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A STUDY ON IMPACT OF VEHICLE OVERLOADING ON JAMMU- SRINAGAR NATIONAL HIGHWAY

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ABSTRACT- The road network is critical to every country's transportation and communication. The state of the pavement is one component in determining the effectiveness of the road network. Roads have a key role in economic development and progress, as well as providing significant social advantages. Overloading on roads is a severe problem in India and other developing countries across the world. Although the subject of vehicle overloading is not new, there has not been much debate about it in emerging nations. It is believed that more than half of the commercial trucks travelling on India's national and state roadways are overcrowded. This is especially dangerous in places near mining operations. The carriers disregard and breach the regulatory axle load limitations and gross vehicle weight limits. The consequences of overloading are numerous. Newly constructed roads are subjected to accelerated loading circumstances, causing loads to surpass design limitations far before their intended life is over. As a result, roads collapse prematurely. The maintenance element gets complicated as a result of this feature, with the resulting fallout being poor road condition or high maintenance. Other negative consequences of overloading include higher road accidents, vehicle damage, slower speeds and inefficiency, delays in vehicular traffic, and congestion. A study was done to determine the root problems, and numerous suggestions were made.

KEYWORDS- vehicle overloading, national highways,Speed, Damage, Traffic Volume

I. INTRODUCTION

A country's road, network is critical to its growth. Roads play a critical, role in the country's overall boost, and progress. They are critical inorder,for the,countrytothriveandflourish.Roadsalsoprovide,accesstojobs,social,health,and educational,facilities, making [1] a transportation, system, critical in the, battle against poverty. Roads, which contribute to employment, generation. India has the, largest road network. Road transportation has grown, significantly over the years, as connection, between municipalities, towns, and a village throughout the country has improved [1]. Roads grew significantly after independence throughout, the planning horizon. Prior to World War II, road transport in the modern sense, i.e. cars powered by internal combustion engines and running onpetrolordiesel,wasessentiallynon-existentinIndia.Thefollowingplanshavebeendevelopedforthedevelopmentofhighways in India.

[2].Theplan'sfocuswasthat no hamlet in a developed agricultural zone should be more than 8 kilometers from a major road or 3 kilometers from any other road, with the average distance of communities from a major road being less than 3.2kilometers.

Twenty Year Plan: After the Nagpur Plan's objectives were met, another plan called as the Twenty Year Road Plan was created in 1961. By 1981, the road length was to be increased from 6.56 lakh km to 10.60 lakh km, and the density to 32 km of road per 100 sq. km [3].

Classification Of Roads

Roads have been classified on various basis viz According to Load, According to transport tonnage, According to importance and According to location and function. The same can be understood as follows

BasedonTrafficVolume

Theroadsfromwhichabove600vehiclespassdailyaretermedasveryheavytrafficroads [3].Similarly roadsonwhich250 to500vehiclesplydailyaretermed asHeavytrafficroads.And roadsonwhichvehiclesplywithaverage70- 250 and below 70 per day are called as Medium and Light traffic roads respectively.

Based on Tonnage

The roads from which above 1524 vehicles pass daily are termed as very heavy traffic roads. Similarly roads on which 1017 to 1524 vehicles ply daily are termed as [4] Heavy traffic roads. And roads on which vehicles ply with average 508-1017 and below 508 per day are called as Medium and Light traffic roadsrespectively.

Based on Location and Function

As classification based on location and purpose is clearly established, it is more acceptable for a country [4]. The Nagpur road plan divides Indian roads into following groups depending on location andfunction

- National Highways These are the primary highways in the country that connect the states, capitals, ports, and cities, among other things. The NHAI is responsible [4] for the construction and maintenance of thesehighways.
- StateHighways Theseroadwaysaretheprincipalthoroughfaresofthestates.Th eseconnecttheheadquartersofthestatesand the cities within the states to the NationalHighwayDistrict Roads: These roads interconnect district and commercial regions to major roads and train stations. These are built and managed by district boards.
- Village Roads: These roadways, connect the remote area, with district roads. Panchayats construct, and maintain these roads [4]. Thus from the above it is very clear that roads are very important for the nation.

II. VARIOUS TYPES OF POOR ROAD

Conditions in the Valley of Kashmir

There are numerous sorts of terrible driving circumstances in the UT of J&K. Although every year government spends a good amount of resources on the construction of roads yet the roads of valley are always in shamble [5]. The main reasons might be the poor quality of aggregate material, improper engineering or something like that yet roads develop cracks ruts etc in a short time span. Some of the serious road conditions that I have seen during the course of research are as:

Potholes

Serious accidents can occur when big pieces of dirt track [5] or asphalt are absent from the pavement. These are the main reasons of the various accidents that occur on the roads.

Spots

These can occur even in the absence of rain or snow. They usually occur at isolated spots along the route. These are very common in the road pavements found in the valley.

Side drop-off

A drop-off zone can be dangerous to vehicles. Due to bad drainage system such things are also visible.

Oily Roads

These are multiple purpose repairs before they are redone [5]. When oil and chip regions are left for an extended length of time, they can become slippery.

Area of renovation

Some of the difficulties seen in construction sites include lane shifts and uneven roadways.

Roads in Jammu & Kashmir

As per the Ministry [5] of Roads and Transport, Government of India the pace of road network in the UT of J&K has been in a full swing from the recent years. According to the survey every nook and corner of the UT is being connected with the roads. Despite the numbers above, the majority of roads in J&K are in very bad condition due to inadequate maintenance. In its recent edition, Kashmir Monitor, one of the leading, daily of Kashmir, relates the entire tale, as ―the status of roads in Jammu and Kashmir is just deplorable.‖ Poor driving surfaces are frequently the result of a confluence [5] of seasonal and traffic circumstances. Seasonal changes are extreme in Kashmir. Weather changes can cause dangers such as slippery surfaces produced by rain and ice, as well as oil patches caused by our cars. Accidents are also common in construction zones with uneven pavement.

Importance of Roads

- Roads serve a critical role in the movement of commodities and persons.
- Roads are inexpensive [6] to build and maintain.
- Road transportation system, which allows for simple connectivity [6].
- Roads may be built on virtually any terrain.
- Roads serve as excellent feeders for trains and ports.

Over Loading of Vehicles

Overloading has been identified as a danger and financial problem, and the National Department of Transport has included an anti- overloading campaign in its Road to Safety plan [6]. Economic development need appropriate transportation infrastructure. Overloaded cars, particularly freight trucks, are damaging our roads and harming economic growth — the damage inflicted escalates exponentially as the load increases [5]. Impairment to roadways caused by overloading increases repair and maintenance expenses and reduces the life of a road, putting an extra burden on the state as well as legislation road users who eventually bear the consequences of careless driving. It

is believed that more than half of the commercial trucks travelling on India's national and state roadways are overcrowded. This is especially dangerous in regions near mining operations. The carriers [6] disregard and breach the authorized axle load restrictions and gross vehicle weight limits. The consequences of overloading are numerous. Newly constructed roads are subjected to accelerated loading circumstances, causing loads to surpass design limitations far before their intended life is over [6]. As a result, roads collapse prematurely.

Overloading and its Effect on the Pavement

Traffic congestion on highways and roads is a significant problem in India and other developing countries across the world. Although the problem of overloading is not new, there hasn't been much debate about it in developing nations [6]. Some facts about overloading and its impact on the pavement are as follows: It is, estimated that0about0over060%0of commercial, vehicles plying on highways are overloaded.

- The legal load limitations are breached by the carriers, resulting in a variety of issues [6].
- The upkeep of roads owing to excessive traffic becomes a challenge as a result of heavy loads.
- Road accidents occur as a result of poor roads, which are generally destroyed as a result of over-loading.
- Overloading necessitates periodic road maintenance [6].

Bad Roads and Traffic

Overloading of vehicles is a global problem and possess a number of negative impacts that may be summed as follows:

- Accidents: It is evident that due to overloading the pavement undergoes various failures and due to which accidents are inevitable.
- Vehicle Damage: It is clear that the maintenance of a vehicle increases [7] when roads are not good. Moreover consumption of fuel is more in case of bad roads. Vehicles will demand increased maintenance.
- Lower Speeds: When roads are up to the mark it is easy for vehicles to operate at an optimum speed but in case of bad roads the driver has to drive the vehicles at lower speeds and thus leads to wastage of time and money [7].
- Inefficiency: Bad road pavements are also lead to delay in reaching a particular place and thus leads to loss of resources. Traffic Jams are also caused to some extent by these roads.
- Others: Apart from this there are a number of ways by which faulty/bad roads affect the daily lives of people.

III. OBJECTIVES OF THE STUDY

The scope of operation was confined to highways going through varied terrain conditions along NH44 in the UT of Jammu and Kashmir. The major objectives, of the research, work were

- To investigate vehicle overloading characteristics on pavement design.
- To investigate the differences in depth and cost of a pavement structure subjected to truck overloading.
- To investigate the impact of heavy cars on pavement

IV. RESEARCH METHODOLOGY

The research methodology adopted for any research work is very important. In my case the whole scenario was as follows:

- Reconnaissance Survey The first and the foremost thing adopted was recee survey. During this the different road sections of the NH-44 were visualized. Some informal talks with the stakeholders were also done.
- Data Collection After the recee various data collections were done. It may be noted that during the research a number of vehicles were surveyed in order to find the excessive loaded vehicles. Apart from this other data was also collected and data was subsequently recorded[8].
- Data Analysis After this the data collected was analyzed by using different analytical and experimental methods. Guidance from the experts was also taken up during the course of research work[9].
- Results After the data collection and analysis the results were calculated and the necessary discussion was taken up and recommendations were put forward.
- Conclusion In order to end the menace of the overloading on the Indian roads/highways the recommendations were put forward

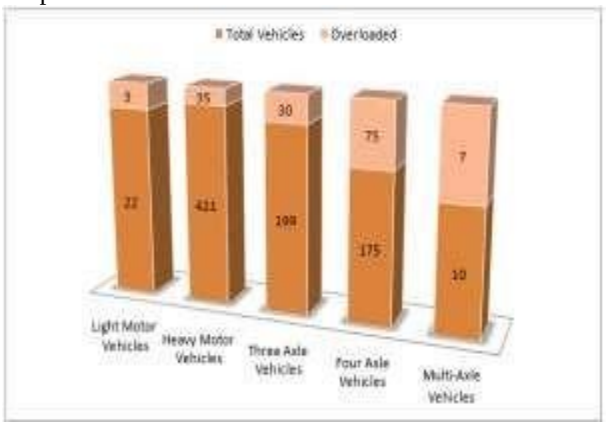

Figure 1: Comparison of Vehicle Loading

Figure 2: Flowchart of research methodology

Experimental Study

Location 1 Parimpora to Nowgam

Figure 1, Figure 2 & Figure 3 shows the Comparison of vehicle
loading & Flowchart of Research Methodology.

Table 1

Vehicle Loading Details from Parimpora to Nowgam

Class of Vehicle	No. of Vehicles Weighed	No. of Vehicles with overload	Overloaded Vehicles percentage	Extra Load as per limit
Light Motor Vehicles	22	3	13.6 %	30000
Heavy Motor Vehicles	421	35	8.3 %	45210
Three Axle Vehicles	199	30	15 %	201215
Four Axle Vehicles	175	75	42.8 %	195265
Multi-Axle Vehicles	10	7	70 %	9365
Total	**827**	**150**	**18.13 %**	**481055**

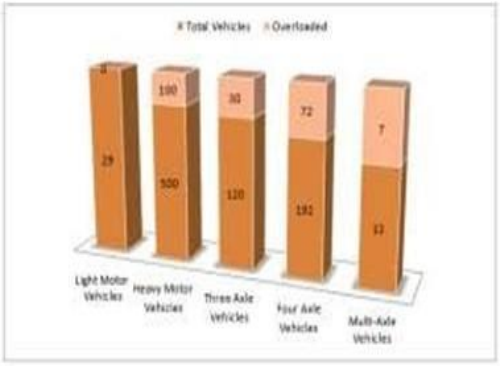

Figure 3: Comparison of Vehicle Loading

Location 2 Pampore to Bijbehara

Table 2, Table 3 & Table 4 shows the vehicle loading data Pampore to Bijbehara, Anantnag to Qazigund and Qazigund to Banihal.

Figure 4 & Figure 5 shows the graphical representation.

Table 2 Comparison of Vehicle Loading from Pampore to Bijbehara

Vehicle loading details from Pampore to Bijbehara

Table 3

Class of Vehicle	No. of Vehicles Weighed	No. of Vehicles with overload	Overloaded Vehicles percentage	Extra Load as per limit
Light Motor Vehicles	29	0	0 %	0
Heavy Motor Vehicles	500	100	20 %	55210
Three Axle Vehicles	120	30	25 %	339216
Four Axle Vehicles	192	72	37.5 %	16256
Multi-Axle Vehicles	12	8	66.6 %	47526
Total	**853**	**210**	**24.61 %**	**458208**

Location 3 Anantnag to Qazigund

Table 3: Comparison of Vehicle Loading from Anantnag to Qazigund

Survey details from Anantnag to Qazigund

Class of Vehicle	No. of Vehicles Weighed	No. of Vehicles with overload	Overloaded Vehicles percentage	Extra Load as per limit
Light Motor Vehicles	50	2	4 %	3212
Heavy Motor Vehicles	600	311	51.8 %	551210
Three Axle Vehicles	133	75	56.3 %	459286
Four Axle Vehicles	200	81	40.5 %	29256
Multi-Axle Vehicles	10	6	60 %	79526
Total	**993**	**483**	**48.6 %**	**1122490**

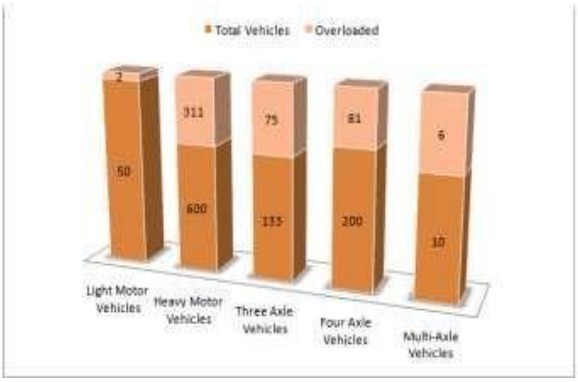

Figure 4: Qazigund to Banihal

Table 4: Comparison of Vehicle Loading from Qazigund to Banihal

Survey details from Qazigund to Banihal

Class of Vehicle	No. of Vehicles Weighed	No. of Vehicles with overload	Overloaded Vehicles percentage	Extra Load as per limit
Light Motor Vehicles	61	35	57.3 %	35212
Heavy Motor Vehicles	620	421	67.9 %	951210
Three Axle Vehicles	251	195	77.6 %	999286
Four Axle Vehicles	211	121	57.34 %	49256
Multi-Axle Vehicles	21	16	76.1 %	991526
Total	**1164**	**788**	**67.6 %**	**3026490**

Figure 5: Kulgam to Wanpoh

Table 5 shows the Vehicle Loading from Kulgam to Wanpoh and Figure 6 shows the Comparison of Vehicle Loading from Kulgam to Wanpoh. Table 6 shows the V.D.FD values & Table 7 shows the Permissible Loading Factor.

Table 5 Vehicle Loading from Kulgam to Wanpoh

Vehicle Loading Details from Kulgam to Wanpoh

Class of Vehicle	No. of Vehicles Weighed	No. of Vehicles with overload	Overloaded Vehicles percentage	Extra Load as per limit
Light Motor Vehicles	33	3	9.09 %	30000
Heavy Motor Vehicles	452	35	7.77 %	45210
Three Axle Vehicles	200	30	15 %	201215
Four Axle Vehicles	180	75	41.6 %	195265
Multi-Axle Vehicles	20	12	60 %	9365
Total	**885**	**150**	**16.9 %**	**481055**

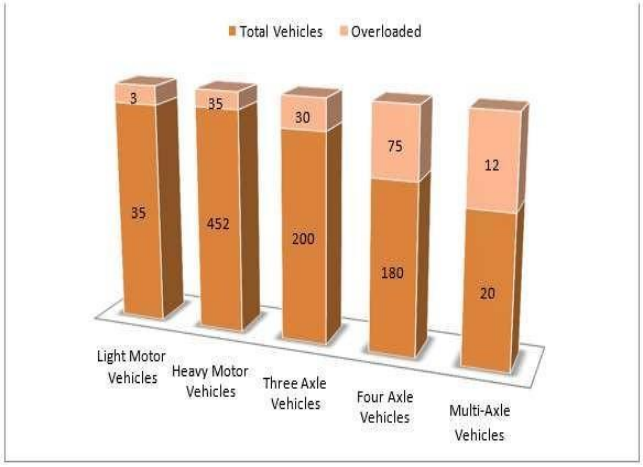

Figure 6: Comparison of Vehicle Loading from Kulgam to Wanpoh

The vehicle damage factor (VDF) is a figure that is used to convert the number of commercial cars with varied axle loads and axle configurations to the number of standard axle-load repetitions

Table 6 Vehicle Damage factor value

Indicative VDF values as per IRC:37 2001

No. of Vehicles per day	Plain Terrain	Hilly Terrain
0-15000	1.5000	0.500
150-1500	3.5000	1.500
More than 1500	4.5000	2.500

Procedure of calculating Vehicle Damage Factor (V.D.F)

- a. Conducting an axle load assessment is the initial step in estimating vehicle damage factor.
- b. The damage factor of the vehicle is then calculated using load comparability calculations. Because the load study is only done for heavier vehicles, the road crash

factor values increase.

- c. The reason for selecting the heavy vehicle group is that this category is responsible for the majority of the damage to the roadway surface.
- d. As a result, vehicles weighing less, such as motorcycles, autos, small buses, or small trucks with single back wheels, are exempt from weighing.
- The equivalent linear axle load is calculated by multiplying the average axle load by the load equivalence factor, which is then multiplied by the vehicle damage factor

$$VDF = \frac{\sum_{i=1}^{N} [V_i \times LEF_i]}{N}$$

where, V_i = Traffic volume of the ith vehicle load-class
LEF_i = Load equivalency factor of ith vehicle load-class
N = Total number of vehicles weighed

Table 7 Permissible Loading Factor

Permissible Loading Factor

S.No	Vehicle Type	Max FOS Weight
1	Light Motor Vehicles	2.5
2	Heavy Motor Vehicles	7.5
3	Three Axle Vehicles	11.25
4	Four Axle Vehicles	25.5
5	Multi-Axle Vehicles	17

Vehicle Damage Analysis and Calculation

Vehicles damage factor is an important ant parameter and is used to analyse the moun the damage done to the pavement by a moving vehicles. It is worth to note that heavy vehicles are usually multi axles and have a number of wheels. It is thus obvious that the overloaded heavy vehicles are very dangerous for the flexible pavments.

After collection of data it was decided to do vehicles damage analysis and the values of the same are mentioned in Table 8 to Table 11.

Table 8: V.D.F Calculation for Paimpora to Nowgam
Table 9: V.D.F Calculation Pampore to Bijbehara
Table 10: V.D.F Calculation Anantnag to Qazigund
Table 11: V.D.F Calculation Wanpoh to Kulgam

Table 8: V.D.F Calculation for Paimpora to Nowgam

VEHICLE TYPE	VALUES
Light Motor Vehicles	5.2
Heavy Motor Vehicles	3.2
Three Axle Vehicles	12.1
Four Axle Vehicles	9.2
Multi-Axle Vehicles	17.2

Table 9: V.D.F Calculation Pampore to Bijbehara

VEHICLE TYPE	VALUES
Light Motor Vehicles	0
Heavy Motor Vehicles	15.2
Three Axle Vehicles	13.5
Four Axle Vehicles	9.1
Multi-Axle Vehicles	12.2

Table 10: V.D.F Calculation Anantnag to Qazigund

VEHICLE TYPE	VALUES
Light Motor Vehicles	2
Heavy Motor Vehicles	16
Three Axle Vehicles	17.5
Four Axle Vehicles	10.2
Multi-Axle Vehicles	19.5

Table 11: V.D.F Calculation Wanpoh to Kulgam

VEHICLE TYPE	VALUES
Light Motor Vehicles	11.1
Heavy Motor Vehicles	14.6
Three Axle Vehicles	20.1
Four Axle Vehicles	15.1
Multi-Axle Vehicles	21.2

V. CONCLUSIONS

The Srinagar-Jammu section of NH-44 is always full of overloaded vehicles as there are a number of reasons behind it. Some of reasons of the road failure are

- First reason is it is the only road that connects Kashmir to other states of India and thus it is always traffic jammed.
- Second reason is that since the distance between Kashmir and other states is much more and transport fare is also high so tuckers try to compensate the same by loading extra materials/loads to the vehicles.
- The highway is used by locals as well and number of vehicles remain significantly higher
- Mullti axle vehicles coming from other states to Kashmir carry heavy loads and are responsible for the pavement erosion.
- Quality control during the design of pavement is also an important factor for the life of pavement.

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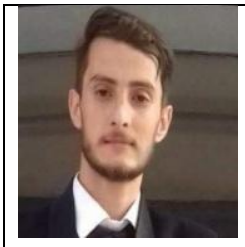

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