



**THESIS ACCAPTANCE CERTIFICATE**

Certified that final copy of MS thesis Title **An Exploratory Study to Propose Enhanced Framework for Axle Load Management System in Pakistan** written by **Majid Ayaz**, Registration No. **NUST 2014 63326 MSCEE 15114E**, of NIT/SCEE has been vetted by undersigned, found complete in all respects as per NUST Statues / Regulations, is free of plagiarism, errors, and mistakes and is accepted as partial fulfillment for award of MS degree. It is further certified that necessary amendments as pointed out by GEC members of the scholar have been incorporated in the said thesis.

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***Dedication***

*To my mother, wife and lovely children Tehreem Fatima and Muhammad Abdullah*

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**LIST OF ABBREVIATIONS & ACRONYMS**

ACE	Associate Consulting Engineers
AASHTO	American Association of State Highway and Transportation Officials
OL	Over Load
WS	Weigh Station
DPHW	Department of Public Highway and Works
DFT	Department for Transport
ESAL	Equivalent Single Axle Load
ESP	Economic Survey of Pakistan
FHWA	Federal Highway Administration Authority
GDP	Gross Domestic Product
GOP	Government of Pakistan
GVW	Gross Vehicle Weight
HGV	Heavy Goods Vehicles
LCV	Longer Combination Vehicles
MOC	Ministry of Communication
MPDC	Marginal Pavement Damage Cost
MR&R	Maintenance, Rehabilitation and Reconstruction
MOI	Ministry of Industries



## **ABSTRACT**

A remarkable growth in infrastructure development is witnessed after start of China Pakistan Economic corridor (CPEC) development. Trade volumes have grown to meet the ever increasing population demands. The overloading of trucks increasingly continues to destroy the highways, motorways and roads. The ‘transport sector’ has, not been able to change from its primitive character that it is guarding traditionally and continuously. This primitive structure has thus resorted to overloading as the only alternative to stay afloat in the transport market. While there has been no substantial support from the government in assisting change / improvement, the curse of overloading continues to perpetuate the destruction of the road infrastructure. Compounded by the ill effects of the ever growing socio-economic imbalance caused by spiraling fuel prices, it is unlikely to witness a break in the overloading-destruction-rehabilitation cycle until radical effective implementable measures are immediately launched.

The maintenance and rehabilitation bill continues to touch staggering proportions. NHA over the last decade has incessantly tried to address the overloading problem through legislation, setting up of weigh stations, stakeholders’ interaction etc, but failed.

The background of the study rests in the country-wide habit of overloading road vehicles with the effect of damage to the roads, a multitude of lethal accidents, unregulated transport conditions with absence of insurance coverage and specifically an enormous and increasing budget for the repair and rehabilitation of the road network of Pakistan. Transport sector accounts for 10% of Pakistan GDP.

Foregoing above a deliberate effort was made to explore the causes of over loading.

A survey based study was done to explore the stakeholders' perceptions about the issues of overloading so as to formulate a framework for the axle load management regime for Pakistan. The framework developed in this study can be used by stakeholders for the formulation of effective axle load management regime for Pakistan

# **1. INTRODUCTION**

## **1.1 BACKGROUND**

Value chain is everything that needs to happen to a product within a company that adds value to it. That might include design, procurement, manufacturing and any services on or related to the product. Supply value chain brings together the supply and demand sides of supply chain planning.

The philosophy of JIT can be traced back to Henry Ford, but formalized JIT originated in Japan as the Toyota Production System. W. Edwards Deming's lesson of variability reduction was a huge influence. The focus of JIT is to improve the system of production by eliminating all forms of 'WASTE'. So in this era of throat cutting competition, the value grabbed by the businesses which encounters minimum losses.

The China Pakistan Economic Corridor (hereafter; CPEC) being a game changer in the world business is mainly because of its influence of affecting the global trade by reducing the transportation time and distance for the commodity transportation. CPEC or One Belt One Road (hereafter; OBOR) will result in a 20% cost reduction of items globally.

Having said this, the traffic volume on the existing transportation road infrastructure is to increase many fold, to support the new world biz régimes the corridor is expected to support not only China but also the land locked CAR (Central Asian Republic states).

This ‘game changer’ is going to bring a new perspective to the world economics and politics.

Considering the potentially advantageous geographical location of Pakistan, China has always been eager to have strong ties with Pakistan to promote its trade. The idea of developing CPEC was visualized by Chinese Premier Li Keqiang during his visit to Pakistan on May 2013. It was formalized to a proper shape during the visit of Chinese President Xi Jinping in 2015. The proposed economic corridor will connect the northwestern Chinese province of ‘Xinjiang’ with the Pakistani port of ‘Gwadar’ through a network of roads measuring around 3000 kms (1,800 miles), providing Pakistan its much needed economic Infrastructure.

The effect of axle loading and, in particular of over loaded vehicles, on the requirement for the road maintenance is considerable. For example, a 10 ton axle causes about 2.5 times as much deterioration to pavement as an axle weighing 8 Ton. It is clearly necessary, for road maintenance purposes to know the value of the actual axle loading, since minor underestimation can shorten the expected life of pavement.

National Highway Authority (hereafter; NHA) is implementing ‘Axle Overload Control Regime’ in accordance with National Highway Safety Ordinance-2000 (hereafter; NHSO-2000) to control premature deterioration of National Highways caused by heavy overload traffic. NHA intends to control overloading to protect the National Highways and simultaneously ensure even competition among players in the transport industry. To achieve this goal, automated Weigh Stations (hereafter; WS) have been established at various points on the National Highway Network.

Previous research has shown that increasing the overloading of trucks and the absence of Pakistan. This has ultimately led to increase in maintenance budgets, which has been an

issue of concern for transport planners in Pakistan. Moreover, the comparison between truck axle load regulations in Pakistan with selected countries have uncovered that higher limits of truck axle loads are implemented in Pakistan in spite of the operation of outdated trucks. A review of axle load management (hereafter; ALM) regime by NHA revealed that serious measures have been taken to reduce the overloading practice by NH&MP (hereafter; National Highways and motorways Police). However, the implementation of this regime has been discontinued due to political pressures developed by transporters.

With the initiation of OBOR program, it is expected that the local transport infrastructure and industry will not be able to cope up with the challenge of increase in demand.

Hence, it is essential to update and enforce the ALM regulations in accordance with the international standards.

Moreover, infrastructure development is an issue to be considered for fully utilizing the benefits of CPEC for the national economy.

## **1.2 PROBLEM STATEMENT**

Pakistan's highways are the source of most of her productivity with majority of the business and development being done via routes on either the National Highway network or the Motorway network of roads. On such roads, rutting has been one of the most critical sources of failure among flexible pavements due to violation of axle load restrictions, high tire pressure and exceeding the weight limit. The result is the poor state of pavements that we see today on most of our highways. These distresses not only cause discomfort but also contribute to the amount of accidents that happen on these roads

annually. Therefore, an understanding can be made that a poor road condition affects the quality of life of the people.

The more detrimental effect of overloading is that the highway money that could have been utilized for constructing more kilometers of new roads or maintaining a larger length of the existing highways gets spent in providing thicker pavements in the first instance followed by premature rehabilitation of pavement, moreover the Overloaded vehicles tend to get involved in accidents more frequently.

The costs of transportation have been increasing continuously. Due to all round increase in prices and costs of spares etc. To meet the rising costs and still make the business profitable the truckers resort to overloading. With overloaded trucks, lesser number of trips are needed to carry the material to the destination, saving on number of trips and thereby on fuel. Overloading is therefore done primarily to save on fuel and thereby increase the profitability of the business. It is the accelerated deterioration of pavements, monetary effects on the highway budgets and the increased rates of accidents involving overloaded vehicles that call for concerted efforts in controlling overloading on roads. However, with the current method of weighing and the fine structure, there is no articulate link between the amount of damage a truck does and the fine it has to pay for it. This has led to many truck drivers utilizing this loophole in having done consequent damage to the pavement without the proper or equivalent damage fine being paid. Therefore, a more coherent axle load management system is required to be in place in the backdrop of the overarching exponential demand in the road infrastructure usage.

### **1.3 RESEARCH OBJECTIVES**

The focus of this study is on the development of effective, updated and internationally compatible axle over load control management system for Pakistan. The following objectives are targeted in order to achieve this goal.

- a. Highlighting the flaws in the effectiveness of axle load management system in Pakistan by studying and analyzing the existing system, rules, regulations, laws and policies developed over the years.
- b. To analyze the state of current and modern best practices in ‘axle load management system’ in the developed countries in order to select / shortlist positive and viable / practically possible aspects of various foreign practices in axle load management for inclusion / improvement of axle load management system In Pakistan.
- c. To study and analyze existing axle load management system in Pakistan with respect to the flaws and improvement options through surveys, interviews and observations through site visits.
- d. To proffer framework for an enhanced axle load management system for Pakistan.

### **1.4 RESEARCH METHODOLOGY**

The processes involved in achieving the said objectives to the problems mentioned earlier sum up to form the methodology of our work.

- a. A systematic review of literature of the past research on axle regime was done.
- b. Then experts and working professionals in the field were interviewed leading to clarity in the understanding of the issue in hand and the formulation of the

research questions (RQ) emerging from the objective of the study. The RQs were further expended into survey questions both open ended and likert scale and the survey form were induced to collect the desired information.

- c. Simultaneously collection and collation of data from different government organizations and institutions.
- d. After data collection, a comprehensive quantitative and qualitative analysis of the data was done by transforming the raw data into pivot tables, bar charts and percentages.
- e. In the end summary of the research findings, recommendations and direction for the future research.

A more detailed explanation of the entire phase is done in Chapter 3.

## **1.5 SCOPE OF STUDY**

Study encompasses an array of issues related to ALM regime (implementation and enforcement), raised by the ‘management’ (public office bearers and regulator) and the ‘users’ (shareholders from transport sector). Without incorporating the perspective of all stake holders no conclusive framework can be reached therefore, study absorbs the perspective of all tiers. The applicability of the finding and recommendations is not only restricted to Pakistan but to the countries and regions with similar socioeconomic and regulatory environment.

## **1.6 LIMITATIONS OF THE STUDY**

This study has a few limitations like any other study. Main limitations includes: (1) sample size (out of above 500 survey questionnaires only 225 were returned filled), (2) demography (Punjab and KPK along N-5, M-2 and Islamabad, Rawalpindi, and Taxila



Districts), (3) paucity of resources and time constraint, (4) since ‘user’ segment includes respondent from drivers and workshop owners / mechanics who are often illiterate therefore questionnaire was translated into Urdu and later into English, (5) pavement damage / distresses costs (including pavement rehabilitation, retrofitting, accidents cost) are not estimated.

## **1.7 ORGANIZATION OF THESIS**

The thesis is organized into five chapters; Chapter-1 is introduction, Chapter-2 literature review (i.e., body of knowledge, rules, regulations and the international best practices review). Chapter-3 elaborates the methodology whereas, Chapter-4 contains data analysis and discussion. Chapter-5 is conclusion and recommendations for enhanced frame work for ALM.

**2. LITERATURE REVIEW****2.1 INTRODUCTION**

Overweight traffic is a menace on highways, as they tend to deteriorate the pavements at a faster rate than is considered normal. Key vehicle characteristics are axle configuration and axle load, pavement damage increase exponential with increase in axle load (Lukson and Walton, 2001). Hang, Xie, and He (2013) confirms that exceeding axle and gross vehicular weight limits is a major cause of infrastructure damage and raises risk of road accidents. Similarly a study of South Carolina DOT reported accelerated pavement damage due to overweight vehicles (Chowdhury. et al. 2013) . This traffic is usually deterred in amount by the imposition of fines on overweight loading. But, the fines sometimes are inadequate and unreflective of the damage done to the pavement. Therefore, in the longer run these highways get more damage done to them than is paid for in terms of fine, and as such people are encouraged to pay the inadequate fee amount and pass on with their immensely overweight freights. The existing systems of measurement will be discussed, such as the facilities and the managerial aspects of the entire weight procedure.

**2.2 AASHTO'S GENERALIZED FOURTH POWER LAW**

During the AASHTO Road Tests to study the performance of pavement structures of known thickness under moving loads of known magnitude and frequency, different

findings were made about the relationship between the loads and their effect on the pavement life. This study was carried out in the late 1590's in Ottawa, Illinois, USA. This road test consisted of six two-lane loops and with each lane subjected to repeated loading by a specific vehicle type and weight. The results so obtained were used to develop a pavement design guide. These tests introduced the '*Generalized Fourth Power Law*' which states that damage caused by vehicles is 'related to the 4th power of their axle weight'.

### **2.3 PAVEMENT DAMAGE DUE TO FREIGHT TRAFFIC**

According to an article titled, 'The hidden trucking industry subsidy' published in 2009 on [truecostblog.com](http://truecostblog.com) the figures of damage that overloaded freight trucks do to the pavements are manifold greater than that caused by average vehicles. The report sheds light on the fact that it is deceptively obvious to most people that the heavier the vehicle, the more damage it does to roads over time. However, the relationship is not linear, it one with of the fourth power, as has been elaborated before as the *Generalized Fourth Power Law*. Road damage rises with the fourth power of weight, and this means that a 40,000 pound truck does roughly 10,000 times more damage to roadways than the average passenger car. In other words, one fully loaded 18-wheeler does the same damage to a road as 9600 cars. Furthermore, according to the American Trucking Associations (ATA), the trucking industry represents 11% of all vehicles on the road in the US, while paying 35% of all highway taxes. But if trucks represent 11% of vehicles, their heavy loads cause them to do 99% of all road damage! The trucking industry paid \$35 Billion in highway taxes in 2005, according to the ATA. Since most of the \$100 Billion in highway taxes paid goes to maintenance (and US infrastructure maintenance is far behind), this implies that the trucking industry receives a \$60 Billion annual subsidy from other drivers.

In order to calculate the damage done by trucks versus other vehicles, let's assume that a fully loaded truck does the same damage to the roadway as 9600 cars, as mentioned above.

In that case, then 11%, or  $0.11 * 9600 = 1056$ . This is a measure of total damage done by truck traffic. Meanwhile, car traffic does  $89% * 1$  or 0.89 in damage. So the total damage is  $1056 + 0.89$  or 1056.89, of which 1056, or 99.9%, is done by trucks.

In the Federal Highway Cost Allocation Study done by the Federal Highway Administration, (1997), it was estimated that light single-unit trucks, operating at less than 25,000 pounds, pay 150 percent of their road costs while the heaviest tractor-trailer combination trucks, weighing over 100,000 pounds, pay only 50 percent of their road costs.

This means that the heavy freight industry gets off without paying for the amount of damage they do to the pavements. To cater for this anomaly, the Heavy Vehicle Use Tax (HVUT) was implemented by the Federal Highway Authority. (Heavy vehicle use tax Retrieved September 8, 2016, from Federal Highway Authority: <http://www.fhwa.dot.gov>). Applied annually on heavy vehicles operating on public highways at registered gross weights equal to or exceeding 55,000 pounds. The HVUT is applied as:

**Table 2.1 HVUT Application**

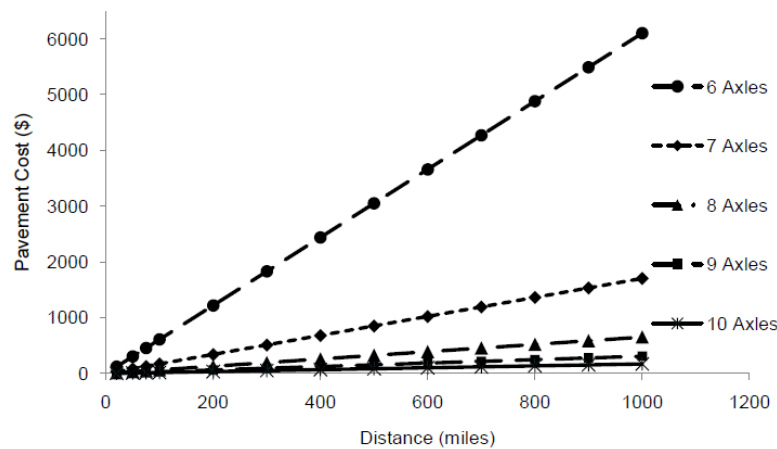
<b>Gross Taxable Weight</b>	<b>Heavy Vehicle Use Tax Rates</b>
Below 55,000 lbs	No tax
55,000-75,000 lbs	\$100 plus \$22 per 1,000 pounds over 55,000 lbs
Over 75,000 lbs	\$550

## **2.4 REPORT ON OVERWEIGHT TRUCK PERMITS IN INDIANA, USA**

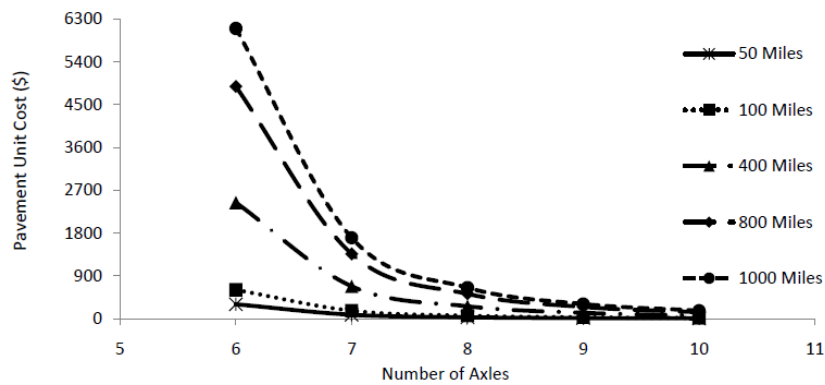
According to report titled ‘A Synthesis of Overweight Truck Permitting’ by Khurshid et al., (2010), the truck permits for overloading freight vehicles needed to be related to the damage done to the pavements by the trucks themselves. This relied heavily on the axles and overweight conditions of these vehicles. It maintained that there was a significant difference in the truck permit fee across different states bordering the state of Indiana. For its findings it stated that the key criterion included: the extents to which size attributes (length, width, height) are in excess of the legal values, distance traveled by the overweight/oversize truck, type of load carried, and axle spacing. The study documented the revenue streams obtained from the permits issued for extra-legal trucking operations: these were found to be approximately \$12 million annually. The report provides nomographs with which INDOT can quantify the increase in pavement damage (and hence repair costs) that can be expected due to additional payload increases for a given axle configuration; and the reduction in pavement damage due to the increase of axles on a truck of a given payload. However, as these relationships between truck load pavement damage costs are based on national level data, there is a need to update these costs using data from Indiana. In the USA, permits have been the bane of the trucking industry as they allow for overloaded trucks to continue operation. Since this is the case with most transportation assets, the need to evaluate a more relevant fee for these permits was necessary. The work introduced new permit fee structure for the state of Indiana based on the pertinent damage done to the highway assets by the overweight trucks that use them. The schemes suggested in the work included certain thresholds as the *Upper Threshold for Legal Weights (UTLW)*, *Upper Threshold for Extra-Legal Weights (UTELW)* and the

*Upper Threshold for Extra-Legal Weights for use of Special Routes.* The study also discussed general observations on the permitting processes, thresholds for legal oversize/overweight permits classification, criteria for fee structures and fee levels, state of practice of the weight-distance fee concept for extra-legal weights and sizes, revenue neutrality of annual permit fee structures, and the practice of delineating special routes for extra-legal vehicles. The report conducted case studies in which it had hypothetical values for trucking data, the first case study shed light on annual blanket permits. The study highlighted the gross differences between the permits expenses generated as per the states surrounding Indiana, i.e. the Midwest.

Among the monographs generated in this study, were ones which were able to predict the pavement cost per distance traveled for different number of axles.



**Figure 2-4: Pavement Cost vs. Truck Miles Travelled for Urban Interstate Highways (0 to 1,000 Miles), 134,000 lb GVW Truck**



**Figure 2-5: Unit Pavement Cost vs. Number of Axles for Urban Interstate Highways (0 to 1,000 Miles), 134,000 lb GVW Truck**

It is clearly understandable by the above relations of monographs, that an increased number of axles for the same distance traveled yields a lower pavement unit cost and similarly, the unit cost increases with distance provided the axle remains the same. Apart from this, it is clearly evident with these monographs that the 6-axle trucks have the highest pavement unit cost and therefore they damage the pavements the most.

## 2.5 NHSO 2000

The National Highway Safety Ordinance 2000 is a set of rules and regulations formulated by the President of the time to provide safe driving experiences on the national highways. This ordinance forms the basis of the transportation industry by defining all the key elements and phenomenon included in the industry. It states the vehicle types and the how they are categorized and therefore, it essentially explains the founding terminology used by our highway systems nationwide. It describes some key expressions for our project including the following:

(iii) “**axle weight**” means in relation to an axle of a motor vehicle the total weight transmitted by the several wheels attached to the axle to the surface whereon the vehicle rests

(xvii) “**gross vehicle weight**” means load of all axles of a goods vehicle transmitted by several wheels attached to all axles to the surface whereon the wheels rest

(xviii) “**heavy transport vehicle**” means a transport vehicle, the registered axle weight of which exceeds *five thousand kilograms*, or the registered laden weight of which exceeds six thousand five hundred kilograms

(xxi) “**laden weight**” means the actual weight of the vehicle as loaded with the crew and passengers and the load carried on it

(xxxv) “**national highway**” means a national highway as defined in the National Highway Authority Act, 1991 (XI 1991); and includes a road declared to be a national highway under the said Act

(xlviii) “**registered laden weight**” means in respect of any vehicle the total weight certified and registered by the *registering authority* as permissible for that vehicle

(lvii) “**single axle weight**” means load of an axle of a goods vehicle transmitted by several wheels attached to that axle to the surface whereon the wheels rest

(lix) “**tandem axle weight**” means load of a twin-axle (two axles center-to-center spaced between forty to forty-eight inches) of a goods vehicle transmitted by the several wheels attached to that twin axle assembly to the surface whereon the wheels rest



(lxiv) “**tridem axle weight**” means the load of a tri-axle (three axles, the outer two axles center-to-center spaced between eighty to ninety-six inches) of a goods vehicle transmitted by the several wheels attached to tri-axle assembly to the surface whereon the wheels rest

(lxvii) “**weigh station**” means stations incorporating static and weigh-in-motion (WIM) devices installed to measure and enforce legal load limits

(lxviii) “**weight**” means the total weight transmitted for the time being by the wheels of a vehicle to the surface on which the vehicle rests

As for the limitations to weighing vehicles and how much if an extent can they be overloaded to, it states in the NHSO:

*75. Offences relating to weights:-*

*Whoever drives a transport vehicle or causes or allows a transport vehicle to be driven on a national highway carrying in excess of fifteen per cent of the permissible load for a goods vehicle as laid down in the Sixth Schedule and in excess of thirty percent of the number of passengers prescribed for a passenger carrier, shall be punished with imprisonment for a term which may extend to one month or with fine which shall not be less than one thousand rupees and may extend to five thousand rupees, or with both.*

## **2.6 ANALYZING EXISTING FRAMEWORK FOR WEIGHING**

We had to not only figure out set up of weighing but also, type of devices and how they worked. With this information at hand we were able to understand how to encounter any overloaded vehicles on its pavements.

### 2.1.1 Types of Weigh Stations

There are currently three types of weighing stations being used on the Highways. Weigh stations perform the task of weighing the heavy vehicles one axle at a time and are therefore mandatory components in running highways as they take most of their damage due to the overloaded haulage of these vehicles

#### a. SSWIM

Slow Speed Weigh-In-Motion: These measure the weight of a vehicle while it is in a relatively slow motion and these are very convenient in their operation. These provide a low cost alternative to traditional static weigh scales. Reduced speed increases the accuracy of the reading, hence the slow speed. All devices on M-1 and most of the weigh devices on M-2 are SSWIM type. A fine example is the LO-TRAC® 300 system by TDC.



**Figure 2.1: A truck using SSWIM (NHA, 2017)**

#### b. Static

Static sensors are those placed on the road at the interchange entry/exit points. These are, as the name implies, stationary and require the vehicle to be immobile at a podium in order for the weight to be measured.



Figure 2.2: A truck using static weight sensor (NHA, 2017)

### c. Mobile Weigh Stations

These are the itinerant weigh stations operated by third party contractors and consist of a moveable arrangement of apparatus with which a vehicle is weighed.
















Figure 2.3: Mobile Weigh Station (NHA, 2017)

#### 2.1.2 Existing Weight Limitations

The details obtained from the NHA includes, values of the existing limits of overloading on truck. Chaudry and Memon (2011) analyzed load limits and the permissible gross weight of the vehicles in tons as promulgated in NHSO-2000.

## PERMISSIBLE LOAD LIMITS AS PER NHSO-2000

SR. NO.	TRUCK TYPE	Permissible Loads (Tons)
1	 2 AXLE (BEDFORD)	17.5
2	 2 AXLE (HINO / NISSAN)	17.5
3	 3 AXLE	27.5
4	 3 AXLE	29.5
5	 4 AXLE	39.5
6	 4 AXLE	39.5
7	 4 AXLE	41.5
8	 5 AXLE	48.5
9	 5 AXLE	49.5
10	 5 AXLE	51.5
11	 5 AXLE	51.5
12	 6 AXLE	58.5
13	 6 AXLE	61.5
<b>FRONT AXLE = 5.50 TONES      REAR AXLE = 12.0 TONES      TENDUM AXLE = 22 TONES</b> <b>TRIDEM AXLE = 32 TONES</b>		

**Figure 2.4: Allowable Load Limits & Truck Configuration in Pakistan (NHA, 2016)**

### 2.1.3 Existing rates of fine

The amount of fines applied on the roads needed to be considered. It showed a rather stern level of flexibility with little variation of loading conditions and inculcated only three loading scenarios for overweight trucks with a specified ceiling load after the three overloading cases. The table below page was obtained from the NHA Head Office at G-9, Islamabad and it details the appropriate fines and ceiling loads of various truck types and

weight categories.

Table 2.2: NHA fine rates & load limits (NHA head office, G-9)

Vehicle Category	Allowed Wight Limit = 17500 KG	Fine Rates (Rs)
2 Ax	17501 KG - 18375 KG	1000/-
	18376 KG - 19250 KG	2500/-
	19251 KG - 20125 KG	5000/-
	<b>Above 20125 KG is NOT ALLOWED</b>	
3 Ax Tandem	<b>Allowed Wight Limit = 27500 KG</b>	
	27501 KG - 28875 KG	1000/-
	28876 KG - 30250 KG	2500/-
	30251 KG - 31625 KG	5000/-
	<b>Above 31625 KG is NOT ALLOWED</b>	
3 A x Single	<b>Allowed Wight Limit = 29500 KG</b>	
	29501 KG - 30975 KG	1000/-
	30976 KG - 32450 KG	2500/-
	32451 KG - 33925 KG	5000/-
	<b>Above 33925 KG is NOT ALLOWED</b>	
4 A x Single – Tandem	<b>Allowed Wight Limit = 39500 KG</b>	
	39501 KG - 41475 KG	1000/-
	41476 KG - 43450 KG	2500/-
	43451 KG - 45425 KG	5000/-
	<b>Above 45425 KG is NOT ALLOWED</b>	
4 A x Single - Single	<b>Allowed Wight Limit = 41500 KG</b>	
	41501 KG - 43575 KG	1000/-
	43576 KG - 45650 KG	2500/-
	45651 KG - 47725 KG	5000/-
	<b>Above 47725 KG is NOT ALLOWED</b>	
5 A x Single - Tridem	<b>Allowed Wight Limit = 48500 KG</b>	
	48501 KG - 50925 KG	1000/-
	50926 KG - 54450 KG	2500/-
	54451 KG - 56925 KG	5000/-
	<b>Above 56925 KG is NOT ALLOWED</b>	
5 A x Tandem - Tandem	<b>Allowed Wight Limit = 49500 KG</b>	
	49501 KG - 51975 KG	1000/-
	51976 KG - 54450 KG	2500/-
	54451 KG - 56925 KG	5000/-
	<b>Above 56925 KG is NOT ALLOWED</b>	
5 A x Single - Single - Tandem	<b>Allowed Wight Limit = 51500 KG</b>	
	51501 KG - 54075 KG	1000/-
	54076 KG - 56650 KG	2500/-
	56651 KG - 59225 KG	5000/-
	<b>Above 59225 KG is NOT ALLOWED</b>	
6 A x Tandem - Tridem	<b>Allowed Wight Limit = 58500 KG</b>	
	58501 KG - 61425 KG	1000/-
	61426 KG - 64350 KG	2500/-
	64351 KG - 67275 KG	5000/-
	<b>Above 67275 KG is NOT ALLOWED</b>	
6 A x Tandem - Single - Tandem	<b>Allowed Wight Limit = 61500 KG</b>	
	61501 KG – 64575 KG	1000/-
	64576 KG - 67650 KG	2500/-
	67651 KG - 70725 KG	5000/-
	<b>Above 70725 KG is NOT ALLOWED</b>	

## **2.7 PDC ESTIMATION – NATIONAL RESEARCH EFFORTS**

Majeed (1982) conducted National Transport Research Center (NTRC) axle load study. The main focus of the study was to evaluate the extent to which the vehicles are overloaded in Pakistan. A survey was carried out across all the main roads in Pakistan and thirty five road segments were selected for this purpose. The vehicle weight data were collected for twenty four hours and three to four times in a year, covering a total of 31,746 commercial trucks

The ESAL for different vehicles were calculated using the legal axle load limits and 4.5 power law. It was observed that 83% of the vehicles exceed the legal limit of 18000 lb. Total ESALs for loaded and empty vehicles were found to be 3.3 and 1.2 respectively.

Associated Consulting Engineers (1988) conducted an axle load survey on Indus Highway (N-55), and seventeen stations were selected and a total of 2640 vehicles were surveyed. The ESAL values for loaded vehicles ranged between 0.814 for tractor trolley to 18.066 for four axle trucks.

Road Research and Material Testing Institute of Punjab highway Department (1989) conducted an axle load survey in 1989. The survey was carried out around the cities of Lahore and Faisalabad.

Transportation Road Research Laboratory UK (1991) reported an overview on the performance and organization of Pakistan road freight industry. A survey which was carried out in 1985 and 1986 include the information about vehicle manufacture, fleet composition, and the role of freight agents towards costs, tariffs and the productivity of industry. The authors found that there is a high concentration of freight traffic along N-5 route. A road side interview survey was also conducted to collect information related to

vehicle age, body, make, insurance, loads and accidents. It was examined that Pakistan freight industry mostly comprised Bedford trucks in 1970s and 1980s but later on modern type of trucks like Mercedes, Hino, and Nissan started dominating the industry. As a result of the road side survey percentages of different truck types were also estimated. It was also deduced from the survey results that industry was mostly run on hire and reward basis and very few consigners own the vehicles.

National Engineering Services (Pakistan) Limited (1993) conducted a survey based study on axle load on Sheikhpura – Multan – D.G Khan Motorway. A total of 658 vehicles were surveyed, comprising two and multi axle vehicles. In the study that ESALs for two and five axle truck trailer were found to be 7.4 and 28.3 respectively.

In 1982 the first axle load study was accomplished by NTRC in Pakistan. Then for the purpose of updating the NTRC study and assessing the present situation NHA conducted a country wide axle load survey in 1995.

The survey was carried out on National Highway system and the data were collected on N-5, 25, 35, 40, 55, 65 and N-70. Commercial vehicles with two, three, four axles and more than four axles were considered for the survey. A total of 4768 trucks were surveyed. Two axle trucks were found to be 68.9% of this traffic volume while multi axle trucks were 31% including 22.7% three axle, 6.5% four axle and 1.9% of five axle trucks. In the study ESALs were estimate for loaded and empty trucks using AASHTOs power law based on 4.5 power of exponent. Average EASLs calculated for different truck configurations are presented in Table 2.4 as follows.

**Table 2.3: ESALs estimates for different truck classes**

<b>Truck Class</b>	<b>Truck configuration</b>	<b>ESALs</b>
Class 6	2 Axle (Steering + 1 Single)	6.49
Class 7	3 Axle (Steering + 2 Single)	18.48
Class 8	3 Axle (Steering + 1 Tandem)	19.00
Class 10	4 Axle (Steering + 3 Single)	17.30
Class 12	4 Axle (Steering + 1 Single + 1 Tandem)	19.59
Class 18	6 Axle (Steering + 1 Tandem + 1 Tri-dem)	27.96

Associated Consulting Engineers (ACE; 2001) conducted a study for updating the design of additional carriageway of Bahawalpur section of N-5. A seven day traffic count was carried out on three segments of N-5 to classify the traffic stream into cars, buses, two, three, four, five and six axle trucks and tractor trailers. Then the traffic was projected to annual daily traffic using 5%, 6% and 7% growth rate. ESALs were then calculated for the three segments.

Rabia and Afsheen (2013) studied the impact of various truck axles on the pavement in Pakistan. In this study, WIM data were collected and analyzed from two stations located on Grand Trunk Road (N-5) between two major cities of Pakistan (Peshawar and Rawalpindi). Truck factors for different truck types were determined and the most damaging axle type in Pakistan was identified. Regression models were developed for numerous truck types to develop a relationship between truck factors and gross vehicle weight.



### **3. METHODOLOGY**

#### **3.1 INTRODUCTION**

The researchers experience, understanding of philosophy and personal believes may also have some bearing on the method adopted (Denzin and Lincoln, 1994), The methodological distinctions most commonly used focus on the differences between quantitative research, which is generally associated with the philosophical traditions of positivism, and qualitative research, most commonly allied with post positivist philosophy (Polit et al.,2001)

(Clarke 1998) explains, “Though some distinction between methods is well placed . . . it is being acknowledged that philosophically the qualitative and quantitative paradigms are not as diverse or mutually incompatible as often conveyed. Staunch identification of methods with particular paradigms may not be as accurate, or even as useful, an endeavor as past trends would indicate”.

In the methodology we will explain the research design followed by the research questions in detail. Than the data collection methodology is elaborated where the focus is kept on the research objectives.

### 3.2 RESEARCH PROCESS



**Figure 3.1: Research Methodology**

### **3.3 RESEARCH DESIGN**

It is an exploratory study and due to particular nature of the problem employing triangulation technique i.e., both quantitative and qualitative analysis techniques during the course of the research process.

In first phase after the development of the research proposal and crystallization of objectives, an extensive literature review of national level studies conducted by NTRC, NHA, research by the academic institutions i.e., NUST, UET and other donor funded studies were done followed by the international studies of US, Africa, and China.

In second phase after the literature reviewing of the studies and preliminary interviews of the stakeholders both road users and the authorities the research objectives were transformed into the deliverable research questions and it was further expanded into research questions for mapping root cause of the issue. A survey questioner tool (**APPENDIX A**) was used to ascertain the root cause of the problem from the road users and the management, the survey questioner composed of 92 questions, was adopted from a study conducted by Finland based multinational consulting firm (FinnRoad consulting), under direct supervision of NHA team. Keeping in view the low education and understanding level of the survey participants: (1) the truck drivers, (2) the workshop owners, (3) the weigh station staff, and (4) police patrolling officers, the survey questionnaire was translated into Urdu. It was composed of open-ended and multiple choice questions, first 26 were of the general category type questions and remaining specific to the following stakeholders / categories:-

**a. Users**

User segment includes truckers, Adda operators, transport companies, truck body manufacturers, and repair mechanics / workshops.

**b. Management**

It included officials from NHA, NH&MP, Islamabad police, FWO and weigh bridge operators.

The questioner data was transformed into meaningful information after porting the data in MS excel software to get descriptive statistics in pie, bar charts, cross tabulation in pivot tables and results in percentages to carry out trends analysis of post policy intervention and coming up to recommendations for the ALM framework.

### **3.4 RESEARCH QUESTIONS**

The thesis in-essence addresses following research questions:-

- a. RQ-1 - What are the causes / origins of axle overloading?
- b. RQ-2 - What are the issues in transport sector?
- c. RQ-3 - What are the effects / menaces of over loading (OL)?
- d. RQ-4 - What is the familiarity and effectiveness of relevant axle overload control laws?
- e. RQ-5 - What are the flaws in the coordination (collaboration) among stakeholders (Management i.e. NHA and NH&MP/ Provincial Motor Vehicle Registration Authority, and Users)?
- f. RQ-6 - What are the flaws in the effectiveness of existing overloading fine structure / weigh limits?

- g. RQ-7 - What interventions / improvements are recommended in existing overloading fine structure?
- h. RQ-8 - What are the flaws in the effectiveness of weigh stations in enforcing the axle overload control?
- i. RQ-9 - What interventions / improvements are recommended in existing WS
- j. RQ-10 - How much is NH&MP effective in enforcing the axle load management?
- k. RQ-11 - What are the Contractual / managerial flaws at the agency level NHA in the implementation of axle over load system?

### **3.5 SAMPLING TECHNIQUE**

The sampling procedure adopted for the study is convenience sampling however, sample was purposefully selected from within the User and management categories. Moreover, after identifying the segments, random sampling was resorted to, for obtaining true representative sample from the segmented population.

### **3.6 SOURCES OF SECONDARY DATA**

PBS (Pakistan Bureau of Statistic) is a reliable source for secondary data NHA road fine collection, fine and accident details from NH&MP and ICT police was collected personally. Motorways truck usage data from FWO was obtained

### **3.7 SOURCES OF PRIMARY DATA**

The data collection involves two methodologies, Questioner was introduce to the relevant stake holders and 225 samples were collected and also informal interaction for

expert opinion with the NHA (Dir NTRC), NLC (GM supply chain), NH&MP (DIG Operations), FWO (GM IT Cell), Consultant on SSWIM Piezoelectric.

### **3.8 DATA COLLECTION METHOD(S)**

For survey data collection and noting of the responses of stake holders, the visits were organized to Highway Police patrolling sites, truck Addas in Pirwadhai, Taxila, and Motorway service area of Balkasar, Chakwal, truck body makers between Rawalpindi and Taxila. The Urdu translation helped in understanding the questioner and replying the answers. Observations of weigh stations on M-2 (Islamabad, Balkasar, Pattoki, Chakwal, Kotmomin), and N-5 (Sangjani, Mullah-Mansur) were noted to ascertain the working environment and practice. 500 survey questionnaires were distributed and pursued rigorously. After repeated deliberations 225 questionnaires came in filled, that was a good response. Getting the questionnaire filled from management was experienced as an uphill task however, minimum essential sample size was attained.

### **3.9 DATA ANALYSIS METHOD(S)**

Here the data was analysed for its validity and reliability. Being a descriptive study its questions are itself reliable being the expert opinion. However in Microsoft excel, cross tabulation, histogram, scatterplot, and pivot table were developed for perception mapping and analysis.

## **4. DATA ANALYSIS AND DISCUSSION**

### **4.1 INTRODUCTION**

This chapter covers data analysis, and discussion on the results obtained through data processing. There are eleven (11) RQs in this study that are answered in this chapter. User and management perspectives are presented in tabular form with graphical depiction where necessary. Analysis of each SQ is presented in the discussion following the tables and graphs to answer the RQs. Secondary data where necessary was obtained from the concerned sources i.e. management often including NHA, NH&MP, and FWO.

As already discussed in Chapter 2, axle overloading is an established fact in case of Pakistan and a principal factor often considered responsible for the existing road conditions. However, without capturing the perspective of the main stakeholders i.e. truckers, no tangible conclusions can be drawn. Moreover, beside users, the perception of other stakeholders i.e. management, has also been obtained through survey questionnaire (Chapter-3).

### **4.2 DEFINITION OF STAKEHOLDERS**

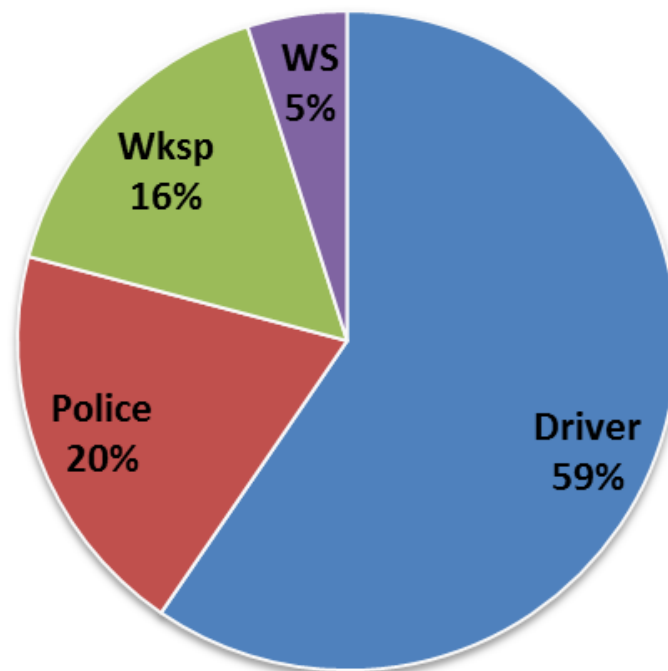
The respondents include all stakeholders related to the issue. Broadly there are two groups of respondents, defined below:-

- a. **Management.** This group includes: (1) NHA, (2) Police (NH&MP, and ICT), and (3) weigh station operators.
- b. **User.** User group incorporates two stakeholders: (1) truckers, and (2) workshops/ truck body makers.

**Table 4.1: Respondents Segments**

<b>Respondent segment</b>	<b>Count</b>	<b>Percentage</b>
<b>Management</b>	<b>55</b>	<b>24.44%</b>
Police	44	19.56%
Weigh Station (WS)	11	4.89%
<b>User</b>	<b>170</b>	<b>75.56%</b>
Driver	134	59.56%
Workshop (Wksp)	36	16.00%
<b>Total</b>	<b>225</b>	<b>100.00%</b>

In the subsequent paras, perspective of both the groups is presented separately for better analysis and understanding.



**Figure 4.1: Respondents Distribution**



### 4.3 RQ-1 - WHAT ARE THE CAUSES / ORIGINS OF AXLE OVERLOADING?

To answer RQ-1, the questioner survey has 16 questions. Out of 16 questions, 6 SQ are generic however, questions asked from users are 9, and 1 SQ is asked from management. Research question mapping is tabulated below:-

**Table 4.2: Mapping RQ 1**

Category	Survey Questions														
Users	2	3	13	17	18	25d	46	48	54	55	56	58	59	60	88
Management	2	3	13	17	18	25d	43								

#### 4.3.1 OL and damaging of roads (SQ-2)

Perspective to SQ-2, “*Up to what extent do you agree that there is an issue of overloaded trucks in Pakistan that are damaging roads and that they are not being effectively controlled?*”.

##### a. User

77.65% users either agree or strongly agree that issue of OL exist and it is damaging the roads. 7.06% disagree to the fact that OL is damaging the roads.

15.29% respondents are neutral, that is also a silent agreement to the issue.

**Table 4.3 SQ-2 (User)**

Users	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Driver	3.73%	3.73%	17.91%	38.81%	35.82%
Wksp	0.00%	5.56%	5.56%	19.44%	69.44%
<b>Total</b>	<b>2.94%</b>	<b>4.12%</b>	<b>15.29%</b>	<b>34.71%</b>	<b>42.94%</b>

### b. Management

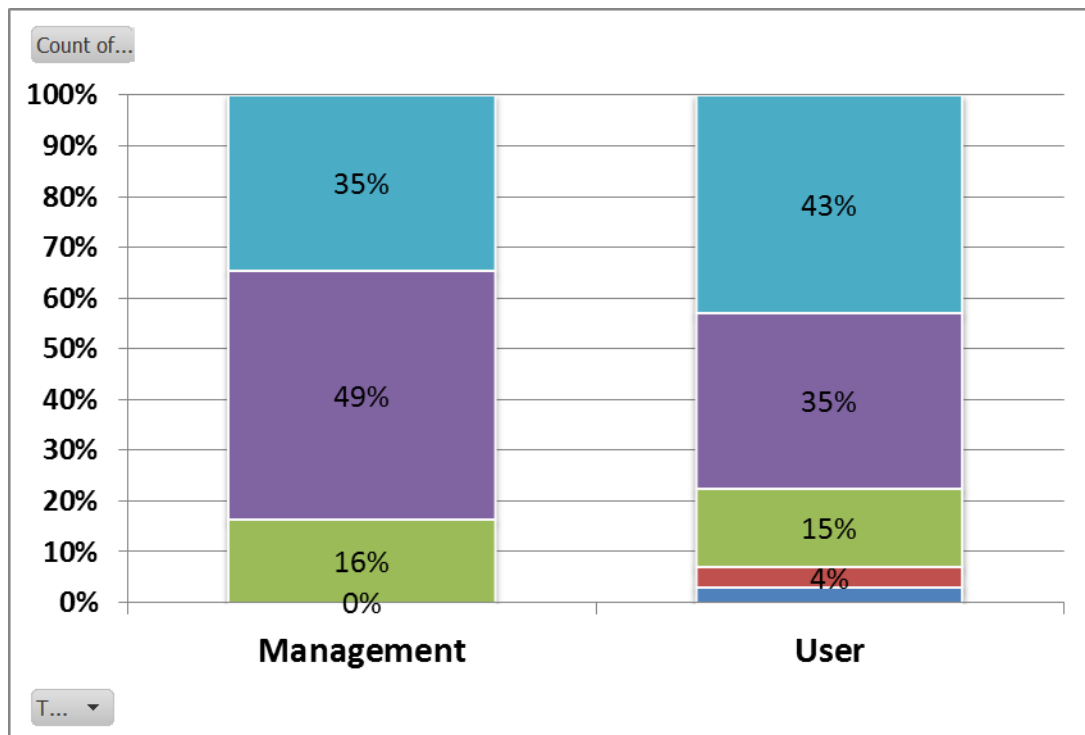
83.67% respondents either agree or strongly agree that issue of OL exist and it is damaging the roads. 16.33% respondents are neutral, that is also a silent agreement to the issue.

**Table 4.4: SQ-2 (Management)**

Management	Neutral	Agree	Strongly Agree
Police	18.18%	52.27%	29.55%
WS	0.00%	20.00%	80.00%
<b>Total</b>	<b>16.33%</b>	<b>48.98%</b>	<b>34.69%</b>

**Table 4.5: Aggregate SQ-2**

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
<b>Management</b>	0.00%	0.00%	16.33%	48.98%	34.69%
<b>User</b>	2.94%	4.12%	15.29%	34.71%	42.94%
<b>Total</b>	<b>2.28%</b>	<b>3.20%</b>	<b>15.53%</b>	<b>37.90%</b>	<b>41.10%</b>



**Figure 4.2: Overloading and damaging of roads**

Out of 225 respondents from all category 79% respondents either strongly agree or agree that issue of overloading is a main cause of road damages and not being effectively controlled. It is worth mentioning that 15.5% respondents replied with, “Can’t say anything”.

However, 8% of users don’t consider the overloading of the trucks as the only reason of the bad roads condition and attribute other factors as well, causing (elaboration in SQ-3) required to be explored further.

#### 4.3.2 Perception on linkage of overloading and damage to the roads (SQ-3)

In response to SQ 3, “Why do you think so (that overloading is damaging the roads and not being controlled)?”, the responses are tabulated below:-

**Table 4.6: Thematic analysis, 'OL causes road damage'**

Serial	Cause	User	Management
1	OL cause road destructions	35%	45%
4	High Operating cost	33%	20%
5	Poor road quality	20%	10%
2	No response	5%	10%
3	No road for heavy traffic	5%	-
6	Strict laws	2%	15%

Out of 225 respondents, respondents (Users=35%, and Management=45%) found OL the major cause of damage to the road, whereas, ‘High operating cost’ is considered to be the main cause for overloading by the users category, moreover the ‘poor road quality’ is advocated by the user as the cause of road damage besides the OL, Moreover, ‘Quality of Road construction’ is considered as major cause by the respondents.

Users also consider having the ‘higher classification roads’ being constructed for the move of heavy loads, whereas the management considers ‘weak laws enforcement’ the cause of damaged roads.

#### 4.3.3 Checking over loading by weighing (SQ-13)

Perspective to SQ-13, “*In Pakistan, how effective in your view is the practice of checking over loading by weighing?*”.

##### a. User

55.30% users either agree or strongly agree that issue of OL exist and it is damaging the roads. 7.06% disagree to the fact that OL is damaging the roads. 15.29% respondents are neutral, that is also a silent agreement to the issue.

**Table 4.7: SQ13 Practice of checking over loading by weighing**

	N. Effective At All	N. Effective	Neutral	Effective	V Effective
<b>User</b>					
Driver	6.72%	26.12%	19.40%	17.91%	29.85%
Wksp	0.00%	0.00%	16.67%	33.33%	50.00%
<b>Total</b>	<b>5.29%</b>	<b>20.59%</b>	<b>18.82%</b>	<b>21.18%</b>	<b>34.12%</b>

##### b. Management

83.5% respondents either agree or strongly agree that issue of OL exist and it is damaging the roads. 15.29% respondents are neutral, that is also a silent agreement to the issue.

**Table 4.8: SQ13 Practice of checking over loading by weighing**

	N. Effective At All	N. Effective	Neutral	Effective	V.Effective
<b>Management</b>					
Police	6.82%	31.82%	4.55%	27.27%	29.55%
WS	20.00%	40.00%	20.00%	20.00%	0.00%
<b>Total</b>	<b>8.16%</b>	<b>32.65%</b>	<b>6.12%</b>	<b>26.53%</b>	<b>26.53%</b>

- c. Out of 225 respondents from all category 78.99% respondents either strongly agree or agree that issue of overloading is a main cause of road damages and not being effectively controlled. It is worth mentioning that 15.5% respondents replied with, “Can’t say anything”. However, 23% of user attributes other factors as well causing the damage to the road infrastructure.

**Table 4.9: SQ13 Practice of checking over loading by weighing**

	<b>N. Effective At All</b>	<b>N. Effective</b>	<b>Neutral</b>	<b>Effective</b>	<b>V Effective</b>
<b>Management</b>	8.16%	32.65%	6.12%	26.53%	26.53%
<b>User</b>	5.29%	20.59%	18.82%	21.18%	34.12%
<b>Grand Total</b>	<b>5.94%</b>	<b>23.29%</b>	<b>15.98%</b>	<b>22.37%</b>	<b>32.42%</b>

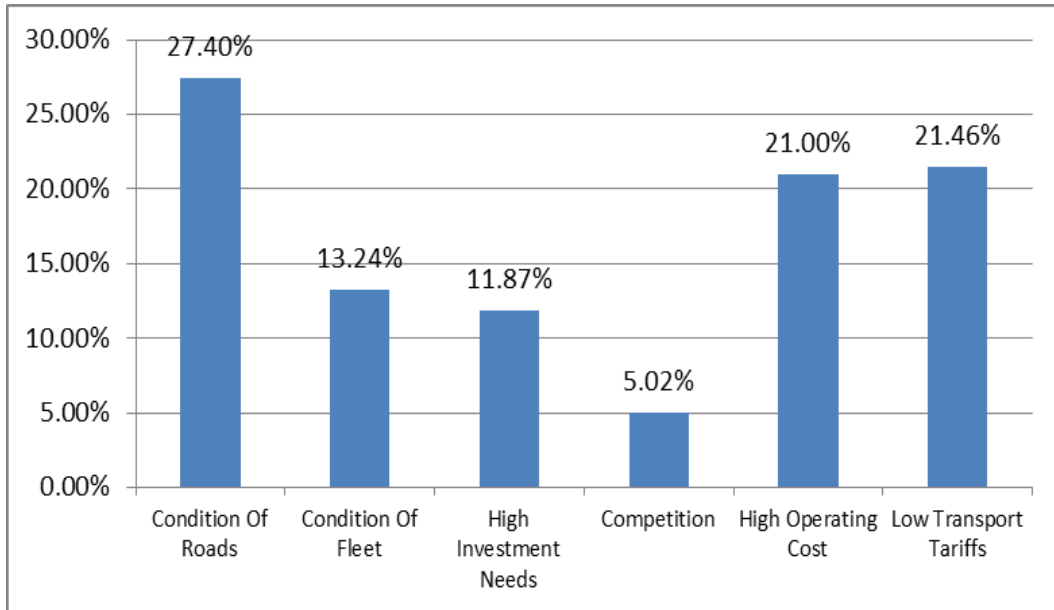
Though 55% respondents from all categories found the ‘checking by weight’ to be either very effective or effective, but 30% of respondents from both segments agree that the practice of checking OL by weight is not effective. And is an indicator of both groups perception about a reasonable wide gap identified.

#### 4.3.4 Main factors creating problems in transport sector

In response to SQ-17 and 18, six options were given so as to identify the factors affecting the transport sector, The responses along with their frequency and categorization are tabulated as under:-

**Table 4.10: Factors creating problems in transport sector**

<b>Row Labels</b>	<b>Condition Of Roads</b>	<b>Condition Of Fleet</b>	<b>High Investment Needs</b>	<b>Competition</b>	<b>High Operating Cost</b>	<b>Low Transport Tariffs</b>
<b>User</b>	<b>30.59%</b>	<b>9.41%</b>	<b>11.76%</b>	<b>5.88%</b>	<b>20.00%</b>	<b>22.35%</b>
Driver	27.61%	9.70%	14.18%	7.46%	17.91%	23.13%
Wksp	41.67%	8.33%	2.78%	0.00%	27.78%	19.44%
<b>Management</b>	<b>16.33%</b>	<b>26.53%</b>	<b>12.24%</b>	<b>2.04%</b>	<b>24.49%</b>	<b>18.37%</b>
Police	11.36%	29.55%	13.64%	2.27%	25.00%	18.18%
WS	60.00%	0.00%	0.00%	0.00%	20.00%	20.00%
<b>Grand Total</b>	<b>27.40%</b>	<b>13.24%</b>	<b>11.87%</b>	<b>5.02%</b>	<b>21.00%</b>	<b>21.46%</b>



**Figure 4.3: Bar Chart of Factors creating problems in transport sector**

In the light of above table the order of priority as envisaged by the respondents is: (1) condition of roads, (2) low transport tariffs, (3) high operating cost, (4) condition of fleet, (5) high investment needs, and (6) competition. The perspective of drivers being more affected by the issue gets the precedence over other stake holders and thus their business concerns are separately presented in the above graph.

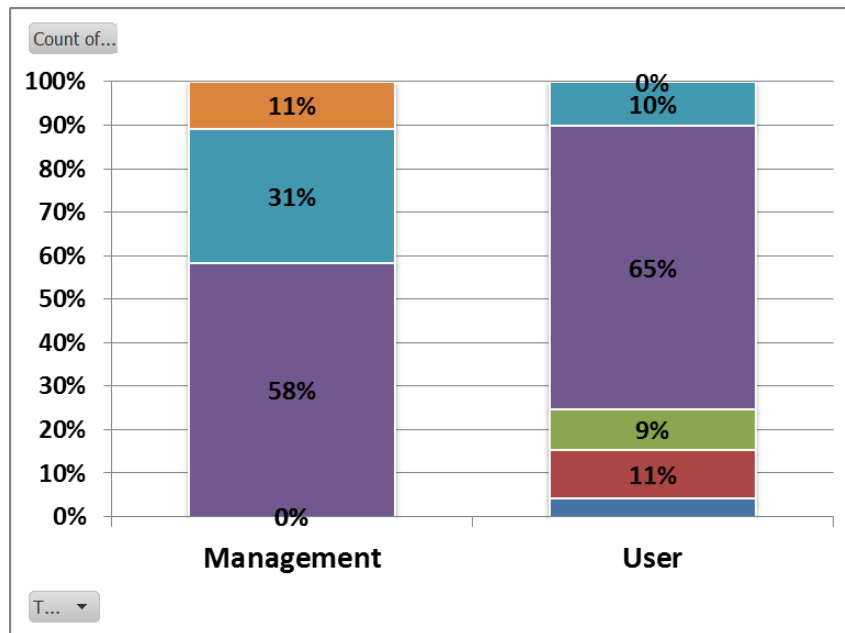
#### 4.3.5 Overloaded trucks harm roads constructed by NHA

In order to get the perspective of all categories of respondents on SQ-25d, “*Overloaded trucks harm roads constructed by NHA*”,

**Table 4.11: SQ-25d Overloaded trucks harm roads constructed by NHA**

	1	2	3	4	5
<b>User</b>	<b>4.12%</b>	<b>11.18%</b>	<b>9.41%</b>	<b>65.29%</b>	<b>10.00%</b>
Wksp	2.78%	8.33%	11.11%	75.00%	2.78%
Driver	4.48%	11.94%	8.96%	62.69%	11.94%
<b>Management</b>	<b>0.00%</b>	<b>0.00%</b>	<b>0.00%</b>	<b>65.31%</b>	<b>34.69%</b>
WS	0.00%	0.00%	0.00%	80.00%	20.00%
Police	0.00%	0.00%	0.00%	63.64%	36.36%
<b>Grand Total</b>	<b>3.20%</b>	<b>8.68%</b>	<b>7.31%</b>	<b>65.30%</b>	<b>15.53%</b>

80% of aggregated respondents agree to the fact that the road conditions leading to the excessive expenses on the rehab are attributed to the OL, however a genius 15% of the user (truckers) consider OL not a sole reason for the roads poor conditions thus, indicate indirectly the poor quality of construction materials and the practices being followed (as discussed in SQ 3).



**Figure 4.4: Bar Chart, OL Truck Harm Road**

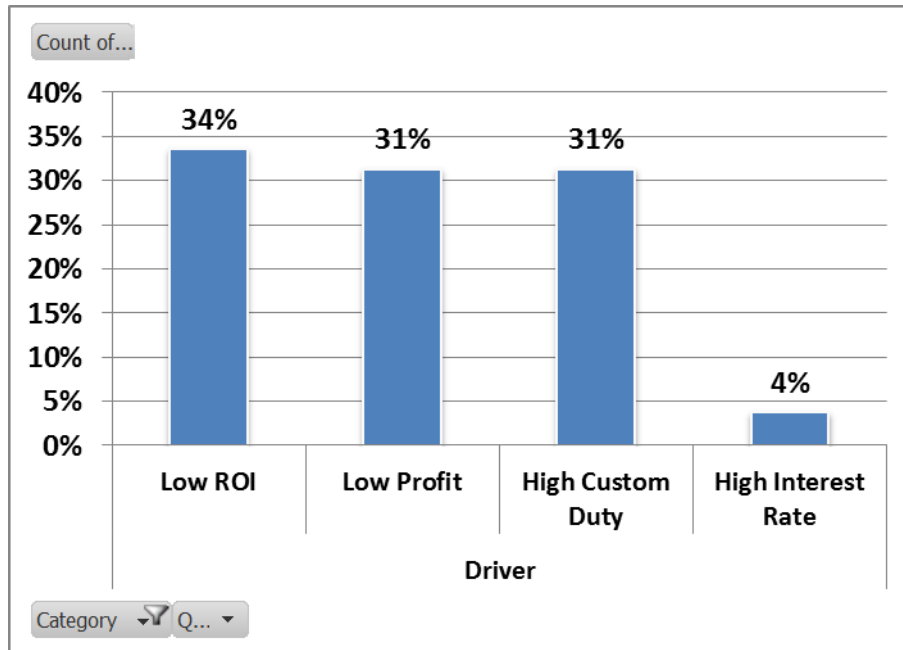
#### 4.3.6 Obstacles hampering the development of the transport sector (SQ-46)

While responding to the SQ-46 (exclusive for the truckers), 33.58% respondents attributed low ROI, 31% respondents conclude high custom duties, 31% respondents consider low profits, whereas, 4% respondents are of the view that high interest rates on borrowing is hampering the development of transport sector.

And these financials constraints are limiting the freedom of action for the truckers thus is forcing them to coup up with their expenses due to unfair means i.e. OL, and subsequent to nonexistent formal sector status the defaults can easily manipulate the system and move around unchecked.

**Table 4.12: SQ 46 Obstacles hampering the development of the transport sector**

Row Labels	Low ROI	Low Profit	High Custom Duty	High Interest Rate
<b>User</b>				
Driver	33.58%	31.34%	31.34%	3.73%
<b>Grand Total</b>	<b>33.58%</b>	<b>31.34%</b>	<b>31.34%</b>	<b>3.73%</b>

**Figure 4.5: Obstacles hampering the development of the transport sector**

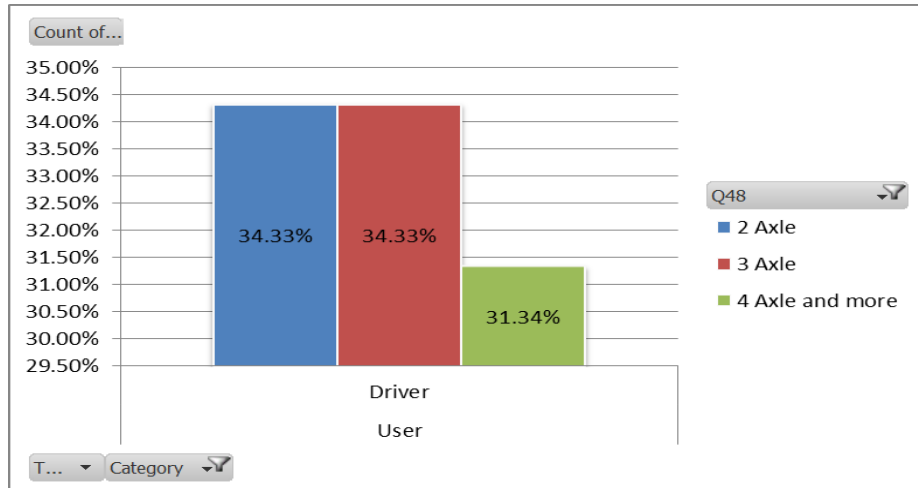
#### 4.3.7 Truck axle configuration (SQ-48)

To inquire axle configuration of the trucks plying on the roads SQ-48 (specific to truckers), ‘*In your trucking company, you or you together with some others own(s) which kind of trucks?*’, was asked, results are tabulated below:

**Table 4.13: SQ-48 Truck axle configuration**

Row Labels	2 Axle	3 Axle	4 Axle and more
<b>User</b>			
Driver	34.33%	34.33%	31.34%
<b>Total</b>	<b>34.33%</b>	<b>34.33%</b>	<b>31.34%</b>

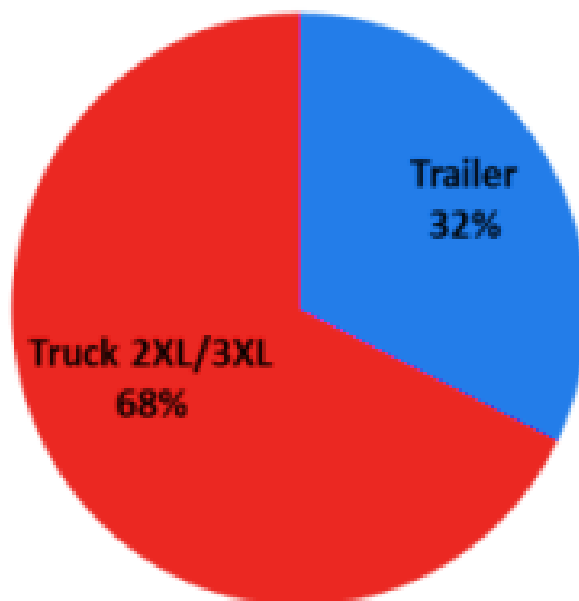




**Figure 4.6: Truck axle configurations**

Moreover secondary data collected from M-2 (Motorways) reveals the truck fleet configuration plying on the roads is 70% 2 / 3-axle and remaining 30% 4-axle and above configuration.

## Truck Type Road (Motorways) Usage Statistics - 2016



**Figure 4.7: Truck axle configuration (M-2 usage data FWO-2016)**

Survey data tabulated above also conforms to the secondary data about M-1 and 2, from where 71.87% of the truck fleet plying on the roads is 2/3 axle configurations, remaining less than 29% of fleet plying on the roads is 4 axle and above category.

It is pertinent to mention that in 2006 PSTP study conducted by the consultants and subsequent research also indicate the 2 axle trucks category the most harmful truck type plying on the roads with excessive OL, and this large data pattern reveals that the Management has not seriously taken / consider the vices of the 2 axle trucks vis-à-vis its damaging effects and no concrete measures or incentives being taken to change the truck fleet composition.

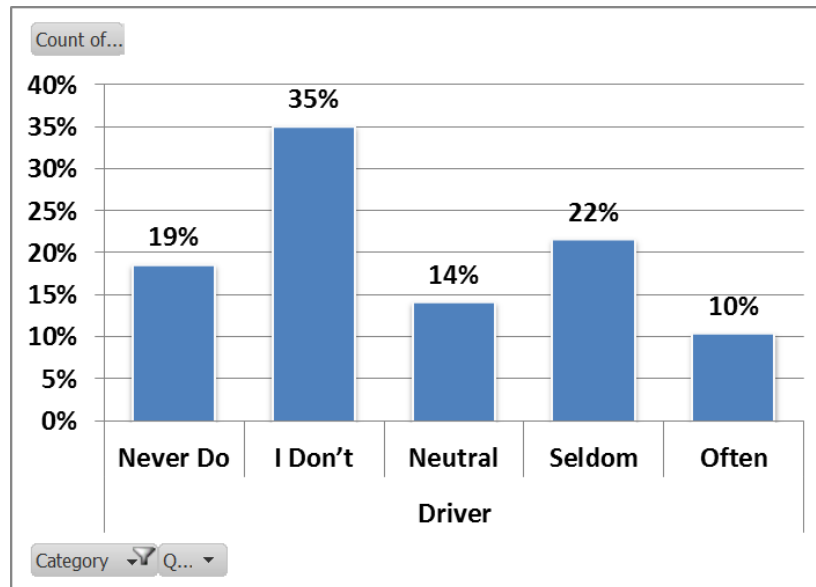
And hence forth the damaging effects are obviously seen in shape of a large number of damaged roads especially the N-5, series and also seen on the linking provincial highways connected to the N-5 and M-1/2.

#### 4.3.8 Do the truckers overload? (SQ-56)

When a direct question was asked from the truckers, “Do you overload?”, the responses were somehow different. 53% respondents negated out rightly, 33% respondents accepted the overloading practice clearly, however, 15% respondents who remained neutral can also be considered with 33% respondents as their neutrality is indicative of their tilt towards overloading.

**Table 4.14: SQ 56 Do the truckers overload**

	<b>Never Do</b>	<b>I Don't</b>	<b>Neutral</b>	<b>Seldom</b>	<b>Often</b>
<b>User</b>					
Driver	18.66%	35.07%	14.18%	21.64%	10.45%
<b>Grand Total</b>	<b>18.66%</b>	<b>35.07%</b>	<b>14.18%</b>	<b>21.64%</b>	<b>10.45%</b>



**Figure 4.8: Do the truckers overload**

The above mentioned graph clearly shows that the practice of OL is considerably at a very large scale, and the drivers' testimony direct / indicate the requisite lack of ALM, its necessary implementation and enforcement.

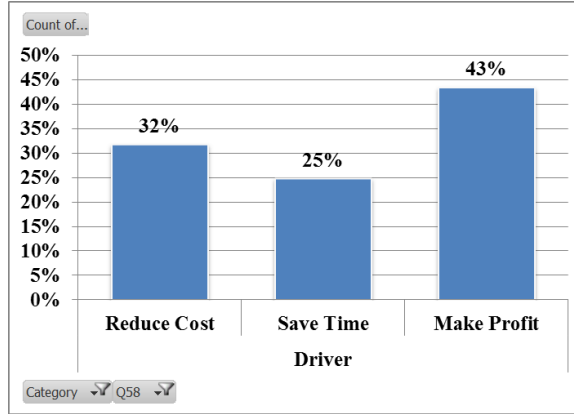
#### **4.3.9 Stake holders' perspective about main reason for over loading (SQ-58, 43)**

To absorb the perception of Management and user on 'reasons for overloading', same question was asked from both. In case of users, SQ-58 seeks to capture the perspective whereas, in the module of Management SQ-43 is included.

Reasons for overloading as perceived by the truckers in response to SQ-58, identified causes include 'profit making' as overwhelming reason with 43.75% and 32.03% respondents consider 'cost reduction' to be another cause. If we look into the options: (1) profit making, and (2) cost reduction, both are closely related being contributing towards truckers' ROI. However 'time saving' is considered as least important reason for overloading (i.e. 21.87%). This result also validates and conforms to the results of SQ-17, 18 and 46.

**Table 4.15: SQ 58 Main reason for over loading**

Row Labels	Reduce Cost	Save Time	Make Profit
User	31.78%	24.81%	43.41%
Driver	31.78%	24.81%	43.41%
<b>Grand Total</b>	<b>31.78%</b>	<b>24.81%</b>	<b>43.41%</b>

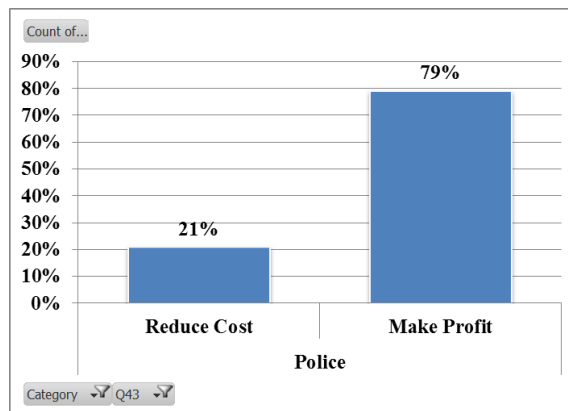


**Figure 4.9: Truckers main reason for over loading**

When same question was asked from the Management (police) the responses show that 77.27% respondents perceive ‘profit making’ to be the principal cause for overloading as compared to ‘cost reduction’ being the perception of 20.93% respondents.

**Table 4.16: SQ-43 Main reason for over loading**

Row Labels	Reduce Cost	Make Profit
Management		
Police	20.93%	79.07%
<b>Total</b>	<b>20.93%</b>	<b>79.07%</b>

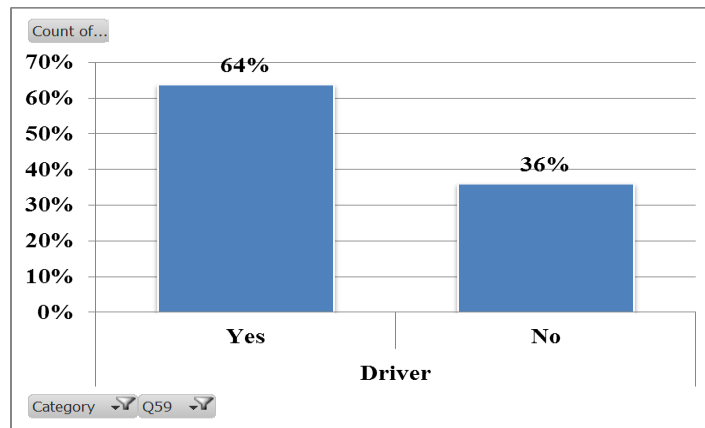


**Figure 4.10: Main reason for over loading (Management)**

Out of respondents from truckers, 36% responded 'No' and 64% responded with 'yes' to the SQ-59 asking, "Is it possible to operate profitably without over loading?". This result validates the previous identified / indicated trend of OL.

**Table 4.17: SQ-59 Profitably without over loading**

Row Labels	Yes	No
<b>User</b>		
Driver	63.91%	36.09%
<b>Grand Total</b>	<b>63.91%</b>	<b>36.09%</b>



**Figure 4.11: Operate profitable without over loading**

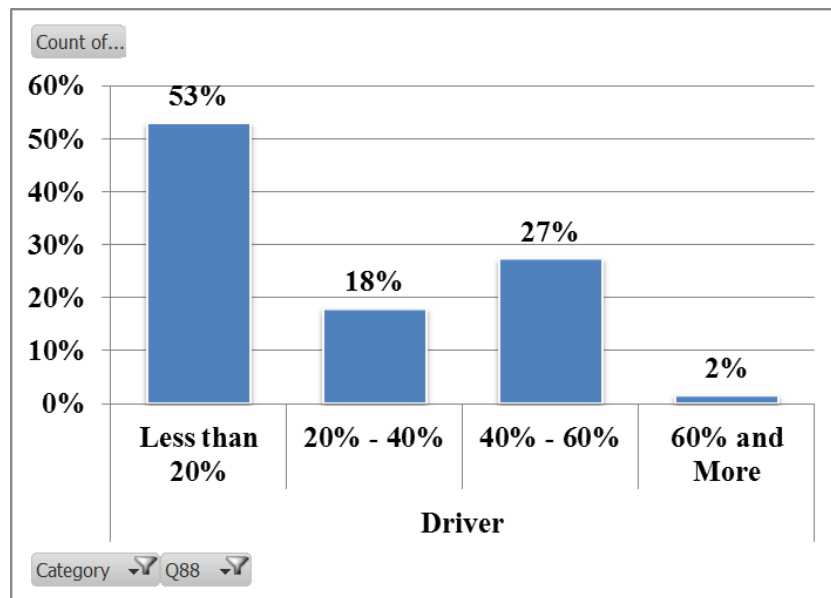
#### 4.3.10 In your view, approximately what percentages of total trucks are overloaded? (SQ-88)

When truckers were asked to quantify their perspective on overloading, respondents identified the overloading proportion to be as: (1) less than 20% - 53.12%, (2) 20 to 40% - 17.97%, and (3) 40 to 60% - 27.34%.

It is prudent to mention that the tabulated data indicate OL practice ranges in between 35 - 40%, which is alarmingly a large number.

**Table 4.18: SQ-88 Total overloaded trucks percentage**

	Less than 20%	20- 40%	40-60%	60% and more
<b>User</b>				
Driver	53.13%	17.97%	27.34%	1.56%
<b>Total</b>	<b>53.13%</b>	<b>17.97%</b>	<b>27.34%</b>	<b>1.56%</b>



**Figure 4.12: Percentages of total trucks are overloaded**

#### 4.3.11 Summary

Road asset management is a serious issue bothering the policy maker and implementers alike. The apparent cause of road damage is OL of trucks.

The survey results reveal that around 30-35% of the truckers resort to OL practice with the compelling constraints of less ROI and higher VOC.

However, the larger segment of 65-70% of the non-OL truckers clearly indicates that OL is not the only cause of poor road conditions. Truckers' perceive causes of deteriorating road condition attributable to shortcomings in the construction industry besides OL.

## 4.4 RQ-2 – WHAT ARE THE ISSUES IN TRANSPORT SECTOR?

Sequel to RQ-1 causes and origin of OL, the RQ-2 is an attempt to have an in-depth view of the transporters on the issues leading to OL practice.

To answer RQ-2, the questioner survey has 11 questions. Research question mapping is tabulated below:-

**Table 4.19: Mapping RQ-16**

Category	Survey Questions										
Users	49	59	60	61	62	63	64	65	66	67	77

#### 4.4.1 Profitability at defined Axle load (SQ-59) and reasons for overloading (SQ-60)

The users perspective about profitability at authorized axle load was asked in SQ-59, "*Is it possible to operate profitably without overloading?*". 63.91% of trucker believes that it is profitable to operate without over loading. However, 36.09% of the truckers found unprofitable if operate without overloading. Finding of SQ-59 shows 63.91% truckers exhibit their agreement on operating without overloading, which confirms the response of management that was 1/3 of the truckers are recorded to be involved in overloading practice.

In response to the SQ-60, "*why do you think so (reasons for overloading)?*", being an open ended question, Users give different reasons which were analyzed qualitatively (thematic analysis) (**Appendix B**) extract of views as under:-

**Table 4.20: SQ-60 Driver reasons for overloading**

Low fare charges	28.00%
So much expenditure	20.00%
For more profit	16.00%
Over Expenditure	8.00%
Token Mafia and Tax receiver at every where	8.00%
No Saving	8.00%
Profitable business can be done without overloading if fuel rate is low	4.00%
Low expenditure in which fuel can complete	4.00%
Due to too many Tax	4.00%

Amongst the pronounced reasons ‘low fare charges’ is preceded by all other, for the reason that transport sector is unstructured and absence of level playing field for charging the competitive fare.

#### 4.4.2 Market Regulations

Market usually operates on contractual basis. There are numerous contractual agreements between market players with following, many-fold objectives:

- a. To secure the market position by either contracting **directly** the carrier on a long term basis to cover the demand, or
- b. To **outsource** the demand to a broker, logistic center, agent or carrier, or
- c. For a broker or multimodal operator to secure a **basic transport** availability, or
- d. To secure **fixed transport tariffs** for a certain period of time.
- e. For a carrier to secure basic **load factor agreements** along specific routes or within a group of cargoes. (Dry or liquid bulk, dangerous goods, refrigerated cargo, container etc)
- f. For an agent to fix a profitable long term agreement with high tariffs receivable and low tariffs payable, making use of transport **surplus capacity**.

The transport agreement is normally based upon any specific domestic or international transport document for road transport, which is regulated either by national law or by an international convention. In Pakistan the only document on domestic transport is a load sheet, “*Bilty*”, which defines the load and destination and excludes nearly all liabilities of the transport operator.

“*Bilty*” (abbreviated form of “bill of lading” from the maritime transport mode) is not endorsable for transfer of cargo ownership. It represents no legal identification of the



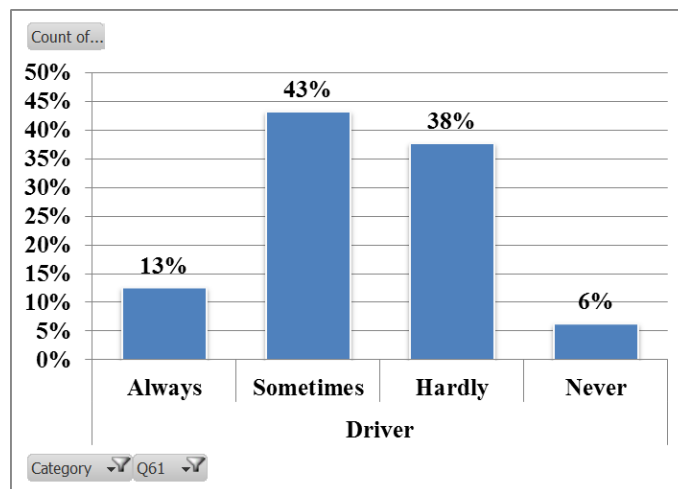
cargo owner and is not identifying the liability sharing between cargo owner and transport operator. On the contrary, the “Bilty” will exclude all transport related risks with some exceptions. Hence, the transport operator is not providing any insurance coverage to transport risks, unless this requirement is an unalterable fact of a special transport order in the context of long term agreements.

#### 4.4.3 Sustainability of trucking business (SQ-61)

In response to SQ-61, “Do you have influence on tariff per ton km?”, 55.64% truckers were found to have influence over tariff rate per ton km, either always or sometimes against 44.36% truckers who never had or hardly have influence over the tariff rate.

**Table 4.21 Q61. Influence on tariff per ton km**

	Always	Sometimes	Hardly	Never
Driver	12.78%	42.86%	38.35%	6.02%



**Figure 4.13: Influence on tariff per ton km**

The main reason for varied opinion of the users is deregulation of the transport sector.

Due to which no standardization exists in tariff. Another factor is absence of **3PLSP** (3<sup>rd</sup>

party logistics service provider) against single truck owners business model. Moreover there is no check and balance by the state Managements other than market forces itself.

#### 4.4.4 Truck Fleet Size (SQ-49)

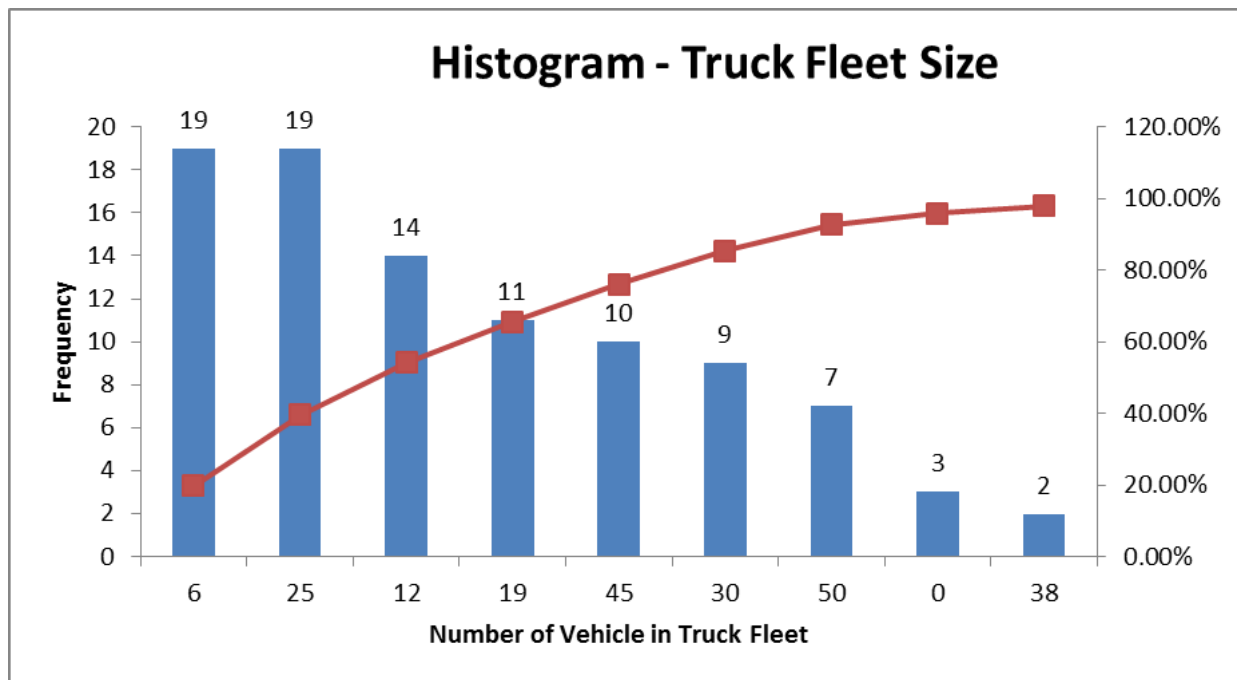
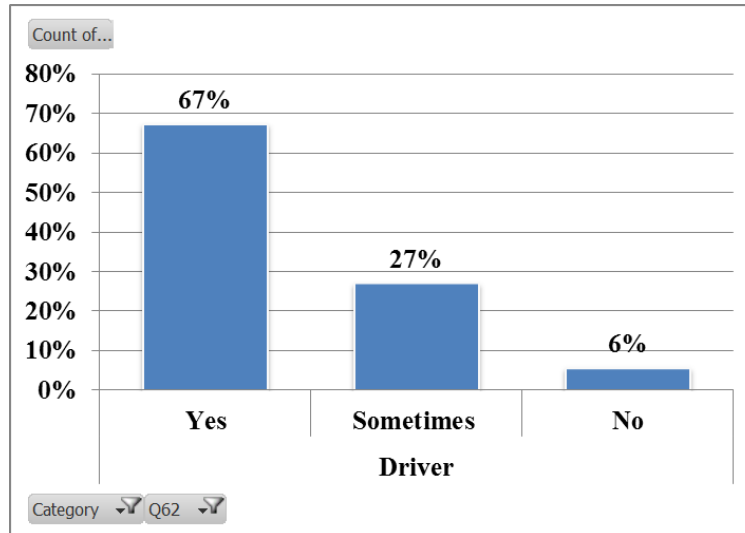


Figure 4.14: SQ49, Trucks fleet size / ownership

As shown in the histogram of the truck fleet size operating, it can be seen that more than 70% of the truck fleets ranges between 6 to 12 trucks per ownership. This is further to the plight of the transporters small company sizes having vulnerabilities of the eternities.

#### 4.4.5 Middle man or the Adda owner (SQ-62)

To explore further the dynamics of transport sector and its profitability the SQ-62, “Do you have a direct reach to cargo owners?”



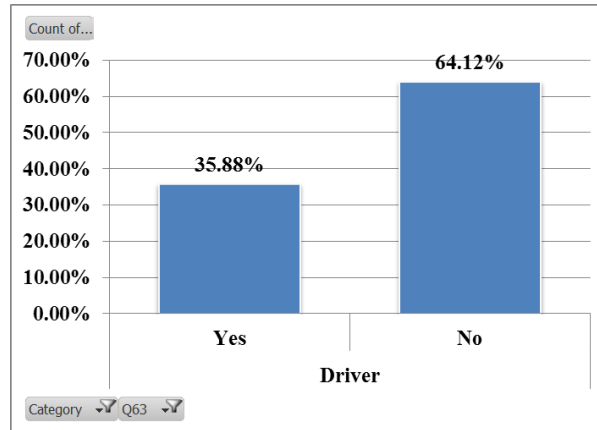
**Figure 4.15: Truckers direct access to owners**

Being a deregulated business segment the place of doing business (market) is controlled by third person (i.e. the Middle man or the Adda Owner). They represent in Pakistan the major market location as middlemen between the majority of small transport enterprises, who cannot afford marketing and sales functions directed to customers demanding transport services. Middle man's incentive is another cost component, negatively impacting the cost of doing business.

#### 4.4.6 Nature of transport contracts (SQ-63 and SQ-64)

To understand the nature of contracts in transport sector respondents were asked to share their views in SQ-63, *“Do you have long term contacts?”*, and SQ-64, *“Are your transport orders mostly ad-hoc?”*

In an endeavor to further explore the causes of high operating cost responses to SQ-63 highlight that only 36.57% transporters have long term contracts which cover operating cost efficiently against 63.43% who have no long term contracts.



**Figure 4.16: long term contracts for truckers**

The trucks are, mostly waiting for ad-hoc Tramp-Operations as highlighted by 88.81% of the respondents from the transporters.

**Table 4.22: SQ64 Are your transport orders mostly ad-hoc?**

	Yes	No
<b>Driver</b>	88.81%	11.19%

#### 4.4.7 Return journey / market risks (SQ-65)

To absorb and determine the risks involved in transportation the SQ-65, “*Do you accept transport orders with risk of having to return empty?*” here 70.15% of the respondents express that they take the risk of taking the contract / transport order even they had to return empty, however this risk taking is to be compensated by the additional carriage of the load.

**Table 4.23: Q65. Do you accept transport orders with risk of having to return empty?**

	Yes	No
Driver	70.15%	29.85%

So this market vulnerability translates the transporters plight / vulnerability into an issue that affects their decision making and to compensate the losses they resort to OL practice.

#### 4.4.8 Tariff (SQ-67)

The SQ-67, “Do you ever refuse a transport order for too low tariff offered?”, 48.84% of the respondents tend to ‘refuse’ transport orders however 52% of the transporters tend to take on the cargo even if the rate of the cargo are too less, so this tariff reduction by the customers in shape of bargain make the profit margin reduced to an extent where the truckers use unfair means (OL) to gain in the profitability.

SQ-67 Do you ever refused a transport order for too low tariff offered?			
	Often	Seldom	Never
Driver	48.84%	44.19%	6.98%

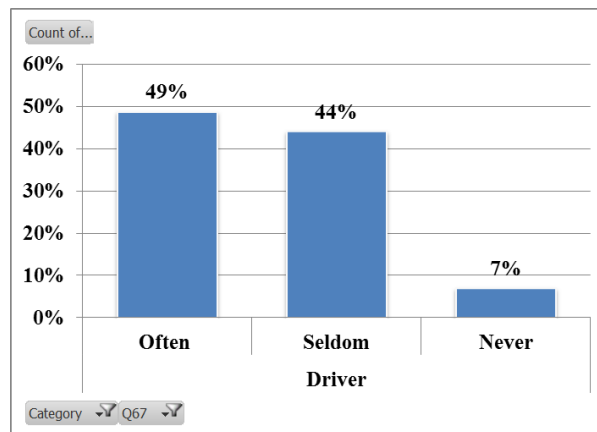


Figure 4.17: Refused transport order for too low tariff

#### 4.4.9 Tariff for Upcountry transport (Northwards) (SQ-68)

In order to view the market trends such that the tariff per ton the SQ-68, “What would be the minimum acceptable tariff per ton you would set for upcountry transportation?” the tariff per ton from the respondents was asked and as shown in the descriptive statistics and 77% respondents give out their view that average per ton cost for the transport is Rs. 4000/- per ton and ranges in between 7500 to 2500 per ton.

This variation in the rates spells out the clear indication that the market is unstructured and highly manipulated both by the customers and the transporters

community. This tariff structure is highly un-structured thus unleashes the menace of OL.

**Table 4.24: SQ 68 Tariff per ton km South Bound**

Mean	4345.16129
Median	4000
Mode	4000
Kurtosis	1.696903521
Skewness	1.300884629
Range	5000
Minimum	2500
Maximum	7500

#### 4.4.10 Expenses vs toll rates (SQ-77)

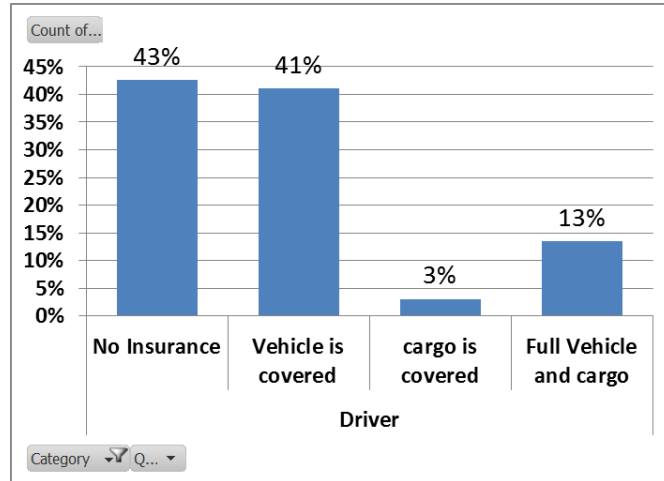
To capture the perspective of the transporters regarding the toll, they pay at the toll plazas the SQ77, “*Up to what extent, are you satisfied with the present toll rates?*” 53.09% of the users are satisfied with the toll they pay at the toll plazas on the highway network, which spells out to be an agreement with the existing fine structure of the road network users, however the remaining 28.12% respondents not in the general agreement of the responses of the view

<b>Table 4.25: Q77 - Up to what extent, are you satisfied with the present toll rates?</b>					
	<b>NSA</b>	<b>NS</b>	<b>Neutral</b>	<b>SE</b>	<b>GE</b>
<b>Driver</b>	2.34%	25.78%	17.97%	39.84%	14.06%

#### 4.4.11 Risk mitigation / insurance (SQ-54)

SQ-54 “What type of insurance do you use?”, is asked from user to answer RQ-2, results show that 43% of the truckers are working without insurance coverage whereas, 57% are operating with some kind of insurance coverage, hence the responsibility of the cargo rests with the transporter and the vulnerability is further raised and the lack of consideration of ‘transport as an industry’ deprive the transporters of the requisite financial coverage / loans for unforeseen.

Row Labels	No Insurance	Vehicle covered	Cargo covered	cargo and vehicle
Driver	42.54%	41.04%	2.99%	13.43%



**Figure 4.18: Type of insurance**

#### 4.4.12 Summary

Further to causes and origin of OL practice in vogue, RQ-2 deals with the internal dynamics of the transport sector.

The transport sector is unstructured (being SMEs instead of 3PLSPs) and under the influence of the middleman / adda operators, who share the maximum dividends but not partnering in risk mitigation. The situation is further compounded with low fare and higher expenses thus paving the way for OL practice.

### 4.5 RQ-3 - WHAT ARE THE EFFECTS / MENACES OF OL?

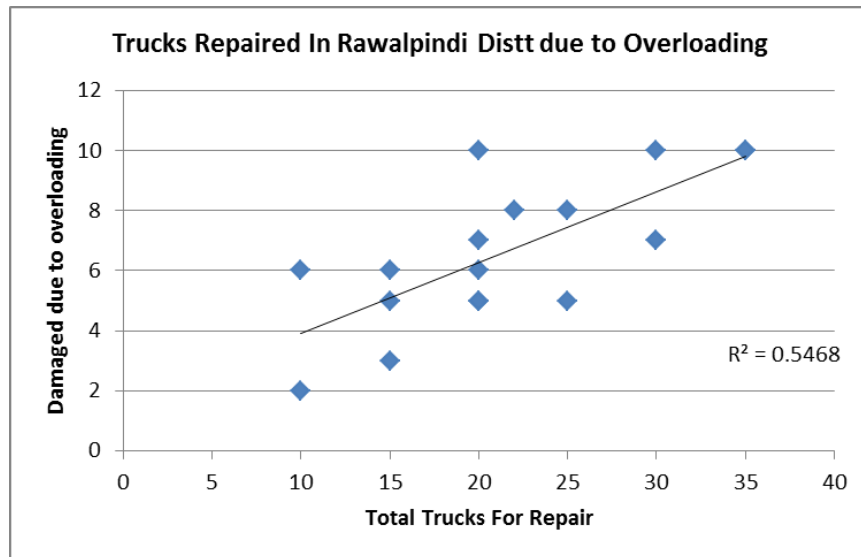
Sequel to RQ-1 causes and origin of OL and the RQ-2 Transport sector issues, RQ-3 is an attempt to have an in-depth view of the effects / menaces of OL practice. To answer RQ-3, the questioner survey has 5 questions. Research question mapping is tabulated below:-

**Table 4.27: Mapping RQ - 3**

	Survey Questions			
User	28	29	32	70
Commoners	89	90	91	92

#### 4.5.1 Trucks damaged due to overloading

Truckers send their vehicle to the workshops on different faults including the faults occurring due to overloading. Therefore perspective of workshop owners is of immense value.



**Figure 4.19: Truck Damaged due to OL**

36 workshop owners participated in the survey, and shared their views about the repair pattern of trucks coming in for repairs due to different faults. When the collected data was transformed to the scatter plot and a line of best fit was plotted as shown with an R-square value of 0.55.

The result prove that out of total trucks reported (i.e. range of 10 to 40 trucks) per month for repairs, at an average 30% (i.e. range of 4 to 10 trucks) in the local workshops in Rawalpindi and Taxila districts were repaired due to overloading.

#### 4.5.2 Risk factors in over loading (SQ-70)

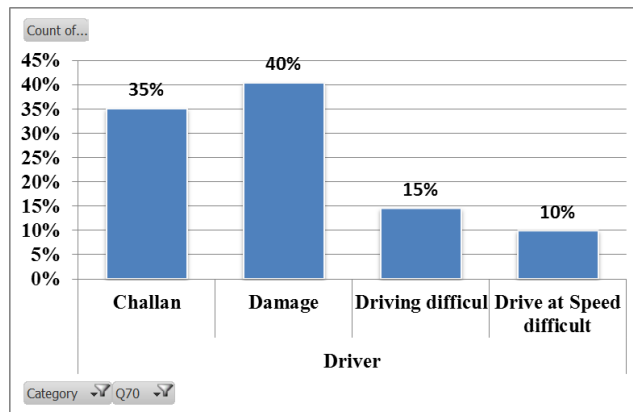
There are many risk factors associated to over loading, such as: (1) challan, (2) damage to the vehicle, (3) difficult to drive, (4) difficult to drive at high speed. In response to SQ-70,



'What are the risk factors involved in over loading?', 40.46% users view 'damage to truck' as highest risk factor in overloading, followed by 'challan' (viewed by 35.11%), 'difficulty to drive' (14.5%), and 'difficulty in driving at high speed' (9.92%).

**Table 4.28: SQ - 70 What are the risk factors involved in over loading?**

	Challan	Damage	Drive at Speed	Drive at High Speed
<b>Driver</b>				
User	35.11%	40.46%	14.50%	9.92%
<b>Grand Total</b>	<b>35.11%</b>	<b>40.46%</b>	<b>14.50%</b>	<b>9.92%</b>



**Figure 4.20: Risk factors involved in over loading**

#### 4.5.3 Effects of overloading on the Environment (SQ-92)

SQ92, "In your opinion what are the effects of overloading on the Environment?" is a general question asked from the commoners. The majority of the respondents are of the view that the OL not only affects the road way but also it is the major cause of accidents on the highways network.

**Table 4.29: SQ-92, Effects of overloading on the Environment**

Accidents	27.27%
Traffic Jam	18.18%
Risk	18.18%
pollution	9.09%
Speed slow	9.09%
Congestion	9.09%
Smoke	9.09%

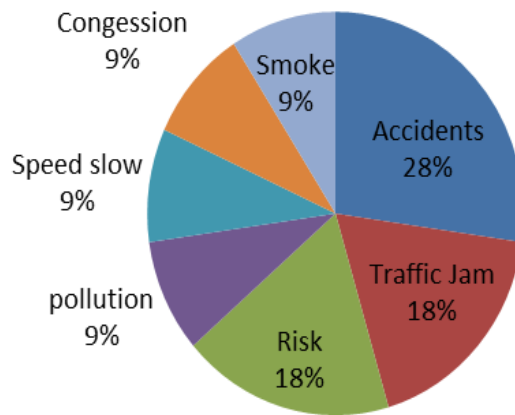


Figure 4.21: SQ-92, Effects of overloading on the environment

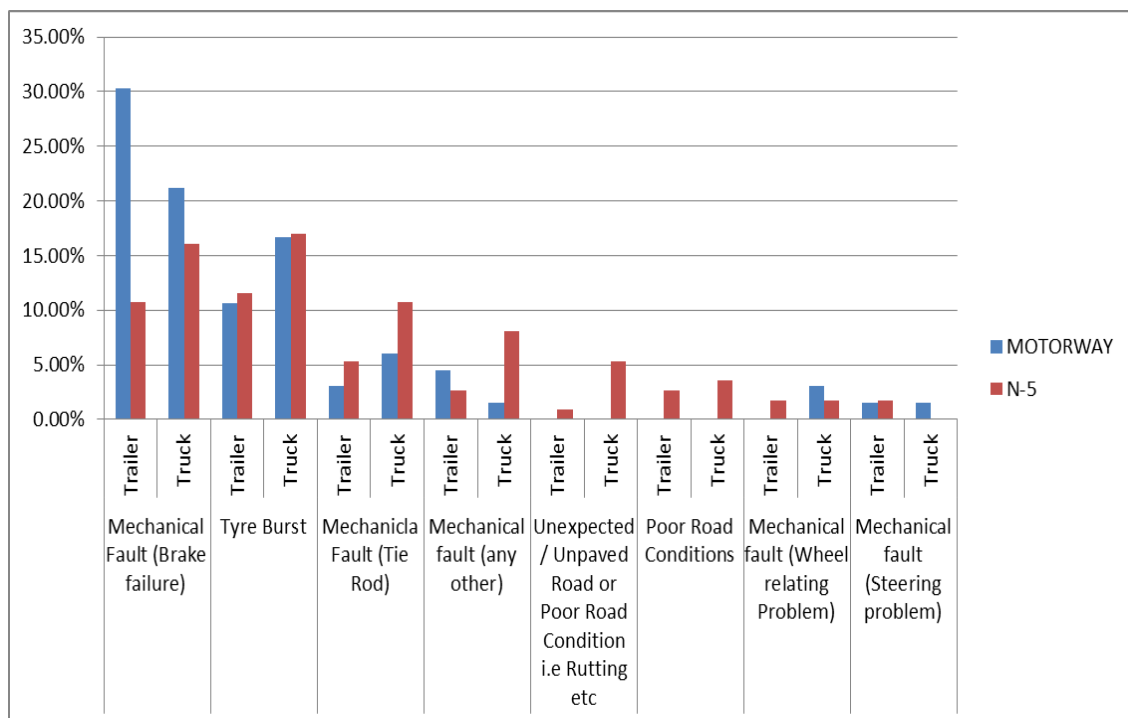
#### 4.5.4 Comparative accident analysis Motorways and National Highways (2009-2014)

Table 4.30: Comparative Accident Analysis Motorways and National Highways (2009-2014)

Row Labels	MOTORWAY	N-5	Grand Total
<b>Trailer</b>	<b>50.00%</b>	<b>37.50%</b>	<b>42.13%</b>
Mechanical Fault (Brake failure)	30.30%	10.71%	17.98%
Tyre Burst	10.61%	11.61%	11.24%
Mechanical Fault (Tie Rod)	3.03%	5.36%	4.49%
Mechanical fault (any other)	4.55%	2.68%	3.37%
Poor Road Conditions	0.00%	2.68%	1.69%
Mechanical fault (Steering problem)	1.52%	1.79%	1.69%
Mechanical fault (Wheel relating Problem)	0.00%	1.79%	1.12%
Unexpected / Unpaved Road or Poor Road Condition i.e Rutting etc	0.00%	0.89%	0.56%
<b>Truck</b>	<b>50.00%</b>	<b>62.50%</b>	<b>57.87%</b>
Mechanical Fault (Brake failure)	21.21%	16.07%	17.98%
Tyre Burst	16.67%	16.96%	16.85%
Mechanical Fault (Tie Rod)	6.06%	10.71%	8.99%
Mechanical fault (any other)	1.52%	8.04%	5.62%
Unexpected / Unpaved Road or Poor Road Condition i.e Rutting etc	0.00%	5.36%	3.37%
Poor Road Conditions	0.00%	3.57%	2.25%
Mechanical fault (Wheel relating Problem)	3.03%	1.79%	2.25%
Mechanical fault (Steering problem)	1.52%	0.00%	0.56%
<b>Grand Total</b>	<b>100.00%</b>	<b>100.00%</b>	<b>100.00%</b>

As shown in the table data above from the NH&MP an aggregate record of accidents being done on Motorways and N-5, so it was evident that the major cause of accident is the ‘Brake failure’ followed by the suspension system failure, these accidents lead to a simple conclusion that the faculty truck body modification in the road side workshops not catering for the design standards lead to catastrophic loss to the vehicle and the passengers on board these accidents indicate that such vehicles are also a menace for the vehicle around on the road network.

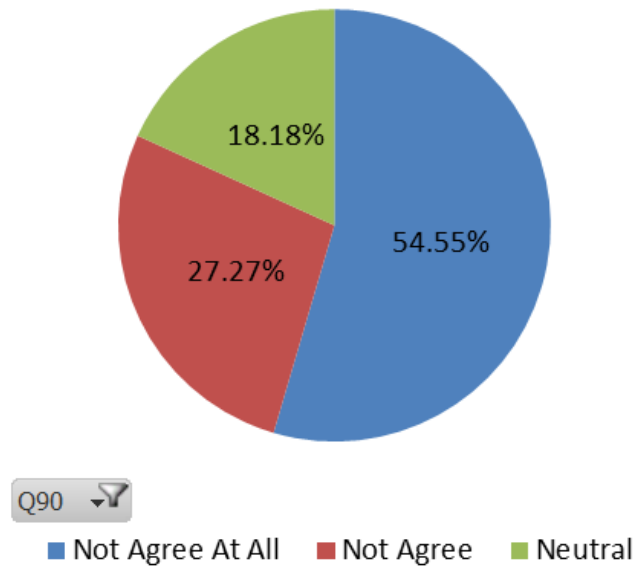
The tabulated data also validate the SQ-92 i.e. the effects of the OL in the form of the record accidents of menace of OL.



**Figure 4.22: Major Accident due to OL on Highways and Motorways (2009 /14)**

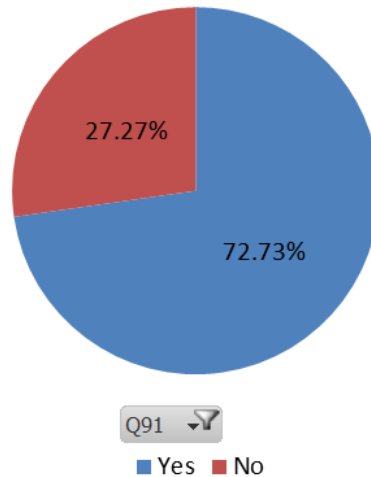
As shown in the figure above the trucks and trailers accident causation profile clearly indicates that the causation of accidents.

SQ-91," *Up to what extent you think that driving with overloading is safe?"*, the perception of the commoners i.e. 54% respondents view about safety in relation to the OL that spells a clear view as follows.



**Figure 4.23: OL and safety**

SQ-91," *Do you believe that overloading by trucks is creating hazards for other drivers on the road?"* a similar question was asked to the commoners about the hazards of OL in relation to other drivers on the road, the overwhelming majority of 72% strongly view that OL is causing hazards for the other drivers, this perception is also validated by the record of accidents by NH&MP police as tabulated and shown in the graphical representation.



**Figure 4.24: OL hazardous for other drivers**

#### 4.5.5 Summery

The OL is not only causing a colossal loss to the environment but it is also damaging the pavement infrastructure as a whole.

The OL practice may seem to be an individual or a small group of people activity / action but the fact of matter remains that this is affecting the society as whole.

## 4.6 RQ-4 - WHAT IS THE FAMILIARITY AND EFFECTIVENESS OF RELEVANT AXLE OVERLOAD CONTROL LAWS?

After having discussed the causes (RQ-1) and origin (RQ-2) of OL practice, RQ-4 seeks to answer about the familiarity of stakeholders about the rules and effectiveness therein. To answer RQ-4, the questioner survey has 11 questions. Out of 11 questions, 2 SQ are generic however, questions asked from users are 6, and 3 SQ asked from Managements. Research question mapping is tabulated below:-

**Table 4.31: Mapping RQ-4**

Category	Survey Questions						
Users	7	8	9	10	11	12	27
Management	7	8	9	13	14	15	

#### 4.6.1 Importance of traffic laws (SQ-7)

SQ-7, “How important are traffic laws to you?” is a generic question asked from both segments to answer RQ-3.

##### a. User

As regards to user perspective 58.82% respondents found it to be ‘very important’ whereas, 37.06% pronounced it as ‘important’, and only a small proportion of 4.12% was in-decisive. Tabulated results are appended below.

**Table 4.32: SQ-7 Importance of traffic laws**

Row Labels	Neutral	Imp	V imp
<b>User</b>			
Driver	3.73%	44.03%	52.24%
Wksp	5.56%	11.11%	83.33%
<b>Total</b>	<b>4.12%</b>	<b>37.06%</b>	<b>58.82%</b>

##### b. Management

When management perspective was asked, the results (tabulated below) show 71.43% respondents said that the traffic laws are ‘very important’ to them against 26.53% who find it ‘important’, and 2.04% who had no opinion (i.e. ‘cannot say anything’).

**Table 4.33: SQ-7 Importance of traffic laws**

Row Labels	Neutral	Imp	V imp
<b>Management</b>			
Police	0.00%	29.55%	70.45%
WS	20.00%	0.00%	80.00%
<b>Total</b>	<b>2.04%</b>	<b>26.53%</b>	<b>71.43%</b>

**Table 4.34: SQ8 Which of the following is important in traffic laws to you?**

	Strict enforcement	Leniency
<b>User</b>		
Driver	63.43%	36.57%
Wksp	88.89%	11.11%
<b>Grand Total</b>	<b>68.82%</b>	<b>31.18%</b>

#### 4.6.2 Implementation of law (SQ-8)

SQ-8, “Which of the following is important to you?” is another generic question asked from both segments to answer RQ-3. Perspective of management and user is presented separately:

##### a. User

As regards to user perspective 58.82% respondents found it to be ‘very important’ whereas, 37.06% pronounced it as ‘important’, and only a small proportion of 4.12% was in-decisive. Tabulated results are appended below

##### b. Management

93.88% of respondents prefer enforcement of traffic laws to be ‘strict’ against 6.12% who believe in leniency in enforcement.

**Table 4.35: SQ8 Which of the following is important in traffic laws to you?**

	Strict enforcement	Leniency
<b>Management</b>		
Police	95.45%	4.55%
WS	80.00%	20.00%
<b>Total</b>	<b>93.88%</b>	<b>6.12%</b>

#### 4.6.3 Familiarity with road rules and weight limits (SQ-9, SQ-10, SQ-11, and SQ-12)

SQ-9, “Up to what extent, are you familiar with road rules?” is a specific question asked from user to answer RQ-3. Perspective of user is presented:

**a. User**

Familiarity of users with road rules is considered a weak area by the management. However, user perspective (noted below) represents that 69.42% of respondents are confident about their familiarity with road rules. Whereas, 30.59% respondents accept their lacking in the knowledge of relevant rules.

If approximately 31% users themselves accept their ignorance to relevant rules, it raises serious questions over driving licensing authorities and weakness of testing system at the time of licensing. Ignorance of users results in damage to the trucks, loss of precious life due to road accidents.

**Table 4.36: SQ9. Up to what extent, are you familiar with road rules?**

	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
User	2.94%	2.94%	24.71%	38.24%	31.18%
<b>Total</b>	<b>2.94%</b>	<b>2.94%</b>	<b>24.71%</b>	<b>38.24%</b>	<b>31.18%</b>

In a different but closely related (in context) SQ-10, “*Up to what extent, are you familiar with maximum weight limit?*”, the users respond overwhelmingly with 95.29% who had familiarity with maximum weight limits. Though this result is apparently high but it indicates another inherent weakness of society where rules are violated intentionally. Moreover, intentional violation of rules related to overloading also exhibit that this violation is done in order to meet the high operating cost, as already indicated in response to RQ-1 and 2.

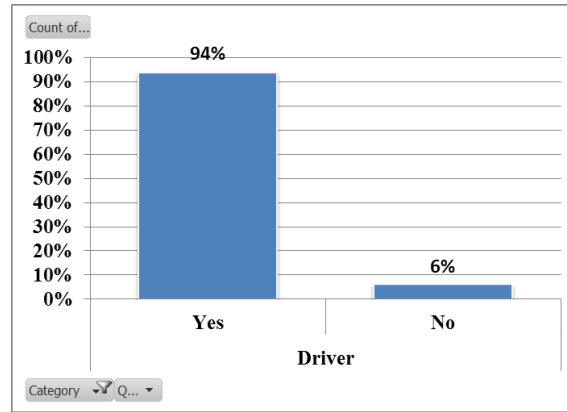
In line with SQ-9, and 10, SQ-11 and 12 yield following results:-

**Table 4.37: SQ-11 maximum limit of overloading?**

	<b>Yes</b>	<b>No</b>
User	88.82%	11.18%
<b>Total</b>	<b>88.82%</b>	<b>11.18%</b>



88.82% respondents are known to the ‘weight limits’ and 94% of respondents are well aware of the ‘maximum limit of overloading’



**Figure 4.25: Awareness about max weight limit**

#### 4.6.4 Perception over road weight limits enforcement in Pakistan (SQ-14)

SQ-14, “Up to what extent do you believe that the road weight limits in Pakistan are enforced properly?” is another generic question asked from both segments to answer RQ-

3. Perspective of management and user is presented separately:

##### a. User

54.71% of users believe that enforcement is effective however, 24.12% think otherwise due to non-functional enforcement mechanism on Provincial (85% of total road network of Pakistan), with 15.29% being indecisive in their response.

**Table 4.38: Q14. Up to what extent do you believe that the road weight limits in Pakistan are enforced properly?**

	Not At All	Not Think So	Neutral	Little
<b>User</b>				
Wksp	0.00%	16.67%	11.11%	30.56%
Driver	7.46%	26.12%	16.42%	31.34%
<b>Total</b>	<b>5.88%</b>	<b>24.12%</b>	<b>15.29%</b>	<b>31.18%</b>

## b. Management

75.51% respondents from managerial segment perceived that the true weight limits are followed. If this higher percentage is accepted true then the problem of overloading is not that grave, which is not true. The explanation of this higher percentage is that only on the Motorways the weight limits specified vide NHSO-2000 are followed objectively that to being close access of entry and reasonably better enforcement.

**Table 4.39: Q14. Up to what extent do you believe that the road weight limits in Pakistan are enforced properly?**

	Not At All	Not Think So	Neutral	Little	Great
<b>Management</b>					
WS	20.00%	20.00%	0.00%	60.00%	0.00%
Police	4.65%	13.95%	2.33%	72.09%	6.98%
<b>Total</b>	<b>6.25%</b>	<b>14.58%</b>	<b>2.08%</b>	<b>70.83%</b>	<b>6.25%</b>

The aggregate results of the enforcement perception are pretty biased reason being the management (policy) views are for the support of their functions however the user are also inclined to comment that the enforcement is stringent, and the violators are not to accept their wrong doings/ practices.

**Table 4.40: Q14. Up to what extent do you believe that the road weight limits in Pakistan are enforced properly?**

Row Labels	Not At All	Not Think So	Neutral	Little	Great
User	5.88%	24.12%	15.29%	31.18%	23.53%
Management	6.25%	14.58%	2.08%	70.83%	6.25%
<b>Total</b>	<b>5.96%</b>	<b>22.02%</b>	<b>12.39%</b>	<b>39.91%</b>	<b>19.72%</b>

### 4.6.5 Penalty for over loading (SQ-15)

Upon asking to share the user perspective about SQ-15, '*Punishment for over loading is just because it is required to?*', received responses are presented as under:-

**Table 4.41: Q15. Punishment for over loading is just because it is required to?**

	Control traffic accident	Maintain discipline	Avoid damage to the roads
User			
<b>Total</b>	<b>45.88%</b>	<b>22.35%</b>	<b>31.76%</b>

‘Controlling traffic accidents’ and ‘maintaining discipline’ is perceived by 68% of respondents from user segment whereas only, 31.76% view ‘avoidance of damage to the road’, as an objective of punishment for overloading. The users’ category is not alive to the issue of OL and considers it to be a non-issue. This serious-lessness of concerns pave the practice for OL.

#### 4.6.6 **Summary**

Perception about severity of set of rules governing OL is not appropriately conceived by the users and the management. OL is not considered as a heinous crime for the damages to the road and inconvenience caused to the road users thereof, rather OL is considered to be a contributing factor towards road accidents and traffic control.

Lack of education of truckers (owners and drivers) pave the way for poor knowledge and lack of understanding of the damages caused to the roads due to non-adherence of laws related to OL.

The problem is further aggravated due to the enforcement agencies failure to interpret the severity of damage to the roads due to violation of ALM system.

There is no media campaign (as corporate social responsibility or paid content) being run at national or provincial level for educating truckers on OL as seen in case of wearing of seatbelts.

## **4.7 RQ-5 –WHAT ARE THE FLAWS IN THE COORDINATION (COLLABORATION) AMONG STAKEHOLDERS (MANAGEMENT I.E. NHA AND NH&MP/ PROVINCIAL MOTOR VEHICLE REGISTRATION AUTHORITY, AND USERS)?**

### **4.7.1 Overview**

There are multiple agencies performing allocated set of responsibilities related to formulation of policy, evaluation, implementation, and enforcement of axle control regime. The existing situation has further aggravated after 18 amendments, empowering the provincial governments to regulate independently. Such a scenario demands close coordination and cooperation among all stakeholders, Managements, implementers and enforcing agencies.

### **4.7.2 Methodology adopted to answer RQ-5**

The nature of RQ dictates the methodology to be adopted for answering that research problem. In case of RQ-5 quantitative measures are not available thereby meaning demands adoption of qualitative approach.

Answer to RQ-5 has its roots into the government promulgated legislations that includes rules and ordinances that necessitates archival analysis. Besides legislation there are general rules that are implemented by district administration and traffic police.

To capture the perspective of different stakeholders from management, semi structured interviews were conducted in contrive environment with DIG (operations) NH&MP, SSP Traffic police Islamabad, Deputy Director (weigh stations) NHA, Director National Transport Research Center (NTRC, NHA). Purposive sampling technique was used and gathered data is analyzed in succeeding paras.

### 4.7.3 Administrative framework

There are number of Governmental and administrative players who are playing their specific role. It involves legal, economic, administrative, and political bodies ranging from municipal to national level, from Prime Minister's office to Provincial traffic police. Thus, the problems of coordination and control become obvious not to say anything about difficulties in finding a consensus even within the politico-administrative machinery on appropriate development measures.

On the top of the administrative pyramid, as far as the roads are concerned, is the Ministry of Communication representing Government of Pakistan. It is entrusted with overall responsibility and control on the transport sector including its development. The responsibilities with regard to enforcement of relevant traffic rules, rests with police.

Safeguarding road safety is also Government's responsibility. Administrative authority is exercised through the offices and officials of federal and provincial controlling agencies e.g. offices of registration, and issuance of fitness certificates of the transport vehicles.

### 4.7.4 Promulgation and Implementation of Motor Vehicle Ordinance 1965

The root cause of gross violation of existing rules and regulations is embedded into MVO. Under the heading of Registration of Motor Vehicle, Section 38b deals with size of nature and size of the tyre:

*"...the number, nature and size of the tyres attached to each wheel;"*

Section 38c deal with axle weight:

*"...the laden weight of the vehicle and the axle weights pertaining to the several axles thereof, determined in accordance with the tyre and Rim Manufactures*

*Association load ratings for tyres as revised from time to time and approved by the Provincial Transport Authority;*

As quoted above, under Section 38c, the Provincial Transport Authority is entrusted the responsibility of ensuring that the ‘fitness certificate’ issued for the commercial vehicle is as per the OEM (original equipment manufacturer) specification for axle weight pertaining to several axles.

However, in practice the ‘fitness certificate ‘ is issued without due diligence to rules and regulation pertaining to the specification, thereby paving the way for the truckers to obtain fake ‘fitness certificates’ even after having incorporated the illegal modifications carried out by truck body makers in axle configuration (strengthening the suspension system including spring leafs and shock absorbers, and transmission system).

The problem persists due to low level malpractices where a vehicle even after repeated inspections is not highlighted for the illegal modifications in the absence of physical inspection by the transport authority. Sub Section (3) on subject is appended below:

*“certificate of fitness shall remain effective for three years unless a shorter period, not being in any case less than six months, is specified in the certificate by the (authority issuing the certificate)”*

#### **4.7.5 Promulgation of NHSO-2000**

NHA implemented Axle Overload Control Regime in 1995 with installation of Sangjani Weigh Station (N-5) near Islamabad as a pilot project, but met with little or no success, primarily because of stiff resistance by transporters/ truckers, inadequate enforcement measures and absence of legislation.

The Honorable Sindh High Court issued an interim order on 31<sup>st</sup> May 2010:

*“At the weighing bridge if any vehicle in contravention of Section 75 of National Highway Safety Ordinance, 2000, is found to carry excess weight, the National Highways Police will take cognizance and shall award penalty whoever drives a transport vehicle in accordance with Law.”*

#### **4.7.6 Negative impact of government intervention in the face of Trucker strike**

Truckers went on strike for 11 days in December 2012, forced PM to appoint Ministerial Committee for negotiations. Fine Collection was, Fine collection recommenced from 11th march 2013 (after deferment for three (03) months) the allowable weigh limits as per NHSO-2000 and proposed weigh limits (with effect from 15 April 2013) as agreed by IG NH&MP & NHA with percentage increase to the allowable limits has reduced fine imposition to almost zero. But 50% allowance was to be withdrawn with effect from 1 November 2013 which is yet to be withdrawn by NH&MP. This laxity has over taxed the road network by causing extensive road damages as seen on the National highways (excluding the Motor ways).

As a deal between user (truckers) and the management (NHA) following relaxation was granted on permissible load limits of gross vehicle weight. This undue favor and unprecedented weight allowance was allowed as a compensation for an un-thoughtful legislative initiative.

PERMISSIBLE LOAD LIMITS OF GROSS VEHICLE WEIGHT AND AGREED RELAXATION

SR. NO.	TRUCK TYPE	Permissible GVW limits as per NH&O-2000	GVW with 15% allowed with Fine as per NH&O-2000	Limits decided in meeting held on 01-04-13 (50% shall be withdrawn w.e.f. 1-11-13)			
		(IN TON S) (A)	(IN TON S)	TRUCK (IN TON S)	% Increase (of A)	OIL TANKER (IN TON S)	% Increase (of A)
1	2 AXLE (BEDFORD)	17.5	20.13	21	20.00	20	14.29
2	2 AXLE (HINO / NISSAN)	17.5	20.13	30	71.43	22	25.71
3	3 AXLE	27.5	31.63	45	63.64	37.50	36.36
4	3 AXLE	29.5	33.93	45	52.54	40	35.59
5	4 AXLE	39.5	45.43	56	41.77	60	51.90
6	4 AXLE	39.5	45.43	56	41.77	60	51.90
7	4 AXLE	41.5	47.73	56	34.94	60	44.58
8	5 AXLE	48.5	55.78	65	34.02	65	34.02
9	5 AXLE	49.5	56.93	65	31.31	65	31.31
10	5 AXLE	51.5	59.23	65	26.21	65	26.21
11	5 AXLE	51.5	59.23	65	26.21	65	26.21
12	6 AXLE	58.5	67.28	80	36.75	72	23.08
13	6 AXLE	61.5	70.73	80	30.08	72	17.07

Figure 4.26: NH&amp;MP promulgated axle load regime

#### 4.7.7 Policy formulation after detail interaction with stakeholders

The policy formulation and promulgation are the later steps, before which detailed interaction and input from all stakeholders (management and users) is mandatory to avoid violations or non-implementation of promulgated policies.

The case in point is a true example of bureaucratic way of lawmaking in isolation, without empathy and due consideration for those who are to be governed. The ill treatment given to the ordinance (NH&O-2000) by the users in the first phase and subsequently by the management adequately explains the case in point.



#### 4.7.8 Non-existent coordination

One set of problems did arise from lack of coordination in management i.e. between NHA and law enforcement bodies. As it was, the weighing station operators did until autumn 2005 have the right to observe the weight of the loads. They did not, however, have the formal authority to enforce payment of the fines for overloads. Police, who would have had the powers, did limit its activities in road safety issues with no concern to overweight. Cooperation was not established.

Since 2005 Police took over the over weight control – inclusive the operation of weighing stations.

Lack of coordination exists also between the above and the federal and provincial officials responsible of registration and issuance of “**fitness certificates**”. If the regulations given in existent law would be adhered to, vehicles modified for carrying overloads would neither be produced nor granted the fitness certificate.

The previously valid customs regulations hampering the possibilities to acquire more suitable equipment for long distance haulage have been counterproductive in view of desire to get rid of over loading practice.

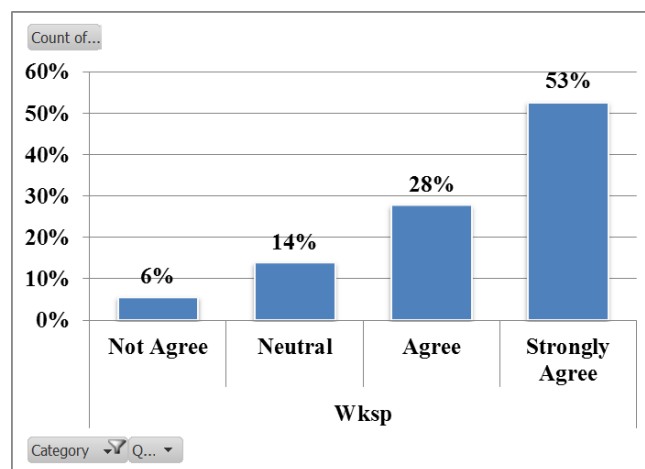
A clear flaw exists also in the coordination between provincial and federal road authorities. It is questionable whether the weighing stations are a solution to the problem at all, but even if those are applied, the truckers tend to find ways to divert from weight controlled Federal roads to in practice non-controlled Provincial roads causing on them even bigger damage. Attempts to expand the stationary weight control to provincial roads have been made, but with no success. Movable weighing units which could be stopping the vehicles for check-ups in random places would serve the purpose much better.

#### 4.1.1 Making of truck body to prevents over loading (SQ-27)

Enforcing agencies consider the main contributing factor towards overloading is truck body modification. In order to absorb the perception of users (i.e. Truck body makers) respondents were asked (SQ-27), 'Up to what extent you agree / disagree with the statement that the body of truck should be made in such a way that it prevents over loading?'. User perspective appended below exhibits 80.56% respondent either 'strongly agree' or 'agree' that making of truck body can prevent overloading against only 5.56% who 'does not agree' whereas, 13.89% decided to be neutral in the issue. The truck bodybuilders had come up with a new informal industry and a large number of trucks are modified by adding an additional 2 axle truck to make it a 3 axle truck this is not limited to truck only, they also transform a Bedford truck to a dump truck being used for the haulage of crush and sand to different construction site.

**Table 4.42: SQ27 - Body of truck be made to prevent over loading?**

	Not Agree	Neutral	Agree	Strongly Agree
<b>User</b>				
Wksp	5.56%	13.89%	27.78%	52.78%
<b>Total</b>	<b>5.56%</b>	<b>13.89%</b>	<b>27.78%</b>	<b>52.78%</b>



**Figure 4.27: Truck Body Modification**

existing law prohibit the kinds of modifications they are doing as well as e.g. easier import of new trucks might endanger their subsistence. This calls for special measures from the side of Government to create alternative means of subsistence. The domestic truck manufacturing industry along with the informal industry comprising truck modification sub- industry, the trailer and body manufactures and the maintenance and spare part sub-sectors have over the years matured into a base industry that has been responsible for creating and maintaining the transport sector. Unrecognized, devoid of quality assurance standards, unsupported and largely technicians based. The industry employs over 1.0 million people and presents an exploitable industrial potential for integrating it into a revamped truck manufacturing industry.

#### 4.7.9 Summary

The RQ in view, adequately explains the collaboration issues amongst the stakeholders and its ill effects in the form of nonconformity to the existing axle control regime.

Another dimension which is highlighted in the above paras is the absence of collaborative and coordinated efforts at the time of policy formulation that resulted into strong resentment (strikes by transporters) and subsequent even bigger damages to the road assets.

The problem stems from the structure of governance for vehicle registration and transport permit issuing authority, where enforcement agency can enforce ALM in the light of permit issued to the vehicle and cannot challenge the permit issuing authority. Therefore issuance of permit for modified vehicle by the vehicle registration authority is the root cause of OL.

To address the non-existent collaboration and coordination amongst the stake holders for the efficient axle regime following measures are suggested to be adopted:

- a. Formulation of working groups at three tiers i.e. National level, provincial level, encompassing following stake holders:
- 1) Management, (1)
  - 2) Users
- b. Though all provinces are empowered to formulate their set of rules but communication being a shared domain between center and provinces should have a uniform policy and set of rules, agreed upon by national and provincial working groups before transforming into rules.
- c. The working group should meet quarterly for performance review.

#### **4.8 RQ-6 –WHAT ARE THE FLAWS IN THE EFFECTIVENESS OF EXISTING OVERLOADING FINE STRUCTURE / WEIGH LIMITS?**

To enforce the NHSO 2000 the fine structure is imposed on the OL violators, the ensuing paras will try to explore the flaws in the existing OL fine structures shortfalls.

To answer RQ-6, the questioner survey has 7 questions. Out of 7 questions, SQs asked from user, and Management segment are 5, and 2 respectively. Research question mapping is tabulated below:-

**Table 4.43: Mapping RQ - 6**

	Survey Questions				
<b>Users</b>	39	57	69	71	72
<b>Management</b>	42	44			

#### 4.8.1 Weight limits (SQ-57 and SQ-42)

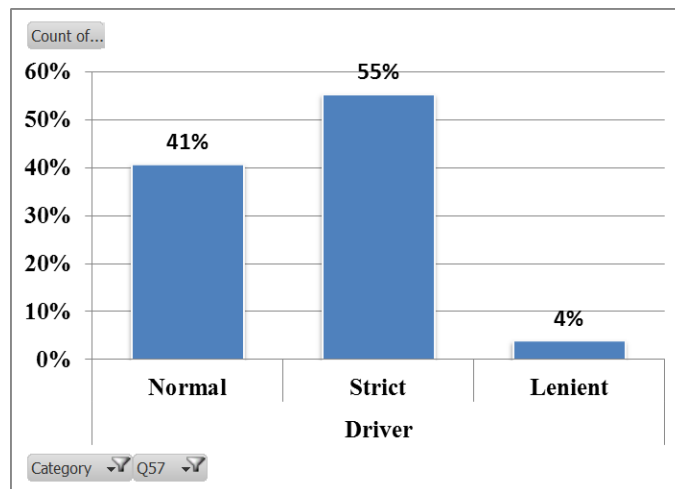
SQ57, "In your opinion, the road weight limits are?", is a specific question asked from drivers to answer RQ-6.

##### a. User (SQ-57)

It should not surprise anybody that the truckers see the weight limitations as too strict. This is the view of roughly 55% of respondents. Furthermore some 41% do see them as "normal", i.e. at the level they should be. Less than 4% would be willing to accept stricter limits.

**Table 4.44: SQ 57 Weight limits**

Row Labels	Strict	Normal	Lenient
Driver	55%	41%	4%
<b>Grand Total</b>	<b>55%</b>	<b>41%</b>	<b>4%</b>



**Figure 4.28: SQ 57 Weight limits**

##### b. Management (SQ-42)

When management perspective was asked, the results are as follows:-

**Table 4.45: SQ- 42 In your opinion, the road weight limits are?**

	Normal	Lenient
Police	65.91%	34.09%

The weight limits perceived by the truckers is strict and the management consider it to be very lenient.

Certainly there is a need for legal load limits in Pakistan and the law is also observing them so the problem is not legislation but rather control and enforcement. Until recently there was practically no weight control and when the weight control through construction of weigh bridges started no punitive punishments in form of proportionate fines were given (on “negotiable” basis on N-5).

SQ-69, “Are you fined when you over load?”, is a specific question asked from users to answer RQ-6.

**a. User**

As regards to user perspective 80% respondents say they are leveed fine once they OL. But the fact of the matter remains quite obvious from the going practice that the respondents’ comments are biased.

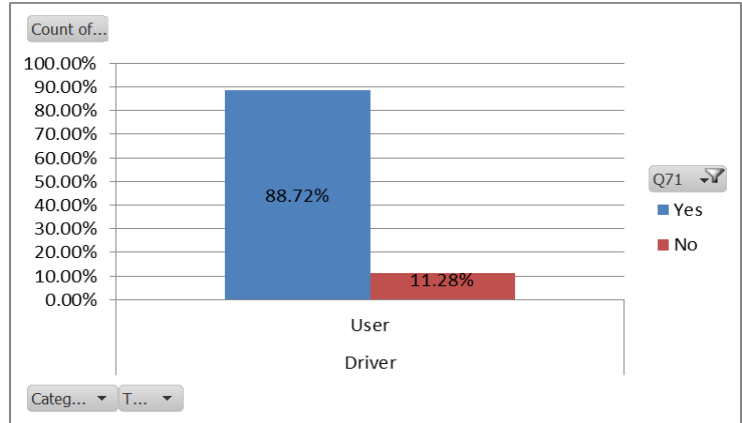
**Table 4.46: SQ – 69 Are you fined when you over load?**

	<b>Yes</b>	<b>No</b>
Driver	80.16%	19.84%

SQ-71, “Are you aware of the structure of fines against overloading?”, was asked from the user and 88% respondents perceived to be aware of the fine structure.

**Table 4.47 SQ-71 Aware of the structure of fines against overloading**

<b>Driver</b>	<b>Yes</b>	<b>No</b>
User	88.72%	11.28%
Total	88.72%	11.28%



**Figure 4.29: SQ-71 Aware of the structure of fines against overloading**

SQ53, "Are you satisfied with the fine leveled against over loading?" the driver perception about the fine 55% and more are not satisfied with the fine level against the OL, and only 20% is satisfied to some extent.

**Table 4.48: SQ-72 satisfied with the fine leveled against over loading**

Row Labels	Greatly Dissatisfied	Dissatisfied	Neutral	Satisfied	Greatly Satisfied
Driver	15.87%	40.48%	22.22%	8.73%	12.70%
User	15.87%	40.48%	22.22%	8.73%	12.70%
<b>Grand Total</b>	<b>15.87%</b>	<b>40.48%</b>	<b>22.22%</b>	<b>8.73%</b>	<b>12.70%</b>

**4.8.2 Fine leveled against OL (SQ- 44)**

SQ-44, "Are you satisfied with the fine leveled against over loading?", was asked from the management.

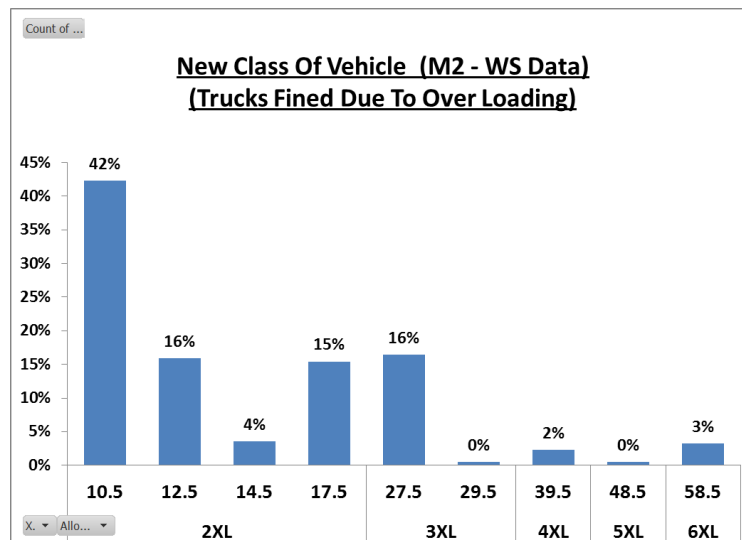
**a. Management**

When management perspective was asked, the results show a clear diversity wherein the 35% of the law enforcing category of management view the fine level very lee punitive to be considered for the deterrence, minimum to be expected for the

The fines this far applied have, in fact, not had any standard structure. In practice they have been based on “negotiable fixed rate”. The negotiated amounts have obviously been such that it still has paid to overload even if the fine has been imposed

**Table 4.49: : Profile of OL Fine on M-2**

<b>Axle Type / Tonnage</b>	<b>Count of Ser</b>
<b>2XL</b>	<b>77.17%</b>
10.5	42.28%
12.5	15.92%
14.5	3.54%
17.5	15.43%
<b>3XL</b>	<b>16.88%</b>
27.5	16.40%
29.5	0.48%
<b>4XL</b>	<b>2.25%</b>
39.5	2.25%
<b>5XL</b>	<b>0.48%</b>
48.5	0.48%
<b>6XL</b>	<b>3.22%</b>
58.5	3.22%
<b>Grand Total</b>	<b>100.00%</b>



**Figure 4.30: Profile of OL Fine on M-2**



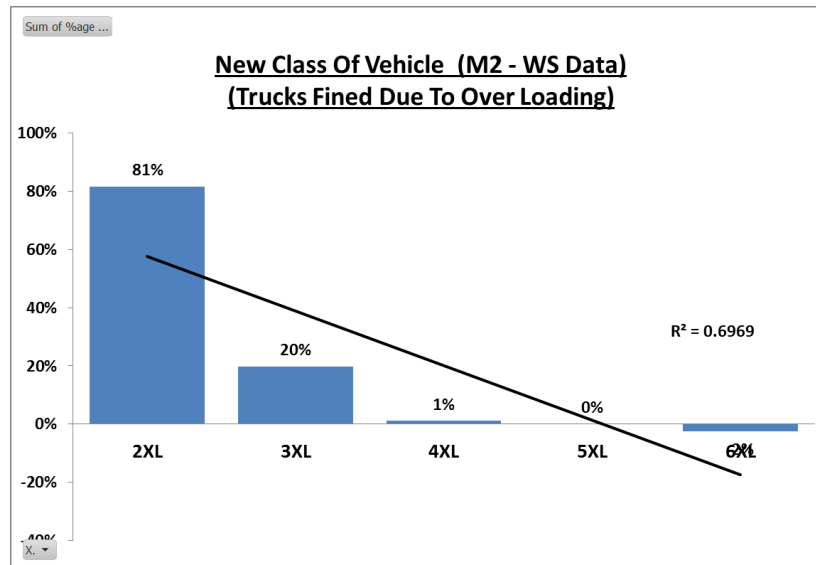


Figure 4.31: Pattern of OL vehicle within Axle load Classification

Table 4.50: SQ - 44 Are you satisfied with the fine leveled against over loading?

	Greatly dissatisfied	Dissatisfied	Neutral	Satisfied	Greatly satisfied
C.T.P.O Rwp	20.00%	40.00%	15.00%	20.00%	5.00%
NH&MP	0.00%	12.50%	4.17%	75.00%	8.33%
<b>Total</b>	<b>9.09%</b>	<b>25.00%</b>	<b>9.09%</b>	<b>50.00%</b>	<b>6.82%</b>

#### 4.8.3 Fine structure

As per the site visit and observations followed by the fine statistics of road infrastructure it is revealed that contrary to the actual fine structure of minimum 17.5ton their a large number of vehicle in the medium category trucks types also plying on the roads.

Moreover the 10.5 ton category vehicle are 16% overloaded may require more elaboration for the research to be done on this aspect.

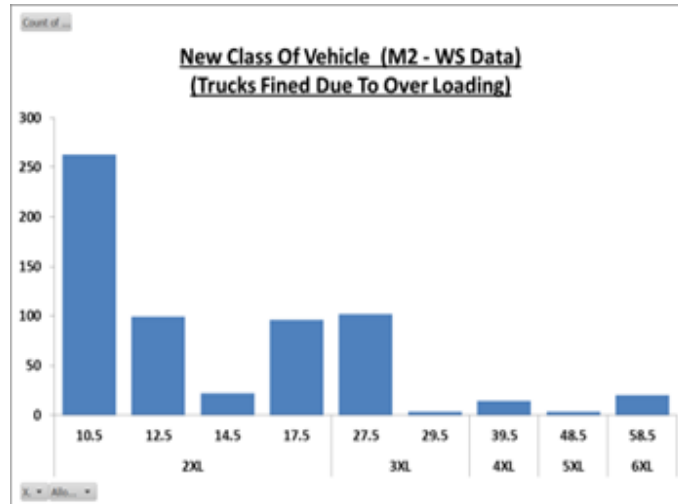


Figure 4.32: Profile of OL Fine on M-2

PERMISSIBLE LOAD LIMITS OF GROSS VEHICLE WEIGHT AND AGREED RELAXATION							
SR. NO.	TRUCK TYPE	Permissible GVV limits as per NHSO-2000	GVV with 15% allowed with Fine as per NHSO-2000	Limits decided in meeting held on 01-04-13 (50% shall be withdrawn w.a.f. 1-11-13)			
		(IN TON S) (A)	(IN TON S)	TRUCK (IN TON S)	% Increase (of A)	OIL TANKER (IN TON S)	% Increase (of A)
1	2 AXLE (BEDFORD)	17.5	20.13	21	20.00	20	14.29
2	2 AXLE (HINO / NISSAN)	17.5	20.13	30	71.43	22	25.71
3	3 AXLE	27.5	31.63	45	63.64	37.50	36.36
4	3 AXLE	29.5	33.93	45	52.54	40	35.59
5	4 AXLE	39.5	45.43	56	41.77	60	51.90
6	4 AXLE	39.5	45.43	56	41.77	60	51.90
7	4 AXLE	41.5	47.73	56	34.94	60	44.58
8	5 AXLE	48.5	55.78	65	34.02	65	34.02
9	5 AXLE	49.5	56.93	65	31.31	65	31.31
10	5 AXLE	51.5	59.23	65	26.21	65	26.21
11	5 AXLE	51.5	59.23	65	26.21	65	26.21
12	6 AXLE	58.5	67.28	80	36.75	72	23.08
13	6 AXLE	61.5	70.73	80	30.08	72	17.07

Figure 4.33: Negotiated weight limits for National Highways

#### 4.8.4 Summary

The fine level applied this far have been relatively low. Decisions to increase it and make the fines progressively punitive have been put forth, but not really implemented. Fines have been more or less theoretical anyway, since in practice they have been negotiable.

A fine for misbehavior should be such that it makes one think at least twice before subjecting himself to the risk of being fined. It should be such, that it not only

takes away the potential benefit of misbehavior but also puts an additional cost as a punishment for it. The philosophy behind overweight fine collection this far seems to have been the one of income generation rather than prevention of overloading.

Whatever the fine level, it does not have the preventive effect unless the fine payment is properly enforced. This is an implementation and enforcement issue.

NH&MP is allowing overloaded vehicle without observing weigh limits as laid down in NHSO-2000 and also allowing vehicles which are overloaded beyond revised weigh limits as applicable till 15<sup>th</sup> April 2014.

#### **4.9 RQ-7– WHAT INTERVENTIONS / IMPROVEMENTS ARE RECOMMENDED IN EXISTING OVERLOADING FINE STRUCTURE**

To answer RQ-7, the questioner survey has 9 questions. Out of 9 questions, 3 SQ are generic however, 3 SQs each are asked from user, and Management segment. Research question mapping is tabulated below:-

**Table 4.51: Mapping RQ - 6**

<b>Category</b>	<b>Survey Questions</b>					
Users	16	20	21	57	71	72
Management	16	20	21	42	44	37

##### **4.9.1 Correct fines structure for violate weight load rules (SQ-16)**

SQ-16, “*What in your opinion is the correct structure of fines for people who violate weight load rules?*”, is asked from user to answer RQ-7.

Table 4.52: SQ16. What is your opinion is the correct structure of fines for people who violate weight load rules?				
User	Fixed fine	Fixed plus the structure of excess weight	Fine only according to the structure of excess weigh	Fine more than benefit due to overloading
Driver	60.16%	13.01%	15.45%	11.38%

### a. User

As regards to user perspective 60.16% respondents supported 'fixed fine', 15.45% advocates 'fine according to the structure of excess weigh', followed by 'Fixed plus the structure of excess weight' (13.01%), and 'more than benefit due to overloading'(11.38%).

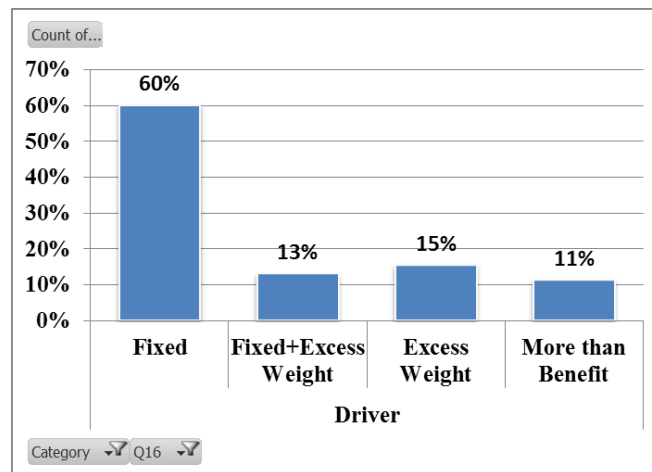


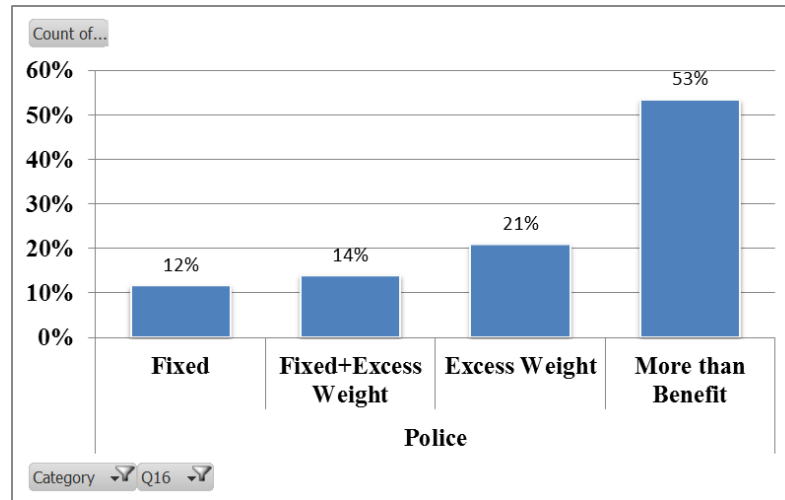
Figure 4.34: Correct structure of fines for violators weight load rules

### b. Management

When management perspective was obtained, the results (exhibited below) highlight that an overwhelming 53.49% of management supports imposition of 'fine more than the benefit due to overloading' (same view is shared by 11.38%), 20.93% respondents proposed 'fine according to the structure of excess weigh', followed by 'Fixed plus the structure of excess weight' (13.95%), and 'fixed fine' (11.63%).

**Table 4.53: Q16. What in your opinion is the correct structure of fines for people who violate weight load rules?**

Management	Fixed fine	Fixed plus the structure of excess weight	Fine only according to the structure of excess weigh	The amount of fine should be more than benefit due to overloading
Police	<b>11.63%</b>	<b>13.95%</b>	<b>20.93%</b>	<b>53.49%</b>

**Figure 4.35: Correct structure of fines for violator weight load rules****Table 4.54: SQ16. What is your opinion is the correct structure of fines for people who violate weight load rules?**

Management	Fixed fine	Fixed plus the structure of excess weight	Fine only according to the structure of excess weigh	The amount of fine should be more than benefit due to overloading
Driver	60.16%	13.01%	15.45%	11.38%
Police	11.63%	13.95%	20.93%	53.49%
<b>Total</b>	<b>47.59%</b>	<b>13.25%</b>	<b>16.87%</b>	<b>22.29%</b>

The aggregate result shows that the amount of fine should be more than the benefits due to overloading by the truckers so as to firmly discourage the tendency of overloading.

#### 4.9.2 Preferred way of treatment of overloaded trucks (SQ- 20)

SQ-20. "In your opinion, what is the preferred way of treatment of overloaded trucks?",

is a generic question asked from both segments to answer RQ-20.

### b. User

As regards to user perspective, 78% respondents supported ‘fine’, 16% suggest ‘impound’, whereas, 7% view ‘cancellation of driving license’ as a preferred treatment.

<b>Table 4.55: SQ20. In your opinion, what is the preferred way of treatment of overloaded trucks?</b>			
	<b>Overloaded trucks should be fined</b>	<b>To be impounded</b>	<b>Cancel the license of habitual offenders</b>
<b>User</b>			
Driver	77.50%	15.83%	6.67%

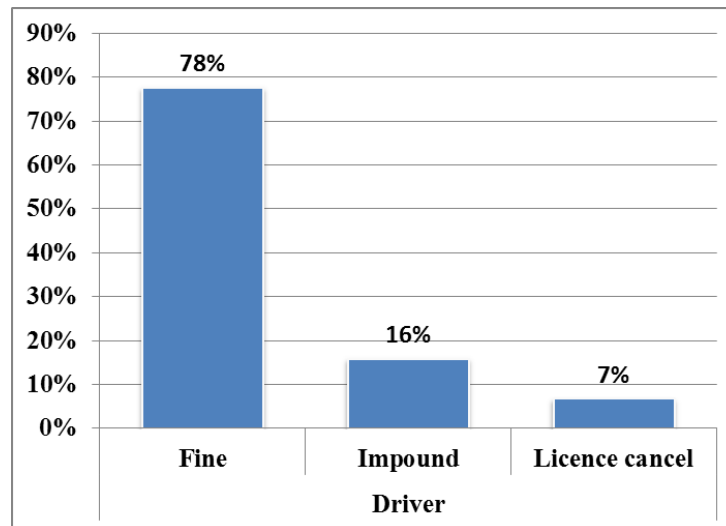


Figure 4.36: Preferred way of treatment of overloaded trucks

### c. Management

In contrast to users, 64.86% management supports ‘cancellation of license’, whereas, 21.62% argue ‘impounding’, and 13.51% found ‘fine’ as an appropriate way of treating the overloaded trucks.

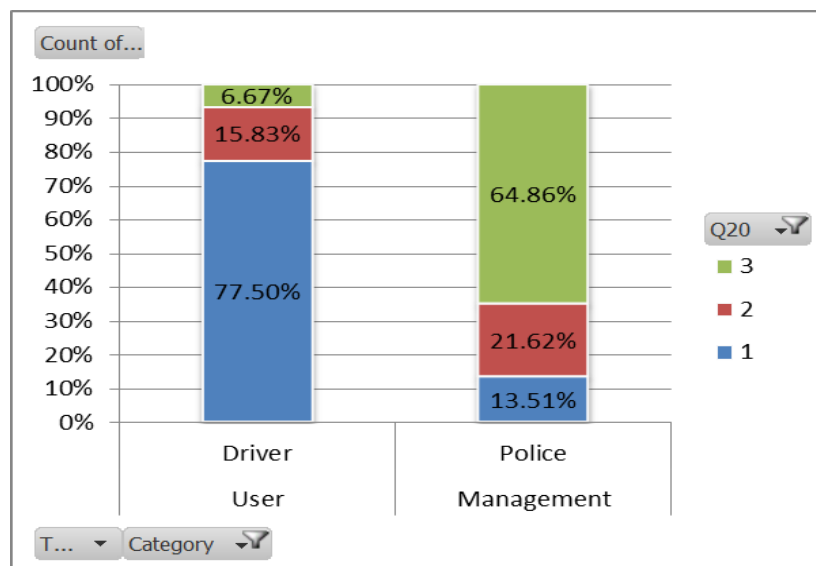
**Table 4.56: SQ20. In your opinion, what is the preferred way of treatment of overloaded trucks**

	<b>Overloaded trucks should be fined</b>	<b>To be impounded</b>	<b>Cancel the license of habitual offenders</b>
<b>Management</b>			
Police	13.51%	21.62%	64.86%

- d. The aggregate perceptions spell a novel direction for the treatment of the problem by making the most deterrent measure i.e. ‘cancellation of license’ making it more deterrent by deferring the re-issue of license for minimum 3 month.

**Table 4.57: Q20. In your opinion, what is the preferred way of treatment of overloaded trucks?**

	Overloaded trucks should be fined	To be impounded	Cancel the license of habitual offenders
Driver	77.50%	15.83%	6.67%
Police	13.51%	21.62%	64.86%
<b>Total</b>	<b>62.42%</b>	<b>17.20%</b>	<b>20.38%</b>



**Figure 4.37: Q20. In your opinion, what is the preferred way of treatment of overloaded trucks?**

4.9.3SQ21, “*The fine should be imposed on?*”, is a generic question asked from both segments to answer RQ-5.

**a. User**

As regards to user perspective about the imposition of fine, respondents had a mix view point 26.40% respondents considered the ‘loading terminal staff’ the main reason for overloading of the trucks, followed by the ‘truck owners’, which force the drivers to load above the rated capacity of the truck for more profit / gains. Moreover,

25.37% consider ‘truck driver, owner, and terminal staff’ cumulatively responsible for the issue. ‘Truck driver’ with 11.19% are suggested to be penalized to the minimum.

**Table 4.58: Q21 The fine should be imposed on**

	<b>Driver</b>	<b>Owner</b>	<b>Loading terminal staff</b>	<b>Driver, owner, terminal Staff</b>
Driver	11.19%	30.60%	32.84%	25.37%

#### **b. Management**

When management perspective was asked, the results were altogether different, whereby, ‘truck driver’ category is considered by the enforcing agency i.e. police 47.73% followed by the ‘truck driver, owner, and terminal staff’ at 27.27%. ‘Truck owner’ with 18.18% ranked third.

**Table 4.59: Q21 The fine should be imposed on**

	<b>Driver</b>	<b>Owner</b>	<b>Loading terminal staff</b>	<b>Driver, owner, terminal Staff</b>
Police	47.73%	18.18%	6.82%	27.27%

**Table 4.60: Q21 The fine should be imposed on**

	<b>Driver</b>	<b>Owner</b>	<b>Loading terminal staff</b>	<b>Driver, owner, terminal Staff</b>
Driver	11.19%	30.60%	32.84%	25.37%
Police	47.73%	18.18%	6.82%	27.27%
<b>Total</b>	<b>20.22%</b>	<b>27.53%</b>	<b>26.40%</b>	<b>25.84%</b>

#### **4.9.4 Summary**

**The Fines and Other Punishments** The fines are not a solution to the overload problem. They can and must be used as “sticks” but only, when the market and operating environment of the transport community have been re-designed or



complemented in such a way as to offer economically viable operations without overloading.

**Main Principles on Fine Level** Absence of uniformity in the OL fine structure at Motorways and National Highways network without any scientific basis of fine provides a reason for violations of ALM regime and results into excessive damages to the National Highways.

Silence of ALM regime on load carriers less than 17.5Ton and more than 5 ton resulted in to a larger development of Mazda and Hino trucks category with loading ranging between 10.5 to 15.5 ton, with obvious single axle loading of more than 12 ton per axle resulting into although non violation of GVW but excessive damages due to the single axle OL violation.

Suspension of Fine Imposition on overloaded vehicles should be discouraged and standard axle load as per NHSO-2000 may be implemented.

Fine is unpredictable as is reflected from the trend of overload fine collection of last 6 years. However, Zero tolerance against overloading shall contribute an average of Rs. 0.20 billion each year and with passage of time it shall decrease till NHA achieve zero fine which shall ultimately result into minimum maintenance expenditures, provided NH&MP implement NHSO-2000 in true spirit.

To achieve zero tolerance, 10% share out of overload fine collection after all the operational expenditure of weigh stations on National Highway and Motorways be given to NH&MP.

For the 1st year revenue generating from overload fine shall be maximum which shall go on decreasing by the following years however this will result in maximum monetary benefits to the authority in terms of low maintenance expenditures.

#### **4.10 RQ-8 – HOW EFFECTIVE ARE WEIGH STATIONS IN ENFORCING THE AXLE OVERLOAD CONTROL?**

To answer RQ-8, the questionnaire survey has 11 questions, out of which 5 SQ are asked from users and 6 SQs are asked from management segment. This RQ explores the effectiveness and the efficiency of the existing weigh stations, which is directly proportional to the implementation and enforcement. Research question mapping is tabulated below:-

**Table 4.61: Mapping RQ - 8**

<b>Category</b>	<b>Survey Questions</b>					
Users	79	80	84	85	86	
Management	33	34	35	36	37	38

##### **4.10.1 Efficiency of Weigh stations (SQ-33) (SQ-34)**

SQ-33, “*Approximately how many trucks are weighed in a day at your station?*”, SQ-34, “*How many of them are over the weight limit?*”, were asked from weigh station staff to answer RQ-8. In order to authenticate the efficiency of the weigh stations, the weigh station staff was asked about the number of trucks being weight and the number found overloaded. Details analysis tabulated as under:-

## a. Management

**Table 4.62: Efficiency of Weigh stations**

Ser	Weigh Stations	SQ 33	SQ 34	%age
<b>Static WS</b>				
1	Islamabad Kanta	10	2	20.0%
2	Afridi Operators South (N-5 Sangani)	2000	150	7.5%
3	Afridi Operators North (N-5 Sangani)	1800	300	16.7%
4	Ejaz Kantah	50	15	30.0%
5	M-2 (Islamabad Interchange)	200	5	2.5%
6	Kohat Tunnel (KPK) North Bound	645	340	52.7%
7	Kohat Tunnel South	268	75	28.0%
8	Jamrud Weigh Station N-5	215	36	16.7%
9	Mullan Masoor (N-5)	1890	150	7.9%
<b>Mobile WS</b>				
10	Mobile WS Mandra (Punjab - N)	55	22	40.0%
11	Mobile WS Eminabad (Panab-N)	53	5	9.4%

Field survey of eleven WS was conducted in order to record their perspective and informally discuss on ground practices and gross violations / OL. Details are discussed in succeeding paras.

a. **Static WS**

- (1) At a private weigh station (Ejaz Kanta) located near Taxila, where crush dumpers get weighed in before embarking journey for Lahore, 30% of the daily incoming trucks are recorded to be OL. Downstream weight station of NHA at Sangani shows only 16% OL, that is a clear indication of gross in-efficiency / malpractice.
- (2) Mullan Masoor (N-5) WS data of 2005 shows 20% OL trucks whereas, the present data reflects only 7.9% OL trucks. If viewed positively, the truckers are abiding by the weight regime whereas, in essence the road conditions IRR indicates otherwise .i.e. under reporting of the OL trucks leading poor ride quality of the road network.

- (3) Kohat Tunnel (KPK) North Bound has maximum recorded OL at around 52% obviously due to ATT (Afghan transit trade). Official data of NHA itself shows gross violation of OL regime and following policy parameters can be inferred: (a) OL surcharge is tangibly lower than the financial benefit attained through OL for ATT, (2) OL trucks should not be allowed on the road. Specifically in this sector OL surcharge is not working thereby meaning not obtaining desired results of discouraging OL practice. Rather it transforms OL into a legitimate irregularity hence be stopped forthwith.
- b. **Mobile WS.** These WS are deployed at unknown locations on the road network, whereby making it unpredictable for the truckers to locate it and subsequently bypass/ avoid it. This best practice is a deterrent for the OL trucks and has positive results. Mobile WS Mandra (Punjab - N) fined as high as 40% OL trucks. This statistics is a reflection of unprecedented gross violation of OL regime at National Highways.
- c. The M-2 (Islamabad Interchange) WS has the minimum recorded OL violations, clearly indicating the effectiveness of the enforcement being implemented at the Motorways of Pakistan.

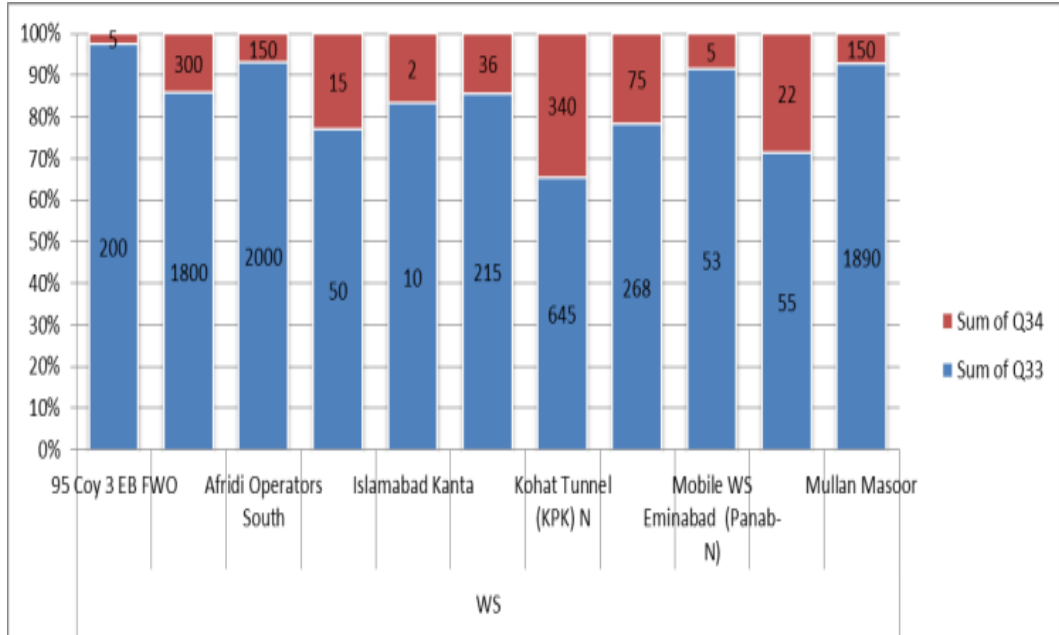


Figure 4.38: WS effectiveness profile

4.10.2 Harms of overloaded truck with their drivers (SQ 35)

SQ – 35, "Do you discuss the harms of overloaded truck with their drivers?", is a specific question asked from WS operators to answer RQ-7.

a. Management

When management perspective was asked, the results are tabulated below:-

Table 4.63: SQ29- Do you discuss the harms of overloaded truck with their drivers?

Management	Yes	No
WS	45.45%	54.55%

55% of the WS operators in the management category responded that they do not discuss the harms of overloading with the truckers. Since they were of the view that, this may not be effecting and motivating the drivers to resort otherwise.

4.10.3 Treatment of Over Loaded Truck

SQ37, "If a truck is above the weight limit, what do you do?", is a specific question asked from WS operators to answer RQ-7.

a. **Weigh station Operator (Motorway)** The WS operator at Motorways, intimated, *‘the overloaded vehicle are fined if within limit and then allowed to proceed/ continue journey, however if it beyond the specified maximum weight limits than it is returned / diverted to National Highways’*

b. **Weigh station Operator (National Highways)**

The WS operator at National Highways, intimated, *‘fine is imposed on OL veh as per the schedule of rates approved by IG NH&MEP, and the vehicle after being fined may continue journey,*

c. **NH&MP (National Highways)** On the specific question about the treatment of OL vehicle the NH&MP official communicated that, (1) the over loaded trucks are fined as per the original NHSO – 2000, schedule of rates for overloading and if beyond the maximum limits, the vehicle is not allowed, and diverted to the National highway network, (2) However same practice is not followed at the National highways, and the over loaded vehicle is charged as per the ‘Negotiated rates’ approved by IG NH&MP. (3) Unloading of excess load was resorted to in case at Sangjani WS, but a huge pile of construction material was accumulated along the road (due to non-availability of requisite unloading / parking facility along with the WS) and it was a hazard to the moving traffic, so it had to be removed after awarding a contract to contractor for clearance of the side. So now unloading of excess weight is not resorted.

#### 4.10.4 Q79. Do you think that the number of weigh stations is appropriate?

**Table 4.64: SQ79. Do you think that the number of weigh stations is appropriate?**

	High	Right	Low
<b>User</b>			
Driver	18.55%	60.48%	20.97%
<b>Total</b>	<b>18.55%</b>	<b>60.48%</b>	<b>20.97%</b>

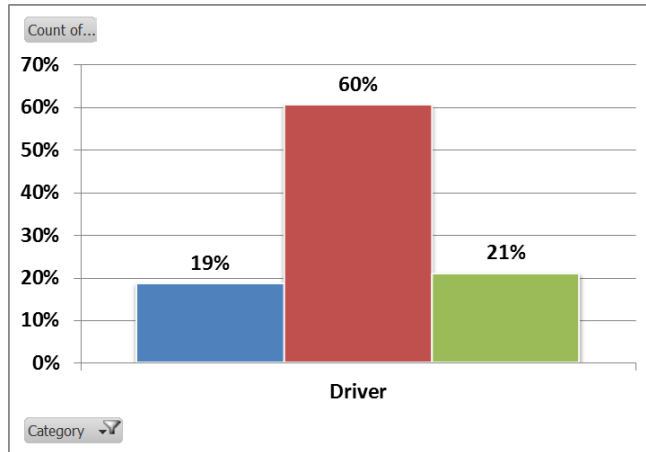


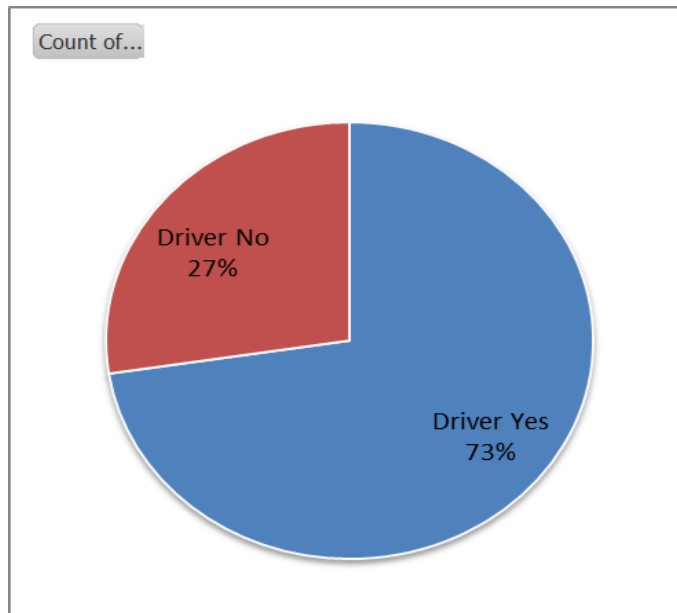
Figure 4.39: Number of weigh Stations

4.10.5 SQ84. Do you believe that the weigh stations are properly serving their purpose?

Table 4.65: SQ84. Do you believe that the weigh stations are properly serving their purpose?

Row Labels	Yes	No
User		
Driver	72.58%	27.42%

Figure 4.40: Q84. Do you believe that the weigh stations are properly serving their purpose?



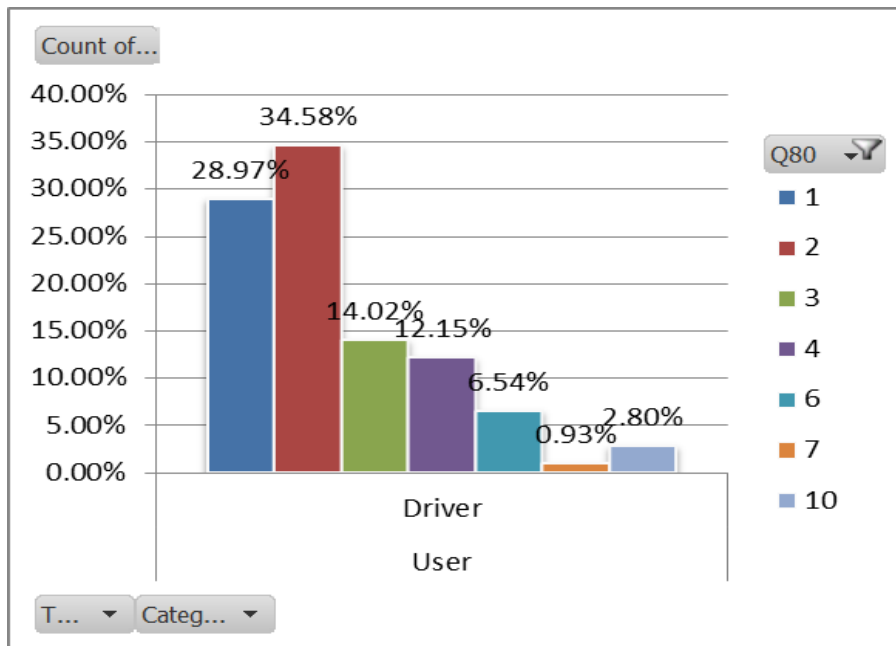
**Table 4.66: SQ85. Do you have any problems regarding weigh stations?**

Row Labels	Yes	No
User		
Driver	37.70%	62.30%
<b>Grand Total</b>	<b>37.70%</b>	<b>62.30%</b>

4.10.6 **Q80. How many times, is your truck weighed during a single trip?**

**Table 4.67 SQ80. How many times, is your truck weighed during a single trip?**

Row Labels	1	2	3	4	6	7	10
User							
Driver	28.97%	34.58%	14.02%	12.15%	6.54%	0.93%	2.80%
<b>Total</b>	<b>28.97%</b>	<b>34.58%</b>	<b>14.02%</b>	<b>12.15%</b>	<b>6.54%</b>	<b>0.93%</b>	<b>2.80%</b>



**Figure 4.41: Q80. How many times, is your truck weighed during a single trip?**



#### 4.10.7 Q85. Do you have any problems regarding weigh stations?

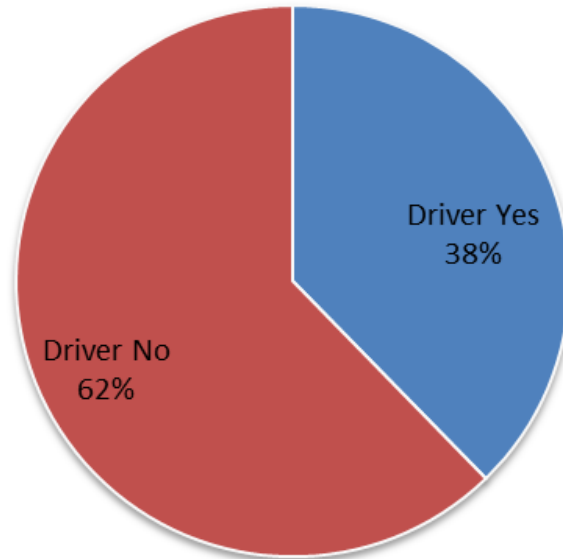


Figure 4.42: Q85. Do you have any problems regarding weigh stations?

Table 4.68 Q86. If yes, what are the problems?

User	
<b>Driver</b>	
Irritate uselessly	5.41%
Weigh Station should be check	2.70%
Weighing staff do not work properly	16.22%
Weighing staff take bribe and allow	51.35%
weight reading different at different weight stations	24.32%
<b>Grand Total</b>	<b>100.00%</b>

#### 4.10.8 Q86. If yes, what are the problems?

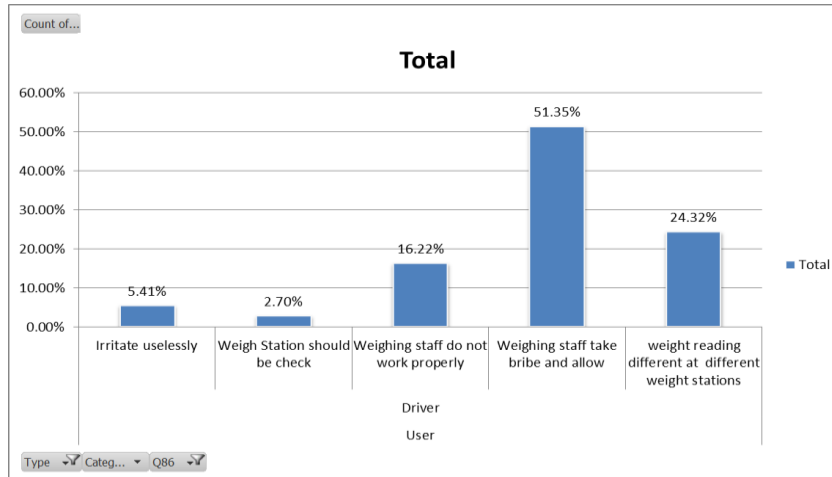


Figure 4.43: Q86. If yes, what are the problems?

#### 4.10.9 SQ32. Do you believe that all the weight stations are doing their job properly?

Table 4.69: SQ32. Do you believe that all the weight stations are doing their job properly?

<b>Management</b>	
<b>WS</b>	
Our Weighing Station is correct.	20.00%
Surely, they are working properly	20.00%
Working properly	20.00%
Yes	20.00%
Yes, all of them is working properly	20.00%
<b>Grand Total</b>	<b>100.00%</b>

#### 4.10.10 Coverage of WS

The length of MW and National Highways including the provincial highways is approximately 260000 Km and the number of WS to cover the infrastructure is far too less.

Table 4.70 Distribution of Pakistan's Road Network

Care-taker	Km	%
National Highways	9,324	3.54
Motorways	2,280	0.87
Strategic Roads	262	0.10
Provincial Government	103151	39.16
Local Government	95832	36.38
Municipal & Cantt. Roads	52920	20.09
Total	263,415	100.00

#### 4.10.11 Summery

The existing WS are not performing the desired task of the enforcement as desired, which is obvious from the fact that the roads in Pakistan are in deplorable conditions. Neither are they effective in function not in the technology, they are a source of bribery for the truckers and their lack of capacity in term of equipment and resources is obvious from the fact that they are practically not serving the desired function due to the obvious above discussed reasons.

### 4.11 RQ-9 – WHAT INTERVENTIONS / IMPROVEMENTS ARE RECOMMENDED IN EXISTING WS

To answer RQ-9, the questioner survey has questions. Already commented in the RQ-8, however the SQ-87, a direct exploratory question may assist us to explore the desired dimensions. Research question mapping is tabulated below:-

**Table 4.71: Mapping RQ - 9**

Category	Survey Questions								
Users	13	14	79	80	84	85	86	87	
Management	13	14	33	34	35	36	37	38	87

#### 4.11.1 Refinement of WS (SQ-87)

When users perspective was asked in an open question, SQ-87, "In your view, how can the authorities rectify (WS) these problems?", the results of the thematic analysis are summed up and tabulated as under:-

**Table 4.72: Q87-In your view, how can the authorities rectify (WS) these problems?**

<b>Row Labels</b>	<b>Driver</b>
<b>User</b>	
Depart to promote honest practices and people	16.95%
By <i>checking weighing station</i> and staff	16.95%
Don't know	16.95%
<i>Bribe and corruption</i>	13.56%
<i>standers</i> of the weight should be equal in all over the Pakistan	6.78%
<i>Police</i> should be honest	6.78%
Coupon should be check and computerized weigh station	5.08%
Improve road condition separate roads	5.08%
Increased the Pay of Weight Operator	3.39%
Govt Servant should be apply	3.39%
If weighing staff is from MW's then this problem can be control	1.69%
Weigh station should be correct	1.69%
Govt should reduce fuel rates to resolve issues	1.69%
<b>Grand Total</b>	<b>100.00%</b>

The respondents highlighted issue, 'corruption' and 'bribery' on the top of list. This need to be addressed, by incorporating the new state of the art technologies in the WS so as to have minimum human interference in the system.

The existing systems are operating in 'standalone mode' making it vulnerable to external influences, however once integrated through a network can transform in the formulation of a potent system

#### 4.11.2 Location /coverage of WS

The existing location / coverage of WS is far less than the desired standard (**Appendix L**) the effectiveness of the WS can only be ensured once the WS are properly located.

A Pareto Principle approach was developed for Mozambique (ANE 2007). It considers the major criteria influencing the weighbridge prioritizing decisions to be project value (cost) and the extent of protection. The extent of protection of a weighbridge largely depends on the volume of heavy traffic it can accommodate. Thus these two important criteria can be differentiated into cumulative cost of the weighbridge project and the AADTT at the location of the weighbridge sites (or potential sites).

To bring both the cost and heavy traffic volume into perspective, a coverage factor is calculated to indicate the amount of AADTT that is covered by spending \$1 on a weighbridge on an average annual day of the expected life of the pavement. This index (coverage factor) merely indicates the “value-for-money” for the weighbridges ranked in the scaled down budget. The average and standard deviation of this index is also calculated.

#### 4.11.3 Location considerations

To determining the number and location of weighbridges

1. Ports of entry, i.e. Gawader port, and dry ports like Sust and other border terminals
2. Commercial centers are the load origination points and also the load start points. Likewise the example of Taxila crush plants, if a ws is located just prior to the crush plant approach to N-5, the OL trucks can be halted prior to entry on the N-5.
3. Development corridors, CPEC and Afghan transit trade rout are the locations considered most important for locating the ws
4. Main freight routes

5. Traffic volumes, or the business centers having the capability to generate huge traffic be considered for ws.
6. Availability (or not) of escape routes

#### 4.11.4 **IT / GIS system for WS**

Central data mgmt. system for interconnectivity of Toll both with WS. Here the east African Community approach is suitable keeping in the upcoming transit trade volumes expected to be increasing many fold.

#### 4.11.5 **Summery**

The WS is the basic enforcing rely point where all the enforcement activities are focused. The ws at the moment is the most weak link in the overall system of enforcement in place.

The NH&MP and traffic police at different tiers are not performing optimum due to lake of capability (absence of required coverage of WS) and suitable equipment and also the absence of required training to undertake the desired task at appropriate level.

Moreover the WS lacks integration / IT infrastructure to harness the changes in the society and business needs of truckers. The vague lines of responsibility in translated by the legislations in terms of NHSO-2000 and MVO make it even more difficult for the issue to be tackled.

By incorporating the state of the art ws system with wide coverage in terms of location and the infusion of technology will make the systems robust to be breached and rendering it to be more efficient and effective.

The WS (**Appendix L**) trends in practice are quite innovative and sequel to the discussion as of paramount importance.

## 4.12 RQ-10 – HOW MUCH IS NH&MP EFFECTIVE IN ENFORCING THE AXLE LOAD MANAGEMENT?

To answer RQ-10, the questioner survey has questions. Out of 16 questions, 3 SQ are generic however, SQs asked from user, and Management segment are 7, and 6 respectively. Research question mapping is tabulated below:-

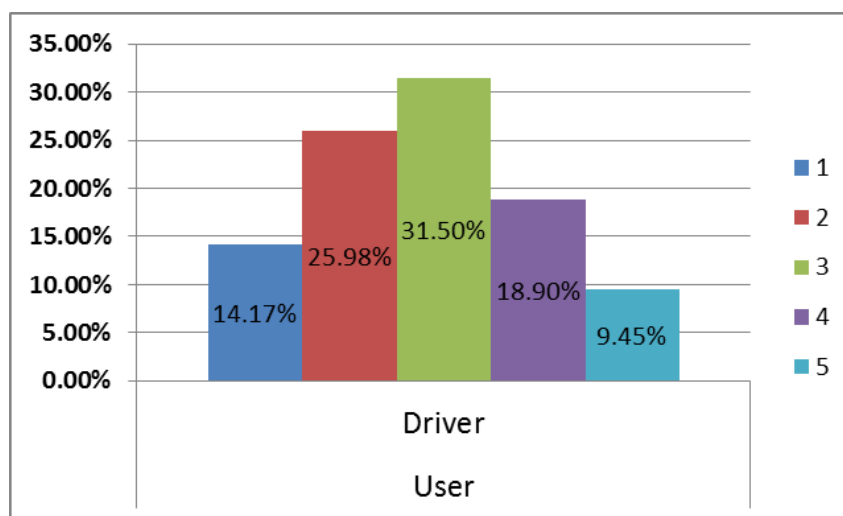
Category	Survey Questions					
Users	69	73	74			
Management	39	40	41	42	43	44

### 4.12.1 Correct fines structure for violate weight load rules (SQ-73)

SQ – 73, “ *What type of behavior is extended to you by the traffic police?* ”, is asked from user to answer RQ-10.

**Table 4.74: SQ – 73 What type of behavior is extended to you by the traffic police?**

Row Labels	V. Bad	Bad	Satisfactory	Good	V. Good
User	14.17%	25.98%	31.50%	18.90%	9.45%
Driver	14.17%	25.98%	31.50%	18.90%	9.45%
<b>Grand Total</b>	<b>14.17%</b>	<b>25.98%</b>	<b>31.50%</b>	<b>18.90%</b>	<b>9.45%</b>



**Figure 4.44**

#### 4.12.2 Q74. Why do you say so?

**Table 4.75: Q74. Why do you say so?**

<b>Row Labels</b>	<b>Driver Responses</b>
Police asks bribe	35.09%
Rough Handling / Unnecessary Disturbing	29.82%
Police is good	22.81%
Police do not obey traffic rules	7.02%
Drop only when VIP person intercede	5.26%
<b>Grand Total</b>	<b>100.00%</b>

The thematic analysis of the open ended question asked to the truckers for the role of police in OL control and management reveals that 35% of respondents are of the view that the ‘police asks bribe’ where by involve in immoral and unethical act of non-professionalism. 29% of the respondents say that the police handling of the subjects is quite rough and uncalled for moreover they are unnecessarily stiff in dealing with the truckers or the road users. A large number i.e. 23% appreciate the role of police in the traffic management and in particular the NH&MP police is appreciated by the commuters and consider them as a role model for the ordinary traffic police operating in different districts and metropolitans. 7% of the respondents spell out that the ‘police is not obeying the traffic rules’ as expected from them by the public in general.

The behavior of the police towards the handling of the subject of OL is still a ‘lot to be done’ domain warranting concrete measures to be taken for a wholesome change.

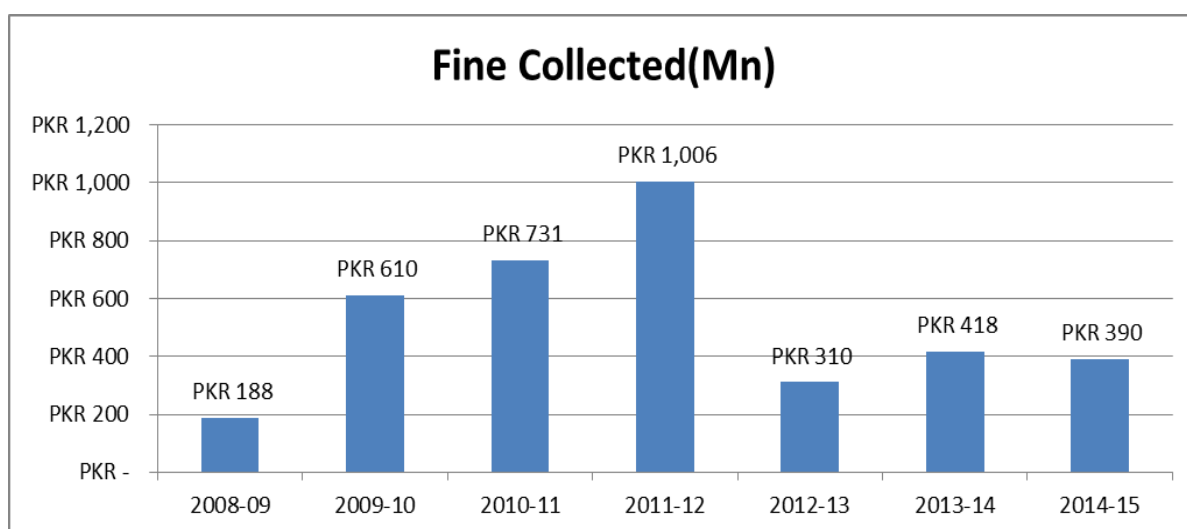
#### 4.12.3 Fine collected on Highways and Motorways

The enforcement and leaving of the fine falls in the preview of NH&MP police. In the financial years 2008 - 09 and 2012 - 13, Fine collection drastically decreased due to overload fine suspension for 9 and 3 months respectively and grant of relaxation on weigh



limits and non-imposition of the same by NH&MP since April 2013 in the backdrop of country wide strike by the truckers.

This political intervention has literally made the enforcement negligible to a tone where a huge loss in the pavement is seen due to OL violations by the truckers.



**Figure 4.45: Fine collection by NH&MP**

**Table 4.76: Fine Collection By NH&MP**

F. Year	Total Fine Collected (Rs.)	Remarks
2008-09	187,558,526	Fine imposed & Collected by NHA Operators
2009-10	610,200,471	Fine imposed & Collected by NHA Operators
2010-11	730,756,318	Fine Imposed by NH&MP and collected by NHA operators
2011-12	1,005,778,900	Fine Imposed by NH&MP and collected by NHA operators
2012-13	310,396,271	Fine Imposed by NH&MP and collected by NHA operators
2013-14	417,785,236	Fine Imposed by NH&MP and collected by NHA operators
2014-15	389,966,250	Fine Imposed by NH&MP and collected by NHA operators

#### 4.12.4 OL enforcement Federal (Islamabad Police) Level

The Islamabad traffic police has only a fine of Rs 500 on OL (**Appendix F**) with no punitive measures for the overloading. And as far as the implementation of the enforcement is concerned it can be seen in the summary of punishments that only 6.22% of the total challans were due to the overloading.

Sum of UP TO DATE OFFENCE	Total
Others	11.60%
Driving without helmet	10.72%
Not Fastening Seat Belt	6.56%
No Parking	6.49%
Over Loading	6.22%
Route Violation	4.72%
Using Mobile Phone while driving	4.61%
Obstructing Traffic	4.60%
Careless driving	4.52%
Signal Light Violation	4.19%
Failure to yeild the right of way to other vehicle	3.53%
Lane Violation	3.27%
Driving without driving licence	3.25%
Fancy Number Plate	2.80%
Tinted Glasses	2.68%
Driving Un-registered vehicles	2.29%
Parking on a bus stop	2.26%
Wrong Turn	1.90%
High Beam	1.84%
Carrying passengers in a dangerous position in transport vehicle	1.72%
Driving on one way	1.64%
Turning where prohibited	1.62%
Driving on the wrong side of the road	1.19%
Reckless and negligent driving	1.12%
Driving PSV without Route Permit	1.08%
Defective Light	1.07%
Under Age Driving	0.86%
Pressure Horn	0.73%
Misbehaving with pesenger	0.43%
Parking on Zebra Crossing	0.36%
Smoke emitting vehicles	0.12%
Over Speeding	0.01%
<b>Grand Total</b>	<b>100.00%</b>

Figure 4.46: Yearly Challan States of Islamabad Traffic Police 2016

The Punjab traffic police fine Rs 500 on account of OL (**Appendix G**).

#### 4.12.5 OL enforcement Federal National Highways and Motorways

The NHSO-2000 (**Appendix H**) warrants the OL vehicle to be fined but it is prudent to mention that the record obtained from NH&MP office indicates not a single

punishment where the driver of the vehicle was to be awarded imprisonment of one month. More over the table shows a comparative analysis with 4% of fine on account of OL on Motorways (679 km, 23%) and 24% of fine on the National highways (2219 Km, 76%). Still the enforcement state is very poor on National highways which are 76% of the NH&MP police area of responsibility.

**Table 4.77: NH&MP Police Fine Statistics**

<b>Row Labels</b>	<b>Sum of Total</b>	<b>Sum of Highways</b>	<b>Sum of Motorway</b>
Improper loading of goods.	74583	46.77%	74.33%
Loading in excess of the restriction of dimension of goods.	29967	22.65%	16.20%
<b><i>Carry goods less than 15% in excess of permissible load.</i></b>	<b>27049</b>	<b>23.47%</b>	<b>3.95%</b>
<b><i>Overloading of goods 15% in excess of permissible limits.</i></b>	<b>7229</b>	<b>6.49%</b>	<b>0.28%</b>
Driving vehicle emitting smoke, visible vapours, girt, sparks, ashes or oily substance.	724	0.45%	0.73%
Driving a transport vehicle not covered by a certificate of fitness.	696	0.02%	2.16%
Offence relating to permits.	421	0.08%	1.06%
Offences relating to construction of vehicle.	396	0.04%	1.12%
Driving a transport vehicle without obtaining a licence or without a license applicable to the vehicle driven.	61	0.02%	0.12%
Overtaking by transport vehicle dangerously where prohibited	15	0.00%	0.04%
Driving when Disqualified	5	0.00%	0.02%
<b>Grand Total</b>	<b>141146</b>	<b>100.00%</b>	<b>100.00%</b>

#### 4.12.6 OL Enforcement KPK

The KPK 2014 ACT (**Appendix I**) shows a reasonable level of punishments such as Rs5000/- however the state and status of enforcement is not different from other provinces and federal area jurisdictions.

#### 4.12.7 Summery

The main responsibility of enforcement lies on the police of different territories however the fine state data and lack of awareness / understanding of the OL gravity and the effects in terms of accidents and loss to the public in terms of the public property loss is very low.

NH&MP police do have limited capability in terms of availability of WS to check the OL, but unfortunately such arrangement or understanding at the provincial level is too less, its important to see that the load originating points such as factories, quarry sites, grain farms warehouses lie on the provincial roads which constitutes of 85% of the road network with ZERO enforcement and once the OL trucks come on to the National Highways or Motorways the wrong notion to expect the NH&MP police be effective is quite obvious from the fact on ground where the strong transporters either go for a strike and completely defy the laws for their own petty gains.

Never the less the enforcement can come into play only once the will to do is there, followed by the legislations and then proper equipment gadgetry for the agency to perform amicably the assigned task.

#### **4.13 RQ-11 – WHAT ARE THE CONTRACTUAL / MANAGERIAL FLAWS AT THE AGENCY LEVEL NHA IN THE IMPLEMENTATION OF AXLE OVER LOAD SYSTEM?**

To answer RQ-11, a thematic analysis of the procedure and the contractual procedure and the term of reference expression of interest for 2016/2018 was studied in detail (**Appendix I**) and the interviews with the experts in the field was also helpful, elaboration as follows:-

##### **4.13.1 Contractual Flaws**

1. The WS operation is contracted out and maintained by NHA HQ through the revenue department / wing. By default the revenue wing with non-engineering background lacks the request basis to encompass the damaging effects of the

OL, rather its considered as revenue generation source. Disregarding the damaging effects of the OL

2. The 'fixed monthly charges basis' is based on the assessment of the truck traffic plying on that particular section. However once the contractors base value is computed / accumulated than they don't have incentive to enforce further.
3. The WS enforcement is highly inefficient, with no incentive to divert the truck for weighing, Secondly the trucks being weighed are far less than the average WS capacity, since a typical day having 1440minutes so virtually if it takes just to go through the WS require min two minutes so an average of 1000 to 1400 trucks can be weighed so the existing single bay of WS are capable not to weigh more than this so it adds up to the inefficiency of the weigh enforcement.
4. By making OM&MC responsible for the availability of parking space to park the OL trucks / unloading the excessive load is practically un realistic, since the WS constructed / located along the highways are without sufficient space to do the need full and hence this inherent flaw in the design of the WS makes it practically impossible to impound / unload/ park the OL vehicle for the practical enforcement.
5. The toll plaza are neither automated nor connected to a centralized data base system (few automated are also operated most of the times manually) hence the very basic data for the 'evaluation for share of Fine Collection' i.e. AADT is unreliable.

6. The truckers majority view of varying reading of the WS on the same stretch of roads is a clear indicator that the WS are not calibrated, as it is desired to be done.

#### 4.13.2 **NHSO-2000 Amendment**

The NHSO-2000 was promulgated, but its amendments / changes and the de-shaped version as enforced on ground i.e. different on Motorways and negligible on Highways has an overall negative effect on ground.

The amendments were not made / passed through the parliament rather its piecemeal version as seen now in the distorted shape is outcome of administrative actions.

A clear indication of this fact can be sorted by once the fine details obtained from M-2 indicate a large amount of fines leveled on the vehicle category less than 17.5 Ton i.e. not part of the NHSO-2000. But on ground a large number of vehicles operating on the roads are also fined.

#### 4.13.3 **Quality control**

The quality control mechanism i.e. inspecting the WS, calibration checking is totally lacking and the fact was highlighted by the truckers indirectly by indicating the variations in the measures of the WS.

#### 4.13.4 **Coordination between NHA and NH&MP**

A desired level of coordination is lacking between the federal agencies.

Ideally the enforcement agency should have been working under the umbrella of Highway authority, however due to the obvious reasons of the role of Police; the coordination mechanism between the two stakeholders is weak.

It can be observed from the least number of formal interactions and absence of common Key performance indicators or organizational goals.

#### 4.13.5 **Summery**

The NHSO-2000 was not refreshed / updated keeping in view the changes in the business environment and fleet configurations and likewise the 17 years old ordinance is not compatible with the present changed environment.

The contract agreements are vague in a sense the authority expectations are very high contrary to the facilities required to be provided on the WS infrastructure very weak, i.e. parking area for unloading, Connectivity to main sever / database etc.

The agencies lack of coordination with the enforcing agencies is a weak link and this is exploited well by the truckers in their benefit up to fullest capacity.

## **5. CONCLUSIONS AND RECOMMENDATIONS**

### **5.1 CONCLUSIONS**

In developing economies where policymakers are constrained for resource paucity, allocation of financial resources for road asset management (i.e. rehabilitation / reconstruction) is a pronounced issue. The issue is further compounded when NHA claims construction of roads as per design specification but fails prematurely.

#### **5.1.1 Causes / origins of axle overloading issues in transport sector (Users)**

Roots of OL are deep down into the financial reasons i.e. low ROI (contributed by high VOC, low profit margins, high interest rate), unstructured market (middle-man domination, non-industry status, absence of 3PLSPs), and high risk business environment (in the absence of comprehensive vehicle and cargo insurance).

#### **5.1.2 Flaws in the coordination (collaboration) among stakeholders**

Absence of collaborative and coordinated efforts at the time of policy formulation (NHSO-2000) results into strong resentment (strikes) that led to even bigger damages to the road assets. Issuance of permit (violating laws) for modified vehicle by the vehicle registration authority is the root cause of OL.

- a. Non-uniformity of federal and provincial regulations governing OL.
- b. Lack of coordination within the enforcing agencies is a weak link and exploited well by the truckers.



### 5.1.3 Flaws in the OL fine structure / weigh limits

- a. Basis of fine structure in NHSO-2000 is unscientific and considerably low on higher axle weight limits thus, fails to create desired deterrence.
- b. Due to non-revision of NHSO-2000, certain newly inducted load carriers (having GVW less than 17.5 tons but individual axle weight more than 12 tons) are missed out.
- c. Alternative route options for truckers owing to variation in rate of fine at National Highways and Motorways.
- d. The philosophy of income generation through fine collection at agency level overrides the basic objective of prevention of overloading.

### 5.1.4 Flaws in weigh stations

- a. Reduced coverage of WS due to less number. Number of WS is very less compared to the road length.(minimum 1xWS per 1000 Kilometer road length).
- b. WS considered to be part of ALM regime enforcement, are not contributing positively owing to their staffs' involvement in malpractices.
- c. Due to non-connectivity of WS and the tolling both effectiveness of WS is compromised.
- d. Underreporting of OL load carriers by WS staff due to ineffective check / quality control mechanism by the NHA.
- e. Non calibration of WS equipment by the contractors, making the WS readings unreliable for both (user and management).

- f. Non availability of parking space for the unloading of OL good, and impounding of OL vehicle.

#### **5.1.5 Role of enforcing agencies**

- a. Lack of understanding of the gravity of the issue of OL by the enforcing agencies (federal / provincial) coupled with lenient rate of fine.
- b. Non availability of OL checking equipment / mobile WS etc.
- c. Malpractices in enforcing agencies weaken the enforcement.

#### **5.1.6 Familiarity and effectiveness of relevant axle overload control laws**

- a. OL is not considered as a heinous crime due to the fact that perception about severity of set of rules governing OL is not appropriately conceived by the users and the management.
- b. Lack of education and understanding of truckers about the damages caused to the roads due to non-adherence of laws related to OL.
- c. Lack of organized awareness campaigns by the management for educating truckers on the damages to the roads due to OL.

#### **5.1.7 Effects / menaces of OL**

OL results into road damages (due to violation of ALM regime) leading to premature failure of pavement and damaged roads in turn cause accidents and loss of precious lives. Other adverse effects include low speed emanating from congestion and traffic jam, making vehicle to produce pollution and indirectly overtaxing the consumer through static running of vehicle (higher VOC).

## **5.2 RECOMMENDATIONS**

### **5.2.1 Fine structure and enforcement**

- a. Existing fine structure is enforced only on 17.5 tons and above category of load carriers however, during data collection process it was observed that M-2 has considerable number of vehicles plied that do not fall under ALM regime.
- b. Fine structure is not scientific as it is applied in slabs where a max ceiling of fine imposition on the implementing agency but there is no limit to overloading, thereby meaning, road damaged by the overloading is not realized in terms of financial effect. This un-scientific imposition of fine fails to discourage the trucker(s) to stop overloading further. Formulation for per ton additional weight per axle be worked out through a designated study before implementation.
- c. A policy decision may be taken to impose a minimum possible overloading limit with maximum rate of fine and above that ceiling of overloading load carrier be considered un-finable thus returned to its origin.
- d. Centralized data be maintained for identification of offenders.
- e. Enforcing agencies be given confidence to implement new ALM regime with zero tolerance upon finalization and promulgation.
- f. Proposed fine table is based upon the monetary benefit of overloading obtained by the trucker (Table 5.1).

Table 5.1: Proposed fine rates &amp; load limits

Vehicle Category	Allowed Wight Limit = 17500 KG	Fine Rates (Rs)
2 Ax	17501 KG - 18375 KG	3000/-
	18376 KG - 19250 KG	5500/-
	19251 KG - 20125 KG	8000/-
	<b>Above 20125 KG is NOT ALLOWED</b>	
3 Ax Tandem	<b>Allowed Wight Limit = 27500 KG</b>	
	27501 KG - 28875 KG	4500/-
	28876 KG - 30250 KG	8500/-
	30251 KG - 31625 KG	12500/-
	<b>Above 31625 KG is NOT ALLOWED</b>	
3 A x Single	<b>Allowed Wight Limit = 29500 KG</b>	
	29501 KG - 30975 KG	4500/-
	30976 KG - 32450 KG	9000/-
	32451 KG - 33925 KG	13500/-
	<b>Above 33925 KG is NOT ALLOWED</b>	
4 A x Single – Tandem	<b>Allowed Wight Limit = 39500 KG</b>	
	39501 KG - 41475 KG	6000/-
	41476 KG - 43450 KG	12000/-
	43451 KG - 45425 KG	18000/-
	<b>Above 45425 KG is NOT ALLOWED</b>	
4 A x Single - Single	<b>Allowed Wight Limit = 41500 KG</b>	
	41501 KG - 43575 KG	6500/-
	43576 KG - 45650 KG	12500/-
	45651 KG - 47725 KG	19000/-
	<b>Above 47725 KG is NOT ALLOWED</b>	
5 A x Single - Tridem	<b>Allowed Wight Limit = 48500 KG</b>	
	48501 KG - 50925 KG	1000/-
	50926 KG - 54450 KG	2500/-
	54451 KG - 56925 KG	5000/-
	<b>Above 56925 KG is NOT ALLOWED</b>	
5 A x Tandem - Tandem	<b>Allowed Wight Limit = 49500 KG</b>	
	49501 KG - 51975 KG	7500/-
	51976 KG - 54450 KG	15000/-
	54451 KG - 56925 KG	22500/-
	<b>Above 56925 KG is NOT ALLOWED</b>	
5 A x Single - Single - Tandem	<b>Allowed Wight Limit = 51500 KG</b>	
	51501 KG - 54075 KG	8000/-
	54076 KG - 56650 KG	16000/-
	56651 KG - 59225 KG	23500/-
	<b>Above 59225 KG is NOT ALLOWED</b>	
6 A x Tandem - Tridem	<b>Allowed Wight Limit = 58500 KG</b>	
	58501 KG - 61425 KG	9000/-
	61426 KG - 64350 KG	18000/-
	64351 KG - 67275 KG	26500/-
	<b>Above 67275 KG is NOT ALLOWED</b>	
6 A x Tandem - Single - Tandem	<b>Allowed Wight Limit = 61500 KG</b>	
	61501 KG – 64575 KG	9500/-
	64576 KG - 67650 KG	18500/-
	67651 KG - 70725 KG	28000/-
	<b>Above 70725 KG is NOT ALLOWED</b>	

### 5.2.2 WS

- a. Static WS should be constructed nearest to the toll plazas for avoiding weight manipulation in between WS and the toll plaza(s).
- b. Number of WS be enhanced to one WS per 1000 Kilometer road length for effective enforcement.
- c. Static WS MUST be automated and electronically linked to the toll plazas to minimize the role of WS contractor.
- d. Mobile WS are effective tool and be increased to be available at maximum sites. Any overloading further to already recorded / fined, should result in: (1) impounding of the load carrier for three months besides punitive fine, and (2) WS contract be cancelled forthwith.
- e. Third party contract for uniform calibration of WS equipment by NHA may be considered.

### 5.2.3 Elevation of trucking business to an industry status

- a. A mutually agreed upon policy be implemented after absorbing the view point of stakeholders from the business to declare trucking sector as industry:-
  - (1) Within a period of 2-3 years proprietary trucking may be transformed into registered / licensed 3PLSPs with minimum 10 load carriers in the name of firm.
  - (2) Leasing of six (6) months should be compulsory before shifting to another 3PLSP.
- b. SME bank financing be extended besides other financial institutions.
- c. For risk mitigation compulsory full TAKAFUL / insurance for load carrier as well as cargo be introduced.

#### 5.2.4 Collaborative policy formulation and implementation

- a. Policy formulation without sectoral input meets the same destiny as experienced in case of ALM regime and NHSO-2000. A working group of business, Management, implementer(s), parliamentarians, and chamber of commerce and industry, be formed to formulate a workable set of recommendations along with policy parameters for legislation encompassing following aspects:-
  - (1) New ALM regime.
  - (2) Enactment / enforcement date.
  - (3) Duration in years (date) of grace period.
  - (4) Fine ceiling.
  - (5) Reversion to origin policy beyond fine imposition limit.
  - (6) Impounding policy with duration.
- b. Once enforcement begins there should be no going back.
- c. Regulatory body steering committee to have representation from all stakeholders.

#### 5.2.5 Capacity building for smooth transition

- a. Within agreed upon grace period:-
  - (1) Soft loans be given for reversion of load carriers to their actual axle load.
  - (2) Soft loans for leasing replacement of the load carriers that cannot be reverted back to allowable axle load.
- b. Education of 3PLSPs and their drivers on new ALM regime.
- c. Tax holiday may be extended for those who voluntarily revert to allowable axle load before completion of grace period.

**5.2.6 Commercial vehicle central registration authority**

- a. All commercial vehicles operating should be registered with the commercial vehicle central registration authority.

**5.2.7 Awareness campaign and training**

Without a proper planned awareness campaign using all the media resources in hand so as to incorporate both print and electronic media the OL concept its effects cannot be taken into account in its fullness.

## **5.3 PROPOSED ENHANCED FRAMEWORK FOR EFFECTIVE ALM IN PAKISTAN**

### **5.3.1 Overview**

The thematic analysis of qualitative data and analysis of quantitative data highlights the root of all problems related to ALM, is lack of collaboration among legislators (national and provincial), regulatory bodies (NHA, NH&MP, District transport authorities and motor vehicle registration authorities), and exclusion of industry (transport associations, 3PLSPs, and truckers) from policy formulation process. The highlighted flaws in policy formulation and implementation have resulted in non-compliance of promulgated regulations (i.e. NHSO-2000, etc.). The problem is further compounded in a situation where transport sector has strong lobbies within the legislator and has the potential to manipulate regulator(s) through influence or bribe.

No legislation can successfully be formulated and implemented without eliminating abovementioned flaws, therefore following framework is proposed.

### **5.3.2 Working Group**

To avoid working in silos, a 'national working group on transport' be formulated. The group will act as apex committee in developing consensus among government agencies and representatives of truckers' association on the issues governing transport and transportation sector.

### **5.3.3 Composition of 'national working group on transport'**

Members from following stakeholders should be included (but not restricted to):-



- a. Parliamentary committee on transport (including one member from each Province).
- b. Minister of communication (National and Provincial).
- c. Secretary communication (National and Provincial).
- d. Chairman NHA.
- e. IG NH&MP.
- f. Chairmen provincial Motor Registration Authorities.
- g. Chairmen provincial Transport Authorities.
- h. Representatives of Transport associations (National and Provincial)
- i. Chairman engineering development board.
- j. Members from truck manufacturer association.
- k. Research group of logistics and transportation professionals and researchers.

#### **5.3.4 Mechanism**

The issue rooted back pre-partition requires a consistent and dedicated effort of all the stakeholders. Though no timeline can be given however, as guideline following milestones are suggested:-

#### **5.3.5 Policy formulation milestones**

- |  |   |          |
|--|---|----------|
| a. Formulating TORs / agenda                   | - | 3 Months |
| b. First draft of national transport framework | - | 1 Year   |
| c. Seminars / Public hearing / Consultation    | - | 6 Months |

- |   |   |                |
|---|---|----------------|
| d. Second draft to be presented in Parliament       | - | 3 Months       |
| e. Final draft after incorporating suggestions      | - | 3 Months       |
| f. Preparation and presentation of legislative bill | - | 6 Months       |
| g. Pre implementation grace period for truckers     | - | to be mutually |

Decided

### **5.3.1 Policy / legislation implementation**

After approval of proposed regulations by the parliament, implementation should be affected in phases as per timelines proposed by the “national working group on transport’. However suggested guideline is already proposed as under.

### **5.3.2 Guide line for TORs / agenda formulation**

- a. Elevation of Trucking Business to an Industry Status, thereby encouraging development of trucking companies instead of single truck owners.
- b. Capacity building for smooth transition by offering soft loans from government owned banks and financial institutions, so as to enable the trucking companies to induct / modify / revert to ALM regime compliant load carriers.
- c. Collaborative mechanism for policy implementation along with agreed upon timelines for gradual transformation of transport sector from present status (ALM regime non-compliant) to the desired status (ALM regime compliant) discussed above.
- d. Determination of damaged based road usage tariffs whereby apportionment (allocation) of cost to the actual damage incurred to the pavement.
- e. Fine Structure to curb OL and enforcement of promulgated ALM.

- f. Weigh station improvement along with ITS.
- g. Possibility of establishing 'central commercial vehicle registration authority' with decentralized fee collection.
- h. Awareness campaign and development of training modules of minimum time period.

#### **5.4 FUTURE RESEARCH**

A detailed study is required to be conducted on 'pavement damage based fine structure' in the environment of Pakistan to determine the actual pavement damages incurred due to different loading configurations.

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## **APPENDIX-A: SURVEY QUESTIONER**

### **USERS**

#### **(Workshops / Truck Manufacturers)**

- Q1. What is the name of your organization? \_\_\_\_\_
- Q2. Up to what extent do you agree that there is an issue of overloaded trucks in Pakistan that are damaging roads and that they are not being effectively controlled?
1. Strongly disagree
  2. Disagree
  3. Can't say anything
  4. Agree
  5. Strongly agree
- Q3. Why do you think so? \_\_\_\_\_
- Q4. Generally speaking, how important are road transport operations to the public?
1. Not at all important
  2. Not important
  3. Can't say anything
  4. Important
  5. Very important
- Q5. How important are roads to you?
1. Not at all important
  2. Not important
  3. Can't say anything
  4. Important
  5. Very important
- Q6. How important is the incidence of traffic to you?
1. Not at all important
  2. Not important
  3. Can't say anything
  4. Important
  5. Very important
- Q7. How important are traffic laws to you?
1. Not at all important
  2. Not important
  3. Can't say anything
  4. Important
  5. Very important
- Q8. Which of the following is important to you?
1. There should be strict enforcement of traffic laws
  2. There should be leniency in traffic laws
  3. There should be no traffic laws
- Q9. Up to what extent, are you familiar with road rules?
1. Not familiar at all
  2. Not familiar
  3. Can't say anything
  4. To a some extent
  5. To a great extent
- Q10. Up to what extent, are you familiar with maximum weight limit?
1. Not familiar at all

2. Not familiar
3. Can't say anything
4. To a some extent
5. To a great extent

Q11. Are you aware that there is a limit to the amount that can be loaded?

1. Yes ( )
2. No ( )

Q12. Are you aware of the maximum limit of overloading?

1. Yes ( )
2. No ( )

Q13. In Pakistan, how effective in your view is the practice of checking over loading by weighing?

1. Not effective at all ( )
2. Not effective ( )
3. Can't say anything ( )
4. Effective ( )
5. Very effective ( )

Q14. Up to what extent do you believe that the road weight limits in Pakistan are enforced properly?

1. I don't believe this at all ( )
2. I do not think so ( )
3. Can't say anything ( )
4. To a little extent ( )
5. To a great extent ( )

Q15. Punishment for over loading is just because it is required to?

1. Control traffic accident ( )
2. Maintain discipline ( )
3. Avoid damage to the roads ( )
4. Any other \_\_\_\_\_

Q16. What is your opinion is the correct structure of fines for people who violate weight load rules?

1. Fixed fine level ( )
2. Fixed plus the structure of excess weight ( )
3. Fine only according to the structure of excess weight ( )
4. The amount of fine should be more than benefit due to overloading ( )
5. Any other(please specify) \_\_\_\_\_

Q17. In your opinion, what are the main factors creating problems in transport sector?

1. Condition of roads ( )
2. Condition of fleet ( )
3. High investment needs ( )
4. Competition ( )
5. High operating cost ( )
6. Low transport tariffs ( )
7. Anyother (please specify) \_\_\_\_\_

Q18. In your opinion, which factor is most important?

1. Condition of roads ( )
2. Condition of fleet ( )
3. High investment needs ( )
4. Competition ( )

5. High operating cost ( )
6. Low transport tariffs ( )
7. Anyother (please specify)\_\_\_\_\_

Q19. In your opinion what steps need to be taken to rectify these problems?  
\_\_\_\_\_

Q20. In your opinion, what is the preferred way of treatment of overloaded trucks?

1. Overloaded trucks should be fined ( )
2. To be impounded ( )
3. Cancel the license of habitual offenders ( )
4. Any other (please specify)\_\_\_\_\_

Q21. The fine should be imposed on?

1. Truck driver ( )
2. Truck owner ( )
3. Loading terminal staff ( )
4. Truck driver, Truck Owner and Terminal Staff
5. Any other (please specify)\_\_\_\_\_

Q22. In your opinion, what benefits should be given to law abiding trucks?

1. Preference in queues by stickers ( )
2. Reduction in toll ( )
3. Any other (please specify)\_\_\_\_\_

Q23. Is it fair that the road users have to pay for the damage caused by violators?

1. Yes ( )
2. No ( )

Q24. Whose responsibility is the maintenance of roads?

1. Government ( )
2. Public ( )
3. Any other (please specify)\_\_\_\_\_

Q25. Do you agree / disagree with the following statement regarding NHA (National Highway Authority)?

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
NHA's maintenance performance is good					
NHA's service meet international standards					
Road user's should pay for NHA's services					
Overloaded trucks harm NHA					

Q26. Who would you suggest any means for the improvement of services of NHA?  
\_\_\_\_\_

Q27. Up to what extent you are agree / disagree with the statement that the body of truck should be made in such a way that it prevents over loading?

1. Strongly agree ( )
2. I agree ( )
3. Neutral ( )
4. I do not agree ( )
5. I do not agree at all ( )

Q28. In your opinion what are the losses of overloading?  
\_\_\_\_\_

Q29. Approximately what percentage of trucks do you think do repair work in week?

Q30. Why do you think so?\_\_\_\_\_



Q31. Approximately how many damaged trucks come in week in your repair shops?

Q32. Approximately how many damaged trucks come in week in your repair shops due to overloading?

**USERS**  
**(TRUCKERS)**

Q27. Do you own any trucks?

1. Yes, alone ( )
2. Yes, together with some others ( )
3. No ( )

Q28. Which of the following are the obstacles hampering the development of the transport sector?

1. Low return to investment ( )
2. Profit too little ( )
3. High custom duties ( )
4. High interest rates on borrowing ( )
5. Any other (please specify)\_\_\_\_\_

Q29. How can these obstacles be removed?

\_\_\_\_\_

Q30. If your company, you or you together with some others own(s) trucks, which kind(s)?

1. 2 – axle (state number) ( )
2. 3 – axle (state number) ( )
3. 4 – axle (state number) ( )
4. 5 – axle (state number) ( )
5. 6 or more axle (state number) ( )

Q31. How many trucks does your company own?

\_\_\_\_\_

Q32. Does your company need more trucks?

1. Yes ( )
2. No ( )

Q33. If Yes, how many?

1. 1 – 10 ( )
2. 11 – 30 ( )
3. 31 – 50 ( )
4. 51 – 100 ( )
5. Other (please specify)\_\_\_\_\_

Q34. Up to what extent do you believe that the size of the trucking fleet in Pakistan is adequate?

1. To a great extent ( )
2. To some extent ( )
3. Not really adequate ( )
4. Not adequate at all ( )

Q35. What type of trucks do you need?

\_\_\_\_\_

Q36. What type of insurance do you use?

1. No Insurance ( )
2. Vehicle is covered ( )

3. Cargo is covered ( )
4. Full cargo and vehicle insurance ( )
5. Other (please specify)\_\_\_\_\_

Q37. What are your preferences with regards to the transport operations? (rank from 1 to 7 where 1 means highest preference while 7 means lowest preference)

1. Fast delivery ( )
2. Timely Delivery ( )
3. Safe Delivery ( )
4. Reasonable Freight Tariffs ( )
5. Vehicle wear and tear ( )
6. Road safety ( )
7. Any Other (please specify)\_\_\_\_\_

Q38. Do you overload?

1. I never do ( )
2. I do not do ( )
3. Neutral ( )
4. I seldom do ( )
5. I often do ( )

Q39. In your opinion, the road weight limits are?

1. Too strict ( )
2. Normal ( )
3. Too lenient ( )

Q40. What is the main reason for over loading?

1. To reduce the cost ( )
2. To save the time ( )
3. Make Profit ( )
4. Any Other (please specify)\_\_\_\_\_

Q41. Is it possible to operate profitably without overloading?

1. Yes ( )
2. No ( )

(If No, ask)

Q42. Why do you think so?

---

Q43. Do you have influence on tariff per ton km?

1. Always ( )
2. Sometimes ( )
3. Hardly ever ( )
4. Never ( )

Q44. Do you have a direct reach to cargo owners?

1. Yes ( )
2. Sometimes ( )
3. No ( )

Q45. Do you have long term contacts?

1. Yes ( )
2. No ( )

Q46. Are your transport orders mostly ad-hoc?

1. Yes ( )
2. No ( )

Q47. Do you accept transport orders with risk of having to return empty?

1. Yes ( )

2. No ( )

Q66. What is the average waiting time per vehicle within a month between orders?

---

Q48. Do you ever refused a transport order for too low tariff offered?

1. Often ( )
2. Seldom ( )
3. Never ( )

Q49. What would be the minimum acceptable tariff per ton km you would set for southbound transportation?

---

Q50. Are you fined when you over load?

1. Yes ( )
2. No ( )
3. Don't Know ( )

Q51. What are the risk factors involved in over loading?

1. Challan ( )
2. Damage ( )
3. Difficult to drive ( )
4. Can't drive at a high speed ( )
5. Any Other (please specify)\_\_\_\_\_

Q52. Are you aware of the structure of fines against overloading?

1. Yes ( )
2. No ( )

Q53. Are you satisfied with the fine leveled against over loading?

1. I am greatly dissatisfied ( )
2. I am dissatisfied ( )
3. Neutral ( )
4. I am satisfied ( )
5. I am greatly satisfied ( )

Q54. What type of behavior is extended to you by the traffic police?

1. Very Bad ( )
2. Bad ( )
3. Satisfactory ( )
4. Good ( )
5. Very Good ( )

Q55. Why do you say so? \_\_\_\_\_

what extent are you satisfied with the management of toll plazas?

1. Not Satisfied at all ( )
2. Not Satisfied ( )
3. Neutral ( )
4. To some extent ( )
5. To great extent ( )

Q57. The Present toll rates are

1. Too high ( )
2. High ( )
3. Normal ( )
4. Too Low ( )

Q58. Up to what extent, are you satisfied with the present toll rates?

1. Not Satisfied at all ( )

2. Not Satisfied ( )
3. Neutral ( )
4. To some extent ( )
5. To great extent ( )

Q59. Do you think that the number of toll plazas is?

1. Too high ( )
2. Just right ( )
3. Too low ( )

Q60. Do you think that the number of weigh stations is?

1. Too high ( )
2. Just right ( )
3. Too low ( )

Q61. How many times, is your truck weighed during a single trip?

\_\_\_\_\_

Q62. Do you have any problem with toll plazas?

1. Yes ( )
2. No ( )

Q63. If yes, what are the problems?

\_\_\_\_\_

Q64. In your view, how can the authorities rectify these problems?

1. \_\_\_\_\_

Q65. Do you believe that the weigh stations are properly serving their purpose?

1. Yes ( )
2. No ( )

Q66. Do you have any problems regarding weigh stations?

1. Yes ( )
2. No ( )

Q67. If yes, what are the problems?

\_\_\_\_\_

Q68. In your view, how can the authorities rectify these problems?

\_\_\_\_\_

Q69. In your view, approximately what percentages of total trucks are overloaded?

1. Less than 20 %
2. 20 – 40 % ( )
3. 40 – 60 % ( )
4. More than 60 %

### **MANAGEMENT** **(WS / SERVICE PROVIDERS)**

Q27. Approximately how many trucks are weighed in a day at your station?

Q28. How many of them are over the weight limit?

Q29. Do you discuss the harms of overloaded truck with their drivers?

1. Yes ( )
2. No ( )

Q30. If not, why not?

---

Q31. If a truck is above the weight limit, what do you do?

---

Q32. Do you believe that all the weight stations are doing their job properly?

---

**(POLICE / AUTHORITIES)**

Q27. Approximately how many chalans are made in a day by you?

---

Q28. Approximately how many chalans are made due to overloading in a day by you?

---

Q29. What is the maximum fine you charge to a overloaded truck?

---

Q30. In your opinion, the road weight limits are?

1. Too strict ( )
2. Normal ( )
3. Too lenient ( )

Q31. What is the main reason for overloading?

1. To reduce the cost ( )
2. To save the time ( )
3. To make more profit ( )
4. Any other (please specify) \_\_\_\_\_

Q32. Are you satisfied with the fine leveled against over loading?

1. I am greatly satisfied ( )
2. I am satisfied ( )
3. Neutral ( )
4. I am dissatisfied ( )
5. I am greatly dissatisfied ( )

**V**

**(OTHERS / COMMONERS / NGOs)**

Q27. In your opinion what are the effects of overloading on the Environment?

---

Q28. Up to what extent you think that driving with overloading is safe?

1. To great extent ( )
2. To some extent ( )
3. Neutral ( )
4. Not Agree ( )
5. Not Agree at all ( )

Q29. Do you believe that overloading by trucks is creating hazards for other drivers on the road?

1. Yes ( )
2. No ( )

Q30. If yes, what are they?

---

## APPENDIX-B: QUALITATIVE ANALYSIS

Row Labels	Count of ID
<b>Management</b>	<b>55</b>
<b>Police</b>	<b>44</b>
Containers use instead of Trucks	1
It requires proper check and balance on every stage, every station not only on MW	1
Long body vehicles should be closed and Container should be used.	1
Overload truck cannot enter the MW	1
Overload truck should not enter MW	1
Overload truck should not enter Roads	1
Same rules of MW be applied for National Highway and Over load trucks should not allow to travel, and this check also apply on link roads.	1
Trucks overloading are not only harm for roads but also cause of accidents	1
Trucks should be finished	1
Weighs station be functional properly for MW and Highway	1
Weight Limits for MW also strictly apply for National Highway.	1
(blank)	33
<b>WS</b>	<b>11</b>
In our opinion extreme strict action should be taken against overloaded trucks and penalized them for overloading	1
Overloading is legitimate crime and is very difficult to control over it.	1
Should be block	1
They damage the road, it is very difficult to control them	1
Weighing station should be correct and overload loaded vehs should not be allow.	1
(blank)	6
<b>User</b>	<b>170</b>
<b>Driver</b>	<b>134</b>
By improving roads	1
By using good Vehicles, can save from loss	1
Can be Controlled	2
Check overloading	1
Construction of more roads can resolve the issue	1
Damages are but the poor man can do	1
Diesel is costly due to which overloading is maximum	1
Driver should be careful	1
Fixed quantity of items should be loaded in the truck	1
Good Roads and Good Vehicle use	4
Good Vehicle to be use	1
Good Vehicles to be use	1
Govt should do something	1
Govt should strictly apply	1
I don't know	1
If police is honest then it could be controllable	4
Impossible	2
Improve roads	2
Increase Fare	1

Law enforcement	1
Loading should be reduced	1
Maintain the Road	2
Make effective and keeping in control	1
Motorway law	1
New law should be introduced	1
Nil	2
NO	1
No Comments	1
No Damage	1
No Solution	1
No solution of this problem	4
Over loading is very critical problem and Un Controllable Problem	1
Overload vehs should not allow to move	1
Overloading damage to the Trucks	1
Overloading of trucks is impossible	1
Overloading should be controll	1
Overloading should be stopped	1
Overloading should not be done	1
People should help Govt	1
Police should be honest	1
poverty	1
Profit comes from overloading	1
Quality material to be use for road construction and good vehicles to be use	1
Quality material to be use while making roads	1
Quality of the Roads is Very Poor	1
Reduce load and check	1
Reduce the loading	2
Reduce the truck loading	1
Reduced the loading	1
Road should be repairs	1
Road should be repairs and Good Standard Vehicle to be use	2
Rods should be upgrade	1
Same law for highway and motorway	1
Small truck did not harm the road	1
Stop over loading	1
Strict Law	2
Th eproblem can be solved if police wotk honestly	1
This is Govt problem	1
This is no problem	1
This is not a problem	1
This problem is un resolvable	1
Time for loading inside city is wrong, time should be change	1
To reduce the fuel rates to stop over loading	1
Traffic laws should be good	1
Truck owner should stop doing loss to others life and his vehicle	1
Un Controllable	1

Un Controllable problem	6
Un Solvable Problem	2
Un stoppable problem	1
Vehicle should move after passing through weigh station	1
Weight should be in limit	1
Yes	1
(blank)	39
<b>Wksp</b>	<b>36</b>
By stopping of bribe money and irritation from police	1
Expenses are so much	1
Heavy duty slab roads for heavy transport be made	1
If diesel rate reduced then over loading can be control	1
It depends upon vehiclesowner, if vehiclesis 22 feet long they order to make it 26 feet or axle sheet increase 6 to 8.	1
It is very difficult to control overloading in Pakistan	1
MW and Highway Police should strictly ordered to control	1
Roads will be continuously damage until stop the over loading	1
Separate line for trucks	4
So much difficult	1
This problem should be resolve but very difficult	1
Truck Owner say to make large body	1
Truck should not be overload and cement slab road for trucks	1
Un Controllable	2
Un Controllable due to dearness	1
Un Controllable Issue	2
Un Resolvable Issue	11
Very Difficult	2
Very difficult till bribe stop	1
Very Difficult to resolve the issue	1
<b>Grand Total</b>	<b>225</b>



**APPENDIX-C: QUALITATIVE ANALYSIS, SQ-87**

<b>Q87-In your view, how can the authorities rectify (WS) these problems?</b>	
<b>Row Labels</b>	<b>Driver</b>
<b>User</b>	<b>59</b>
<b>Coupon should be check and computerized weigh station</b>	<b>2</b>
Awan Sons Goods Company	1
Pakistan Coaches Safeer Awan	1
<b>Don't know</b>	<b>10</b>
Islamabad Margala	1
Kaali Meem Goods	1
Kohat Peshawar Goods	1
Margalla Stone	1
Nourooz Goods	2
Quetta International	1
Supper Khyber Mardan	1
Umera Khan Goods	1
Umra Khan Goods	1
<b>Govt Servant should be apply</b>	<b>2</b>
Awan Transporter Company	1
Pakistan Transport Company	1
<b>Govt should reduce fuel rates to resolve issues</b>	<b>1</b>
Batgram Hazara Gods Forwarding Agency	1
<b>If weighing staff is from MW's then this problem can be control</b>	<b>1</b>
Pindi Goods Forwarding Agency Islamabad	1
<b>Increased the Pay of Weight Operator</b>	<b>2</b>
Khyber Ithad	1
Umrs Khan Goods	1
<b>Police should be honest</b>	<b>4</b>
Awan Goods	1
Kashmir Goods Transport Company	1
Lucky Karwan Goods Far wading Agency	1
New Khan Goods	1
<b>standers of the weight should be equal in all over the Pakistan</b>	<b>4</b>
Nourooz Goods	4
<b>Weigh station should be correct</b>	<b>1</b>
Frontier Islamabad Goods Forwarding Agency	1
<b>Weight coupon should be checked</b>	<b>1</b>
Super Star Goods Transporter Company	1
<b>Bribe and corruption</b>	<b>8</b>
Ghosia Margalla	1
New Barq Goods Transport Company Rawalpindi	1

New Quetta Punjab Goods Transport Company	1
Pak Hazara Goods Compnay Abbotabad	1
Sheikh Ayaz Goods Transport Company	1
Thall Paracha Goods Forwarding Agency, Timergirrah	1
The Jadoon Hazara Goods Forwarding Agency	1
Umar Afridi Goods Transport Company	1
<b>Depart to promote honest practices and people</b>	<b>10</b>
Al Noor Transport Goods	1
Daewoo International Goods Islamabad	1
Hunza Nagar Goods Forwarding Agency	1
Huzro Goods Forwarding Agency, Faisalabad	1
Karachi Lahore Goods Transport Company	1
Lahore Pindi Goods Forwarding Agency	1
Pindi Hazara Goods Forwarding Agency Islamabad	1
Raftar Hazara Goods	1
Sargodha Pindi Goods Forwarding Agency Sargodha	1
Sultan Mehmood Goods Forwarding Islamabad	1
<b>By checking wegheing station and staff</b>	<b>10</b>
Bewstway Cement	1
Faran International Goods	1
Firdos Adda Sawat	1
Frontier Punjab Goods Transport Company	1
Furqan Arslan Goods Transporter Company	1
Multan Karachi Goods Forwarding Agency Karachi	1
New Afridi Goods Transporter Company	1
New Lasani Goods Forwarding Agency	1
Sindh Punjab Transport Company	1
The Lahore Pindi Goods Forwarding Agency	1
<b>Improve road condition separate roads</b>	<b>3</b>
Abid Goods Transport and Forwarding Agency	1
Gul Muhammad Good Lucky Marwat	1
New Pindi Lahore Goods Transport Company	1
<b>Grand Total</b>	<b>59</b>

## APPENDIX-D: QUALITATIVE ANALYSIS

Count of ID	Column Labels
Row Labels	Driver
<b>New Afridi Goods Transporter Company</b>	<b>1</b>
So much expenditure	1
<b>Al-Madad Company</b>	<b>1</b>
Over Expenditure	1
<b>New Lasani Goods Forwarding Agency</b>	<b>1</b>
So much expenditure	1
<b>Firdos Adda Sawat</b>	<b>1</b>
Over Expenditure	1
<b>Frontier Punjab Goods Transport Company</b>	<b>1</b>
Profit ratio is low	1
<b>Umra Goods</b>	<b>1</b>
For more profit	1
<b>Kazmi Brothers</b>	<b>1</b>
Want more profit	1
<b>Lucky Karwan Goods Far wading Agency</b>	<b>1</b>
Due to over expense	1
<b>Pak Kashmir Goods Forwarding Agency Rawalpindi</b>	<b>1</b>
Low fare charges	1
<b>Mardan Goods</b>	<b>1</b>
Over Expenditure	1
<b>Pakistan Safeer Awan</b>	<b>Coaches 1</b>
Low fares	1
<b>Naveed Karim Hashmi Goods Haripur</b>	<b>1</b>
Luggage charges are low	1
<b>Pindi Hazara Goods</b>	<b>1</b>
No Saving	1
<b>Kohistan Hazara Goods</b>	<b>1</b>
Profitable business can be done with out overloading if fuel rate is low	1
<b>Sindh Punjab Transport Company</b>	<b>1</b>
So much expenditure	1
<b>Mardan Peshawar Goods Transporter Company</b>	<b>1</b>
Low expenditure in which fuel can complete	1
<b>Super Abbasine Hazara Goods Forwarding Agency</b>	<b>1</b>
Token Mafia and Tax receiver at every where	1
<b>Lucky Muslims Hazara Goods Forwarding Agency</b>	<b>1</b>
Due to Too Tax	1
<b>Super Star Goods Transporter Company</b>	<b>1</b>
So much expenditure	1
<b>Awan Transporter Company</b>	<b>1</b>
So much expenditure	1
<b>The Lahore Mushtarka Mehmmand Goods Transport Company</b>	<b>1</b>

Costly diesel and tool tax	1
<b>Nourooz Goods</b>	<b>2</b>
N/A	1
No Reply	1
<b>Umrs Khan Goods</b>	<b>2</b>
Expenditure is so heavy and the Fare is not enough	1
No Reply	1
<b>Grand Total</b>	<b>25</b>

<b>Count of ID</b>	<b>Column Labels</b>	
<b>Row Labels</b>	<b>Driver</b>	<b>Grand Total</b>
<b>Costly diesel and tool tax</b>	<b>1</b>	<b>1</b>
The Lahore Mushtarka Mehmand Goods Transport Company	1	1
<b>Due to over expense</b>	<b>1</b>	<b>1</b>
Lucky Karwan Goods Far wading Agency	1	1
<b>Due to Too Tax</b>	<b>1</b>	<b>1</b>
Lucky Muslims Hazara Goods Forwarding Agency	1	1
<b>Expenditure is so heavy and the Fare is not enough</b>	<b>1</b>	<b>1</b>
Umrs Khan Goods	1	1
<b>For more profit</b>	<b>1</b>	<b>1</b>
Umra Goods	1	1
<b>Low expenditure in which fuel can complete</b>	<b>1</b>	<b>1</b>
Mardan Peshawar Goods Transporter Company	1	1
<b>Low fare charges</b>	<b>1</b>	<b>1</b>
Pak Kashmir Goods Forwarding Agency Rawalpindi	1	1
<b>Low fares</b>	<b>1</b>	<b>1</b>
Pakistan Coaches Safeer Awan	1	1
<b>Luggage charges are low</b>	<b>1</b>	<b>1</b>
Naveed Karim Hashmi Goods Haripur	1	1
<b>N/A</b>	<b>1</b>	<b>1</b>
Nourooz Goods	1	1
<b>No Reply</b>	<b>2</b>	<b>2</b>
Nourooz Goods	1	1
Umrs Khan Goods	1	1
<b>No Saving</b>	<b>1</b>	<b>1</b>
Pindi Hazara Goods	1	1
<b>Over Expenditure</b>	<b>3</b>	<b>3</b>
Firdos Adda Sawat	1	1
Al-Madad Company	1	1
Mardan Goods	1	1

<b>Profit ratio is low</b>	<b>1</b>	<b>1</b>
Frontier Punjab Goods Transport Company	1	1
<b>Profitable business can be done without overloading if fuel rate is low</b>	<b>1</b>	<b>1</b>
Kohistan Hazara Goods	1	1
<b>So much expenditure</b>	<b>5</b>	<b>5</b>
New Lasani Goods Forwarding Agency	1	1
Awan Transporter Company	1	1
Sindh Punjab Transport Company	1	1
New Afridi Goods Transporter Company	1	1
Super Star Goods Transporter Company	1	1
<b>Token Mafia and Tax receiver at every where</b>	<b>1</b>	<b>1</b>
Super Abbasine Hazara Goods Forwarding Agency	1	1
<b>Want more profit</b>	<b>1</b>	<b>1</b>
Kazmi Brothers	1	1
<b>Grand Total</b>	<b>25</b>	<b>25</b>

<b>Count of ID</b>	<b>Column Labels</b>
<b>Row Labels</b>	<b>Driver</b>
Low fare charges	29.17%
So much expenditure	20.83%
Over Expenditure	12.50%
Profit ratio is low	4.17%
Due to Too Tax	4.17%
Low expenditure in which fuel can complete	4.17%
For more profit	4.17%
Profitable business can be done without overloading if fuel rate is low	4.17%
Token Mafia and Tax receiver at every where	4.17%
Want more profit	4.17%
Due to over expense	4.17%
No Saving	4.17%
<b>Grand Total</b>	<b>100.00%</b>

<b>Count of ID</b>	<b>Column Labels</b>
<b>Row Labels</b>	<b>Driver</b>
Low fare charges	28.00%
So much expenditure	20.00%
For more profit	16.00%
Over Expenditure	8.00%
Token Mafia and Tax receiver at every where	8.00%

No Saving	8.00%
Profitable business can be done without overloading if fuel rate is low	4.00%
Low expenditure in which fuel can complete	4.00%
Due to Too Tax	4.00%
<b>Grand Total</b>	<b>100.00%</b>

**APPENDIX-E: SUMMARY OF PAST NATIONAL  
RESEARCH – RELATED TO PDC**

Sr	Study	Year	Author	
1.	Axle load survey report	1982	National Transport Research Center (NTRC)	
2.	Axle load survey	1988	Associated Consulting Engineers (ACE)	
3.	Axle load survey	1989	Road Research and Material Testing Institute (RR&MTI)	
4.	An overview of Pakistan road freight industry	1991	Transportation Road Research Laboratory (TRRL) ,UK	HINE, J., & CHILVER, A. (1991). PAKISTAN ROAD FREIGHT INDUSTRY: AN OVERVIEW. <i>TRRL RESEARCH REPORT</i> , (314).
5.	Axle load survey	1993	National Engineering Services of Pakistan (NESPAK)	
6.	Axle load study on national highways of Pakistan	1995	National Highway Authority (NHA)	
7.	Report on traffic study, axle load survey and pavement design	2001	Associated Consulting Engineers (ACE)	
8.	Effects of variation in Truck factor on pavement performance in Pakistan	2013	Rabia and Afsheen	Chaudry, R., & Memon, A. B. (2000). Effects of Variation in Truck Factor on Pavement Performance in Pakistan.
9	Development of database of		<i>Muhammad Usman Shaf, Syed Muhammad Ali,</i>	Shaf, M. U., Ali, S. M., Shah, S. A.

	heavy truck load data in Peshawar, Pakistan		<p><i>Syed Akhtar Ali Shah, Kamran Ahmad</i></p>	<p>A., &amp; Ahmad, K. (2015). DEVELOPMENT OF DATABASE OF HEAVY TRUCK LOAD DATA IN PESHAWAR, PAKISTAN. <i>Journal of Engineering and Applied Sciences (JEAS), University of Engineering and Technology, Peshawar, 34(1).</i></p>
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## APPENDIX-F: ISLAMABAD CAPITAL TERRITORY, OL

### FINE SCHEDULE

**ISLAMABAD CAPITAL TERRITORY AMENDMENT "12<sup>TH</sup> SCHEDULE"**  
**(SEE SECTION 116-A (1) MOTOR VEHICLE ORDINANCE 1965**

ٹریفک قواعد پر خلاف ورزی پر جرمانوں کی تفصیل

S. No	Violations	Penalty	S. No	Violations	Penalty
1.	Exceeding prescribed speed limit	RS. 200.00	36.	Driving motor vehicles without Insurance coverage	RS. 100.00
2.	Carrying passengers in public service Vehicle exceeding permissible limits.	RS. 200.00	37.	Driving a transport vehicle without, or with a defective speedo meter	RS. 200.00
3.	Violation of Manual Traffic Signals	RS. 200.00	38.	Carrying passengers in a dangerous position in a transport vehicle	RS. 400.00
4.	Disobeying traffic signals-		39.	Improper turning (turn from wrong lane).	RS. 100.00
	(i) Amber flashing.	RS. 100.00	40.	Improper lane usage (lane violation)	RS. 300.00
	(ii) Red thinking.	RS. 200.00	41.	Blowing horns in silence zone.	RS. 200.00
	(iii) Red light	RS. 500.00	42.	Improper U-Turn.	RS. 100.00
5.	Overloading by public transport vehicles (goods carriers)	RS. 300.00	43.	Failing to stop when required by traffic Police.	RS. 300.00
6.	Driving a vehicle exceeding prescribed weight limits or overloading of goods 15% in excess of Limits	RS. 500.00	44.	Driving without fitness certificate.	RS. 500.00
7.	Overloading of passengers 50% in excess of permissible limits	RS. 200.00	45.	Using pressure or musical horns.	RS. 300.00
8.	Overloading where prohibited (Goods)	RS. 300.00	46.	Driving PSV without route permit.	RS. 500.00
9.	Overtaking where prohibited.	RS. 200.00	47.	Misbehaving with passengers. (only on complaint)	RS. 300.00
10.	Failure to yield the right of way to other vehicles.	RS. 100.00	48.	Driving in violation of law or rules not Otherwise provided.	RS. 300.00
11.	Obstructing movement of emergency vehicles.	RS. 300.00	48 (i)	Driving any vehicle without fastening seat belt by the driver and front seat passenger.	RS. 300.00
12.	Loading in excess of the restriction of Dimension of goods.	RS. 300.00	48 (ii)	Using hand-held Mobile Phone while driving for voice calls, text message or videoing.	RS. 300.00
13.	Driving at night without proper light.	RS. 300.00	49.	Smoke emitting vehicles.	RS. 500.00
14.	Driving at the wrong side of the road.	RS. 400.00	50.	Underage driving.	RS. 500.00
15.	Improper crossing on railway track.	RS. 200.00	51.	Repeating the same violation.	RS. 500.00
16.	Following too closely or cutting too sharply.	RS. 200.00	52.	Abetment of the above violation.	RS. 500.00
17.	Driving with tinted or covered glasses obstructing visibility from within the vehicles	RS. 300.00	53.	Violation of red-light by cyclist.	RS. 100.00
18.	Jumping traffic queue.	RS. 200.00	54.	Driving when disqualified.	RS. 500.00
19.	Failing to dip head light for other traffic	RS. 200.00	55.	Altering a license or using an altered or forged license.	RS. 500.00
19 (i)	Driving any vehicle at night on high beams are using dazzling light / powerful lamps	RS. 200.00	56.	Driving a transport vehicle without obtaining a license or with a license which is defective or without a license applicable to the vehicle driven.	RS. 500.00
20.	Driving wrong way in one way street	RS. 300.00	57.	Taking part in unauthorized race or trial or speed.	RS. 500.00
21.	Using turns indicator for any purpose other than those prescribed.	RS. 200.00	58.	Driving when mentally or physically unfit to Drive or under Influence of drug or alcohol.	RS. 500.00
22.	Playing where prohibited	RS. 100.00	59.	Repeating the same violations.	RS. 500.00
23.	Improper loading of goods or improperly loaded goods.	RS. 300.00		<b>PARKING VIOLATIONS</b>	
24.	Failing to observe lighting hours.	RS. 100.00	60.	More than 0.5 meter from the kerb.	RS. 200.00
25.	Obstructing traffic.	RS. 300.00	61.	Parking on a side walk.	RS. 200.00
26.	Failure to observe slow sign	RS. 100.00	62.	Less than 0.5 meter from another car.	RS. 200.00
27.	Riding motorcycle without safety helmet.	RS. 100.00	63.	Parking on zebra crossing.	RS. 300.00
28.	Failure to stop for a school bus.	RS. 100.00	64.	Less than 3 meters from fire hydrant.	RS. 200.00
29.	Turning where prohibited	RS. 200.00	65.	Less than 10 meters from a stop sign.	RS. 200.00
30.	Failure to protect learning driver	RS. 200.00	66.	Less than 10 meters from intersection	RS. 300.00
31.	Failure to yield right of way to pedestrians.	RS. 200.00	67.	Parking in a "NO PARKING" zone.	RS. 300.00
32.	Reckless and negligent driving.	RS. 500.00	68.	Parking in front of an entrance to premises	RS. 300.00
33.	Careless driving	RS. 200.00	69.	Parking on a Bus Stop.	RS. 200.00
34.	Driving without driving license.	RS. 500.00	70.	Parking on a Bridge.	RS. 300.00
35.	Driving an unregistered vehicle.	RS. 200.00	71.	Parking on a Foot-path.	RS. 200.00

**APPENDIX-G: PUNJAB TRAFFIC POLICE; AMENDMENT  
IN TWELFTH SCHEDULE OF ORDINANCE XIX OF 1965**

<b>Punjab Traffic Police; Amendment in Twelfth Schedule of Ordinance XIX of 1965</b>		
<b>"Twelfth schedule Violations and Penalties"</b>		
<b>Code</b>	<b>Violation</b>	<b>Fines Truck</b>
1.	Exceeding prescribed speed limit	Rs.750
2.	Carrying passengers in a public service vehicle exceeding permissible limit	Rs.750
3.	Violation of traffic signals(Electronic/Manual)	Rs.1000
<b>4.</b>	<b><u>Overloading a goods vehicle</u></b>	<b><u>Rs.500</u></b>
5.	Driving a motor vehicle at night without proper lights	Rs.500
6.	Driving a motor vehicle on the wrong side of the road	Rs.750
7.	Driving a motor vehicle with tinted/covered glasses	-
8.	Violation of line/lane/zebra crossing etc.	Rs.500
9.	Plying a motor vehicle where and when prohibited	Rs.750
10.	Obstructing traffic	Rs.1000
11.	Reckless and negligent driving	Rs.1000
12.	Driving a motor vehicle without a driving licence	Rs.1000
13.	Using a pressure horn, musical horn or using any other horn in a silence	Rs.750

	zone	
14.	Emitting excessive smoke	Rs.750
15.	Driving an unregistered motor vehicle	Rs.1000
16.	Driving in violation of age limit	Rs.1000
<b>17.</b>	<b>Driving a motor vehicle without fitness certificate</b>	<b>Rs.1000</b>
18.	Driving without or in violation of conditions of route permit	Rs.1000
19.	Riding a two wheel motorcycle without crash helmet	-
20.	Pillion riding by more than two persons	-
21.	Use of hand-held mobile phone while driving	Rs.1000
22.	Non-fastening of seatbelt while driving on a notified road	Rs.750
23.	Violation of parking rules	Rs.1000
24.	Violation of any other provision of the ordinance or the rules made there under punishable under section 112	Rs.500

**APPENDIX-H: PENALTY TABLE NH&MP**

<b>Code</b>	<b>Offence</b>	<b>Penalty (Rs)</b>	<b>Imprisonment</b>
A20	Driving when disqualified	1000	Upto 6 Months
A21	Obtaining or Applying for a driving licence without disclosing particulars of endorsement	500-1000	Upto 6 Months
<b>A22</b>	<b>Offence relating to construction of vehicle</b>	<b>500-1000</b>	<b>Upto6Months</b>
A23	Offence relating to permits	1000-2000	Upto 6 Months
<b>A24</b>	<b>Overloading of goods 15 % in excess of permissible limits.</b>	<b>1000-5000</b>	<b>Upto 1Month</b>
A25	Overloading of passengers 30 % in excess of permissible limits	1000-5000	Upto 1Month
A26	Offence relating to accidents	1000-2000	Upto 6 Months
A27	Taking vehicle without lawful authority	1000-2000	Upto 6 Months
A28	Unauthorized interference with vehicle	500-1000	Upto 6 Months
A29	Willful disobedience or obstruction of lawful orders.	1000-2000	Upto 6 Months
A30	Altering a licence or using an altered or forged licence.	1000-3000	Upto 6 Months
A31	Driving a transport vehicle without obtaining a licence or without a licence which is effective or without a licence applicable to the vehicle driven	500-1000	Upto 1Month
A32	Taking part in unauthorized race or trail or speed.	1000-2000	Upto 1Month
A33	Overtaking by transport vehicle dangerously where prohibited.	500-1000	Upto 1Month
A34	Driving at speed 40 KM/H higher then specified.	750-1500	Upto 1Month
A35	Driving a vehicle not covered by a certificate of fitness	500-1000	Upto 3 Months
A36	Failing to stop when ordered by a police officer in uniform.	500-1000	Upto 1 Month
A37	Driving when mentally or physically unfit to drive or under influence of drug or alcohol	5000-10000	Upto 1 Month
A38	Driving recklessly	500-1000	Upto 1 Month
B20	Exceeding speed limits by less then 40 KM/H	750	
B21	Carrying passengers in a public service vehicle less then 30 % in excess of the permissible limits.	1500	
B22	Failure to observe traffic signals	200	
	(i) Amber flashing	200	
	(ii) Red flashing	300	
	(iii) Red Light		
B23	Carrying goods less then 15% in excess of permissible load	1000	
B24	Overtaking where prohibited.	300	
B25	Failure to yield the right of way to other vehicle.	300	
B26	Interfering with an emergency vehicle.	500	
B27	Loading in excess of the restriction of dimension of goods.	500	
B28	Driving at night without proper lights.	1000	

B29	Driving on the wrong side of the road.	500	
B30	Disobeying stop signs.	500	
B31	Improper crossing of railway track.	500	
B32	Following too closely or cutting in sharply	300	
B33	Driving with rear screen covered.	150	
	i) Partially	300	
	ii) Fully.		
B34	Jumping traffic queue.	500	
B35	Failing to dip headlight for other traffic.	500	
B36	Driving wrong way in one way street.	500	
B37	Using turn indicator for any purpose other then described.	300	
B38	Playing where prohibited.	500	
B39	Improper loading of goods.	500	
B40	Failing to observe lighting hours.	500	
B41	Obstructing traffic	500	
B42	Failure to observe slow sign.	200	
B43	Driver of motor cycle without safety helmet.	200	
B44	Failure to stop for school bus	200	
B45	Prohibited lane changing.	200	
B46	Disobeying yield signs.	200	
B47	Failure to protect beginner driver etc.	200	
B48	Failure to yield of way to pedestrian	300	
B49	Careless driving.	300	
B50	Driving without driving licence.	750	
B51	Driving an unregistered vehicle.	500	
B52	Driving a motor vehicle without a certificate of "No fault insurance coverage".	1000	
B53	Carrying passengers in dangerous position in a transport vehicle.	750	
B54	Opening doors dangerously.	200	
B55	Improper turn (turn from wrong lane).	300	
B56	Improper lane usage (lane straddling).	200	
B57	Driving vehicle emitting smoke, visible vapours, grits, sparks, ashes or oily substance.	500	
B58	Using horn in silence zone.	200	
B59	Driving motor vehicle producing unduly harsh, shrill, loud or alarming noise.	300	
B60	Improper U-turn	300	
B61	Other violations listed in part (i) and (ii) of the eighth schedule.	300	
B62	More then 0.5M from the curb.	200	
B63	Parking on a side walk.	200	
B64	Less then 0.5M from another car.	200	
B65	Parking on Zebra crossing.	300	
B66	Less then 3 M from fire hydrant.	200	

B67	Less than 10 M from a stop sign	200	
B68	Less than 10 M from intersection.	300	
B69	Parking in a "No parking" zone.	300	
B70	Parking in front of entrance to premises.	300	
B71	Parking on a bus stop.	200	
B72	Parking on a bridge.	300	
B73	Parking on the road pavement outside municipal limit.	200	
B74	Parking on a footpath.	200	
B75	Parking on or near brow of a hill.	200	
B76	Parking on grass verge.	200	
C21	Any other offence.	500	
C22	Committing C21 subsequently.	1000	

**APPENDIX-I: PROVINCIAL MOTOR VEHICLES KHYBER  
PAKHTUNKHWA AMENDMENT ACT**

<b>Traffic Violation Fines Amended vide Provincial Motor Vehicles Khyber Pakhtunkhwa Amendment Act XVII of 2010 &amp; Act No. XXXIV of 2014.</b>				
<b>PART</b>				<b>I</b>
<b>MOVING VIOLATIONS</b>				
<b>Sr</b>	<b>Nature of violations</b>	<b>Penalty</b>		
1	2	3		
		Motor car/Jeep @Rs.	LTV @Rs.	HTV/PSV @Rs.
1	Exceeding prescribed speed limit.	300	500	700
2	Carrying passengers in public service vehicles exceeding permissible limit.	200	500	700
3	Violation of traffic signals (manual/electrical)	300	500	1000
<b>4</b>	<b>Overloading by public transport vehicles (Goods Carriers).</b>	–	<b>1000 for 1% to 5% of overloading</b> <b>2500 for 5.1% to 10% of overloading</b> <b>5000 for 10.1% to 15% and above of overloading.</b>	<b>1000 for 1% to 5% of overloading</b> <b>2500 for 5.1% to 10% of overloading</b> <b>5000 for 10.1% to 15% and above of 15% overloading shall not be allowed to ply on road.</b>
8	Loading in excess of the restrictions of dimension of goods.	–	300	500
19	Plying where prohibited.	200	300	500
20	Improper loading of goods/improper loaded goods.	–	300	400
22	Obstructing traffic.	300	500	1000
23	Failure to observe low sign.	100	100	100
29	Reckless & negligent driving.	400	500	600
30	Driving without driving license.	600	600	1000
31	Driving an unregistered vehicle.	200	500	600
32	Driving a motor vehicle without insurance coverage.	100	100	100

33	Driving a transport vehicle without, or with a defective speedometer.	200	200	300
41	Driving without fitness certificate.	–	300	500
42	Driving a vehicle exceeding prescribed weight limit.	–	300	500
43	Using vehicle in unsafe condition.	200	400	600
44	Using pressing/musical horns.	200	300	500
45	Driving vehicle in violation of law/rules not otherwise provided.	200	300	500
46	Smoke emitting vehicle.	400	500	600
47	Juvenile driving.	300	500	600
48	Using mobile phone while driving.	500	500	500
50	Repeating the same violations.	600	600	600
51	Abetment of the above violations.	200	300	500
52	Driving motor vehicle without route permit if any.	–	5000	5000
53	Repeating the violation at serial No. 52 above.	–	10000	10000
<b>54</b>	<b>Repeating the violation at serial No. 4 above.</b>	–	<b>10000</b>	<b>10000</b>



**APPENDIX-J: LOCATION OF PERMANENT (WS) AT  
NATIONAL HIGHWAYS**

<b>LOCATION OF PERMANENT WS AT MOTORWAYS</b>					
<b>Package No.</b>	<b>Location</b>	<b>No. of Sites</b>	<b>Route</b>	<b>No. of Equipment</b>	<b>Type</b>
WS(MW)-01	Peshawar Entry Point (SB)	5	M-1	SSWIM	SSWIM
	Charsada (NB&SB)				
	Rashakai (NB&SB)				
WS(MW)-02	Wali Khan (NB&SB)	4	M-1	SSWIM	SSWIM
	Col. Sher Khan (NB&SB)				
WS(MW)-03	Sawabi (NB&SB)	4	M-1	SSWIM	SSWIM
	Chach (NB&SB)				
WS(MW)-04	Ghazi (NB&SB)	4	M-1	SSWIM	SSWIM
	Burhan (NB&SB)				
WS(MW)-05	Brahama Bahatar (NB&SB)	4	M-1	SSWIM	SSWIM
	Fateh Jang (NB&SB)				
WS(MW)-06	Faisalabad (NB)	3	M-3	SSWIM	SSWIM
	Sahianwala (NB&SB)				

<b>Package No.</b>	<b>Location</b>	<b>Route</b>	<b>No. of Sites</b>	<b>No. of Equipment</b>	<b>Type</b>
<b>WS(NH)-01</b>	Gaddani (SB)	N-25	2	2	STATIC
	Pipri (NB)	KTHH			
<b>WS(NH)-02</b>	Petaro (NB)	N-55	1	1	STATIC
<b>WS(NH)-03</b>	Sukkur (NB)	N-65	2	2	STATIC
	Sukkur (SB)				
<b>WS(NH)-04</b>	Ranipur (SB)	N-5	1	1	STATIC
<b>WS(NH)-05</b>	Rohri (NB)	N-5	2	2	SSWIM
	Rohri (SB)				
<b>WS(NH)-06</b>	Pattoki (NB)	N-5	2	4	SSWIM
	Pattoki (SB)				
<b>WS(NH)-07</b>	Eminabad (NB)	N-5	2	4	SSWIM
	Eminabad (SB)				
<b>WS(NH)-08</b>	Sangjani (NB)	N-5	2	3	SSWIM
	Sangjani (SB)				
<b>WS(NH)-09</b>	M. Mansoor (NB)	N-5	2	4	SSWIM
	M. Mansoor (SB)				
<b>WS(NH)-10</b>	Jamrud (NB)	N-5	1	1	SSWIM
<b>WS(NH)-11</b>	Kohat Tunnel (NB)	N-55	3	3	SSWIM
	Kohat Tunnel (SB)				
	Kohat Link Road				
<b>WS(NH)-12</b>	D. I. Khan	N-55	1	1	SSWIM
<b>WS(NH)-13</b>	Lakpass (SB)	N-25	1	1	STATIC
<b>WS(NH)-14</b>	Noshki (NB)	N-40	1	1	STATIC
<b>WS(NH)-15</b>	Nokundi (NB)	N-40	1	1	STATIC
<b>Total:</b>	<b>24</b>	<b>31</b>			

## APPENDIX-K: SALIENT OF NHA EOI FOR WS

<b><u>OPERATION, MANAGEMENT AND MAINTENANCE OF PERMANENT WEIGH STATIONS ON NATIONAL HIGHWAYS AND MOTORWAYS</u></b>	
<b><u>Relevant Sections</u></b>	<b><u>Comments</u></b>
<p><b><u>Revenue Section – Admin Wing</u></b></p> <p>a. General Manager(Revenue)            b. Director (Revenue)            c. Director (Revenue Contracts)            d. Deputy Director (Weigh Stations)</p>	<p>The WS operation is contracted out and maintained by NHA HQ through the revenue department / wing. By default the revenue wing with non-engineering background lacks the request basis to encompass the damaging effects of the OL, rather its considered as revenue generation source.            Disregarding the damaging effects of the OL</p>
<p><b><u>2 Weighing Station Operations</u></b></p> <p><i>b. prequalified private entrepreneurs for “Operation, Management &amp; Maintenance of following Permanent weigh stations on National Highways and Motorways” on ‘fixed monthly charges basis’ for a period ending 30th June 2018 from the date of commencement</i></p>	<p>The ‘fixed monthly charges basis’ is based on the assessment of the truck traffic plying on that particular section. However once the contractors base value is computed / accumulated than they don’t have incentive to enforce further.</p>
<p><i>d. OM&amp;MC has to ensure proper weighing operation of all the truck traffic flows through the Weigh Station. Regular and random exercises will be done on the main roadway to urge vehicle to divert to the Weigh Station. OM&amp;MC will ensure that the truck traffic is escorted into the left side of the main carriageway and screen the traffic for empty trucks</i></p>	<p>The WS enforcement is highly inefficient, with no incentive to divert the truck for weighing,            Secondly the trucks being weighed are far less than the average WS capacity, since a typical day having 1440minutes so virtually if it takes just to go through the WS require min two minutes so an average of 1000 to 1400 trucks can be weighed so the existing single bay of WS are capable not to weigh more than this so it adds up to the inefficiency of the weigh enforcement.</p>
<p><b><u>3 Technical Capability</u></b></p> <p><i>c. OM&amp;MC will ensure a <b>parking area</b> is available within Weigh Station limits where all heavily overloaded trucks will be parked for unloading extra load before they are allowed to ply over NHA network</i></p>	<p>By making OM&amp;MC responsible for the availability of parking space to park the OL trucks / unloading the excessive load is practically un realistic, since the WS constructed / located along the highways are without sufficient space to do the need full and hence this inherent flaw in the design of the WS makes it practically impossible to impound / unload/ park the OL vehicle for the practical enforcement.</p>

<p><u>6.Progress/Results:</u></p> <p>c. <b>Evaluation for share of Fine Collection</b> should be based on Trucks/Trailers Traffic passing through the nearest Toll Plaza and the same will be monitored during the currency of contract</p>	<p>The toll plaza are neither automated nor connected to a centralized data base system (few automated are also operated most of the times manually) hence the very basic data for the 'evaluation for share of Fine Collection' i.e. AADT is unreliable.</p>
<p><u>7.3.4 Calibration of Weigh Equipment</u></p> <p><i>The Calibration of Weigh Equipment shall be done after every Ninety (90) days period and as and when required basis (if required prior to Ninety (90) days period) in presence of Supervisory officer of Weigh Stations/ Deputy Director concerned.</i></p>	<p>The truckers majority view of varying reading of the WS on the same stretch of roads is a clear indicator that the WS are not calibrated, as it is desired to be done.</p>

## **APPENDIX-L: OVERLOAD ENFORCEMENT**

### **IMPLEMENTATION MECHANISM / TECHNOLOGIES**

Weight control is exercised mainly through a network of weighing stations along the main trucking routes where the trucks are weighed and the overload ones are penalized as per the law.

NHA established its first weighing stations at the change of millennium. The number of those has been multiplied ever since.

#### **1. Types of Weigh Station**

Generally speaking, weigh stations are categorized as

- a. Permanent Weigh Stations.** These are the weigh stations which are permanently installed at a specific location for their life span
- b. Portable Weigh Stations.** These are make-shift type weigh stations generally used by law enforcement agencies like police for surprise enforcement. These types of weigh stations cannot be used for 24/7 application.

#### **2. Types of Weighing**

On the principle of operation, weighing can be classified as

##### **a. Static Weighing**

At static weigh stations, vehicles are made to stop on a purpose built weighing platform and the static weight of the vehicle is recorded. The size of the platform is according to the largest expected vehicle of that particular area.

*Advantage* of the static weighing is their dead weight accuracy and vehicle accurate profiling.

Whereas the *disadvantages* are

- i. Inherent low throughput

- ii. Resource intensive
- iii. Vehicles are diverted from the main highway into the weigh station area.
- iv. Vehicles needed to be dead stopped for weighing.
- iv. Only Gross Vehicle Weight – GVW can be recorded.

Whereas, in the recent years attention has focused on “**Axle Loads**” rather than Gross Vehicle Weight (GVW) as the damage to the roads and bridges is caused by Axle overloading.



Static Weigh Station

**b. DYNAMIC WEIGHING OR WEIGH IN MOTION – WIM**

In the American Society for Testing and Materials (ASTM) Standard Specification E 1318-94, WIM is described as

*“the process of measuring the dynamic tire forces of a moving vehicle and estimating the corresponding tire loads of the static vehicle”*

WIM systems have better throughput, unbiased samples and better coverage of vehicle’s dynamics impact on the road. WIM equipment provides highway planners and designers with traffic volume and classification data by time of day and day of week. In addition, WIM equipment also provides planners and designers with equivalent single axle loadings (ESAL) that heavy vehicles place on pavements. Motor vehicle enforcement officers use heavy truck axle load data to plan enforcement activities. In summary, the uses of traffic and

truck weight data include enforcement, pavement, bridge, and legislative and regulatory issues.

### **1). Advantages of WIM**

WIM, Weigh In Motion, or dynamic weight measurements, are used for a wide area of applications. Some of the most important are

#### **a). Statistics**

How many vehicles per hour, types of vehicles, empty or fully loaded, number of axles, classification, speed, spacing between vehicles.

#### **b). Overload Detection**

#### **c). Pre Selection**

A WIM station a few kilometers upstream of the static scale monitors all vehicles. The obviously overloaded trucks are then taken out of the traffic for inspection.

#### **d). Weight Enforcement**

Law enforcement by means of high speed WIM.

#### **e). Bridge & Construction Protection**

Preventing overweight vehicles from crossing a bridge of limited capacity. Can be combined with video/still camera for law enforcement.

#### **f). Toll Roads**

Measures vehicle weights for a weight-dependent toll. In future, the tolling will be based on the road user charge (weight-dependent) rather than by classification. A fully loaded truck

therefore will be charged more than an empty truck, since a fully loaded truck uses the infrastructure to a much higher degree.

**g). Pavement Management System**

Decision-making process designed to help authorities to prevent pavement problems through judicious maintenance, and to diagnose and repair damages in a timely, cost-effective manner. It consists of a comprehensive database and historical information on pavement condition, structure and traffic, and is a set of tools that allows to determine existing and future pavement conditions, predict financial needs, and identify and prioritize pavement preservation projects.

### **3. WIM TECHNOLOGIES**

Following are the present age popular WIM technologies

**a. BENDING PLATE**

Bending Plate WIM systems utilize plates with strain gauges bonded to the underside. As a vehicle passes over the bending plate, the system records the strain measured by the strain gauge and calculates the dynamic load. The static load is estimated using the measured dynamic load and calibration parameters. The calibration parameters account for the influences factors, such as vehicle speed and pavement/suspension dynamics, have on estimating the static weight.

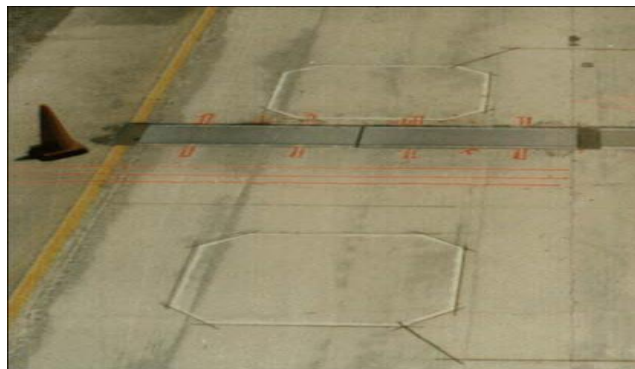
**Sensor**

Bending Plate WIM systems consist of either one or two scales. The scale or pair of scales is placed in the travel lane perpendicular to the direction of



travel. When two scales are used in a lane, one scale is placed in each wheelpath of the traffic lane so that the left and right wheels can be weighed individually. The pair of scales is placed in the lane either side-by-side or staggered by five meters (16 feet). Bending plate systems with one scale placed in either the left or right wheelpath are usually used in low volume lanes. Bending Plate WIM systems consist of at least one scale and two inductive loops. The scales are placed in the travel lane perpendicular to the direction of travel. The inductive loops are placed upstream and downstream from the scales. The upstream loop is used to detect vehicles and alert the system of an approaching vehicle. The vehicle speed, which is used to determine the axle spacing, can be determined by three methods: weighpad to inductive loop, weigh pad to axle sensor, and weighpad to weighpad, if the weighpads are staggered. If an axle sensor is used to determine the vehicle speed, it is placed downstream of the weigh pad.

#### Example of Bending Plate System Layout Installed Bending Plate



Installed Bending Plate

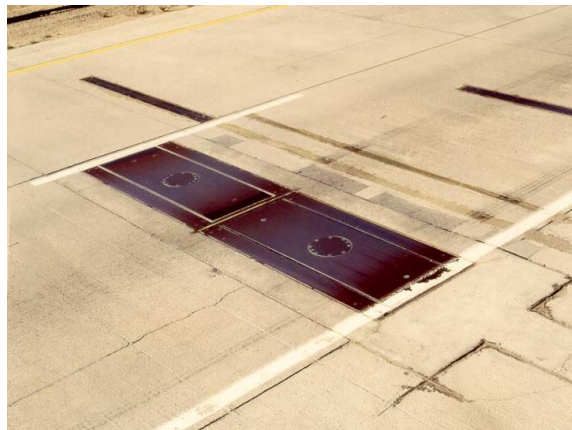
#### **b. LOAD CELL**

Load Cell WIM systems utilize a single load cell with two scales to detect an axle and weigh both the right and left side of the axle simultaneously. As a

vehicle passes over the load cell, the system records the weights measured by each scale and sums them to obtain the axle weight.

### **Sensor**

The typical Load Cell WIM systems consist of a single load cell placed across the traffic lane. The single load cell has two in-line scales that operate independently. Off-scale detectors are integrated into the scale assembly to sense any vehicles off the weighing surface. The typical system consists of the load cell and at least one inductive loop and one axle sensor. The load cell is placed in the travel lane perpendicular to the direction of travel. The inductive loop is placed upstream of the load cell to detect vehicles and alert the system of an approaching vehicle. If a second inductive loop is used, it is placed downstream of the load cell to determine axle spacings, which is used to determine the vehicle speed. The axle sensor is placed downstream of the load cell to determine axle spacings and vehicle speed. An example of the layout for a load cell WIM system is shown as under.



Installed Load Cell Station

### **c. PIEZOELECTRIC SENSORS**

Piezoelectric WIM systems utilize piezo sensors to detect a change in voltage caused by pressure exerted on the sensor by an axle and measure the axle's weight. As a vehicle passes over the piezo sensor, the system records the electrical charge created by the sensor and calculates the dynamic load. The static load is estimated using the measured dynamic load and calibration parameters.

### **Sensor**

Piezoelectric WIM systems consist of one or more sensors, which are placed across the traffic lane. Piezoelectric WIM systems are Piezo sensors that may or may not be encapsulated in an epoxy-filled metal channel, usually aluminum.

The typical system consists of at least one sensor and one inductive loop. The sensor(s) is placed in the travel lane perpendicular to the direction of travel. The inductive loops are placed upstream and downstream from the sensor. The upstream loop is used to detect vehicles and alert the system of an approaching vehicle. The downstream loop is used to determine speed and axle spacings based on timing. An example of the layout for a piezoelectric WIM system is shown on the following page



Installed Piezo Quartz WIM

## **APPENDIX-M: OVER VIEW TRANSPORT INDUSTRY**

1. Axle Overloading is a main problem for NHA. The laws, prohibiting the practice i.e. (Motor vehicle Rules 1965) are present since long, however, never been properly enforced. Therefore the practice of overloading is going on and has increased.
2. In 2005 NHA, responsible of 3.5% of Pakistani roads but serving 80% of the commercial traffic of the country, has reported that 60% of the roads in its responsibility are in bad condition and the life span of these roads is reduced to 1/3 of the expected because of rampant overloading practices in Pakistan.



**Figure 0.1 Excessive Axle Loads Due to Overloading**

- Traffic number increasing rapidly due to economic activity in the Country
- Modal shift from rail to road
- Neglected Essential Maintenance
- Unchecked / unregulated heavy axles loads moving on national highway network resulting in damage to national highway network

1. Traffic number increasing rapidly due to economic activity in the Country

Table 0.1 Cargo Handling At Ports (2015-2016)

Year	KPT		PQA		Total		%age
	2015	2016	2015	2016	2015	2016	
<b>Import &amp; Export (Million Ton)</b>	43422	50045	30014	33321	73436	83366	12%
<b>Container Handling (Million TEU)</b>	1724	1956	971	1124	2695	3080	13%

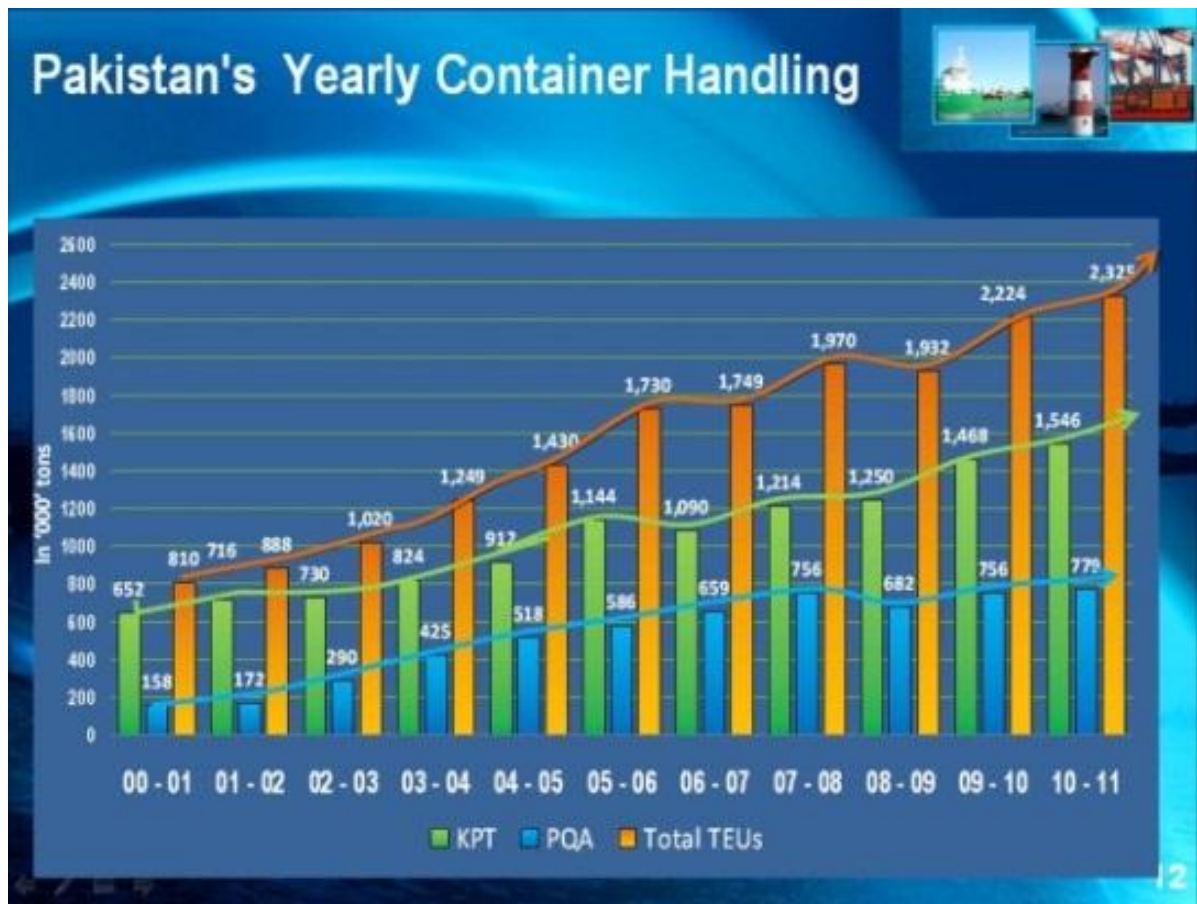


Figure 0.2 Container Move Profile

## 2. Modal shift from rail to road

<b>Table 0.2 Principal Statistics Pakistan Railways</b>				
<b>PLANT &amp; EQUIPMENT</b>	<b>Unit.</b>	<b>1999-2000</b>	<b>2014-2015</b>	<b>Progress %age</b>
<b>Route - Kilometers</b>	Km	7791	7791	0%
<b>Track - Kilometers</b>	Km	11515	11881	3%
<b>Locomotives</b>	No	596	458	-23%
<b>Coaching Vehicles</b>	No	1956	1459	-25%
<b>Other Coaching Vehicles</b>	No	936	281	-70%
<b>Freight Wagons</b>	No	23906	15452	-35%
<b>Rly Station</b>	No	687	456	-34%
<b>Freight Carried (Public Goods)</b>	Million Tons	5.169	2.835	-45%

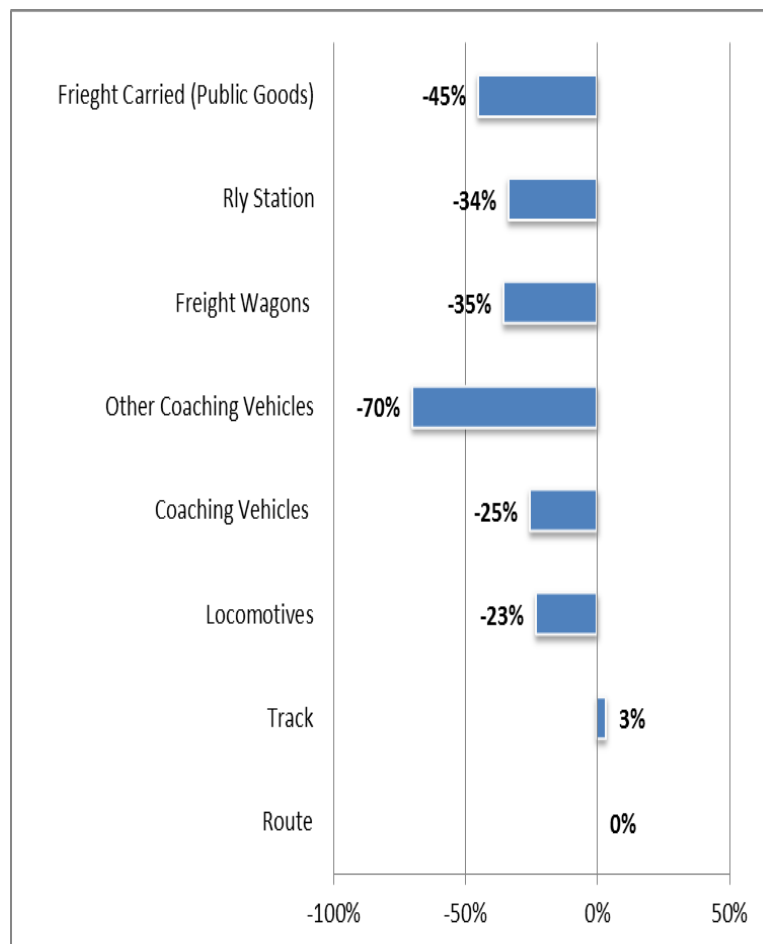


Figure 0.3 Basic Facility of Pakistan Railways

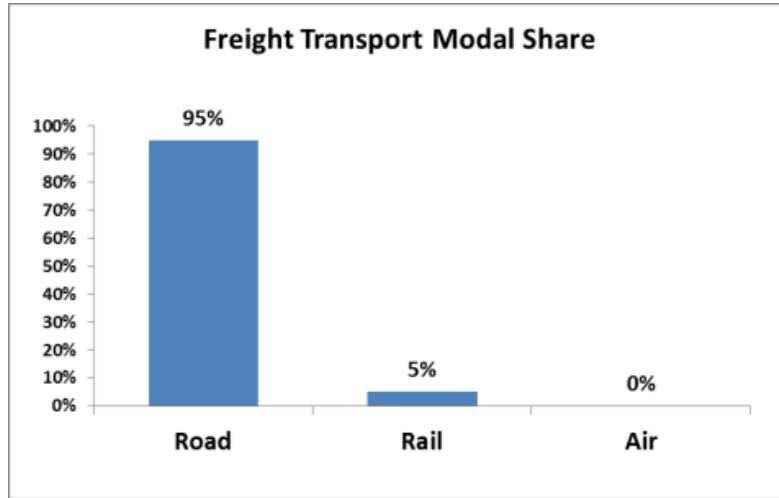


Figure 0.4 Mode Wise Share Of Transport

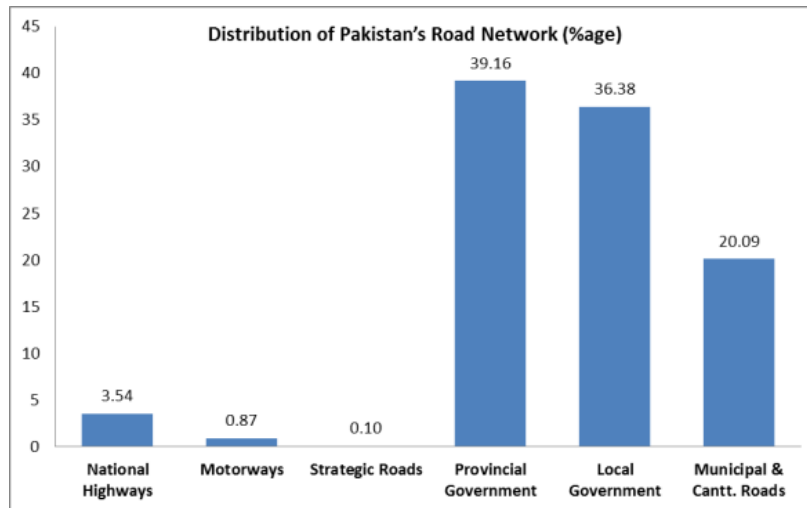


Figure 0.5 Road network Of Pakistan

Distribution of Pakistan's Road Network		
Care-taker	Km	%
National Highways	9,324	3.54
Motorways	2,280	0.87
Strategic Roads	262	0.10
Provincial Government	103151	39.16
Local Government	95832	36.38
Municipal & Cantt. Roads	52920	20.09
Total	263,415	100.00