A COMPARATIVE ANALYSIS ON DEGRADATION OF ROADS IN JAMMU AND KASHMIR REGION

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ABSTRACT

Road degradation is widespread in Kashmir, and pavements seldom endure more than five years. Road maintenance is a major issue in the Kashmir valley, since pavement deteriorates at a higher pace than in the rest of India. A research was conducted to determine the primary causes of the region's pavement degradation. First, several road sections were taken throughout the study process. Jammu based and Kashmir based roads were chosen and it was found that roads in Jammu region last long than the roads of Kashmir. They were chosen based on a number of considerations. For example, Sephora road, is entirely degraded despite the fact that it was built only a few years ago and has low traffic flow. There are potholes everywhere. Following the selection of road sections, a brief visual screening test was performed to determine the kind of pavement breakdown and its potential causes. A questionnaire was also created to collect feedback from stakeholders. Following that, several laboratory tests were done on the road aggregates to cross-check potential reasons of failed pavements. A number of factors emerged following the end of the inquiry. It was evident that the pavements had deteriorated for a variety of causes. The primary causes are bad engineering and design. The roads of Jammu region were far better than that of Kashmir: the main reason was climatic difference and quality control difference. The study found that vehicle overloading, poor road drainage system, non-engineered roads that are unable to withstand weather fluctuations and the use of low-quality materials were to blame for the valley's rapid deterioration of roads.

KEYWORDS: Road Pavement, Deterioration, Maintenance, Valley, Kashmir

1. INTRODUCTION

Roads are one of the important infrastructures of a nation that help in the overall development. Roads are the gateways for the prosperity of a nation. They serve for multipurpose things and are regarded as the temples of nation's development. India Roads have existed in our nation for over 5000 years. Roads were built by Chandragupta and Ashoka of the Maurya Dynasty, but substantial development was achieved during the Mughal and Sur period. During Maurya period around 2600 Km long roadways were constructed .The Grand Truck Road (G.T Road) which was constructed by one of the greatest emperor Sher Shah Suri is the oldest motorable road. Its length is about 2400 Km and was popularly known as "Sadak-e-Azam". Then, with the advent of British in 1830, they began a road-building project, the first of which was the repairing of Grand Trunk road.In 1934 IRC was formed and Nagpur Road Plan and Bombay Road Plan was proposed. The goal of these initiatives was to expand the country's road network. Its primary objective was to raise road density from 32 Km^2 to 100 Km^2.

In 1988 another independent body National Highway Authority of India was formed. Its main work was to construct, develop and manage the National Highways. However, little changed in the country until extensive economic freedom was implemented. It was when Atal Bihari Vajpayee, India's former Prime Minister, visited Pakistan and, upon his return, launched a project known as the National Highways Development Project (NHDP). This project resulted in the construction of about 5800 kilometres of roadways. This is recognised as the most significant road development in this era. Following the enormous success of this project, the Government of India established a special agency known as the National Highways and Infrastructure Development Corporation Limited in 2014. (NHIDCL).

Its primary mission is to improve road connection in the country's high-altitude locations. From 2017 until the present, roads and highways in India have witnessed significant growth under the leadership of Nitin Gadkari, Minister of Roads and Highways in the Government of India. From the launch of the Bharatmala Project, which aims to build over 84000 km of roads across the country, to the increased speed of road construction, this industry is thriving day by day.

IMPORTANCE OF ROADS IN CURRENT WORLD.

Roads were and will remain important for the existence of any nation. More the number of roads more will be the development of an area as roads open a number of avenues for the stakeholders. In case of a highway a number of business hubs begin to emerge one a road or highway passes through that area. During the construction of roads a large number of employments are generated. The importance of roads may be summed as follows:

1. **Flexibility**: Roads are the most flexible means of transport. Even after travelling by air or water one has to travel by roads to reach their final destinations. Roads can reach every corner of the area.

2. **Suitability:** Roads are the most suited ways of transport. They are viable, economical and Routes and schedules in road transport may be easily altered and changed to meet individual needs..

3. **Speedy**: Road transportation is best suited for quick delivery. Water transport is quite sluggish. Air and train transportation need excessive documentation, formalities, and packing.

4. **Economy*:*** When compared to other means of transportation, road transport is extremely cost effective. It necessitates a significantly lower initial capital expenditure, as well as lower operating and maintenance costs

5. **Others***:* Other than road transportation, no other method of transportation provides doorstep services... Road and vehicle transport provide primary connectivity to all other forms of transportation, including railroads, ships, and aeroplanes.

2. OBJECTIVES OF THE STUDY

The current paper aims on identifying the factors that cause the deterioration of roads in the valley of Kashmir and establishing their relative importance for various groups and main road contracting firms. The main focus was indexed towards:

1. To study the main reasons of road pavement deterioration in the areas of Kashmir.

2. To interact with the stakeholders and knowing their opinion on this issue.

3. To analyse the problem by using various parameters.

4. To put forward the best possible results so as to save future problems.

3. LITERATURE REVIEW

A Study **by Dr Sultan Tarawneh et al (2003)** done on different roads in the Jordan reveals that a number of factors are responsible for the pavement failure. Overloading of the vehicles is the core cause as per their research.

Another research was done by **Dr Rupal Shah et al (2016)** and according to the research the main causes that are responsible for the early failure of a road pavement in the overloading of the vehicles. It states that overloading not only affects the roads but also has a key factor on the fuel efficiency of a vehicle. In their research overloading was the main indicator of pavement failure.

Vandana Tare et al (2013) did an extensive research on 10 road sections with an average length of 0.5 Km.Different roads were studied by them before and after the monsoon season. They found that the main distresses in the roads were cracking, longitudinal depression.

Marcin Staniek (2017) did an extensive research on the cracking of pavements. He put forward that adequate road maintenance policy is required to curb the menace of cracking in the pavements. He puts forward solution to the cracking of pavements by recording videos in the form of sequences and morphological and filtering operations were used to find the noise.

Shun Guo et al (2019) did a research on measurement of holistic road damage to the road pavements and it was tried to calculate the pavement distresses. He put forward that holistic road damage degree is inversely directed to the average speed of a moving vehicle.This clearly imparted that poor road conditions directly reduce the efficiency of the vehicles.

Hiroya Maeda et al (2018) say "many inquiries are merely focused with determining whether or not harm has occurred. However, in the actual life, when road management from a governing body are called in to repair such damage, they must first determine the nature of the damage in order to take effective action. Additionally, in many of these previous studies, the researchers collected their own data using a variety of methods"

Anwar A Ahmad et al (2015) says that a number of maintenance and rehabilitation of the road must be in such a way so that commuters don't face any problem. The paper illustrates that the technique employed should be thorough in order to estimate the cost of pavement damage in a fair and efficient manner.

N.A Parker et al (2006) did a research on road pavement damage and it was found that multi axle vehicles are responsible for the road deterioration. Around 30 % damage was done by the overloaded vehicles it mentions.

A Rumintang et al (2017) suggested "heavy trucks or tronton type vehicles are often responsible for the pavement damage. The link between EAL (Equivalent Axle Load) and road damage is intertwined and affects one another. Distortion Profile is the most common form of damage on Kalianak Road Surabaya, accounting for 19.8 percent in phase I and 20.24 percent in phase II."

4. RESEARCH METHODOLOGY

During the course of research first of all different road section were taken. They were selected depending upon several factors. For example one section viz Anantnag (RD) road is one of the important road that is completely deteriorated although the road was constructed just a few years ago and has low traffic volume. Likewise another road section was taken viz Sehpora road. This very section is also completely damaged. Pot holes are everywhere. After the selection of road sections, rapid visual screening test was done to identify the type of pavement failure along with the possible causes. After this different laboratory tests were performed on the road aggregates so as to cross check various causes of failed pavements. At last the results were drawn and recommendations especially to curb the menace of early road deterioration in the J&K were put forward.

During the research a questionnaire was prepared in consultation with the various experts and same was distributed among the locals, vehicle drivers and other stake holders. There were some questions and the answer was asked from the stakeholders. The sample of the same is below

Questionnaire Sample

Table 2

Road Name: _____

| Question	Positive Comment	Negative Comment	Total Stakeholders
Road Service Age			
Road Quality			
Drainage of Road			
Materials used			
Ease of access			
Weather Damages			
Overloaded Vehicles			

FEATURES OF ROAD SECTIONS

a. Akhnoor 1.5 Km : Akhnoor road section is an important road in the district Jammu. The section of 1.5 Km was recently macadamized by the R&B department in the year 2021.

b. Anantnag 1.5 Km: Likewise 1.5 section of Anantnag road was also taken into the consideration as the same was macadamized earlier in recent past.

c. Bantalab 1.5 Km: Bantalab is in the east side of Jammu region and is strategically important for the whole Jammu as it connects Jammu to Rajouri and Akhnoor also.

d. Sehpora 1.5 Km: It is also an important road in the South Kashmir area and it was recently macadamized by the local authorities.

e. Janipur 1 Km: It lies in the heart of Jammu region and is an important and oldest road that connects main points of Jammu. It is very important road as it connects High court of J&K also

f. Mattan 0.5 Km: Famous for its springs and other religious monuments Mattan road was also recently

g. Bari-Brahamna 1 Km: Known as the industrial hub of the Jammu some section of the Bari-Brahamna was also macadamized and this very area was also taken into consideration.

h. Cheeni-Chowk 0.5 Km: Also known as China Square, this very part of the road was also repaired in the month of October 2021.

6. EXPERIMENTAL STUDY

Around 500 Question samples were distributed among the stakeholders that included Daily commuters, Engineers, Government Authorities and others. The data that was extracted from the Questionnaire reports for all the Jammu based roads roads are summed as follows.

Questionnaire Reports for Jammu Region
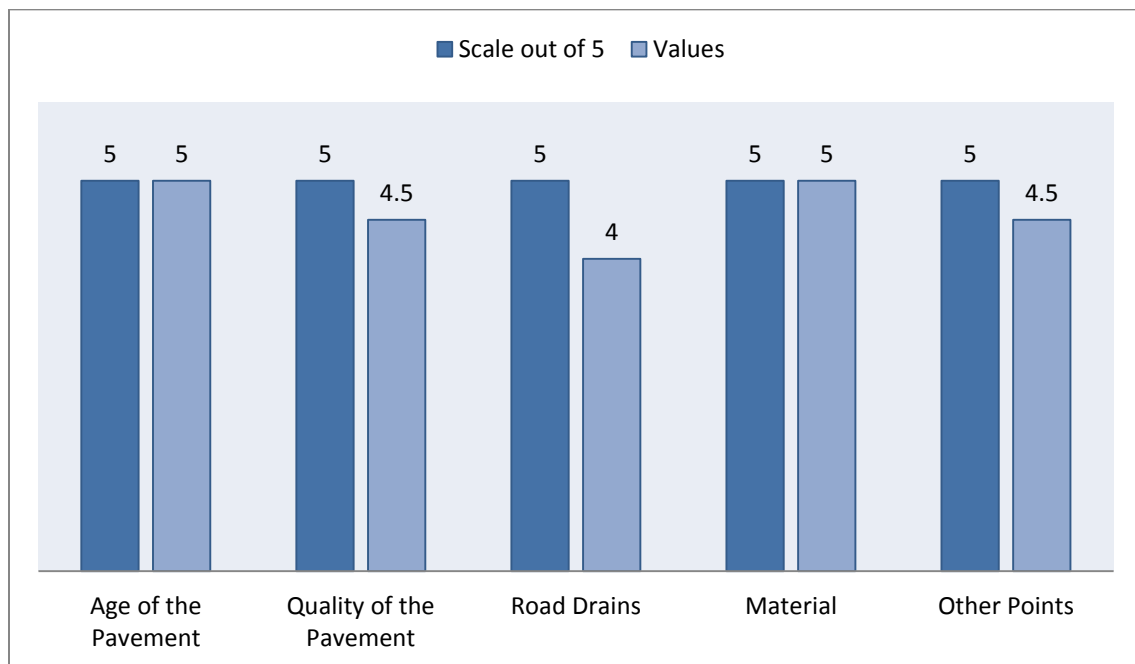
Questionnaire Reports for Kashmir Based Roads
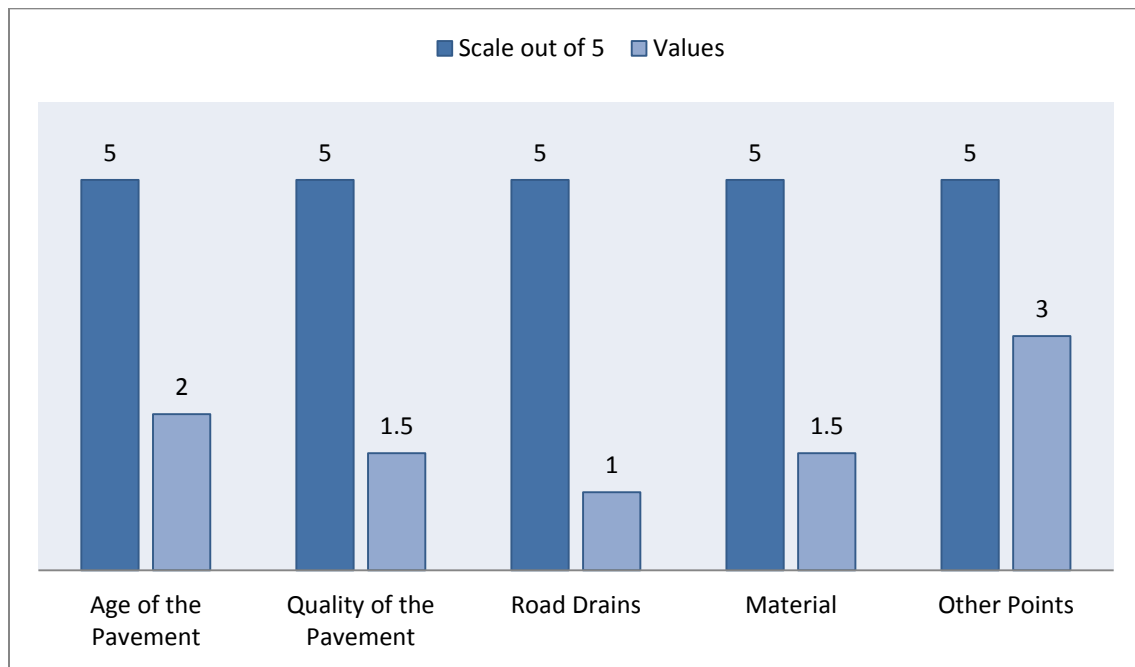
Crushing Strength Test

It is an important test that is carried out to find the crushing strength of an aggregate.The test is done as per the specifications written in IS:2386 part IV. As per the Codal provisons if the crushing strength value id around 10 % then the aggregate is tough and durable however value above 35 % denotes the aggregate is weak. Around 50 samples were taken from each road comprising around 150 samples and the average value of same are recorded belo

Crushing Value Test Reports

Table 4

S.No	Name of the Roads	Average Value	Remarks
01	Jammu Based	9.8 %	Excellent
02	Kashmir Based	50.1 %	Extremely Poor

Abrasion Strength Test

It is also an important test and is done to determine hardness properties of an aggregate. The Los Angeles abrasion test is designed to determine the percentage wearing due to the relative contact action of the material and steel balls employed as gritty charge. Along with the aggregates, an abrasive charge of cast iron spherical balls with diameters of 48 mm and weights of 340-445 g is put in the cylinder. The number of abrasive spheres changes according to the sample's grade. The amount of aggregate to be utilised is determined by the gradation and typically ranges from 5 to 10 kg. The cylinder is then locked and spun at 30-33 rpm for a total of 500-1000 revolutions, depending on aggregate gradation. In Indian circumstances, a maximum value of 40% is permitted for WBM base course. A maximum value of 35% is specified for bituminous concrete.

Here also around 50 samples were taken from each road comprising around 150 samples and the average value of same are recorded below

Abrasion Strength Test Results

Table 5

S.No	Name of the Roads	Average Value	Remarks
01	Jammu Based	10.2 %	Excellent
02	Kashmir Based	31 %	Extremely Poor

Soundness Test

The purpose of the soundness test is to investigate the endurance of aggregates to weathering action through the use of enhanced weathering test cycles. Porous aggregates exposed to freezing and thawing are prone to premature disintegration.

Aggregates of a certain size are treated to 16 – 18 hours of alternating soaking in a suitable solvent of either sodium sulphate or magnesium sulphate before being dried to a consistent weight in an oven at 105 to 1100 degrees Celsius. The weight loss of aggregates is calculated after five cycles by filtering away all undersized particles and the loss in weight should not exceed 12 percent when tested with sodium sulphate and 18 percent with magnesium sulphate solution.

Soundness Test Results

Table 6

S.No	Name of the Roads	Average Value	Remarks
01	Jammu Based	8 %	Excellent
02	Kashmir Based	26.2 %	Extremely Poor

RESULTS

From the results above it is clear that firstly around 70 % stakeholders were not satisfied with the service life of the road. They were of the opinion that the road failed earlier than expected. Similarly 70 % stakeholders were not satisfied with the quality of road. As majority of these roads lack a good drainage thus 96 % stakeholders had consensus on this issue that lack of proper drainage had caused the road to deteriorate at a faster rate. Apart from this use of poor materials in the pavement and damage due to weather also were pointed by the stakeholders.But in case of Jammu based roads the results were quite different and roads were of good quality and stakeholders were happy also.
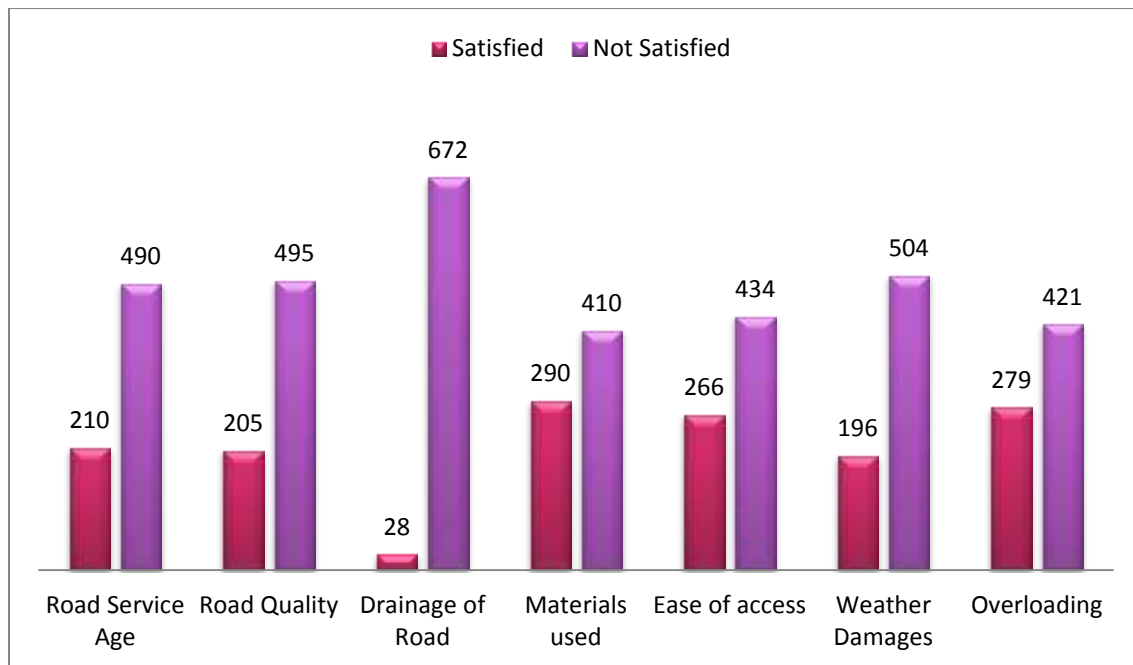
Graphical Representation of Questionnaire Survey

Figure 1

RECOMMENDATIONS AND CONCLUSION

After the conclusion of research a number of factors have came to light. Out of all the three road sections it was clear that there are a number of reasons why the pavements have failed. Failed engineering and poor designs are the prime reasons. The whole can be summed as follows

1. **Construction Materials:** After conducting various laboratory tests on the pavements it was found that during the construction of these roads sub-standard materials were used. The materials tested were of such poor quality that they could not pass even one test. This was horrific!

2. **Overloading:** The menace of overloading was found to be the one of the main causes that led to early failure of the road. According to the survey conducted it was revealed that heavy trucks ply on these village roads which don't have such specifications that they can resist such loading.

3. **Drainage Failure:** The drainage enhances the life of a pavement but in all the three cases the drains were either choked or were not functional. This led to the collection of water on the surface and lead to the failure of pavement.

4. **Weather Effect:** The valley of Kashmir remains under the blanket of snow for a period of 3 months. This affects the road quality and is one of the key factors responsible for the pavement failure

5. **Others:** Apart from this there are factors like negligence from the authorities that are responsible for the failure of roads in the valley of Kashmir.

ACKNOWLEDGEMENT

REFERENCES

[1] Dr. Sultan Tarawneh and Dr. Mohmd Sarireh, Causes of Cracks and Deterioration of Pavement on Highways in Jordan from Contractors' Perspective Civil and Environmental Research www.iiste.org ISSN 2224-5790 (Paper) ISSN 2225-0514 (Online) Vol.3, No.10, 2013

[2] Rupal Shah , Yogesh Sharma , Binil Mathew , Vijay Kateshiya and Jatin Parmar Review Paper on Overloading Effect, International Journal of Advanced Scientific Research and Management, Vol. 1 Issue 4, April 2016.

[3] Tare, Vandana & Goliya, H. & Bhatore, Atul & Meshram, Kundan. (2013). Pavement Deterioration Modeling for Low Volume Roads. Journal of The Indian Roads Congress. 73. 67-81.

[4] Staniek, M. Detection of cracks in asphalt pavement during road inspection processes. Scientific Journal of Silesian University of Technology. Series Transport. 2017, 96, 175-184. ISSN: 0209-3324. DOI: https://doi.org/10.20858/sjsutst.2017.96.16.

[5] Shun Guo, Zhengfeng Huang, Pengjun Zheng, Ting Lu, Lili Lu, Xuan Li, "Measurement of Holistic Road Damage and Analysis of Its Corresponding Traffic Characteristics", Advances in Civil Engineering, vol. 2019, Article ID 8628235, 11 pages, 2019.

[6] Hiroya Maeda∗, Yoshihide Sekimoto, Toshikazu Seto, Takehiro Kashiyama, Hiroshi OmataUniversity of Tokyo, 4-6-1 Komaba, Tokyo, Japan .Road Damage Detection Using Deep Neural Networks withImages Captured Through a Smartphone https://arxiv.org/abs/1801.09454v2

[7] Anwaar Ahmed, PhD, , , Qiang Bai, PhD, , , and Samuel Labi, PhD, , Pavement damage cost estimation: a synthesis of past research https://doi.org/10.1680/tran.12.00075

[8] Sholichin and A Rumintang 2018 Relation analysis of road damage with excessive vehicles load on Kalianak road Surabaya J. Phys.: Conf. Ser. 953 012231 The 2nd International Joint Conference on Science and Technology (IJCST) 2017 doi :10.1088/1742-6596/953/1/012231