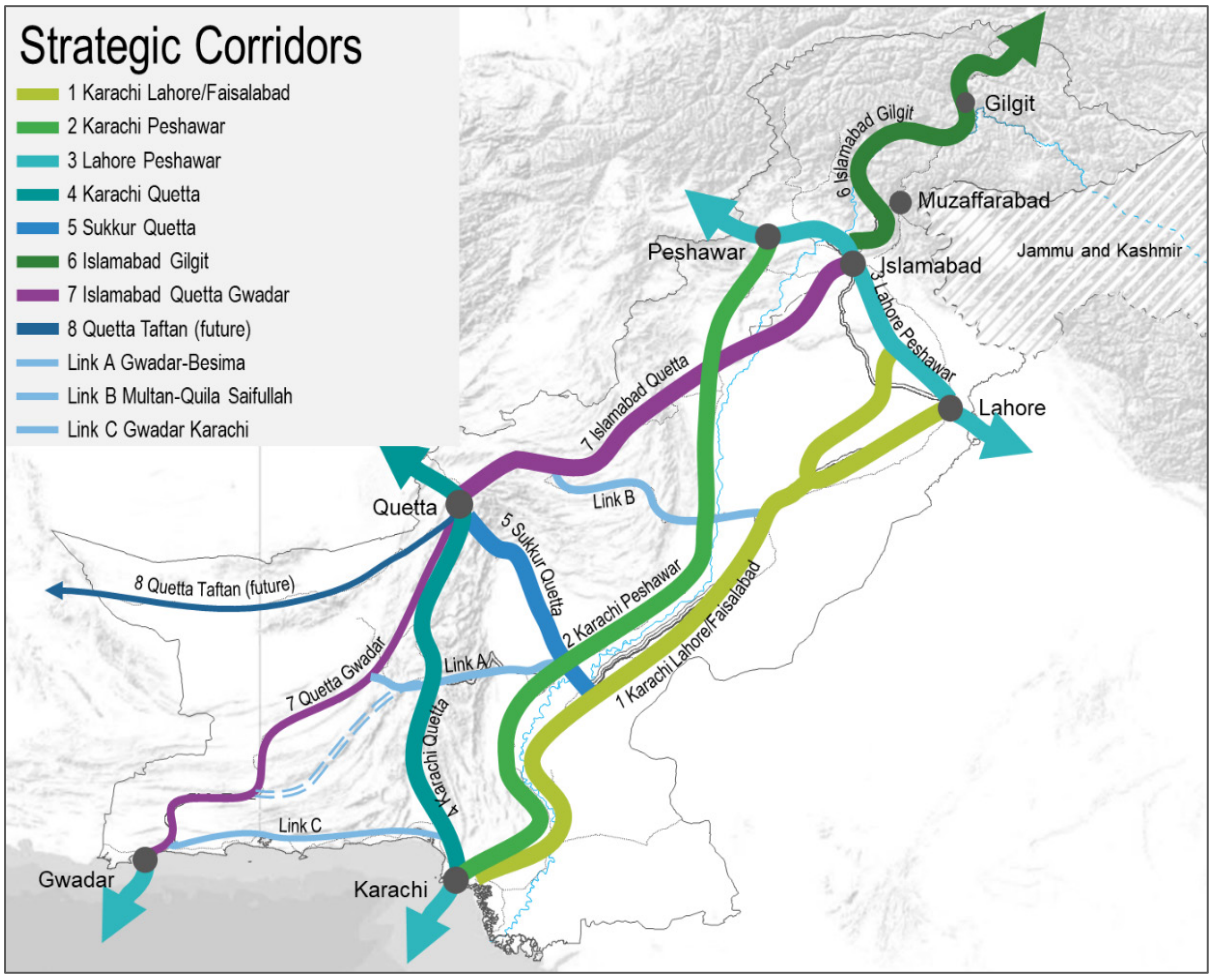


Figure 5.1: Strategic National Corridors

Source: Analysis

Details of the five main corridors, along with three links between these corridors are summarized in Table 5.1. Other parameters such as road distance, road condition, traffic volume, axle load information, travel time aspects, etc., were gathered from NTRC, NHA, and other related agencies' databases. This information was required to work out the freight rate and vehicle operating cost of different types of trucks on each identified corridor.

Table 5.1: Strategic National Corridors of Road Transport

Strategic Corridor	Roads	Rail	Airports	Maritime	Cities	Logistics	Economic Zones
1. Karachi - Lahore **Corridor 1** is a 1260 km corridor that joins the largest commercial and economic center of the country Karachi, the capital of the Sindh Province, with the second most economically productive city Lahore the capital of Punjab Province.	Karachi Port – Karachi Northern Bypass - M9 to Hyderabad Bypass- Sukkur – Sadiqabad- R Y Khan – Khanewal- Sahiwal – Okara- Pattoki – Lahore	ML1 (dual), Several branches lines	Jinnah (Karachi), Allama Iqbal (Lahore), Multan,	Port Karachi, Port Qasim	Karachi, Hyderabad, Sukkur, Bahawalpur, Multan, Sahiwal, Okara Lahore	**Dry port:** Karachi, NLC Karachi, Multan, Lahore, Wagha Terminal, **Borders:** Wagha,	**SEZ:** Bin Qasim, Korangi Creek, Dhabeji, Khairpur, Rahim Yar Khan, Vehari, Value Addition, M3, Allama Iqbal, Bahawal IE, Quaid Azam, Rachna IP.
2. Karachi – Faisalabad **Corridor 2** is an 1110 km corridor that connects Karachi with Faisalabad and the so-called 'Golden Triangle' of Gujranwala, Sialkot, and Gujrat. In so doing the Corridor serves CAREC Corridor Six, CPEC Eastern Alignment, and Asian Highways AH2 & AH4.	Karachi Port – Karachi Northern Bypass - M9 to Hyderabad Bypass- Sukkur – Multan – Abdul Hakim Faisalabad	ML1 (dual), Several branches lines	Jinnah (Karachi), Multan, Faisalabad	Port Karachi, Port Qasim	Karachi, Hyderabad, Sukkur, Bahawalpur, Multan, Sahiwal, Faisalabad	Dry port: Karachi, NLC Karachi, Multan, Faisalabad	**SEZ:** Bin Qasim, Korangi Creek, Dhabeji, Khairpur, Rahim Yar Khan, Vehari, Value Addition, M3, Allama Iqbal, Bahawal IE, Quaid Azam, Rachna IP.

Strategic Corridor	Roads	Rail	Airports	Maritime	Cities	Logistics	Economic Zones
3. Karachi - Peshawar **Corridor 3** is 1700 km in length and links the economic center of the country Karachi and the other main centers of Sindh Province with Peshawar and the Khyber Pakhtunkhwa Province. It also provides north-south access for the western parts of Punjab Province to both these corridor terminals. Corridor 2 forms part of each of CAREC Corridor Six from Hyderabad to Dera Ghazi Khan, the Central and Western Alignments of CPEC, and Asian Highway AH51 from D. I. Khan to Peshawar. Corridor 2 shares the facilities of Corridor 1 for the section from Karachi to Hyderabad but then mainly uses the western bank of the Indus River to provide transport to communities along this side of the River.	N5, M9 to Hyderabad to N55 to Peshawar	ML1 (dual) to Kotri at Hyderabad to ML2 (single) to Peshawar	Jinnah (Karachi), Bach Khan (Peshawar), D.G. Khan, D.I. Khan.	Port Karachi, Port Qasim Possible Inland waterway Karachi to Attock	Karachi, Hyderabad, Larkana, D.G. Khan, D.I. Khan, Kohat	**Dry port:** Karachi, NLC Karachi, Jamrud, Peshawar. **Borders:** Torkham, Ghulam Khan	**SEZ:** Bin Qasim, Korangi Creek, Dhabeji, Mohamad Marble City, Rashaki, Hattar
4. Karachi - Quetta **Corridor 4** is approximately 690 km linking the capital of Sindh Province, Karachi, to the capital of Balochistan Province, the City of Quetta. The Corridor extends	N25	None	Jinnah (Karachi), Quetta, Khuzdar	Port Karachi, Port Qasim	Karachi, Hub, Khuzdar, Quetta	**Dry Ports:** Karachi, NLC Karachi, Quetta Chaman **Borders:**	**SEZ:** Bin Qasim, Korangi Creek, Dhabeji, Bostan IZ

Strategic Corridor	Roads	Rail	Airports	Maritime	Cities	Logistics	Economic Zones
northwest from Quetta a further 130 km to the Chaman border crossing into Afghanistan. This corridor accommodates parts of the international corridors of CAREC Corridors Five and Six and the CPEC Western Alignment also uses part of this Corridor. Karachi – Chaman is also designated as Asian Highway No. AH7.						Chaman (Taftan)	

6 Road Freight Transport Prices

This study attempts to expand both the breadth and depth of the research and can claim to be original in several areas. Primarily, this is the first comprehensive and practical effort in the past 15 years to measure and quantify the transport costs and prices in Pakistan using clear empirical evidence.

This is also the first attempt of its kind in Pakistan to disaggregate input factors into three tiers of costs and prices: (i) transport prices or tariffs incurred by end-users, (ii) transport costs, and (iii) vehicle operating costs (VOCs) incurred by commercial transport providers. Logistics costs are not formally assessed here but only used to complement the analysis, as there is no agreed definition of logistics costs.

However, in the context of this study, the term logistics may be defined as the process of planning, implementing, and controlling the efficient, cost-effective flow and storage of raw materials, in-process inventory, finished goods, and related information from point of origin to point of consumption.

In other words, logistics costs encompass a much wider range of activities than do transport costs and include transaction costs (related to transport and trade processing of permits, customs, and standards), financial costs (such as inventory, storage, and security), and nonfinancial costs (such as insurance).

For the discrepancy between costs and prices to be analyzed, the distinction between the three tiers of cost factors needs to be clarified. This distinction is useful because transport prices may or may not reflect transport costs and major parts of transport costs are based on Vehicle Operating Costs (VOCs). Also, VOCs are a good reflection of the quality of road infrastructure and the types of vehicles on the roads.

I. **Transport prices are the rates charged by a transport company or a freight forwarder to the shipper or importer. Normally transport prices = TC's + operator's overhead and profit margin.**
II. **Transport costs (TCs) = VOCs + other indirect costs, such as license, insurance, road toll, fines, and roadblocks payment.**
III. **Vehicle operating costs (VOCs) include various direct costs to operate a given vehicle, notably maintenance, tires, fuel, labor, and capital costs**

Vehicle operating costs (VOC) is directly dependent on the road condition which is measured by International Roughness Index (IRI) worldwide. Roadblock payments are made by the driver to the police as a payment of gratitude on traffic duty; this practice is very common in the country. A definition of the three tiers of cost factors is given in Figure 6.1.

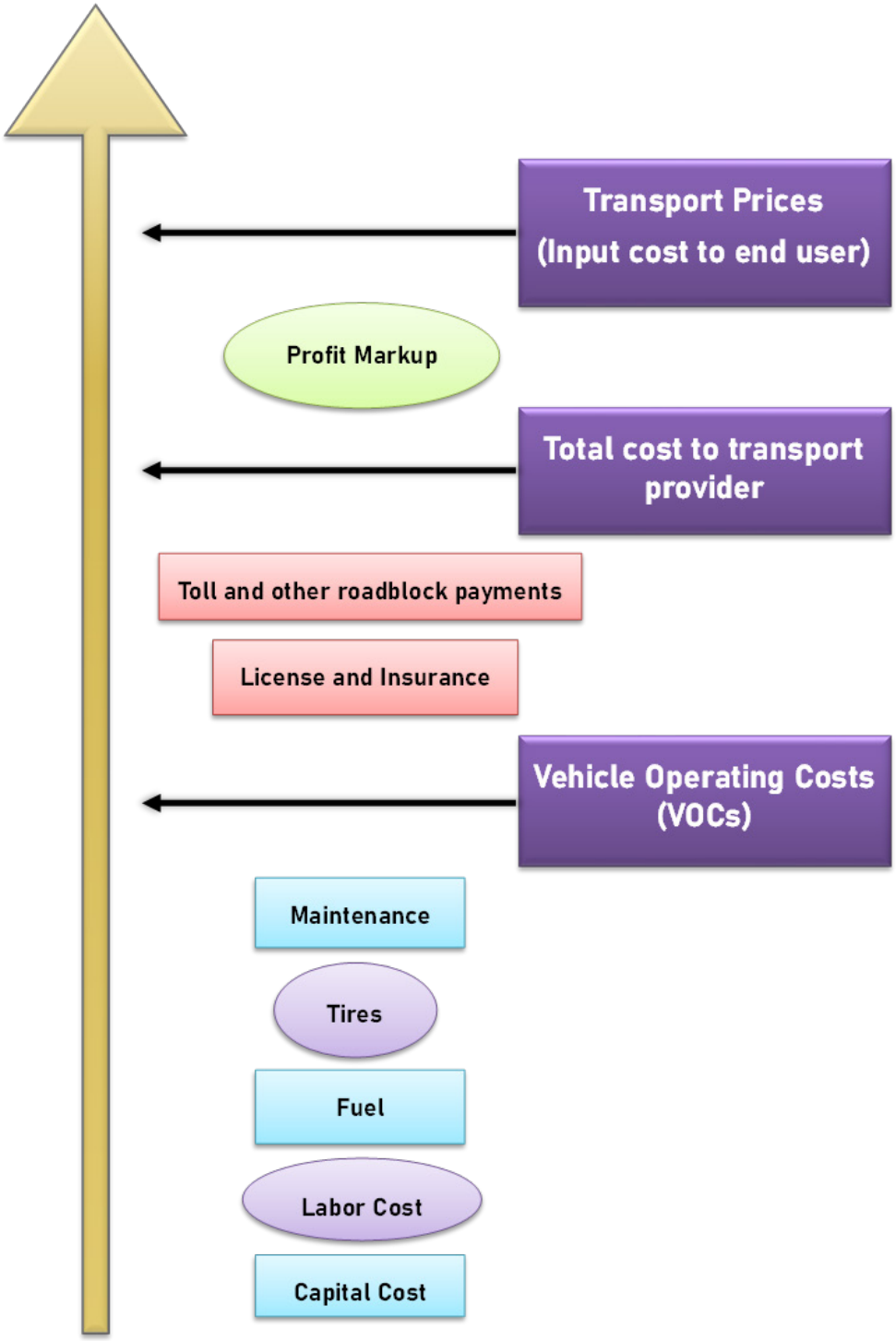


Figure 6.1: Various Definitions Related to Transport

As shown in Figure 6.2, transport prices in Pakistan are the lowest. Prices (per ton-kilometer (tkm)) on the Central African Douala–N'Djame´na route (linking Cameroon with Chad) are more than three times higher than in Brazil and more than five times higher than in Pakistan.

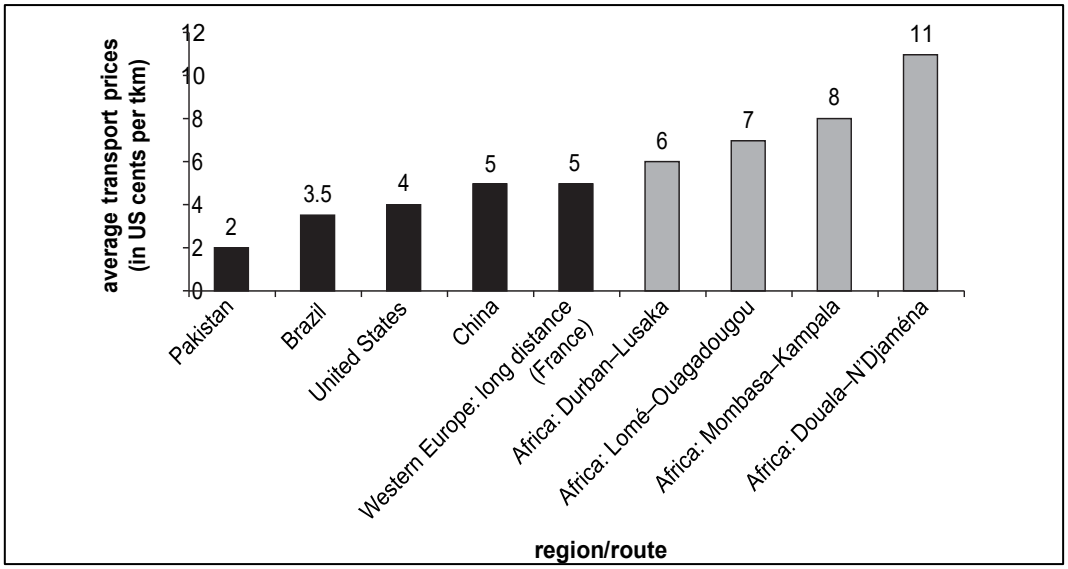


Figure 6.2: Average Transport Prices: A Global Comparison in 2007

Source: The World Bank

Determination of transport prices or tariffs in the trucking sector has been a tricky estimation as trucking costs are influenced by many factors such as fuel prices, distance traveled, load capacity of the freight vehicle, market characteristics, type of cargo, etc. They are also subject to demand and are cyclical. In this study for determining the freight rates, three categories of truck transport were identified i,) transportation of petroleum products; ii) transportation of containerized goods; iii) transportation of bulk cargo.

6.1 Transport Prices for Transportation of Petroleum Products

Trucking (Road) freight rates for transportation of petroleum products are based on the round-trip distance (RTD) from the supply source to the destination (delivered location) and computed as per the freight working formula duly approved by the Oil & Gas Regulatory Authority (OGRA). Total freight for different capacity trucks can be calculated by multiplying per kiloliter freight by the quantity of a tank truck. Per kiloliter trucking (Road) freight charges for required routes were gathered from Pakistan State Oil Company Limited (PSO) on 29th September 2021 and are produced as under in Table 6.1:

Table 6.1 Freight Charges for Major Routes in Pakistan (Source: PSO)

S. No	Routes	Distance (Round Trip) / Kms			Freight / Rs. Per kilolitre
		Plain	Hilly	Total	
1	**Karachi - Peshawar**	2,878	98	2,976	8,397
2	**Karachi - Lahore**	2,574	-	2,574	7,066
3	**Karachi - Faisalabad**	2,352	-	2,352	6,457
4	**Karachi - Quetta**	914	526	1,440	5,246

Freight charges are calculated for one–way trips by having a factor of 0.7 for a freight rate and as the legal load regime has been followed by oil tankers the load parameters adopted are as follows in Table 6.2:

Table 6.2: Freight Rates (Rs/ton-km) for Major Routes in Pakistan

Motorways & National Highways						
In ton	6-wheeler	10-wheeler	14-wheeler	18-wheeler	18-wheeler	22-wheeler
	2-Axle Rigid	3-Axle Rigid	4-Axle (2S2)	5-Axle (2S3)	5-Axle (3S2)	6-Axle (3S3)
Maximum Allowed Load	17.5	27.5	39.5	49.5	49.5	58.5
Average Operating Load	17.5	27.5	39.5	48.5	49.5	58.5
Average Empty Load	7	12	20	22	21	23.5
Average Pay Load	10.5	15.5	19.5	26.5	28.5	35
Karachi – Peshawar, One-way Trip Distance 1488 Km						
Freight Charge	61,718	91,107	114,619	155,764	167,520	205,727
ton-km	15624	23064	29016	39432	42408	52080
Tariff in Rs/ ton-km	3.95	3.95	3.95	3.95	3.95	3.95
Karachi – Lahore, One-way Trip Distance 1287 Km						
Freight Charge	51,935	76,666	96,451	131,074	140,967	173,117
ton-km	13514	19949	25097	34106	36680	45045
Tariff in Rs/ ton-km	3.84	3.84	3.84	3.84	3.84	3.84
Karachi – Faisalabad, One-way Trip Distance 1176 Km						
Freight Charge	47,459	70,058	88,138	119,777	128,817	158,197
ton-km	12348	18228	22932	31164	33516	41160
Tariff in Rs/ ton-km	3.84	3.84	3.84	3.84	3.84	3.84
Karachi – Quetta, One-way Trip Distance 800 Km						
Freight Charge	38,565	56,930	71,622	97,332	104,678	128,552
ton-km	7560	11160	14040	19080	20520	25200
Tariff in Rs/ ton-km	5.10	5.10	5.10	5.10	5.10	5.10

Tariff in terms of Rs/ ton-km for transportation of petroleum products in the country varies from Rs. 3.84 – 5.10 with the lowest Rs 3.84 for Karachi – Lahore route and the highest Rs 5.10 for Karachi – Quetta route.

6.2 Transport Price for Transportation of Containerized Cargo

Freight rates for transportation of containerized products in 20’ and 40’ containers have been fixed by the market forces based on the one-way trip distance from the supply source to the destination (delivered location). Freight charges for 20’ & 40’ loaded containerized semi-trailers for required routes were gathered from National Logistic Cell (NLC) on 29th October 2021 and are produced with average value as under in Table 6.3:

Table 6.3: Freight Rates for 20' & 40' Container Transportation by Articulated Trucks (Source: NLC)

Sr. #	Routes	Distance / Kms	20' Feet Container Freight in Rs.	40' Feet Container Freight in Rs.
1	**Karachi - Peshawar**	1550	130,000	205,000
2	**Karachi - Lahore**	1205	107,500	145,000
3	**Karachi – Faisalabad**	1100	100,000	127,500
4	**Karachi - Quetta**	800	92,500	125,000

Freight charges are based on one–way trip rate and on the assumption that the legal load regime has been followed by the operator's load parameters adopted are as follows in Table 6.4:

Table 6.4: Tariff (Rs/ton-km) of Containerized Products for Major Routes in Pakistan

In ton	10-wheeler	14-wheeler	18-wheeler	18-wheeler	22-wheeler
	(20')	(40')	(40')	(40')	(40')
	3-Axle Rigid	4-Axle (2S2)	5-Axle (2S3)	5-Axle (3S2)	6-Axle (3S3)
Maximum Allowed Load	27.5	39.5	49.5	49.5	58.5
Average Operating Load	27.5	39.5	49.5	49.5	58.5
Average Empty Load	12	20	22	22	23.5
Average Pay Load	15.5	19.5	26.5	28.5	35
Karachi – Peshawar, One-way Trip Distance 1550 Km					
Freight charge	130,000	163,517	222,216	238,987	293,493
ton-km	24025	30225	41075	44175	54250
Tariff in Rs/ ton-km	5.41	5.41	5.41	5.41	5.41
Karachi – Lahore, One-way Trip Distance 1205 Km					
Freight charge	107,500	135,108	183,609	197,467	242,506
ton-km	18677	23497	31932	34342	42175
Tariff in Rs/ ton-km	5.75	5.75	5.75	5.75	5.75
Karachi – Faisalabad, One-way Trip Distance 1100 Km					
Freight charge	100,000	125,697	170,819	183,711	225,610
ton-km	17050	21450	29150	31350	38500
Tariff in Rs/ ton-km	5.86	5.86	5.86	5.86	5.86
Karachi – Quetta, One-way Trip Distance 800 Km					
Freight charge	92,500	116,376	158,152	170,088	208,880
ton-km	12400	15600	21200	22800	28000
Tariff in Rs/ ton-km	7.46	7.46	7.46	7.46	7.46

Tariff in terms of Rs/ ton-km for transportation of containerized products in the country varies from Rs. 5.41 – 7.46 with the lowest on Karachi – Peshawar corridor and highest on Karachi – Quetta corridor.

6.3 Transport Price for Transportation of Bulk Cargo

In order to have an assessment of bulk cargo transportation tariff following Table 6.5 shows the loading parameters based on the NTRC Axle Load Survey 2020:

Table 6.5: Bulk Cargo Transportation Tariff (Source: NTRC Axle Load Survey 2020)

National Highways						
In ton	6-wheeler	10-wheeler	14-wheeler	18-wheeler	18-wheeler	22-wheeler
	2-Axle	3-Axle	4-Axle (2S2)	5-Axle (2S3)	5-Axle (3S2)	6-Axle (3S3)
Maximum Allowed	17.5	27.5	39.5	48.5	49.5	58.5
Average Operating Load	20	40.4	41.4	57.4	57.7	75
Average Empty Load	7	12	20	22	21	23.5
Average Pay Load	13	28.4	21.4	35.4	36.7	51.5

In bulk cargo transportation there are no fixed tariff charges, and the customer has to settle it with the goods company or the truck owners who operate independently. The information regarding the freight charges gathered from the telephonic survey and by joining the WhatsApp group “Karachi Keraya Market” and also analyzing the driver’s dairy data, tariffs in terms of Rs / ton-km for different commodities transported in bulk have been worked for the following routes: -

i. Karachi – Lahore
ii. Karachi – Peshawar
iii. Karachi – Faisalabad
iv. Karachi - Quetta

The commodity-wise freight rates of the above-mentioned routes are presented below:

Table 6.6: Commodity Wise Tariff (Rs/ton-km); Route, Karachi - Peshawar

Karachi – Peshawar, One-way Trip Distance 1550 km						
Truck Type	6-wheeler	10-wheeler	14-wheeler	18-wheeler	18-wheeler	22-wheeler
	2-Axle	3-Axle	4-Axle (2S2)	5-Axle (2S3)	5-Axle (3S2)	6-Axle (3S3)
Construction Materials						
Freight charge	67,600	147,524	111,280	184,080	190,840	267,800
ton-km	20150	44020	33170	54870	56885	79825
Tariff in Rs/ ton-km	3.35	3.35	3.35	3.35	3.35	3.35
Textile						
Freight charge	65,000	141,850	107,000	177,000	183,500	257,500
ton-km	20150	44020	33170	54870	56885	79825
Tariff in Rs/ ton-km	3.22	3.22	3.22	3.22	3.22	3.22
Wheat, Rice, Sugar						

Karachi – Peshawar, One-way Trip Distance 1550 km						
Truck Type	6-wheeler	10-wheeler	14-wheeler	18-wheeler	18-wheeler	22-wheeler
	2-Axle	3-Axle	4-Axle (2S2)	5-Axle (2S3)	5-Axle (3S2)	6-Axle (3S3)
Freight charge	65,000	141,850	107,000	177,000	183,500	257,500
ton-km	20150	44020	33170	54870	56885	79825
Tariff in Rs/ ton-km	3.22	3.22	3.22	3.22	3.22	3.22
Fertilizer						
Freight charge	52,000	113,480	85,600	141,600	146,800	206,000
ton-km	20150	44020	33170	54870	56885	79825
Tariff in Rs/ ton-km	2.58	2.58	2.58	2.58	2.58	2.58

Table 6.7: Commodity Wise Tariff (Rs/ton-km); Route, Karachi - Lahore

Karachi – Lahore, One-way Trip Distance 1205 km						
Truck Type	6-wheeler	10-wheeler	14-wheeler	18-wheeler	18-wheeler	22-wheeler
	2-Axle	3-Axle	4-Axle (2S2)	5-Axle (2S3)	5-Axle (3S2)	6-Axle (3S3)
Construction Materials						
Freight charge	52,000	113,480	85,600	141,600	146,800	206,000
ton-km	15665	34222	25787	42657	44223	62057
Tariff in Rs/ ton-km	3.17	3.17	3.17	3.17	3.17	3.17
Textile						
Freight charge	50,700	110,643	83,460	138,060	143,130	200,850
ton-km	15665	34222	25787	42657	44223	62057
Tariff in Rs/ ton-km	3.24	3.24	3.24	3.24	3.24	3.24
Wheat, Rice, Sugar						
Freight charge	52,000	113,480	85,600	141,600	146,800	206,000
ton-km	15665	34222	25787	42657	44223	62057
Tariff in Rs/ ton-km	3.2	3.2	3.2	3.2	3.2	3.2
Fertilizer						
Freight charge	52,000	113,480	85,600	141,600	146,800	206,000
ton-km	15665	34222	25787	42657	44223	62057
Tariff in Rs/ ton-km	3.32	3.32	3.32	3.32	3.32	3.32

Table 6.8: Commodity Wise Tariff (Rs/ton-km); Route, Karachi - Faisalabad

Karachi – Faisalabad, One-way Trip Distance 1100 km						
Truck Type	6-wheeler	10-wheeler	14-wheeler	18-wheeler	18-wheeler	22-wheeler
	2-Axle	3-Axle	4-Axle (2S2)	5-Axle (2S3)	5-Axle (3S2)	6-Axle (3S3)
Construction Materials						
Freight charge	46,800	102,132	77,040	127,440	132,120	185,400

Karachi – Faisalabad, One-way Trip Distance 1100 km						
Truck Type	6-wheeler	10-wheeler	14-wheeler	18-wheeler	18-wheeler	22-wheeler
	2-Axle	3-Axle	4-Axle (2S2)	5-Axle (2S3)	5-Axle (3S2)	6-Axle (3S3)
ton-km	14300	31240	23540	38940	40370	56650
Tariff in Rs/ ton-km	3.27	3.27	3.27	3.27	3.27	3.27
Textile						
Freight charge	49,400	107,806	81,320	134,520	139,460	195,700
ton-km	14300	31240	23540	38940	40370	56650
Tariff in Rs/ ton-km	3.45	3.45	3.45	3.45	3.45	3.45
Wheat, Rice, Sugar						
Freight charge	48,100	104,969	79,180	130,980	135,790	190,550
ton-km	14300	31240	23540	38940	40370	56650
Tariff in Rs/ ton-km	3.36	3.36	3.36	3.36	3.36	3.36
Fertilizer						
Freight charge	50,700	110,643	83,460	138,060	143,130	200,850
ton-km	14300	31240	23540	38940	40370	56650
Tariff in Rs/ ton-km	3.54	3.54	3.54	3.54	3.54	3.54

Table 6.9: Commodity Wise Tariff (Rs/ton-km); Route, Karachi - Quetta

Karachi – Quetta, One-way Trip Distance 800 Km						
Truck Type	6-wheeler	10-wheeler	14-wheeler	18-wheeler	18-wheeler	22-wheeler
	2-Axle	3-Axle	4-Axle (2S2)	5-Axle (2S3)	5-Axle (3S2)	6-Axle (3S3)
Construction Materials						
Freight charge	46,800	102,132	77,040	127,440	132,120	185,400
ton-km	10400	22720	17120	28320	29360	41200
Tariff in Rs/ ton-km	4.5	4.5	4.5	4.5	4.5	4.5
Textile						
Freight charge	49,400	107,806	81,320	134,520	139,460	195,700
ton-km	10400	22720	17120	28320	29360	41200
Tariff in Rs/ ton-km	4.75	4.75	4.75	4.75	4.75	4.75
Wheat, Rice, Sugar						
Freight charge	48,100	104,969	79,180	130,980	135,790	190,550
ton-km	10400	22720	17120	28320	29360	41200
Tariff in Rs/ ton-km	4.62	4.62	4.62	4.62	4.62	4.62
Fertilizer						
Freight charge	50,700	110,643	83,460	138,060	143,130	200,850
ton-km	10400	22720	17120	28320	29360	41200
Tariff in Rs/ ton-km	4.87	4.87	4.87	4.87	4.87	4.87

The above tables indicate that the lowest transport price of Rs. 2.58/ ton-km has been found in the case of transportation of fertilizer from Karachi to Peshawar, while the

highest transport price has been found in the case of transportation of fertilizer from Karachi to Quetta. The telephonic survey and by joining the WhatsApp group “Karachi Keraya Market” it was found that 10 tons of light dry cargo from Karachi to Lahore costs PKR 200,000. However, an increase in weight is not proportionally accompanied by an increase in freight rate, as a 30-ton light dry cargo would cost between PKR 220,000 to 230,000. Rates for heavy cargo like iron and coal are different e.g., for coal per ton rate is PKR 2600. Another interesting finding of the survey was that upcountry rates for freight are far less than down country freight rates e.g., a 10-ton truckload will only cost between PKR 100,000 to PKR 150,000 for a trip from Lahore to Karachi which in the reverse case would cost PKR 220,000 to 230,000.

The disparity between the down country freight rates and the up-country freight rates is explained by analyzing the import-export imbalance, as more goods are imported into the country than exported, the traffic going down from Karachi has more demand and thus charge higher rates while the exports destined for Karachi have gone down resulting in lower rates. Besides most of the companies are in Karachi based a low-priced trip back home is better than an empty one. Type of commodities transported by trucks such as ballast, gravel, stone, cement, fruit, fertilizers, and wheat are the most important commodities in terms of tons transported by trucks. The transport volume of fruit is the highest in terms of tons per kilometer.

As compared to Transport Price, Travel Time is a better indicator of efficiency in the freight system. Interview with company officials reveals that trucks operate long hours and carry excessive loads while traveling at low speeds in the country, ranging between 20 and 25 kilometers per hour compared to 80-90 kilometers per hour in Europe. A journey in Pakistan takes three times longer than in Europe. Road freight takes 5-7 days between ports and the north of Pakistan (approximately 1,400-1,800 kilometers), which is twice what it takes in Asia and Europe. Trucks’ repairs need due to overloading also extends the transport time. In a globally integrated market, a comparison between Pakistan and developed countries is not out of context as it is with these economies that Pakistan competes internationally.

Transport of Agri-products despite the limited availability of refrigerated vehicles, perishable goods such as fruits, vegetables, meat, eggs, and milk, among others are transported over long distances by roads. Yet, the country’s true potential to trade fresh foods is severely undermined due to the lack of a temperature-controlled transport system. According to an estimate, about 30-40% of the produce is wasted during transportation between the farm, wholesale, and retail markets. In addition to the poor farm-to-market roads and lack of refrigerated transport and warehousing, low-quality packaging materials and faulty methods of loading and unloading also contribute to the wastage of perishable goods. There are different reasons for damage to perishable items, according to a study conducted by the Ministry of Commerce in 2007, the majority of respondents declared that 10 percent of their consignments ended up having damage issues.

7 Road Freight Transport Costs

To appraise certain investments in highways, trucking operations, or analyzing transportation policies, Transport Costs (VOC) are important to be considered in the appraisal and to compare the alternatives. Transport costs (TC's) are equal to the Vehicle Operating Costs (VOCs) + other indirect costs, such as license, insurance, road toll, and roadblocks payment.

In this study, the transport costs of different types of trucks have been worked out at 2021 prices with the objective to get an assessment of the profitability of operations of road freight transport in Pakistan by comparing the Transport Costs (TCs) with Transport Prices (Freight Rates).

7.1 Components of Transport Costs

Fuel, Lubricants/Engine Oil, Tires, Vehicle Maintenance, and Repair are the possible components of VOC and when a vehicle runs on a run, costs are incurred due to the utilization of these components. VOC changes with varying surface types, pavement conditions, roadway geometrics, environment, speed of operation, and other factors. Other components of VOC include vehicle depreciation and crew costs which may vary with vehicle operating time and utilization. Finally, the last few components such as overheads (license, insurance, road toll, and roadblocks payment) and interest charges would lead to transport costs.

7.2 Transport Cost Estimation using HDM-4 VOC Model

The financial cost was estimated based on the free flow vehicle operating cost model HDM-4 developed by the World Bank. Figure 7.1 shows the snapshot of the HDM-4 Model, Version 2 Interface "Main Menu Worksheet" used to estimate the TC.

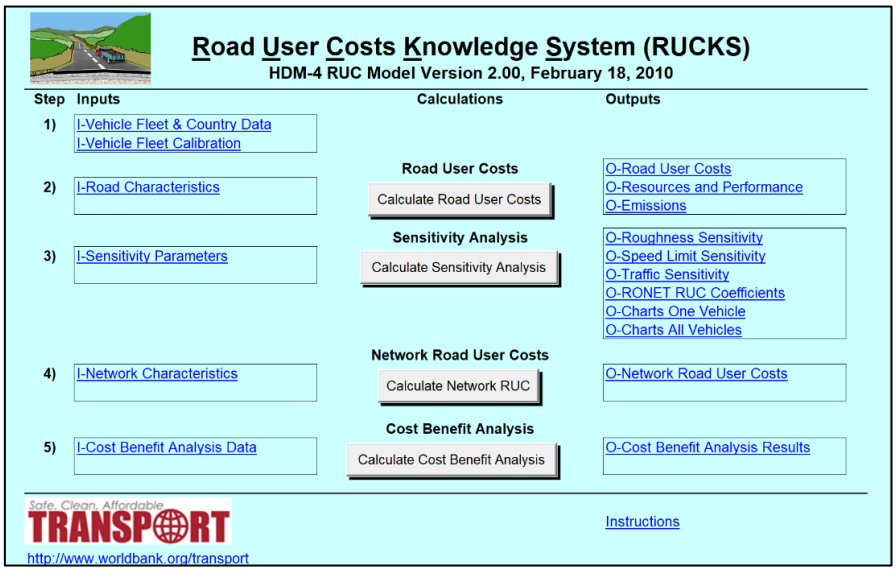


Figure 7.1: HDM-4 Model Version 2 Interface "Main Menu Worksheet"

For analysis, current market prices of vehicles, tires, and fuel & lubricants have been used. Financial estimates are carried out by the model designed to calculate unit road user costs adopting the Highway Development and Management Model (HDM-4) Version 2 relationships for speeds, travel times, and vehicle operating costs. The following steps were followed using the software to calculate the TC.

Step 1: The Vehicle Fleet & Country Data worksheet was selected, and vehicle fleet unit costs and basic characteristics were entered. The Vehicle Fleet data was entered only for the vehicles that were intended to be evaluated and other tabs were left empty. The yellow color represents the parameters that needed to be entered by the user of the model.

Vehicle Fleet Data

	Economic or Financial Unit Costs ($)											Basic Vehicle Fleet Characteristics						
Vehicle Description	New Vehicle ($/vehicle)	New Tire ($/tire)	Fuel ($/liter)	Lubricating Oil ($/liter)	Maintenance Labor ($/hour)	Crew Wages ($/hour)	Annual Overhead ($/year)	Annual Interest (%)	Passenger Working Time ($/hour)	Passenger Non-Working Time ($/hour)	Cargo Time ($/hour)	Annual km Driven (km)	Annual Working Hours (hours)	Service Life (years)	Private Use (%)	Numbe of Passengers (#)	Work Related Passengers Trips (%)	Gross Vehicle Weight (t)
Motorcycle	542	10.00	0.80	2.60	1.00	0.00	10	0.0	0.13	0.30	0.00	14,000	400	10	100	1	50	0.2
Car Small	4,914	41.14	0.80	5.38	2.53	0.00	50	0.0	0.13	0.52	0.00	20,000	900	15	100	4	50	0.8
Car Medium	13,978	75.94	0.80	6.01	2.53	0.00	50	0.0	0.13	0.52	0.00	25,000	900	15	100	4	50	1.2
Wagon	36,381	113.92	0.80	6.01	2.53	0.73	316	0.0	0.13	0.52	0.00	54,000	1,200	15	0	10	50	4.5
Four-Wheel Drive	35,137	151.89	0.80	6.01	2.53	0.00	100	0.0	0.13	0.52	0.00	36,000	600	12	100	6	50	2.0
Truck Light	15,000	130.00	0.80	2.60	2.00	0.60	200	0.0	0.13	0.52	0.10	45,000	1,300	10	0	1	50	4.2
Truck Medium (Rigid 2-Axle)	30,000	208.86	0.80	3.48	3.29	0.66	380	0.0	0.13	0.52	0.10	55,000	1,200	15	0	1	50	18.0
Truck Heavy (Rigid 3-Axle)	45,000	220.00	0.80	3.48	3.29	0.70	380	0.0	0.13	0.52	0.10	100,000	1,750	15	0	1	50	47.0
Truck Articulated	70,000	350.00	0.80	3.38	3.29	0.75	390	0.0	0.13	0.52	0.10	100,000	2,000	12	0	1	50	65.0
Bus Light	55,000	150.55	0.80	3.48	3.29	0.60	500	0.0	0.13	0.52	0.00	55,000	1,500	15	0	12	50	3.0
Bus Medium	80,040	230.00	0.80	3.48	3.29	0.60	500	0.0	0.13	0.52	0.00	75,000	1,900	15	0	25	50	7.6
Bus Heavy	95,000	350.00	0.80	3.48	4.00	0.80	500	0.00	0.13	0.52	0.00	90,000	2,200	15	0	35	50	12.7

Country and Currency

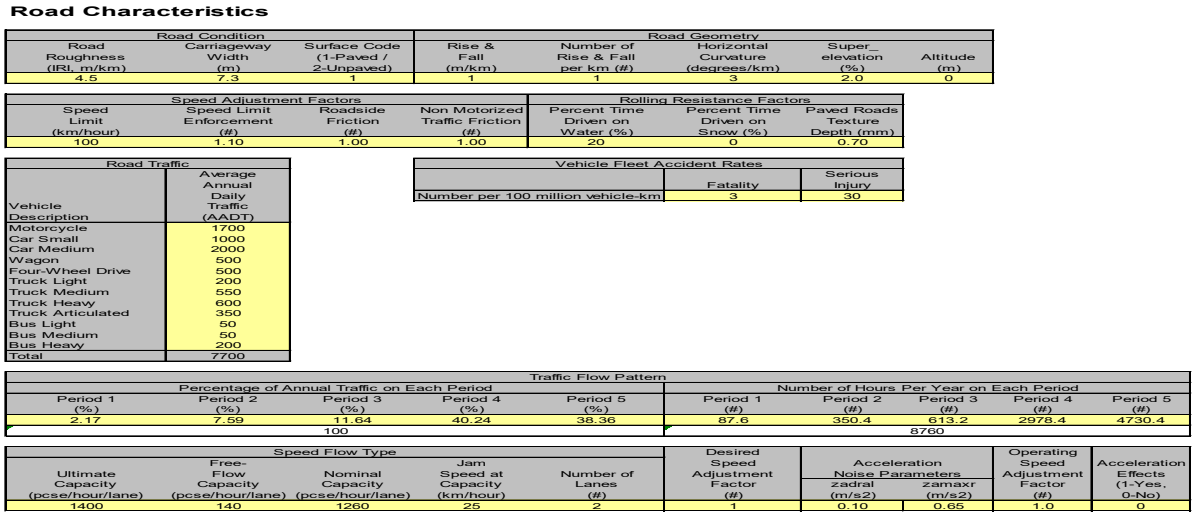
Country Name	Currency	Year
Pakistan	US$	2021

Emissions Unit Costs

Emissions Unit Costs ($ per ton)						
Carbon Dioxide	Carbon Monoxide	Hydrocarbon	Nitrous Oxide	Particulate	Sulfur Dioxide	Lead
0.00	0.00	0.00	0.00	0.00	0.00	0.00

Figure 7.2: HDM-4 Model Version 2 Interface "Vehicle Fleet Data"

Step 2: The Road Characteristics worksheet was selected and the characteristics of the road to be evaluated were entered. At the end of the worksheet, some default values for typical road classes were suggested which were also adopted where data was unknown for local roads. Default values are represented by white colors in the screenshots given below in Figure 7.3.



Road Characteristics

Road Condition			Road Geometry				
Road Roughness (IRI, m/km)	Carriageway Width (m)	Surface Code (1-Paved / 2-Unpaved)	Rise & Fall (m/km)	Number of Rise & Fall per km (#)	Horizontal Curvature (degrees/km)	Super_ elevation (%)	Altitude (m)
4.5	7.3	1	1	1	3	2.0	0

Speed Adjustment Factors				Rolling Resistance Factors		
Speed Limit (km/hour)	Speed Limit Enforcement (#)	Roadside Friction (#)	Non Motorized Traffic Friction (#)	Percent Time Driven on Water (%)	Percent Time Driven on Snow (%)	Paved Roads Texture Depth (mm)
100	1.10	1.00	1.00	20	0	0.70

Road Traffic	
Vehicle Description	Average Annual Daily Traffic (AADT)
Motorcycle	1700
Car Small	1000
Car Medium	2000
Wagon	500
Four-Wheel Drive	500
Truck Light	200
Truck Medium	550
Truck Heavy	600
Truck Articulated	350
Bus Light	50
Bus Medium	50
Bus Heavy	200
Total	7700

Vehicle Fleet Accident Rates		
	Fatality	Serious Injury
Number per 100 million vehicle-km	3	30

Traffic Flow Pattern									
Percentage of Annual Traffic on Each Period					Number of Hours Per Year on Each Period				
Period 1 (%)	Period 2 (%)	Period 3 (%)	Period 4 (%)	Period 5 (%)	Period 1 (#)	Period 2 (#)	Period 3 (#)	Period 4 (#)	Period 5 (#)
2.17	7.59	11.64	40.24	38.36	87.6	350.4	613.2	2978.4	4730.4
100					8760				

Speed Flow Type					Desired Speed Adjustment Factor	Acceleration Noise Parameters		Operating Speed Adjustment Factor	Acceleration Effects (1-Yes, 0-No)
Ultimate Capacity (pcse/hour/lane)	Free-Flow Capacity (pcse/hour/lane)	Nominal Capacity (pcse/hour/lane)	Jam Speed at Capacity (km/hour)	Number of Lanes (#)	(#)	zadral (m/s2)	zamaxr (m/s2)	(#)	
1400	140	1260	25	2	1	0.10	0.65	1.0	0

Figure 7.3: HDM-4 Model Version 2 Interface "Road Characteristics Data"

Step 3: After entering the input values, the Menu tab was selected, and the "Calculate Road User Costs" button was pressed. A message appeared after a few moments indicating that the calculations were done.

Step 4: Results were available on the Road User Costs worksheet, the resulting unit road user costs and speeds. Since the currency for the model is USD, the estimate given was represented in $/km. The final estimate was converted to Rs/1000 km. The table below shows the results.

Table 7.1 shows the transport cost estimated using the HDM-4 Model keeping the International Roughness Index (IRI) value equal to 4.5 m/km.

Table 7.1: Transport Cost by Types of Vehicles in Rs/ 1000 vehicle - km

	Motor cycle	Small Car	Medium Car	Wagon / HiAce	4-Wheel Drive	light Truck	Medium 2-Axle Truck	Heavy 3-Axle Truck	Articulated Truck	Small Bus	Medium Bus	Large Bus
Vehicle Operating Cost (Rs/1000 vehicle-km)	7160	18881	28803	51969	42934	37608	70528	137206	160793	61260	72298	98342
Fuel (Rs/1000 vehicle-km)	5834	11999	13855	18153	14805	20346	37298	85595	80632	18622	26963	41803
Lubricant (Rs/1000 vehicle-km)	209	603	713	1087	1016	849	1165	2670	2549	1236	1312	1904
Tire (Rs/1000 vehicle-km)	120	432	756	756	1883	1452	1921	3783	12716	1628	2473	5246
Maintenance (Rs/1000 vehicle-km)	109	2191	6674	21852	11965	5186	14166	29380	45450	21955	22996	29216
Maintenance Labor (Rs/1000 vehicle-km)	334	1302	1352	1532	1124	3345	6159	9533	9506	5929	6139	7730
Crew Time (Rs/1000 vehicle-km)	0	0	0	1340	0	1212	1211	1445	1605	1177	1217	1639
Depreciation (Rs/1000 vehicle-km)	555	2355	5424	6765	12192	4908	4799	4352	7919	10058	10665	10338
Interest (Rs/1000 vehicle-km)	0	0	0	0	0	0	0	0	0	0	0	0
Overhead (Rs/1000 vehicle-km)	0	0	0	484	0	311	581	448	417	654	534	466

Table 7.2 presents the transport costs of different types of trucks for the trip length.

Table 7.2: Transport Cost of Trucks by Type in Rs for Route Length Km

Route	Light Truck	Medium 2-Axle Truck	Heavy 3-Axle Truck	Articulated Truck
Karachi - Peshawar ,1550 Km	58,293	109,319	212,669	249,229
Karachi – Lahore, 1205 Km	45,318	84,986	165,333	193,756
Karachi – Faisalabad, 1100 Km	41,369	77,581	150,927	176,872
Karachi – Quetta, 800	30,087	56,423	109,765	128,635

In order to estimate the profit made by a particular type of truck for a specific route, the freight charges for containerized goods were compared with vehicle operating costs. Table 7.3 below presents the result:

Table 7.3: Profit in Rs/ trip by Truck Type for Carriage of Construction Materials.

Route	Transport Cost (Rs/ trip length)		Transport Price (Rs/ trip length)		Profit in Rs/ trip	
	Heavy	Articulated	Heavy	Articulated	Heavy	Articulated
	3-Axle Truck 20' Container	Truck 40' Container	3-Axle Truck 20' Container	Truck 40' Container	3-Axle Truck 20' Container	Truck 40' Container
Karachi – Peshawar, 1550 Km	212,669	249,229	130,000	293,493	-82,669	44,264
Karachi – Lahore, 1205 Km	165,333	193,756	107,500	242,506	-57,833	48,750
Karachi – Faisalabad, 1100 Km	150,927	176,872	100,000	225,610	-50,927	48,738
Karachi – Quetta, 800 Km	109,765	128,635	92,500	208,880	-17,265	80,245

Three-axle rigid trucks appeared to be in the loss while larger capacity six-axle trucks get very nominal profit. With its low wage levels, Pakistan's transport costs and prices are much lower—probably the lowest in the world—since the trucking industry is still a labor-intensive activity.

By examining the costs associated with transporting goods on four major corridors in four different parts of the country, the authors derive surprising results, along these corridors transportation costs are lower than in other developing countries and also transportation prices are much lower compared to other developing countries. Paradoxically, Pakistan's lower transport prices are accompanied by poor service quality, on average below other regions in the world, thus scoring a lower Logistic Performance Index.

8 Truck Manufacturing & Assembling in Pakistan

At the time of the establishment of Pakistan in 1947, there was neither any automobile assembly plant nor any industrial capability for manufacturing cars, light commercial vehicles, buses, and trucks. During the early years of independence, commercial vehicles and trucks of different variations manufactured by Leyland, Ford, Mercedes, etc. were available.

The first breakthrough came in 1953 when General Motors Overseas Distribution Company (GM) of USA set up a representation office in Karachi to facilitate auto industry requirements. Bedford chaises were first manufactured in 1958 in England and the GM-Karachi coordinated all requirements of heavy commercial vehicles in Pakistan. The use of Bedford trucks and buses continued up to 1975 in England, and thereafter it was manufactured only for export to Australia, Pakistan, and South Africa. The production of Bedford trucks and buses in England was stopped in 1985.

8.1 Ghandhara Industries Limited

In 1963, all interests of General Motors in Karachi were acquired, and a new company, Ghandhara Industry Limited (GIL) was established. GIL continued to deal with this business until this industry was nationalized in 1972 and a new company, National Motors was set up under the government to run the affairs of this business. During this period GIL's major products were Bedford trucks, buses, and Vauxhall cars. While in control of the business, in 1984, National Motors added Isuzu vehicles to the existing Bedford models and Toyota vehicles. However, in 1985, the Toyota franchise was transferred from National Motors to House of Habib. In 1992, the company was re-acquired from the Government by its previous owners, and in 1999, it was renamed GIL. And, now this company is managed by Bibojee Services Private Limited. Its business now includes the manufacture, assembly, marketing of Isuzu truck chaises, and fabrication. Bedford trucks remained the market leader in the freight transport sector for about 30-35 years and achieved about 80 percent share of the fleet composition in Pakistan. It has now been captured by Japanese trucks, and their present share in truck fleet composition in Pakistan is now almost equal to the one enjoyed by Bedford trucks for many years. There are many reasons and lessons for this swing in technology change for Pakistan's auto industry to ponder and learn.

Figure 8.1: Bedford Trucks still plying on Highways

8.2 Post Ghandhara Industries

In addition to GIL, over a period of time, some other players entered into the business of truck assembly and manufacturing. These major players in this business are: Indus Motors Company; Ghandhara Nissan Ltd; National Motors; Sindh Engineering (Pvt.) Ltd; Volvo Pakistan Ltd.; Afzal Motors Pvt. Ltd; Yasoob Truck, Master Motors; Hino-Pakistan Motors. A brief description of these companies and their respective product lines are as follows:

8.2.1 Indus Motors Company Limited

Indus Motors is a joint venture between the House of Habib, Toyota Motor Company, and Toyota Tsusho Corporation. IM started its business in 1989 for assembling, progressive manufacturing, and marketing Toyota vehicles in Pakistan. IM is also the sole distributor of Toyota vehicles in Pakistan. The company started commercial production in May 1993. Its main product line in trucking is as under: • Toyota Hilux Double Cabin Pick-up 180 horsepower • Vigo Champ Double Cabin Pick-up 165 horsepower.

8.2.2 Ghandhara Nissan Ltd.

Ghandhara Nissan Ltd. (GNL) was established as a Private Limited in 1981 to import and market Nissan vehicles in Pakistan. It has also been marketing Nissan Diesel trucks assembled in the country. It was converted into a public limited company in May 1992 to undertake the production of Nissan vehicles. GNL main product line in trucking is as follows:

Table 8.1: Details of Truck Product Line of Ghandhara Nissan and their Installed Capacity

	Model of Truck	Horsepower	Installed Capacity
1	**Nissan PKD-311 Truck**	177	**4,200**
2	**Nissan PKB-211 Truck**	180	
3	**Nissan CDA-311 Truck**	213	
4	**Nissan PKC-311 Prime Mover**	213	
5	**Nissan PK0-411 Truck**	220	
6	**Isuzu NPR-66 Truck**	120	**3,000**
7	**Isuzu FTR-33 Truck**	200	
8	**FTS -33 H Truck**	200	

8.2.3 National Motors

This company is the successor of Ghandhara Industries Ltd. (GIL) which was established in Pakistan in 1963. In its early years of establishment, GIL's main business was related to the manufacturing, sale, and marketing of Bedford trucks and buses, which also dominated the freight truck industry in Pakistan up to 1985, when the company added progressive manufacturing, assembly, and marketing of Isuzu trucks and buses. Their main product line in the trucking sector is Kamaz 6460 Prime Movers, with 360 horsepower and 200 capacities.

8.2.4 Sind Engineering Private Limited

Sind Engineering Company (SEL) was initially incorporated as a company in 1963 under M/s Wazir Ali Engineering (Pvt.) Limited. It was taken over by the government in 1972 under Economic Reform Order and placed under the newly formed Pakistan Automobile Corporation (PACO). SEL is now the only remaining public enterprise under PACO. This company has now a market share of about 72-75 percent of Mazda trucks in the segment 3.5-6 tons (GVW) weight range. SEL is presently manufacturing the following brands of vehicles:

- Assembly of Mazda T-3500 Truck chaises
- Fabrication of bus and truck bodies Mazda T-3500 chaises
- Import and sale of completely built-up (CBU) Mazda vehicles (pick-up and vans)
- Fabrication of specialized vehicles (dump trucks, vans, firefighter lorries, water bowsers, troupe carriers)

8.2.5 HinoPak Motors Limited

HINOPAK Motors Ltd. is a joint venture between Pakistan Automobile Corporation (PACO), Al-Futtaim of Dubai, Hino Motors of Japan, and Toyota Tsusho of Japan. This company became a full-fledged member of the Hino-Toyota family as Al-Futtaim

Group handed over its 59 percent stake to Hino Motors and Toyota Tsusho in 1998. This company has a strong presence in the market of buses and trucks. It has been facing competition from Sind Engineering Ltd. when started manufacturing Volvo Trucks in 1997. The import of buses by Daewoo and Mercedes as a completely built unit (CBU) gave a setback to the company. The Hino brand is, however, going strong in Pakistan, especially in the provinces of Punjab and Khyber Pakhtunkhwa. Its main product line in Pakistan is as under:

Table 8.2: Details of Truck Product Line of HINO and their Installed Capacity

Model of Truck		Horse Power	Installed Capacity
1	**Hino FG1J Truck**	210	**5,000**
2	**Hino FL1 Truck**	210	
3	**Hino SG1J Prime Mover**	260	
4	**Hino FMIJ Mover**	260	
5	**Hino FM2P Mover**	320	
6	**WU420 Truck Prime Mover**	105	**6,600**

8.2.6 Volvo Pakistan Ltd.

In Pakistan, Volvo trucks and UD trucks are exclusively represented by VPL Limited. VPL is a leading 3S distributor and serves a diverse and specialized range of industries including transportation, construction, cement, mining, marine, telecommunications, and industrial segments. These industries are served with world-renowned products including Volvo Trucks, UD Trucks, Volvo Buses, Sunwin Buses, Volvo Construction Equipment, Sandvik Mining Equipment, Volvo Penta Industrial & Marine Engines, Onis Visa Generators, and Gomaco Concrete Pavers. Detail of their truck product line is given in the following Table 8.3:

Table 8.3: Details of Truck Product line of Volvo Pakistan and their Installed Capacity

Model of Product	Horsepower	Installed Capacity
Volvo FM Truck	300-480	**500**
Volvo FM Truck	400-660	

8.3 Production of Trailers in Pakistan

Trailers are the backbone of the modern trading system. Its development is necessary along with the advancement of trucks and prime movers' engines. Pakistan has been reasonably responding to the requirement of the trucking sector. Major clusters of trailer manufacturing in Pakistan are located in Karachi, Sahiwal, Lahore, and Rawalpindi. The manufacturing activities are both in the organized and unorganized sectors. The various types of trailers being manufactured in Pakistan include flat-bed, low-bed, semi low- bed, and special purpose and customized trailers.

Most of the trailers manufactured in Pakistan use mechanical and rigid suspensions. On the other hand, most of the trailers manufactured in other countries use pneumatic suspensions. The later enables the trucking sector to better control and keep the vehicles at constant height irrespective of the load. This modification in the trailers reduced the wear and tear of the trailers (reduced vibrations and structural fatigue as well as component replacement) as well as the life of the tires.

Figure 8.2: Different Types of Trailers Plying on Highways

9 Truck Standards, Registration & UN Conventions

9.1 Rigid Trucks

National standards for the manufacturing of rigid trucks do not exist. If a single vehicle is defined as a rigid truck in Pakistan, it is the Bedford TJ1090 and the truck art on it. Variants of this 1966 model dominate the Pakistani trucking landscape. In the 1960s, the GOP aimed to standardize the trucking industry so that the industry for locally manufactured spare parts could be developed. Gandhara Industries Ltd. Pakistan began the manufacturing of Bedford TJ1090 midsized trucks under license in 1966. These trucks soon became the standard trucks in Pakistan. A large spare parts industry developed over the years and the trucks also began to be modified according to local needs by roadside retrofitters. Soon, these retrofitters started assembling the trucks themselves using locally manufactured spare parts and eliminated the need for a licensed manufacturer or manufacturing standards.

Figure 9.1: Evolution Stages of Development of Bedford Truck in Pakistan

The Bedford company closed down in the UK, however, due to a lack of copyright and market regulation, the Bedford truck continued to be produced in Pakistan unlicensed; assembled by local bodybuilding shops using locally made spare parts. Unregulated and ungoverned, these trucks subsequently began to evolve and over decades morphed into trucks that are functionally immensely different from their predecessor. The lack of regulation of the vehicle manufacturing industry has been a major hindrance to its development.

The retrofitting of old rail bogey axles into truck/trailer axles is also a common practice, which is a cause of many road accidents. Vehicle safety laws on the standards for better braking systems are not present and most trucks use outdated S-cam drum brakes which are prone to overheating and failure. The excessive use of vehicle decorative art is also a major issue because it restricts the driver's vision around the

vehicle. This contributes to increased fatalities of vulnerable road users including motorcyclists and pedestrians.

9.2 Trailers and Multi Axle Freight Vehicles

Technical standards also do not exist for locally manufactured trailers or prime movers. Currently, there is a large industry involved in building and modifying heavy vehicles. This includes many roadside manufacturers making modifications that use sub-standard materials and technically flawed practices. For example, many heavy vehicles are built from imported chassis that are declared as scrap and originate from off-road vehicles like dump trucks and concrete mixers. Some chassis are also purchased locally from suppliers including the armed forces. These chassis are then used in the construction of 2 and 3-Axle rigid trucks and buses.

Figure 9.2: Multi Axles Truck and Car Carrier in Pakistan

Typically, many of these trucks and trailers are built with a higher center of gravity which makes them prone to tipping over. The safety issues with heavy vehicle manufacture in Pakistan have long been understood and strategies to regulate this industry have been developed within the EDB Trucking Policy. An inter-governmental committee has also been active in implementing these strategies, however, no major change was observed on the ground.

9.3 Rigid and Articulated Oil Tankers, LPG Carriers

The technical standards for locally manufactured and imported fuel tankers are the most comprehensive of any class of trucks. These comprehensive standards were developed by OGRA (Oil and Gas Regulatory Authority) in 2009 and were based on the ADR (Carriage of Dangerous Goods by Road) standards. The OGRA RT 2009 Standards, cover overall configuration, tractor/trailer compliance, engine ratings, and design, tank construction, baffle plates, tank safety equipment, and safety valves, brakes, and weight to power ratio. The international ADR standards were updated in 2017. The OGRA RT Technical Standards 2009, now require updating to meet the 2017 standard.

Figure 9.3: Rigid and Multi Axles Oil Tanker & LPG Carrier in Pakistan

Fuel supplies are mainly transported by oil tanker trucks in Pakistan. Oil tankers are manufactured by either roadside manufacturers or in an EDB certified manufacturing facility. Oil tankers are constructed using rigid tankers retrofitted over a factory-built chassis-cab. The prime mover can either be built locally or imported. The oil tanker industry is regulated by OGRA, 2009 tanker design technical standards. However, loopholes in the registration system exist. Trailers do not require registration. In the case of a rigid tanker truck, the chassis cab can be registered as a standalone unit before the body is built upon it. Thus OGRA, 2009 regulations are unable to be enforced. The Ahmedpur Sharqia oil tanker crash in 2017 is an example of the lack of enforcement of current law. The Ministry of Communications investigation found that the oil tanker shell and baffle plates were not built according to OGRA requirements in the instant case, which made the tank structure weaker, unstable, and prone to leakages. The tanker did not have a fire engulfment release valve required by the standards which caused the tank to explode. Had these measures been in place, the tanker would not have exploded.

Figure 9.4: Overturned Tanker Non-compliant with OGRA Standards

In 1999, the first ADR compliant tanker was manufactured in Pakistan. On its first delivery run outside Karachi, it was deliberately set on fire. However, since the vehicle had ADR-required safety systems in place including the fire engulfment release valve, the 25,000 liters of petrol inside the vehicle did not ignite despite the outer vehicle being on fire.

Many multi-national oil marketing companies, such as Shell are fully compliant with ADR. However, the biggest oil transport company, the Government-owned Pakistan State Oil, which has 55% of the market share in oil transportation by road is not fully compliant. The OGRA regulations have been strongly opposed, including through the use of strike action by tanker truck unions.

Only three manufacturers in the country are registered with EDB as tank body and tank semi-trailer manufacturers. Only one company, AutoCom Pakistan uses a design that complies with OGRA standards for its 48KL design. This design was verified by an independent third-party assessor as required by the Ministry of Industries. Apart from that, transporters and their multinational clients rely on manufacturer claims of compliance with the OGRA RT 2009 standard.

In recent years, the demand for Liquefied Petroleum Gas (LPG) as an alternative to petrol and compressed natural gas has increased. OGRA allows only accredited tanker manufacturers to construct LPG tankers. Nearly all LPG tankers on the road are non-compliant with safety standards due to a lack of enforcement. These LPG tanks are also used to transport other potentially lethal chemicals such as Anhydrous Ammonia. Like the Ahmedpur Sharqia tragedy, a major disaster involving this type of transport is a real possibility.

9.4 Truck Registration

The Pakistan Motor Vehicle Ordinance 1965, and subsequent amendments mandate the registration, including initial and ongoing registration of all motor vehicles except

tractors and tractor-trailers in all provinces and federal territories. A vehicle license plate is issued as part of the initial registration. There are standards set for license plates, however, non-standardized license plates are common because of weak enforcement of traffic laws.

Provincial and territory Excise and Taxation departments (E&TD) retain registration data, using both manual and computer-based record systems. No protocols or processes have been established and implemented to enable inter-provincial data access and sharing by enforcement agencies. This has led to multiple issues developing in Pakistan including incomplete data recorded for each vehicle and multiple registrations of the same vehicle chassis number.

The Excise and Taxation departments in Pakistan had only one category for new registration of trucks at the rate of PKR 2.5 per kilogram of laden weight from filers of income tax returns, and PKR 4.0 per kilogram of laden weight from the non-filers of the income tax returns.

The manufacturers and assemblers of trucks in Pakistan produce vehicles of different categories and engine capacities under the generic category of trucks, varying from 2 tons to 60 tons laden weight and this broad grouping makes it very difficult to understand the nature of the problem of each category of trucks and recommendations for their solutions. The availability of disaggregated data on trucks is, therefore, necessary for making any concrete recommendation, especially relating to their role and contribution to the problems of urban air pollution as well as the emission of GHGs.

The problem is also compounded as according to the Motor Vehicle Ordinance, 1965 and Motor Vehicle Rules, 1969 only two types of drivers' licenses are issued: One is Light Transport Vehicle Driving License (LTV) and the second Heavy Transport Vehicle Driving License (HTV). The HTV License entitles its holders to drive buses and trucks in Pakistan. No specific category of driving license for driving trucks is in practice in Pakistan.

The above position is anonymous to practice in many other countries where the driver of a truck is required to have a Commercial Driving License (CDL) to drive a truck. And if the truck is of complex configuration involving one or more trailers, special endorsements are required from the Traffic Police or the relevant Licensing Authorities.

The National Highway Safety Ordinance, 2000 (NHSO-2000) is only specific to classifying a freight vehicle if its laden, or Gross Vehicle Weight (GVW) is more than 5,000 kg (about 5 tons). The practical difficulty, in this case, is that some of the current manufacturers are freight vehicles producing freight vehicles with a capacity less than 5-ton GVW or exceeding this limit. These inconsistencies need to be streamlined.

Some time ago, at the request of Truck Associations, the National Highway Authority (NHA) relaxed allowable limits from 2.5 tons to 8 tons for National Highways. No relaxation is available on motorways. This concession owing to the enforcement of the restrictions and potential damage to road pavement on National Highways is under review for withdrawal by NHA.

In many other countries where freight road transport by trucks has fairly advanced follow specific categories trucks type for regulation purposes. These include 'ultra-light trucks', 'light duty trucks', 'heavy-duty trucks', and special purpose trucks (attached to the concrete mixers, trucks for carrying ores from mines to the processing factories).

9.5 Vehicle Licensing Regime

In good practice, a vehicle licensing system is an essential component of a road transport safety management system. Licensing systems provide a legal connection between the vehicle owner and the vehicle. This connection then enables the implementation of road safety measures that regulate the safe operation of vehicles on the road network both nationally, and across regions such as the European Union (EU), vehicle registration systems are harmonized in terms of data fields, documentation, and procedures to ensure minimum safety standards and enhance enforcement of these standards.

Following the 18th Constitutional Amendment since July 2011 responsibility for vehicle licensing has been devolved to provincial and federal territory governments. Chapter 2 of the Motor Vehicle Rules of 1969 was made under the Motor Vehicle Ordinance 1965. Section 3, Federal Excise Act of 2005, requires that all motor vehicles (except tractors, and trailer units of the articulated trucks and tractor-trailers) with an engine capacity above 50cc must be registered. The process for vehicle licensing consists of:

1. Proof of compliance with applicable technical standards:
    - Manufacturer's datasheet [for locally manufactured vehicles]
    - Customs Clearance [imported vehicles]
    - Pakistan Standards & Quality Control Authority (PSQCA) Compliance certificate [two and three-wheelers]
    - Periodic technical inspection at a motor vehicle fitness facility [for commercial and public service vehicles only]
2. Registration
3. Insurance

9.6 Motor Vehicle Fitness Certification

Chapter 6 of the Motor Vehicle Rules (MVR) of 1969 made under the Motor Vehicle Ordinance 1965, established motor Vehicle Fitness Certification Offices (MVFCO) within the Provincial Department of Transport who are responsible for certification for all vehicles used as public service vehicles such as taxis, vans, motorcycle rickshaws, buses, and trucks is prescribed in MVR 1969.

MVFCO offices are established in all of the 143 provincial districts and are responsible for periodic inspection of public service vehicles. Periodic fitness inspections include inspection of brakes, lights, suspension, reversing, horns, silencers, mirrors, dangerous projections, noise, safety glass, wipers, tires, emissions, speedometer, overall dimensions, turning radius, and seating. Punjab has recently introduced a Vehicle Inspection and Certification System (VICS). In Punjab the inspection fee for an initial registration fee of Rs.1080 per transport vehicle and PKR 720 for rickshaws. Ongoing inspections are required every 6 months to obtain a fitness certificate for license renewal. In Punjab, this inspection fee is currently PKR 540 per transport vehicle and PKR 450 for rickshaws.

9.7 Key Issues for Truck Licensing Laws and Standards

I. Oil tankers, two-wheelers, and three-wheelers are the only three categories of vehicle types with technical design standards. No technical standards exist for any other vehicle type.
II. The technical standards for oil tankers are not a prerequisite for registrations, resulting in non-compliance with these standards.
III. Only OGRA and ADR-compliant oil tankers should be issued a vehicle license or be able to get fitness certification.

IV. The OGRA RT 2009 standard must be both implemented and updated to reflect ADR 2017.
V. Farm tractors are classified as agricultural vehicles and are not currently required to be licensed. However, these farm tractors are fitted with a trailer (tractor-trailers) and used as trucks on public roads. Tractors should be licensed according to to use as farm vehicles. Legislation is required to ban the use of tractors as goods transport vehicles on highways and motorways.
VI. Buses have no technical design standards or dimensional constraints. In addition, there are no axle load limits or front-to-rear axle load ratio.
VII. Vehicle registration practices should ban the current practice of registering and licensing a truck chassis and subsequently building a bus body or fitting a tank to this chassis. All trucks and buses manufactured in Pakistan should only be issued a vehicle license if they comply with all current requirements including a manufacturer's compliance certificate and the recently implemented Vehicle Dimensional Rules 2017.
VIII. Only the prime mover in articulated vehicles is required to be registered. The trailers do not have an independent registration system. This has resulted in an undocumented, unsafe, untaxed, and unregulated trailer and tanker building industry, bypassing all checks and balances.
IX. There are no requirements for periodic fitness inspections for privately owned passenger vehicles and motorcycles. This is only required for commercial and public service vehicles. Once a private car/motorbike is registered, there is no further requirement to have its fitness assessed for the lifetime of the vehicle.

9.8 TIR Convention

Pakistan has signed the TIR convention, TIR stands for Transports Internationaux Routiers (International Road Transport). In practice, it is an international Customs transit system for the movement of goods by road across the borders of countries party to the TIR Convention. This system enables point-to-point transportation of cargo with the least interference at international borders of the countries of origin and destination, and thus facilitates international trade and regional connectivity. Regional connectivity achieved in practice will result in foreign trucking companies coming to Pakistan and Pakistani trucking companies crossing over the border into other countries. This situation might result in joint ventures between local and foreign companies or direct competition between the two. In either scenario, competition or issues might arise. This also calls for greater communication between different competition agencies of the region to address competition issues that might arise due to operations of Pakistani trucking companies in other countries and vice versa. Preferential treatment towards local companies should be discouraged and a level playing field must be ensured to drive the market forces toward providing the most efficient transport solution.

9.9 Carriage of Dangerous Goods (ADR)

The international standards for the regulation of the carriage of dangerous goods by road are the 2009 ADR (Carriage of Dangerous Goods by Road) Regulations. Key provisions of ADR include:

i. Applicable duties as Consignor, Carrier, (Un)Loader, Packer, Filler, Driver, Vehicle Crew, Consignee
ii. Training of employees according to their roles and responsibilities. Maintaining records of training is also required.
iii. Requirements for vehicles used for transport and safety equipment/ plates and placards required. Vehicle audit sheets and keeping of records on vehicle maintenance, safety checks, equipment, and marking.
iv. Identify all packaging used and handled. Note correct packaging type for goods and limitations of certain packaging. Create processes and procedures to ensure correct packaging/labeling is used and when appropriate remove packaging from circulation that is damaged or out of date.
v. Consignors to create transport document(s). Ensure all documentation is identified and accompanies each dangerous goods shipment. Carriers to supply instructions in writing. Transport documentation must be held on record for 3 months.

In Pakistan, regulations governing vehicles transporting petroleum products must comply with standards under OGRA Road Transport 2009 does not meet (but are based on) ADR 2009. Pakistan requires increased regulation to address the standards required for the transport of all dangerous goods. It is also recommended that part-built truck and chassis units be prohibited from being issued a vehicle license.

It is recommended that ADR legislation be introduced to ensure the safe transport of dangerous goods. National legislation should provide for general participant duties, the practical safe transport of dangerous goods, competent authorities, powers of enforcement, offenses, and penalties.

9.10 New Road Safety Legislation

The study of the existing motor vehicle laws in the country reveals that new road safety legislation is needed due to following reasons: -

- The fast-increasing number of both commercial vehicles and personal vehicles in the country.
- Increase regional transportation by road.
- Adoption of international transport agreements in the national law.
- The need for encouraging the adoption of road safety standards in the automotive sector.
- The need for encouraging the use of technology in managing safety on roads.

- Concern for road safety standards, and standards for the transportation of hazardous and explosive materials
- Need for effective ways of tracking down traffic offenders.
- Rationalization of certain definitions with additions of certain new definitions of new types of vehicles.
- Stricter procedures relating to the grant of driving licenses and the period of validity thereof.
- Laying down of standards for the components and parts of motor vehicles.
- Provision for issuing fitness certificates of vehicles also by the authorized testing stations. Enabling provision for updating the system of registration marks.
- Introduction of post-crash response standards.

The United Nations General Assembly passed Resolution 74/299 on 31st August 2020 and adopted the proclamation of the Second Decade of Action for Road Safety 2021–2030, with a goal to reduce road fatalities and injuries by 50 percent by 2030. Pakistan is committed to the UN's second Decade of Action for Road Safety. In this respect, the Ministry of Communications is the lead national agency implementing the National Road Safety Action Plan 2020-2024 in which provincial governments are stakeholders.

In view of the above, the Ministry of Communications prepared the draft modal Road Safety Act (RSA) within the context of a federal constitutional system in which many legislative powers have been devolved to the provinces. These include the power to make laws in respect of roads other than motorways and national highways. As a result of this constitutional arrangement the draft Road Safety Act (RSA) has been designed with the following objectives:

- **Harmonization:** with the increase in motorized road traffic in Pakistan there is a need to achieve harmonization on a number of issues. These include driver licensing, vehicle registration, examination, law enforcement, and insurance of motor vehicle third-party risks.
- **Local autonomy:** constitutional reform (the 18th amendment to the Constitution) has devolved the power of administration of roads and road traffic. The draft RSA provides scope for local autonomy within the context of a harmonized law. This includes decisions as to the appointment of bodies to perform the functions of driver license authority, vehicle registration authority, vehicle inspection authority, road authority, and emergency care council (post-crash response).
- **Road Safety Goals:** These two principles are consistent with a third: that an Act should deal with major issues related to road safety which should be addressed and determined by the legislative arm of government (the Parliament), leaving implementation issues to the executive (the relevant agencies with accountability to a Minister). Much of the administration will rely on rules which are to be made under the RSA.

The RSA upon promulgation would repeal the existing NHSO-2000, Pakistan Motor Ordinance 1965, and Motor Vehicle Rules 1969. RSA will be a model federal law that the provinces can adopt as per their institutional requirements. If needed necessary briefing on the subject may be arranged by NTRC.

9.11 Intra-city Freight Logistics

For urban freight logistics, in large and middle-sized cities, urban distribution encounters difficulties such as truck movement, parking, and loading and unloading, which reduces efficiency and increases the costs of logistics. These issues are very obvious in Karachi, Lahore, Faisalabad, Sialkot, Multan, Rawalpindi, and Gujranwala. In response to these difficulties, the overall objective needs to be set for an effective management system and operation mechanism with clear functions between competent authorities, efficient operation, and strong enforcement in cities.

Table 9.1: Guidance in Policy Areas to Improve Urban Distribution

Policy Area	Guidance
Improve management System	- Identify clear functions between competent authorities in urban distribution at both national and local levels.
	- Establish coordination mechanisms at local levels, with local government taking the lead.
Plan well	- The urban distribution development plan should be developed by the city planning authority in association with the authorities involved in urban distribution management.
	- The urban distribution development plan should be incorporated into overall city planning, and linked with other relevant plans such as land, commerce, transport, logistics, and express mail.
Enhance infrastructure	- Build infrastructure for urban distribution channels and terminals.
	- Improve parking and loading and unloading facilities.
	- Issue rules and standards for conducting a transport impact assessment of urban distribution, and make transport impact assessment of urban distribution obligatory for any new, renovation, or extension projects of urban roads, commercial areas, residential areas, and large public areas when applying for approval at the planning stage.
Strengthen the management of the transport market	- Promote the standardization of trucks for urban distribution.
	- Regulate the behaviors of companies leasing trucks for doing the urban distribution.
	- Establish trust review systems for urban distribution enterprises.
Optimize movement control measures	- Use a permit system to control access of trucks to congested urban roads at peak periods.
	- Provide more parking areas for urban distribution trucks.
Strengthen enforcement	- Eliminate existing unnecessary or illegal charges throughout the entire logistics process.
	- Supervise urban distribution prices to direct reasonable market Pricing.

Policy Area	Guidance
	- Impose a punishment for violations.
	- Ensure safety of logistics enterprises.
Accelerate promotion and application of science and technology	- Encourage and guide logistics enterprises to integrate resources for cost reduction and efficiency improvement through centralized storage and warehouse management, demand-based distribution, and planned delivery.
	- Encourage the application of advanced technologies and equipment for urban distribution
	- Accelerate the construction of an urban distribution of information platform.
Speed up implementation	- Local government should take the lead in organizing the urban distribution development.
	- Implement pilot projects.
	- Monitor performance of competent authorities through.

9.12 Employment Generation by Trucking Industry

In Pakistan, statistics relating to employment in various sectors are maintained according to Industrial Classification Schedule (ICS), primarily by two broad categories: (i) commodity producing sectors and (ii) service sectors. The commodity-producing sectors are further divided into (a) primary sector and (b) secondary sector. The service sector is also termed as tertiary sector. Employment in Transport, Storage, and Communication is one of the 6 subsectors of the tertiary sector. According to the above categories, the leading sector of employment in Pakistan in the year 2015 is the tertiary/service sector (42.1 percent), followed by the primary sector with the share of 36.1 percent of the employment. Employment in the secondary sector (manufacturing, construction, electricity, and gas) lags at 21.7 percent of the total employment in the country. On the other hand, the Pakistan Bureau of Statistics (PBS) maintains its labor force statistics of the tertiary/service sector by the type of the workforce in percentage terms for Pakistan and the provinces. According to this data in 2020-21, the sales and service workforce was about 16.10 percent of the total labor force in the service sector. Since the category of transport, storage and communication are very broad, it is difficult to arrive at the number of persons directly or indirectly employed in the transport, or even the trucking sector.

Under the circumstances, it may be reasonable to estimate the number of persons employed in the trucking sector at an assumed rate of about 40 employees per truck on the road. Taking into consideration that presently about 350,000 trucks are registered, or on-road, the number of persons employed in the sector would be in the range of 14 million. Once the truck population increase to a projected 400,000, the number of employed in the sector would be around 16 million.

10 Modern Trucking Concepts

10.1 Information System used in Trucking Sector on International Level

Most freight transportation information technology (IT) is the same as in other industries. Differences arise because of the nature of the industry and the consequences of terrorist exploitation of potential vulnerabilities. The freight transportation industry uses IT in several ways:

- Backroom management and integration
- Mobile communications and tracking,
- Internet applications

A freight information system is a significant factor in the steadily improving efficiency of the industry. These systems also help provide highly reliable delivery, which, among other benefits permits customers to operate with lower inventories, including “just-in-time” inbound materials strategies. The transport/logistics system functions globally, but it is made up of discrete and varied subsystems among the different modes and even among the companies within a mode. The system is not integrated; instead, the subsystems are only interconnected at many different points and in different ways.

Many transport and logistic firms also connect with their customers and government agencies such as Customs. Each interconnection represents a point of potential vulnerability to attack. In addition, the ever-changing mix of carriers, shippers, distributors, and freight forwarders who are or can be connected to the “system” makes it very difficult to identify and authenticate users. The complexity and diversity of these systems are a serious challenge in the development and implementation of a comprehensive cyber security strategy for freight transportation information systems.

10.2 Trucking Software’s used Internationally

Verizon Networkfleet transforms the way fleets operate by monitoring mileage, fuel use, engine diagnostic codes, and other vehicle data. The online system offers 24/7 access to fleet information, robust reporting capabilities, reliable tracking of fixed and movable assets, and third-party data integration to automate fleet management tasks and improve efficiency.

Telogis is the only provider that offers a single integrated platform to cover all location intelligence needs. It is a complete, future-proofed platform solution. It helps to maximize profits, security, safety, compliance, and productivity. From commercial GPS fleet tracking and fuel management to route planning and navigation, Telogis’s modern, web-based architecture allows efficient data exchange between common systems, and right across the entire business.

ArcFleet (by Arcline 2000) simplifies all aspects of managing the truck dispatching with ArcFleet. From initial lead tracking, creating load orders, trip reports, driver

settlements, and posting into the accounting software, the ArcFleet system tracks every aspect of the business. From the time you book a load, right through until it's delivered, this software puts the user in control of load information, dispatching, invoicing, and equipment maintenance all in one powerful, accurate and reliable package.

RTA Fleet Management (by Ron Turley Associates) RTA Fleet Management Software helps the user to manage the maintenance of their trucking fleet. From PM tracking to inventory management, this system allows the user to measure the full cost of owning and maintaining your trucks. This intuitive system is in use by thousands of fleets throughout the world.

10.3 Best Practices in Trucking Industry

This section provides a detailed review of literature indicating and highlighting the best practices used in the trucking sector to improve GHG emissions and fuel efficiency. Based on a review analysis of key elements of the best practices in the road freight transport sector, the criteria for the key elements of the trucking sector in organized form cover the major areas of interest in the following domains:

- Clean and Low Carbon Fuels
- Advanced Technologies,
- Operations and Management
- Improvement in Infrastructure
- Policies and Institutional arrangements

The domains are characterized by potential best practices applicable to the truck mode. These best practices are divided into subgroups, including:

- Reduction in fuel use and emissions during extended idling,
- Air conditioning system improvement,
- Reduction in aerodynamic drag,
- Reduction in tire rolling resistance,
- Hybrid propulsion,
- Weight reduction,
- Improved transmission efficiency,
- Improved diesel engine efficiency,
- Reduction in accessory load,
- Modifications in driver operational practices,
- Alternative fuels, and
- Improved policies and institutional arrangements

On the matter of better truck technologies, many improvements can increase fuel efficiency, including improvements to truck shapes to reduce aerodynamic drag, reduction in truck weight, alterations to tire tread and tire configuration, and a range of

improvements to engines, transmissions, cooling systems, and other components and systems, as well as alternative fuels and engine technologies.

10.4 General Areas for Improvement

10.4.1 Technology

There are various improvements in the area of technology, which can benefit enormously. Sometimes best practices will only bring minor changes and benefits in a business process, sometimes one can make heavy investments, which although will only pay off after some/long time of usage, the savings will build up over time and be very significant. Whether the amount of money saved from new technology justifies the (sometimes big) investment in new machinery/software or whether the economic benefits of introducing new technology sometimes remain a risk, all are ideas best-evaluated case by case.

In principle, a freight company should keep its truck fleet up to date, because newer trucks will for example feature the latest emissions-control technologies. With the new software, an organization may have the possibility to continually monitor engine performance. Investment in new technologies will help reduce emissions and energy consumption at the same time.

Another idea would be to have primarily team-driven vehicles, which would result in fewer empty runs (by generating a lot more revenue per kilometer). For this strategy to be successful, there should be no imbalance between inbound and outbound freight: this means that one of the greatest efforts should also be made to adjust the commercial policy in order to achieve this result. Transportation management systems can help analyze and identify profitable/unprofitable routes.

10.4.2 Personnel

In the area of personnel, there are various possibilities to enhance both the economic and environmental performance at the same time. Thinking of logistics, the most notable and well-known is driver education and training, which focuses on making drivers aware of fuel-efficient driving, and contributes to enhancing the safety of both driver and goods. This generates savings in the form of lower insurance premiums, less energy consumption, and better use of resources.

Some examples of driver education are teaching drivers about tire maintenance and optimal tire pressures etc. This contributes to lifting the current low levels of tire maintenance and prolonging the life cycle of tires. Driver training programs can give incentives to drivers who perform efficiently in achieving fuel economy through reducing idle time and keeping speed limits within a certain range: engine control modules can be used to set speed limits, which again will help to diminish the waste of fuel and accidents.

10.4.3 Smart/Strategic Logistics

The third area of possible improvements, in addition to technology and personnel, is an area, which is called smart or strategic logistics, i.e., the improved management of the supply chain. These have a great advantage over technology in that the costs are limited, and they will often remain an integral part of the business process over a long period of time, while technology often has to be replaced after some years to have the newest or best available technology. The training of personnel also produces long-term effects, but personnel may leave (with the training it has received), and starting from scratch become necessary, once new employees are hired.

Route planning enables a freight organization to identify less profitable (or more costly) routes, whose planning can be optimized. In commercial route planning, less profitable routes can be abandoned to the competition, if no other solution is available. Modern computer programs, in addition to tracking and tracing technology and reporting schemes, can calculate the best solutions and the best routes. Identifying a non-profitable route is the first step to amending the situation. Here software can also help, but often a forwarder will need to look for solutions without the help of management software, once the problem is identified (e.g., find new customers to decrease empty running).

Intermodal solutions can bring great benefits, because they combine the best of various modes of transport, possibly improving the overall performance. When carrying goods from A to B, it is generally advisable to look for alternative solutions and compare them. It is thus possible to create geographical shortcuts in the trips, whilst reducing greenhouse gas emissions.

The consolidation of cargo is one of the best techniques to cut costs and emissions. It increases logistics service providers' revenues whilst offering lower costs to shippers and providing environmental advantages to all. Consolidation works both in transit (groupage services) and when goods are standing still (third-party warehouses). Consolidation has many advantages such as less freight traffic, less environmental damages, better utilization of the vehicle fleet, less space occupancy, etc.

10.4.4 Clean and Low Carbon Fuels for Improved Environmental Performance and Energy Efficiency

Low carbon fuels, or clean fuels, are those that result in less carbon pollution compared to petroleum-based fuels and that are produced sustainably. Also called the next generation of advanced biofuels, it can overcome the limitations of both fossil fuels and first-generation predecessors by utilizing existing infrastructure, reducing emissions, and careful use of land when coupled with proper sustainability certification.

- Clean fuels generally have lower vehicle emissions that contribute to smog, air pollution, and global warming.

- Most low-carbon fuels don't come from finite fossil-fuel resources and are sustainable.
- Alternative fuels can help nations become more energy independent.

Table 10.1: Comparative Analysis of Different Fuel Options

ETHANOL	
Description	An alcohol-based alternative fuel is made by fermenting and distilling crops such as corn, barley, or wheat. It can be blended with gasoline to increase octane levels and improve emissions quality.
Advantage	Materials are renewable.
Disadvantage	Ethanol subsidies have a negative impact on food prices and availability.
NATURAL GAS	
Description	Natural gas is an alternative fuel that burns clean and is already widely available to people in many countries through utilities that provide natural gas to homes and businesses.
Advantages	Cars and trucks with specially designed engines produce fewer harmful emissions than gasoline or diesel.
Disadvantages	Natural gas production creates methane, a greenhouse gas that is 21 times worse for global warming than CO2.
ELECTRICITY	
Description	Electricity can be used as a transportation alternative fuel for battery-powered electric and fuel-cell vehicles. Battery-powered electric vehicles store power in batteries that are recharged by plugging the vehicle into a standard electrical source. Fuel-cell vehicles run on electricity that is produced through an electrochemical reaction that occurs when hydrogen and oxygen are combined.
Advantages	Electricity for transportation is highly efficient, and we already have an extensive electricity network. In the case of fuel cells, they produce electricity without combustion or pollution.
Disadvantages	Much electricity is generated today from coal or natural gas, leaving a bad carbon footprint.
HYDROGEN	
Description	Hydrogen can be mixed with natural gas to create a clean fuel for vehicles that use certain types of internal combustion engines. Hydrogen is also used in fuel-cell vehicles that run on electricity produced by the petrochemical reaction that occurs when hydrogen and oxygen are combined in the fuel "stack."
Advantages	No bad emissions.
Disadvantages	The cost and lack of fueling infrastructure and the difficulty of putting it in place
PROPANE	
Description	Propane - also called liquefied petroleum gas or LPG - is a by-product of natural gas processing and crude oil refining. Already widely used as a fuel for cooking and heating, propane is also a popular alternative fuel for vehicles.

Advantages	Propane produces fewer emissions than gasoline, and there is also a highly developed infrastructure for propane transport, storage, and distribution.
Disadvantages	Natural gas production creates methane, a greenhouse gas that is 21 times worse for global warming than CO2.
BIODIESEL	
Description	Biodiesel is an alternative fuel based on vegetable oils or animal fats, even those recycled after restaurants have used them for cooking. Vehicle engines can be converted to burn biodiesel in its pure form, and biodiesel can also be blended with petroleum diesel and used in unmodified engines.
Advantages	Biodiesel is safe, biodegradable, and reduces air pollutants associated with vehicle emissions, such as particulate matter, carbon monoxide, and hydrocarbons.
Disadvantages	Limited production and distribution infrastructure.
METHANOL	
Description	Methanol, also known as wood alcohol, can be used as an alternative fuel in flexible fuel vehicles that are designed to run on M85, a blend of 85 percent methanol and 15 percent gasoline, but automakers are no longer manufacturing methanol-powered vehicles.
Advantages	Methanol could become an important alternative fuel in the future as a source of the hydrogen needed to power fuel-cell vehicles.
Disadvantages	Automakers are no longer manufacturing methanol-powered vehicles.
P-SERIES FUELS	
Description	P-Series fuels are a blend of ethanol, natural gas liquids, and methyl tetrahydrofuran (MeTHF), a co-solvent derived from biomass. P-Series fuels are clear, high-octane alternative fuels that can be used in flexible fuel vehicles.
Advantages	P-Series fuels can be used alone or mixed with gasoline in any ratio by simply adding it to the tank.
Disadvantages	Manufacturers are not making flexible fuel vehicles.

10.5 Advanced Trucking Manufacturing Technologies

10.5.1 Aerodynamic Drag Reduction

The difference in truck size also affects fuel economy and fuel consumption, vehicle range and fuel storage requirements, and subsequent vehicle cost, and helps guide the identification of the most appropriate technologies for reducing CO_2.

Typical heavy-duty trucks need to use a significant portion of fuel to overcome aerodynamic drag. Since higher speed causes larger aerodynamic drag, the effect of aerodynamic drag on fuel economy is higher at highway speeds compared to local road speeds. Thus, reduction of aerodynamic drag may significantly improve the fuel efficiency of trucks, especially during highway speed operations. Aerodynamic drag can be significantly reduced by installing add-on devices to improve the vehicle profile,

pneumatic blowing systems, and boat tail plates, or by improving the vehicle load profile.

10.5.2 Vehicle Profile Improvement I – Cabin Top Deflector, Sloping Hood, and Cabin Side Flares

Truck tractor aerodynamic drag reduction options, including cabin top deflector, sloping hood, and cabin side flares, have been introduced into the market. These add-on devices are estimated to reduce the aerodynamic drag of medium- and heavy-duty trucks and increase their fuel efficiency and reduce GHG emissions. Taking into account that these devices reduce only a fraction of aerodynamic drag. Although this best practice increases truck weight slightly, the estimated reduction in fuel use and GHG emissions takes this into account.

Figure 10.1: Common Wind Deflectors on Truck Cabin

10.5.3 Vehicle Profile Improvement II – Closing and Covering of Gap between Cabin and Trailer

Truck side and underside aerodynamic drag reduction options, including closing and covering the gap between a tractor and trailer (or van), aerodynamic bumper, underside air baffles, and wheel well covers, are commercially available technologies for medium- and heavy-duty trucks. The aerodynamic drag that results from the tractor-trailer gap can be reduced by installing gap-covering add-on devices. Drag underneath the vehicle can be reduced by installing a lower bumper and underside air baffles. Wheel well covers enclose the open space between the wheels and the truck body, which streamlines the side of the truck. From the results of field tests, combining these options is estimated to reduce energy use and GHG emissions. Although this best practice increases truck weight slightly, the estimated reduction in fuel use and GHG emissions takes this into account.

Figure 10.2: Covering the Gap between Cabin and Trailer

10.5.4 Vehicle Profile Improvement III – Trailer or Van Leading and Trailing Edge Curvatures

Truck trailer (or van) aerodynamic drag reduction options, including the improvement of their leading and trailing edge curvatures, are commercially available strategies. Aerodynamic drag can be reduced by the redesign of leading and trailing edges, such as rounded front corners and rounded aft corners.

10.5.5 Pneumatic Aerodynamic Drag Reduction

Pneumatic blowing systems are being tested as add-on devices that reduce aft-end aerodynamic drag. This type of system blows air from slots at the rear of the trailers of heavy-duty vehicles in order to smooth airflow over the trailer surfaces and reduce aft-end aerodynamic drag. This results in a reduction in vehicle fuel energy requirements. From the results of full-scale tests, this system reduces energy use for an individual truck by 3.9% to 4.8%. However, based on the results of field tests, some truck configurations, such as the dimensions of the tractor-trailer gap, may inhibit the reduction of aerodynamic drag achievable via this system. This best practice is suitable for combination trucks that have van trailers, which are a portion of the total truck fleet.

10.5.6 Planar Boat Tail Plates on Tractor-Trailer

Planar boat tail plates are being tested as add-on devices that reduce aft-end aerodynamic drag. These devices are rectangular plates mounted in the after-end of a trailer in an attempt to reduce the wake of trucks. The formation of a wake requires energy; thus, reducing the wake can energy consumption. From a full-scale test for a tractor-van trailer, this practice significantly reduces aerodynamic drag, and it was found to reduce the average energy use by approximately 8.3% over a 10,000-mile trip. This best practice is suitable for combination trucks that have van trailers, which are a portion of the total truck fleet. The drawback of this practice is that it may interfere with loading and unloading operations, depending on the design.

10.5.7 Vehicle Load Profile Improvement

Aerodynamic drag can be reduced by the use of a streamlined load profile for a trailer, which is a low-tech option. This practice keeps the load profile of a trailer as low as possible and secures tarpaulins to smooth airflow and reduce energy use. The drawback of this practice is that extra work in loading and unloading operations may be required.

10.5.8 Tire Rolling Resistance Improvement

Tire rolling resistance refers to a frictional effect associated with the contact of the tread of the tire with the road surface, and the flexing of the tread. Given that many trucks have a large number of tires in contact with the road, this effect can be significant. Thus, rolling tire resistance is an important component of the total engine power demand on a truck. Rolling resistance can be reduced by avoiding under-inflation of existing tires (to reduce unnecessary flexing), substituting one wide tire for a pair of dual tires (leading to a net reduction in the total tread area, sidewall flexing, or both), use of alternative tire materials to reduce rolling resistance, or use of pneumatic blowing. To the extent that rolling resistance can be reduced, total engine power demand is also reduced. This, in turn, leads to reductions in fuel use and exhaust CO_2 emission from the truck.

10.5.9 Automatic Tires Inflation Systems

With properly inflated tires, tire rolling resistance is decreased and fuel use is reduced compared to under-inflation. Automatic tire inflation systems (ATIS) are commercially available and are intended to keep vehicle tires properly inflated. These systems continuously monitor and adjust the level of pressurized air in tires.

Figure 10.3: Automatic Tire Inflation System Installed on Truck

10.5.10 Weight and Accessory Load Reduction

Truck auxiliary loads, such as the air-conditioning compressor, air compressor, fans, hydraulic pump, and coolant pump, are typically gear- or belt-driven and thus directly consume energy provided by the base engine. Full electrification of these mechanically driven auxiliaries can reduce engine load and use less energy. Using fuel cell units as the electricity source for electric auxiliaries can reduce more energy than using a generator to power electric auxiliaries. Reducing the truck weight can be very effective, with research indicating fuel savings of 3.5% to 4% for a 10% weight reduction in trucks. Other studies have found that a 4% reduction of weight by lightweight material substitution could offer energy savings of up to 4%.

10.5.11 Lightweight Materials

The energy consumed by a truck depends on many factors, including the tare weight of the vehicle itself. Substitution of lightweight materials for conventional materials can reduce the total vehicle weight. High-strength, lightweight materials include aluminum, plastics, high-strength steel alloys, and others. Since fuel use is directly proportional to truck weight, trimming 3,000 pounds (about 4% of truck weight) from a heavy-duty truck by using lighter-weight components improves fuel economy by 3%, and every 10% reduction in truck weight is estimated to reduce fuel use by 5 to 10%. In one study, the mass reduction was estimated to reduce energy use by 4.8% or more. However, current lightweight materials are costly and with no satisfactory material characteristics. Further research and development for advanced materials are needed.

10.5.12 Advanced Transmission

Advanced transmission technologies, such as the optimization of transmission engine-wheel speed ratios and reduction of mechanical losses, can reduce truck fuel use. A traditional transmission has a fixed number of gears that do not often achieve maximum efficiency. A continuously variable transmission (CVT) has belt-connected pulleys that can optimize transmission speed-load conditions and reduce fuel consumption. Mechanical losses in transmission can be reduced by the reduction of gear surface roughness, the use of low-friction coatings, the use of new gear materials, and the use of a lock-up torque converter that eliminates slip at cruising speed. In one study, advanced transmission and improved lubricants were estimated to reduce energy use by 2%. Since improved transmission lubricants are estimated to reduce energy use by 1%, this practice is estimated to reduce fuel use by 1.0% on average for all conditions. Driver training may be needed to avoid confusion because the sound of the engine with traditional transmissions changes for acceleration operations, but the sound of the engine with improved transmission does not change in the condition of acceleration.

10.5.13 Hybrid Trucks

Trucks that have high fractions of stop-and-go freight transport activities within their driving cycles, such as medium-duty package and beverage delivery trucks, are good candidates for hybridization. Most heavy-duty trucks and a fraction of medium-duty trucks are long-haul trucks. Long-haul trucks have a lower proportion of short-term idling or low engine power demand in their duty cycles because of traffic conditions or frequency stops compared to medium-duty trucks in local services. Based on the results of hybridization effects modeling, medium-duty trucks in local service (e.g., delivery) can reduce energy use by 41.5%. This best practice is considered to be more suitable for medium-duty trucks because of the characteristics of their duty cycles. A key disadvantage is the initial capital cost and uncertainty regarding the life of the battery pack and battery replacement costs.

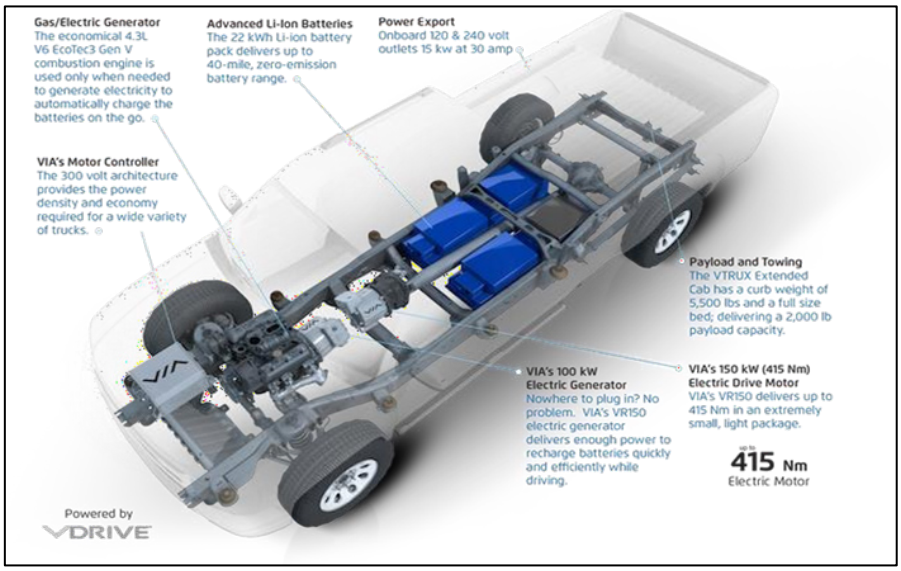


Figure 10.4: Hybrid Pickup Truck (Source: GMC)

10.6 Operations and Management of the Trucking Industry

10.6.1 Best Practice: Diesel Engine Retrofit Program

Diesel engines are important power systems for on-road and off-road vehicles. These reliable, fuel-efficient, high-torque engines power many of the world's heavy-duty. Diesel engines are easy to repair, inexpensive to operate, and extremely durable. It is common for a diesel engine to last 15-20 years and achieve a one-million-mile life. From the standpoint of greenhouse gas emissions, diesel engines can compete with other advanced technologies, like hybrid electric vehicles, due to a diesel engine's inherent fuel economy relative to conventional spark-ignited, petrol engines. Diesel-powered vehicles have demonstrated a 30-40% fuel economy advantage over their petrol counterparts.

While diesel engines have many advantages, they have the disadvantage of emitting significant amounts of particulate matter (PM) and oxides of nitrogen (NO_x) into the atmosphere. Diesel engines also emit toxic air pollutants. Health experts have concluded that pollutants emitted by diesel engines adversely affect human health and contribute to acid rain, ground-level ozone, and reduced visibility. Studies have shown that exposure to diesel exhaust causes lung damage and respiratory problems and there is increasing evidence that diesel emissions may cause cancer in humans.

Companies that manufacture emission controls have responded to the challenge of reducing air pollution from the in-use diesel vehicle fleet by developing a large portfolio of retrofit emission control devices. These cost-effective retrofit technologies were developed to reduce the entire range of regulated and unregulated harmful emissions. Some of these devices can significantly reduce the number of ultrafine particles that have been receiving much attention in recent years from both health experts and the regulatory communities.

Many countries have established mandatory, and volunteer retrofit programs for most in-use diesel-powered vehicles. For instance, the U.S. EPA has established a program with state and federal funding under its National Clean Diesel Campaign. Similarly, in Europe, many projects are in progress related to the diesel engine retrofit for trucks as well as buses.

Today, viable emission control technologies exist to reduce exhaust emissions from existing diesel vehicles. The major retrofit technologies are listed below. Retrofit technologies designed to control particulate matter (PM) include:

- Diesel oxidation catalysts (DOCs)
- Diesel particulate filters (DPFs)
- Flow-through filters (FTFs)
- Closed crankcase ventilation (CCV)

Retrofit technologies designed to control oxides of nitrogen (NO_x) include:

- Exhaust gas recirculation (EGR)
- Selective catalytic reduction (SCR)
- Lean NOx catalysts (LNCs or HC-SCR)
- Lean NOx traps (LNTs)

The retrofit of oxidation catalysts on diesel engines has been taking place for well over twenty years in the off-road vehicle sector. Oxidation catalysts installed on engines running 500 ppm or less sulfur fuel have achieved total particulate matter reductions of 20 to 50%, hydrocarbon reductions of 60 to 90% (including those HC species considered toxic), and significant reductions of carbon monoxide, smoke, and odor.

The number of vehicles retrofitted with high efficiency; wall-flow diesel particulate filters (DPF) has grown significantly over the past few years. The operating and

durability performance of DPFs has been very impressive. For example, a growing number of on-road DPF-equipped heavy-duty vehicles have been successfully operating for millions of miles. Today, second and third-generation retrofit filter systems can reduce PM emissions from 85% to more than 90%. The majority of these installed retrofit DPF systems make use of high-efficiency, ceramic wall-flow filters. Since 2007, every new diesel vehicle sold in the U.S. or Canada has been equipped with a high-efficiency DPF as required by the U.S. EPA's 2007/2010 highway heavy-duty emission regulation.

Flow-through filter (FTF) technology or partial filters employ catalyzed metal wire mesh structures or tortuous flow, metal foil-based substrates with sintered metal sheets to reduce diesel PM. Technologies verified to date employ catalysts and/or fuel-borne catalysts to oxidize soot. This technology is more widely applicable on older, dirtier engines than wall-flow filters because it is much less likely to plug and most often does not require ash cleaning. Flow-through filters are capable of achieving PM reduction of about 30 to 75%, as well as trapping the sub-micron, ultrafine particles capable of penetrating deep into the lungs. FTFs can be catalyzed to offer co-benefits of reducing HC, CO, and toxics by up to 80-90%.

Black carbon from diesel engines can be significantly reduced through emission control technology that is already commercially available. High-efficiency DPFs on new and existing diesel engines provide nearly 99% reductions in black carbon emissions. During the regeneration of DPFs, captured carbon is oxidized to CO_2, but this filter regeneration still results in a net climate change benefit since the global warming potential of black carbon has been estimated to be up to 4500 times higher than that of CO_2 on a per gram of emission basis.

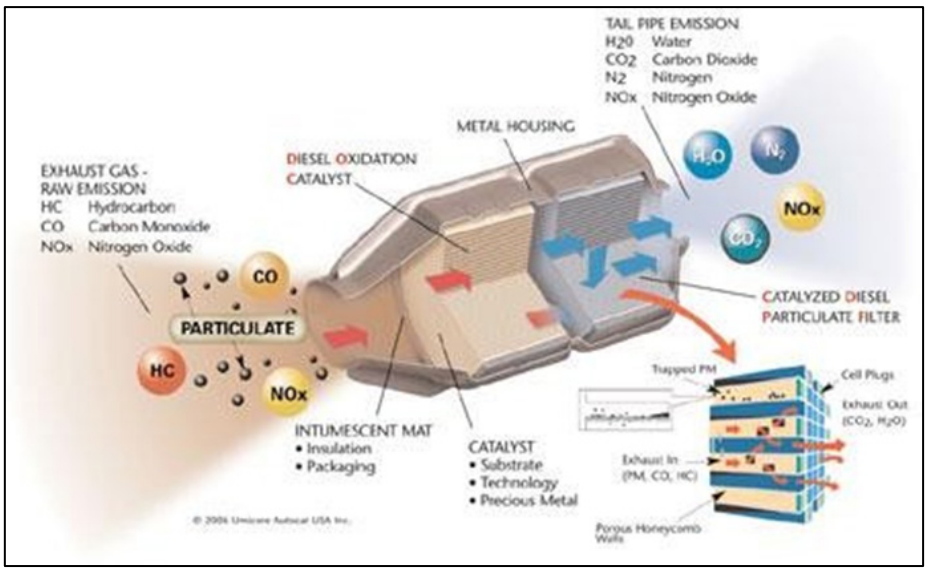


Figure 10.5: Working of a Diesel Retrofit Device (Source: ECTA)

Factors that influence vehicle selection include application, duty cycle, exhaust temperature, and vehicle maintenance. Knowing this information will help in the selection of appropriate technology for the vehicle. For optimum results, the engine of a vehicle should be rebuilt to the manufacturer's specifications before a catalyst, filter system, or other emission control device is installed.

Along with California's Diesel Risk Reduction Plan and U.S. EPA's Voluntary Diesel Retrofit Program, retrofit programs have been initiated worldwide, including those in Hong Kong, Japan, Sweden, United Kingdom, Switzerland, Korea, Mexico, and other countries throughout the world. In the U.S., six regional collaborative have been formed to bring together public and private funding and interests in reducing emissions from all diesel engines currently operating in these regions.

Retrofit technologies, including DOCs, DPFs, FTFs, EGR, lean NO_x catalysts, and SCR, have been successfully commercialized and/or demonstrated on both on-road and off-road vehicles. These technologies can greatly reduce particulate matter, oxides of nitrogen, and other harmful pollutants from diesel exhaust.

10.6.2 Best Practice: Truck Scrappage Scheme

It would be a clear winner and several factors point towards the introduction of a regulatory mechanism for mandatory truck scrapping. Trucks are a relatively high contributor to transport emissions, and older trucks are a high contributor to air pollution. China has introduced fuel economy standards for cars and trucks, which is tightening vehicle emission and fuel quality standards and several cities deployed a "yellow label" scheme that bans polluting trucks from city centers and the government aims to have yellow label trucks removed from the fleet all together by 2017.

The Society of Indian Automobiles Manufacturers (SIAM) strongly advocates the need for the introduction of a "Fleet Modernization Program" that puts an age limit of ten years for commercial vehicles. A financial incentive is suggested for operators through a 50% rebate of excise and sales tax, which could lead to a rebate per vehicle. Removing old trucks from the fleet can help address air pollution and fuel efficiency.

10.6.3 Best Practice: Truck Load Efficiency

In China, Japan, and the Philippines, 30-40% of truck trips are empty. Reducing the number of empty or only partially full loads has a significant impact on greenhouse gas emissions. And research has shown that mixing light and heavy products in a load can maximize the load's efficiency. If the heavy products alone are packed, they soon reach maximum load weight while leaving space in the trailer, while the light products take up available space before reaching the most efficient load weight.

A range of technologies can help to plan the shortest, quickest, and least congested routes, match up the supply of and demand for freight carrying capacity so that loads

are fullest (including on return journeys), keep track of and manage vehicles, and improve driving.

10.6.4 Best Practice: Road Net Program

A transport company in Thailand is using a traffic flow database called Road Net Program, which calculates the fastest, most cost-effective route by processing traffic volumes, route restrictions, and other data. One analyst, writing in the context of Korea, has suggested subsidies and loans switch to green logistics, the establishment of an integrated national information center for logistics, and a green logistics certification plan.

Pakistan's 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, demand this sector to upgrade and equip itself. Thereby enhancing efficiency by reducing the cost to the economy incurring in the form of road damages, and higher fuel costs. An efficient trucking system is a prerequisite to becoming 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.

10.6.5 Best Practice: Use of Advanced Technologies of Telematics

There is a huge potential for advanced operation and management technologies, including telematics and logistics information systems for providing several benefits including truck tracking, route optimization, fuel expense reduction, accident response, stolen vehicle recovery, and improved safety through driver education. However, barriers lie in convincing truck operators of the need and the investment costs.

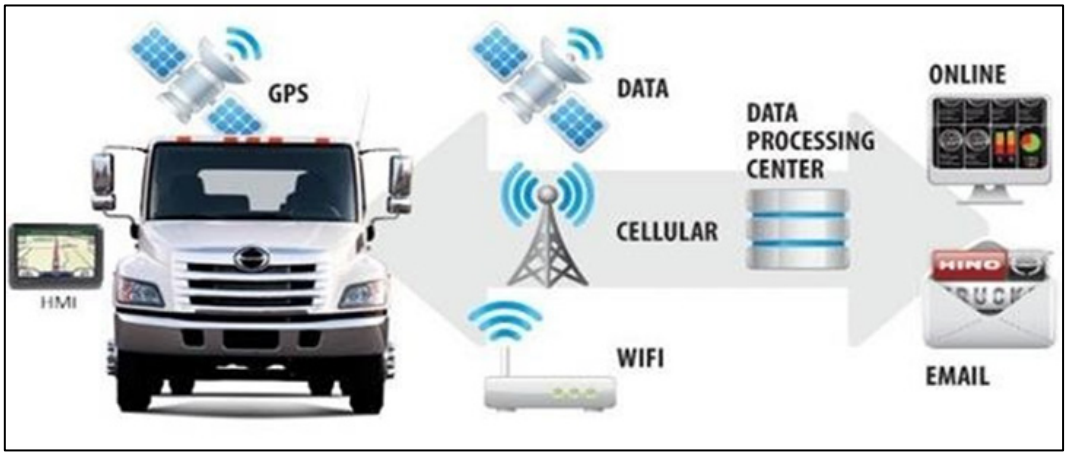


Figure 10.6: Telematics: Communicate with Onboard Vehicle Systems

India initiated a pilot project in Orissa and Goa with Essen RFID telematics to improve operational efficiency. China started pilot projects in nine cities, including Guangzhou, Wuhan, and Lanzhou with $2.35 million. It supported companies' efforts to update their logistics information systems and upgraded to use new technologies, including GPS real-time monitoring systems and RFID, or radio frequency identification systems.

10.7 Improvements in the Transport Infrastructure System

10.7.1 Best Practice: Advanced Technology in Collecting Toll

Tolls and congestion taxes (and bans on freight transport on particular roads) can be for all times or just for some times of the day or week, or there can be higher charges in busier periods. If tolls are to be imposed, electronic toll collection can avoid the generation of additional emissions that would otherwise result from stop-start traffic and vehicle idling when traffic banks up before manual toll collection points and such technology can be financed out of the tolls. Fuel taxes will encourage better vehicle maintenance and the use of more fuel-efficient vehicles, and there can also be subsidies or tax concessions for electric or hybrid vehicles.

10.7.2 Best Practice: Differential Pricing

Differential pricing for larger and smaller trucks, or bans on larger trucks in certain areas, will deter or prevent larger truck pickups and deliveries in busy city centers, and instead encourage larger trucks to deliver to or pick up from freight centers further out, with smaller trucks undertaking the first or last leg. These extra stages also remove the door-to-door advantage that road freight can have over other modes.

10.7.3 Best Practice: Maintenance and Monitoring for Fuel Efficient Trucks

Trucks also need to be more fuel-efficient and thus less greenhouse gas generating, and this leads to the question of vehicle maintenance and the adoption of better technologies and fuels. The government needs to look at ways of encouraging or requiring vehicle owners to maintain their vehicles, and a range of measures are covered, precisely:

- Setting standards for vehicle fuel economy
- Setting standards for vehicle emissions
- Vehicle inspections
- Mandatory adoption of particular technologies in extreme cases
- Taxation and pricing measures relating to emissions, vehicle age, and fuel economy
- Requiring the inclusion of emissions standards in vehicle warranties
- Schemes to get older vehicles off the roads
- Euro standards for fuel quality and their implementation at oil refineries
- Driver or owner education about vehicle maintenance.

There is an example of “The Green Trucks Pilot Project” in Guangzhou, China, which sought to improve fuel efficiency and reduce greenhouse gas emissions and local pollutants through the retrofitting of new technologies and driver training. Adoption of the particular tire and aerodynamic technologies alone paid for itself in 1.8 years through improved fuel efficiency, and, if adopted by all of the 826,000 heavy trucks in Guangdong Province, this would save 8.6 billion liters of fuel a year and reduce CO_2 emissions by 22.3 million tons a year, equal to the emissions of a large city.

10.7.4 Training for Driver Operational Practices

Driving practices that increase fuel efficiency and road safety can be achieved through information provision, driver training, and real-time performance monitoring technology. “Eco-driving schemes” in Japan have resulted in 12% savings in fuel consumption, through things like proper use of gears, switching off the engine when the vehicle is stationary, and avoiding heavy acceleration. Owner-drivers have a material incentive to improve their driving in these ways; companies can consider offering efficiency bonuses for employed drivers so they too can have such an incentive.

10.7.5 Best Practice: Use of Articulated Trucks for Drop and Hook and Company Consortia

Partnerships, cooperation, and alliances for sustainable freight are extremely useful as it reduces empty trips. China has been promoting and supporting the use of articulated trucks or “drop-and-hook” transport. Several important policies have been made to promote the development of drop-and-hook transport in China. Especially, to overcome the obstacles to drop-and-hook implementation to be cleared, including adjusting trailer insurance charges; improving/adjusting the customs supervision system of drop-and-hook vehicles; improving/adjusting the toll collection of drop-and-hook vehicles; standardizing tractors and trailers; improving the trailer permit management; encourage transport enterprises to expand the transport network, and encourage logistics enterprises to strengthen cooperation.

10.7.6 Best Practice: Financing

There is a wide range of financial and economic mechanisms or instruments to facilitate investment in technologies and logistics solutions that reduce fuel use and emissions and increased efficiency. These mechanisms have an impact on investment decisions or on an entity’s ability to invest by helping to reduce the overall costs of the investment (easing the decision to invest) or by facilitating the financing of the investment (reducing barriers to and costs of commercial financing). Financing mechanisms can be policy-based or market-based as shown below:

- **Policy-Based:**
  - Tax (e.g., taxes and tax credits)
  - Subsidies (e.g., subsidies and grants)
- **Market-based:**
  - Debt financing or lending programs (e.g., bank loans, soft loans, revolving funds, guarantee funds, energy efficiency “bank windows”)
  - Emission credits (e.g., clean development mechanism [CDM])
  - Energy service companies (e.g., guaranteed savings, shared savings, pay from savings)

11 Worldwide Road Freight Initiatives: Case Studies

This chapter summarizes the implemented best practices and freight initiatives. It presents selected case studies from the developed and developing parts of the world and special emphasis is given to the neighboring countries of Pakistan. A similar sustainable transportation project in Egypt is also included in the case studies, which was initiated six years back and sponsored by the UNDP and GEF in collaboration with local partners.

11.1 United States of America SmartWay Transport Partnership Program

In 2004, the U.S. Environmental Protection Agency (EPA) pioneered SmartWay to encourage greater efficiency and lower greenhouse gases and other harmful emissions from transportation supply chains. In the years since, SmartWay and its partners have made significant progress toward these goals, leading businesses through a historic transition toward a new era of freight sustainability.

From the beginning, EPA and its partners worked through SmartWay to collaborate, provide technical assistance and funding to seed investment in verified environmental and energy improvements, and create tools to quantify freight emissions and their costs in the supply chain. Moving forward, EPA will continue to leverage SmartWay and help businesses and their transportation service providers find ways to move goods more efficiently in an increasingly energy-constrained, low-carbon world.

SmartWay Transport Partnership is a strong government/industry collaboration between freight shippers, carriers, logistics companies, and other stakeholders, to voluntarily achieve improved fuel efficiency and reduce environmental impacts from freight transport. Participating companies use performance-based quantification and reporting tools that benchmark and inform industry and the marketplace on freight operations, energy, and environmental efficiency. SmartWay partners demonstrate to customers, clients, and investors that they are taking responsibility for the emissions associated with goods movement, are committed to corporate social responsibility and sustainable business practices, and are reducing their carbon footprint. To date, the partnership includes nearly 3,000 companies and associations committed to improving fuel efficiency.

It aims to accelerate the availability, adoption, and market penetration of advanced fuel-efficient technologies and operational practices in the freight supply chain, while helping companies save fuel, lower costs, and reduce adverse environmental impacts. EPA helps SmartWay Partners move more goods, more miles with lower emissions and less energy.

In addition to the U.S. EPA program, SmartWay has been administered in Canada by Natural Resources Canada since 2012. SmartWay continues to positively influence

green freight programs in other regions of the world, creating a single seamless network that can effectively cut carbon from our global goods movement system.

SmartWay Tractors and Trailers meet voluntary equipment specifications that can reduce fuel consumption by 10 to 20 percent for 2007 and newer long-haul tractors and trailers. Each qualified tractor/trailer combination can save between 2,000 to 4,000 gallons of diesel per year. Models that meet these equipment specifications save operators money and reduce greenhouse gas emissions and air pollutants.

USEPA SmartWay Technology Assessment Center develops test protocols, reviews, strategies and verifies the performance of vehicles, technologies, and equipment that have the potential to reduce greenhouse gases and other air pollutants from freight transport. As a result, companies can compare the fuel efficiency and environmental performance of various technologies and make more informed purchases.

Program Highlights

Saves Oil and Supports Energy Independence

- Since 2004, SmartWay has helped its partners save 144.3 million barrels of oil. This is equivalent to taking over 13 million cars off the road for an entire year.
- By helping the American freight industry reduce dependence on foreign fuel, we can invest more dollars at home and reduce our national trade deficit.

Saves Money and Supports U.S. Business Interests

- Working with SmartWay, U.S. businesses have saved $20.6 billion on fuel costs to date, lowering prices for the typical consumer while supporting American truckers.
- Tractor, trailer, and equipment suppliers to the U.S. trucking industry rely upon SmartWay to demonstrate the benefits of more efficient products to customers.
- Works with thousands of partners and affiliates
- More than 3,000 of the nation’s carriers (truck, rail, barge, and multimodal), shippers, and logistics companies are SmartWay partners, continuing to improve efficiency within their transportation supply chains.
- SmartWay counts among its partners a significant and growing number of Fortune 500 firms, representing a broad cross-section of industries.
- SmartWay affiliates work with the program to achieve environmental and other goals and promote the benefits of SmartWay.
- The federal government has set ambitious greenhouse gas emissions reduction targets for itself in Executive Order 13693. The federal government, through the General Services Administration, is specifically instructed to utilize SmartWay partners.

Helps to Protect the Health of Americans

- Since 2004, SmartWay has helped partners avoid emitting 61.7 million metric tons of carbon dioxide, 1,070,000 tons of nitrogen oxides, and 43,000 tons of particulate matter. These help to counter climate change and keep Americans healthy.
- These emissions reductions benefit communities near ports, borders, and truck stops the most, protecting the health and well-being of the citizens in these areas.

An International Leader in Green Freight

- SmartWay is a seamless bi-national program jointly operated by both EPA and Natural Resources Canada and includes over 300 Canadian partners.
- The Climate and Clean Air Coalition (CCAC), of the United Nations Environment Program, works with the World Bank, governments, and key international organizations to utilize SmartWay's technical assistance, methods, and tools.
- SmartWay is an integral component of the CCAC Global Green Freight Action Plan, which aims to develop and implement green freight programs in other countries and regions.
- SmartWay has developed a comprehensive training curriculum to help other countries build the capacity to implement their green freight programs. The curriculum is available in English and four other languages.

11.2 India Green Freight Initiative

Between 1950 and 2012, India's GDP grew at the rate of 7.4 percent. But during the same period, the road freight volume grew by 9 percent. Currently, road and rail carry 99 percent of India's freight in a ratio of 70:30. While freight vehicles constitute less than 10 percent of the vehicle fleet on Indian roads, they consume a disproportionate amount of fuel and are the primary polluters. Presently, fuel costs constitute about 40 to 50 percent of the transportation cost of goods.

It is estimated that in 2011-12, trucks consumed 38 percent of the country's diesel and emitted about 63 percent of the CO_2. It is, therefore in the interest of both business and society to seek a sustainable freight system that reduces transport costs as well as emissions.

In 2012, a dialogue among stakeholders led to the formation of the India Green Freight Initiative (GFI). The GFI is an informal group comprising civil society organizations, industry associations, academics, experts, and bureaucrats who recognize the importance of Green Freight in India. Helmed by civil society, GFI uses a market-based collaborative approach to provide freight shippers, carriers, and logistics

companies with tools to benchmark fuel efficiency, strategies to improve it, and ways to measure their progress.

Clean Air Asia has developed a Green Truck Toolkit (GTT) to help businesses in Asian countries calculate the baseline fuel consumption and emissions of the trucks in their fleet and provide insights on the potential impacts of several interventions. GFI has modified the toolkit for India. It ran a pilot to test the reliability and robustness of the refined methodology. The GTT was tested on Tata Steel's outsourced fleet of trucks in Jamshedpur, operated by Naresh Kumar and Company Private Limited (NKCPL). The GFI Initiative attempts to use a market-based, civil society-led collaboration framework to provide freight shippers, carriers, and logistics companies with tools to benchmark and improve fuel efficiency, save money, and track progress for their achievements. Its principal elements include:

Partnership program – through the GFI, attempts are made to assess, benchmark, and track emissions of private sector organizations like carriers, shippers, or logistics companies. Further, the data will be used to identify the most economical intervention and strategies that could be utilized in order to increase fuel efficiency and thus reduce the carbon footprint of the partnering association. The program will assist in providing benchmarking and reporting tools to further optimize their road fleet.

The Green Trucks Toolkit

The Green Trucks Toolkit (GTT) is a Microsoft Excel-based tool built for the Asian Development Bank under the Greater Mekong Subregion Core Environment Program Biodiversity Conservation Corridors Initiative (GMS CEP-BCI) for the ASEAN region. The model was designed as a capacity-building tool for truck operators and managers, to understand the impacts of various fuel savings options. The tool adopts the globally accepted ASIF methodology (Activity, Structure, Intensity, and Fuel) to estimate emissions. It allows for the calculation of the baseline fuel consumption and emissions of the trucks in a fleet as well as provides insights on the potential impacts of several interventions.

The tool provides the baseline or current status of the fleet with respect to fuel consumption and various emission impacts. Through the application of various interventions that are available in the tool, the savings impact is estimated with respect to the baseline.

Application of GTT India under GFI

Over the decades the Tata Group is acknowledged as a pioneer in diverse sectors (e.g., automotive, aviation, power, household goods, industrial products, and software services). Tata Steel endeavors to be a green organization with many sustainability measures and were keen to be part of the Green Freight Initiative. Naresh Kumar and Company Private Limited or NKCPL handle steel and coal for Tata Steel at various stages of production. It has been associated with Tata Steel since 1964 and handles

more than 1 million metric tons annually. NKCPL also works with leading corporate houses such as ACC, Aditya Birla, Lafarge, Ultratech, Sesa Group, Jaypee and Vedanta, etc.

The operations data from NKCPL for the year 2014 consisted of details of 75 trucks from two operating locations, the Tata steel plant, and a railway siding at Birarajpur on the outskirts of Jamshedpur. Both the locations involved in short-haul and almost all trucks were heavy-duty truck trailers and dumpers except for 4 mediums. The average age of the fleet is 6 years and 73% of the fleet is in the range of 5 to 8 years. 13% of trucks are 9 to 10 years old and 13% are 1 to 4 years old. Tata Steel has a policy that does not permit trucks older than 10 years, which is enforced through contracts with the transport operators.

The impact of age on fuel efficiency is evident. For example, a 25-ton dumper 5 years or less does an average of 23,000 km per year at 1.55kmpl, while a vehicle that is 5 to 10 years does 19,000km at 1.46kmpl.

Eco-driving, which involves training the drivers on techniques that help improve the performance of the vehicle, is estimated to have the largest saving of more than 2000 liters of diesel per truck annually. Considering that the drivers have not been trained before, a higher saving percentage of 20% has been assumed. The payback period is 6 months due to the high savings potential and also with a caveat that the learning is sustained. An average savings of INR 0.3 million can be achieved every year for 5 years. The initial expenditure is higher as more time is required to train the untrained drivers and later refresher courses of shorter duration can be delivered twice a year to ensure the drivers' consistent behavior. The other advantages are that it can be piloted quickly, compared to technologies that require procurement, testing, etc. Eco-driving will also involve training the drivers to reduce idling by switching off the engine when waiting for long durations.

11.3 Best Practices linkage to the context of Pakistan

11.3.1 Vehicle Phase-Out Program

The vehicle fleet in Pakistan, especially in the trucking sector is old and technologically outdated. Consequently, it is fuel inefficient and extremely environmentally unfriendly. One area for possible improvement is vehicle tune-up. According to an estimate that regular checks of the fuel, emissions, and ignition systems, as well as the battery, charging and starting system, and the engine mechanical and powertrain control systems can improve gas mileage by an average of 4 percent. In addition, keeping tires properly inflated improves gas mileage by 3 percent. A clean air filter can improve fuel efficiency by as much as 14 percent on older vehicles and also helps the environment, as can regular oil and oil filter changes. Air filters are usually inspected during an oil change, which should be performed regularly as recommended in the owner's manual.

These actions pay for themselves and should only need vehicle owners to be made aware of the benefits through various behavioral measures. Currently, motor spirit and diesel in cars and taxis account for around 12 million tons of CO_2. If a combination of the above measures were to be implemented with a success rate of 25 and if it were to save around ten percent of each type of fuel. The main difficulty is convincing people of the benefits of these measures. One possibility is to use mandatory inspections as a means of improving performance (e.g., changes in clean air filters) as well as informing owners of the savings in fuel from other measures.

Pakistan may adopt the vehicle phase-out scheme with financial support from the government. It may be a volunteer program for initial five years and then by that time it may be adopted as mandatory. Trucks shall be scrapped if they meet one or more of the following four conditions as practiced in China:

a) Limits of service years reached from the date the vehicle is registered;
b) Failure to meet the national standard of vehicle safety, technical requirements for in-use vehicles;
c) Failure to meet national standards of air pollution emissions or noise prevention for in-use vehicles; and,
d) Fail three times consecutively at vehicle inspection. Recommended scrappage is referred to when truck kilometers traveled have reached a certain level as designated under the rule (Table 11.1).

Table 11.1: Limits of Vehicle Compulsory and Recommended Scrappage in China

Types of Vehicles	Compulsory Scrappage		Recommended Scrappage
	Service Life (Year)	Travel Distance (10,000 Km)	Travel Distance (10,000 Km)
Mini trucks	12	50	50
Light-duty trucks	15	60	60
Heavy-duty trucks	15	70	70
Trucks for Transportation of Dangerous Goods	10	40	40
Three-wheeled low-speed trucks loaded with a single cylinder engine	9	NA	NA
Low-speed trucks loaded with a multi-cylinder engine	12	30	30
Trucks for special uses	15	50	50

Source: CA-Asia and WB

In addition to compulsory scrappage, Pakistan may introduce a labeling scheme with green and yellow labels in relation to vehicle emissions control. Green labels may be applied to diesel vehicles that correspond to Euro II emission standards or above,

whereas yellow labels are given to diesel vehicles that do not meet Euro II standards. These restrictions may tighten with the passage of time to meet Euro III or higher. To provide disincentives for high-polluting vehicles running in cities and thus phase out them before compulsory scrappage conditions should be met, yellow label vehicles should be restricted from running in the cities for specific hours of the day. The local government should be involved intensively to regulate the overall phase-out schemes.

A compulsory vehicle scrappage is not applied in Europe, US, and Japan. Hong Kong has a vehicle scrappage scheme that also includes trucks. Rather than imposing an age limit, vehicles are tested, and only those that fail to meet the legal fuel efficiency and emission standards are retired: vehicles should be retired because they do not perform well, not merely because of the vehicle age. Setting an age limit to retire vehicles does not take this development into account and risks retiring vehicles unnecessarily that continue to meet current standards. However, some studies suggest that giving companies, financial compensation to scrap old vehicles may be very expensive and potentially divert government funds from other more cost-effective ways of modernizing the truck fleet.

12 Identification of Key Performance Indicators (KPIs) for the Road Freight Industry

Performance indicators are the ways to analyze the improvement of a system. Key Performance Indicators (KPIs) are the critical factors by which the performance of a process or a system can be tracked. Selecting the appropriate KPIs is important to evaluate the performance of the truck freight industry. To be effective, a KPI must be; well-defined, quantifiable, and vital for achieving set targets. For the trucking industry, KPIs are usually divided into five categories: Financial, Process, Customer, Tonnage, and People.

- **Financial**
  - Profit: Both gross and net profit margins.
  - Revenue v/s. Target: Comparison between projected revenue and actual revenue generated.
  - Cost per Kilometer: Operational cost on a per Kilometer basis.
- **Process**
  - Equipment Utilization: For trucking, maximizing equipment utilization is the key to increasing profitability. Usage verse idle time to determine the utilization factor.
- **Customer**
  - Customer Satisfaction: How satisfied the customer is with the services and timely delivery.
- **People**
  - Driver and Assistance Satisfaction: Satisfied workers work hard and become productive.
- **Tonnage**
  - The volume that is delivered, can be expressed as a percentage of vehicle capacity over the time frame.

Different KPIs are required by decision-makers to analyze different aspects of performance. Figure 12.1 provides the different areas of the freight industry for which the KPIs could be implemented.

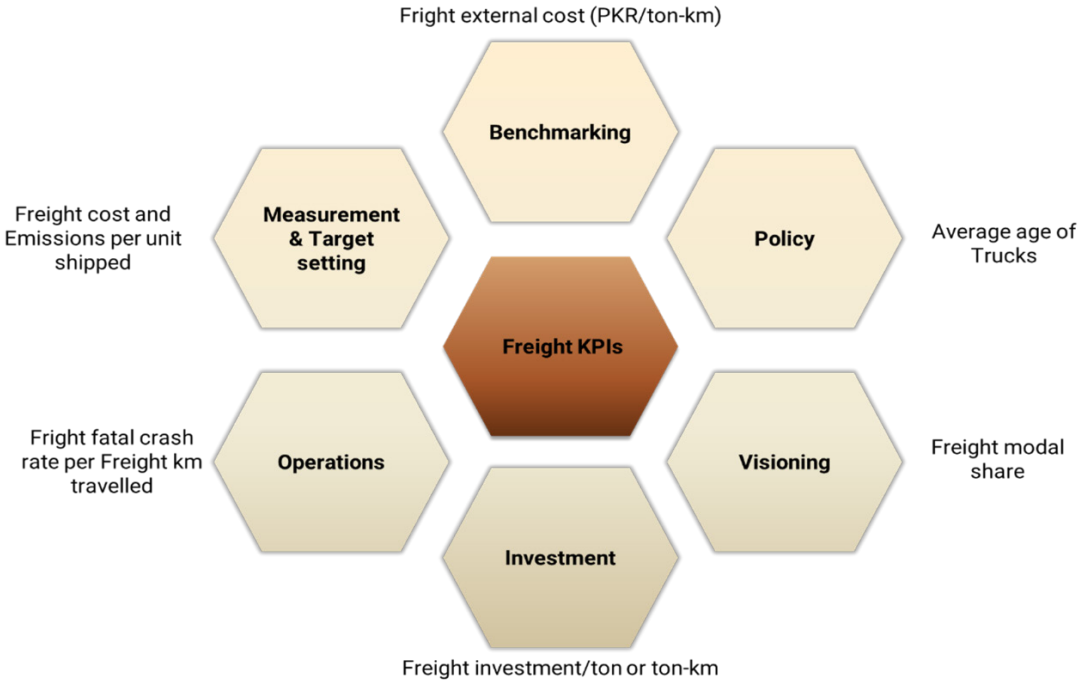


Figure 12.1: Freight KPIs for Implementation in Different Areas

Some examples of key performance indicators (KPIs) for transportation are discussed below:

- **Freight cost per unit**:

It is calculated by dividing the total freight cost by the number of units shipped in a period of time. It is commonly used when the units are standard (kg, liters, tons) or the products are always identical.

- **Percentage of truck capacity used**

It is calculated by dividing the transported weight by the maximum one allowed. For example, if the average usage is 80%, this means that there is an idle capacity of 20%, which can be converted into more efficiency.

- **Equipment Utilization**

Efficiency is measured differently in every industry. For trucking, maximizing equipment utilization is the key to increased profitability. It can be measured by the equipment's usage versus idle time to determine productivity levels.

- **Time in transit**

It is measured as the number of days (or hours) from the time the freight is shipped until the time it is delivered to the customer. The time in transit varies greatly by the modal choice.

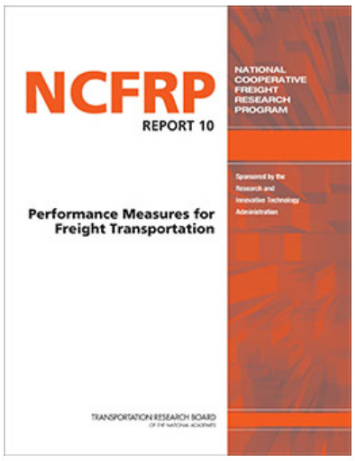
➢ **Truck turnaround rate**

This indicator is calculated by measuring the average time it takes between the arrival of the truck and its exit. The smaller, the longer the truck is on the road, delivering the products. If this time is high, it means that the process of handling the lots and of those handling the loading and unloading needs to be improved.

➢ **Percentage of traceable loads**

This indicator is calculated by dividing the number of loads transported with tracking by the total number of loads sent over a period. This indicator measures the relative degree of carrier sophistication.

Transportation Research Board (TRB) of the USA conducted the National Cooperative Freight Research Program (NCFRP) and its Report 10: Performance Measures for Freight Transportation explored the set of measures to gauge the performance of the freight transportation system in the USA.



The Information Technology used by the service providers can be categorized into intra-firm and inter-firm information systems. Intra-firm systems are used to facilitate and collaborate among different functions within a firm. Examples include intranet, barcoding, radiofrequency technology, and warehouse management system. Interfirm systems are used to communicate with different parties outside a firm. It is mainly used to connect with customers. Some of the examples of the types of information technologies that are currently being used by the fleet management industry in the US and other developed countries are:

- Internet Services
- Maintenance Management Systems
- Accounting Software
- Electronic Data Interchange
- Route Planning and Scheduling Systems
- Tracking Systems
- Electronic fund transfer

Worldwide research studies have been carried out in this regard. AI, KEE-HUNG, et al. researched the adaptation of IT in Hong Kong's logistics industry. The study is based on empirical data collected through a questionnaire survey. They compiled the results based on 195 responses received from logistics service providers. (Hall and Intihar) also studied the adaptation of IT through a series of surveys and interviews of personnel involved in trucking freight such as managers, and telephone interviews

with technology providers. (Golob and Regan, 2002) carried out the research to understand the demand for information technology among trucking companies in California, USA. They survey a total of over 1100 trucking companies to assess the adoption of the seven technologies using a structural multivariate probit model. The selected technologies were: (1) satellite or radio-based communication (S/RC), (2) automatic vehicle locator (AVL) technologies, (3) automatic vehicle identification (AVI) systems (4) electronic data interchange (EDI), (5) vehicle maintenance software (VMS), (6) routing and scheduling software (R/SS) and (7) CB radio (CBR). They developed a model to forecast the probabilities of technology adoption by the trucking companies.

A research approach suggested by (Golob and Regan, 2002) and (AI, KEE-HUNG, et al., 2005) has been adopted by the consultant. Several logistics service providers, fleet management companies, freight forwarders, shippers, transportation, and warehouse service providers were contacted for the study. A survey questionnaire was compiled in light of the above-mentioned studies. The questionnaire consisted of scale as well as open-ended questions. They were interviewed to assess the current and planned use of the information technologies and their attitude towards the service. Figure 12.2 shows the sample questionnaire for the use of IT. The perception of barriers and benefits of implementation of IT has been investigated by asking the respondents to rate the identified potential barriers and benefits on a 5- or 10-point Likert scale.

	In Use	Currently Under planning and development	No Plans
IT Tools			
1. Intranet			
2. Internet			
3. Bar-coding			
4. Vehicle tracking system			
5. Email			
6. Digital Marketing			
7. Electronic funds transfer			

Figure 12.2: Sample Questionnaire (The use of IT)

A comprehensive review of the KPIs for the trucking freight transportation in Pakistan tried to be performed based on this report. The interviews and survey conducted during the earlier steps provided the basic data for the analysis and determination of KPI values. Moreover, the KPIs followed in other countries have been reviewed during this task.

All efforts were made to get the related information from stakeholders for the assessment of performance indicators of the trucking industry in Pakistan, however, due to the very limited information available, such assessment could not be made. As a result, generic data with many assumptions are used in other assessments in the study. The availability of data from regular trucking surveys could greatly improve the quality of the analysis and lead to more realistic results.

12.1 The Use of IT by the Trucking Industry

One of the key objectives of this task was to determine the adoption of information technology by the trucking industry and to identify the barriers to adopting IT, such as financial burden, lack of expertise, and technical support, as well as benefits, such as increased efficiency and service. The benefits of, and barriers to, using IT are derived from the literature (e.g., Arunachalam 1995; Crum, Premkumar, and Ramamurthy 1996; Murphy and Daley 1996; Murphy and Daley 1998).

The characteristics of the fleet operators/owners surveyed to determine the adaptation of IT by the industry are illustrated in Table 12.1.

Table 12.1: Characteristics of Fleet Owners Surveyed to determine the Use of IT

	Frequency	Percentage
Number of Trucks Owned		
<5	29	34.1
5 – 10	40	47.1
11-25	14	16.5
>25	2	2.4
Total =	85	100%
Principal cargo is generally transported		
Construction Material (cement, sand, steel, etc.)	47	55.3
Wheat, Rice	66	77.6
Fertilizer	52	61.2
Textile	35	41.2
General Cargo	49	57.6
Others	31	36.5

The results show that over half of the respondents had adopted the Internet, use of electronic funds transfer (EFT) services, and vehicle tracking systems. As shown in Table 12.2, over 60 percent of the respondents use email to communicate with customers and suppliers. The use of Enterprise resource planning and ERP (such as account management, warehouse management, etc.) is relatively low. Nearly 23 percent of the respondents indicated that they were planning and developing to use the Internet in the future whereas, about 26% of the respondents indicated that they had no such plan to use the internet services.

Table 12.2 The Use of IT by Trucking Companies

	In Use		Currently under Planning & Development		No Plan to Use	
Tools	**n**	**%**	**n**	**%**	**n**	**%**
Internet (such as company's website etc.)	44	51.8	19	22.4	22	25.9
Electronic fund transfer (such as online bank transactions, Easy Paisa, etc.)	73	85.9	10	11.8	2	2.4
E-mail	54	63.5	9	10.6	22	25.9
Vehicle tracking system	44	51.8	16	18.8	25	29.4
Bar-coding	6	7.1	11	12.9	68	80.0
Intranet	17	20.0	8	9.4	60	70.6
Enterprise resource planning, ERP (such as account management, warehouse management, etc.)	15	17.6	16	18.8	54	63.5
Digital Marketing	4	4.7	14	16.5	67	78.8

12.1.1 Perceived Benefits of the Implementation of IT

Table 12.3 shows the mean ratings of the benefits achievable through the adoption of IT in the Trucking Industry. The perception of benefit is rated on a five-point scale, with 5 being "a major benefit" and 1 being "not a benefit." Based on the responses, benefits with a mean rating are all greater than 3 on the five-point scale. A variable with a mean significantly larger than 3 is regarded as a potential benefit.

The results indicate that all of the perceived benefits have a mean significantly larger than 4. As can be seen from Table 12.3, "reduces error" has the highest mean score of 4.68.

Table 12.3 Perceived Benefits to the Implementation of IT

Perceived Benefits	Mean	S.D
Reduces error	4.68	0.598
Reduces paperwork	4.53	0.696
Helps in making a more informed decision	4.52	0.566
Improves customer service	4.47	0.776
Enhances competitiveness	4.45	0.604
Reduces manpower	4.19	0.447
Quick response and access to information	4.14	0.464
The factors were measured on a five-point scale, with 1 = ' 'not a benefit" and 5 = "a major benefit"		

12.1.2 Perceived Barriers to the Implementation of IT

The perception of barriers to the implementation of IT for the Trucking Industry is investigated by asking the respondents to rate each of the six potential barriers shown in Table 12.4.

Table 12.4 shows the mean ratings of the potential barriers to the implementation of IT in the Trucking Industry in Pakistan. Perceptions of barriers were measured on a five-point rating scale with 5 being "the greatest barrier" and 1 being "not a barrier." A variable with a mean significantly larger than 3 is regarded as a potential barrier.

The results indicated that five out of six of the perceived barriers have a mean significantly larger than 4. The top two potential barriers to the adoption of IT by the Trucking Industry are " insufficient finances " (mean = 4.56) and "difficulty in changing the organizational culture " (mean = 4.33). Lack of expertise in IT and inadequate knowledge by employees on the implementation of IT is regarded as potential barriers to the implementation of IT, which suggests that the barriers to adopting IT encountered by the respondents are mainly resource related.

Table 12.4 Perceived Barriers to the Implementation of IT

Perceived Barriers	Mean	S.D
Insufficient finances	4.56	0.583
Difficulty in changing the organizational culture	4.33	0.540
Lack of expertise(s) in IT	4.28	0.876
Inadequate knowledge in implementing the system by employees	4.22	0.517
A lot of paperwork that is difficult to computerize	4.22	0.859
Not perceived as an advantage at all	2.11	1.572
The factors were measured on a five-point scale, with 1 = * 'not a barrier" and 5 = ' 'the greatest barrier"		

The graph in Figure 12.3 depicts the percentage of specific reasons perceived as barriers to the implementation of IT in the trucking industry. It illustrates that about 80 percent of the respondents perceived the “inadequate knowledge in implementing the system by employees” as a barrier to the implementation of IT systems for their trucking operations. Whereas a similar number of respondents perceived the lack of finances as a barrier to the implementation of IT. It is interesting to note that about 70 percent of the respondents perceived the “difficulty in changing the organizational culture” as a barrier. Only 10 percent of transporters didn’t perceive the implementation of IT as an advantage.

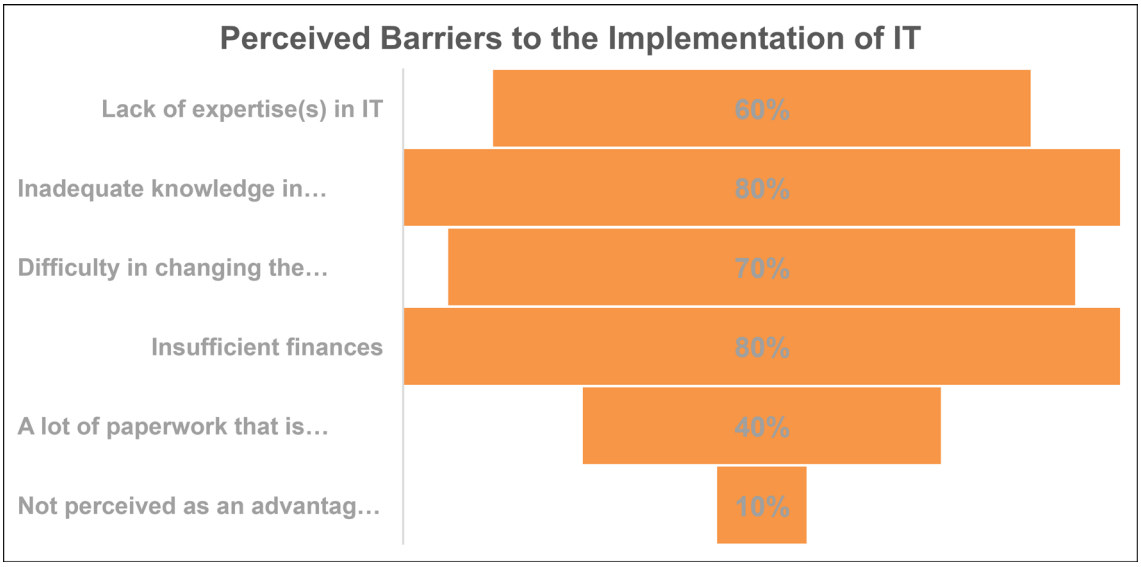


Figure 12.3: Perceived Barriers to the Implementation of IT (Transport Operators' Survey)

The above results and findings provide insights to understand the adoption of IT in the industry and identify areas for improvement in adopting IT. The major obstacle to the adoption of IT by the trucking industry is resource-related which is a lack of finances and expertise in IT and technical support for IT.

13 SWOT Analysis

13.1 Strength

I. The flexibility of door-to-door services makes freight transport by roads attractive for all shorter distances and even for long-distance transport of certain non-bulk commodities, although rail services could be quicker and cheaper over longer intercity distances.
II. Transportation of goods by road via truck is the preferred method in the country for traders due to inefficient railway.
III. Freight transport through road provides accessibility and reach to markets in all remote and far-flung areas of the country.
IV. Despite many challenges, the trucking industry in Pakistan is functional and growing.
V. Trucking provides direct employment and thus has the potential to lower unemployment and thus lower poverty in the country.

13.2 Weakness

I. The dynamics of the Pakistani road freight are quite different from the rest of the world, unlike most other countries Pakistan's inland freight is highly tilted towards the road (96%) as compared to rail. The composition of the trucking fleet itself is outdated and capital-starved with 79% of the companies falling in the small size (1-5 vehicles) firm category. An overwhelming majority of these firms form the informal part of the trucking industry in Pakistan. This segment gives the trucking industry its fragmented shape and it faces a lot of problems and unhealthy competition in order to survive.
II. The major hurdles for the freight service in the country are the low transport price (which constrain the revenue of independent truckers) and high import tariffs on high-capacity multi-axle trucks (which range between 30 to 60 percent). Lower freight rates in Pakistan are reflective of the fierce competition in the industry. Although this helps in lowering the cost of doing business for those who use trucking services, however, costs to the economy due to road damage rises significantly due to overload and extensive use of highways. Wastage of perishable items and damage to goods during transportation and increased rate of accidents are also the by-product of this.
III. Prevalence of pressure groups resisting regulation in a sector that has never been regulated as such, but most cannot importantly realize the potential of the transport sector and its contribution to the economy, therefore strong ownership on part of government is needed through a dedicated ministry in the Federal Government.
IV. Road freight transport is a complex business in Pakistan, a mix of formal and informal service providers, vendors, freight forwarders, and formal and informal manufacturers are stakeholders. The lack of a comprehensive Trucking Policy

by the Federal Government that must be implemented in letter and spirit makes it a much-neglected sector.

V. In 2007 the Trucking Policy was tabled, the policy was thought to be the first step towards documenting, regulating, financing, and formalizing a sector that up till then was not even considered an industry. It was a comprehensive policy that touched upon all the issues faced by the Pakistani trucking industry. However, due to change conditions updation of the trucking policy is required.

VI. There is no institutional home at the national level for the promotion of the trucking sector in terms of policy formulation, strategy development, monitoring performance, policy reviews, inter-sectoral coordination, reporting, and providing the leadership required at all levels of the government.

VII. One of the major problems faced by this informal part of the sector is access to formal finance. These small operators are unable to secure finance for increasing the number and capacity of their fleet from formal financial institutes and have to opt for the informal market for finance.

VIII. Necessary institutional arrangements are needed for policy making, coordination, and support, chamber of trucking operations, occupational health and facilities, training facilities for truck drivers, and other HR resources. NTRC in consultation with the relevant agencies of the government and private sector may identify their priorities for addressing existing problems of the trucking sector and also meeting its emerging challenges during a reasonable timeframe.

IX. Infrastructure facilities linked with the trucking sector are weigh-bridges, registered workshops, transfer stations, axle load management, MVE facilities, engineering standards of roads, and infrastructure which needs upgradation. Data and databases: CDR, IT support and connectivity, harmonization of standards and parameters, and real-time availability are available tools to modernize trucking in the country.

X. Laws, rules, regulations, and standards linked with the trucking sector are registration, motor vehicle inspections, licensing of drivers, training of drivers, standards of truck bodies, and trailers. Updation of indicated laws requires updating for bringing efficiency in the logistics.

13.3 Opportunities

I. The industry does not face any competition issues in terms of barriers to entry as there is no barrier to entry or exit. There is no limit on the number of vehicles or type of vehicles in a fleet to operate in the market. The fragmented nature of the industry has made the trucking companies price takers in the market rather than price givers this argument is supported by the fact that freight rates in Pakistan are among the lowest in the country. However, it is an evolving industry that is and will experience change. The number of middle size companies and large companies is growing suggesting a trend for the future and with it some possible competition concerns that may arise.

II. Due to population and economic growth, the freight transport demand in the country is on the rise. It is estimated that by 2030 the annual freight transport demand in the country would be 290 billion ton-km. Assuming 90% contribution by road the demand would be around 260 billion ton-km. Therefore, additional 100,000 trucks would be needed by 2030.

III. The use of modern technology to improve and enhance services in the trucking industry has certainly picked up in recent times but is mostly limited to large and medium-sized companies, while the sector is dominated by small size companies. Large and medium-sized fleet operators in the market have GPS-installed vehicles and they use the internet for sensitizing the market and reaching out to their clients. Although the use of the internet, for marketing, has certainly increased in the recent past, during the research, it was found that the contact details given for most of the relatively smaller operators were not valid.

IV. Pakistan has signed the TIR convention, TIR stands for Transports Internationaux Routiers (International Road Transport). In practice, it is an international Customs transit system for the movement of goods by road across the borders of countries party to the TIR Convention. This system enables point-to-point transportation of cargo with the least interference at international borders of the countries of origin and destination, and thus facilitates international trade and regional connectivity. Regional connectivity if achieved in practice, will result in foreign trucking companies coming to Pakistan and Pakistani trucking companies crossing over the border into other countries this situation might result in joint ventures between local and foreign companies or direct competition between the two. In either scenario, competition or issues might arise. This also calls for greater communication between different competition agencies of the region to address competition issues that might arise due to operations of Pakistani trucking companies in other countries and vice versa. Preferential treatment towards local companies should be discouraged a level playing field must be ensured to drive the market forces toward providing the most efficient transport solution.

13.4 Threats

I. The analysis reveals that the sector is not ready for reaping the opportunities knocking on Pakistan's door in the form of the Pak-China Economic Corridor and integration with other international trade routes. Pakistan's reliance on an obsolete and inefficient fleet has consequences on the road infrastructure as well. A major challenge in the road freight sector is the existing fleet composition. There is a parallel informal manufacturing sector operating in Pakistan. A manufacturer in the informal sector costs PKR 1 to 1.5 million using secondhand materials while second-hand imported trucks that meet Euro II specifications cost about PKR 7 to 8 million.

II. The government's investment of billions of dollars in the construction of motorways in the country could only be justified/ returned if the volume of trucks

would increase on these routes. Only modern trucks having sufficient engine power and speed could be operated on the available high-speed motorways. Therefore, Government should place a policy for attracting investment in the trucking industry.

III. Access to formal finance especially for the informal part of the industry is a very important aspect that needs to be looked at if the industry has to reshape and cope with the emerging situation that demands a modernized and adequately powered fleet. Incentives, special schemes, and investment injections from the government in this sphere are essential. Competition aspect in this area would mean ensuring access to every eligible company without any preferential treatment tilted towards any specific company.

IV. One of the ways to modernize and upgrade the fleet is by lowering the import duty on trucks thus making a good business case for firms to import trucks that meet international standards. Government should also relax the import of reconditioned (second-hand) trucks that meet international standards as they might be the only choice for most capital-starved companies. This move will result in creating competition between the product of formal local manufacturers and the imported product. This will benefit the industry in the shape of quality improvement in local products due to competition with the international standard product.

V. There is a wide range of financial and economic mechanisms or instruments to facilitate investment in technologies and logistics solutions that increase efficiency. These mechanisms have an impact on investment decisions or on an entity's ability to invest by helping to reduce the overall costs of the investment (easing the decision to invest) or by facilitating the financing of the investment (reducing barriers to and costs of commercial financing). Financing mechanisms can be policy-based or market-based as shown below:

- **Policy-Based:**
  - Tax (e.g., taxes and tax credits)
  - Subsidies (e.g., subsidies and grants)
- **Market-based:**
  - Debt financing or lending programs (e.g., bank loans, soft loans, revolving funds, guarantee funds, energy efficiency "bank windows")
  - Emission credits (e.g., clean development mechanism [CDM])
  - Energy service companies (e.g., guaranteed savings, shared savings, pay from savings)

VI. Fiscal policies interact with transport services in several ways, but two are especially important: (i) fuel taxes and (ii) tariffs on the importation of vehicles, notably trucks. These policies are important because they significantly affect transport prices and the efficiency of the trucking industry. Fuel taxes in the country are the instrument of choice for recovering road maintenance costs from road users while generating revenue. As such, fuel taxes are both a user

charge and a general tax. The impact of fuel taxes on transport costs and prices in Pakistan is substantial. The fuel costs amount to at least 40 percent of total VOCs, of which taxes amount to at least 50 percent. This means that at least 20 percent (and up to 40 percent) of VOCs are the result of fiscal policy. Because fuel taxes generally create less economic distortion than other taxes and are easy and inexpensive to collect, it is unlikely that government will consider lowering fuel taxes and losing revenue.

VII. Tariffs on truck imports are another dimension of the overlap between fiscal policies and transport. Such a tariff, depending on how it is set and structured, may have a major influence on the efficiency of the trucking industry and on the extent that which road improvement programs benefit the trucking industry. There are two aspects to consider: the relative import tax between new and old trucks and the level of the tax. As this study has shown, the trucking fleet in Pakistan is old and inefficient. In most countries, the tariff on truck imports is a proportion of the truck price, and therefore lower for used, cheap trucks. Old trucks not only are fuel inefficient but also create concerns about road safety hazards and pollution. Because of their inefficiency, they usually put on less annual mileage and thus do not benefit as much from road improvement as do newer trucks. Various alternative tariff policies could influence the truckers' decisions regarding new versus old trucks. One policy would be a higher tariff (as a percentage of price) on second-hand trucks, relative to the age of trucks. Another could be a tariff set as a fixed lump sum, independent of the truck price, which would have the effect of favoring the import of newer trucks (as long as the trucking industry is deregulated in order to give an incentive to the most efficient companies to invest in new trucks).

VIII. Trucking has two distinct components: manufacturing and non-manufacturing in nature. The Manufacturing component covers the Industry Status, Taxes and Duties, Financing, Insurance Coverage, Profitability, Industrial Estates, Trailers Manufacturing, Industrial Rates for Electricity and Utilities, and Direct Foreign Investment. Whereas the Non-Manufacturing component, requires Industry Status, Efficient Logistic Change, and a Holistic and Integrated Approach to trucking. In the manufacturing arena, trucking shares many common problems of the automotive industry, and matters relating to its modernization and performance have to find solutions remaining within this domain, by making a strong case for incentives and recognition, despite being a small segment of the auto sector.

IX. The non-manufacturing component of trucking equally requires a holistic and integrated approach, as it has strong linkages with the providers of high-class infrastructure, an efficient logistics chain, and a smooth interface between public and private sectors and other stakeholders in a business environment. It is not regulated and facilitated by a designated lead agency.

X. Unlike the previous NTCIP from 2006 to 2007, so far CPEC has not announced the Government's intention and commitment toward the modernization of the

trucking sector. No financial appropriation towards this sector has been made under CPEC Program. In the absence of the same, it will be naive to expect any quantum change from the private sector alone. Indication of the government to lead this process is not yet available. Even the major fleet holders in the public sector, such as NLC have presented their plans to the government for the modernization of their truck fleet.

XI. For Pakistan to compete regionally and internationally, modernization of the entire Road Freight Sector with particular emphasis on Trucking Sector modernization is required as our dependence on road freight is almost 96% of the total ton/km and is growing fast.

13.5 Summary of the Analysis

The objective of this document is to reform and promote an integrated, enduring, and sustainable modernization of the trucking sector in Pakistan with a holistic approach. Instead of dealing with each subject in isolation. The proposed policy framework will provide for the encouragement of fleet operations through incentives, which will improve the scale of operations, and equipment and ensure better returns to the operators.

A checklist of the new and emerging challenges of the sector has been made to summarize a set of new and emerging challenges which have to find their due place in the present and/or future trucking policies of the government.

Table 13.1: List of New and Emerging Challenges of the Trucking Sector

Sr. No	Challenges	Enablers and Facilitation
1	Long-term planning of the sector with clear institutional responsibilities	Designation of the lead agency in the government, improved statistics on trucks and road freight movement trends
2	Create and expand domestic demand for heavy freight vehicles	Appropriate tariffs, improved product quality, improved affordability of consumers
3	Encourage manufacturing and export of heavy commercial vehicles	The paradigm shift from assembling to manufacturing, competitive prices for entry to the new market
4	Rationalize fiscal and monetary measures for the promotion of the truck freight transport sector	Reduced GST rates and minimum taxes on the export of the vehicles.
5	Remove sector externalities and inefficiencies and encourage fleet modernization	Promote vehicles safety and performance standards, limit the import of second-hand and under-performing vehicles

Sr. No	Challenges	Enablers and Facilitation
6	Attract investments in all modes of land freight transport	Encourage investments in railways to reduce the burden on the road freight transport
7	Improve efficiency and environmental performance of road freight vehicles within the country and across the region	Develop and implement fuel improvement program in the country, enhanced vehicle emission standards
8	Extend credit facilities and financial services at concessional rates to the road freight transport sector	Encourage fresh entry into the sector and promotion of employment opportunities, multiplier effects on the economy
9	Ensure long-term stability of the government policies in the sector	The time horizon of the policy should be 3-5 years with normal annual reviews
10	Improved and effective coordination at all levels in the government for efficient operations of the road freight transport	Functions falling outside the jurisdiction of the federal government should be financially supported for the policy to be successful

14 Major Findings

Findings that emerged under the study are enlisted below:

I. There are 354,220 trucks are registered in provinces and territories of Pakistan by 30th June 2021. Which include 103,257 Mini Trucks, 161,840 Rigid Trucks, 60,003 Articulated Trucks, and 29,120 Oil/ Water Tankers.

II. The highest number of trucks i.e., 140,283 are registered in Punjab, and the second highest is 104,277 in Balochistan.

III. The composition of goods vehicles by truck type illustrated that about 45.7% of the trucking fleet in Pakistan has rigid suspension technology whereas, about 16.9% of the trucks are articulated. Mini trucks are about 29.2% of the total fleet and Oil / Water Tankers are just 8.2% of the total number of registered trucks in Pakistan.

IV. Bedford trucks are still the most common rigid trucks and comprise nearly half (47.4%) of the rigid trucks in Pakistan. Hino-made 2-Axle and 3-Axle trucks are the second most popular category and these trucks comprise about 30.1% of the total rigid trucks.

V. Hino trucks (Prime Mover) are the most common multi-axle trucks, followed by Nissan. About 43.7% of the total multi-axle articulated trucks are Hino-made, whereas about 33.7% of the articulated trucks are Nissan-made.

VI. About 37.1% of the oil tankers registered are Hino made whereas, most of the mini trucks in Pakistan are Mazda, exactly 19% of total registered mini trucks.

VII. The data analysis shows that trucks manufactured in 1981 – 1990 are the most common and this group comprises more than one-fifth (22.6%) of the total fleet. Trucks manufactured in 1991 – 2000 are about 22.5% of the total trucks plying on the road of Pakistan. Trucks manufactured in 2001-2010 comprise about 19.2% of the total truck fleet, whereas trucks manufactured in 2011-2020 comprise about 12.8% of the total truck fleet in Pakistan. Therefore, about 68% of the existing fleet comprises trucks older than twenty years.

VIII. According to Pakistan Automobile Manufacturers Association (PAMA) historical data, the total number of trucks manufactured from 1995-96 till 2014-15 was 5,346. The data of total trucks produced show an increasing trend post-2012-13. A total of 9,326 trucks were produced in 2017-18, which is the highest number of trucks produced in a calendar year. Till now a total of 88,952 trucks have been produced.

IX. In the financial year 2020-2021, Pakistan imported 2,660 prime movers in new/ used form as completely built or knocked down kits (CKD). More than 50% of these units were imported from China and mostly in a new form. The average unit price of a new prime mover is the US $ 32,062. The import of new units is significantly more than the used ones.

X. Most of the trailers manufactured in Pakistan use mechanical and rigid suspensions. On the other hand, most of the trailers manufactured in other countries use pneumatic suspensions. The latter enables the trucking sector to

better control and keeps the vehicles at constant height irrespective of the load. This modification in the trailers reduced the wear and tear of the trailers (reduced vibrations and structural fatigue as well as component replacement) as well as the life of the tires.

XI. The roadside interviews survey further elaborated that in the Heavy Goods Vehicle category; 2-Axle Rigid Truck (6-wheelers) comprised 25%, 3-Axle Rigid Truck (10-wheelers) 32%, 4-Axle Articulated Truck (14-wheelers) 16%, 5-Axle Articulated Truck (16-wheelers) 7% and 6-Axle Articulated Truck (22-wheelers) 10%.

XII. Data on ownership and management of the industry was collected in the roadside interviews survey. The data on the ownership type of trucks reveals that more than half of the trucks (53%) surveys belonged to the sole owner. In Pakistan, it is usual for an owner to employ the main driver and tasks him with the operations of the vehicle. Partnership accounted for about 21% of the total. A very few numbers of vehicles belonged to commercial companies.

XIII. In the roadside interviews survey, drivers were asked several questions about the finance and purchase of the trucks. Most of the drivers were well acquainted with such information. Data reveals that more than 50 percent (about 52%) of the privately-owned fleet was purchased on an installment basis. About 21% of the trucks were purchased by a single payment. A very few numbers of trucks were acquired on a load and rent basis.

XIV. Insurance provides financial benefits against physical damage to vehicles and covers risks such as accidents, theft, third-party liability, and other damages. However, in Pakistan, the trend of insurance of vehicles is very uncommon. Only 29.6% of trucks surveyed during the roadside interviews survey were insured and out of that 50% have third-party coverage.

XV. One of the objectives of this study is to determine the characteristics of long-distance freight travel. Most of the freight destinations in Pakistan are over the 500 km mark. Truck drivers usually make a round trip. The time taken for Karachi – Lahore – trip is 5 days and 12 hours. Table 13.1 provides the approximate distance from Karachi to other major destinations; the average turnaround time is also provided.

Table 14.1: Approximate Distance and Turnaround Time for Major Routes

Route	Distance (Kms)	Average Turnaround Time
Karachi to Lahore	1260	5 days 12 hours
Karachi to Peshawar	1700	7 days
Karachi to Quetta	690	6 days 12 hours
Karachi to Faisalabad	1110	5 days 12 hours

XVI. Many trucks operate long hours and carry excessive loads while traveling at low speeds of 20–25 kilometers per hour compared to 80–90 kilometers per hour in Europe. Road freight takes an average of 6–7 days between ports and

the north of the country (a distance of 1,400–1,700 kilometers), which is twice what it takes in some other countries of Asia and Europe.

XVII. Bulk or lose cargo transportation by trucks in Pakistan is dominated by large numbers of individual owners who provide services on a “hire and reward” (contracting) basis. They are also coordinated by numerous small-scale transport agents. Agents play an important role in the operations of the trucking industry in Pakistan. They sometimes act as a middleman in hire-purchase agreements. Agents help in booking loads, placing consignments, and often run warehouses. The level of service received by the consignee is generally commensurate with the amount they are willing to pay. Large private bulk shippers such as cement manufacturers generally secure a contract will the local broker (addas) to avoid supply shortages. They demand low-quality but powerful trucks.

XVIII. In transport operators’ survey, it is revealed that small and medium-sized fleet operators usually have contracts with major customers to provide trucks to ship cargo at a fixed / lump-sum rate. They usually secure a two to three months contract, agreeing to provide a specific number of trucks on a daily basis for the distribution of goods.

XIX. The study shows that comparatively multi-axle trucks (articulated trucks) are less as compared to rigid trucks however the proportion is increasing. Truck technology is aging, and trucks are sometimes illegally modified to increase loading capacity.

XX. Trucks are operated for long hours (there are no tachographs) thus putting the driver on over stress and fatigued. However, empty running is low, spare parts and maintenance facilities are readily available, and annual kilometrage is reasonable compared with other developing countries.

XXI. The legacy of Pakistan’s import substitution policy that, while protecting the local assembly of trucks, has in the past impeded access of truckers to more modern and efficient truck technology. As a result, the existing fleet still has a sizeable share of two and three-axle rigid trucks and tractor-trailer units characterized by dated and fuel-inefficient technology.

XXII. Nonetheless, most of the shippers and forwarding agents interviewed by the Consultant found both freight rates and service quality satisfactory. The lack of third-party liability insurance is compensated for by individual shippers making their assurance arrangements.

XXIII. Motor Vehicle Examination (MVE) is a provincial function and is performed through the Provincial Motor Vehicle Ordinance, 1965, its Rules, and the I\151-10-2000. The combined effects of all these statutes are weak, and their poor enforcement has deleterious on the performance and regulation of the trucking sector. The institutions of MVE generally do not have proper testing workshops and skilled manpower to examine the vehicles. These offices are generally located in congested areas of cities, where facilities are not available for technical inspection of vehicles. These approvals are therefore no material use.

XXIV. It is estimated that the number of persons employed in the trucking sector at an assumed rate of about 40 employees per truck on the road and taking into consideration presently registered trucks of 350,000 on road, the number of persons employed in the sector would be in the range of 14 million. Once the truck population increase to a projected 400,000, the number of employed in the sector would be around 16 million.

XXV. Transport Price in terms of Rs/ ton-km for transportation of petroleum products in the country varies from Rs. 3.84 – 5.10 with the lowest Rs 3.84 for Karachi – Lahore route and the highest Rs. 5.10 for Karachi – Quetta route.

XXVI. Transport Price in terms of Rs/ ton-km for transportation of containerized products in the country varies from Rs. 5.41 – 7.46 with the lowest on Karachi – Peshawar corridor and the highest on Karachi – Quetta corridor.

XXVII. Minimum Transport Cost by type in Rs. for route length in Km is found as follows:

Route	Light Truck	Medium 2-Axle Truck	Heavy 3-Axle Truck	Articulated Truck
Karachi – Peshawar, 1550 Km	58,293	109,319	212,669	249,229
Karachi – Lahore, 1205 Km	45,318	84,986	165,333	193,756
Karachi – Faisalabad, 1100 Km	41,369	77,581	150,927	176,872
Karachi – Quetta, 800 km	30,087	56,423	109,765	128,635

XXVIII. In the case of bulk cargo, 10 tons of light dry cargo from Karachi to Lahore costs PKR 200,000. However, an increase in weight is not proportionally accompanied by an increase in freight rate, as a 30-ton light dry cargo would cost between PKR 220,000 to 230,000. Rates for heavy cargo like iron and coal are different e.g., for coal per ton rate is PKR 2600. Therefore, transport price in terms of Rs/ ton-km varies between Rs. 2.58 – 4.87 depending upon the type of bulk cargo and the length and condition of the route.

XXIX. Another interesting finding of the survey was that upcountry rates for freight bulk cargo are far less than down country freight rates e.g., a 10-ton truckload will only cost between PKR 100,000 to PKR 150,000 for a trip from Lahore to Karachi which in the reverse case would cost PKR 220,000 to 230,000.

XXX. The disparity between the down country freight rates and the up-country freight rates is explained by the import-export imbalance, as more goods are imported into the country than exported the traffic going down from Karachi has more demand and thus charge higher rates while the exports destined for Karachi have gone down resulting in lower rates.

XXXI. Besides most of the companies are in Karachi based a low-priced trip back home is better than an empty one. Type of commodities transported by trucks Ballast, gravel, stone, cement, fruit, fertilizers, and wheat are the most important commodities in terms of tons transported by trucks. The transport volume of fruit is the highest in terms of tons per kilometer.

XXXII. Unfortunately, one of the main reasons for the low trucking costs in Pakistan is not efficient operation but a very high level of overloading, causing major damage to the roads. Some of these weaknesses can be removed by investments, but others require policy changes and freedom for the private sector to make its own decisions and investments.

XXXIII. In order to estimate the profit made by a particular type of truck for a specific route the transport price for containerized goods were compared with transport costs as shown below:

Route	Transport Cost (Rs/ trip length)		Transport Price (Rs/ trip length)		Profit in Rs/ trip	
	Heavy	Articulated	Heavy	Articulated	Heavy	Articulated
	3-Axle Truck 20' Container	Truck 40' Container	3-Axle Truck 20' Container	Truck 40' Container	3-Axle Truck 20' Container	Truck 40' Container
Karachi – Peshawar, 1550 Km	212,669	249,229	130,000	293,493	-82,669	44,264
Karachi – Lahore, 1205 Km	165,333	193,756	107,500	242,506	-57,833	48,750
Karachi – Faisalabad, 1100 Km	150,927	176,872	100,000	225,610	-50,927	48,738
Karachi – Quetta, 800 Km	109,765	128,635	92,500	208,880	-17,265	80,245

XXXIV. Three-axle rigid trucks appeared to be in the loss while larger capacity six axles trucks get very nominal profit. With its low wage levels, Pakistan's transport costs and prices are much lower—probably the lowest in the world—since the trucking industry is still a labor-intensive activity. Paradoxically, Pakistan's lower transport prices are accompanied by poor service quality, on average below other regions in the world thus scoring a lower Logistic Performance Index.

XXXV. Workshops conducted focused on the study's findings concluded that without a level playground trucking industry would not grow as uncontrol overloading creates disparity among the operators. The stakeholders, notably the trucking companies and owner-operators, accepted the findings of the study but were concerned that appropriate compensation schemes should be developed to mitigate the effects of the reform on the operators who would have to exit the road transport market. Participants strongly emphasized the importance of mitigating the social impact that would result from a streamlining of the transport sector on international corridors.

XXXVI. Further research and analysis will be needed to define in detail the possible compensation schemes to put in place so that some truckers exit the regional road transport market.

15 National Policy Interventions for Trucking Industry

Developing the trucking industry is essentially a task for the benefit of the private sector. The government needs to create appropriate framework conditions. The industry's role in developing transport logistics and the government's role in creating an appropriate framework for modernizing trucking requires continued cooperation and dialogue between the parties.

The major drivers of transport costs are vehicle capacity (economy of scale) and utilization. Larger vehicles are cheaper to operate on a per-ton basis than small trucks. They are more efficient in terms of fuel consumption and fewer emissions per ton than small trucks.

Transport, especially road transport, tends to create negative externalities in the form of environmental impact, safety hazards, and damage to infrastructure. Inherent to the nature of externalities, the ensuing costs are not shouldered by those who have caused them and are not easily recouped by a pricing mechanism. While this may not affect competitiveness in the short run, the long-term effects will be reflected in the increase of cost items that affect overall competitiveness (for instance, the cost of road accidents on average cost for 1% of a developing country).

While non-compliance with existing regulations – especially safety regulations – may create short-term benefits in the form of lower transport costs and prices, lax enforcement is not a policy option. The government's role in the trucking industry is to make a longer perspective to ensure sustainability and long-run cost efficiency.

It is recommended that action to support the development of the trucking industry be non-intrusive and focused on measures to enforce existing legislation for drivers' training and licenses, and road safety requirements. Registration of trucking firms by a Federal Authority is recommended to mainstream those operating on the verges of legality if any.

The major drivers of transport costs are vehicle capacity (economy of scale) and utilization. Larger vehicles are cheaper to operate on a per-ton basis than small trucks. They are more efficient in terms of fuel consumption and fewer emissions per ton than small trucks. The country needs new trucks and specially semi-trailers as a priority. New full-size semi-trailers can consume less than half the fuel on basis of a ton-kilometer. Until Pakistan can upgrade its trucking fleet, it will be a comparative disadvantage in transport costs from the farm gate to processing or export. A move to semi-trailers is a critical factor in achieving economy of scale and reducing unit costs, especially in the agriculture sector. Recognition of semi-trailers as transport vehicles is urgently needed.

Import duties on new trucks need to be minimized to encourage fleet renewal. The Federal Board of Revenue is responsible for fixing duties and taxes, the duty structure

needs to be such that the ability to purchase an efficient truck with a high payload is not being prevented by taxes.

It is observed that forwarders do not consider roads as a constraint, particularly not on the main corridor. In contrast, the road linking to the corridor is generally considered to be in poor condition. Operators expressed a preference for national highways, rather than motorways. Motorways are avoided because of toll charges and strict enforcement of legislation concerning drivers' licenses and axle load limits. The financial advantages of using national highways instead of the faster motorways, while contributing to short-term logistics efficiencies, may not be sustainable in the long run.

Tolls and congestion taxes (and bans on freight transport on particular roads) can be for all times or just for some times of the day or week, or there can be higher charges in busier periods. If tolls are to be imposed, electronic toll collection can avoid the generation of additional emissions that would otherwise result from stop-start traffic and vehicle idling when traffic banks up before manual toll collection points and such technology can be financed out of the tolls.

Fuel taxes will encourage better vehicle maintenance and the use of more fuel-efficient vehicles, and there can also be subsidies or tax concessions for electric or hybrid vehicles.

Access to formal finance especially for the informal part of the industry is a very important aspect that needs to be looked at if the industry has to reshape and cope with the emerging situation that demands a modernized and adequately powered fleet. Incentives, special schemes, and investment injections from the government in this sphere are essential. Competition aspect in this area would mean ensuring access to every eligible company without any preferential treatment tilted towards any specific company.

16 Recommendations

i. The study's key recommendation is to initiate institutional changes as rent-seeking behavior and governance are at the core of the issues faced by the trucking industry in the country.
ii. To bring efficiency in the trucking industry and for its modernization, it urgently needed to bring the trucking industry under a wider network of regulatory controls under the Federal Ministry of Government of Pakistan.
iii. The Regulatory Authority in the Federal Government for containerized and bulk cargo transportation by road may regulate aspects of cargo transportation by road under the pretext of the Oil & Gas Regulatory Authority (OGRA) which regulates the transportation of oil and gas transportation by road in the country.
iv. Overloading by commercial trucks in Pakistan is a serious problem. The axle load regime must be enforced in letter and spirit to provide a level field ground for all truck operators in the country. At source control of overloading is important, like at ports, dry ports particularly those near borders, industrial and agricultural centers, etc., as it greatly limits overloading and damage inflicted to the pavement. Therefore, weigh stations should be strategically located near the load generating centers.
v. Containerized cargo helps control overloading. Therefore, inland container/cargo/freight stations need to be established in big cities for efficient stuffing & de-stuffing, cataloging, inspection for damage, and labeling of cargo.
vi. Availability of containers is a recurring challenge since maritime companies, being dominant players allocate empty containers according to their commercial requirements. The establishment of inland freight stations will ensure greater availability of containers and efficient intermodal transportation thereby reducing travel time/cost and limiting the need for overloading.
vii. Stricter enforcement of truck safety, mechanical and environmental regulations by means of proper, regular testing/ inspection (this applies to all vehicle categories) – the aim should be to gradually enhance safety standards over time.
viii. National design standards for Two-wheelers, three-wheelers, and Oil tankers have been devised by Pakistan Standards & Quality Control Authority (PS&QCA) in past years. For 4-wheel vehicles, WP-29 standards are being complied with by manufacturers in the country in compliance with the S.R.O 837(1)/2021 issued by the Ministry of Finance & Revenue in June 2021. However, no technical standards existed for any type of rigid, articulated trucks and buses in the country, therefore there is an urgent requirement for the development of national design standards for such vehicles.
ix. The technical standards for oil tankers are not a prerequisite for registrations, resulting in non-compliance with these standards. Only OGRA and ADR-compliant oil tankers should be issued a vehicle license (registration) or be able to get fitness certification. The OGRA RT 2009 standard must be both implemented and updated to reflect ADR 2017.

x. Relaxation of import restrictions on used trucks (not only for dump trucks), so as to encourage the use of more multi-axles trucks on long-distance hauls. These trucks should be subjected to proper testing.
xi. Abolition of most of the road checks, which consume time and cost money as it slows down truck's speed.
xii. In locations where trucks move slowly on inclines on single-lane roads, consideration should be given to building climbing lanes; together with passing bays on narrow roads, as appropriate,
xiii. Vehicle registration authorities should ban the current practice of registering and licensing a truck chassis and subsequently building a bus body or fitting a tank to this chassis. All trucks and buses manufactured in Pakistan should only be issued a vehicle license if they comply with all current requirements including a manufacturer's compliance certificate or vehicle PIN as proposed in the draft Road Safety Act 2022.
xiv. Under the existing laws, only the prime mover in articulated vehicles is required to be registered. The trailers do not have an independent registration system. This has resulted in an undocumented, unsafe, untaxed, and unregulated trailer and tanker building industry, bypassing all checks and balances. Therefore, necessary legislation is made for trailer manufacturing and registration.
xv. The existing registration and periodic inspection system need revamping. The prevailing system of vehicle inspectors and subsequent inspection certificates issued by them is not based on modern time requirements with respect to road safety. Therefore, a vehicle registration and inspection system based on technology through specialized authorized service providers should be introduced in the country.
xvi. Agriculture/ Farm tractors are classified as agricultural machinery and are currently required to be registered by Vehicle Registration Authority. However, these farm tractors are fitted with a trailer (tractor-trolley) and used as trucks on public roads. Tractors/ tractor-trolley should be licensed according to to use as farm vehicles and limit their use only on the tertiary road. Legislation is required to ban the use of tractors as goods transport vehicles on highways and motorways.
xvii. Truck conditions not only affect operational performance, but also fuel consumption and emission. A routine inspection/maintenance (I/M) is barely enough to ensure good condition. Special training and improved fleet management can help operators to improve the condition of their trucks. Engine rebuilding is considered the strongest enhanced maintenance strategy.
xviii. Several other strategies based on vehicle body improvement can be applied to reduce diesel consumption by reducing drag. Truck weight reduction is a common strategy to improve the fuel economy of a truck. Improved aerodynamics reduces drag and thus fuel consumption. Several technological options, including auxiliary power units (APUs), automatic engine idle systems, and truck stop electrification can assist drivers in reducing truck idling.

xix. Low-Sulphur diesel can reduce emissions of in-use trucks immediately. It is also a precondition for a successful emission retrofit program. The use of low viscosity lubricant can also help improve fuel economy. The oil by-pass filtration system improves oil life performance and indirectly contributes to fuel efficiency due to reduced engine wear. It is recommended that low-Sulphur diesel should be available in the country.

xx. In-use diesel retrofits with emission control devices, including EGR (Exhaust Gas Recirculation), DPF (Diesel Particulate Filter), and DOC (Diesel Oxidation Catalyst) systems have been widely applied in the United States and Europe. The selection of target trucks and technology verification is crucial for a successful retrofit. Fleet modernization can introduce much cleaner engines into the fleet to lower PM and NO_X emissions. Engine replacement is also a type of fleet modernization strategy.

xxi. Driver training, including eco-driving and equipment handling training, can greatly add to fuel and emissions savings. For example, drivers mistakenly switched off pressure monitoring sensors while increasing tire pressure, because instructions on handling the equipment had not covered the subject. Technology training of the drivers of pilot trucks directly by the technology supplier would be preferable.

xxii. Establish a truck renewal program. Scrappage schemes for outdated trucks should be adopted to convert them into modern energy-efficient technology. Financial support should be offered to the volunteers. Pakistan may adopt the vehicle phase-out scheme with financial support from international development partners. It may be a volunteer program for initial five years and then by that time it may be adopted as mandatory.

xxiii. Trucks shall be scrapped if they meet one or more of the following four conditions as practiced in China: Limits of service years reached from the date the vehicle is registered.

a) Failure to meet the national standard of vehicle safety, and technical requirements for in-use vehicles.
b) Failure to meet national standards of air pollution emissions or noise prevention for in-use vehicles; and,
c) Fail three times consecutively at vehicle inspection. Recommended scrappage is referred to when truck kilometers traveled have reached a certain level as designated under the rule.
d) designated under the rule (Table 11.1).

Types of Vehicles	Compulsory Scrappage		Recommended Scrappage
	Service Life (Year)	Travel Distance (10,000 Km)	Travel Distance (10,000 Km)
Mini trucks	12	50	50
Light-duty trucks	15	60	60
Heavy-duty trucks	15	70	70

Types of Vehicles	Compulsory Scrappage		Recommended Scrappage
	Service Life (Year)	Travel Distance (10,000 Km)	Travel Distance (10,000 Km)
Trucks for Transportation of Dangerous Goods	10	40	40
Three-wheeled low-speed trucks loaded with a single cylinder engine	9	NA	NA
Low-speed trucks loaded with a multi-cylinder engine	12	30	30
Trucks for special uses	15	50	50

xxiv. In addition to compulsory scrappage, Pakistan may introduce a labeling scheme with green and yellow labels in relation to vehicle emissions control. Green labels may be applied to diesel vehicles that correspond to Euro III emission standards or above, whereas yellow labels are given to diesel vehicles that do not meet Euro III standards. These restrictions may tighten with the passage of time to meet Euro IV or higher. To provide disincentives for high-polluting vehicles running in cities and thus phase out them before compulsory scrappage conditions should be met, yellow label vehicles should be restricted from running in the cities for specific hours of the day.

xxv. It is suggested that all action items for fleet renewal and upgrading to semi-trailers be coordinated by one agency.

xxvi. There are ample opportunities for companies willing to operate modern truck fleets in the country. Moreover, the international experiences of foreign companies could play a key role in introducing cost-effective and efficient concepts in the industry. An example is the international experiences of German companies by introducing cost-effective and efficient concepts such as long body 50 ft. trailers and road trains.

xxvii. Transport of agri-products despite the limited availability of refrigerated vehicles, perishable goods such as fruits, vegetables, meat, eggs, and milk, among others are transported over long distances by roads. Yet, the country's true potential to trade fresh foods is severely undermined due to the lack of a temperature-controlled transport system. According to an estimate, about 30-40% of the produce is wasted during transportation between the farm, wholesale, and retail markets. In addition to the poor farm-to-market roads and lack of refrigerated transport and warehousing, low-quality packaging materials and faulty methods of loading and unloading also contribute to the wastage of perishable goods. Cold chain facilities should urgently be made available in the country to enhance the transportation of perishable goods by road.

xxviii. Reliable data on the trucking fleet and operations are essential for analysis and policy formulation. Trucking surveys should be carried out periodically, probably every three to five years. Clear and detailed protocols for data collection related

to the trucking industry are needed to be established. Their implementation can be difficult, and if not implemented correctly, the margin of error may exceed the savings percentage thus rendering unreliable results.

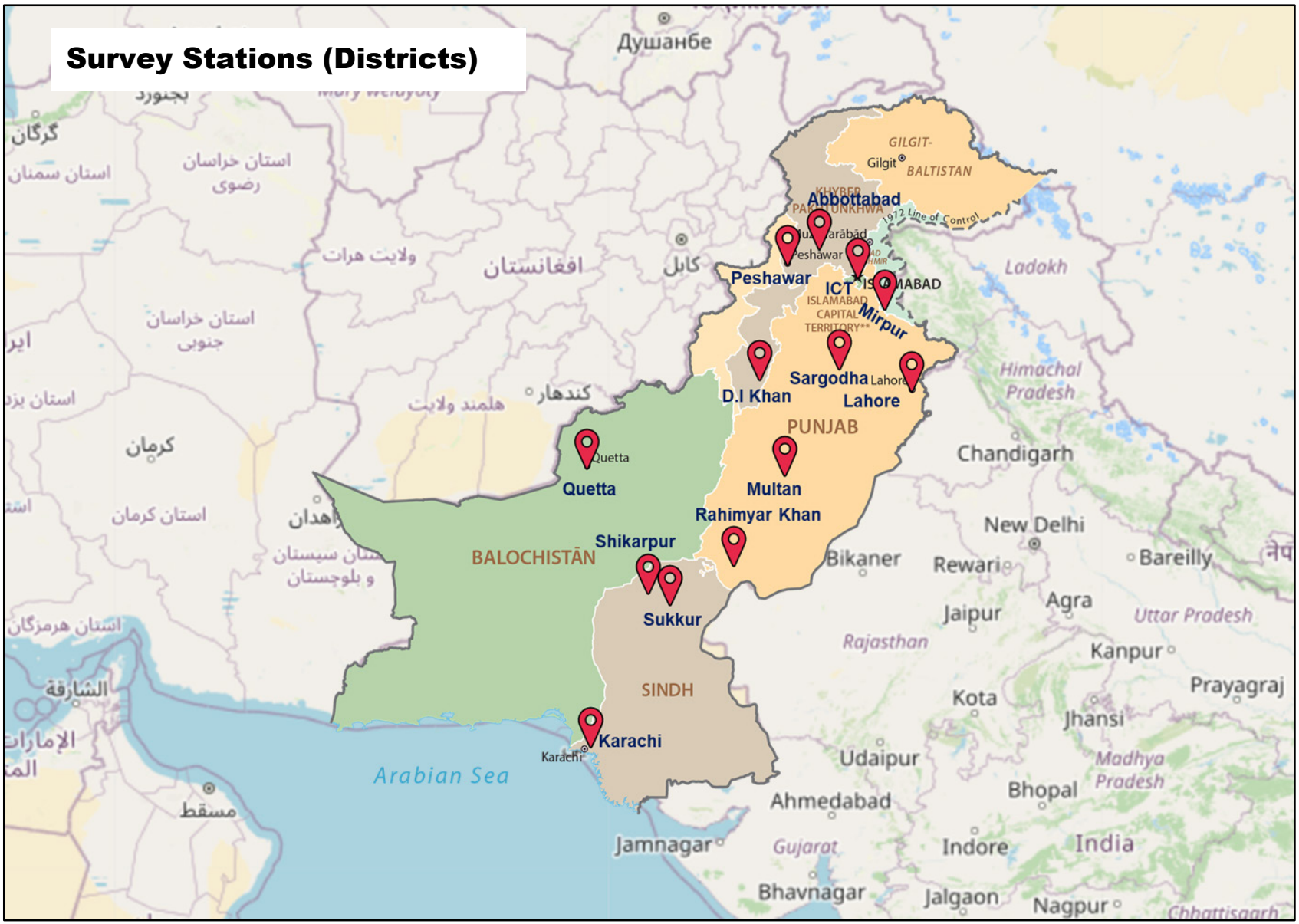
xxix. Data collection on the trucking fleet, transport prices, and costs is largely inadequate in the country. For instance, data on vehicle registration have to be used with caution as many vehicles out of service have not been removed from the database. Vehicle registration data need to be systematically updated. Hard data on overloading practices are not available for most corridors in the country despite the fact that major rehabilitation works of road infrastructure have been carried out or are underway and overloading practices should have been monitored and controlled in parallel to the new investment.

xxx. Support the use of country-specific trucking data in the economic analysis and design of road maintenance strategies. Such analysis is, in most countries, done with the HDM-4 model, although country-specific trucking data are sparse. As a result, generic data with many assumptions are used in such model simulations. Data from trucking surveys could greatly improve the quality of the analysis and lead to more realistic results. One example is the need to introduce in the models the actual purchase price of the trucks, which in the country often are bought secondhand, instead of using the price of new trucks. Using actual data would lead to different results, in particular reducing the possibility of overinvestment due to the overestimation of investment benefits. If the investment analysis were done properly with realistic data, higher traffic levels might be needed to justify road improvements in some cases.

xxxi. Where the appropriate intervention is to support the deregulation of the transport market, development partners should provide technical assistance and help fund any compensation schemes required to mitigate the social effects of deregulation. Without coordinated efforts from the donor community, changes in regulation are unlikely to be implemented. Successful institutional change such as trucking deregulation requires patience, policy dialogue, and support from the donor community.

APPENDIX I

Details of Field Surveys & Survey Locations


Survey Stations (Districts)
Abbottabad
Peshawar
ICT
Mirpur
Sargodha
D.I Khan
Lahore
PUNJAB
Quetta
Multan
Rahimyar Khan
Shikarpur
BALOCHISTĀN
Sukkur
SINDH
Karachi
Arabian Sea
GILGIT-
BALTISTAN
Gilgit
1972 Line of Control
Ladakh
Himachal Pradesh
Chandigarh
New Delhi
Bikaner
Rewari
Bareilly
Jaipur
Agra
Uttar Pradesh
Rajasthan
Kanpur
Prayagraj
Kota
Jhansi
Udaipur
Madhya Pradesh
Bhopal
Ahmedabad
Gujarat
Indore
India
Jamnagar
Bhavnagar
Jalgaon
Nagpur
Chhattisgarh
Душанбе
افغانستان
کابل
کندهار
کرمان
مسقط
الشارقة

Details of Field Surveys

Sr. No.	District	No. of Samples Collected
1.	Abbottabad	109
2.	Mirpur	07
3.	Peshawar	122
4.	Mardan	121
5.	Sargodha	278
6.	Lahore	274
7.	Multan	281
8.	Rahim Yar Khan	302
9.	Sukkur	251
10.	Shikarpur	27
11.	Karachi	1,000
12.	Quetta	267
13.	Dera Ismail Khan	243
	TOTAL	**3,282**

APPENDIX II

Survey Forms

NATIONAL TRANSPORT RESEARCH CENTRE

Project : NTRC STUDY ON FREIGHT TRANSPORT (TRUCKING) IN PAKISTAN

Roadside Interview Survey

	Form No. _____				**Date_____**		
	Interview Details						
I	**Interviewer Name:**				**Road/City/Place:**		
II	**Direction.** Truck Travelling: From _____ To _____						
	Vehicle Details						
1	**Truck's Registration plate #**			**2**	**No. of Axles**		
3	**Make:**	Bedford	Nissan	Hino	Isuzu	Mercedes	Other _____
4	**Model:** _____ year			**5**	**Body Configuration:** Rigid / Trailer Unit		
6	**Vehicle registered in:** _____ year				Don't know		
7	**Has the vehicle been altered, strengthened, or improved?** Chassis	Engine	Extra Axle added		Not at all	Don't know	
8	**How many Kilometrage has been done by vehicle (Odometer reading):**						
9	**What is the ownership type of Vehicle?** Driver (self)	Sole Owner	Joint Owner	Commercial Company	Government	Don't know	
10	**What is the acquisition mode for the vehicle?** Single payment purchase	Several payments / installments	Loan	Lease	Rent	Don't know	
11	**What type of insurance does truck have?**	None	Third Party Act	Don't know			
12	**How often are tires CHANGED for the truck?**	Every _____ kilometers	Every _____ months				
13	**Cost of Tires:**	**NEW:** Rs. _____	**OLD:** Rs. _____				
14	**Routine Maintenance after:**	Every _____ kilometers	Every _____ months				
15	**Cost of routine maintenance (in Rs.):**	Rs. _____					
	Driver Details						
1	**Driver's age**			**2**	**No. of staff with Truck**		
3	**Driver belongs to _____ province**						
4	**Driver's HTV License:** Year issued _____			**5**	**Experience as Truck Driver:** _____ years		
6	**On average how often does the driver return to base/home?** Daily	One every _____ days			Don't know		
7	**Does the driver use any kind of drug while in operation?**	YES / NO _____					
8	**Principal driver's wages:**	Rs. _____ per month	Daily expenses (Rs) _____				
	Travel Details						
1	**What is the current journey purpose?** 1 = Returning to base 2 = Driver looking to transport load 3 = Driver looking to pick up load	4 = Going for repair 5 = Other reason (state) _____ Don't know [ ]					
2	**Truck is:** EMPTY / PARTIALLY LOADED / FULLY LOADED						
3	**Principal cargo carried by Truck:**						
4	**Total cargo weight:**	Amount _____	Unit _____				
5	**Cargo Origin and Destination** **Load Origin:** Town _____ District _____ **Load Destination:** Town _____ District _____						

6	**Route for THIS trip:**			
7	**Journey time for THIS trip:**	Hours: _____	Days: _____	
8	**Approximate travel distance:** _____ Kilometers			
9	**Fuel consumption:** _____ liters	10	**Toll paid for THIS trip:** Rs. _____	
11	**Total amount charged for THIS trip:**	Rs. _____		
12	**Other expenses:**	Rs. _____		
13	**What is the FIRST response of driver in case of EMERGENCY (such as vehicle breakdown or accident)?**			
14	**Give approximate travel distance run by truck (in Kilometers):** _____ per day _____ per week _____ per month			
15	**What is the total number of days a truck spends on road (in days)?**	_____ days a month		

Driver & Driver-Truck-Owner Relation Details

1	**How long has driver been with THIS vehicle?** _____ years	Don't Know		
2	**Driver's Education:** _____ pass	No Schooling [ ]		
3	**Driver's marital status:** MARRIED / UNMARRIED; If MARRIED, then how many children: _____			
4	**Does the driver own other trucks?**	YES (Give no.) _____ / NO		
5	**If DRIVER is not the OWNER, then what is the relationship between driver and owner:** **1 = Salary per month:** Rs. _____ per month **2 = Per trip payment, if YES** How much the driver earns per month: Rs. _____ **3 = Rented the truck,** How much rent is paid per month: Rs. _____ **4 = Any other agreement (state):** _____			
6	**Driver's assistant wages:**	Rs. per month _____		
7	**Where is vehicle mainly based?** Town _____	District _____	Don't know	

Comments/Feedback by Drivers

What are the main problems faced by driver?

i. Police Harassment ii. Poor Roads iii. High Running Costs iv. Toll Taxes v. Low Salary
vi. Finding Loads vii. Competition viii. Fear of Robbers ix. Difficulty to get HTV license
x. Other Problems

What are the main constraints preventing more efficient transport operations?

Does the truck carry any Vehicle Safety Equipment? YES / NO

If YES, then

i. First Aid Kit
ii. Fire Extinguisher
iii. Other (state): _____

NATIONAL TRANSPORT RESEARCH CENTRE
NTRC STUDY ON FREIGHT TRANSPORT (TRUCKING) IN PAKISTAN
Roadside Interview Survey

فارم نمبر ---------- تاریخ ----------

I. تاریخ/وقت کشدد: ---------- سڑک/شاہراہ/مقام: ----------

II. سمت: سفر بذریعہ ٹرک از ---------- تا ----------

گاڑی کے بارے میں تفصیلات

1. ٹرک کی رجسٹریشن پلیٹ نمبر: ----------
2. ایکسل کی تعداد: ----------
3. ساخت: ہینو فورڈ نسان ہینو اسوزو مرسیڈیز دیگر
4. ماڈل: سال ----------
5. باڈی کی ساخت: بریڈ/اُٹھا ہوا نٹ
6. گاڑی سال ---------- میں رجسٹرڈ ہوئی ، معلوم نہیں
7. کیا گاڑی میں کوئی تبدیلی کی گئی ہے، مضبوطی کی گئی ہے، یا اپگریڈ کی گئی ہے؟
   پیسنجر انجن اضافی ایکسل لگایا گیا بالکل بھی نہیں معلوم نہیں
8. گاڑی کتنے کلو میٹر چلی ہے؟ (اوڈو میٹر (Odometer) کی ریڈنگ: ----------
9. گاڑی کے مالکانہ حقوق کی قسم:
   ڈرائیور (خود مالک) یک فردی ملکیت مشترکہ ملکیت تجارتی کمپنی سرکاری معلوم نہیں
10. گاڑی کی خریداری کا طریقہ:
    خریداری بذریعہ کمشت ادائیگی متعدد ادائیگیاں/اقساط قرض لیز کرایہ معلوم نہیں
11. ٹرک کی انشورنس کس قسم کی ہے؟ کوئی نہیں ، تھرڈ پارٹی بیک ، دیگر
12. ٹرک کے ٹائر کب تبدیل کیے جاتے ہیں؟ ہر ---------- کلو میٹر کے بعد ، ہر ---------- مہینے بعد
13. ٹائروں کی لاگت: نئے: ---------- روپے ، استعمال شدہ: ---------- روپے
14. عمومی دیکھ بھال کا دورانیہ: ہر ---------- کلو میٹر کے بعد ، ہر ---------- مہینے بعد
15. عمومی دیکھ بھال کی اخراجات (روپوں میں): ---------- روپے

ڈرائیور کے بارے میں تفصیلات

1. ڈرائیور کی عمر ----------
2. ٹرک کے ساتھ کام کرنے والے افراد کی تعداد ----------
3. ڈرائیور: صوبہ ---------- سے تعلق رکھتا ہے
4. ڈرائیور کا HTV لائسنس ہے؟: ہاں، سال ---------- سے جاری شدہ ہے ، نہیں
5. ٹرک ڈرائیونگ کا تجربہ ---------- سال
6. ڈرائیور اپنے گھر کتنی دفعہ واپس لوٹتا ہے؟
   روزانہ ہر ---------- دن بعد معلوم نہیں
7. کیا ڈرائیور اپنے کام کے دوران کوئی نشیات استعمال کرتا ہے؟ ہاں/نہیں ----------
8. ڈرائیور کی تنخواہ: ---------- روپے ماہانہ روزمرہ خرچہ ---------- روپے

سفری تفصیلات

1. موجودہ سفر کس مقصد کے لیے ہے؟
   i. اپنے ڈپو تک واپسی iv. مرمت کے لیے
   ii. ڈرائیور کو لے جانا v. دیگر وجوہات کے لیے (بیان کریں) ----------
   iii. ڈرائیور کو لینا vi. معلوم نہیں

2. ٹرک: خالی ہے / تھوڑا بھرا ہوا ہے / مکمل بھرا ہوا ہے
3. ٹرک کے ذریعے لے جایا جانے والا اصل مال: ----------
4. کارگو/مال کا وزن: تعداد/مقدار ---------- یونٹ ----------
5. کارگو/مال کا اٹھایا جانے والا مقام اور کارگو کی منزل مقصود
   کارگو اٹھانے کا مقام: شہر ---------- ضلع ----------
   کارگو کی منزل: شہر ---------- ضلع ----------
6. اس سفر کا مستقبل: ----------
7. اس سفر کا دورانیہ: ---------- گھنٹے ---------- دن
8. سفر کا فاصلے کی طوالت/اندازہ: ---------- کلو میٹر
9. ایندھن کی کھپت: ---------- لیٹر
10. اس سفر کے لیے اندازہ مال لیکس: ---------- روپے
11. اس سفر کی کل چارج کردہ رقم: ---------- روپے
12. دیگر اخراجات: ---------- روپے
13. کسی بھی ہنگامی صورت حال میں ڈرائیور کو پیارڈ عمل کیا ہوتا ہے (مثلاً گاڑی میں اچانک خرابی یا کسی حادثے کی شکل میں)؟ ----------
14. اندازے سے بتائیں کہ ٹرک نے کتنا فاصلہ طے کیا ہے (کلو میٹر میں):
    ---------- فی دن ، ---------- فی ہفتہ ، ---------- فی مہینہ
15. ایک ٹرک سڑک پر کل کتنے دن گزارتا ہے (دن)؟ فی مہینہ ---------- دن

ڈرائیور اور ڈرائیور۔ٹرک مالک کے درمیان تعلق کی تفصیل

1. ڈرائیور کب سے اس گاڑی کے ساتھ ہے؟ ---------- سال ، معلوم نہیں
2. ڈرائیور کی تعلیم: ---------- پاس ، اسکول نہیں گیا
3. ڈرائیور کی ازدواجی حیثیت: شادی شدہ/غیر شادی شدہ ---------- اگر شادی شدہ تو بچوں کی تعداد ----------
4. کیا ڈرائیور دوسرے ٹرکوں کا بھی مالک ہے؟ ہاں (تعداد اور درج کریں) ----------/نہیں
5. اگر ڈرائیور مالک نہیں ہے، تو ڈرائیور اور مالک کے درمیان تعلق کی نوعیت:
   i. ماہانہ تنخواہ: ---------- روپے ماہانہ
   ii. فی پھیرا ادائیگی ہاں تو: ڈرائیور مہینے کے کتنے کماتا ہے؟ ---------- روپے
   iii. ٹرک کرایہ پر لیا ہے: مہینے کا کتنا کرایہ دیتا ہے؟ ---------- روپے
   iv. کوئی اور طرح کا معاہدہ (بیان کریں) ---------- روپے ماہانہ
6. ڈرائیور کے جانب کی اجرت: ---------- روپے ماہانہ
7. گاڑی کا تعلق بنیادی طور پر کس جگہ سے ہے؟ شہر ---------- ضلع ---------- ، معلوم نہیں

تیسرے/ڈرائیوروں کی طرف سے جوابات

I. ڈرائیوروں کے سب سے بڑے مسائل کون سے ہیں؟
   i. پولیس کا خوفزدہ کرنا ii. خراب سڑکیں iii. بڑھتے ہوئے اخراجات iv. ٹال ٹیکس
   v. کم تنخواہ vi. مال برداری کی تلاش vii. مسابقت/مقابلہ viii. ڈکیتی کا خطرہ
   ix. HTV لائسنس کے اجرا میں مشکلات x. دیگر مسائل

II. وہ کیا رکاوٹیں ہیں جو کہ بہتر مستعد نقل و حمل کے نظام کی راہ میں حائل ہیں؟

III. کیا ٹرک میں سیٹلائٹ سے متعلق کوئی آلات ساتھ رکھے جاتے ہے؟ ہاں/نہیں
   اگر ہاں، تو: i. فرسٹ ایڈ (ابتدائی طبی امداد) کٹس ii. آگ بجھانے کا آلہ iii. دیگر (بیان کریں) ----------

NATIONAL TRANSPORT RESEARCH CENTRE

Project : NTRC STUDY ON FREIGHT TRANSPORT (TRUCKING) IN PAKISTAN

Transport Operators' Survey

Form No. _____ **Date_____**

I **Company's Name:** _____ **City:** _____

II **Type of Company:**

Private Individual	Partnership	Private Company	Government Owned	Other _____

1 **What proportion of business is obtained by the following ways:**

a. Through freight agents _____ %
b. By telephone from customers _____ %
c. By trucks waiting at Truck Addas _____ %
d. By drivers finding their own loads _____ %
e. Other channels _____ %

2 **Please list the number of different types of vehicles currently in operation with the company:**

i. 2-Axle Truck _____ number(s)
ii. 3-Axle Truck _____ number(s)
iii. 4-Axle Truck _____ number(s)
iv. 5-Axle Truck _____ number(s)
v. 6-Axle Truck _____ number(s)

3 **Please give estimate of current complete purchase price in Pakistan for NEW and/or Second-hand vehicles:**

Vehicle		Make	Model	Body Weight (Tons)	Price (in PKR)
2-Axle Truck	New/ _____ Yrs. old	_____	_____	_____	_____
3-Axle Truck	New/ _____ Yrs. old	_____	_____	_____	_____
4-Axle Truck	New/ _____ Yrs. old	_____	_____	_____	_____
5-Axle Truck	New/ _____ Yrs. old	_____	_____	_____	_____
6-Axle Truck	New/ _____ Yrs. old	_____	_____	_____	_____

4 **What are the principal commodities moved?**

_____

_____

5 **What are the main destinations?**

_____

_____

6 **Please give estimate of the current freight rates to most frequent origins & destinations served for main commodities:**

Sr. #	Origin/Designation	Commodity	Freight Rate/Tariff (in PKR)
1)	**From** _____ **to** _____	_____	_____ per ton load
2)	**From** _____ **to** _____	_____	_____ per ton load
3)	**From** _____ **to** _____	_____	_____ per ton load
4)	**From** _____ **to** _____	_____	_____ per ton load
5)	**From** _____ **to** _____	_____	_____ per ton load

7 **What mileage do you expect from your vehicle?**

Sr. #	Vehicle Type	Monthly Mileage	Annual Mileage
1)	**Type** _____	_____ kilometers/month	_____ kilometers/year
2)	**Type** _____	_____ kilometers/month	_____ kilometers/year
3)	**Type** _____	_____ kilometers/month	_____ kilometers/year
4)	**Type** _____	_____ kilometers/month	_____ kilometers/year
5)	**Type** _____	_____ kilometers/month	_____ kilometers/year

8

For different vehicle types operated by the firm can you give some estimates of current vehicle operating costs:

1. Truck Type _____

Driver's salary	Rs. _____ per month
Assistant's salary	Rs. _____ per month
Average budget for tire	Rs. _____ per _____ kilometers
Average budget for maintenance & repair	Rs. _____ per _____ kilometers
Average budget for fuel	Rs. _____ per _____ kilometers

2. Truck Type _____

Driver's salary	Rs. _____ per month
Assistant's salary	Rs. _____ per month
Average budget for tire	Rs. _____ per _____ kilometers
Average budget for maintenance & repair	Rs. _____ per _____ kilometers
Average budget for fuel	Rs. _____ per _____ kilometers

9

What is the policy of the company for manning the trucks?

a. Allocate one main driver to the vehicle
b. Allocate two drivers to the vehicle for shift work
c. Allocate one main driver and his assistant to the vehicle
d. Other, please explain: _____

10

How are repairs and services carried out?

1. Own workshop facilities
2. Use of Local commercial workshop
3. Both

Comments/Feedback

What are the main problems faced by transport operators in Pakistan?

What are the main constraints preventing more efficient transport operations?

NATIONAL TRANSPORT RESEARCH CENTRE
NTRC STUDY ON FREIGHT TRANSPORT (TRUCKING) IN PAKISTAN
Transport Operators' Survey

فارم نمبر---------- جرح----------

I. کمپنی کا نام:---------- شہر:----------

II. کمپنی کی قسم:

پرائیویٹ فرد/شراکت داری پرائیویٹ کمپنی سرکاری دیگر

1. مندرجہ ذیل ذرائع سے کس شرح سے کاروبار حاصل کیا جاتا ہے؟

a. فریٹ ایجنٹوں کے ذریعے ---------- %
b. گاہکوں کے ٹیلی فون کے ذریعے ---------- %
c. ٹرک اڈوں پر کھڑے ٹرکوں کے ذریعے ---------- %
d. ڈرائیوروں کی اوڈی اپنی تلاش کے ذریعے ---------- %
e. دیگر ذرائع سے ---------- %

2. براہ کرم کمپنی کے ساتھ کام کرنے والی مختلف قسم کی گاڑیوں کی فہرست بنائیں:

i. 2- ایکسل ٹرک ---------- تعداد
ii. 3- ایکسل ٹرک ---------- تعداد
iii. 4- ایکسل ٹرک ---------- تعداد
iv. 5- ایکسل ٹرک ---------- تعداد
v. 6- ایکسل ٹرک ---------- تعداد

3. براہ کرم پاکستان میں نئی/یا استعمال شدہ گاڑیوں کی مکمل قیمت کا تخمینہ دیں

گاڑی	ایکسل	ہارس پاور	گاڑی کا وزن (ٹن)	قیمت
2- ایکسل ٹرک نیا/ ------ سال پرانا	------	------	----------	------
3- ایکسل ٹرک نیا/ ------ سال پرانا	------	------	----------	------
4- ایکسل ٹرک نیا/ ------ سال پرانا	------	------	----------	------
5- ایکسل ٹرک نیا/ ------ سال پرانا	------	------	----------	------
6- ایکسل ٹرک نیا/ ------ سال پرانا	------	------	----------	------

4. کن اشیاء کی نقل و حمل ہوتی ہے؟

5. اہم ترین ترسیلی سیکٹر کون سی ہیں؟

6. براہ کرم اہم ترین اشیاء کی ترسیل کی مد میں ان مقامات کے ریٹ یا قیمتیں بیان کریں جہاں سے یہ اشیاء کوئٹہ سے بھیجی اور وصول کی جاتی ہیں۔

سیریل نمبر	از مقام/تا مقام	اشیاء	فی سیٹ یونٹ/ٹن (پاکستانی روپیہ)
(1)	از---------- تا ----------	----------	----------
(2)	از---------- تا ----------	----------	----------
(3)	از---------- تا ----------	----------	----------
(4)	از---------- تا ----------	----------	----------
(5)	از---------- تا ----------	----------	----------

7. آپ اپنی گاڑی سے کتنی مائیلیج کی توقع رکھتے ہیں؟

سیریل نمبر	گاڑی کی قسم	مائیلیج	سالانہ مائیلیج
(1)	قسم----------	----------کلومیٹر/مہینہ	----------کلومیٹر/سال
(2)	قسم----------	----------کلومیٹر/مہینہ	----------کلومیٹر/سال
(3)	قسم----------	----------کلومیٹر/مہینہ	----------کلومیٹر/سال
(4)	قسم----------	----------کلومیٹر/مہینہ	----------کلومیٹر/سال
(5)	قسم----------	----------کلومیٹر/مہینہ	----------کلومیٹر/سال

8. فرم کی جانب سے چلنے والی مختلف اقسام کی گاڑیوں کے حوالے سے کیا آپ ان گاڑیوں کے چلنے کے موجودہ اخراجات کا کوئی تخمینہ بیان کر سکتے ہیں؟

1. ٹرک کی قسم ----------
ڈرائیور کی تنخواہ ----------روپے ماہانہ
ہیلپر کی تنخواہ ----------روپے ماہانہ
ٹائروں کے لیے اوسط بجٹ ----------روپے فی----------کلومیٹر
دیکھ بھال اور مرمت کے لیے اوسط بجٹ ----------روپے فی----------کلومیٹر
ایندھن کے لیے اوسط بجٹ ----------روپے فی----------کلومیٹر

2. ٹرک کی قسم ----------
ڈرائیور کی تنخواہ ----------روپے ماہانہ
ہیلپر کی تنخواہ ----------روپے ماہانہ
ٹائروں کے لیے اوسط بجٹ ----------روپے فی----------کلومیٹر
دیکھ بھال اور مرمت کے لیے اوسط بجٹ ----------روپے فی----------کلومیٹر
ایندھن کے لیے اوسط بجٹ ----------روپے فی----------کلومیٹر

9. ٹرکوں کو اطراری قوت دینے کے بارے میں کمپنی کی کیا پالیسی ہے؟

i. ایک گاڑی پر ایک مرکزی پائیدار ڈرائیور لگانا
ii. ایک گاڑی پر شفٹ میں کام کی غرض سے دو ڈرائیور لگانا
iii. ایک گاڑی پر ایک ڈرائیور اور ایک اس کا ہیلپر یا کلینر لگانا
iv. دیگر، براہ کرم وضاحت سے بیان کریں ----------

10. مرمتی کام اور خدمات کیسے سرانجام پاتی ہیں؟

i. اپنی ورکشاپ کی سہولت ہے
ii. مقامی کاروباری ورکشاپ کا استعمال
iii. دونوں

تبصرے/جوابات

I. پاکستان میں ذرائع نقل و حمل چلانے والوں کے اہم ترین مسائل کون سے ہیں؟

II. ذرائع نقل و حمل کو زیادہ مستعدی سے چلانے کے راستے میں کیا رکاوٹیں حائل ہیں؟

NATIONAL TRANSPORT RESEARCH CENTRE

Project : NTRC STUDY ON FREIGHT TRANSPORT (TRUCKING) IN PAKISTAN

Owners' Survey

Form No. _____					**Date _____**		
Interviewee Details							
I	**Respondent's Name:**				**Respondent's Age: _____**		
II	**Which province does Interviewee's belong to? _____**						
III	**How many vehicles does OWNER own? _____**						
Vehicle Details							
1	**Truck's Registration plate #**			**2**	**No. of Axles**		
3	**Make:**	Bedford	Nissan	Hino	Isuzu	Mercedes	Other _____
4	**Model: _____** year			**5**	**Body Configuration:** Rigid / Trailer Unit		
6	**No. of engine cylinders**			**7**	**Horsepower rating:**		
8	**Has the vehicle been altered, strengthened or improved?** Chassis Engine Extra Axle added Not at all						
9	**How many Kilometrage has been done by vehicle (Odometer reading):**						
10	**Motive Power of Vehicle:** Petrol [ ] Diesel [ ]						
Financial Details of Vehicle							
1	**What is the ownership type of Vehicle?**	Sole Owner [ ]	Joint Owner [ ]				
2	**Purchase status of Truck:**	New purchase [ ]	Secondhand Purchase [ ]				
3	**What is current approximate value of Truck?**	PKR _____					
4	**What is the acquisition mode for the vehicle?** Single payment purchase Installments Loan Lease from Bank Rent						
5	**What type of insurance does truck have**	None	Third Party Act	Other _____			
6	**Where is vehicle mainly based:**	Town _____	District _____				
Vehicle Operating Cost Details of Truck							
1	**How often are tires CHANGED for the truck?**	Every _____ kilometers	Every _____ months				
2	**Cost of Tires:**	**NEW:** Rs. _____	**OLD:** Rs. _____				
3	**Routine Maintenance after:**	Every _____ kilometers	Every 15 days	Every Month			
4	**Cost of routine maintenance (in Rs.):**	PKR _____					
5	**Give approximate travel distance run by truck (in Kilometers):**	_____ kilometers per month					
6	**Give approximate cost of fuel:**	PKR _____ per month					
7	**Give approximate revenue earned:**	PKR _____ per month PKR _____ per year					

Comments/Feedback by Truck Owners

What are the main problems faced by Transport Operators / Owners?

What are the main constraints preventing more efficient transport operations?

PART 2: ADOPTATION OF INFORMATION TECHNOLOGY (IT)

Please respond to the following questions by placing a check mark (✔) in the answer box that corresponds to your response.

1. What is the principal cargo generally transported by the company?

i. General cargo [ ]
ii. Construction material (cement, sand, steel etc.) [ ]
iii. Petroleum products [ ]
iv. Coal [ ]
v. Grain [ ]
vi. Other (please specify) _____

2. Are the IT tools listed below in use by your company (or plan to use)? Please place a tick mark (✔).

SR. NO.	IT TOOL	IN USE	CURRENTLY UNDER PLANNING & DEVELOPMENT	NO PLAN TO USE
I.	Internet (such as company's website etc.)			
II.	Electronic fund transfer (such as online bank transactions, easy paisa etc.)			
III.	E-mail			
IV.	Vehicle tracking system			
V.	Bar-coding			
VI.	Intranet			
VII.	Enterprise resource planning, ERP (such as account management, warehouse management etc.)			
VIII.	Digital marketing			

PART 3: PERCEIVED BENEFITS OF ADOPTATION OF IT

Some of the perceived benefits of implementation of IT by the freight industry in Pakistan have been identified and listed below.
Please rate the degree to which you agree with the statement.
Please note that 1 = "not a benefit" and 5 = "major benefit".

	Perceived Benefits	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
		Not a Benefit		Potential Benefit		Major Benefit
		(1)	(2)	(3)	(4)	(5)
1.	Quick response and access to information	O	O	O	O	O
2.	Reduces manpower	O	O	O	O	O
3.	Helps in making more informed decision	O	O	O	O	O
4.	Reduces paperwork	O	O	O	O	O
5.	Reduces error	O	O	O	O	O
6.	Improves customer service	O	O	O	O	O
7.	Enhances competitiveness	O	O	O	O	O

PART 4: PERCEIVED BARRIERS TO ADOPTATION OF IT

Some of the perceived barriers to implementation of IT by the freight industry in Pakistan have been identified and listed below.
Please rate the degree to which you agree with the statement.
Please note that 1 = "not a barrier" and 5 = "major barrier".

	Perceived Barriers	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
		Not a Barrier		Potential Benefit		Major Barrier
		(1)	(2)	(3)	(4)	(5)
1.	Lack of expertise(s) in IT	O	O	O	O	O
2.	Inadequate knowledge in implementing the system by employees	O	O	O	O	O
3.	Difficulty in changing the organizational culture	O	O	O	O	O
4.	Insufficient finances	O	O	O	O	O
5.	A lot of paperwork that is difficult to computerize	O	O	O	O	O
6.	Not perceived as an advantage at all	O	O	O	O	O

Zeeruk International Pvt. Ltd. Owners' Survey - Questionnaire

NATIONAL TRANSPORT RESEARCH CENTRE
NTRC STUDY ON FREIGHT TRANSPORT (TRUCKING) IN PAKISTAN
Transport Owners' Survey

فارم نمبر--------- تاریخ----------

انٹرویو کردہ فرد کی تفصیلات

I. جواب دہندہ کا نام---------- جواب دہندہ کی عمر----------

II. انٹرویو دینے والے کا تعلق کس صوبے سے ہے؟----------

III. مالک کی ملکیت میں کتنی گاڑیاں ہیں؟----------

گاڑی کی تفصیلات

1. ٹرک کا رجسٹریشن پلیٹ نمبر----------
2. ایکسل کی تعداد----------
3. ساخت: ہینو فورڈ لیلان ہینو اسوزو مرسیڈیز دیگر----------
4. ماڈل: سال----------
5. باڈی کی ساخت: فلوس یا ساخت / ٹریلر یونٹ
6. انجن سلینڈروں کی تعداد----------
7. ہارس پاور کا درجہ:----------
8. کیا گاڑی میں کوئی تبدیلی کی گئی ہے، مضبوط کی گئی یا بہتر بنائی گئی ہے؟
   چیسز انجن زائد ایکسل لگائے گئے ہیں کوئی نہیں
9. گاڑی کتنے کلو میٹر چلی ہے (اوڈو میٹر کی ریڈنگ)؟----------
10. گاڑی کس ایندھن پر چلتی ہے؟ پٹرول [ ] ڈیزل [ ]

گاڑی کی مالیاتی تفصیل

1. گاڑی کی ملکیت کس قسم کی ہے؟ ایک مالک [ ] مشترکہ ملکیت [ ]
2. ٹرک کس حالت میں خریدا گیا؟ نیا خریدا گیا [ ] استعمال شدہ خریدا گیا [ ]
3. ٹرک کی موجودہ مالیت کیا ہے؟ ---------- پاکستانی روپے

4. ٹرک کی خریداری کے لیے ادائیگی کس طرح کی گئی؟
   یک مشت ادائیگی اقساط ادھار بینک سے قرضہ کرایہ
5. ٹرک کی انشورنس کس قسم کی ہے؟ کوئی نہیں تھرڈ پارٹی ایک دیگر----------
6. گاڑی کا بنیادی تعلق کہاں سے ہے؟ شہر---------- ضلع----------

ٹرک کے چلنے کے خرچوں کی تفصیل

1. ٹرک کے ٹائر کب تبدیل کیے جاتے ہیں؟ ہر-------- کلو میٹر بعد ، ہر---------- مہینے بعد
2. ٹائروں کے اخراجات: سے ---------- روپے ، استعمال شدہ ---------- روپے
3. عام دیکھ بھال: ہر---------- کلو میٹر بعد ، ہر 15 دن بعد ، ہر مہینے
4. عام دیکھ بھال کے اخراجات (روپے میں): ---------- روپے
5. تخمینے سے بتائیں کہ ٹرک کتنا چلتا ہے (کلو میٹر میں): ---------- کلو میٹر ماہانہ
6. ایندھن کے اخراجات کا تخمینہ: ---------- روپے ماہانہ
7. آمدن کا تخمینہ بتائیں: ---------- روپے ماہانہ ----------روپے روزانہ
8. ٹول ٹیکس کا تخمینہ بتائیں: ---------- روپے ماہانہ ، ---------- روپے سالانہ
9. دیگر ٹیکس کا تخمینہ بتائیں: ---------- روپے ماہانہ ، ---------- روپے سالانہ

تبصرے / جوابات

I. ذرائع نقل و حمل چلانے والوں اور مالکان کے اہم ترین مسائل کون سے ہیں؟

II. کیا آپ تھرڈ پارٹی انشورنس کے نظام سے مطمئن ہیں؟

III. ذرائع نقل و حمل کو زیادہ مستعدی سے چلانے کے راستے میں کیا رکاوٹیں حائل ہیں؟

جز2: انفارمیشن ٹیکنالوجی (آئی ٹی) سے مطابقت و موافقت

براہ کرم مندرجہ ذیل سوالات کے جواب دیں۔ اپنے درست جواب کے آگے دیے گئے خانے میں ٹک مارک (✔) لگائیں۔

1	کمپنی کس قسم کے سامان کی باربرداری کے لیے مخصوص ہے؟ i. ہر قسم کا کارگو [ ] ii. تعمیراتی سامان (سیمنٹ، ریت، سریا وغیرہ) [ ] iii. پٹرولیم کی اشیاء [ ] iv. کوئلہ [ ] v. گندم [ ] vi. دیگر (براہ کرم وضاحت کریں) ----------	
2	کیا درج ذیل آئی ٹی کے آلات آپ کی کمپنی کے زیر استعمال ہیں (یا استعمال کا منصوبہ ہے)؟ براہ کرم ٹک (✔) لگا کر نشان دہی کریں۔	

سیریل نمبر	آئی ٹی کے آلات	زیر استعمال	موجودہ وقت میں زیر منصوبہ و تشکیل	استعمال کا کوئی منصوبہ نہیں
i.	انٹرنیٹ، مثلاً کمپنی کی ویب سائٹ وغیرہ			
ii.	منتقلی رقوم بذریعہ الیکٹرانک (مثلاً آن لائن بینک ترسیلات، ایزی پیسہ، وغیرہ)			
iii.	ای میل			
iv.	گاڑی کا ٹریکنگ کا سسٹم			
v.	بار کوڈنگ			
vi.	انٹرانیٹ			
vii.	انٹرپرائزریسورس پلاننگ، ای آر پی (مثلاً اکاؤنٹ مینیجمنٹ، ویئر ہاؤس مینیجمنٹ وغیرہ)			
viii.	ڈیجیٹل مارکیٹنگ			

جز3: آئی ٹی اپنانے کے ظاہری فوائد

پاکستان کی باربرداری کی صنعت کو آئی ٹی اپنانے اور اس کے استعمال سے ہونے والے کچھ فوائد درج ذیل میں بیان کیے گئے ہیں۔
جس حد تک آپ نیچے دیے گئے کسی بیانیے سے متفق ہیں، براہ کرم اس حد تک اس کی درجہ بندی کریں۔
براہ کرم یہ نوٹ کر لیں کہ 1="یہ فائدہ نہیں" اور 5="اہم فائدہ"

ظاہری فوائد	مکمل غیر متفق یہ فائدہ نہیں (1)	غیر متفق (2)	غیر جانب دار ممکنہ فائدہ (3)	متفق (4)	مکمل متفق اہم فائدہ (5)
1. فوری جواب اور معلومات تک رسائی ہوتی ہے	0	0	0	0	0
2. افرادی قوت کا کم استعمال ہوتا ہے	0	0	0	0	0
3. معلومات پر مبنی فیصلہ سازی میں مدد دیتی ہے	0	0	0	0	0
4. کاغذ کا استعمال کم ہوتا ہے	0	0	0	0	0
5. غلطیوں کی گنجائش کم ہوتی ہے	0	0	0	0	0
6. گاہکوں کی خدمات بہتر ہوتی ہیں	0	0	0	0	0
7. مسابقت میں بہتری لاتی ہے	0	0	0	0	0

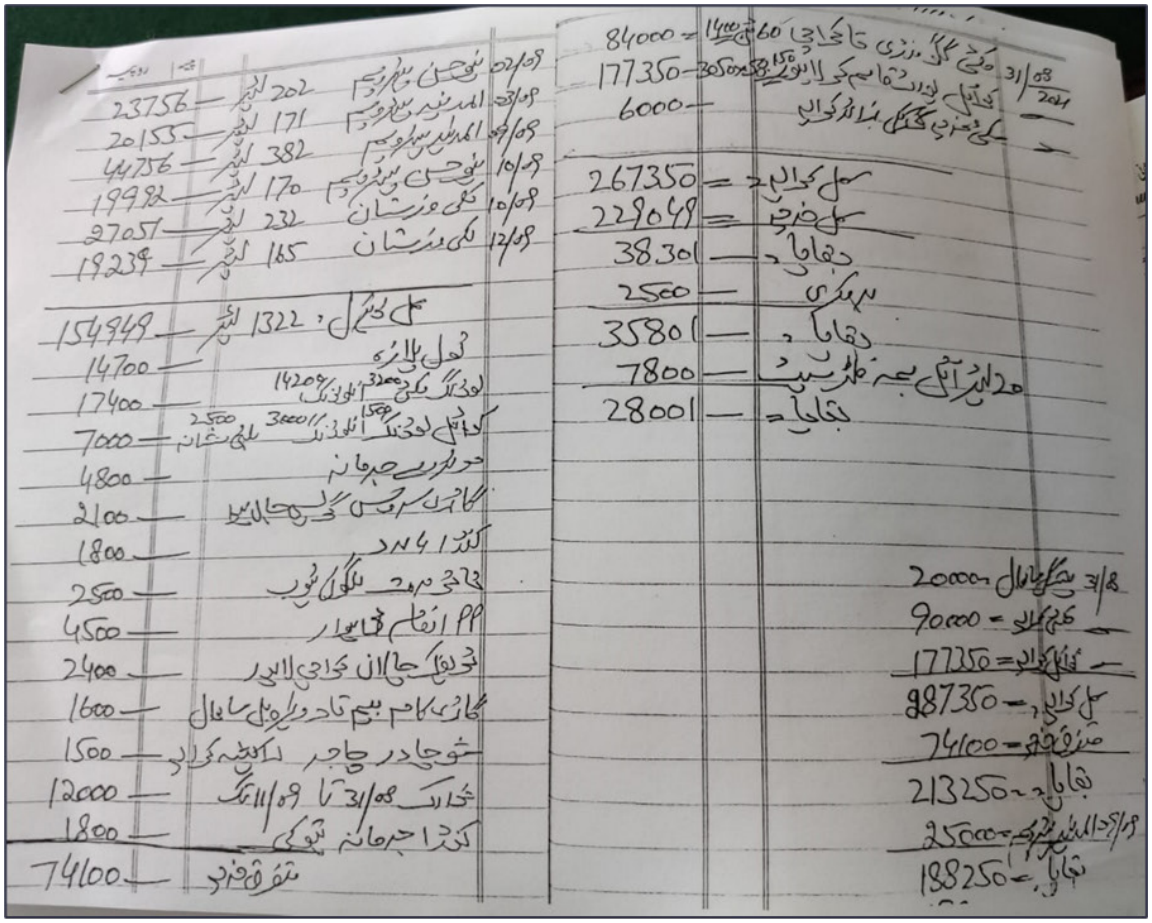
جز4: آئی ٹی اپنانے میں ظاہری رکاوٹیں

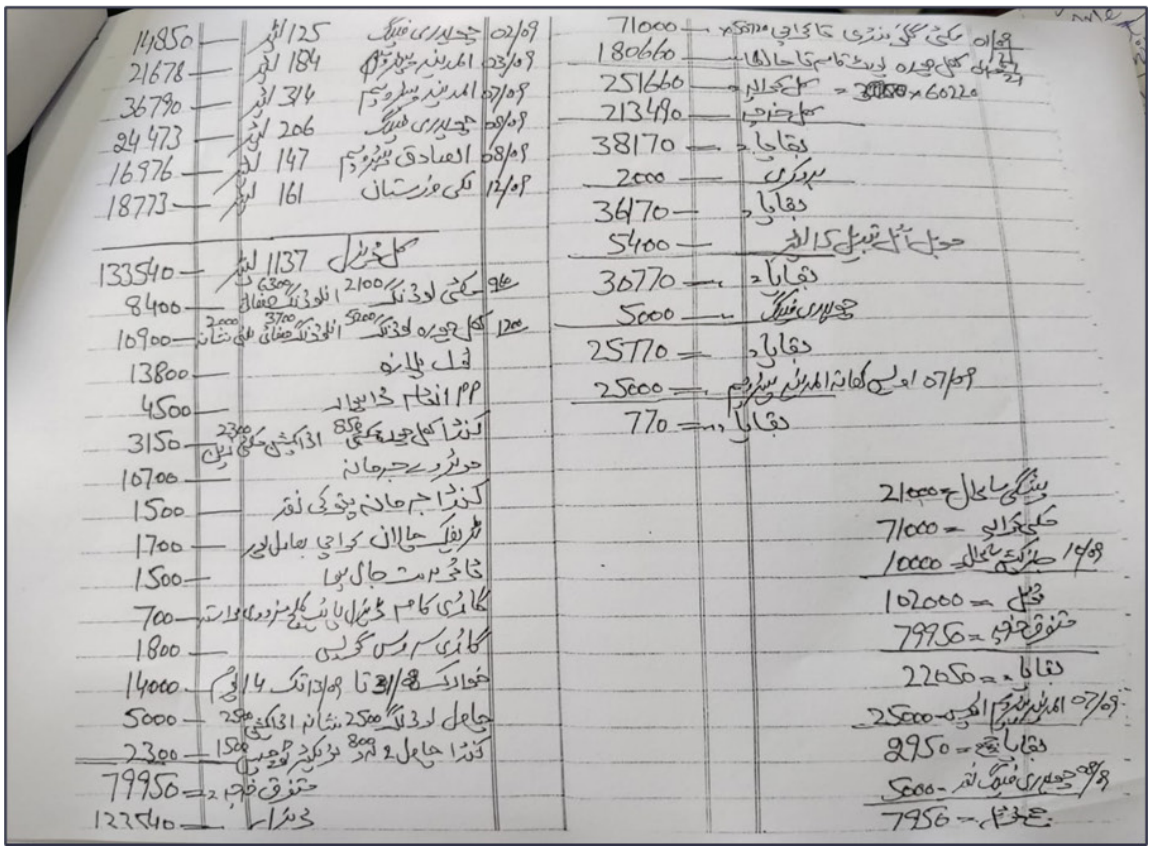
پاکستان کی باربرداری کی صنعت کو آئی ٹی اپنانے اور اس کے استعمال سے متعلق کچھ ظاہری رکاوٹیں درج ذیل میں بیان کی گئی ہیں۔
جس حد تک آپ نیچے دیے گئے کسی بیانیے سے متفق ہیں، براہ کرم اس حد تک اس کی درجہ بندی کریں۔
براہ کرم یہ نوٹ کر لیں کہ 1="یہ رکاوٹ نہیں" اور 5="اہم رکاوٹ"

ظاہری رکاوٹ	مکمل غیر متفق یہ رکاوٹ نہیں (1)	غیر متفق (2)	غیر جانب دار ممکنہ رکاوٹ (3)	متفق (4)	مکمل متفق اہم رکاوٹ (5)
1. آئی ٹی میں مہارت یا مہارتوں کی کمی	0	0	0	0	0
2. سسٹم کے نفاذ کے بارے میں ملازمین میں معلومات کی کمی	0	0	0	0	0
3. ادارے کی ثقافت میں تبدیلی میں مشکلات	0	0	0	0	0
4. ناکافی مالیاتی وسائل	0	0	0	0	0
5. کاغذی کام بہت ہوتا ہے، جسے کمپیوٹرائز کرنے میں مشکل ہوتی ہے	0	0	0	0	0
6. اسے کسی قسم کا کوئی فائدہ مانا ہی نہیں جاتا	0	0	0	0	0

APPENDIX III

Load, Tariff, & Revenue Data from Drivers' Diaries





APPENDIX IV

Additional Tables to Main Text

Surveyed Trucks: Model and Make Spectrum

Year	Bedford	Hino	Isuzu	Mercedes	Nissan	Others	Total
1964	2	-	-	-	-	-	2
1965	3	2	-	-	-	-	5
1967	1	-	-	-	-	-	1
1968	-	2	-	-	-	-	2
1969	5	-	-	-	-	-	5
1970	7	-	1	-	-	4	12
1971	1	1	-	-	-	-	2
1972	7	1	1	-	6	-	15
1973	5	-	-	-	-	-	5
1974	4	1	-	-	-	-	5
1975	9	3	-	-	-	-	12
1976	8	2	-	-	-	-	10
1977	6	-	1	-	-	-	7
1978	18	4	-	-	-	-	22
1979	29	2	-	1	1	1	34
1980	33	9	1	-	2	3	48
1981	5	1	1	-	1	-	8
1982	36	11	-	-	2	2	51
1983	6	5	1	-	-	-	12
1984	19	3	-	-	2	1	25
1985	11	14	-	1	4	6	36
1986	10	5	-	-	3	5	23
1987	19	21	-	-	3	4	47
1988	18	8	-	1	4	4	35
1989	13	18	2	1	5	6	45
1990	30	33	5	1	10	6	85
1991	7	18	2	-	2	7	36
1992	8	50	2	2	10	6	78
1993	-	33	1	-	13	1	48
1994	1	18	1	2	2	2	26
1995	17	55	1	3	9	9	94
1996	5	36	5	2	12	3	63
1997	3	37	2	3	7	3	55
1998	11	69	1	-	12	6	99
1999	2	21	-	-	6	2	31
2000	5	46	5	-	15	6	77
2001	23	128	9	3	16	7	186
2002	6	38	1	1	14	6	66
2003	5	23	4	-	15	1	48
2004	10	64	7	1	22	2	106
2005	5	27	1	-	10	6	49
2006	16	49	4	-	18	11	98

Year	Bedford	Hino	Isuzu	Mercedes	Nissan	Others	Total
2007	8	57	3	1	12	10	91
2008	8	58	7	1	14	8	96
2009	11	47	8	1	13	9	89
2010	30	83	8	-	45	16	182
2011	12	133	7	1	34	3	190
2012	12	77	4	-	23	3	119
2013	8	69	1	-	14	6	98
2014	23	81	6	3	36	9	158
2015	8	45	2	-	21	8	84
2016	27	89	9	-	44	13	182
2017	16	15	5	1	23	10	70
2018	8	29	6	-	10	10	63
2019	14	8	3	-	3	4	32
2020	-	3	-	-	2	-	5
N/A	21	34	4	-	11	39	109
TOTAL	**635**	**1,686**	**132**	**30**	**531**	**268**	**3,282**

Surveyed Trucks: Model and Axle Configuration Spectrum

Description	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Total
1964	2	-	-	-	-	2
1965	3	2	-	-	-	5
1967	1	-	-	-	-	1
1968	-	2	-	-	-	2
1969	5	-	-	-	-	5
1970	10	1	1	-	-	12
1971	1	1	-	-	-	2
1972	10	3	2	-	-	15
1973	4	1	-	-	-	5
1974	5	-	-	-	-	5
1975	11	-	1	-	-	12
1976	9	-	1	-	-	10
1977	7	-	-	-	-	7
1978	19	2	1	-	-	22
1979	29	2	1	2	-	34
1980	32	7	6	1	2	48
1981	7	-	1	-	-	8
1982	40	8	3	-	-	51
1983	9	3	-	-	-	12
1984	17	8	-	-	-	25
1985	22	9	3	1	1	36
1986	12	5	3	2	1	23
1987	30	10	3	2	2	47
1988	20	9	3	2	1	35
1989	25	11	3	3	3	45
1990	37	24	14	6	4	85
1991	18	12	3	3	-	36
1992	38	23	7	6	4	78
1993	22	14	8	1	3	48
1994	8	8	4	3	3	26
1995	36	34	8	6	10	94
1996	17	21	16	6	3	63
1997	15	20	14	1	5	55
1998	25	33	26	8	7	99
1999	12	13	5	-	1	31
2000	13	28	24	5	7	77
2001	44	78	37	11	16	186
2002	16	24	19	3	4	66
2003	15	17	7	6	3	48
2004	21	36	28	8	13	106
2005	7	17	8	14	3	49
2006	19	41	14	13	11	98

Description	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Total
2007	21	33	17	7	13	91
2008	21	39	16	3	17	96
2009	21	27	16	6	19	89
2010	50	66	28	14	24	182
2011	26	86	36	18	24	190
2012	21	54	15	12	17	119
2013	24	40	15	8	11	98
2014	39	61	27	7	24	158
2015	18	34	9	4	19	84
2016	39	62	39	16	26	182
2017	23	24	8	4	11	70
2018	18	23	5	4	13	63
2019	9	12	3	-	8	32
2020	2	3	-	-	-	5
N/A	37	47	12	4	9	109
TOTAL	**1,062**	**1,138**	**520**	**220**	**342**	**3,282**

Surveyed Trucks: Make, Vehicle Alterations, and Axle Configuration Spectrum

Description	Chassis	Engine	Extra Axle Added	Total
Bedford				
2-Axle	2	18	30	**50**
3-Axle	-	6	6	**12**
4-Axle	-	-	5	**5**
5-Axle	-	1	-	**1**
Hino				
2-Axle	1	59	17	**77**
3-Axle	3	72	29	**104**
4-Axle	-	42	13	**55**
5-Axle	-	20	8	**28**
6-Axle	-	19	-	**19**
Isuzu				
2-Axle	-	1	1	**2**
3-Axle	-	-	5	**5**
4-Axle	-	-	5	**5**
5-Axle	-	-	1	**1**
Mercedes				
2-Axle	-	1	-	**1**
4-Axle	-	-	1	**1**
Nissan				
2-Axle	1	11	3	**15**
3-Axle	-	19	9	**28**
4-Axle	-	5	11	**16**
5-Axle	-	2	-	**2**
6-Axle	-	7	-	**7**
Others				
2-Axle	2	2	2	**6**
3-Axle	-	3	3	**6**
TOTAL	**9**	**288**	**149**	**446**

APPENDIX V

Data Methodology and Reliability

Data Methodology and Reliability

1. Data Selection

The final database is composed of 192 observations along 4 routes in the country. The selected corridors were chosen in terms of data reliability, route importance in terms of trade volume, and a significant number of observations available. Outliers have been excluded from the database.[1] In data selection few assumptions (mentioned below) were taken while preserving the original answers from the survey.

2. Variable Description

2.a. Transport Prices

2.a.i. Inputs

Distance: Distance measured in kilometers. Source: Distance charts available in the countries.

Payload utilization: Yearly mileage on empty haul for the route *i* / Yearly mileage (*i* = 1;2;3;4; or 5 for trucking companies and *i* = 1 for truckers). Variable measured in kilometers.

Turnarounds: Number of turnarounds per year for a truck dedicated to this route.

Yearly Mileage: Turnarounds * Distance. Variable measured in kilometers.

Average load: Average load in tons from origin to destination (base value for the return trip).

Price per trip:

If [unit = Tons] [Price per unit * Average load] If [unit = Container] [Price per unit]
If [unit = Liters] [Price per unit * Average load * 1000]
If [unit = Kilometers] [Price per unit * Average load * Distance] Else [Price per unit * Average load * Distance]

Price per trip is measured originally in local currency for a standard load (container of truckload).

Assumption: Because of the lack of information about when the truck is empty, we assume that:

If [Average route Price per trip to go >= Average route Price per trip return] [Price per trip = Price per trip to go]

Else [Price per trip = Price per trip return]

Principal product: Principal product transported[2] categorical variable. *Assumption*: Because of the lack of information about when the truck is empty, we assume that

If [Average route Price per trip to go >= Average route Price per trip return] [Principal product transported = Principal product transported to go]

Else [Principal product transported = Principal product transported return]

2.a.ii. Outputs

Yearly revenue: Yearly revenue to go + Yearly revenue return. Revenue is measured in terms of full truckload equivalents.

Given the lack of information about when the truck is empty, we assume that if price discrepancies exist between the price to go and the price return, the truck is going full loaded one way and partly loaded the other way.[3] Therefore, payload utilization impact is attributed to the least profitable way, using the following formulas:

Yearly revenue to go:

If [Price per trip to go > Price per trip return] [Price per trip to go *Turnarounds]
If [Price per trip to go = Price per trip return] [Price per trip to go *Turnarounds * Payload utilization]
If [Price per trip to go < Price per trip return] [Price per trip to go *Turnarounds * (Payload utilization)* 2]

Yearly revenue return:

If [Price per trip to go < Price per trip return] [Price per trip to go *Turnarounds]
If [Price per trip to go = Price per trip return] [Price per trip to go *Turnarounds * Payload utilization]
If [Price per trip to go > Price per trip return] [Price per trip return *Turnarounds * (Payload utilization–0.5) * 2]

2.b. Transport Costs

Fleet: New vehicles + Secondhand vehicles

Age: New vehicles * Average age of new vehicles + Secondhand vehicles * Average age of secondhand vehicles] / Fleet

2.b.i. ***Fixed costs*** per day are the sum of staff costs, license costs, overhead costs, insurance costs, communication costs, security costs, losses, financial costs, and depreciation costs. All fixed costs are calculated as an average for a truck owned by the company (that is, Total costs divided by Fleet) and per calendar day (divided by 365). The original values are in local currency and were converted into current U.S. dollars using IMF exchange rates.

Staff: Cost of labor, including wages, salaries, bonuses, and social payments / Fleet

License: Cost of licenses / Fleet

Overhead: Overhead costs, including rental of land/buildings, equipment, and furniture and excluding all the other fixed costs / Fleet

Insurance: Insurance cost / Fleet

Communication: Cost of communication / Fleet

Security:

If [The establishment paid for security = Yes] [Total annual security cost / Fleet] or [Annual cost as percentage of total sales * Total sales / Fleet]
Else [0]

Losses:

If [The establishment experienced losses as a result of road accidents or theft and robbery = Yes] [Total annual losses / Fleet] or [Percentage of total sales * Total sales / Fleet]
Else [0]

Finance: Interest rates provided by the survey respondents are supposed to be actual annual percentage rates (APR) for truck purchases. Companies that do not have access to bank loans to finance their trucks (cash financing) are supposed to bear no financial costs.

If [Percentage of recent purchases financed by bank loan is all blank] [0] (i.e., the establishment has not bought trucks in the last 3 years and has therefore no bank loan to repay)

If [Percentage of recent purchases financed by bank loan is all null] [0] (i.e., the establishment does not finance its fixed assets through bank loans)

Else, [Percentage of bank loan finance purchase/100 * Interest rate/100 * Purchase price of the truck]

Depreciation: All companies bear depreciation costs. These costs are, however, inversely proportionate to the number of years of use and are therefore almost null for companies that use their truck for a large number of years. Some companies do not fully depreciate their new trucks and secondhand trucks and keep a good resale value. We have modeled the resale value drop of an average new truck owned by the establishment by the following formula:

Drop new = minimum(logarithm(Years of use / 4 * (exponential (0,5)–1)+1);1) and the resale value drop of an average secondhand truck owned by the establishment by the formula value:

Drop secondhand = minimum(logarithm(Years of use / 5 * (exponential (0,5)–1)+1);1).

The main assumption here is the logarithmic drop off the truck resale value, with an estimated residual value of 50 percent reached after 4 years for new trucks and 5 years for secondhand trucks. After 11 years and 14 years, respectively, for new and secondhand trucks, the residual value would be null. The periods have been extrapolated from local interviews of transport companies. As for the purchase value, we use the value provided by the person interviewed or a default value when data were not provided. We differentiated between years of use on the road for new trucks and years of use on the road for secondhand trucks.

Depreciation costs = (Depreciation costs new + Depreciation costs secondhand) / Fleet

If [New vehicles > 0] [Depreciation costs new = New truck purchase value * New vehicles * minimum[Drop new; 100 percent] / Years of use]

Else [0]

If [Secondhand vehicles > 0] [Depreciation costs secondhand = Secondhand truck purchase value * Secondhand vehicles * minimum [Drop secondhand; 100 percent] / Years of use]

Else [0]

2.b.ii. ***Variable costs*** per kilometer are the sum of fuel costs, tire costs, maintenance costs, and bribes. Variable costs are route specific (i = 1; 2; 3; 4; or 5). Survey data, however, do not relate variable costs to routes traveled (except for bribes), and we assume that fuel and tire consumption and maintenance costs are uniform within the company fleet. The original values are in local currency and were converted into current U.S. dollars using IMF exchange rates.

Fuel: Companies have provided the average fuel consumption of light-weight, mediumweight, and heavyweight trucks. The tonnage ranges used in the questionnaire are, respectively, 0–5 tons for lightweight, 5–7 tons for medium weight, and 7+ for the heavyweight. However, feedback from interviewers has encouraged us to use different ranges: 0–10 tons, 10–20 tons, and 20–30 tons, respectively, because these are more representative of actual loads.

The unit fuel cost (LCU per liter) has been derived from "International Fuel Prices (2007), 5th edition data preview, GTZ (2006 values) using the IMF-IFS exchange rates (Q4 2006). We have used the super gasoline price (3 to 10 percent higher than the diesel price in the countries selected) as an estimate of the fuel plus lubricant unit cost (no relevant source of lubricant cost available).

For trucking companies, fuel cost per km is:

If [Actual load <= 10] [Fuel consumption light weight/100 * Unit fuel cost]
If [10 > Actual load >= 20] [Fuel consumption medium weight/100 * Unit fuel cost]
If [Actual load > 20] [Fuel consumption heavy weight/100 * Unit fuel cost]

For truckers, fuel cost per km is calculated using the same formula as for trucking companies but using systematically the default value for fuel consumption because average consumption data is not available.

Tires: The questionnaire provides us with extensive data on the companies, and truckers' new tires, secondhand tires, and retread tire consumption. The unit tire cost is not always provided, and the category average in the country is used as the default value. We assume that trucks use an average of 12 tires and the distribution of new, secondhand, and retread tires is homogeneous in the establishment's truck fleet.

Tire cost per km= 12 * [percentage of new * Cost of New / Life of new + percentage of secondhand * Cost of secondhand / Life of secondhand + percentage of retread * Cost of Retread / Life of retread]. Where unit cost or average life in km was not provided, we used the default value.

Maintenance: Annual maintenance costs per km are provided by trucking companies for each truck category:

For the trucking industry Maintenance = Annual maintenance costs (or default value) / Yearly mileage

For truckers, Maintenance = Cost of servicing, repairs, spare parts, excluding fuel tires and lubricants / (Fleet * Yearly mileage). We assume yearly mileage is homogeneous within the same truckers' fleet.

Bribes: Bribe paid on the selected route / Distance

2.b.iii. Fixed–variable cost ratio:

[(Fixed Cost per day * 365/ Turnarounds) / (Fixed Cost per day * 365 / Turnarounds + Variable cost per km * 2 * Distance] percent -

[(Variable cost per km * 2 * Distance) / (Fixed Cost per day * 365 / Turnarounds + Variable cost per km * 2 * Distance] percent

Note about default value. When data were not available, we calculated a default value as the average of available data on that variable.

Note about the sources. With the exception of Distance, Unit fuel cost, and exchange rates, all the data are coming from the trucking survey.

2.c. Profitability

Profit margin per turnaround:

(Yearly revenue / Turnarounds) / (2 * Variable costs * Distance + Fixed costs * 365 / Turnarounds) – 1

2.d. Quality Indexes

2.d.i. ***Transport quality:*** This infrastructure quality index by country has been calculated as a weighted average of other indexes using the following weights:

Parameters	*Weighting coefficients*
Education	2
Experience	1
Domestic competition	2
Contracts	2
Tracking system	1
Fleet	1
Age	3
Number of employees	1

Education: Weighted average[4] of the highest level of education of the top manager.

Experience: Average of years of managerial experience working in this sector as the top manager.

Domestic competition: Weighted average[5] of the importance of the pressure from domestic transporters on reducing operating costs of existing transport services or expanding services.

Contracts: Average of the percentage of all the freight business obtained through contracts with clients.

Tracking system: Percentage of companies with a communication tracking system.

Number of employees: Average amount of full-time employees including managers, truck drivers, and mechanics (service/repair).

Note about the transport quality index. All fields have been normalized between 0 and 1. The index is calculated considering absolute averages for education, experience, domestic competition, and contracts; and relative indices with respect to the country's maximum value as a reference for the tracking system, fleet age, and a number of employees.

Note about the source. The data come from the trucking survey.

2.d.ii. ***Negotiation power:*** Average of the sum of the percentage of all the freight businesses for which price is determined by negotiating with clients. Freight business could be obtained by independent freight agents, through public-private institutions in charge of freight allocation, by telephone/fax from customers, by trucks waiting at lorry parks, by drivers finding their loads, and through a contract with clients. Index normalized between 0 and 1.

2.d.iii. ***Infrastructure condition:*** This index measures the percentage of the road section in good and fair condition. Index normalized between 0 and 1. *Source*: NHA.

APPENDIX VI

Snapshots of Site Visits

Drivers' interviews at local workshop

Drivers' interviews at Roadside locations

Drivers' interviews at local truck hotel


ZEERUK