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PROJECT IMPLEMENTATION UNIT (PIU)

ADB
ASIAN DEVELOPMENT BANK

GOVERNMENT OF KHYBER PAKHTUNKHWA

KHYBER PAKHTUNKHWA RURAL ROADS DEVELOPMENT PROJECT

(KP – RRDP)

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ABBREVIATIONS

FL	-	Feasibility Length
CWD	-	Communication & Works Department
RRDP	-	Rural Roads Development Project
RST	-	Road Surface Type
IRI	-	International Roughness Index
MCC	-	Manual Classified Counts
PCU	-	Passenger Car Unit
ADT	-	Average Daily Traffic
AADT	-	Average Annual Daily Traffic
TST	-	Triple Surface Treatment
DST	-	Double Surface Treatment
ESAL	-	Equivalent Single Axle Load
SN	-	Structural Number
CBR	-	California Bearing Ratio
AASHTO	-	American Association of State Highway and Transportation Officials
GPS	-	Global Positioning System
PCC	-	Plain Cement Concrete

CHAPTER 1: INTRODUCTION

1.1 Background

Rural roads in KPK have a critical role in accessing basic facilities including health, education, markets, and connecting rural communities to the district centers and the rest of the province. A recent analysis by the World Bank shows that there has been a development disparity among various districts of the province concerning accessibility to Education, Health, and Market facilities through the Periphery Rural Road Network, which is either nonexistent, unpaved or in poor condition.

About 85% of the population in Khyber Pakhtunkhwa lives in rural areas, whereas access to public service is not only poor but also deteriorating. Basic services provision in the province lags national averages, partly due to the region's geographic characteristics that make service delivery a challenge. For instance, northern and southern Districts in the province face severe service delivery challenges in contrast to central districts.

The province has a rural road network of 21,679 Km worth US$ 2.4 Billion, which is being managed by the Communications & Works (CWD) Department. About 72% of this network is spread over 25-established districts serving 30 million inhabitants while 28% of it is in the 13 Merged Districts serving 5 million inhabitants. Almost 41% of the total road network is in poor condition, an additional 30% is expected to move from fair to poor condition if not timely maintained (2013, CWD RAMS Study). The districts in the north and south have a higher proportion of roads in fair – poor condition. However, almost 19% of the entire network is still unpaved, which in general has a higher requirement for rehabilitation and periodic maintenance.

The allocated road maintenance and rehabilitation budget by CWD over the last 5 years was $93 million against the actual requirement of $500-600 million. This allocated budget is insufficient for financing maintenance works. As a result, maintenance is either carried out on small road sections or deferred leading to complete deterioration. The absence of spot and routine maintenance makes certain strategic roads inaccessible during weather calamities. Limited maintenance of the network resulted in progressive deterioration and if further continued would lead to rendering 67% of the entire network in poor condition and depreciation of assets by $274 million. Poor network condition also poses safety hazards to the commuters and has a direct impact on transport and trade costs. Disparity in the travel time to access education facilities between various districts of the province correlates to the fact that some of the districts lack the required all-weather roads, have poor surface existing roads, and inadequate transport services i.e., School buses. Students in these districts generally must walk or rely on private vehicles to access their schools.

Therefore, this project is a dire need of the province now to scientifically select the road network to enhance overall accessibility to Education, Health, and Markets as well as reduce the maintenance backlog on the CWD up to some extent. Priority will be given to more accessible and fairer and poor condition roads which can ultimately save the complete deterioration of such roads before time, and results in huge savings overall.

1.2 List of Districts

Rural Road Development Project (RRDP) is designed for 21 shortlisted Districts of Khyber Pakhtunkhwa province. These districts further constitute of roads selected based on priority. The districts included in RRDP are enlisted below:

1. Bannu
2. Battagram
3. Bunner
4. Charsadda
5. Chitral
6. D.I. Khan
7. Dir Lower
8. Dir Upper
9. Haripur
10. Karak
11. Kohat
12. Kohistan
13. Malakand
14. Mansehra
15. Mardan
16. Nowshera
17. Peshawar
18. Shangla
19. Swabi
20. Swat
21. Torghar

1.3 Project Benefits

Access to education, health and markets is a basic life necessity and right of every individual. This project is a dire need of the province now to scientifically select the road network to enhance overall accessibility to Education, Health, and Markets as well as reduce the maintenance backlog on the CWD to some extent. Priority is given to more accessible and fairer and poor condition roads which can ultimately save the complete deterioration of such roads before time, and results in huge savings overall. This project will improve the road network in rural areas of the province which will enhance the quality of life consequently. If mobility is compromised, it automatically affects the quality of life in that area.

1.4 Study Objectives

The main objective of the study was to perform a travel demand forecast for the selected roads in the above-given districts. This report also covers various other objectives which are briefly given as follows:

- Classified Traffic Count
- Travel speed Study
- Future Growth Projection
- The IRI and Road Surface Type (RST) survey
- Travel demand forecast, as a part of traffic capacity improvements through the selected roads

This report will describe the methodology and results of the traffic study.

CHAPTER 2: METHODOLOGY AND DATA COLLECTION

Traffic study is considered as the prime data source required for estimating present and future needs of a transport and justifies the provision of new links within the existing road network. Traffic volume data collection is the first and most important step leading towards a successful traffic demand and supply analysis of any proposed project. Therefore, it has become imperative to carry out data collection with higher accuracy to achieve the given objectives.

2.1 Methodology and Adopted Procedure

To evaluate traffic volume, on site classified traffic counts data is necessary for which several methods are available. Two (02) of the widely used methods are described below:

2.1.1 Direct Count Method

In direct count method vehicles are counted at site using tally sheets manually. Using this method vehicles classification and traffic turning counts can also be obtained. Usually 2(two) to 3(three) surveyors are required to carry out this type of traffic count in a single working shift. Accuracy may affect high-speed traffic volume roads.

2.1.2 Indirect Count Method

In this method traffic data is collected and saved digitally using a high-resolution video recording camera. Cameras are installed at a suitable place to cover significant road lengths. This is beneficial since video can be captured for a longer duration without interruption and can be used later in the office for translation into classified counts.

2.2 Adopted Method for Classified Traffic Count

For this assignment, direct and indirect traffic count methods have been adopted. In direct method, traffic count was carried out for 24 hours while on the intersection indirect method was used. Peak hour was identified, and traffic count was conducted in these hours.

2.3 Survey Teams

For the traffic volume study, the highly professional and experienced team was mobilized to conduct the survey and they were well-versed with the methodology of the survey. They were trained again for public communication and were made aware of the city names and their anticipated importance related to trip generation and attraction. Details of the project were briefly explained to each member of the survey team for a better understanding of alignment and to answer the questions of commuters if asked. For safety and security, assistance was requested from local police.

2.4 Methodology Of Data Collection

The road locations were selected after field visits to record significant traffic volumes, which connect major regions/population centers in the vicinity of the project.

The data was collected using the following method.

i. Manual classified count (MCC)

For MCC, the road Start point is selected strategically and the survey teams were deployed on that point for traffic counts. A Performa was used, which was filled by the professionals at their designated position.

2.4.1 Manual Classified Counts (MCC)

The MCC involves counting all the vehicles passing through a selected location on a road for a determined time. The count was conducted by the officials deployed at the roadside and they recorded the passing vehicles on a Proforma.

2.4.2 Types of vehicles

The following types of vehicles were recorded on a proforma as shown in **Table 2-1**.

Table 2.4.1 Types of vehicles recorded using MCC.

2.4.3 Location

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Car	Motorcycle	Mazda / Coaster	Rickshaw	Pickup/ Delivery Truck	Suzuki / Wagon	2 Axle	3 Axle	4 Axle	5 Axle	6 Axle	Bus	Animal Driven Cart	Bi-Cycle	Tractor

The MCC was taken at the start of the existing route.

2.4.4 Duration

The MCC was conducted for 24 hours.

2.4.5 Classified traffic volume counts.

Passenger Car Unit (PCU) is a metric unit used in Transportation Engineering, to assess traffic-flow rate on a highway. A Passenger Car Unit is a measure of the impact that a mode of transport has on traffic variables (such as headway, speed, density) compared to a single standard passenger car.

For this purpose, the filed data was collected by the Consultants for 3 days continuously.

The vehicle classification used in the survey along with their PCU factors, are presented in the Table below.

Table 2.4.2 Vehicle Classification & PCU Factors

VEHICLE CLASSIFICATION & PCU FACTORS	
Vehicle type	**PCU Factor**
Rickshaw, Car, Jeep, Van	1
Mini-Bus, Coaster, Tractors	1.5
Truck 2 Axle	3
Truck 3 Axle	3
4 to 6 Axle truck	4.5
More than 6 Axle truck	4.5

The analysis of the classified traffic volume at selected locations were carried out to deduct at the following:

- Average Daily Traffic (ADT) and Annual Average Daily Traffic (AADT)
- Average Composition of traffic

2.5 Survey Forms

The traffic count was recorded on the survey form attached in **Annexure I**. The survey forms covered all the vehicles classes. The Data was then compiled and used for further traffic analysis.

2.6 Travel Speed Survey

Travel time studies were performed on project road. This study was undertaken to utilize the travel time data and speed data to analyze the link's Level of Service (LOS) and operational performance. Other major utilization of travel time studies is:

- To identify problem locations on facilities by virtue of high travel times and/or delay.
- To measure arterial level of service, based on average travel speeds and travel times.
- To provide necessary input to traffic assignment models, which focus on link travel time (impedance) as a key determinant of route selections.
- To provide travel-time data for economic evaluation of transportation improvements.
- To develop time, contour maps and other depictions of traffic congestion in an area or region.

2.7 Determination Of Road Surface Type

A survey was conducted to find the surface type of the road which will help in assessment of the type of surface and its condition. Road Surface type (RST) survey was conducted using pictures taken at 100 meters intervals on the surveyed roads. The surface type was also noted on field by the engineers undertaking the survey. It was ensured that field data correlated with actual surface type by analyzing the pictures taken at 100 m intervals. Road surface types were divided into five categories: Asphaltic, TST/DST, PCC, Shingle, and Earthen or Kacha.

This information will be used by road designers in judging the existing condition of the road and design accordingly.

2.8 Determination Of Roughness

The roughness of the roads was evaluated using a mobile application (Road Bounce Pro). Road Bounce Pro uses GPS tracking features to determine the roughness of the roads. Road roughness assists in determining the road condition that will help in conditional assessment of the road. Road condition was categorized as Excellent, Good, Average, Poor, and Worst based on roughness. Mobile is placed on the dashboard of the car while the car traverses the road section under study. The mobile app notes the irregularities in the road surface and the results are presented in the app at the end of survey. This data was utilized in the conditional assessment of the roads to evaluate the existing condition of the road with respect to roughness and irregularities.

2.9 Determination Of Growth Rate Factors

To estimate the future forecast of travel demand data, the traffic growth rate is to be obtained for each class of vehicle considered in the network and facility. Historical growth trends have been reviewed for the following indicators to determine growth rates for this study:

- Population growth rates Pakistan
- Population growth rates Khyber Pakhtunkhwa
- Growth in GDP and Growth in industrial and agriculture sector
- Growth of registered vehicles in Pakistan
- Growth in Fuel Consumption
- Growth in Tourism in Pakistan and Bannu district

For traffic analysis purpose the growth rate of 5 % is taken. The study of previous traffic reports and in the general literature concerning the population, vehicle registration, fuel consumption, and other indicators of the GDP growth was built up as a rationale for the adoption of realistic growth rates for future traffic forecast.

CHAPTER 3: ACCESS ROADS TRAFFIC ANALYSIS

3.1 Project Area- Bannu

Bannu is a district in Bannu Division of Khyber Pakhtunkhwa province in Pakistan. It was recorded as a district in 1861 during the British Raj. It is one of 26 districts that make up the Khyber Pakhtunkhwa province of Pakistan. It borders North Waziristan to the northwest, Karak to the northeast, Lakki Marwat and Bettani to the southeast, and South Waziristan to the southwest.

3.1.1 Priority Roads in District Bannu

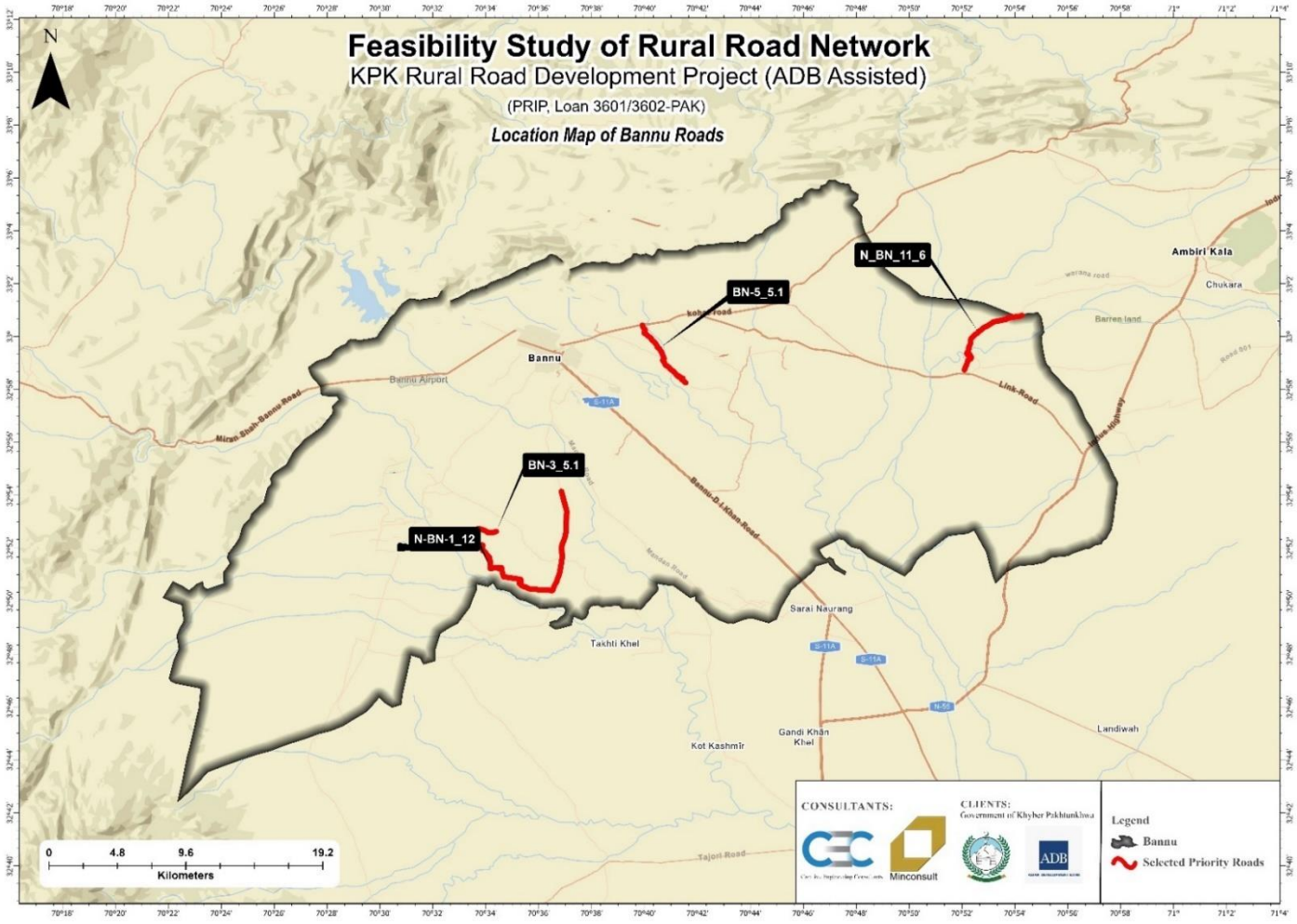
The following roads have been found feasible for Rural Road Development Project in District Bannu.

Table 3.1.1 Access Roads in Bannu

#	ID	Road Name	Districts	FL	Type
1	**BN-3**	Alla Khel To Havid	Bannu	5.2	Access
2	**BN-5**	Durrani Chowk to Piran Titter Khel	Bannu	5.3	Access
3	**N-BN-1**	Alla Khel To Mir Sher Khan Chowk Via Havid	Bannu	11.3	Access
4	**N-BN-11**	Reconstruction / Widening of Village Waligai Uc Zaraki Pirba Khel Road	Bannu	6.3	Access

3.1.2 Location Map of Priority Roads

All the access roads selected for traffic study after scrutinization of the surveyed roads in the district are shown in the figure below.



Map 3.1.1 Location Map of Bannu

3.1.2.1 BN-3 (Alla Khel to Havid):

The road is in the Southern region of Bannu. The road connects area of Alla Khel to Havid having length of 5.15 km. Road link along its length also connects areas such as Landidak, Mazanga etc. The road link helps to connect the educational institutions such GPS Zodi Dawlat Dardariz School etc. to road network. Furthermore, the road network also enables access to local farmers and industries to supply and transport their crop yields to retailers of local urban centres such as Main Bannu city in a timely and efficient manner along with safe and efficient transport facility for local inhabitants. Road surroundings possess rural landscape environment surrounded with agricultural farms and residential areas.

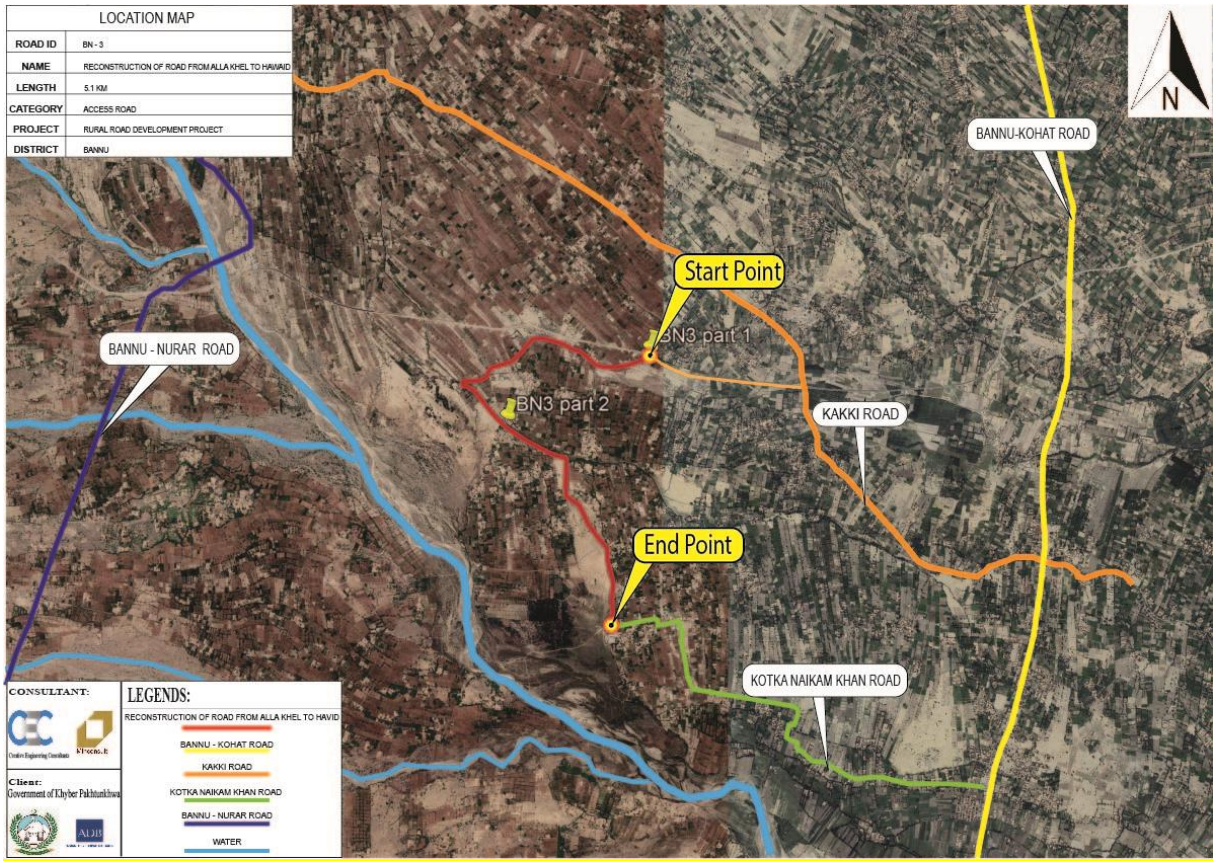


Figure 3.1.1 Location Map of BN-3

3.1.2.2 BN-5 (Durrani Chowk to Piran Titter Khel)

The road is in the Eastern region of Bannu. The road connects area of Durrani Chowk to Piran Titter Khel having length of 5.25 km. Road link along its length also connects areas such as Banu Road, Koti Sadaat etc. The road link helps to connect the educational institutions such Al-Khalid Public School Koti sadat Surani Bannu, GPS Barlashti sadrawan etc. to the road network. Furthermore, the road network also enables access to local farmers and industries to supply and transport their crop yields to retailers of local urban centres such as Main Bannu city in a timely and efficient manner along with safe and efficient transport facility for local inhabitants. Road surroundings possess rural landscape environment surrounded with agricultural farms and residential areas.

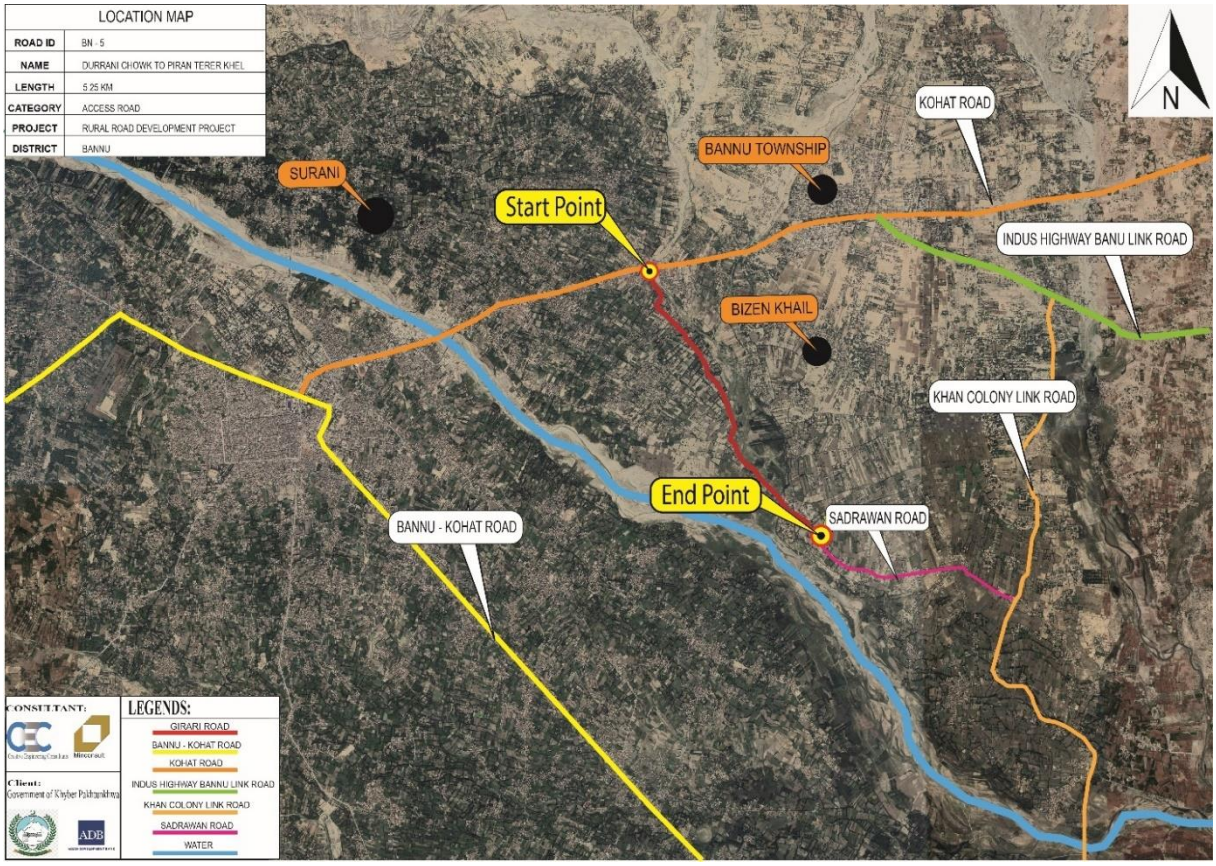


Figure 3.1.2 Location Map of BN-5

3.1.2.3 N-BN-1 (Alla Khel to Mir Sher Khan Chowk Via Havid)

The road is in the Southern region of Bannu. The road connects area of Alla Khel to Mir Sher Khan Chowk having length of 11.34 km. Road link along its length also connects areas such as Ashezo Naway Kalay, Ashizo Maira, Salarzo Maira etc. The road link helps to connect the educational institutions such as Govt. Primary School Kotka Naikam Khan, GPS Hakim Khan Haved, GHSS Hakim Khan Haved etc. to the road network. Furthermore, the road network also enables access to local farmers and industries to supply and transport their commodities to consumer markets of local urban centres such as Dray Khulai Landidak etc. in a timely and efficient manner along with safe and efficient transport facility for local inhabitants. Road surroundings possess rural landscape environment surrounded with agricultural farms and residential areas.

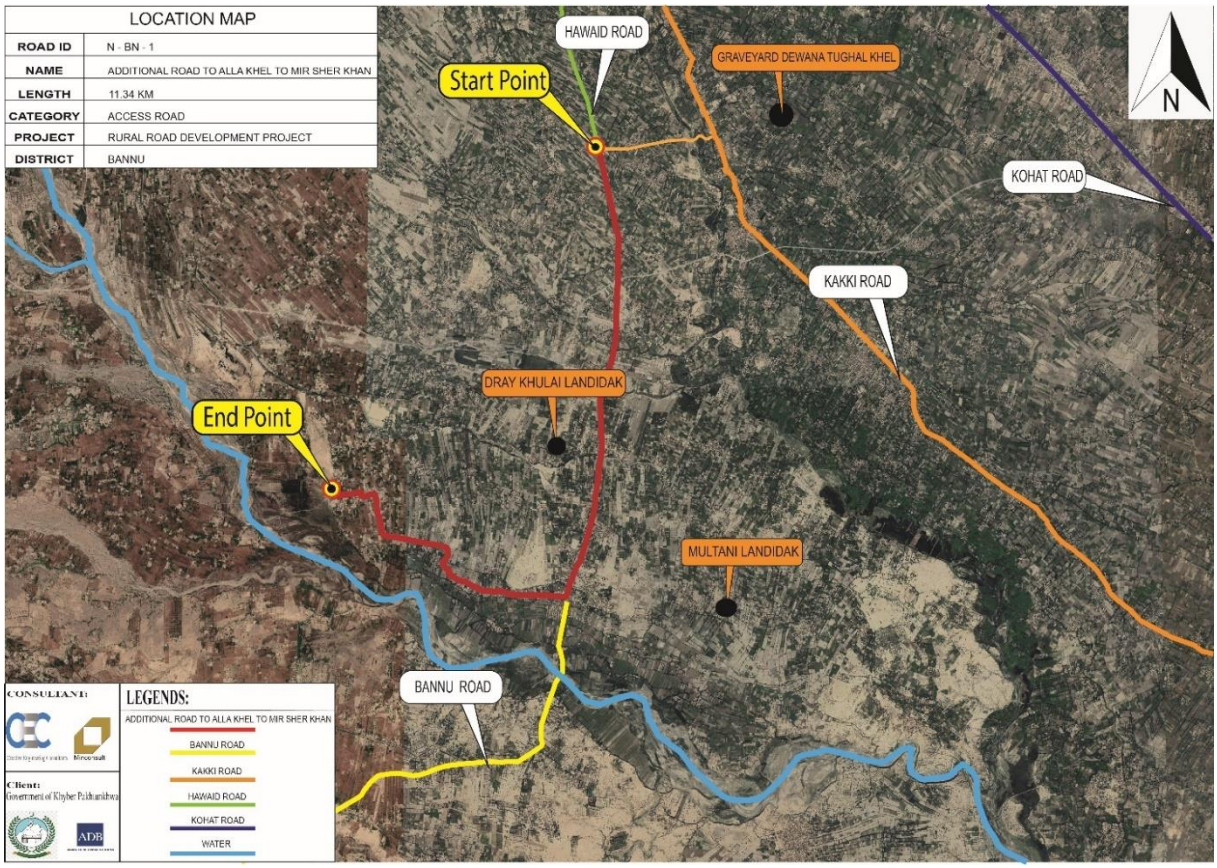


Figure 3.1.3 Location Map of N-BN-1

3.1.2.4 N-BN-11 (Reconstruction / Widening of Village Waligai Uc Zaraki Pirba Khel Road)

The road links Indus Highway Bannu Link Road to Wrana Musakan Banda having span of 6.30 km. Road link along its length also connects areas such as Warana Dali Khail, Warana Mashan Khail, Warana Mir Hassan Khel etc. The road link helps to connect the educational institutions such as Govt Jamal primary school and health sector institution such as Waligai Hospital etc. to road network. Furthermore, the road network also enables access to local farmers and industries to supply and transport their commodities to consumer markets of through Indus highway Bannu Link Road in a timely and efficient manner along with safe and efficient transport facility for local inhabitants. Road surroundings possess rural landscape environment surrounded with agricultural farms and residential areas.

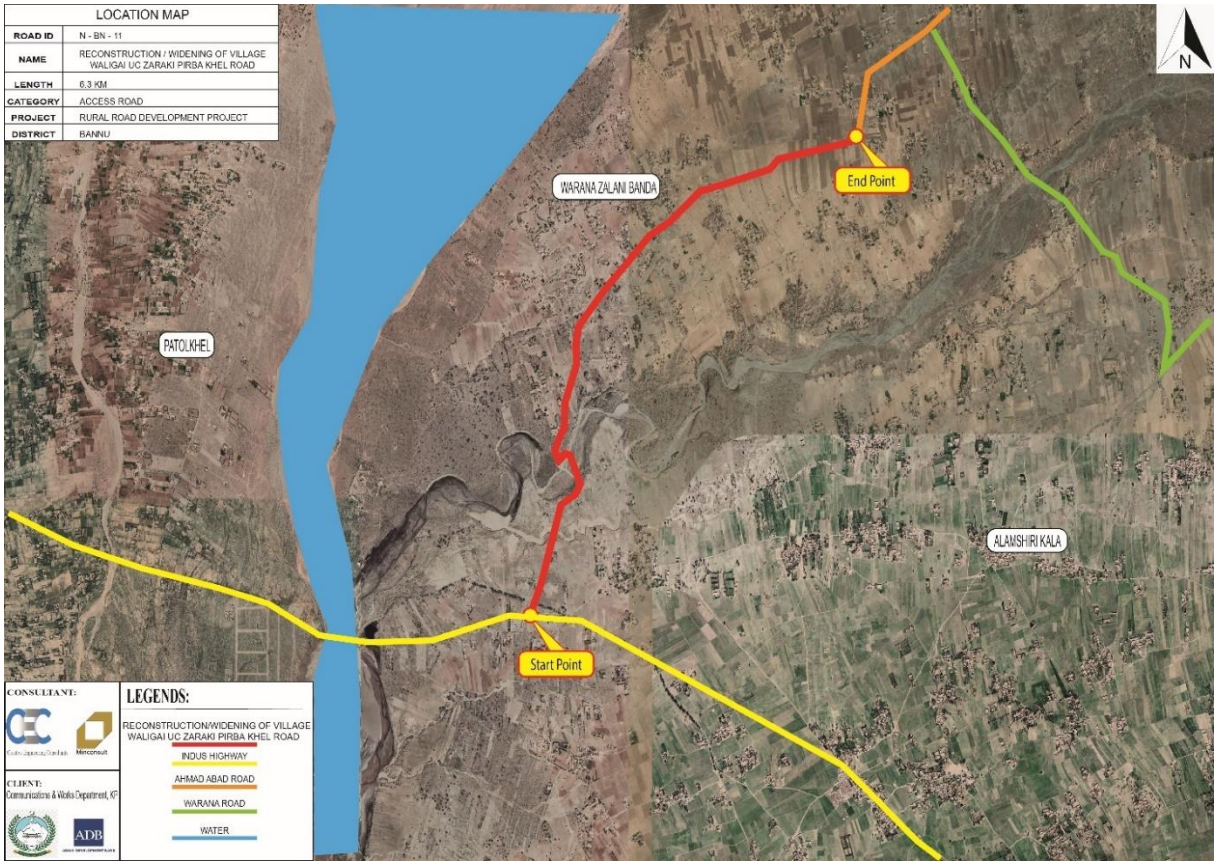


Figure 3.1.4 Location Map of N-BN-11

3.1.3 IRI Classification Pie Chart of Selected Roads

The International Roughness Index (IRI) is used by highway professionals throughout the world as a standard to quantify road surface roughness. A poor road surface roughness influences the traffic speeds and times. It also effects the mobility and accesibility of users traversing that road.

The IRI Classification Charts for are given below.

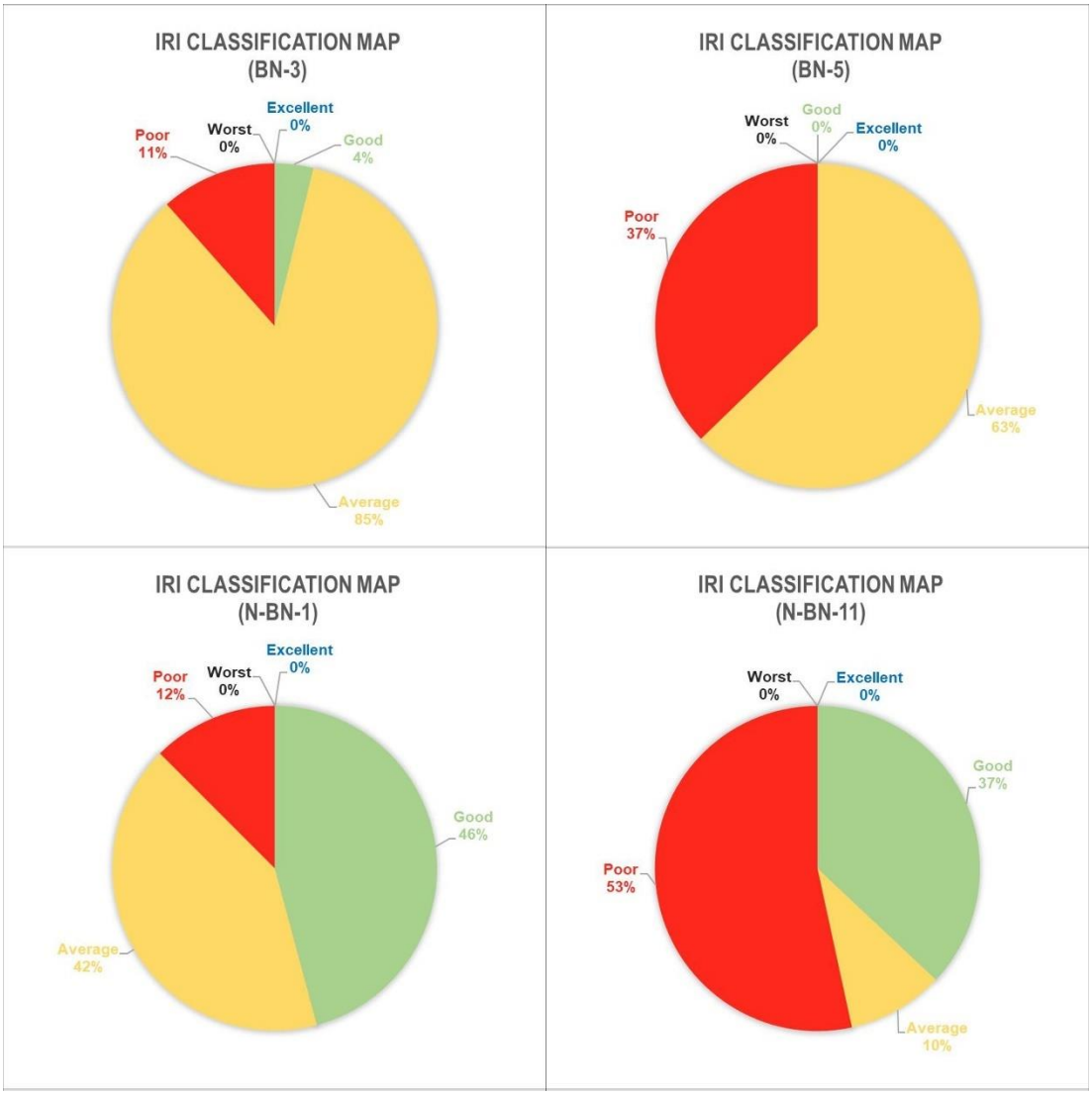


Figure 3.1.5 IRI Classification Chart of Access Roads District Bannu

3.1.4 RST Pie Chart of Selected Roads

Road Surface type (RST) survey was conducted to investigate the actual condition and type of surface of the road under observation. In rural areas earthen or kacha tracks and TST/DST are common that affect the mobility of road users and accessibility to necessities.

The RST Classification Charts for are given below.

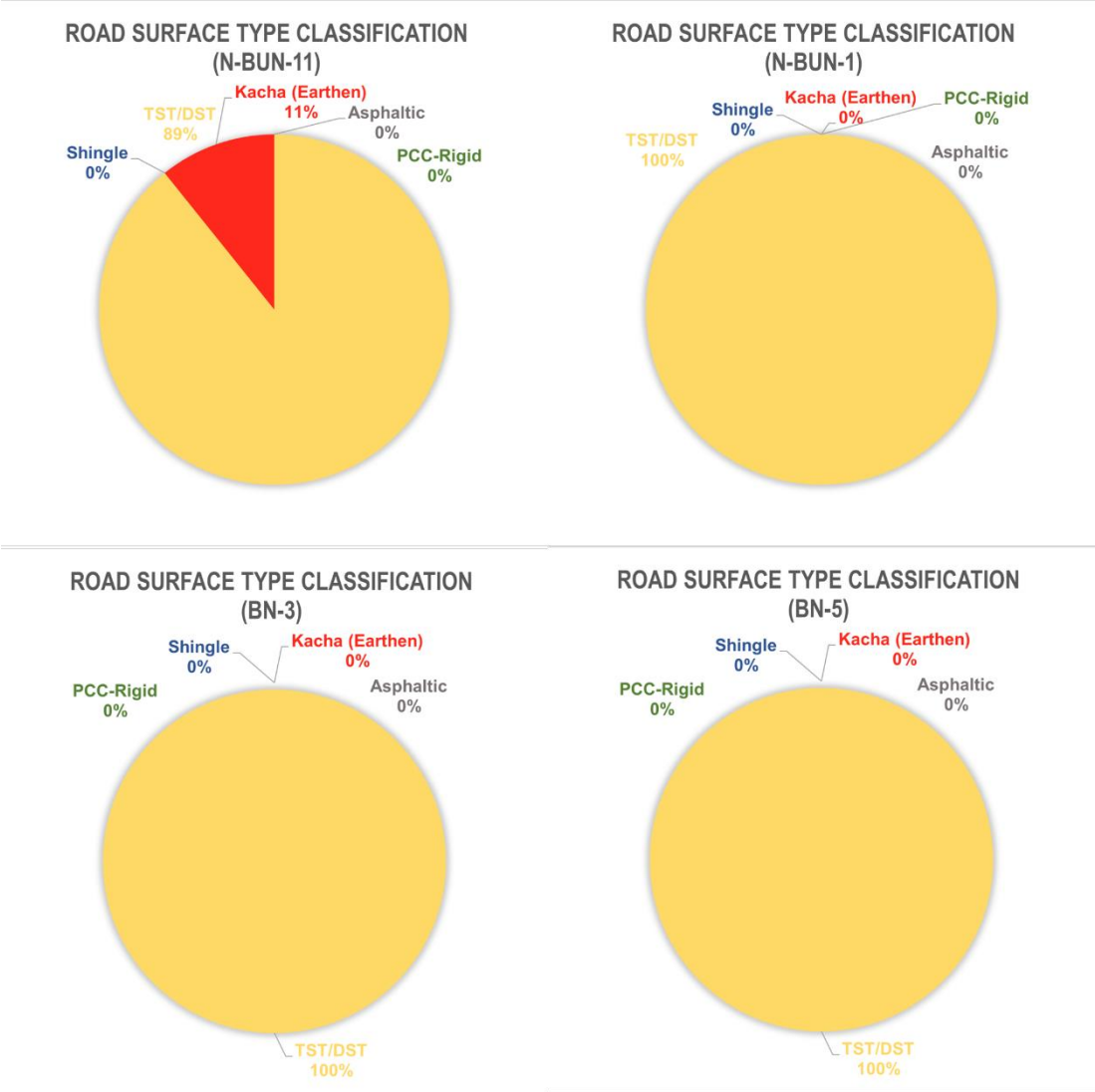


Figure 3.1.6 RST Classification Chart of Access Roads District Bannu

3.1.5 Travel Speed Survey

Table 3.1.2 Travel Speed Survey of Access Roads District Bannu

Road ID	Distance (km)	Total Ascent (m)	Total Descent (m)	Total Time	Average Speed (km/h)	Avg. Moving Speed (km/h)	Maximum Speed (km/h)	Moving Time
BN-3	10.4	15.33	23.33	08:34.0	25.79	29.43	55	07:14.0
BN-5	6.23	61	21	12:56.0	28.92	28.92	59	12:56.0
N-BN-1	12.18	95.66	44.33	31:55.0	13.11	19.90	47.65	12:11.3
N-BN-11	6.14	24.00	54.00	13:59.0	26.35	26.35	53.10	13:59.0

The travel speeds for all roads are low due to the deteriorated road condition which is reflected from the RST and IRI pie charts. Mobility of the road users is affected as indicated by lower average speeds and higher travel times, which can be attributed to the poor road conditions.

It can be inferred from these observations that these roads need to be reconstructed for better mobility and access of people to basic livelihood necessities.

3.1.6 Traffic Analysis

3.1.6.1 Summary of Existing Average Daily Traffic (ADT)

The summary of traffic counts obtained is given in the following Table.

ADT's

Table 3.1.3 Existing ADT of Access Roads District Bannu

Road ID	Car	Motorcycle	Mazda Coaster	Rickshaw / Q.chi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	TOTAL Vehicles
BN-3	98	218	14	75	36	3	31	13	1	0	0	0	16	38	541
BN-5	163	268	24	145	46	9	30	11	3	0	0	0	59	68	824
N-BN-1	481	1223	25	543	71	19	55	39	20	1	0	0	59	73	2608
N-BN-11	266	834	0	228	43	23	4	5	1	0	0	0	0	50	1453

PCUs

Table 3.1.4 Existing PCUs of Access Roads District Bannu

Road ID	Car	Motorcycle	Mazda Coaster	Rickshaw / Qingqi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	Total PCUS
BN-3	98	109	28	56	54	5	78	38	4	0	0	0	73	150	693
BN-5	163	134	48	109	69	18	75	34	9	0	0	0	264	270	1191
N-BN-1	481	611	50	407	107	38	138	116	70	5	0	0	264	290	2577
N-BN-11	266	417	-	171	64	45	9	15	4	-	-	-	-	200	1191

3.1.6.2 Composition Of Vehicle Types

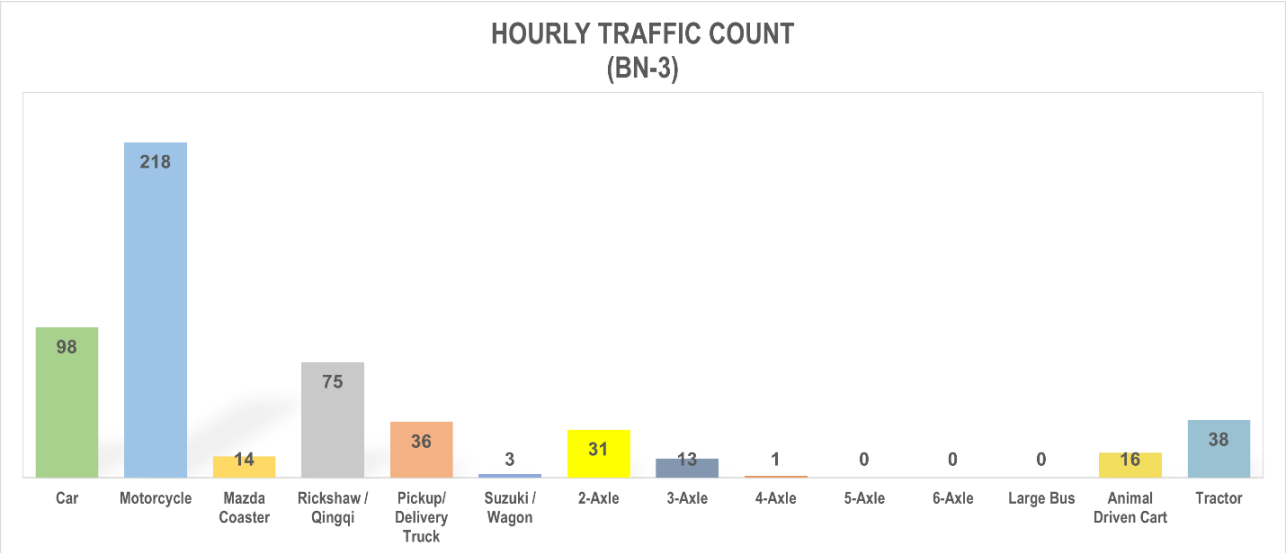


Figure 3.1.7 Vehicle Composition of BN-3

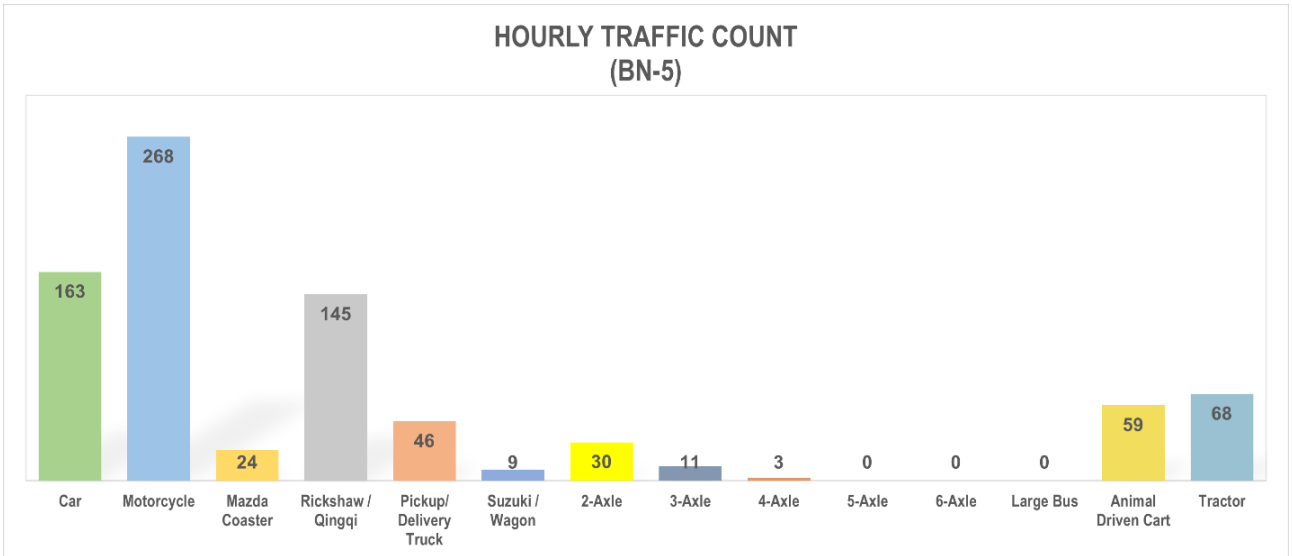


Figure 3.1.8 Vehicle Composition of BN-5

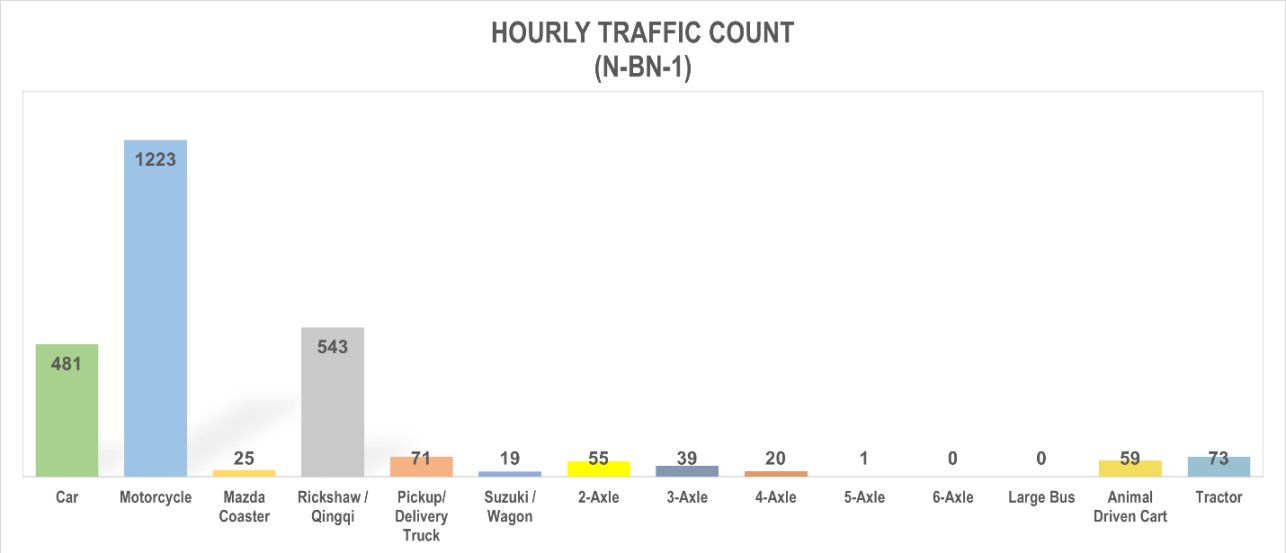


Figure 3.1.9 Vehicle Composition of N-BN-1

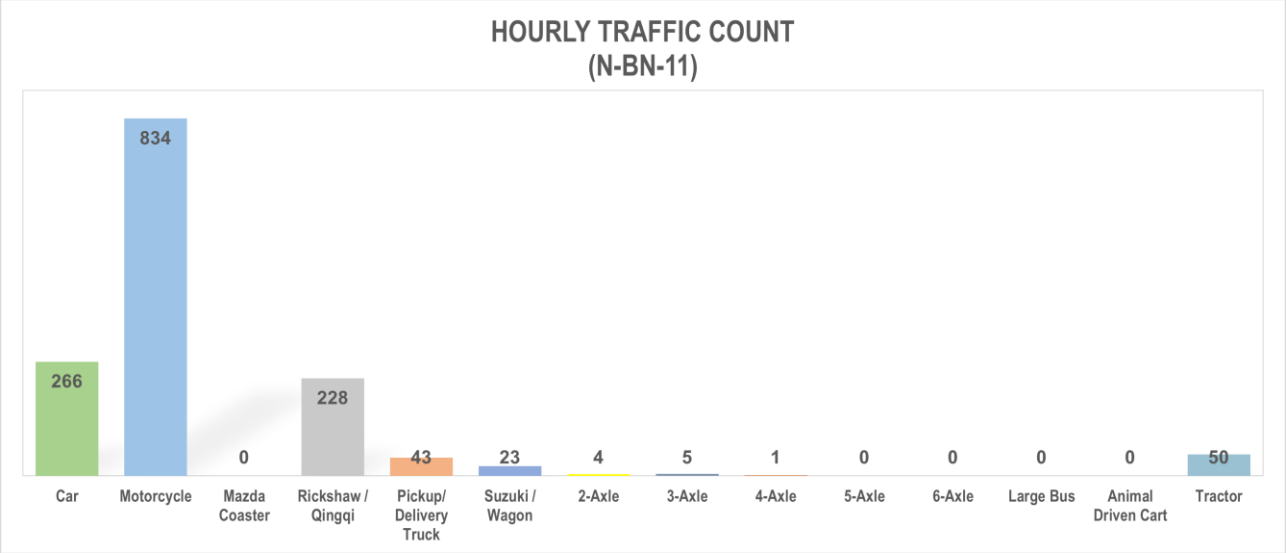


Figure 3.1.10 Vehicle Composition of N-BN-11

Most of the vehicles on the subject roads are Cars and Motorcycles. This Vehicle Composition can be attributed to the rural area type of the considered roads. Most of the people travel on these roads in their personal cars or motorcycles due to lack of proper public transport facilities.

The reason we have cars and motorcycles as the majority constituents of the vehicle mix, is because of the diversity of the road users utilizing the facility. Those people that have the available resources and own a car or motorcycle are reluctant of using public transport due to the poor services and condition of vehicles, whereas those people who do not own a private car or motorcycle have no other option then using public transport that constitutes of rickshaws and Suzuki/Wagons as seen in some roads.

3.1.6.3 TRAFFIC ANALYSIS FORECAST

ADT:

The ADT Base Year is 2022 and ADT Forecast year is 2032 as can be seen in the table below.

The following table represents the annual daily traffic forecast (10 years).

ADTs

Table 3.1.5 Forecast ADT of Access Roads District Bannu

Year	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
BN-3	**541**	568	597	627	658	691	725	762	800	840	882
BN-5	**824**	865	908	954	1,001	1,051	1,104	1,159	1,217	1,278	1,342
N-BN-1	**2,608**	2,738	2,875	3,019	3,169	3,328	3,494	3,669	3,852	4,045	4,247
N-BN-11	**1,453**	1,525	1,601	1,681	1,766	1,854	1,946	2,044	2,146	2,253	2,366

PCU:

The PCU Base Year is 2022 and PCU Forecast year is 2032 as can be seen in the table below.

Table 3.1.6 Forecast PCUs of Access Roads District Bannu

Year	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
BN-3	**693**	727	763	802	842	884	928	974	1,023	1,074	1,128
BN-5	**1,191**	1,251	1,313	1,379	1,448	1,520	1,596	1,676	1,760	1,848	1,940
N-BN-1	**2,577**	2,706	2,841	2,983	3,132	3,289	3,453	3,626	3,807	3,998	4,197
N-BN-11	**1,191**	1,251	1,313	1,379	1,448	1,520	1,596	1,676	1,760	1,848	1,940

3.1.7 Discussion and Analysis

The analysis conducted on these roads indicates that the condition of these roads is affecting the traffic characteristic which consequently influences the access of people to necessities of life. The poor condition of these roads is reflected by the Road Surface Type (RST) and International Roughness Index (IRI) pie charts which indicates that these roads need immediate consideration with respect to construction and rehabilitation. The poor mobility of these roads is indicated by the lower speeds and high travel times. Reconstructing these roads will improve speeds and lower travel times of users.

The utility of these roads in providing access to necessities like education, health, and markets will be enhanced with the improvement in road condition after reconstruction.

3.2 Project Area- Battagram

The district of Battagram is located at the latitude of 34.41 and longitude 73.1. It is surrounded by Kohistan District to the north, Mansehra District to the east, Kala Dhaka (now Torghar District) to the south and Shangla District to the west. It has a total land area of 1301 square kilometers. Battagram obtained the status of district in July 1993 when it was upgraded from a Tehsil and separated from Mansehra District.

3.2.1 Priority Roads in District Battagram

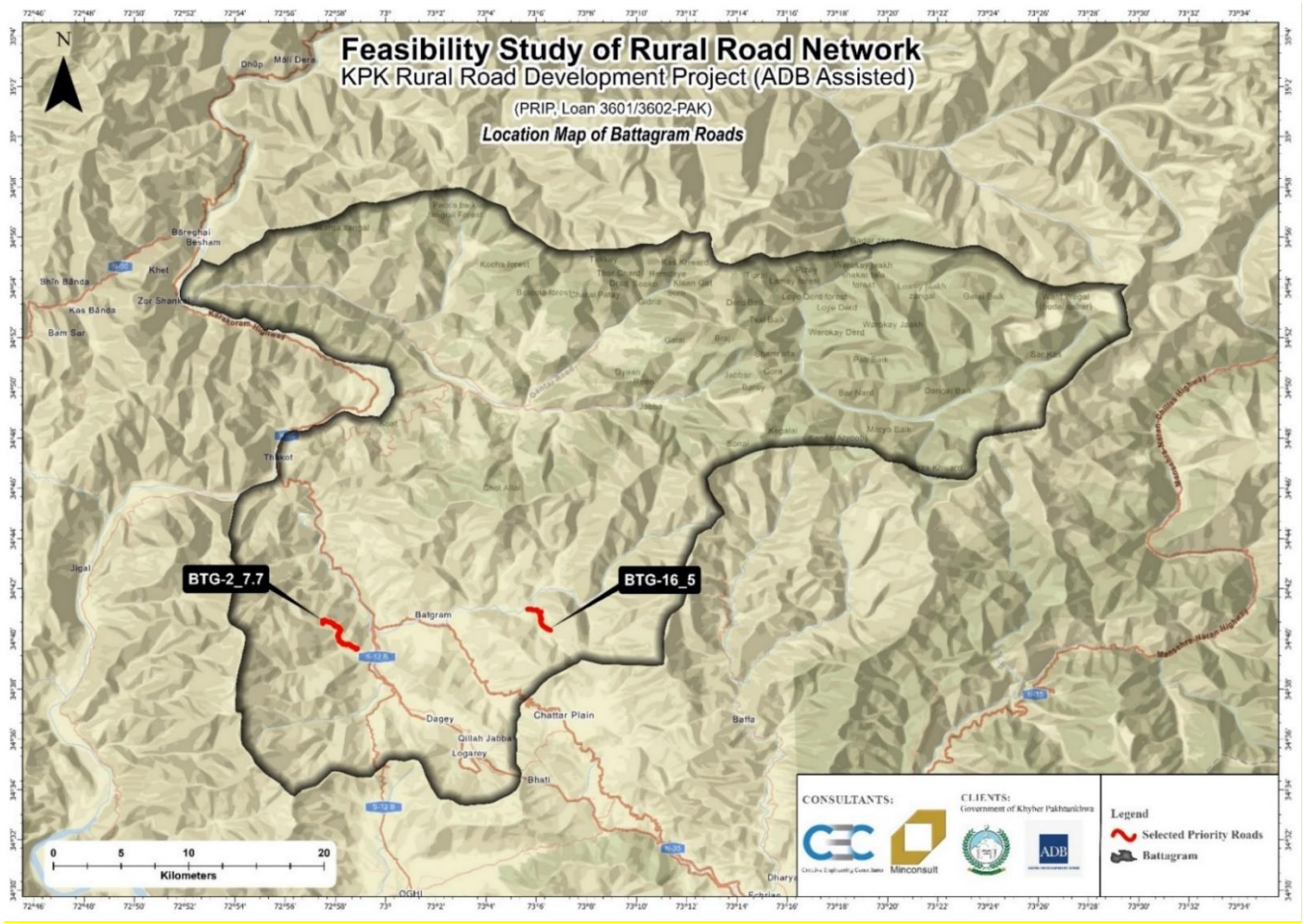
The following roads have been found feasible for Rural Road Development Project in District Battagram.

Table 3.2.1 Access Roads in Battagram

#	ID	Road Name	Districts	FL	Type
1	BTG-16	Rajdari To Kathora Road I/C Link Road	Battagram	8.10	Access
2	BTG-2	Road Kandar To Sokar Chilar	Battagram	7.64	Access

3.2.2 Location Map of Priority Roads

All the access roads selected for traffic study after scrutinization of the surveyed roads in the district are shown in the figure below.



Map 3.2.1 Location Map of Battagram

3.2.2.1 BTG-2 (Road Kandar to Sokar Chilar)

This road is in Battagram. The length of the road is 7.64 km. The start point of this road is kandar dheri masha khel & end point is Chilar. Geographically the road is in a mountainous area. The road links touch with Battagram interchange Hazara motorway. The road near the starting point connects with Dara Arqam school. This road is important for the villages area such as kandar, Sokar & chilar.

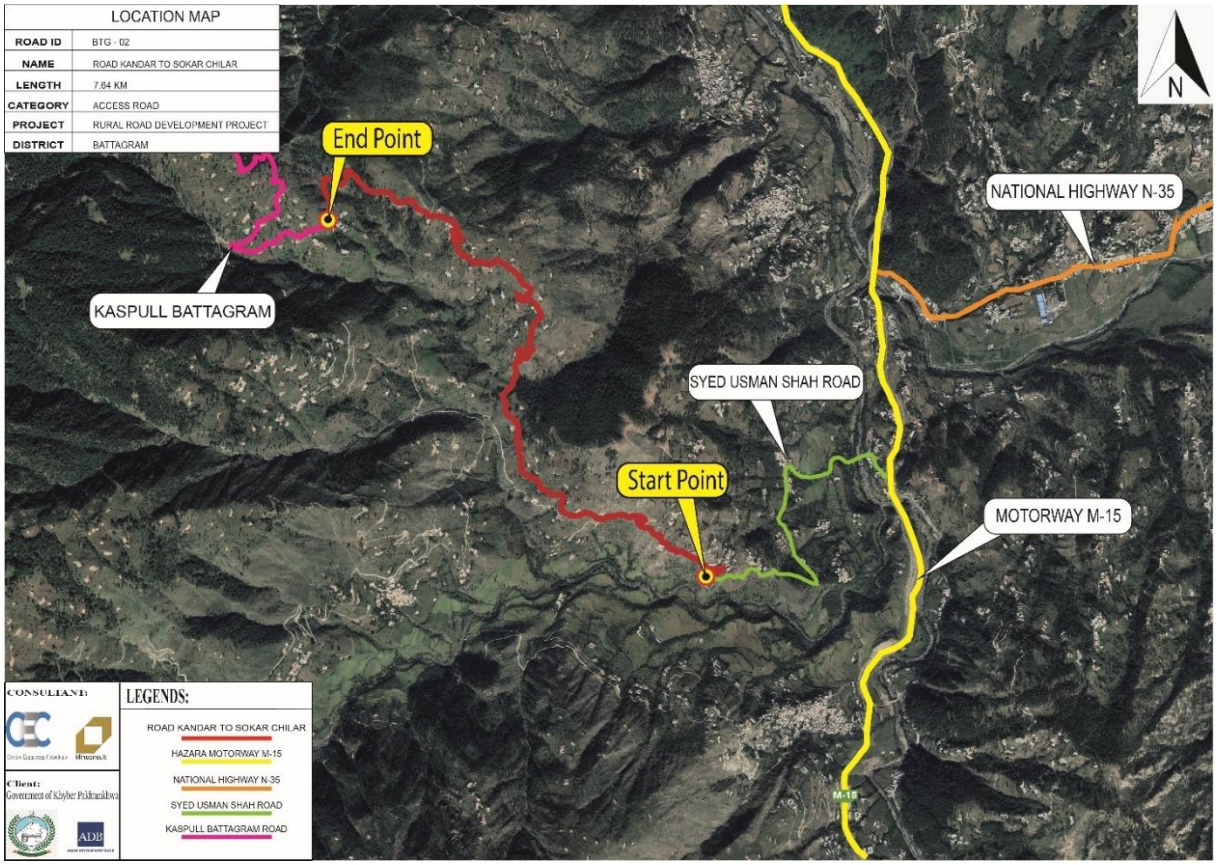


Figure 3.2.1 Location Map of BTG-2

3.2.2.2 BTG-16 (Rajdari to Kathora Road I/C Link Road)

The road situated at south of Battagram district. The total length of road is 8.10 km. the road starts from Rajdari, and end point is Kathora road. The road located in east of Battagram. The road situated in mountainous area of Battagram district. The road start point connect with Bilal masjid. This road along its length connects one education institute such as GPS Iqabal Abad Battamori. Road along its length connect with Alshifa medical center Rajhdari.

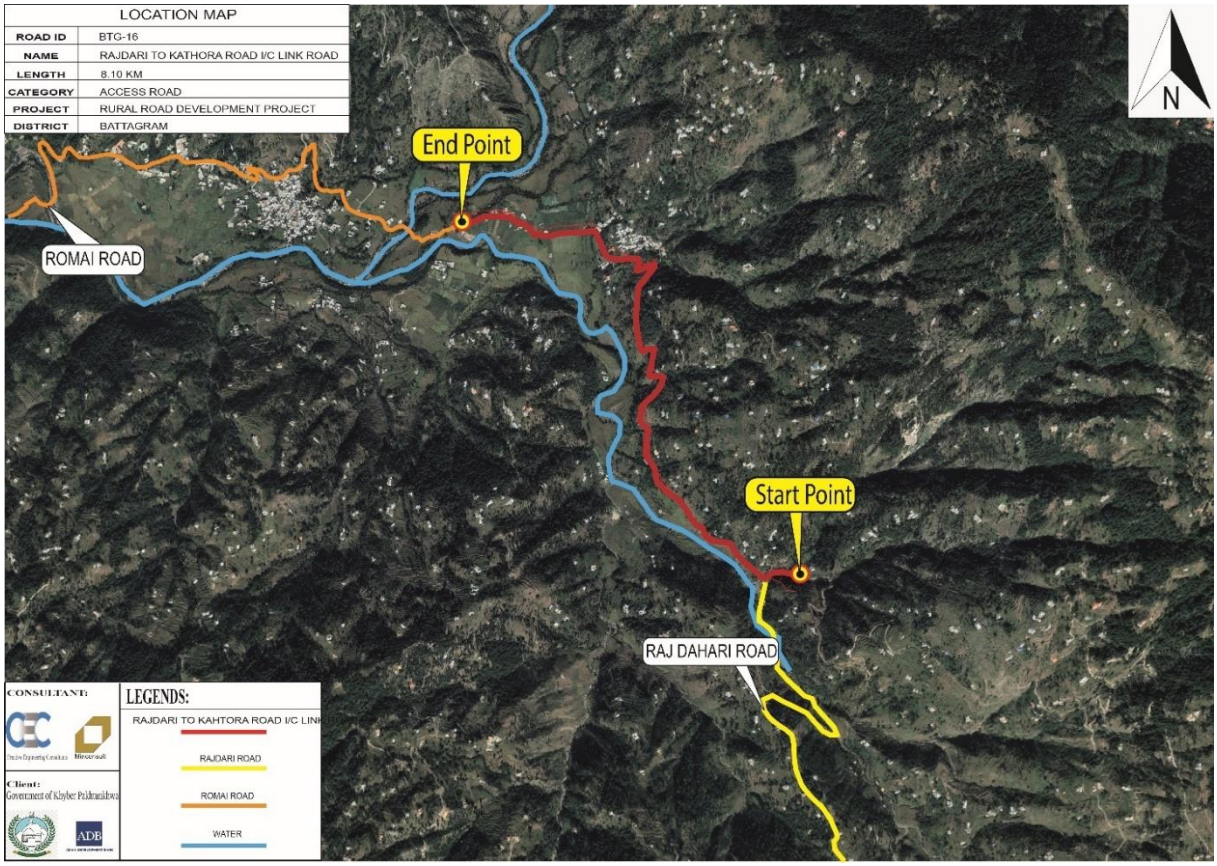


Figure 3.2.2 Location Map of BTG-16

3.2.3 IRI Classification Pie Chart of Selected Roads

The International Roughness Index (IRI) is used by highway professionals throughout the world as a standard to quantify road surface roughness. A poor road surface roughness influences the traffic speeds and times. It also effects the mobility and accesibility of users traversing that road.

The IRI Classification Charts for are given below.

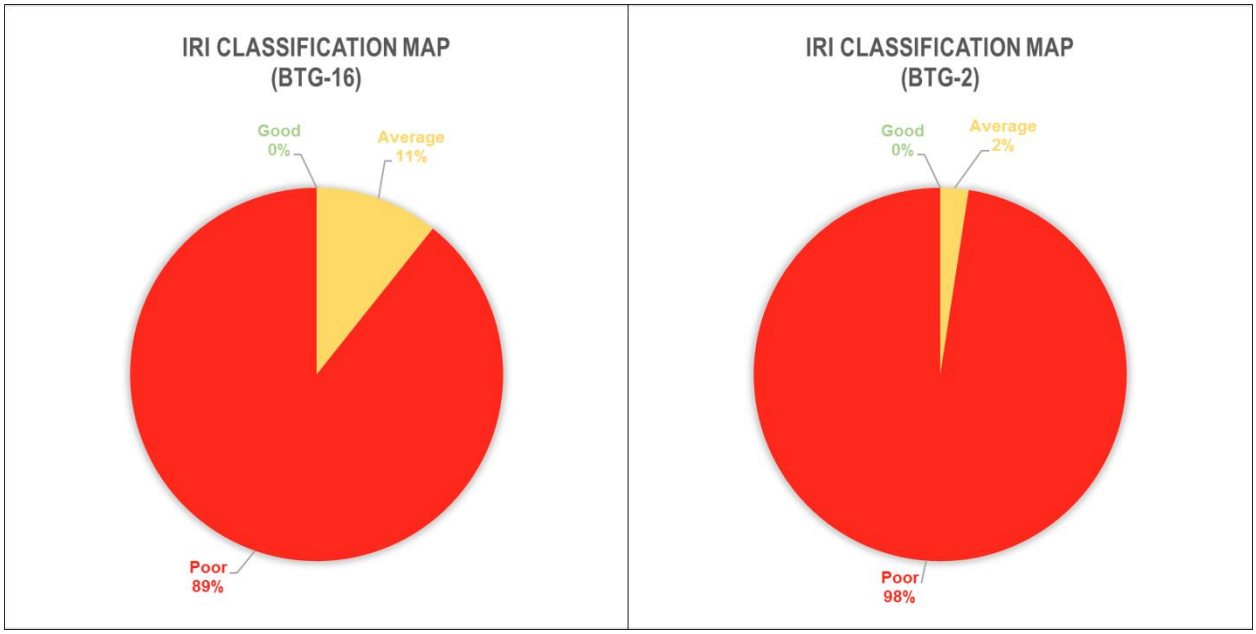


Figure 3.2.3 IRI Classification Chart of Access Roads District Battagram

3.2.4 RST Pie Chart of Selected Roads

Road Surface type (RST) survey was conducted to investigate the actual condition and type of surface of the road under observation. In rural areas earthen or kacha tracks and TST/DST are common that affect the mobility of road users and accessibility to necessities.

The RST Classification Charts for are given below.

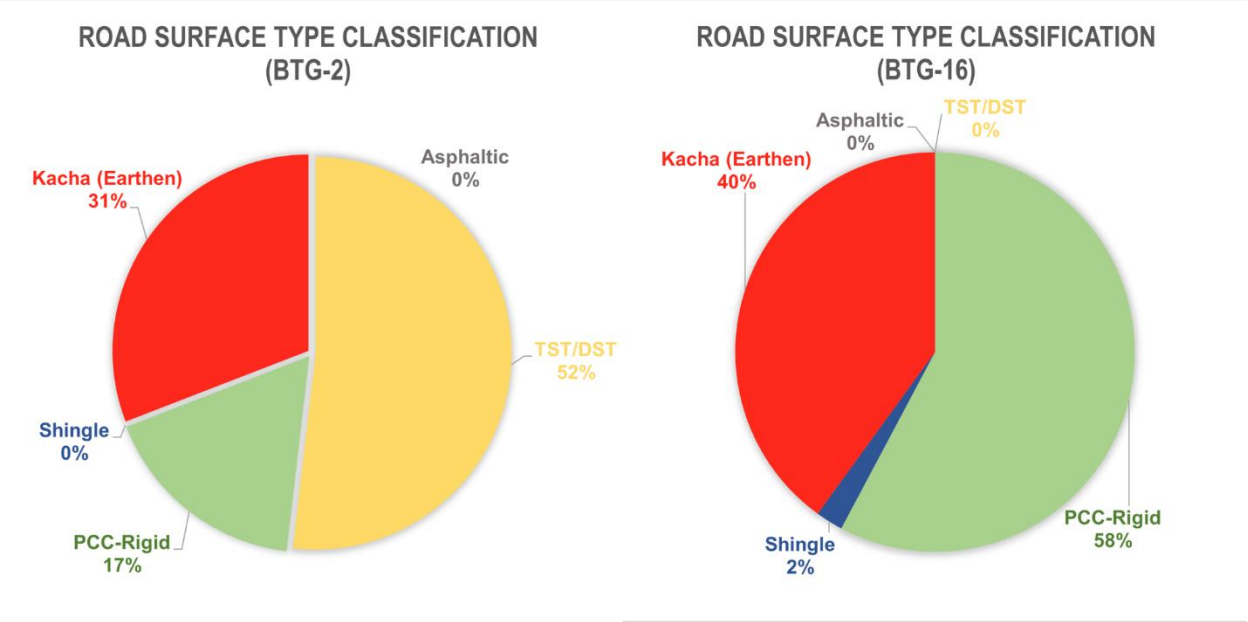


Figure 3.2.4 RST Classification Chart of Access Roads District Battagram

3.2.5 Travel Speed Survey

Table 3.2.2 Travel Speed Survey of Access Roads District Battagram

Road ID	Distance (km)	Total Ascent (m)	Total Descent (m)	Total Time	Average Speed (km/h)	Avg. Moving Speed (km/h)	Maximum Speed (km/h)	Moving Time
BTG-2	4.85	472.00	41.00	31:47.0	9.15	9.38	99.33	30:58.0
BTG-16	2.89	168.00	91.00	14:01.0	12.39	13.18	27.04	13:09.0

The travel speeds for all roads are low due to the deteriorated road condition which is reflected from the RST and IRI pie charts. Mobility of the road users is affected as indicated by lower average speeds and higher travel times, which can be attributed to the poor road conditions.

It can be inferred from these observations that these roads need to be reconstructed for better mobility and access of people to basic livelihood necessities.

3.2.6 Traffic Analysis

3.2.6.1 Summary of Existing Average Daily Traffic (ADT)

The summary of traffic counts obtained is given in the following Table.

ADT's

Table 3.2.3 Existing ADT of Access Roads District Battagram

Road ID	Car	Motorcycle	Mazda Coaster	Rickshaw / Q.chi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	TOTAL Vehicles
BTG-02	128	109	0	0	86	48	15	0	0	0	0	0	0	0	385
BTG-16	39	86	5	14	30	4	8	1	0	0	0	0	9	19	214

PCUs

Table 3.2.4 Existing PCUs District Battagram

Road ID	Car	Motorcycle	Mazda Coaster	Rickshaw / Qingqi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	Total PCUS
BTG-02	128	54	0	0	129	95	38	0	0	0	0	0	0	0	444
BTG-16	39	43	10	10	45	8	19	4	0	0	0	0	39	75	292

3.2.6.2 Composition Of Vehicle Types

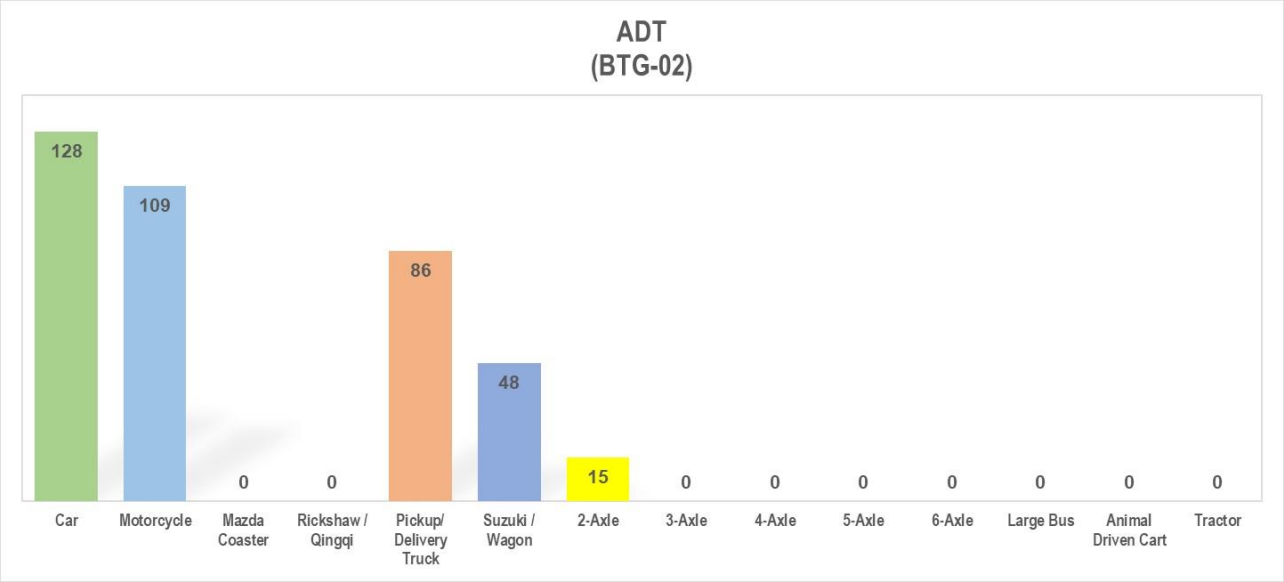


Figure 3.2.5 Vehicle Composition Chart of BTG-2

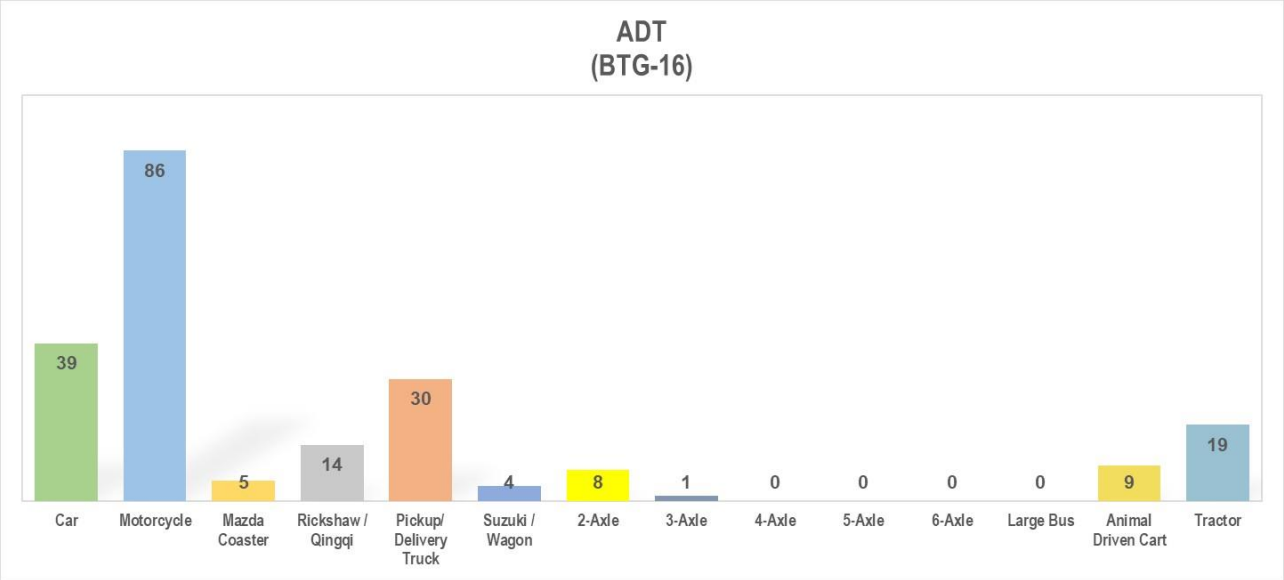


Figure 3.2.6 Vehicle Composition Chart of BTG-16

Most of the vehicles on the subject roads are Cars and Motorcycles. This Vehicle Composition can be attributed to the rural area type of the considered roads. Most of the people travel on these roads in their personal cars or motorcycles due to lack of proper public transport facilities.

The reason we have cars and motorcycles as the majority constituents of the vehicle mix, is because of the diversity of the road users utilizing the facility. Those people that have the available resources and own a car or motorcycle are reluctant of using public transport due to the poor services and condition of vehicles, whereas those people who do not own a private car or motorcycle have no other option then using public transport that constitutes of rickshaws and Suzuki/Wagons as seen in some roads.

3.2.6.3 Traffic Analysis Forecast

ADT:

The ADT Base Year is 2022 and ADT Forecast year is 2032 as can be seen in the table below.

The following table represents the annual daily traffic forecast (10 years).

Table 3.2.5 Forecast ADT of Access Roads District Battagram

Year	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
BTG-02	**385**	404	424	446	468	491	516	542	569	597	627
BTG-16	**151**	159	167	175	184	193	203	213	223	235	246

PCU:

The PCU Base Year is 2022 and PCU Forecast year is 2032 as can be seen in the table below.

Table 3.2.6 Forecast PCUs of Access Roads District Battagram

Year	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
BTG-02	**444**	466	489	514	539	566	595	624	656	688	723
BTG-16	**180**	189	198	208	219	230	241	253	266	279	293

3.2.7 Discussion and Analysis

The analysis conducted on these roads indicates that the condition of these roads is affecting the traffic characteristics which consequently influence the access of people to necessities of life. The poor condition of these roads is reflected by the Road Surface Type (RST) and International Roughness Index (IRI) pie charts which indicates that these roads need immediate consideration with respect to construction and rehabilitation. The poor mobility of these roads is indicated by the lower speeds and high travel times. Reconstructing these roads will improve speeds and lower travel times of users.

The utility of these roads in providing access to necessities like education, health, and markets will be enhanced with the improvement in road condition after reconstruction.

3.3 Project Area- Bunner

Bunner is a district in Malakand Division of Khyber Pakhtunkhwa province in Pakistan. Before becoming a district in 1991, it was a tehsil within Swat District. The Bunner Valley lies between Swabi in the South and Swat in the North. It is a mountain valley, dotted with villages and divided into four sub-divisions. The Mora Hills and the Ilam range divide it from the Swat Valley, the Sinawar range from Yusafzai, the Guru mountains from the Mardan Valley, and the Duma range from the Puran Valley.

3.3.1 Priority Roads in District Bunner

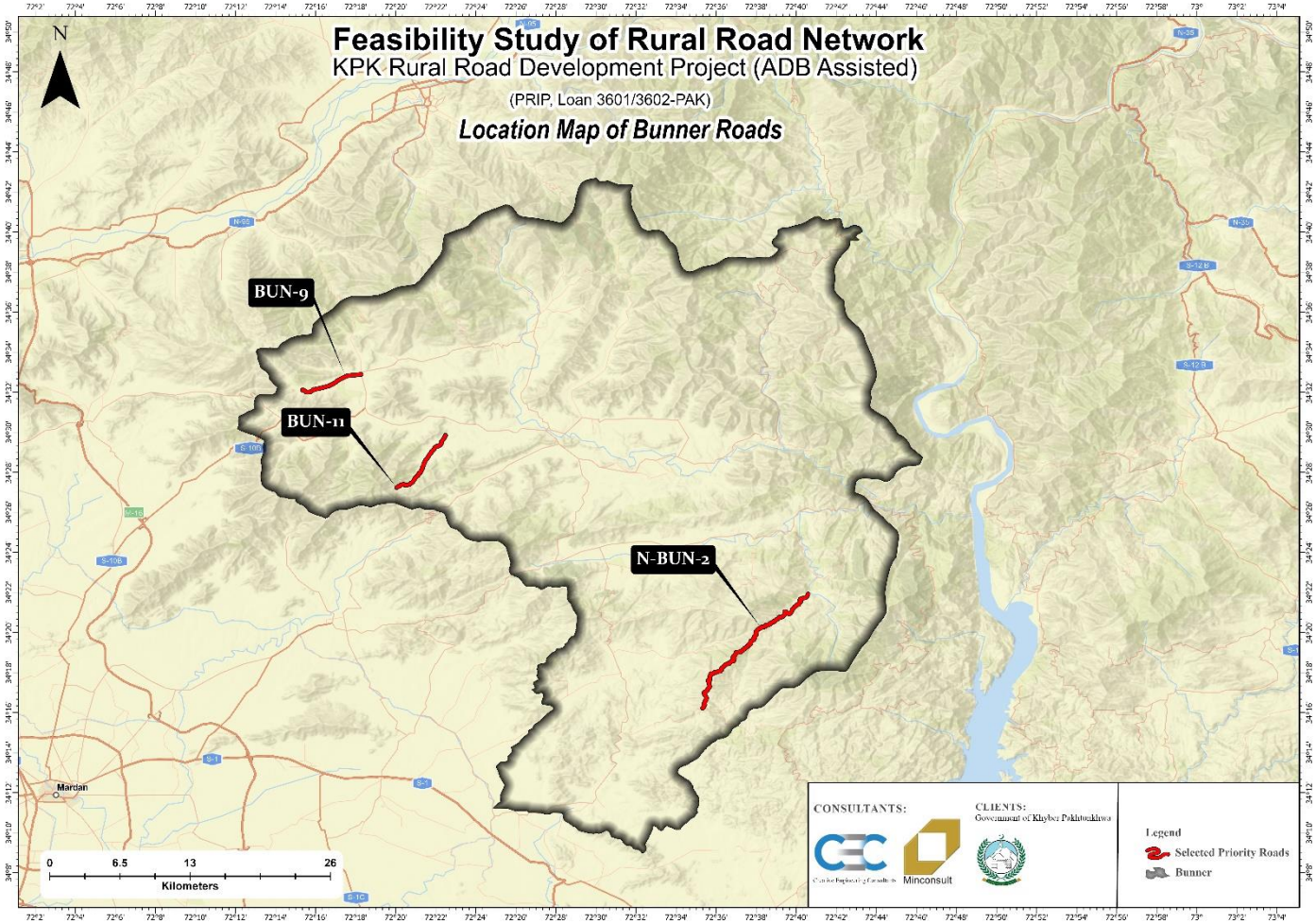
The following roads have been found feasible for Rural Road Development Project in District Bunner.

Table 3.3.1 Access Roads in Bunner

#	ID	Road Name	Districts	FL	Type
1	**BUN-11**	Jangdara Bato Road	Bunner	6.80	Access
2	**BUN-9**	Girari Road	Bunner	5.05	Access
3	**N-BUN-2**	Bababir to Manga Thana to Nagarai	Bunner	18.80	Access

3.3.2 Location Map of Priority Roads

All the access roads selected for traffic study after scrutinization of the surveyed roads in the district are shown in the figure below.



Map 3.3.1 Location Map of Bunner

3.3.2.1 BUN-9 (Girari Road)

The road connects Girai to Sowari Mingora Road having span of 5.05 km. Road link along its length also connects areas such as Jowar Bunner etc. Road surrounding environment possess charming countryside scenic views.

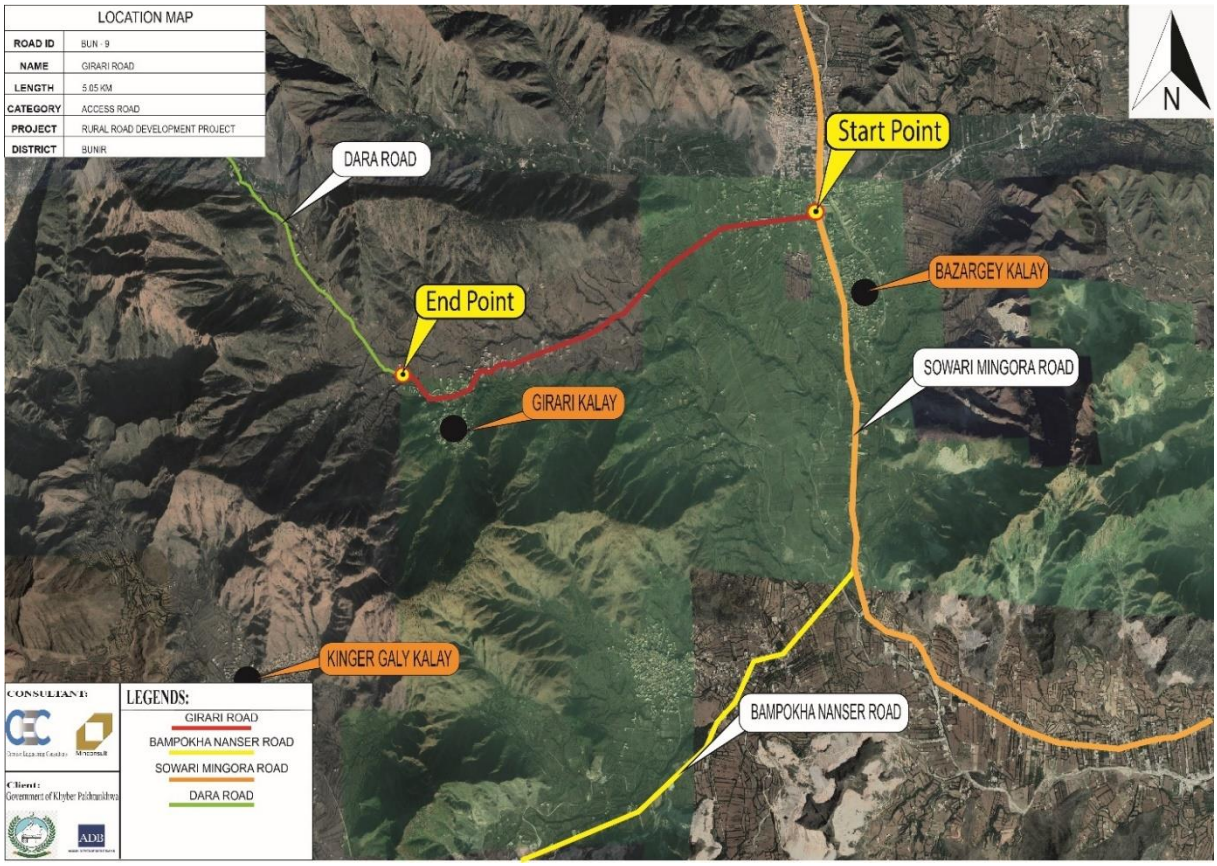


Figure 3.3.1 Location Map of BUN-9

3.3.2.2 BUN-11 (Jangdara Bato Road)

The road link joins Kas Korona to Jangdara having length of 6.80 km. Road link along its length also connects areas such as Anghapur etc. The road link helps to connect the educational institutions such as GPS Anghapur No1, GMS Jangdara Torwarsak etc. to the main road network. Furthermore, the road network also enables access to local farmers to supply and transport their crop yields to consumer markets of local urban centres such as Kas Korona, Torwarsak etc. along with safe and efficient transport facility for local inhabitants. Road surroundings possess rural landscape environment surrounded with agricultural farms and residential areas.

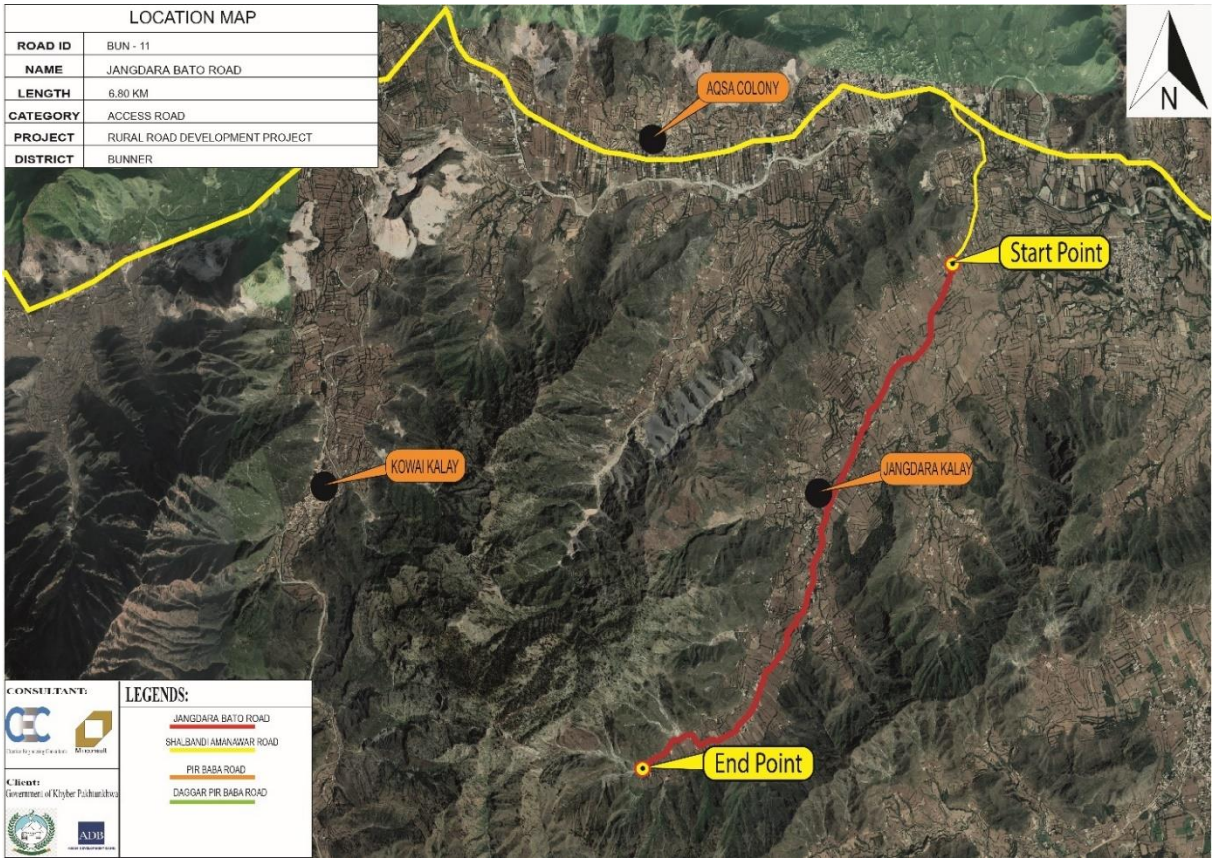


Figure 3.3.2 Location Map of BUN-11

3.3.2.3 N-BUN-2 (Bababir to Manga Thana to Nagarai)

The road is named Sarwai – Amazai Road. This road is in Bunner district. It starts from Jalaibari kandao, passes through Mali Kandao, Jan Muhammad Kandao, Ashraf Kandao, connects Tarinan road and ends at Khanpur Amazai. The length of this road is 18.80 km.

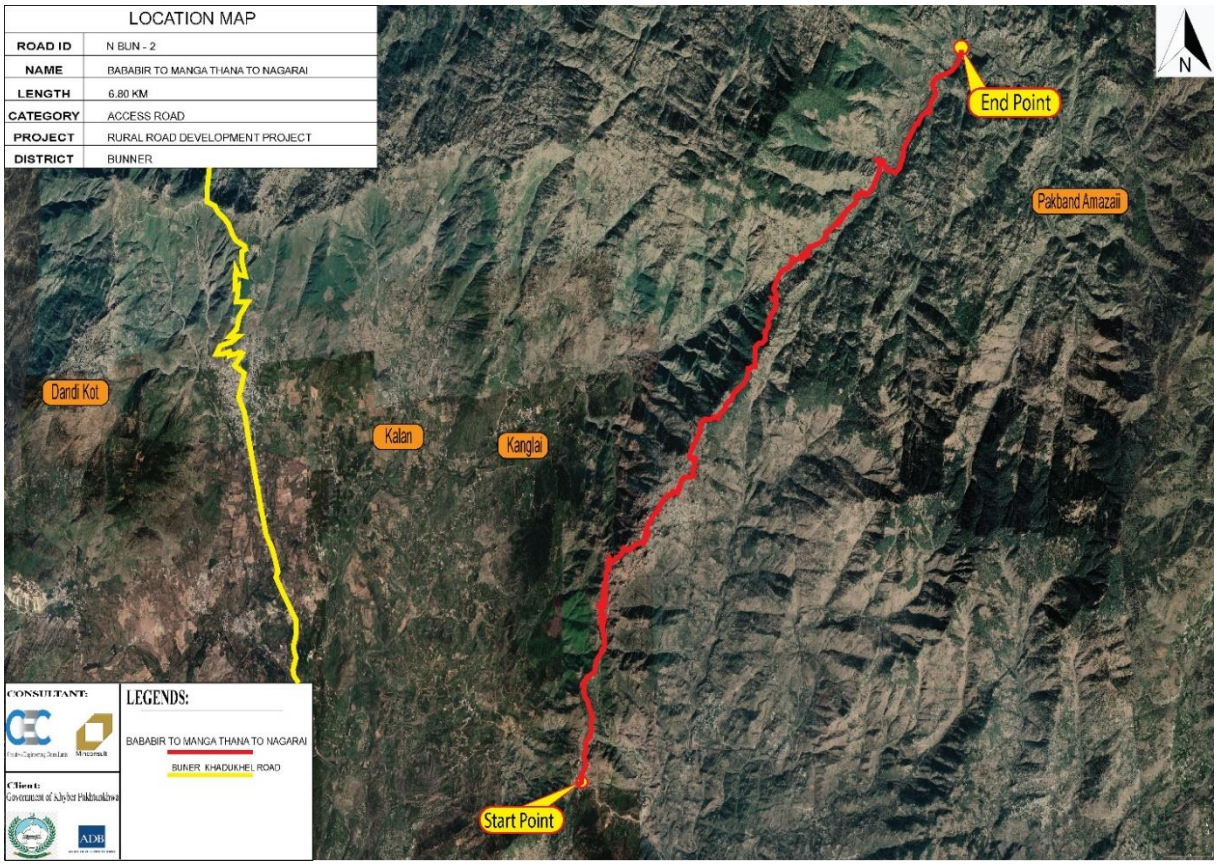


Figure 3.3.3 Location Map N-BUN-2

3.3.3 IRI Classification Pie Chart of Selected Roads

The International Roughness Index (IRI) is used by highway professionals throughout the world as a standard to quantify road surface roughness. A poor road surface roughness influences the traffic speeds and times. It also effects the mobility and accesibility of users traversing that road.

The IRI Classification Charts for are given below.

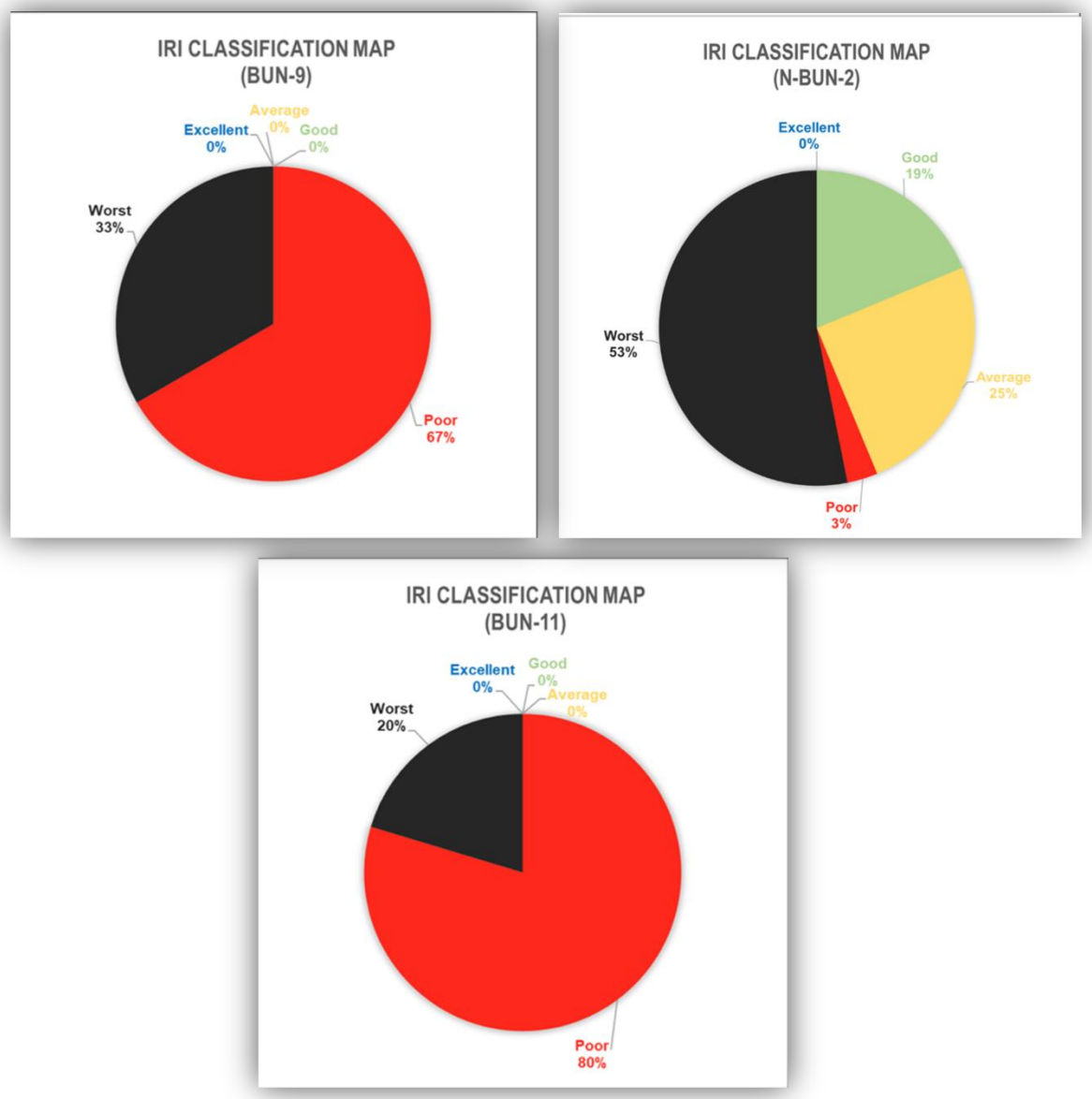


Figure 3.3.4 IRI Classification Chart of Access Roads District Bunner

3.3.4 RST Pie Chart of Selected Roads

Road Surface type (RST) survey was conducted to investigate the actual condition and type of surface of the road under observation. In rural areas earthen or kacha tracks and TST/DST are common that affect the mobility of road users and accessibility to necessities.

The RST Classification Charts for are given below.

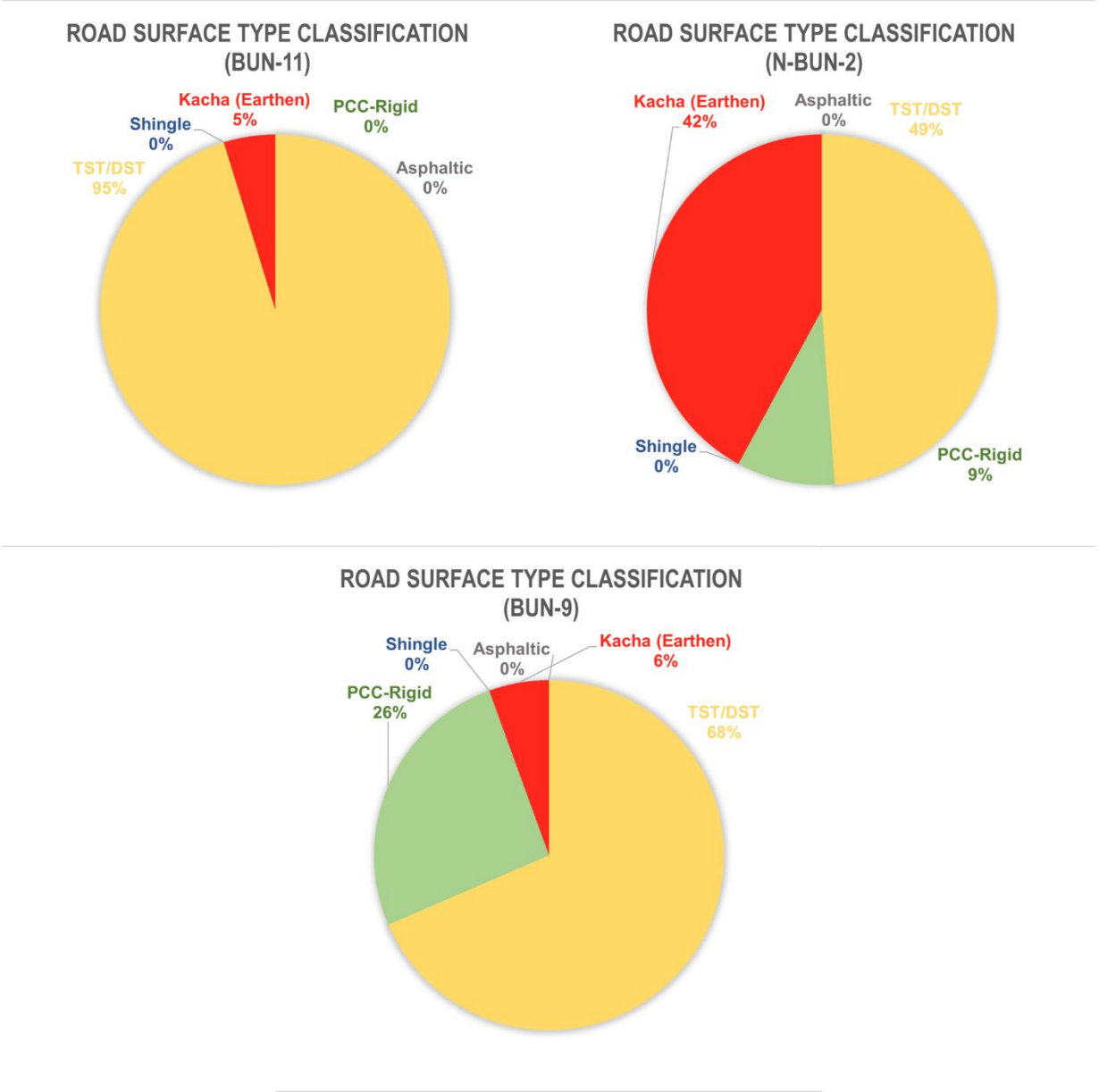


Figure 3.3.5 RST Classification Chart of Access Roads District Bunner

3.3.5 Travel Speed Survey

Table 3.3.2 Travel Speed Survey of Access Roads District Bunner

Road ID	Distance (km)	Total Ascent (m)	Total Descent (m)	Total Time	Average Speed (km/h)	Avg. Moving Speed (km/h)	Maximum Speed (km/h)	Moving Time
BUN-9	5.86	53.00	165.00	21:33.0	16.32	18.52	37.47	18:57.0
BUN-11	6.06	69.00	129.00	20:31.0	17.71	19.07	33.19	19:02.0
N-BUN-2	19	396.00	400.00	40:46.0	17.84	19.84	35.48	39:16.0

The travel speeds for all roads are low due to the deteriorated road condition which is reflected from the RST and IRI pie charts. Mobility of the road users is affected as indicated by lower average speeds and higher travel times, which can be attributed to the poor road conditions.

It can be inferred from these observations that these roads need to be reconstructed for better mobility and access of people to basic livelihood necessities.

3.3.6 Traffic Analysis

3.3.6.1 Summary of Existing Average Daily Traffic (ADT)

The summary of traffic counts obtained is given in the following Table.

ADT's

Table 3.3.3 Existing ADT of Access Roads District Bunner

Road ID	Car	Motorcycle	Mazda Coaster	Rickshaw / Q.chi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	TOTAL Vehicles
BUN-9	165	85	5	33	26	6	3	0	0	0	0	0	0	9	331
BUN-11	145	97	5	30	66	6	2	0	0	0	0	0	0	7	360
N-BUN-2	254	220	35	200	34	10	0	0	0	0	0	0	5	15	773

PCUs

Table 3.3.4 Existing PCUs of Access Roads District Bunner

Road ID	Car	Motorcycle	Mazda Coaster	Rickshaw / Qingqi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	Total PCUS
BUN-9	165	43	10	24	39	13	6	0	0	0	0	0	0	35	335
BUN-11	145	49	10	23	99	13	6	0	0	0	0	0	0	30	374
N-BUN-2	254	110	70	150	51	20	0	0	0	0	0	0	23	60	738

3.3.6.2 Composition Of Vehicle Types

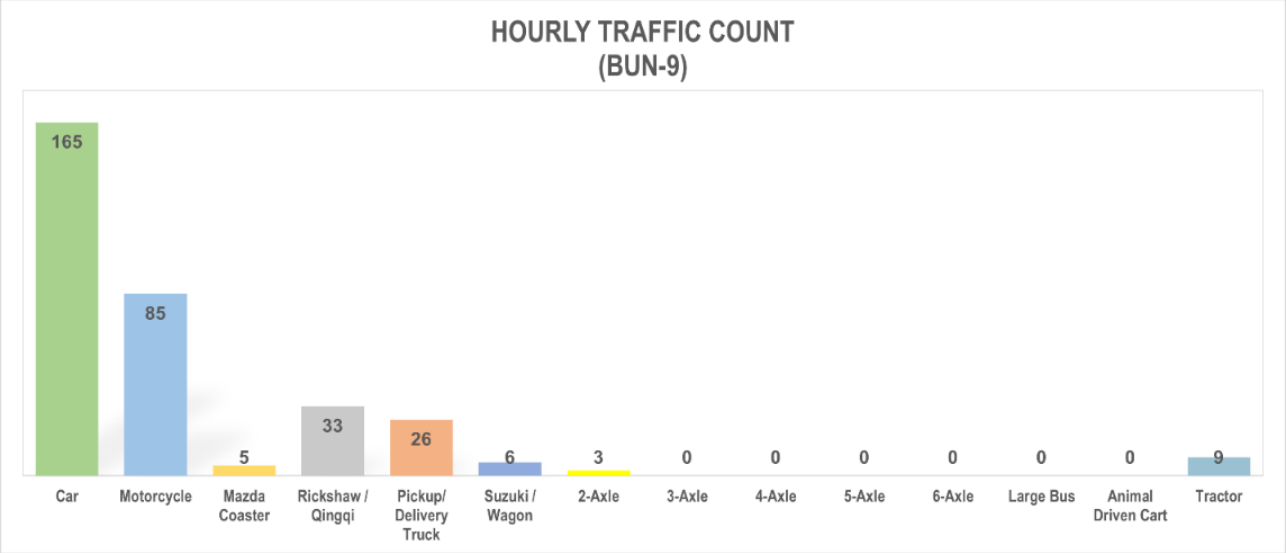


Figure 3.3.6 Vehicle Composition of BUN-9

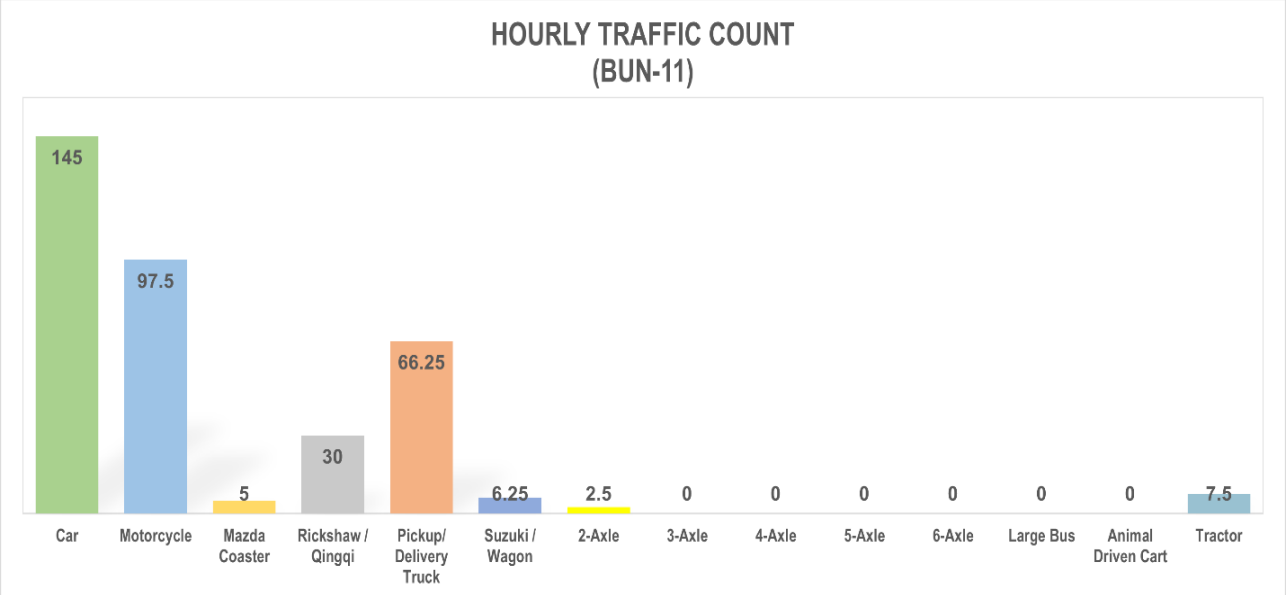


Figure 3.3.7 Vehicle Composition of BUN-11

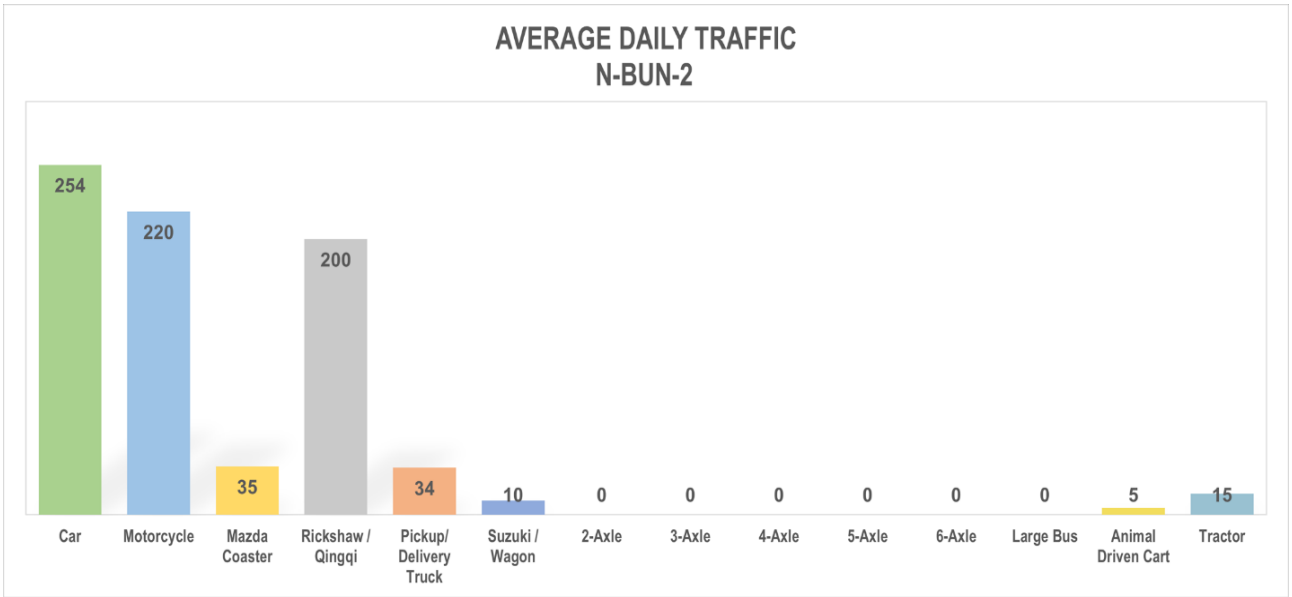


Figure 3.3.8 Vehicle Composition of N-BUN-2

Most of the vehicles on the subject roads are Cars and Motorcycles. This Vehicle Composition can be attributed to the rural area type of the considered roads. Most of the people travel on these roads in their personal cars or motorcycles due to lack of proper public transport facilities.

The reason we have cars and motorcycles as the majority constituents of the vehicle mix, is because of the diversity of the road users utilizing the facility. Those people that have the available resources and own a car or motorcycle are reluctant of using public transport due to the poor services and condition of vehicles, whereas those people who do not own a private car or motorcycle have no other option then using public transport that constitutes of rickshaws and Suzuki/Wagons as seen in some roads.

3.3.6.3 Traffic Analysis Forecast

ADT:

The ADT Base Year is 2022 and ADT Forecast year is 2032 as can be seen in the table below. The following table represents the annual daily traffic forecast (10 years).

Table 3.3.5 Forecast ADT of Access Roads District Bunner

Year	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
BUN-9	331	348	365	383	403	423	444	466	489	514	540
BUN-11	360	378	397	417	438	459	482	507	532	558	586
N-BUN-2	**773**	812	852	895	940	987	1,036	1,088	1,142	1,199	1,259

PCU:

The PCU Base Year is 2022 and PCU Forecast year is 2032 as can be seen in the table below.

Table 3.3.6 Forecast PCUs of Access Roads District Bunner

Year	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
BUN-9	335	352	369	388	407	428	449	471	495	520	546
BUN-11	374	393	413	433	455	478	502	527	553	581	610
N-BUN-2	**738**	774	813	854	896	941	988	1,038	1,090	1,144	1,201

3.3.7 Discussion and Analysis

The analysis conducted on these roads indicates that the condition of these roads is affecting the traffic characteristic which consequently influences the access of people to necessities of life. The poor condition of these roads is reflected by the Road Surface Type (RST) and International Roughness Index (IRI) pie charts which indicates that these roads need immediate consideration with respect to construction and rehabilitation. The poor mobility of these roads is indicated by the lower speeds and high travel times. Reconstructing these roads will improve speeds and lower travel times of users.

The utility of these roads in providing access to necessities like education, health, and markets will be enhanced with the improvement in road condition after reconstruction.

3.4 Project Area- Charsadda

Charsadda is a district in Peshawar Division of Khyber Pakhtunkhwa province in Pakistan. Prior to its establishment as a separate district in 1998, it was a tehsil within Peshawar District. Charsadda lies about 29 kilometers (18 mi) from the provincial capital of Peshawar at an altitude of 276 meters (906 ft). The total area of Charsadda District measures about 996 square Km. The district is geographically organized into two primary parts: Hashtnagar and Do Aaba.

3.4.1 Priority Roads in District Charsadda

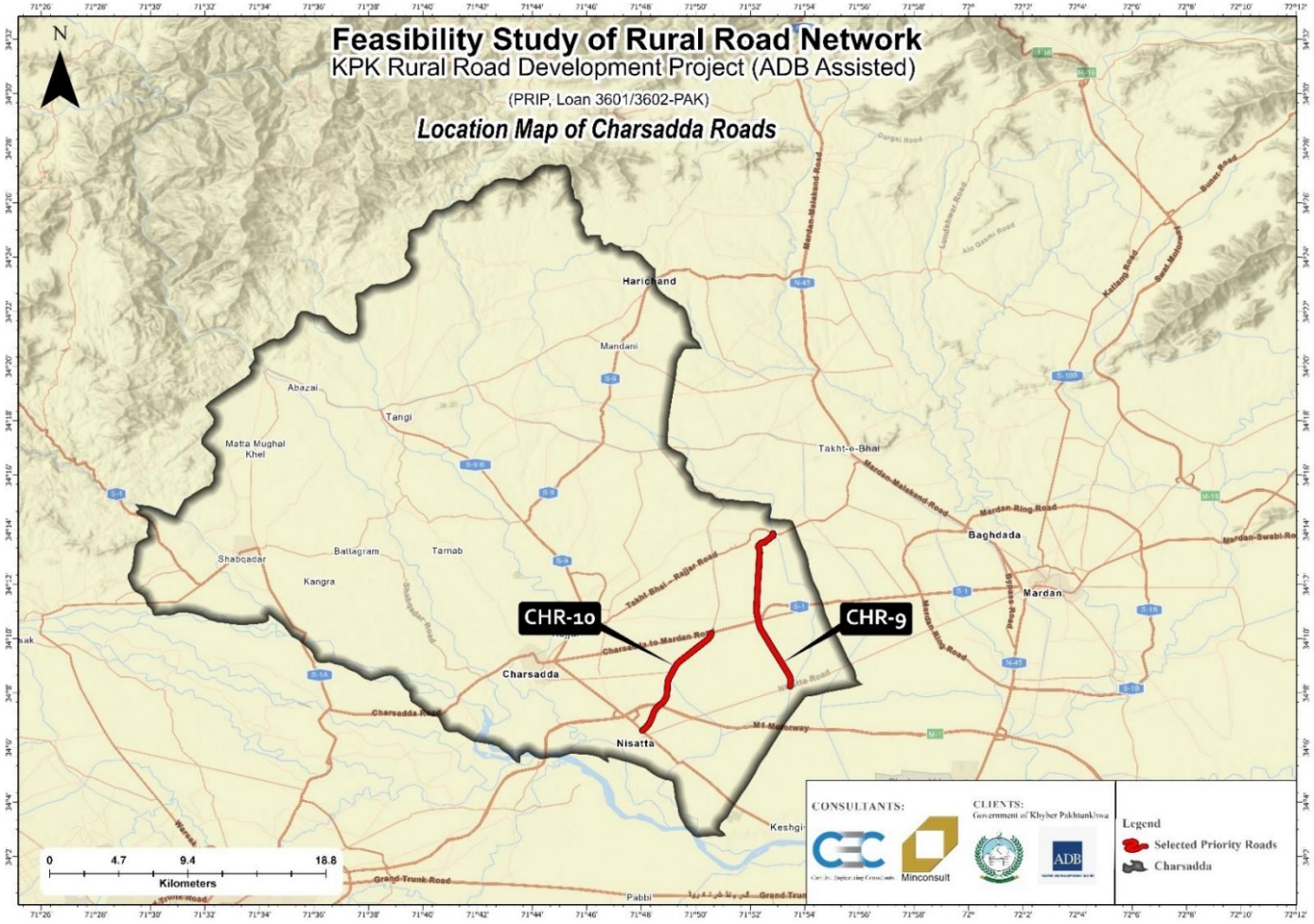
The following roads have been found feasible for Rural Road Development Project in District Charsadda.

Table 3.4.1 Access Roads in Charsadda

#	ID	Road Name	District	FL	Type
1	**CHR-9**	**Takhtbhai Road to Malang Abad**	Charsadda	11	Access
2	**CHR-10**	Sardheri Bazar to Nisata via Zarin Abad	Charsadda	10	Access

3.4.2 Location Map of Priority Roads

All the access roads selected for traffic study after scrutinization of the surveyed roads in the district are shown in the figure below.



Map 3.4.1 Location Map Charsadda

3.4.2.1 CHR-9 (Takhtbhai Road to Malang Abad)

The historic Takht Bhai Road, spanning a generous 11 kilometers, commences its journey from the revered site of Takht Bhai, meandering its way towards the quaint village of Malangabad. This vital thoroughfare serves as the economic lifeline between these two communities, bearing substantial significance for the local populace. Unfortunately, the road's current state of disrepair stands as a notable hindrance, necessitating immediate attention to restore its functionality and ensure the continued prosperity of these interconnected villages.

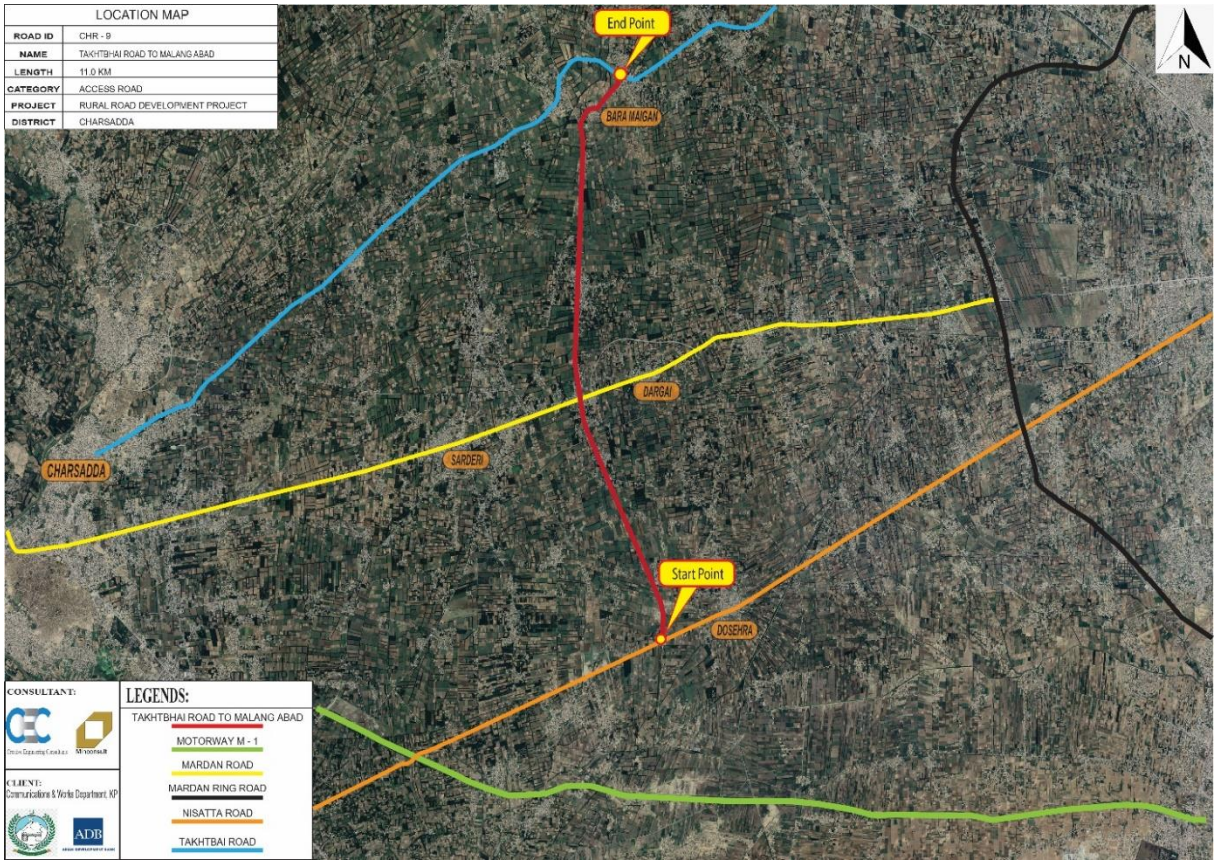


Figure 3.4.1 Location Map CHR-9

3.4.2.2 CHR-10 (Sardheri Bazar to Nisata via Zarin Abad)

The Sardheri Bazar to Nisatta via Zarin Abad road embarks from the charming town of Nisatta, gracefully extending along the motorway, and culminating at the bustling hub of Sardheri. This crucial thoroughfare spans 10 kilometers, yet regrettably, its present state is deplorable. A much-needed repair holds the promise of transformative benefits for the local community, granting effortless access to vital amenities such as hospitals and educational institutions. It is with anticipation that the revitalization of this road will herald a new era of convenience and improved quality of life for all who rely on it.

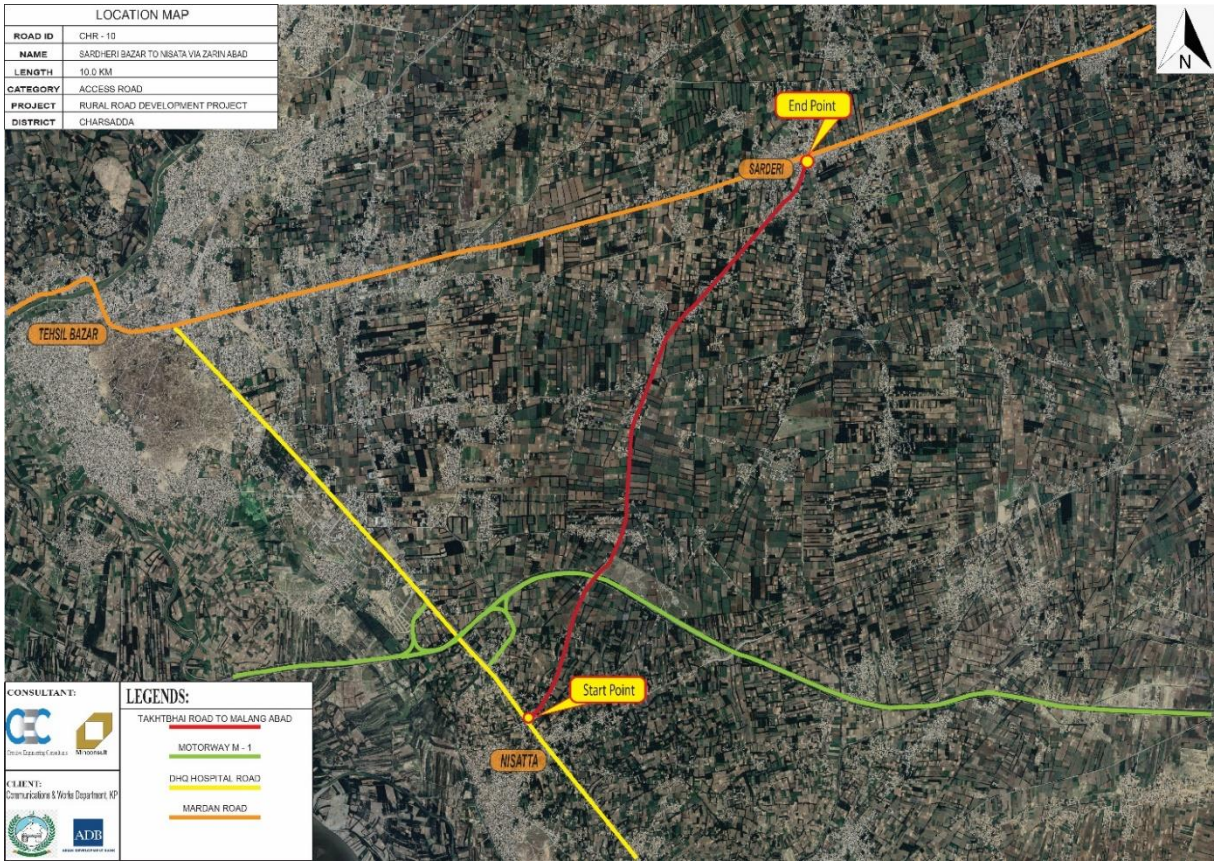


Figure 3.4.2 Location Map CHR-10

3.4.3 IRI Classification Pie Chart of Selected Roads

The International Roughness Index (IRI) is used by highway professionals throughout the world as a standard to quantify road surface roughness. A poor road surface roughness influences the traffic speeds and times. It also effects the mobility and accesibility of users traversing that road.

The IRI Classification Charts for are given below.

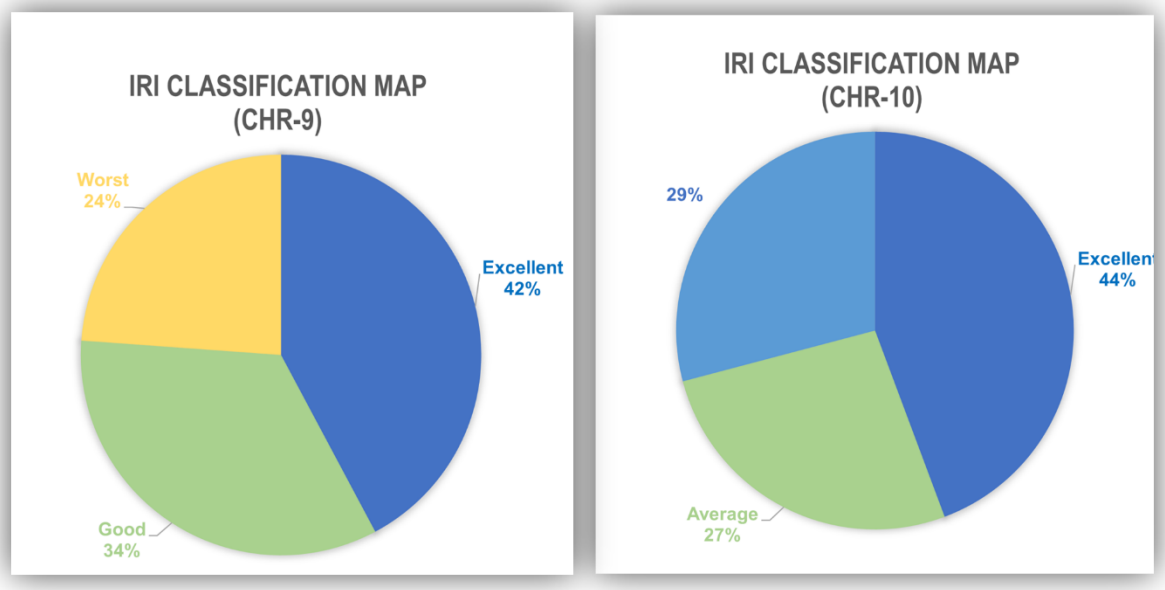


Figure 3.4.3 IRI Classification Chart of Access Roads District Charsadda

3.4.4 RST Pie Chart of Selected Roads

Road Surface type (RST) survey was conducted to investigate the actual condition and type of surface of the road under observation. In rural areas earthen or kacha tracks and TST/DST are common that affect the mobility of road users and accessibility to necessities.

The RST Classification Charts for are given below.

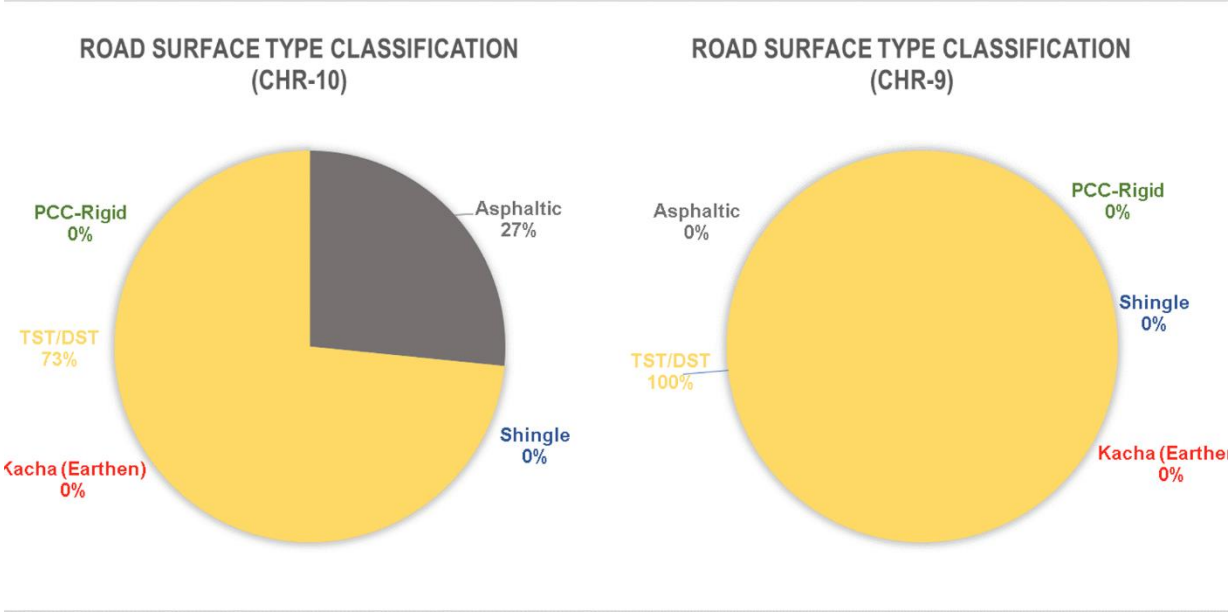


Figure 3.4.4 RST Classification Chart of Access Roads District Charsadda

3.4.5 Travel Speed Survey

Table 3.4.2 Travel Speed Survey of Access Roads District Charsadda

Road ID	Distance (km)	Total Ascent (m)	Total Descent (m)	Total Time	Average Speed (km/h)	Avg. Moving Speed (km/h)	Maximum Speed (km/h)
CHR-9	10	100	80	33:20.0	12.23	12.85	97.03
CHR-10	9.8	62	31	17:42.0	21.2	21	42

Travel speeds for the given roads are very slow, which increases the travel time for commuters. This is due to the increased surface roughness of the roads. The IRI classification maps show that most of the road sections are either in poor or worst condition which explains the reason for slow speeds.

3.4.6 Traffic Analysis

3.4.6.1 Summary of Existing Average Daily Traffic (ADT)

The summary of traffic counts obtained is given in the following Table.

ADT's

Table 3.4.3 Existing ADT of Access Roads District Charsadda

Road ID	Car	Motorcycle	Mazda Coaster	Rickshaw / Q.chi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	TOTAL Vehicles
CHR-9	500	700	56	378	185	123	12	0	0	0	0	0	60	43	2057
CHR-10	980	2678	97	1278	71	591	21	0	0	0	0	0	129	268	6113

PCUs

Table 3.4.4 Existing PCUs of Access Roads District Charsadda

Road ID	Car	Motorcycle	Mazda Coaster	Rickshaw / Qinggi	Pickup/ Delivery Truck	Suzuki/ Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	Total PCUS
CHR-9	500	350	112	284	278	246	30	0	0	0	0	0	270	172	2241
CHR-10	980	1339	194	959	107	1182	53	0	0	0	0	0	581	1072	6465

3.4.6.2 Composition Of Vehicle Types

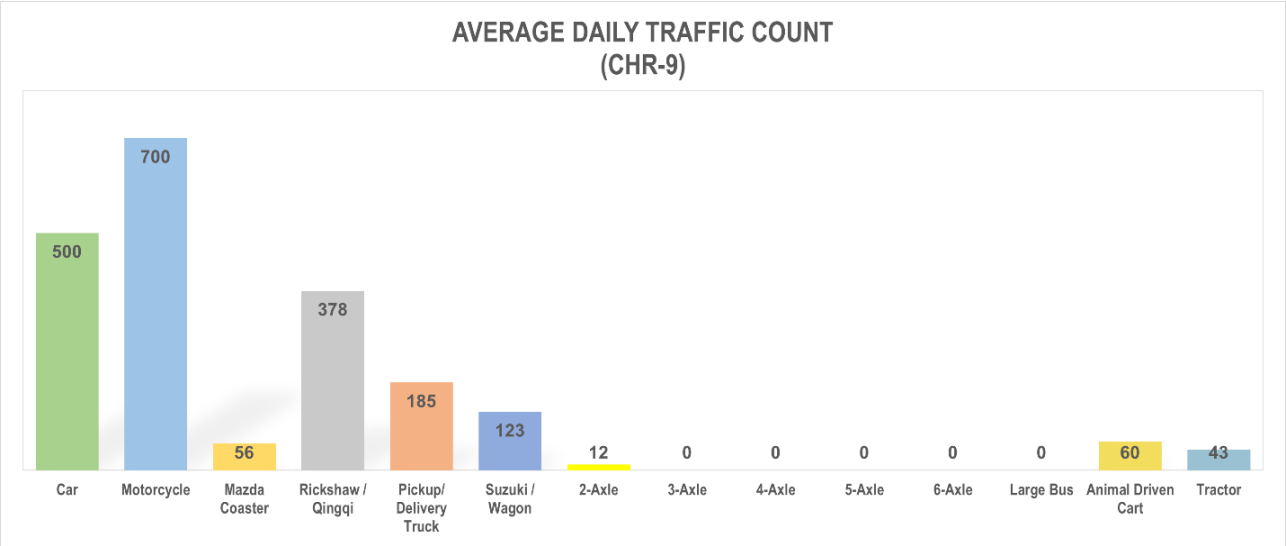


Figure 3.4.5 Vehicle Composition of CHR-9

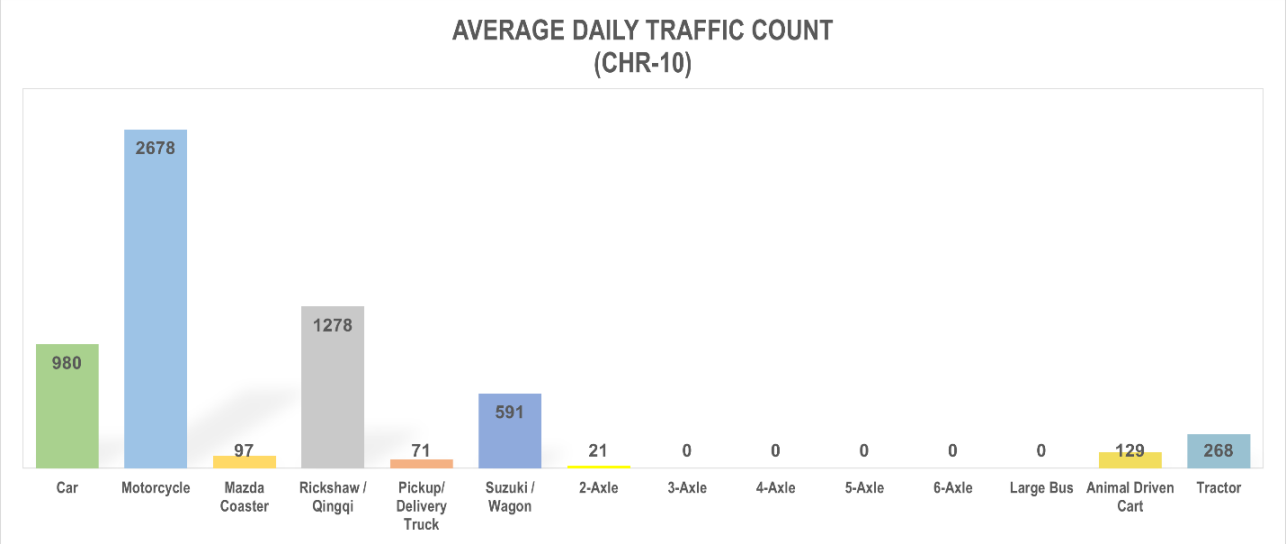


Figure 3.4.6 Vehicle Composition of CHR-10

Most of the vehicles on the subject roads are Cars and Motorcycles. This Vehicle Composition can be attributed to the rural area type of the considered roads. Most of the people travel on these roads in their personal cars or motorcycles due to lack of proper public transport facilities.

The reason we have cars and motorcycles as the majority constituents of the vehicle mix, is because of the diversity of the road users utilizing the facility. Those people that have the available resources and own a car or motorcycle are reluctant of using public transport due to the poor services and condition of vehicles, whereas those people who do not own a private car or motorcycle have no other option then using public transport that constitutes of rickshaws and Suzuki/Wagons as seen in some roads.

3.4.6.3 Traffic Analysis Forecast

ADT:

The ADT Base Year is 2022 and ADT Forecast year is 2032 as can be seen in the table below.

The following table represents the annual daily traffic forecast (10 years).

Table 3.4.5 Existing ADT of Access Roads District Charsadda

Road ID	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
CHR-9	2057	2160	2268	2381	2500	2625	2757	2894	3039	3191	3351
CHR-10	6113	6419	6740	7077	7430	7802	8192	8602	9032	9483	9957

PCU:

The PCU Base Year is 2022 and PCU Forecast year is 2032 as can be seen in the table below.

Table 3.4.6 Existing PCUs of Access Roads District Charsadda

Road ID	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
CHR-9	2241	2353	2471	2594	2724	2860	3003	3153	3311	3477	3650
CHR-10	6465	6788	7128	7484	7858	8251	8664	9097	9552	10029	10531

3.4.7 Discussion and Analysis

The analysis conducted on these roads indicates that the condition of these roads is affecting the traffic characteristic which consequently influences the access of people to necessities of life. The poor condition of these roads is reflected by the Road Surface Type (RST) and International Roughness Index (IRI) pie charts which indicates that these roads need immediate consideration with respect to construction and rehabilitation. The poor mobility of these roads is indicated by the lower speeds and high travel times. Reconstructing these roads will improve speeds and lower travel times of users.

The utility of these roads in providing access to necessities like education, health, and markets will be enhanced with the improvement in road condition after reconstruction.

3.5 Project Area - Chitral

District Chitral is the largest district in the Khyber-Pakhtunkhwa province of Pakistan, covering an area of 14,850 km². It is a part of the Malakand Division and is the northernmost district of Pakistan. It shares a border with Gilgit-Baltistan to the east, with Kunar, Badakshan and Nuristan provinces of Afghanistan to the north and west, and with the Khyber-Pakhtunkhwa districts of Swat and Dir to the south. A narrow strip of Wakhan Corridor separates Chitral from Tajikistan in the north.

3.5.1 Priority Roads in District Chitral

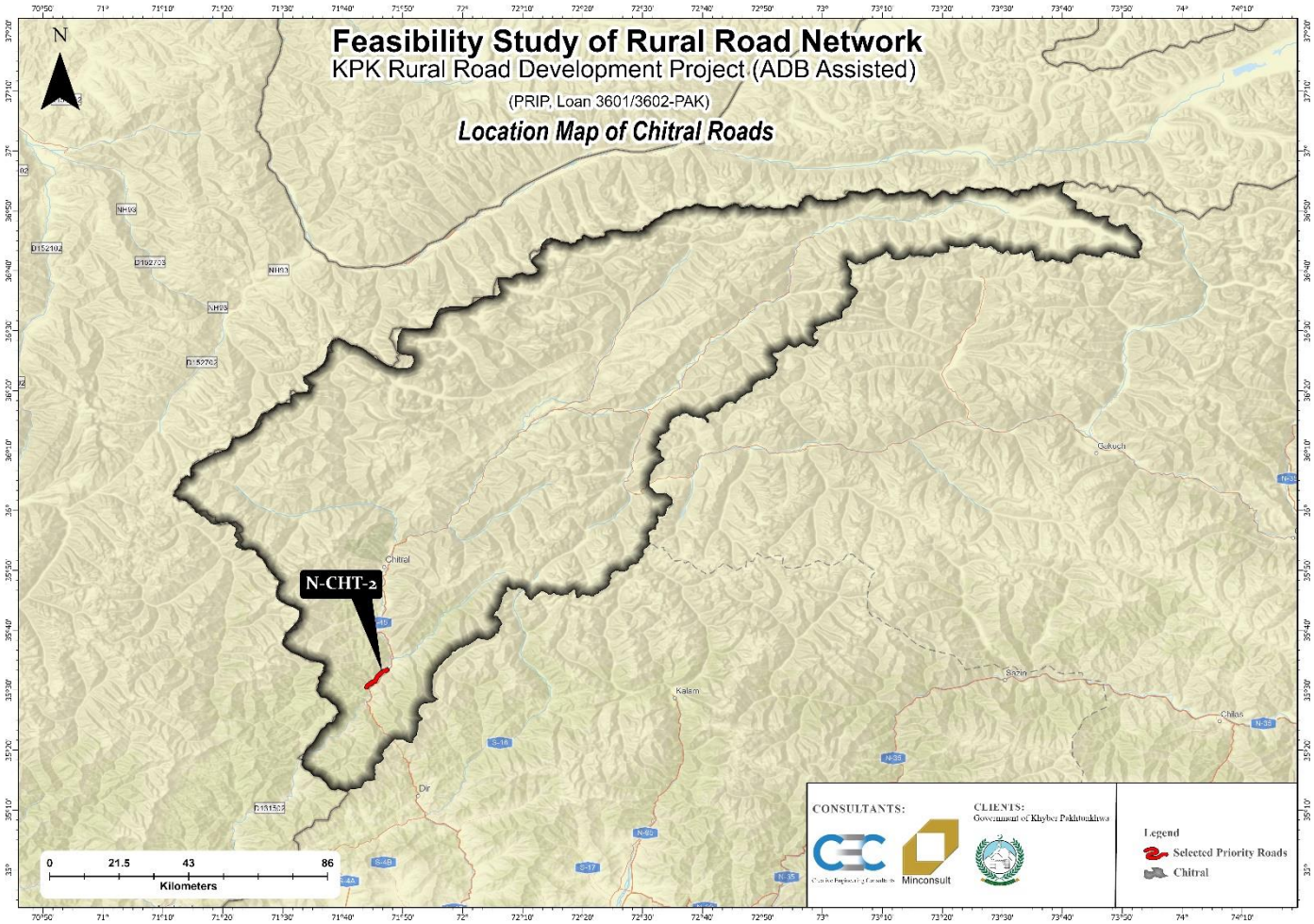
The following roads have been found feasible for Rural Road Development Project in District Chitral.

Table 3.5.1 Access Roads in Chitral

#	ID	Road Name	Districts	FL	Type
1	**N-CHT-2**	Osaic To Orsoon	Chitral	22.0	Access

3.5.2 Location Map of Priority Roads

All the access roads selected for traffic study after scrutinization of the surveyed roads in the district are shown in the figure below.



Map 3.5.1 Location Map Chitral

3.5.2.1 N-CHT-2 (Osaic to Orsoon)

. This road is situated along the Chitral river in Drosh, to the east of Dir-Chitral Road and provides access to Sweer Bala and Damik villages of Drosh. The length of the road is 9.3 km. Survey conducted to assess road condition shows that 60% of the road is in average condition while 30% is in poor condition. A small portion of about 10% is relatively in good condition. 60% of the road is earthen and about 28% is TST. A Small portion of 5% of total road length is asphaltic.

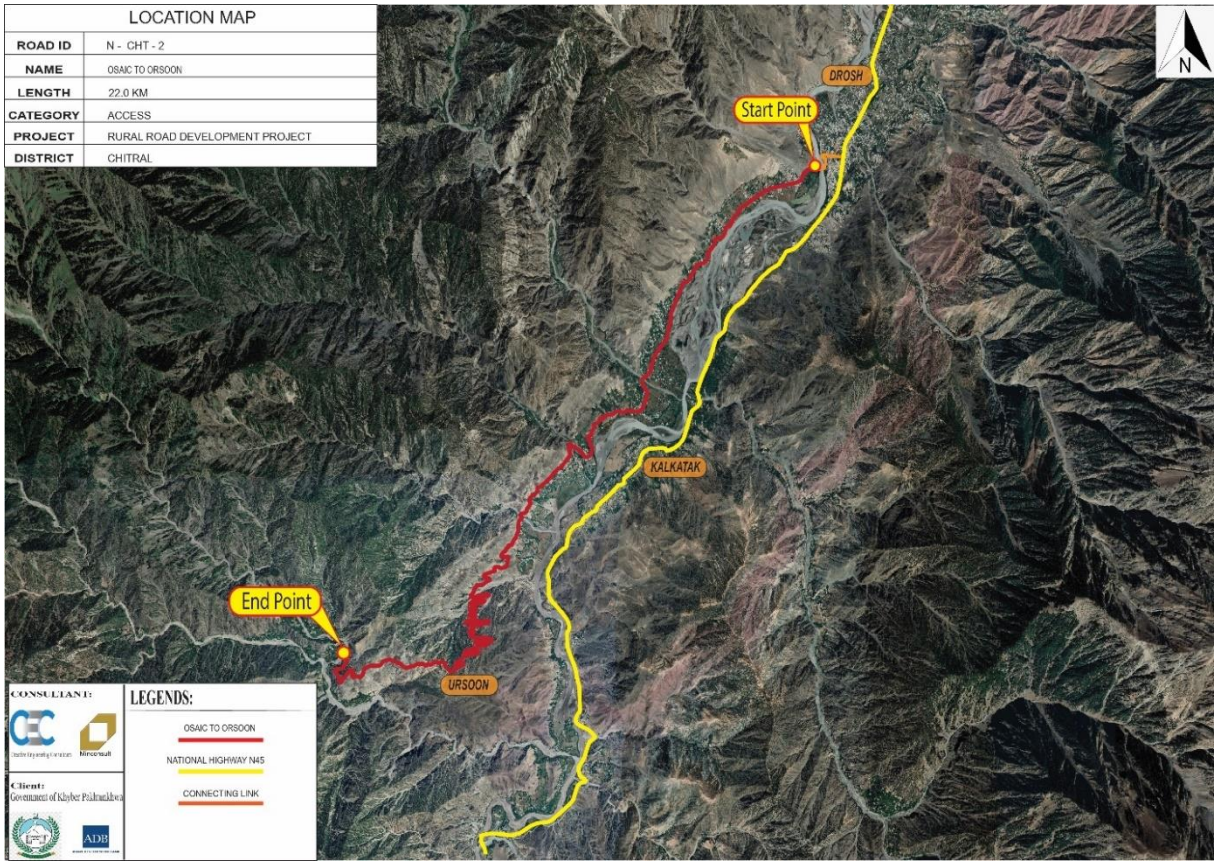


Figure 3.5.1 Location Map N-CHT-2

3.5.3 IRI Classification Pie Chart of Selected Roads

The International Roughness Index (IRI) is used by highway professionals throughout the world as a standard to quantify road surface roughness. A poor road surface roughness influences the traffic speeds and times. It also effects the mobility and accesibility of users traversing that road.

The IRI Classification Charts for are given below.

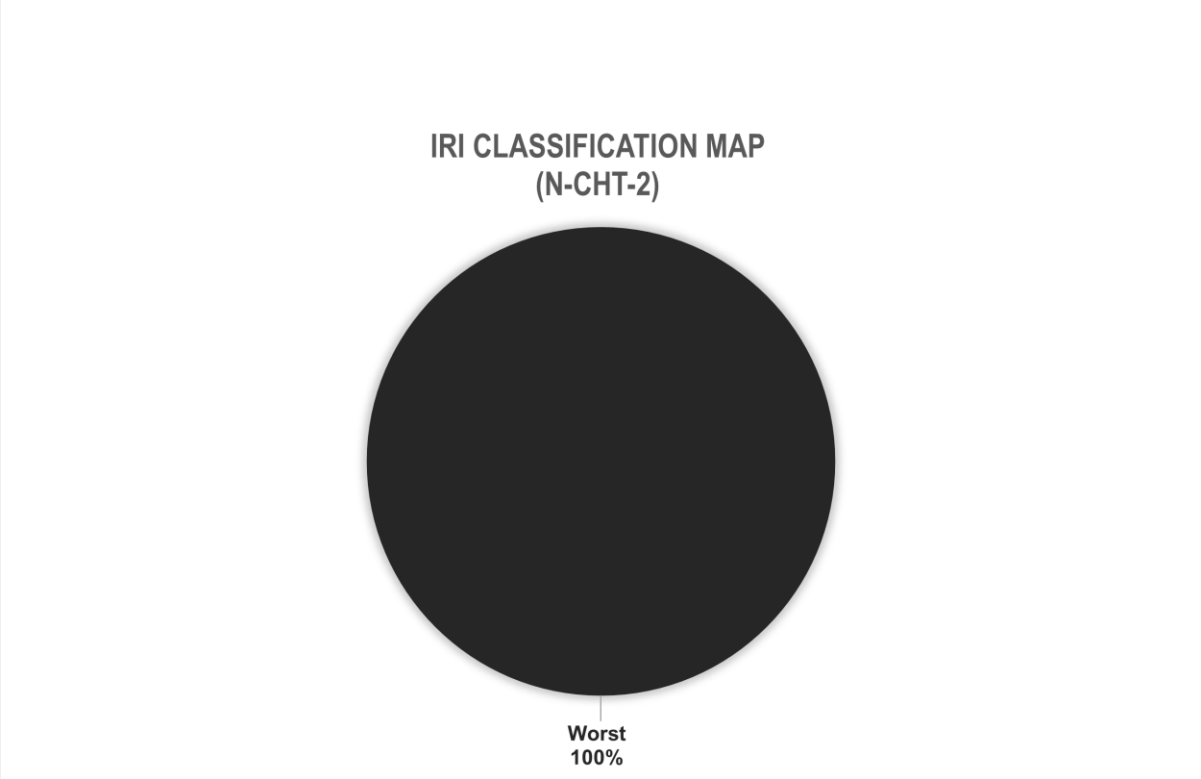


Figure 3.5.2 IRI Classification Chart of Access Road District Chitral

3.5.4 RST Pie Chart of Selected Roads

Road Surface type (RST) survey was conducted to investigate the actual condition and type of surface of the road under observation. In rural areas earthen or kacha tracks and TST/DST are common that affect the mobility of road users and accessibility to necessities.

The RST Classification Charts for are given below.

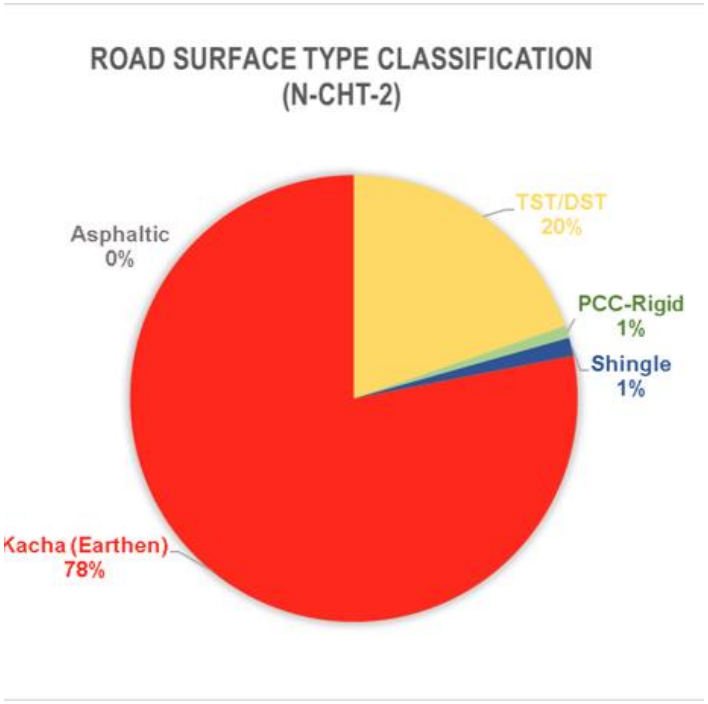


Figure 3.5.3 RST Classification Chart of Access Road District Chitral

3.5.5 Travel Speed Survey

Table 3.5.2 Travel Speed Survey of Access Roads District Chitral

Road ID	Distance (km)	Total Ascent (m)	Total Descent (m)	Total Time	Average Speed (km/h)	Avg. Moving Speed (km/h)	Maximum Speed (km/h)
N-CHT-2	9.1	172	231	38:54.0	14.34	14.34	89.4

The travel speeds for all roads are low due to the deteriorated road condition which is reflected from the RST and IRI pie charts. Mobility of the road users is affected as indicated by lower average speeds and higher travel times, which can be attributed to the poor road conditions.

It can be inferred from these observations that these roads need to be reconstructed for better mobility and access of people to basic livelihood necessities.

3.5.6 Traffic Analysis

3.5.6.1 Summary of Existing Average Daily Traffic (ADT)

The summary of traffic counts obtained is given in the following Table.

ADT's

Table 3.5.3 Existing ADT of Access Roads District Chitral

Road ID	Car	Motorcycle	Mazda Coaster	Rickshaw / Q.chi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	TOTAL Vehicles
N-CHT-2	9	5	8	0	0	0	0	0	0	0	0	0	0	3	25

PCUs

Table 3.5.4 Existing PCUs of Access Roads District Chitral

Road ID	Car	Motorcycle	Mazda Coaster	Rickshaw / Qingqi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	Total PCUS
N-CHT-2	9	3	16	0	0	0	0	0	0	0	0	0	0	12	40

3.5.6.2 Composition Of Vehicle Types

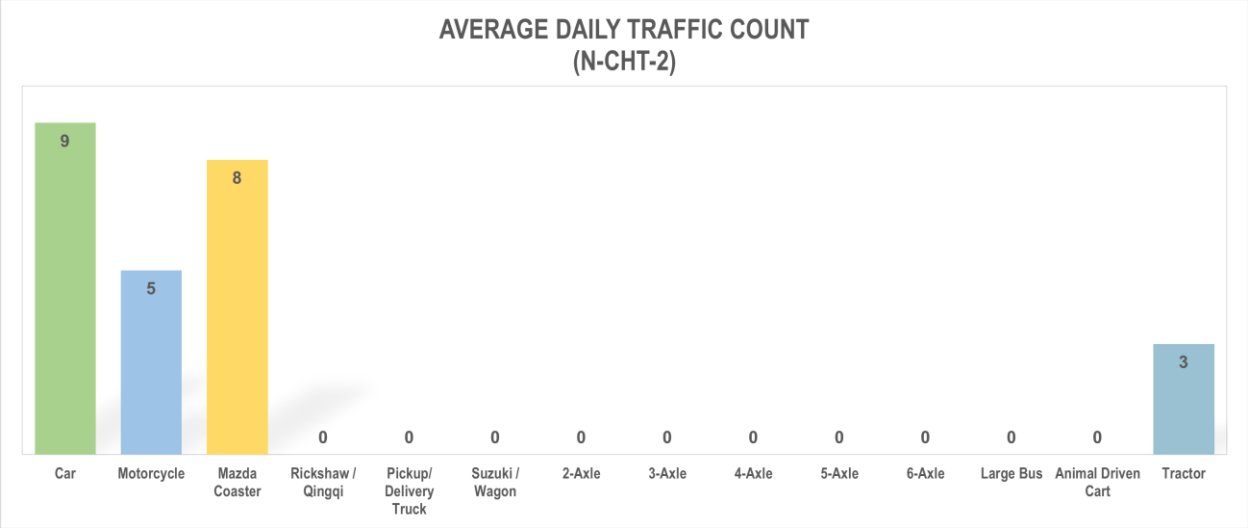


Figure 3.5.4 Vehicle Composition N-CHT-2

Most of the vehicles on the subject roads are Cars and Motorcycles. This Vehicle Composition can be attributed to the rural area type of the considered roads. Most of the people travel on these roads in their personal cars or motorcycles due to lack of proper public transport facilities.

The reason we have cars and motorcycles as the majority constituents of the vehicle mix, is because of the diversity of the road users utilizing the facility. Those people that have the available resources and own a car or motorcycle are reluctant of using public transport due to the poor services and condition of vehicles, whereas those people who do not own a private car or motorcycle have no other option then using public transport that constitutes of rickshaws and Suzuki/Wagons as seen in some roads.

3.5.6.3 Traffic Analysis Forecast

ADT:

The ADT Base Year is 2022 and ADT Forecast year is 2032 as can be seen in the table below.

The following table represents the annual daily traffic forecast (10 years).

Table 3.5.5 Forecast ADT of Access Roads District Chitral

Road ID	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
N-CHT-2	25	26	28	29	30	32	34	35	37	39	41

PCU:

The PCU Base Year is 2022 and PCU Forecast year is 2032 as can be seen in the table below.

Table 3.5.6 Forecast PCUs of Access Roads District Chitral

Road ID	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
N-CHT-2	40	41	44	46	48	50	53	56	58	61	64

3.5.7 Discussion and Analysis

The analysis conducted on these roads indicates that the condition of these roads is affecting the traffic characteristics which consequently influence the access of people to necessities of life. The poor condition of these roads is reflected by the Road Surface Type (RST) and International Roughness Index (IRI) pie charts which indicates that these roads need immediate consideration with respect to construction and rehabilitation. The poor mobility of these roads is indicated by the lower speeds and high travel times. Reconstructing these roads will improve speeds and lower travel times of users.

The utility of these roads in providing access to necessities like education, health, and markets will be enhanced with the improvement in road condition after reconstruction.

3.6 Project Area- Dir Lower

Lower Dir is a district in Malakand Division of Khyber Pakhtunkhwa province in Pakistan covering an area of 1583 km². The town of Timergara is the district headquarter. It shares border with upper Dir to the north, Swat to the east and Afghanistan to the west.

3.6.1 Priority Roads in District Dir Lower

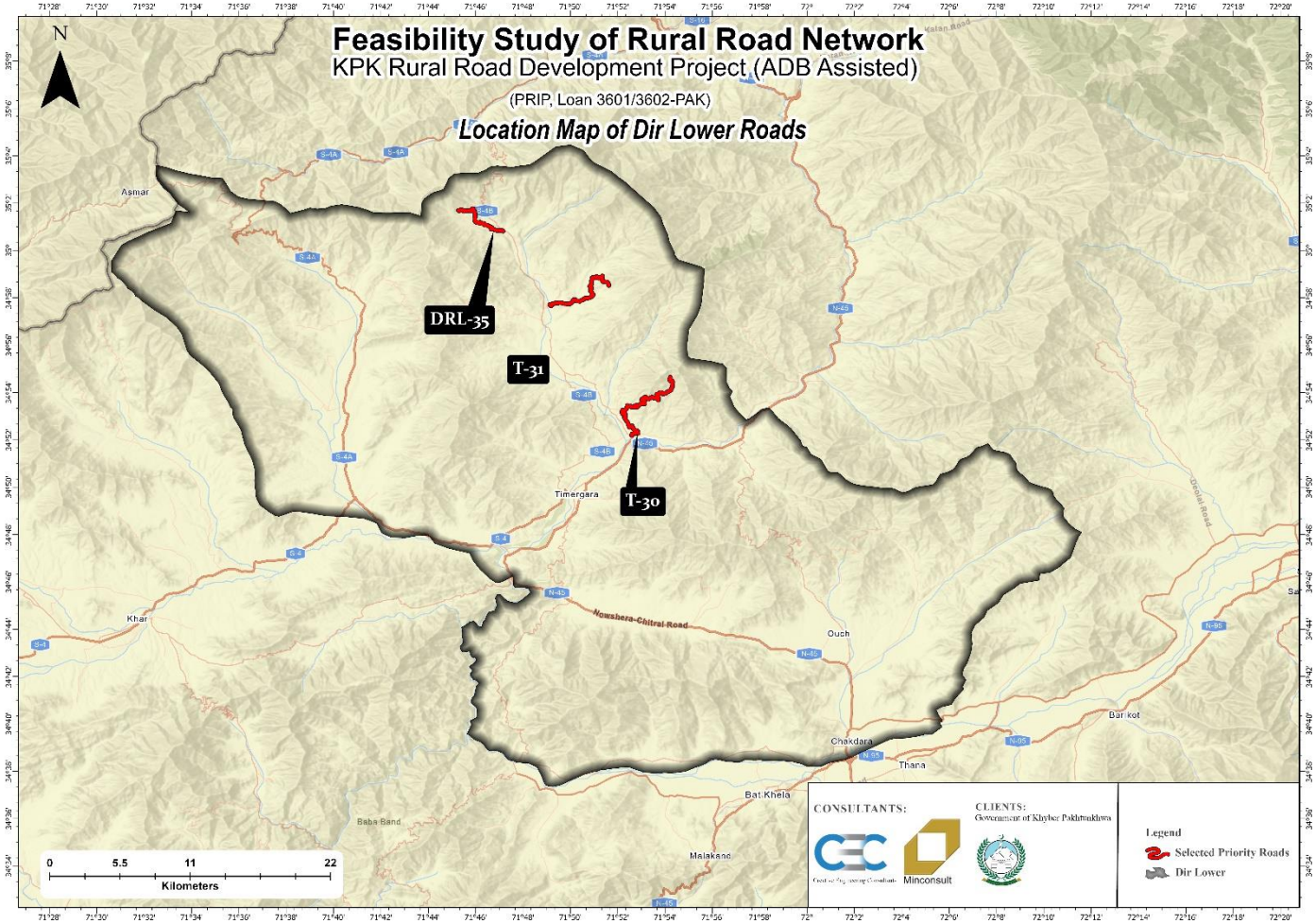
The following roads have been found feasible for Rural Road Development Project in District Dir Lower.

Table 3.6.1 Access Roads in Dir Lower

#	ID	Road Name	District	FL	Type
1	**DRL-35**	Mula Hukam Baba to Sro Gul Khero Shah	Dir Lower	5.20	Access
2	**T-30**	Shorshing Jakra Baba Road	Dir Lower	8.40	Access
3	**T-31**	Malakand College Road	Dir Lower	8.0	Access

3.6.2 Location Map of Priority Roads

All the access roads selected for traffic study after scrutinization of the surveyed roads in the district are shown in the figure below.



Map 3.6.1 Location Map of Dir Lower

3.6.2.1 DRL-35 (Mula Hukam Baba to Sro Gul Khero Shah)

This road is situated in North-western part of lower Dir district. This road connects villages of Didan Pura and Sarogai with Zaimdara. The road is primarily used for access purposes to these areas. The length of this road is about 5.2 km

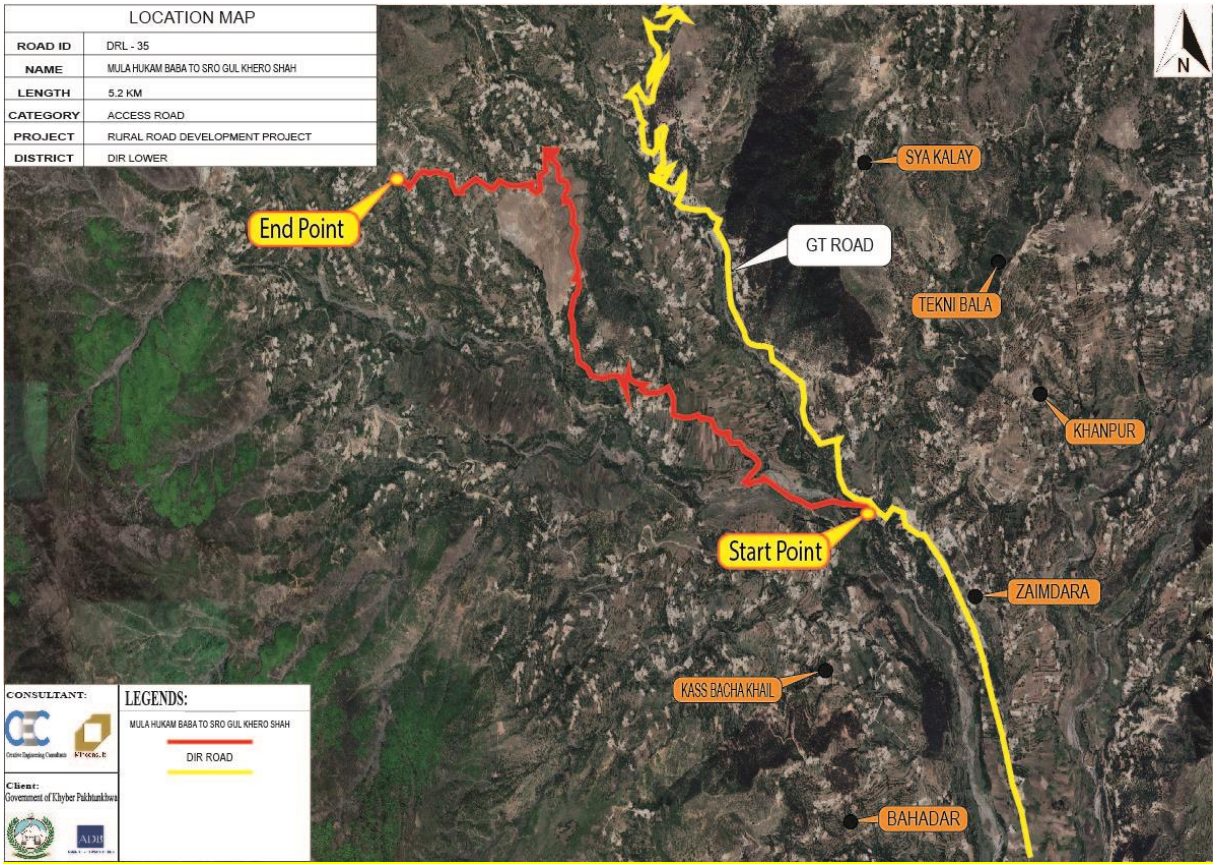


Figure 3.6.1 Location Map of DRl-35

3.6.2.2 T-31 (Pantolo Picnic Spot)

This road provides access to Pantolo picnic point and connects Kambar and Markhani areas of maidan region of lower Dir district of KPK. The road length is 7.7 km. The pavement surface type is mostly TST and asphaltic but a small section of about 10 % of total road length is earthen.

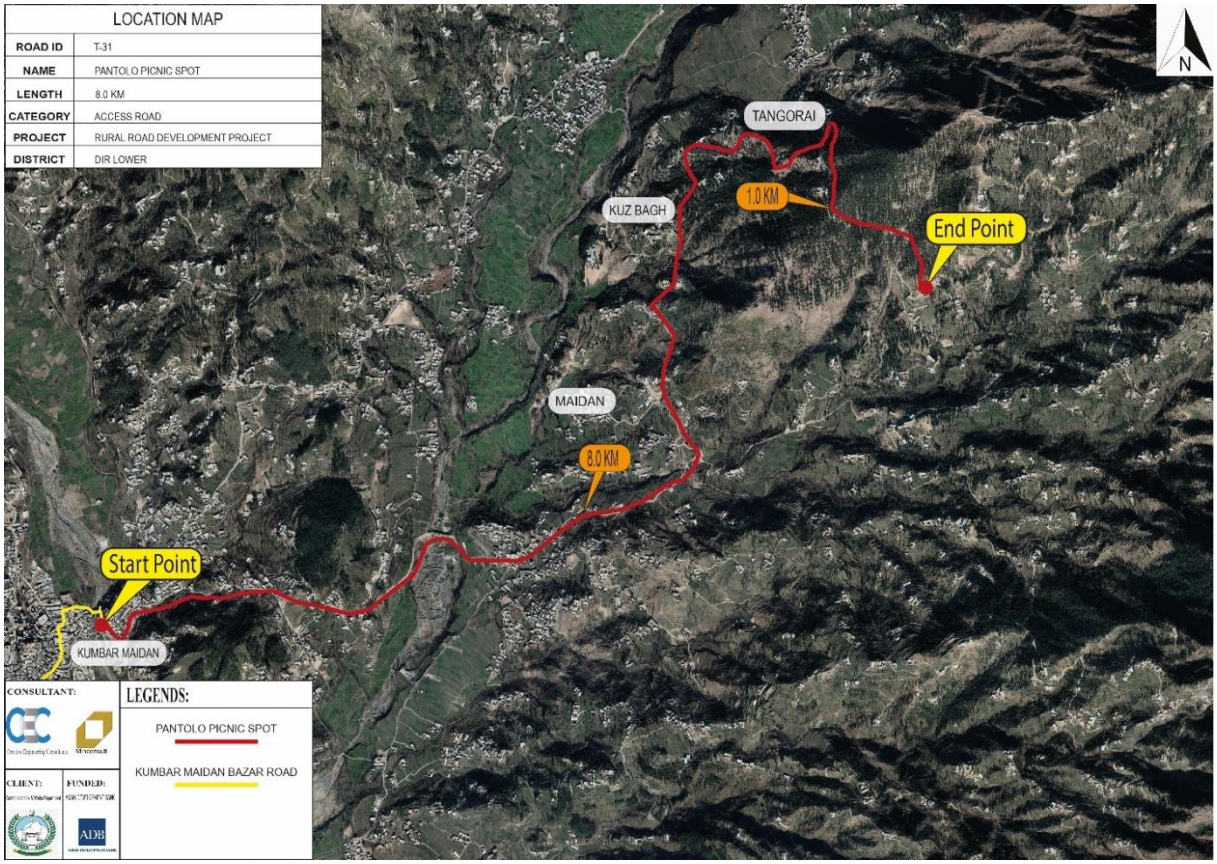


Figure 3.6.2 Location Map T-31

3.6.2.3 T-30 (Sar Banda Munjai Top)

The road is in Dir lower of length 8.93km starting at the Manzary Tangy. The area of the road is mountainous.

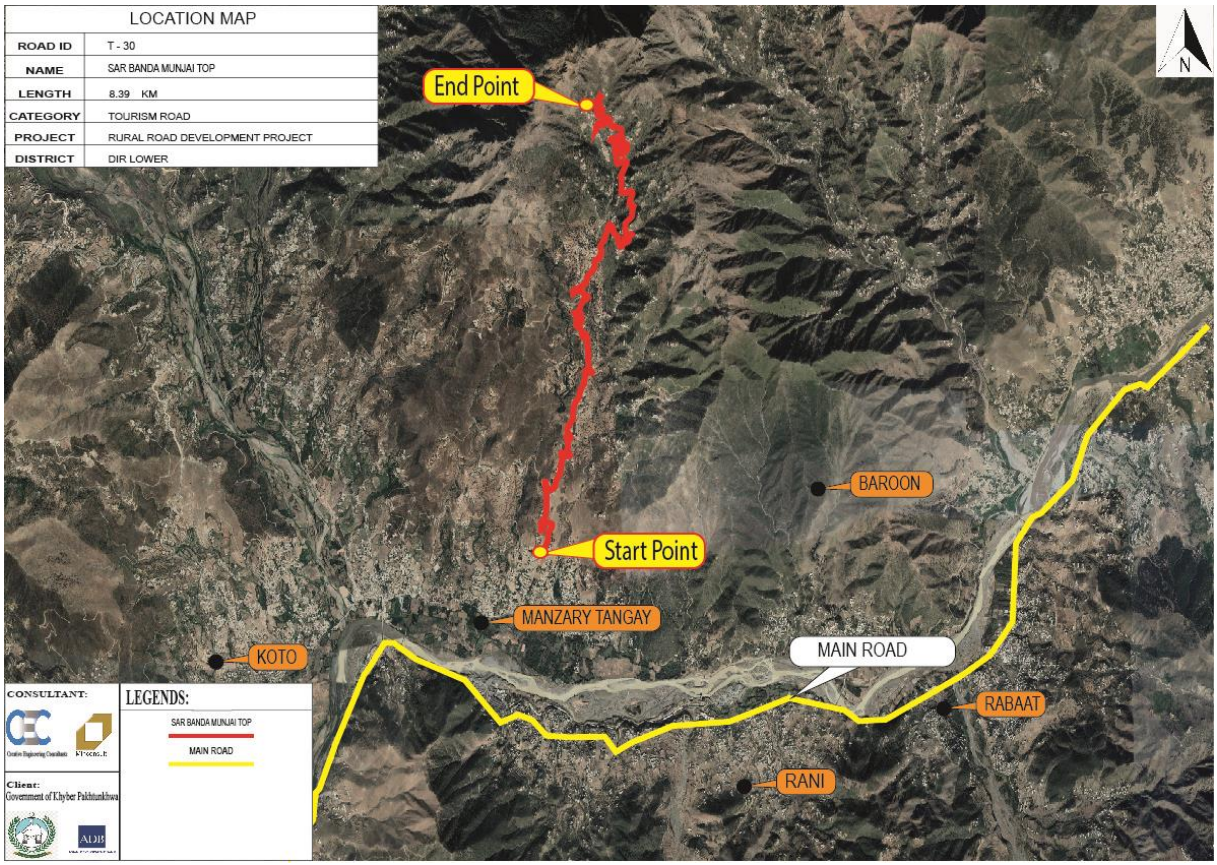


Figure 3.6.3 Location Map of T-30

3.6.3 IRI Classification Pie Chart of Selected Roads

The International Roughness Index (IRI) is used by highway professionals throughout the world as a standard to quantify road surface roughness. A poor road surface roughness influences the traffic speeds and times. It also effects the mobility and accesibility of users traversing that road.

The IRI Classification Charts for are given below.

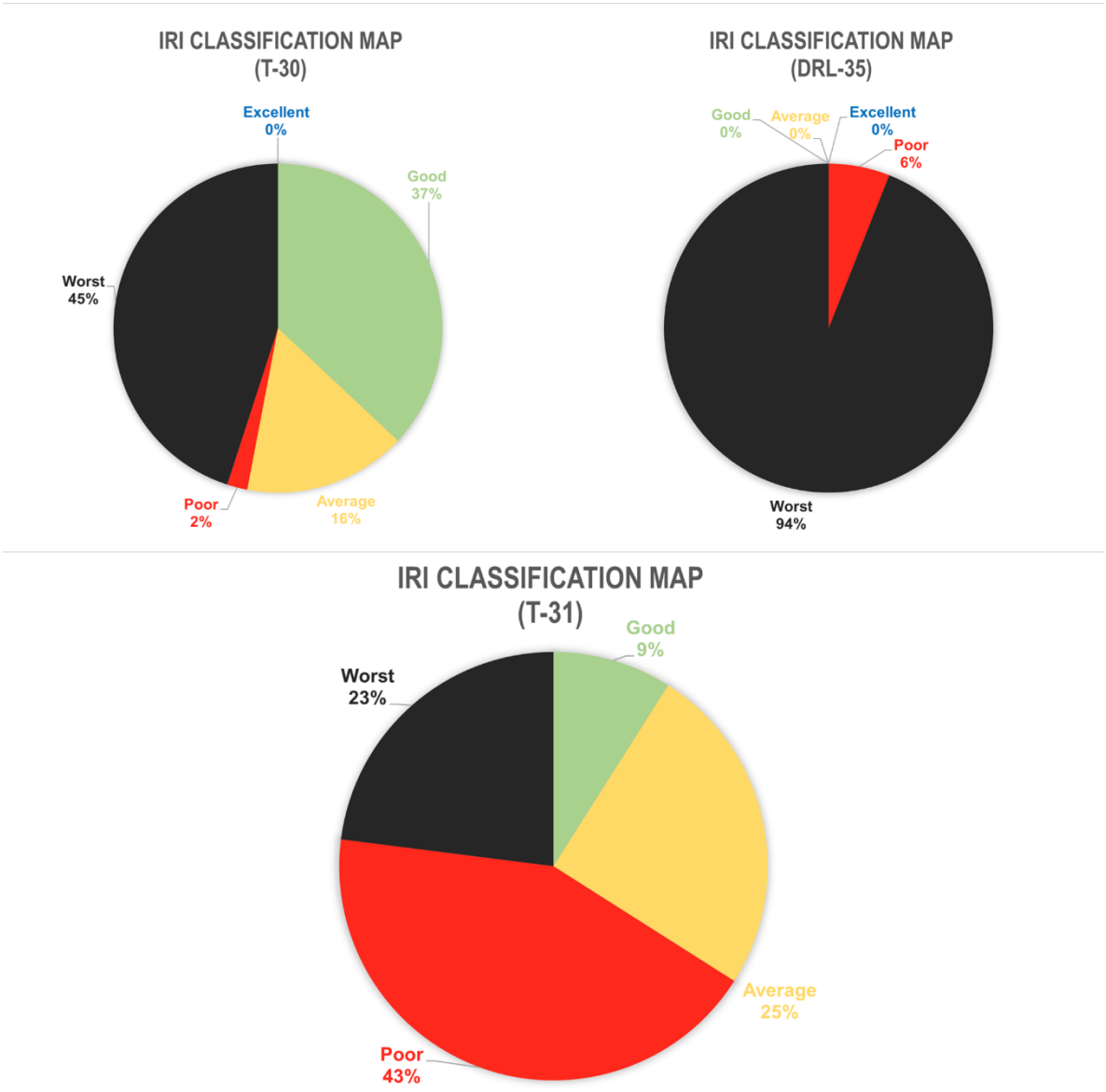


Figure 3.6.4 IRI Classification Chart of Access Roads District Dir Lower

3.6.4 RST Pie Chart of Selected Roads

Road Surface type (RST) survey was conducted to investigate the actual condition and type of surface of the road under observation. In rural areas earthen or kacha tracks and TST/DST are common that affect the mobility of road users and accessibility to necessities.

The RST Classification Charts for are given below.

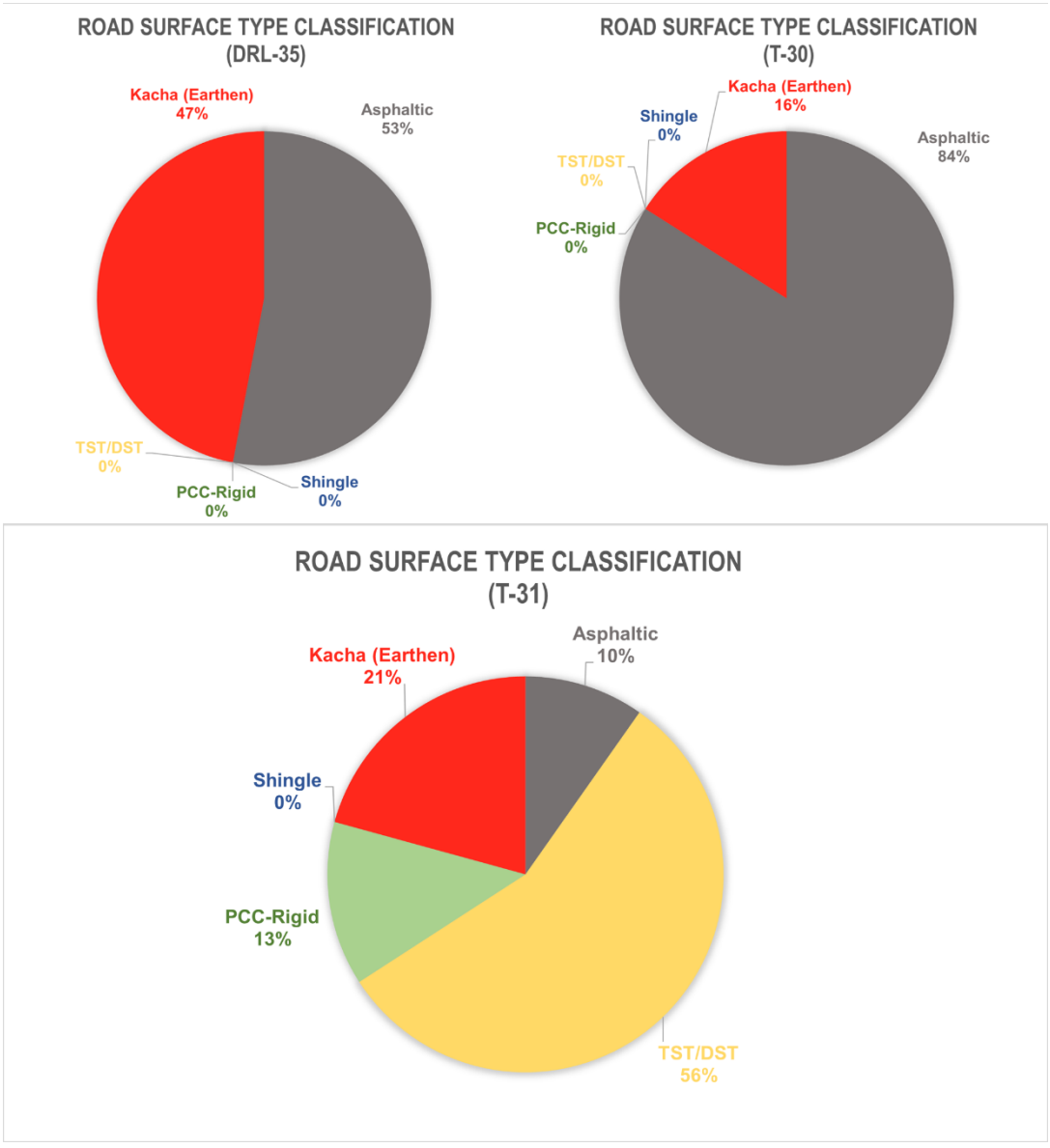


Figure 3.6.5 RST Classification Chart of Access Roads District Dir Lower

3.6.5 Travel Speed Survey

Table 3.6.2 Travel Speed Survey of Access Roads District Dir Lower

Road ID	Distance (km)	Total Ascent (m)	Total Descent (m)	Total Time	Average Speed (km/h)	Avg. Moving Speed (km/h)	Maximum Speed (km/h)
DRL-35	5.22	68	420	37:54.0	8.26	8.34	20.82
T-31	8.0	107	412	39:14.0	11.92	14.12	38.52
T-30	12.731	71	1183	58:23.0	15.01	16.24	40.87

The travel speeds for all roads are low due to the deteriorated road condition which is reflected from the RST and IRI pie charts. Mobility of the road users is affected as indicated by lower average speeds and higher travel times, which can be attributed to the poor road conditions.

It can be inferred from these observations that these roads need to be reconstructed for better mobility and access of people to basic livelihood necessities.

3.6.6 Traffic Analysis

3.6.6.1 Summary of Existing Average Daily Traffic (ADT)

The summary of traffic counts obtained is given in the following Table.

ADT's

Table 3.6.3 Existing ADT of Access Roads District Dir Lower

Road ID	Car	Motorcycle	Mazda Coaster	Rickshaw / Q.chi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	TOTAL Vehicles
DRL-35	40	55	0	0	3	0	4	0	0	0	0	0	0	5	106
T-30	37	21	0	3	6	0	2	0	0	0	0	0	0	5	74
T-31	19	25	0	0	0	3	0	3	0	0	0	0	0	4	54

PCUs

Table 3.6.4 Existing PCUs District of Access Roads Dir Lower

Road ID	Car	Motorcycle	Mazda Coaster	Rickshaw / Qingqi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	Total PCUS
DRL-35	40	28	0	0	4	0	9	0	0	0	0	0	0	20	101
T-30	37	11	0	2	9	0	5	0	0	0	0	0	0	20	84
T-31	19	13	0	0	0	6	0	9	0	0	0	0	0	16	63

3.6.6.2 Composition Of Vehicle Types

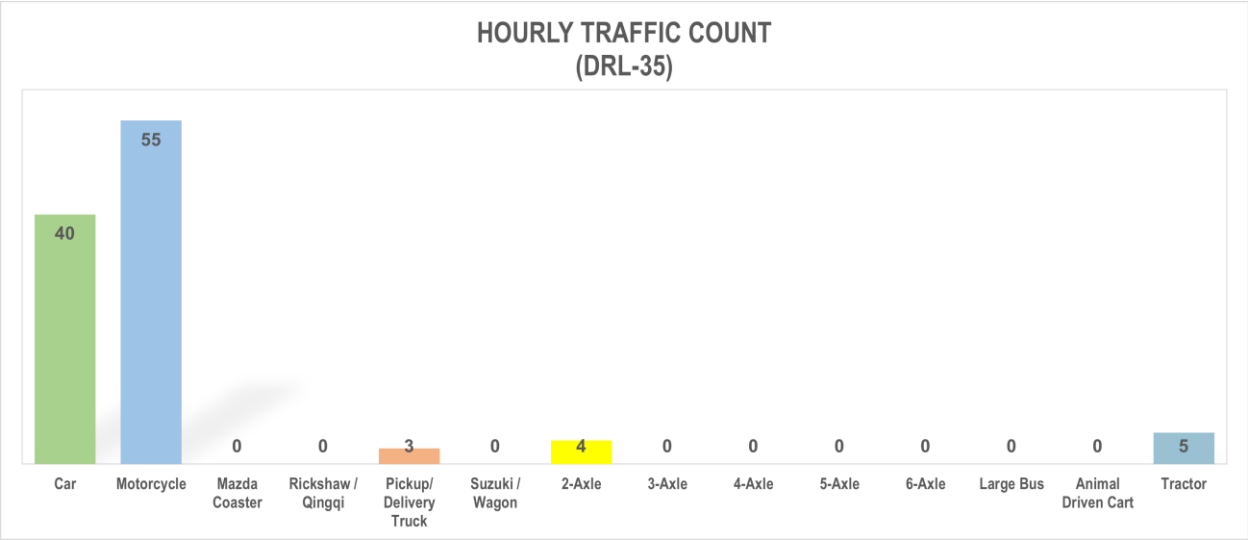


Figure 3.6.6 Vehicle Composition of DRL-35

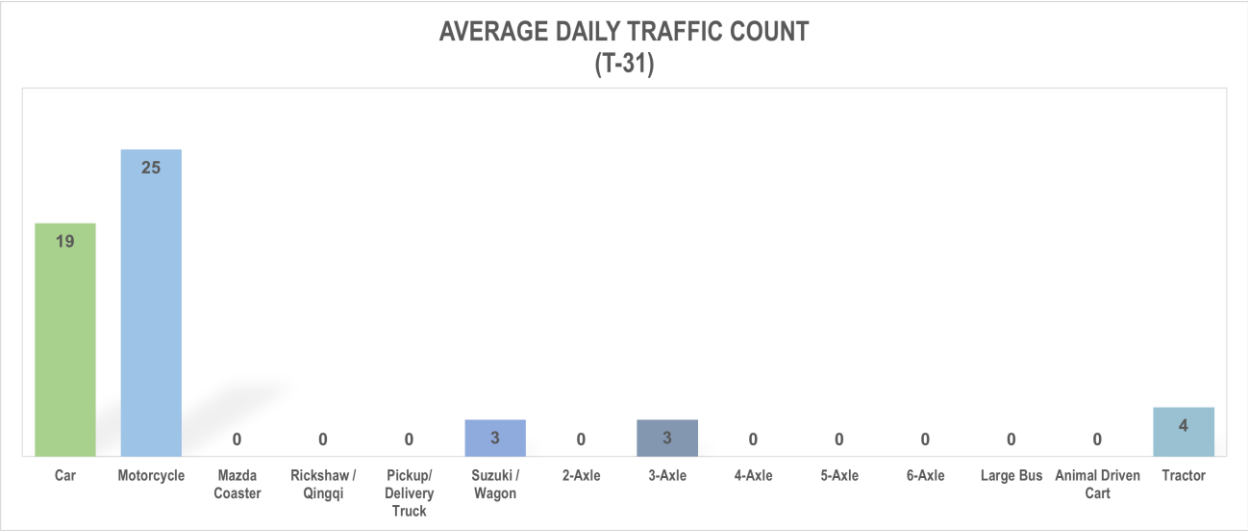


Figure 3.6.7 Vehicle Composition T-31

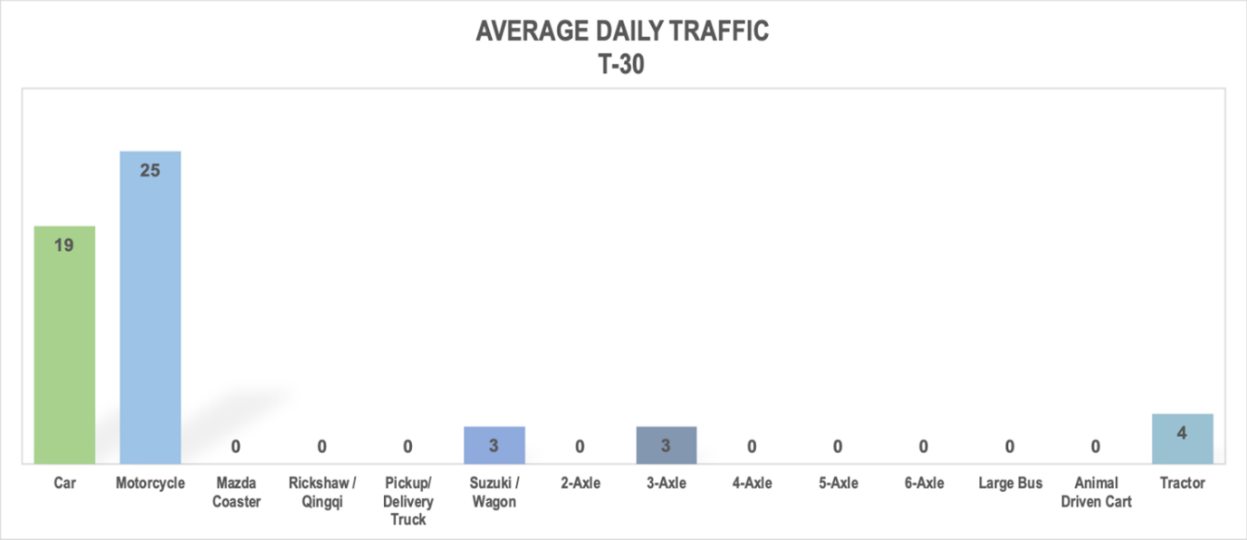


Figure 3.6.8 Vehicle Composition T-30

Most of the vehicles on the subject roads are Cars and Motorcycles. This Vehicle Composition can be attributed to the rural area type of the considered roads. Most of the people travel on these roads in their personal cars or motorcycles due to lack of proper public transport facilities.

The reason we have cars and motorcycles as the majority constituents of the vehicle mix, is because of the diversity of the road users utilizing the facility. Those people that have the available resources and own a car or motorcycle are reluctant of using public transport due to the poor services and condition of vehicles, whereas those people who do not own a private car or motorcycle have no other option then using public transport that constitutes of rickshaws and Suzuki/Wagons as seen in some roads.

3.6.6.3 Traffic Analysis Forecast

ADT:

The ADT Base Year is 2022 and ADT Forecast year is 2032 as can be seen in the table below.

The following table represents the annual daily traffic forecast (10 years).

Table 3.6.5 Forecast ADT of Access Roads District Dir Lower

Road ID	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
DRL-35	**106**	112	117	123	129	136	142	150	157	165	173
T-30	74	78	82	86	90	94	99	104	109	115	121
T-31	54	57	60	63	66	69	72	76	80	84	88

PCU:

The PCU Base Year is 2022 and PCU Forecast year is 2032 as can be seen in the table below.

Table 3.6.6 Forecast PCUs of Access Roads District Dir Lower

Road ID	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
DRL-35	**101**	106	111	116	122	128	135	142	149	156	164
T-30	84	88	92	97	102	107	112	118	124	130	130
T-31	63	66	69	72	76	80	84	88	92	97	102

3.6.7 Discussion and Analysis

The analysis conducted on these roads indicates that the condition of these roads is affecting the traffic characteristic which consequently influences the access of people to necessities of life. The poor condition of these roads is reflected by the Road Surface Type (RST) and International Roughness Index (IRI) pie charts which indicates that these roads need immediate consideration with respect to construction and rehabilitation. The poor mobility of these roads is indicated by the lower speeds and high travel times. Reconstructing these roads will improve speeds and lower travel times of users.

The utility of these roads in providing access to necessities like education, health, and markets will be enhanced with the improvement in road condition after reconstruction.

3.7 Project Area- Karak

Karak is a district in Kohat Division of Khyber Pakhtunkhwa province in Pakistan. It is situated to the south of Kohat District and on the north side of Bannu and Lakki Marwat districts on the main Indus Highway between Peshawar and Karachi – it is 123 km from the provincial capital Peshawar.

3.7.1 Priority Roads in District Karak

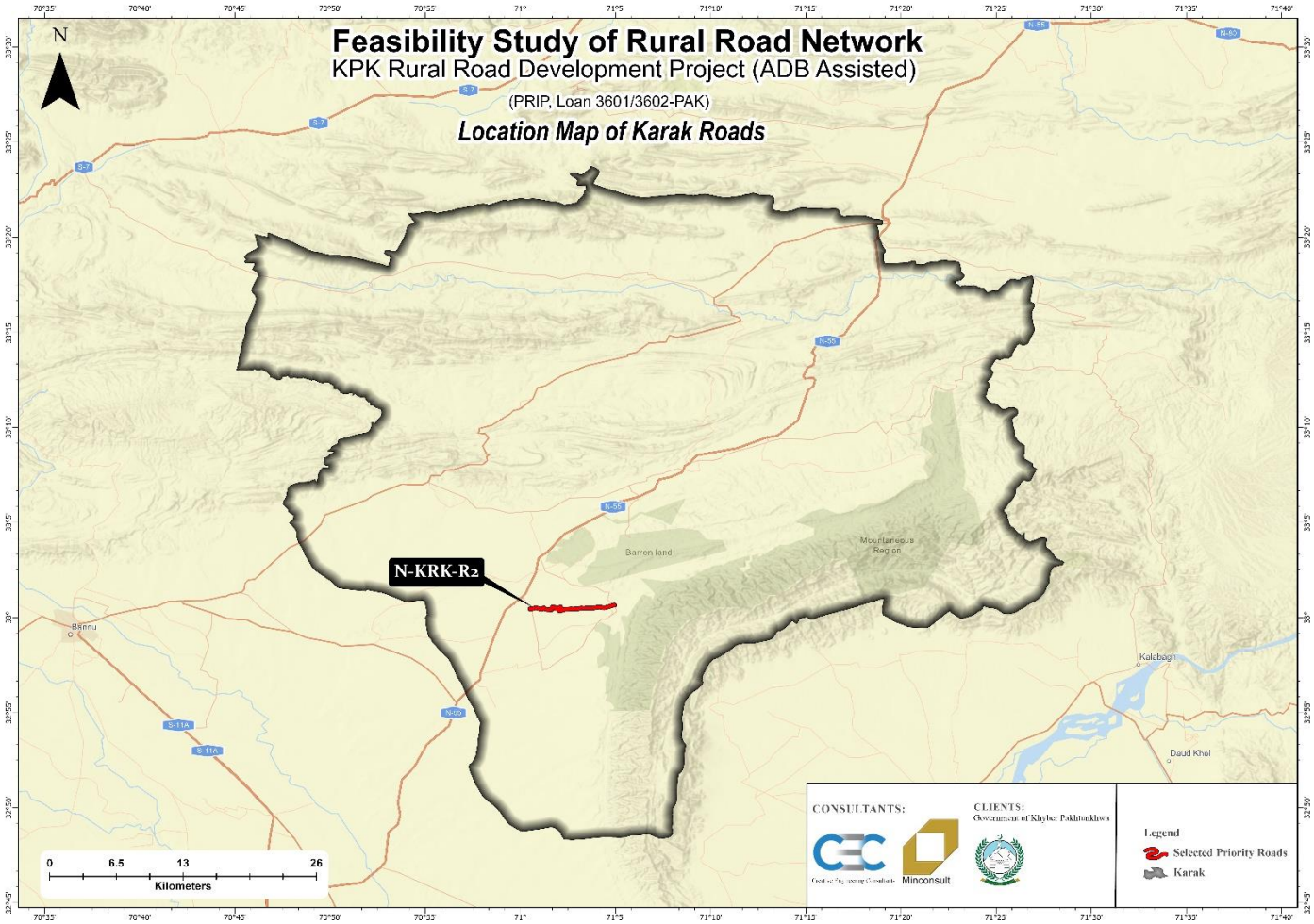
The following roads have been found feasible for Rural Road Development Project in District Karak.

Table 3.7.1 Access Roads in Karak

#	ID	Road Name	Districts	FL	Type
1	N-KRK-R2	Takhate Nasrati Bridge to Khadda Banda via Bhogara Culvert Rose Baig Khail Kalah	Karak	10	Access

3.7.2 Location Map of Priority Roads

All the access roads selected for traffic study after scrutinization of the surveyed roads in the district are shown in the figure below.



Map 3.7.1 Location Map of Karak

3.7.2.1 N-KRK-R2 (Takhate Nasrati Bridge to Khadda Banda via Bhogara Culvert Rose Baig Khail Kalah)

The Takhate Nasrati Bridge to Khadda Banda via Bhogara Culvert Rose Baig Khail Kalah Road, spanning approximately 10 kilometers in District Karak, serves as a vital access route connecting communities and facilitating essential transportation needs. This road is the backbone of the region, linking various settlements and enabling the smooth flow of goods and services. It plays a pivotal role in fostering economic activities, allowing businesses to thrive and communities to prosper.

The journey culminates at Khadda Banda, where this road continues to serve as a lifeline for the local community, connecting them to markets and vital services. In essence, the Takhate Nasrati Bridge to Khadda Banda via Bhogara Culvert Rose Baig Khail Kalah Road is the lifeblood of the region, fostering connectivity, economic growth, and an improved quality of life for its residents.

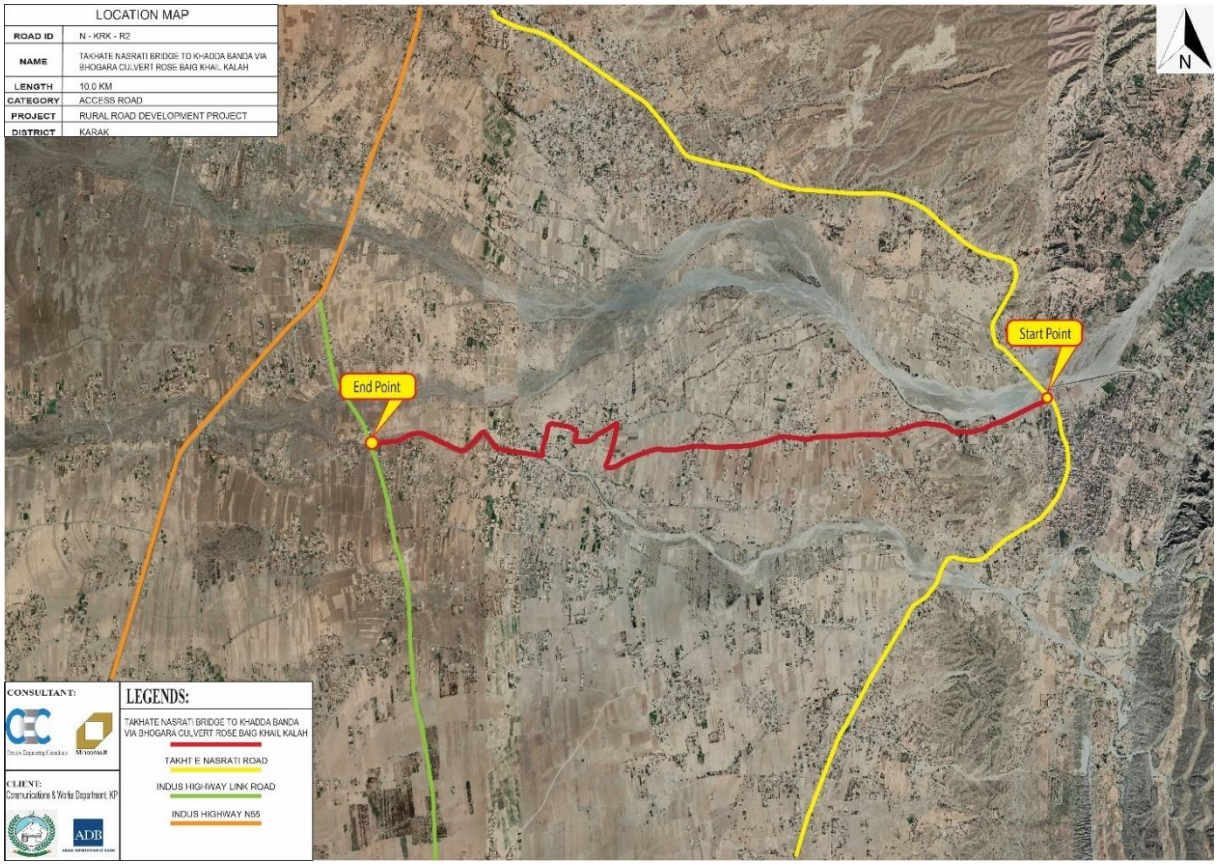


Figure 3.7.1 Location Map of N-KRK-R2

3.7.3 IRI Classification Pie Chart of Selected Roads

The International Roughness Index (IRI) is used by highway professionals throughout the world as a standard to quantify road surface roughness. A poor road surface roughness influences the traffic speeds and times. It also effects the mobility and accesibility of users traversing that road.

The IRI Classification Charts for are given below.

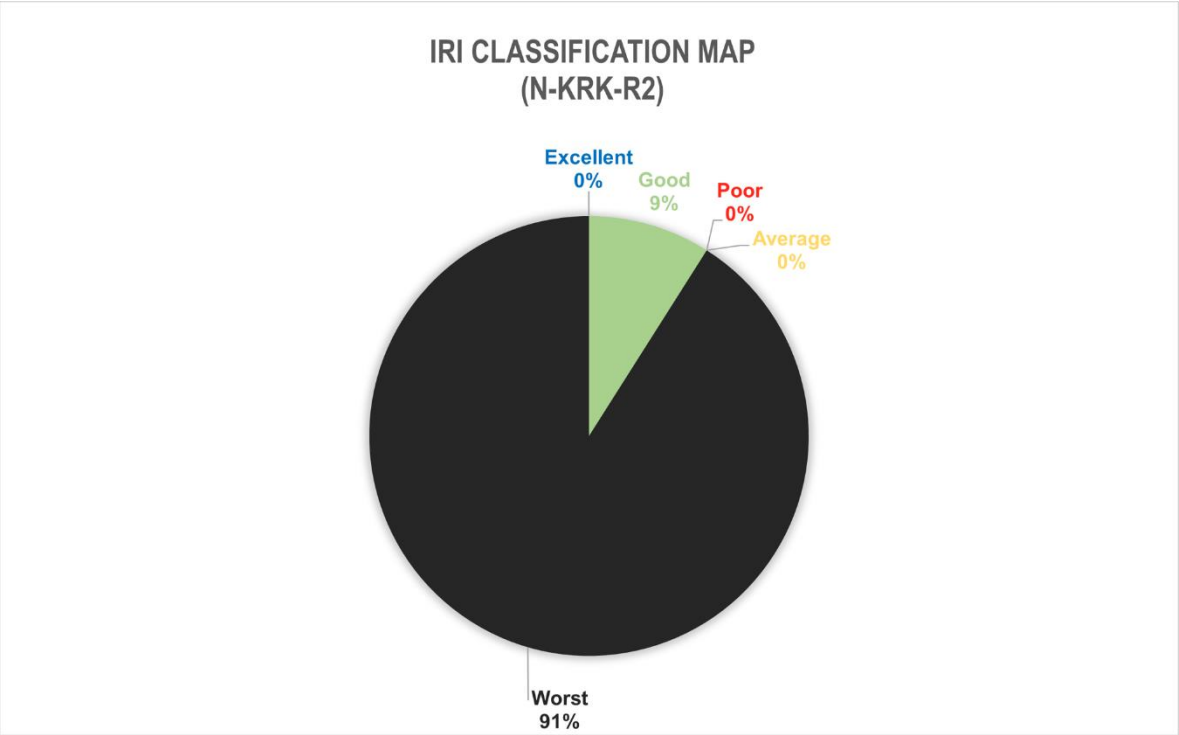


Figure 3.7.2 IRI Classification Chart of Access Road District Karak

3.7.4 RST Pie Chart of Selected Roads

Road Surface type (RST) survey was conducted to investigate the actual condition and type of surface of the road under observation. In rural areas earthen or kacha tracks and TST/DST are common that affect the mobility of road users and accessibility to necessities.

The RST Classification Charts for are given below.

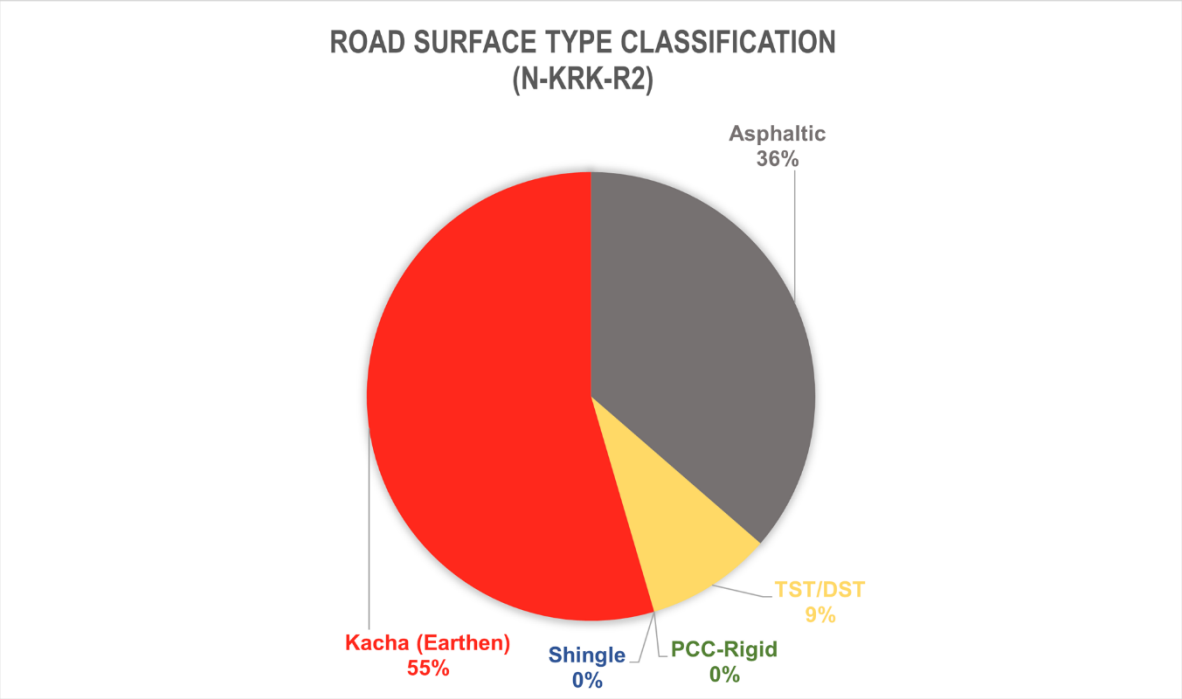


Figure 3.7.3 RST Classification Chart of Access Road District Karak

3.7.5 Travel Speed Survey

Table 3.7.2 Travel Speed Survey of Access Roads District Karak

Road ID	Distance (km)	Total Ascent (m)	Total Descent (m)	Total Time	Average Speed (km/h)	Avg. Moving Speed (km/h)	Maximum Speed (km/h)
N-KRK-R2	9.8	76	151	23.33	20.15	35.41	70.07

The travel speeds for all roads are low due to the deteriorated road condition which is reflected from the RST and IRI pie charts. Mobility of the road users is affected as indicated by lower average speeds and higher travel times, which can be attributed to the poor road conditions.

It can be inferred from these observations that these roads need to be reconstructed for better mobility and access of people to basic livelihood necessities.

3.7.6 Traffic Analysis

3.7.6.1 Summary of Existing Average Daily Traffic (ADT)

The summary of traffic counts obtained is given in the following Table.

ADT's

Table 3.7.3 Existing ADT of Access Roads District Karak

Road ID	Car	Motorcycle	Mazda Coaster	Rickshaw / Q.chi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	TOTAL Vehicles
N-KRK-R2	41	85	5	25	25	1	11	4	0	0	0	0	26	28	251

PCUs

Table 3.7.4 Existing PCUs of Access Roads District Karak

Road ID	Car	Motorcycle	Mazda Coaster	Rickshaw / Qingqi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	Total PCUS
N-KRK-R2	41	43	10	19	38	3	28	11	0	0	0	0	118	110	420

3.7.6.2 Composition Of Vehicle Types

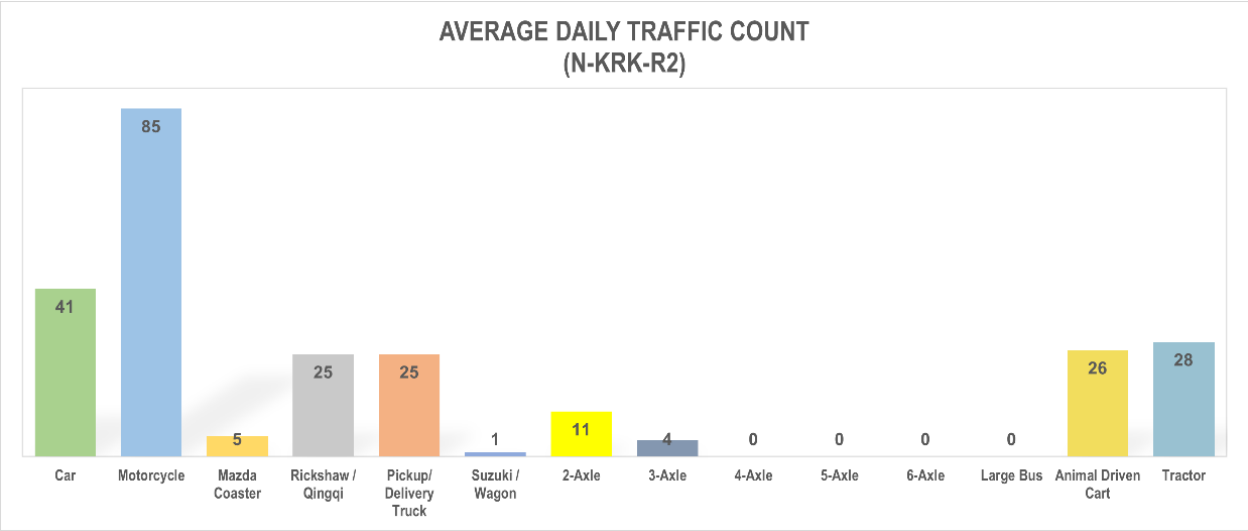


Figure 3.7.4 Vehicle Composition Chart N-KRK-R2

Most of the vehicles on the subject roads are Cars and Motorcycles. This Vehicle Composition can be attributed to the rural area type of the considered roads. Most of the people travel on these roads in their personal cars or motorcycles due to lack of proper public transport facilities.

The reason we have cars and motorcycles as the majority constituents of the vehicle mix, is because of the diversity of the road users utilizing the facility. Those people that have the available resources and own a car or motorcycle are reluctant of using public transport due to the poor services and condition of vehicles, whereas those people who do not own a private car or motorcycle have no other option then using public transport that constitutes of rickshaws and Suzuki/Wagons as seen in some roads.

3.7.6.3 Traffic Analysis Forecast

ADT:

The ADT Base Year is 2022 and ADT Forecast year is 2032 as can be seen in the table below.

The following table represents the annual daily traffic forecast (10 years).

Table 3.7.5 Forecast ADT of Access Roads District Karak

Road ID	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
N-KRK-R2	**251**	264	277	291	305	321	337	354	371	390	409

PCU:

The PCU Base Year is 2022 and PCU Forecast year is 2032 as can be seen in the table below.

Table 3.7.6 Forecast PCUs of Access Roads District Karak

Road ID	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
N-KRK-R2	**416**	437	459	482	506	531	558	586	615	646	678

3.7.7 Discussion and Analysis

The analysis conducted on these roads indicates that the condition of these roads is affecting the traffic characteristic which consequently influences the access of people to necessities of life. The poor condition of these roads is reflected by the Road Surface Type (RST) and International Roughness Index (IRI) pie charts which indicates that these roads need immediate consideration with respect to construction and rehabilitation. The poor mobility of these roads is indicated by the lower speeds and high travel times. Reconstructing these roads will improve speeds and lower travel times of users.

The utility of these roads in providing access to necessities like education, health, and markets will be enhanced with the improvement in road condition after reconstruction.

3.8 Project Area- Kohat

Kohat is a district in Kohat Division of Khyber Pakhtunkhwa province in Pakistan covering area of 2545 sq. km. he population of Kohat district is about 993,874. It shares borders with Dara Adam Khel to the north, Karak to the south and Hangu to the East. Kohat city is the capital of the district.

3.8.1 Priority Roads in District Kohat

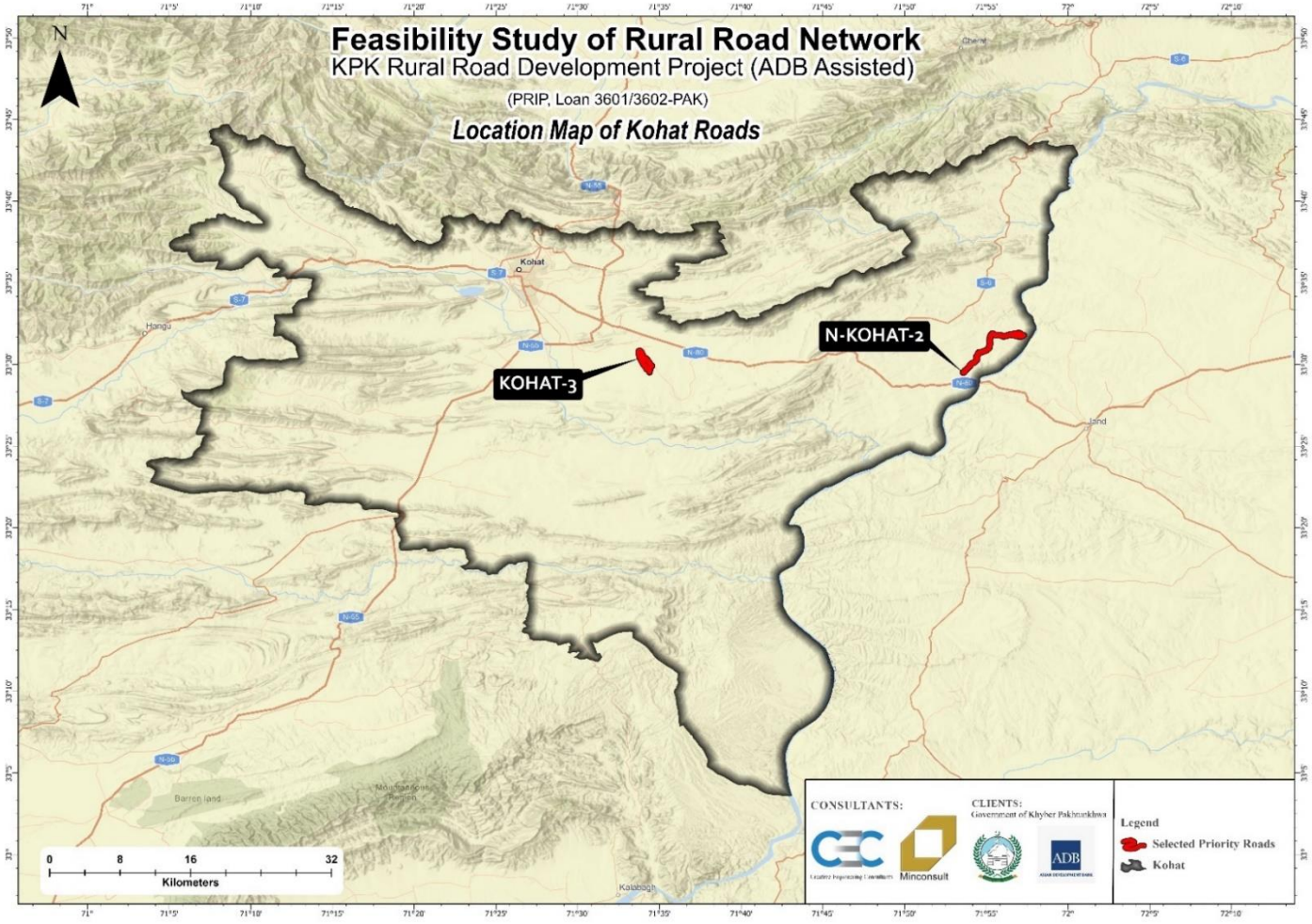
The following roads have been found feasible for Rural Road Development Project in District Kohat.

Table 3.8.1 Access Roads in Kohat

#	ID	Road Name	Districts	FL	Type
1	**KOHAT-3**	From Mukarab Khan Korona to Kot Road	Kohat	5.4	Access
2	**N-KOHAT-2**	Khusal Garh to Kamar Dok Road	Kohat	9.9	Access

3.8.2 Location Map of Priority Roads

All the access roads selected for traffic study after scrutinization of the surveyed roads in the district are shown in the figure below.



Map 3.8.1 Location Map of Kohat

3.8.2.1 KOHAT-3 (From Mukarab Khan Korona to Kot Road)

This road is situated to the east of Bora Ghari and south of billitang in district Kohat. The road starts at Mukarab Khan and connects it to Kot Road. This road provides access to agricultural fields which is the main source of economic activities in the region. The length of this road is 5.46 km. Survey conducted to assess road roughness condition shows that the condition of 11.11% of road is average, 33.33% poor, 55.56% worst. The road surface type is 43% TST, 38% shingle and 19% earthen.

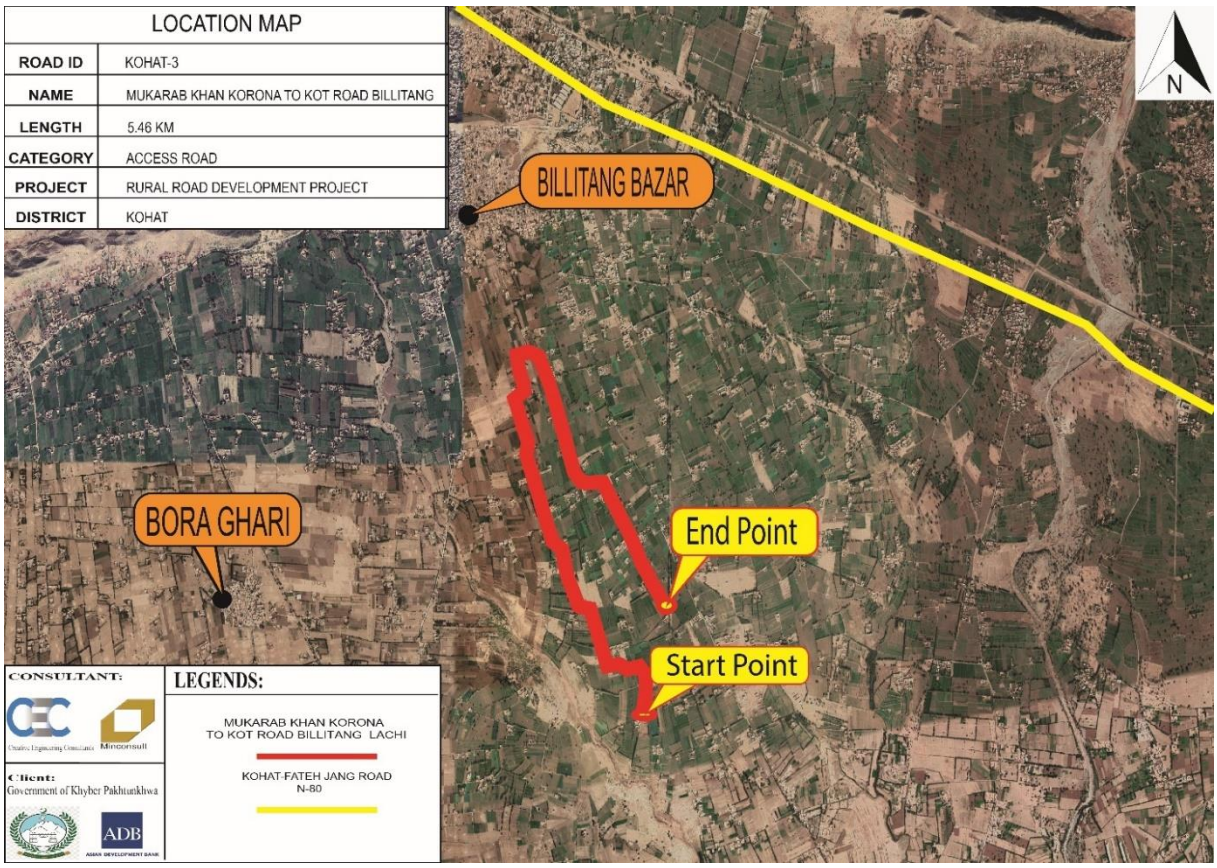


Figure 3.8.1 Location Map of Kohat-3

3.8.2.2 N-KOHAT-2 (Khusal Garh to Kamar Dok Road)

This road is named Qamar Road, located in Khushal Garh union council of Kohat district. The road is 9.9 km long, which includes a short link.

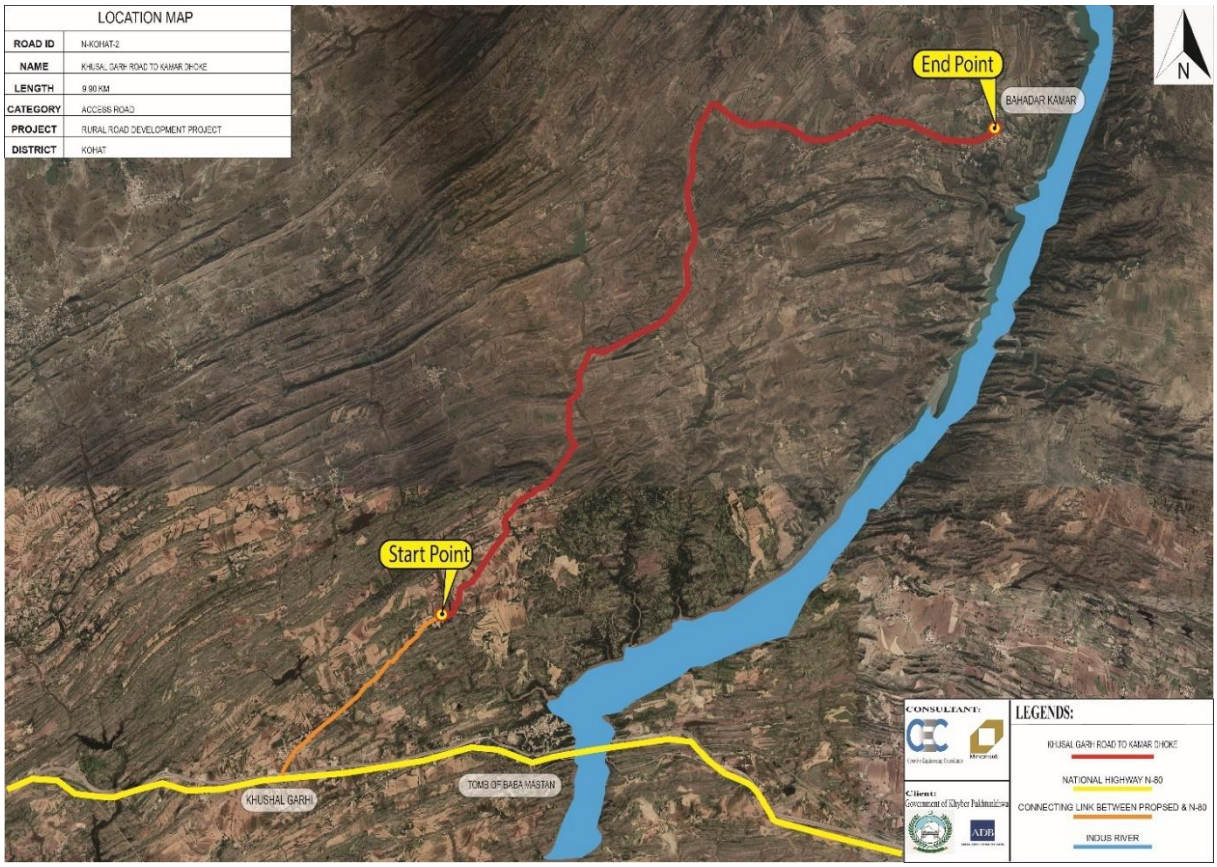


Figure 3.8.2 Location Map of N-KOHAT-2

3.8.3 IRI Classification Pie Chart of Selected Roads

The International Roughness Index (IRI) is used by highway professionals throughout the world as a standard to quantify road surface roughness. A poor road surface roughness influences the traffic speeds and times. It also effects the mobility and accesibility of users traversing that road.

The IRI Classification Charts are given below.

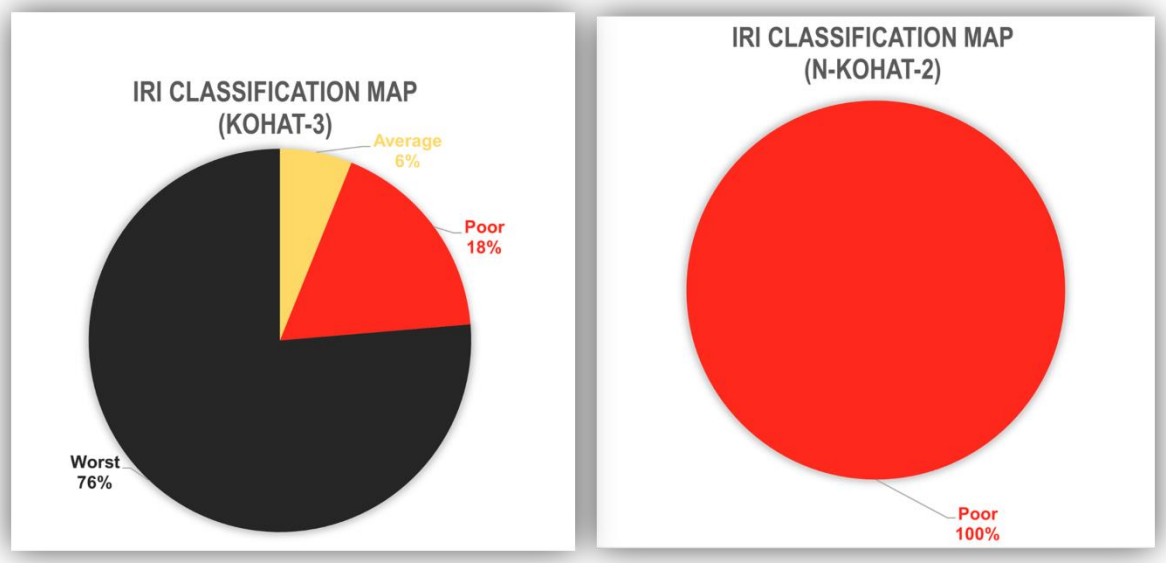


Figure 3.8.3 IRI Classification Chart of Access Roads District Kohat

3.8.4 RST Pie Chart of Selected Roads

Road Surface type (RST) survey was conducted to investigate the actual condition and type of surface of the road under observation. In rural areas earthen or kacha tracks and TST/DST are common that affect the mobility of road users and accessibility to necessities.

The RST Classification Charts are given below.

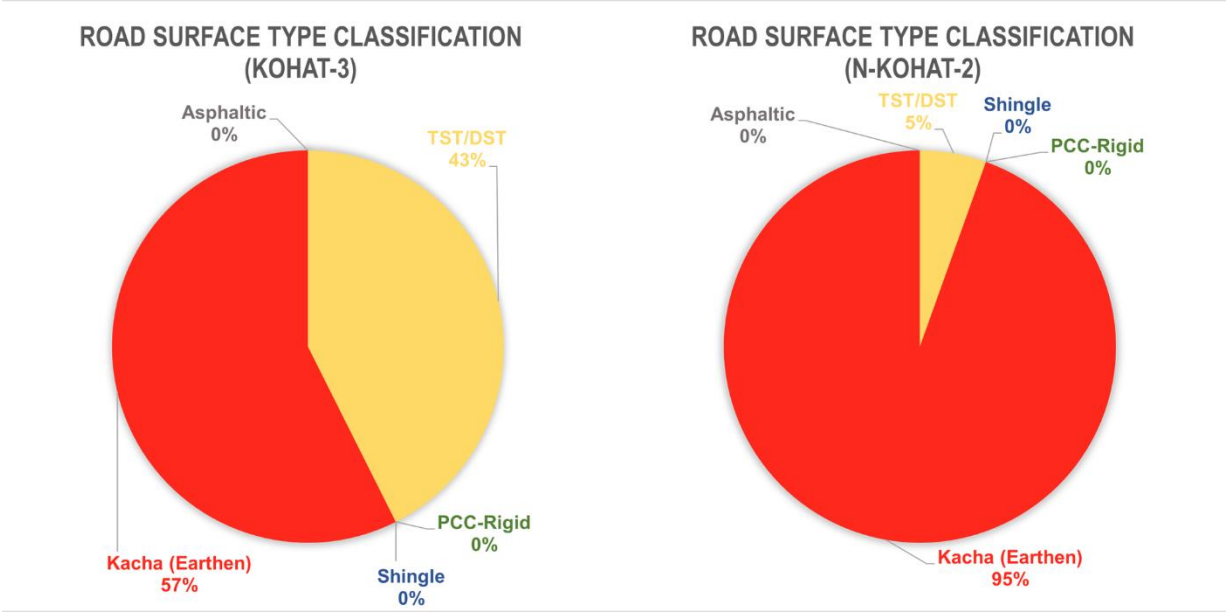


Figure 3.8.4 RST Classification Charts of Access Roads District Kohat

3.8.5 Travel Speed Survey

Table 3.8.2 Travel Speed Survey of Access Roads District Kohat

Road ID	Distance (km)	Total Ascent (m)	Total Descent (m)	Total Time	Average Speed (km/h)	Avg. Moving Speed (km/h)	Maximum Speed (km/h)	Moving Time
KOHAT-3	5.46	39	39	15:12.0	21.58	22.57	47.9	5.46
N-KOHAT-2	10.7	88	76	21:51.0	22.3	22.3	32	10.7

The travel speeds for all roads are low due to the deteriorated road condition which is reflected from the RST and IRI pie charts. Mobility of the road users is affected as indicated by lower average speeds and higher travel times, which can be attributed to the poor road conditions.

It can be inferred from these observations that these roads need to be reconstructed for better mobility and access of people to basic livelihood necessities.

3.8.6 Traffic Analysis

3.8.6.1 Summary of Existing Average Daily Traffic (ADT)

The summary of traffic counts obtained is given in the following Table.

ADT's

Table 3.8.3 Existing ADT of Access Roads District Kohat

Road ID	Car	Motorcycle	Mazda Coaster	Rickshaw / Q.chi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	TOTAL Vehicles
KOHAT-3	10	43	1	5	4	21	1	0	0	0	0	0	20	16	121
N-KOHAT-2	77	182	11	32	42	22	21	0	4	0	0	0	19	14	424

PCUs

Table 3.8.4 Existing PCUs of Access Roads District Kohat

Road ID	Car	Motorcycle	Mazda Coaster	Rickshaw / Qingqi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	Total PCUS
KOHAT-3	10	22	2	4	6	42	3	0	0	0	0	0	90	64	242
N-KOHAT-2	77	91	22	24	63	44	53	0	14	0	0	0	86	56	529

3.8.6.2 Composition Of Vehicle Types

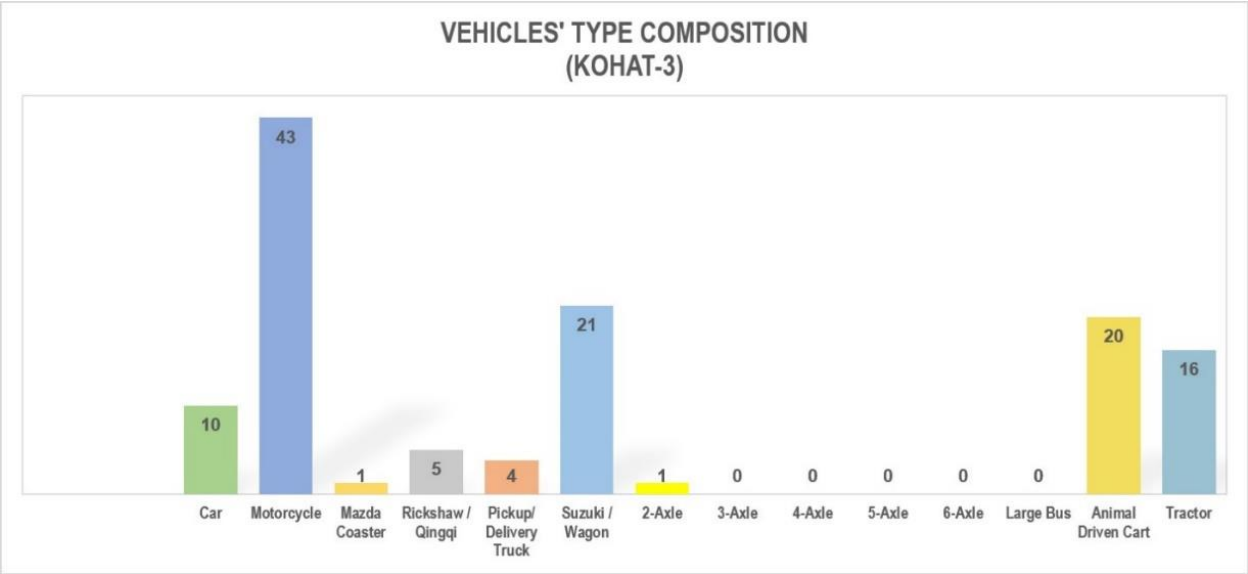


Figure 3.8.5 Vehicle Composition of Kohat-3

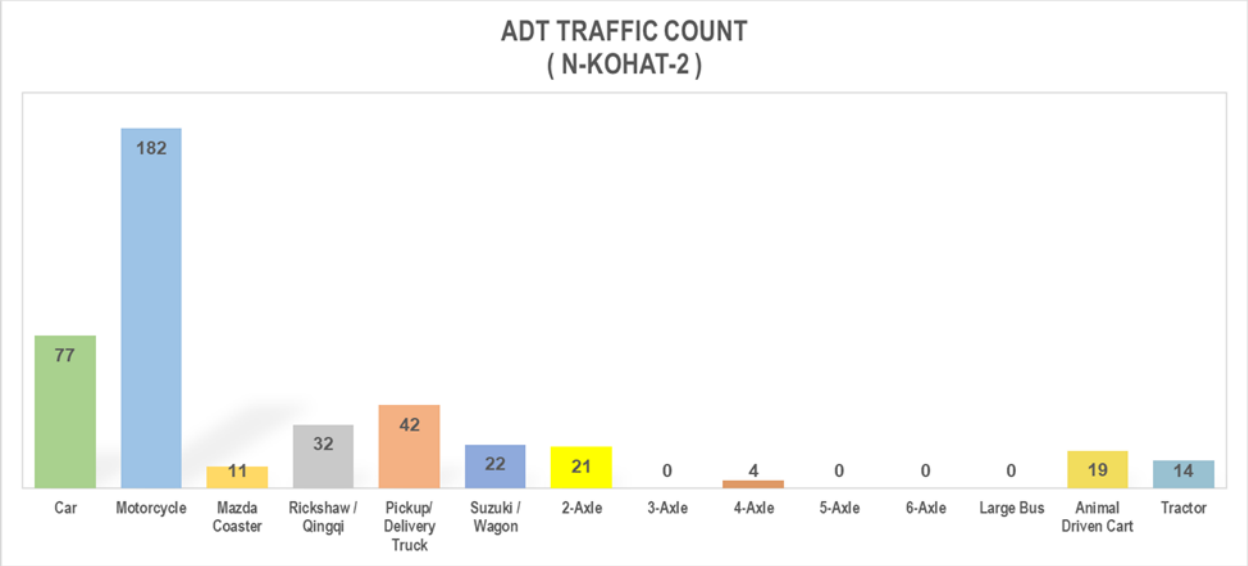


Figure 3.8.6 Vehicle Composition Chart N-KOHAT-2

Most of the vehicles on the subject roads are Cars and Motorcycles. This Vehicle Composition can be attributed to the rural area type of the considered roads. Most of the people travel on these roads in their personal cars or motorcycles due to lack of proper public transport facilities.

The reason we have cars and motorcycles as the majority constituents of the vehicle mix, is because of the diversity of the road users utilizing the facility. Those people that have the available resources and own a car or motorcycle are reluctant of using public transport due to the poor services and condition of vehicles, whereas those people who do not own a private car or motorcycle have no other option then using public transport that constitutes of rickshaws and Suzuki/Wagons as seen in some roads.

3.8.6.3 Traffic Analysis Forecast

ADT:

The ADT Base Year is 2022 and ADT Forecast year is 2032 as can be seen in the table below.

The following table represents the annual daily traffic forecast (10 years).

Table 3.8.5 Forecast ADT of Access Roads District Kohat

Road ID	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
KOHAT-3	121	127	133	140	147	154	162	170	179	188	197
N-KOHAT-2	424	445	467	491	515	541	568	597	626	658	691

PCU:

The PCU Base Year is 2022 and PCU Forecast year is 2032 as can be seen in the table below.

Table 3.8.6 Forecast PCUs of Access Roads District Kohat

Road ID	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
KOHAT-3	242	254	267	280	294	309	324	340	357	375	394
N-KOHAT-2	529	555	583	612	643	675	709	744	782	821	862

3.8.7 Discussion and Analysis

The analysis conducted on these roads indicates that the condition of these roads is affecting the traffic characteristic which consequently influences the access of people to necessities of life. The poor condition of these roads is reflected by the Road Surface Type (RST) and International Roughness Index (IRI) pie charts which indicates that these roads need immediate consideration with respect to construction and rehabilitation. The poor mobility of these roads is indicated by the lower speeds and high travel times. Reconstructing these roads will improve speeds and lower travel times of users.

The utility of these roads in providing access to necessities like education, health, and markets will be enhanced with the improvement in road condition after reconstruction.

3.9 Project Area- Malakand

Malakand is a district in Malakand Division of Khyber Pakhtunkhwa province in Pakistan. The District was formed in 1970 as a Provincially Administered Tribal Area, It had previously been a tribal area known as the Malakand Protected Area, part of the Malakand Agency.The total area of malakand is 952 km².

3.9.1 Priority Roads in District Malakand

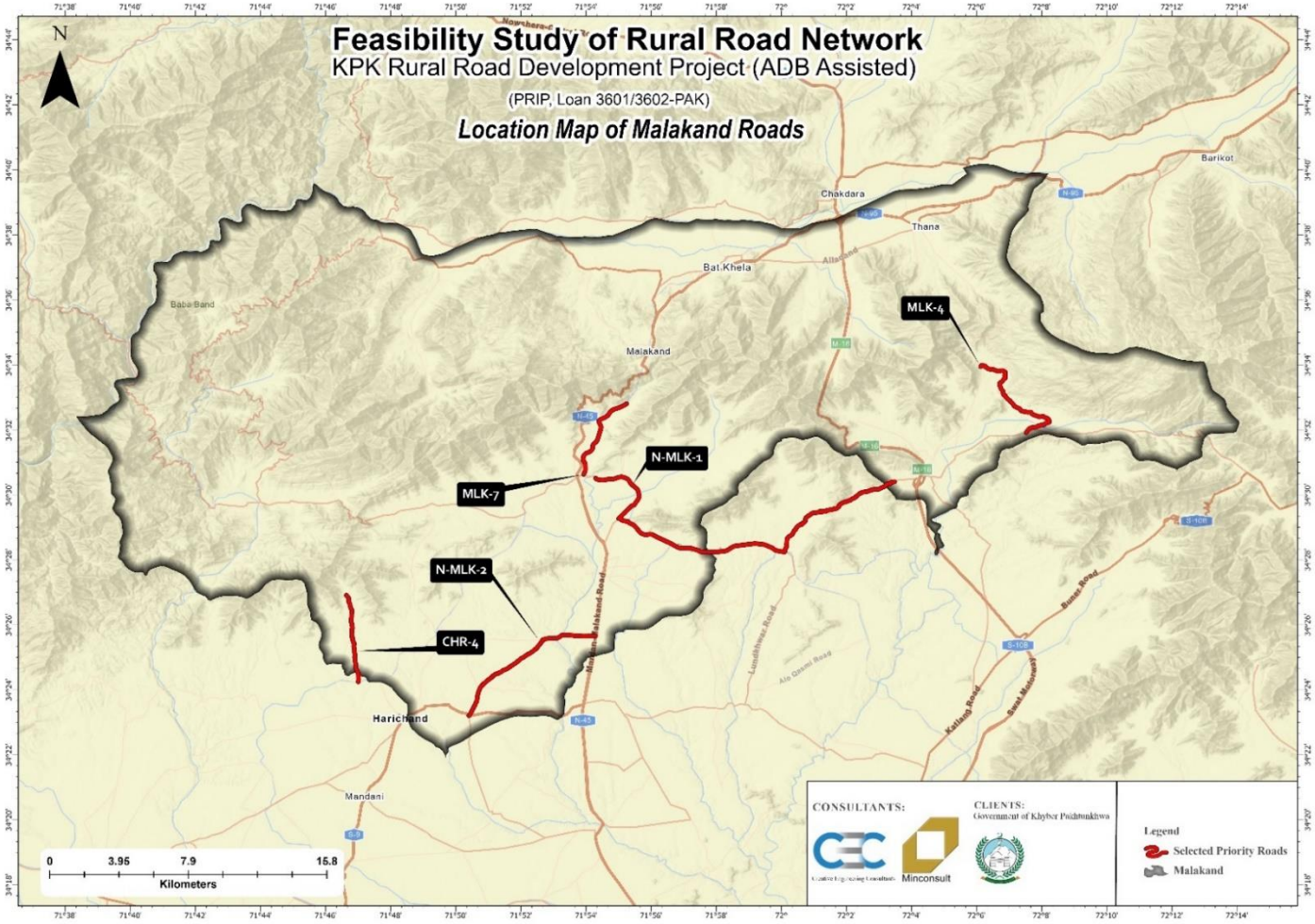
The following roads have been found feasible for Rural Road Development Project in District Malakand.

Table 3.9.1 Access Roads District Malakand

#	ID	Road Name	Districts	FL	Type
1	**CHR-4**	Landi Shah To Narrai Uba	Malakand	5.1	Access
2	**N-MLK-2**	Rehablitation of Road from Badranga to Jazoona Dag Road	Malakand	8	Access
3	**MLK-7**	Neher Quarter to Jaban Powerhouse Road	Malakand	5.1	Access
4	**N-MLK-1**	Daragai - Palai Interchange Swat Motorway	Malakand	20.0	Access
5	**MLK-4**	Mura Banda Link Road	Malakand	7.1	Access

3.9.2 Location Map of Priority Roads

All the access roads selected for traffic study after scrutinization of the surveyed roads in the district are shown in the figure below.



Map 3.9.1 Location Maps District Malakand

3.9.2.1 CHR-4 (Landi Shah to Narrai Uba)

CHR-4 road (Landi Shah to narrai uba UC heroshah) is located at southwest side of district malakand Road is 5.16 Km in length. The road starts as a linkage road from shakoor road landishah region and ends at narrai uba heroshah.The villages in vicinity of this road are khattakaba;Hazrat manan koroona and narrai uba heroshah .Government public school hazrat manan korona is located on this road. This road has a linkage towards Yaseen hospital malakand.

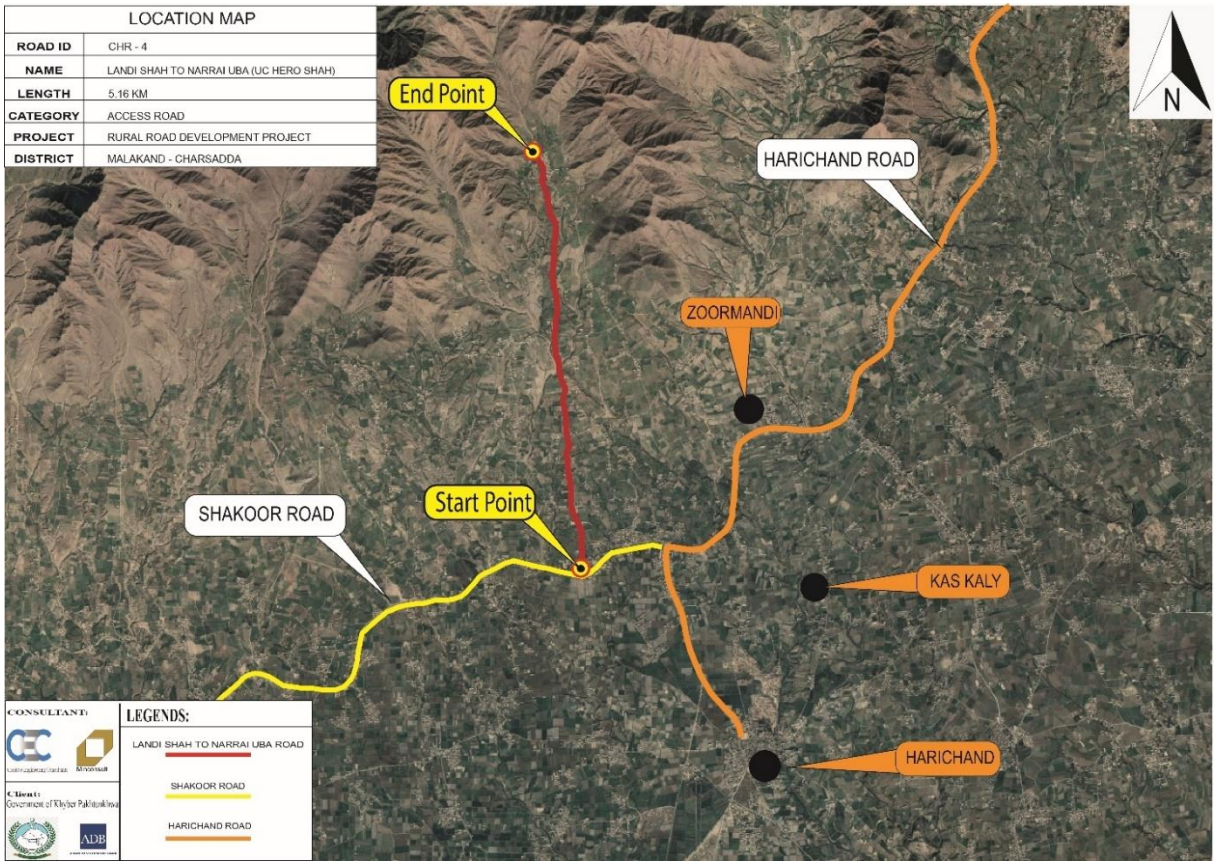


Figure 3.9.1 Location Map CHR-4

3.9.2.2 MLK-7 (Neher Quarter to Jaban Powerhouse Road)

MLK-7 road (Nehar Quarter to Jaban Powerhouse road) is located at southeast side of district malakand Road is 5.05 Km in length. The road start as a link road near FIMS school and college Girls campus Harichand road and ends at jaban canal road. The villages in vicinity of this road are College road dargai;PESCO division dargia;Dargai 2 and jaban malakand 1. FIMS school and college girls campus dargai and Government Middle school jaban lie on this road.

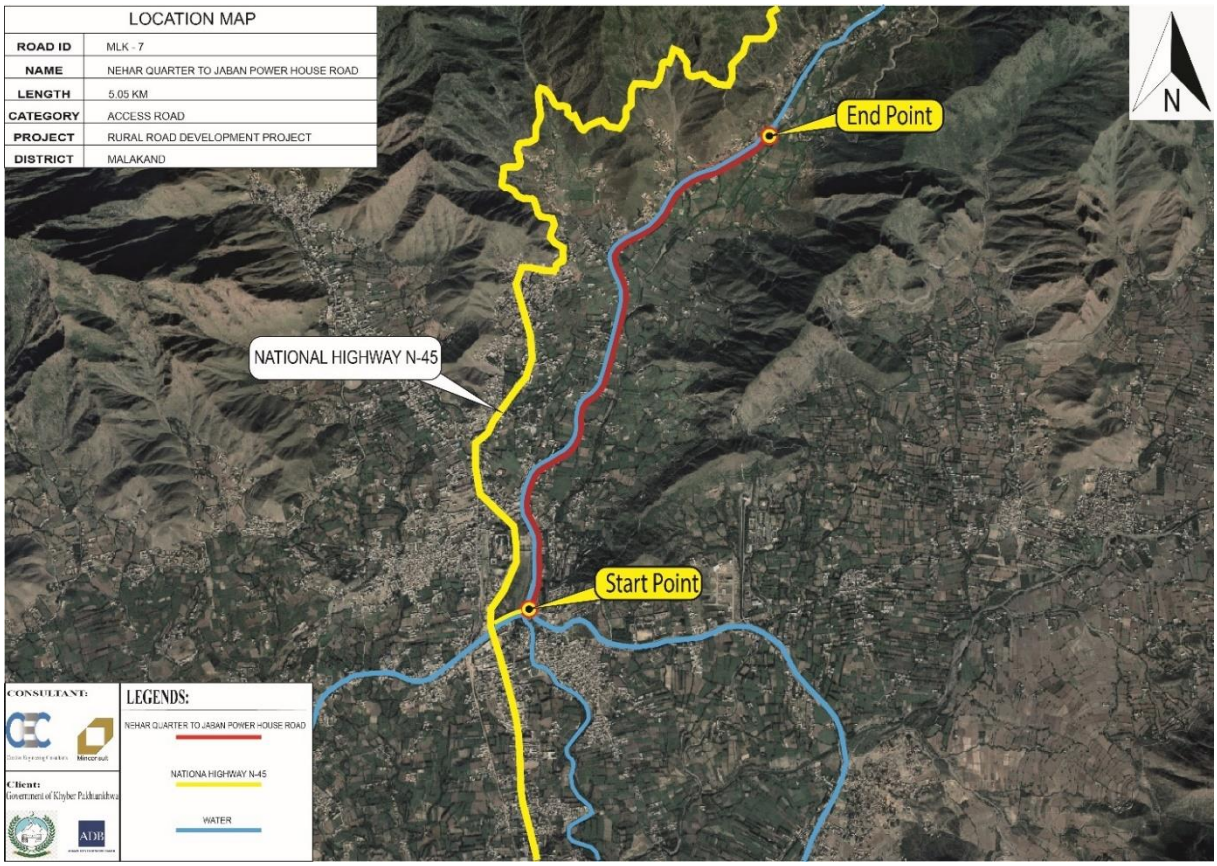


Figure 3.9.2 Location Map MLK-7

3.9.2.3 N-MLK-1 (Daragai - Palai Interchange Swat Motorway)

N-MLK-1 road (Dargai Palai interchange swat motorway) is located at south side of district malakand Road is 20 Km in length.The road starts from palai road dargai and ends at palai Bunner road..The villages in vicinity of this road are naik Muhammad khan kalay;khatakkoshah;Ghareeb abad;shareefabad;kherki;akramabad;zahirabad and Baizo kharki.

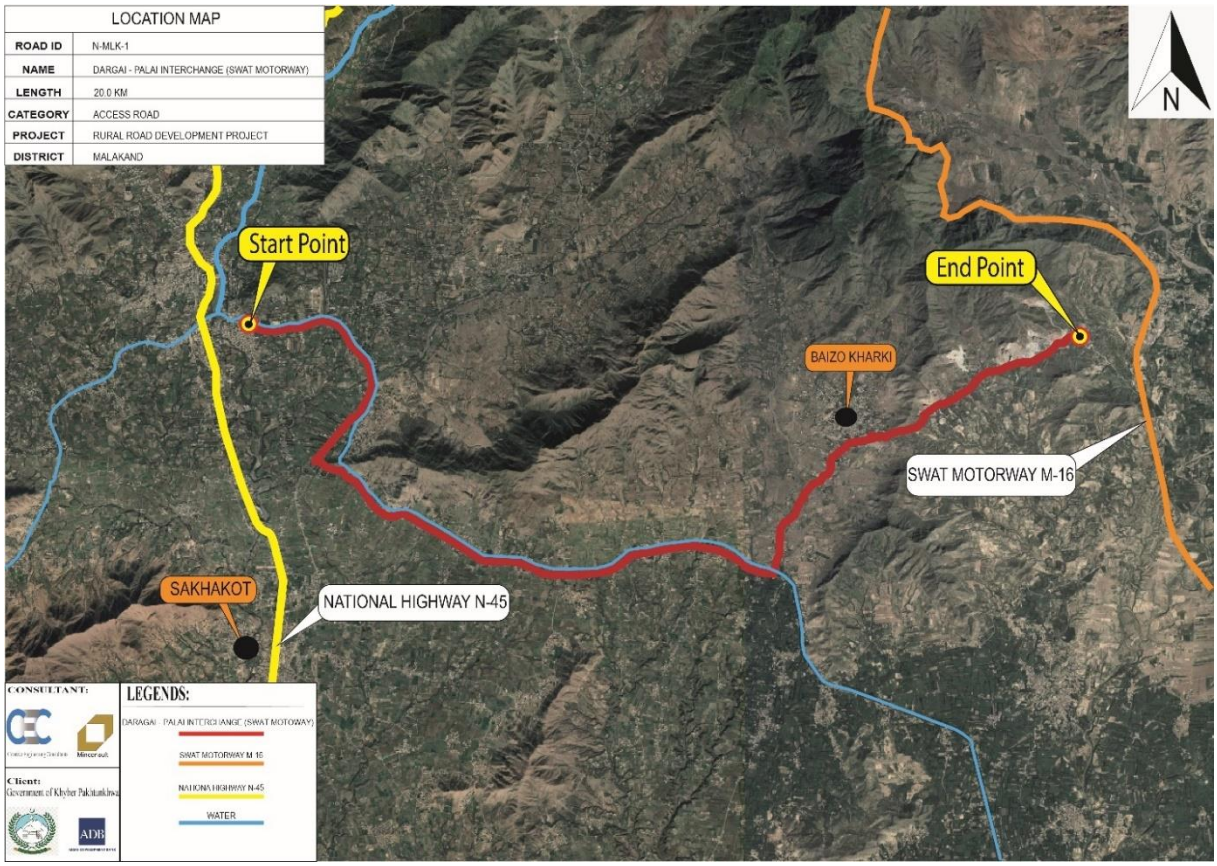


Figure 3.9.3 Location Map N-MLK-1

3.9.2.4 MLK-4 (Mura Banda Link Road)

The road is in the Malakand district. It starts from Jalal Pur Road, covering Kohe Mora road and a part of Palai Bunner road. The road Crosses Mura Banda Palai and Koza Bazdara towns. The length of the road is 7.06 km long.

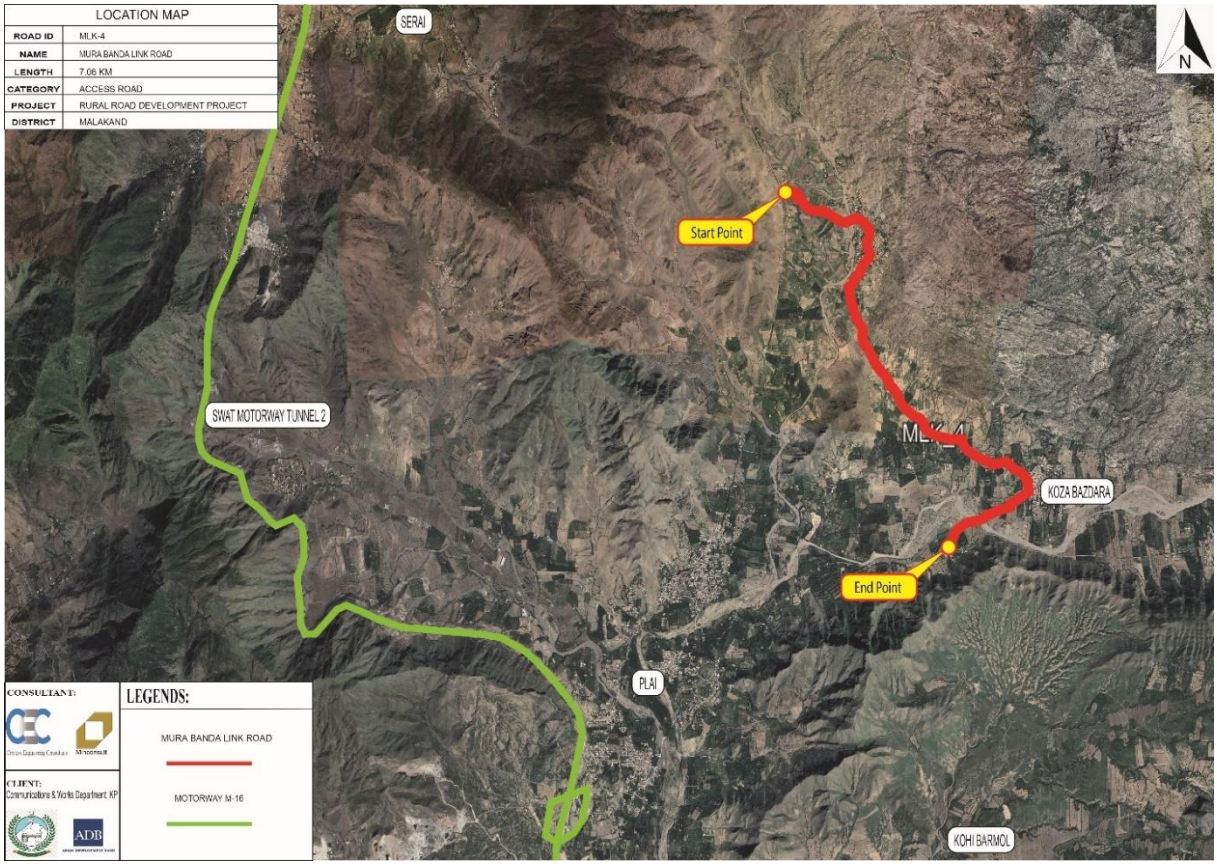


Figure 3.9.4 Location Map MLK-4

3.9.2.5 N-MLK-2 (Rehablitation of Road from Badranga to Jazoona Dag Road)

The Badranga to Jazoona Dag Access Road, spanning 8 km, serves as a crucial link between communities, facilitating accessibility and connectivity in the region. This road, classified as an access road, plays a vital role in ensuring that residents have efficient and convenient travel options.Starting from Badranga Bazar on Shergarh Road, this road journey takes you through the heart of the region, connecting villages and towns along the way. It concludes at National Highway N-45 at Jazoona Dag, providing a seamless link to the broader transportation network.While categorized as an access road, its importance cannot be understated. It ensures that residents have easy access to essential services, such as healthcare, education, and commerce. Moreover, it offers a pathway for economic activities and regional development.The Badranga to Jazoona Dag Access Road is a lifeline for the local population, embodying progress, and connectivity. It signifies the commitment to improving the quality of life for residents and fostering a thriving community.

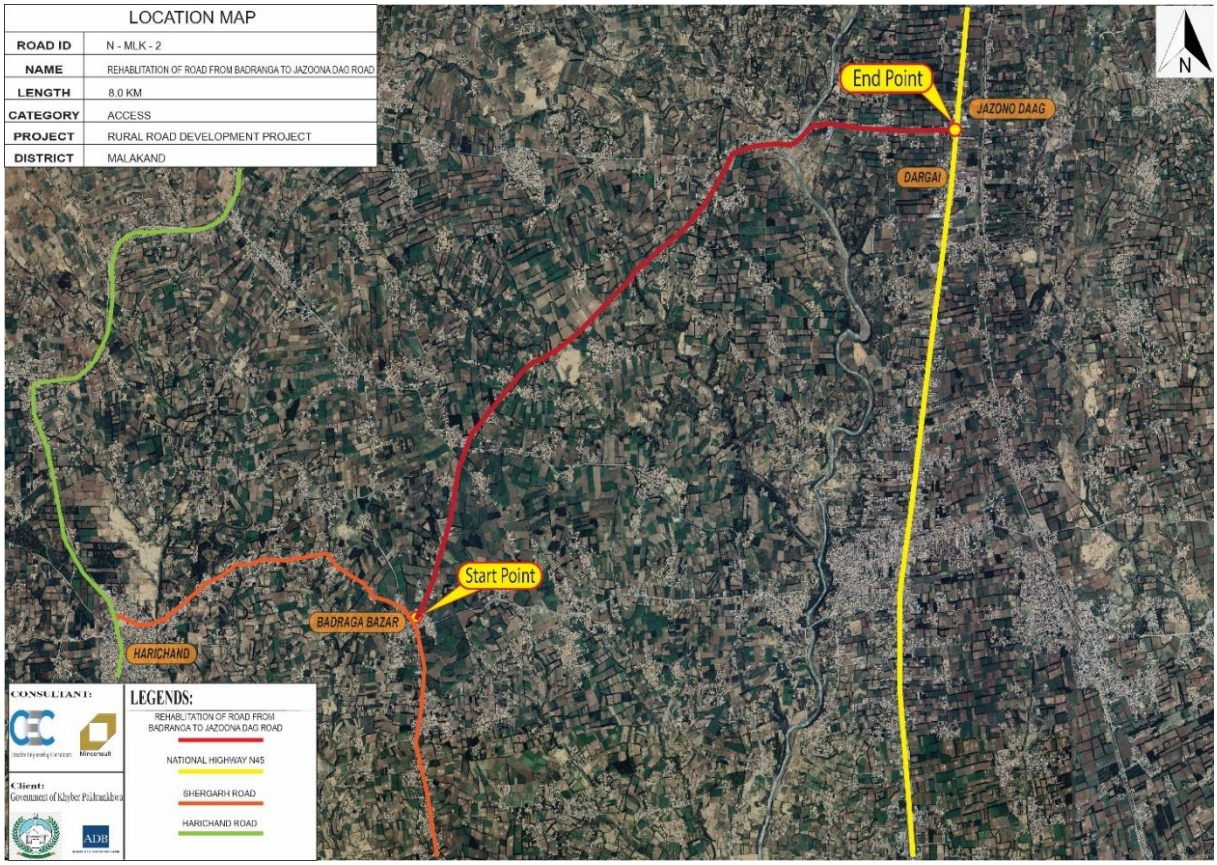


Figure 3.9.5 Location Map N-MLK-2

3.9.3 IRI Classification Pie Chart of Selected Roads

The International Roughness Index (IRI) is used by highway professionals throughout the world as a standard to quantify road surface roughness. A poor road surface roughness influences the traffic speeds and times. It also effects the mobility and accesibility of users traversing that road.

The IRI Classification Charts are given below.

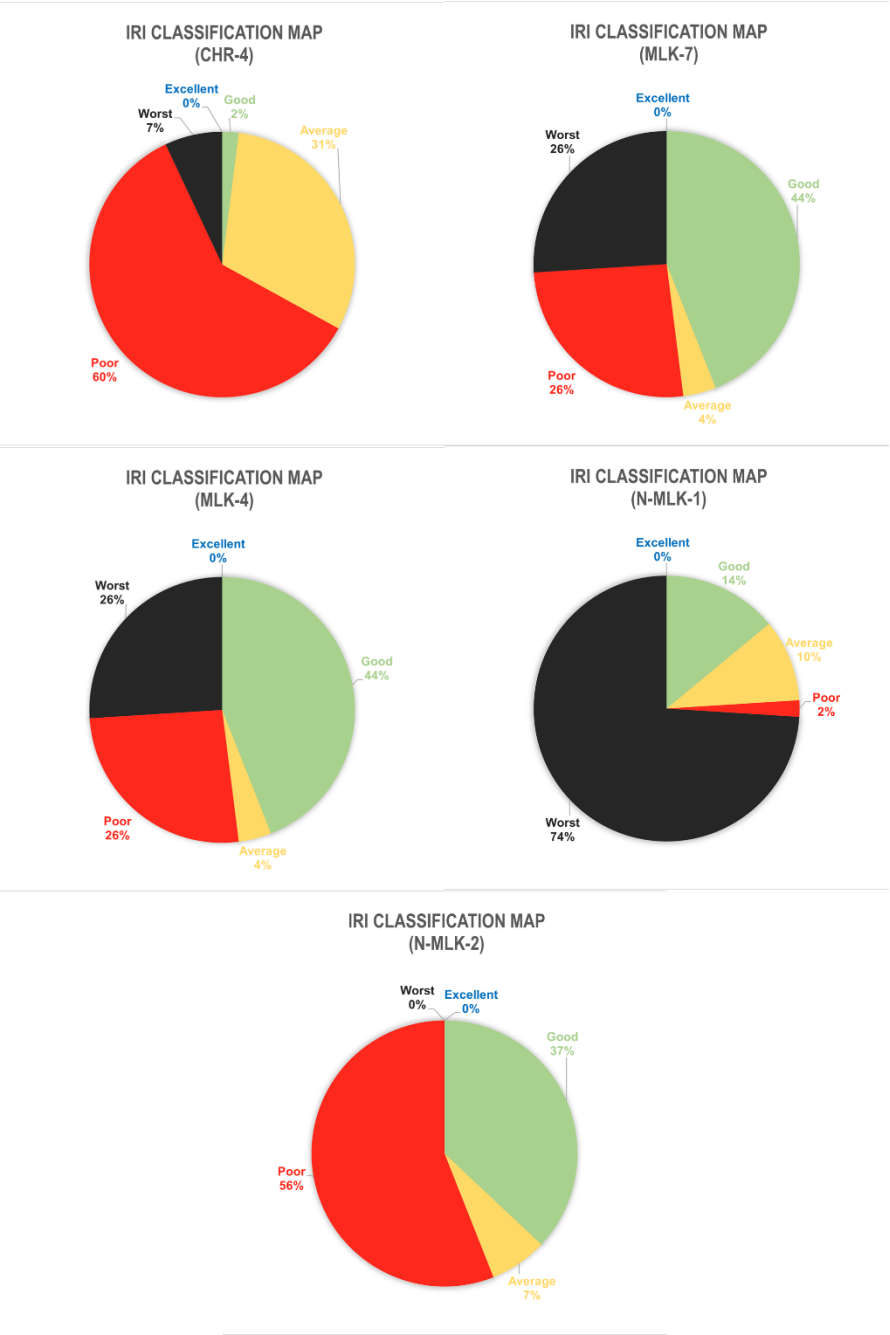


Figure 3.9.6 IRI Classification Charts of Access Roads District Malakand

3.9.4 RST Pie Chart of Selected Roads

Road Surface type (RST) survey was conducted to investigate the actual condition and type of surface of the road under observation. In rural areas earthen or kacha tracks and TST/DST are common that affect the mobility of road users and accessibility to necessities.

The RST Classification Charts are given below.

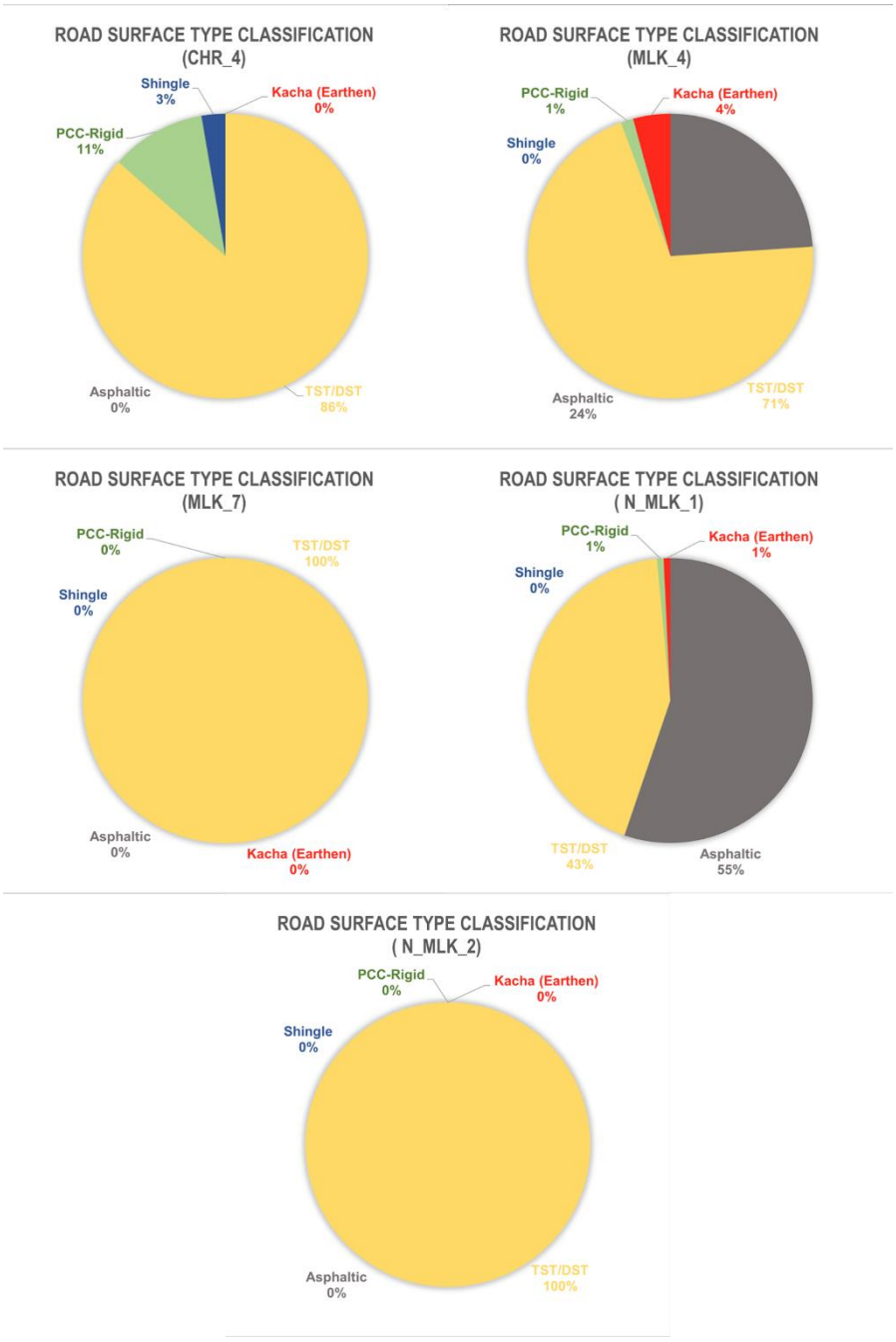


Figure 3.9.7 RST Classification Chart of Access Roads District Malakand

3.9.5 Travel Speed Survey

Table 3.9.2 Travel Speed Survey of Access Roads District Malakand

Road ID	Distance (km)	Total Ascent (m)	Total Descent (m)	Total Time	Average Speed (km/h)	Avg. Moving Speed (km/h)	Maximum Speed (km/h)
CHR-4	4.59	24	108	11:34.0	23.82	23.82	52.89
N-MLK-2	7.8	129	169	31:49:0	15.31	15.41	48.94
MLK-7	21.23	227	209	19:41.0	9.12	16.54	89.23
N-MLK-1	20.0	116	127	41:19.0	31.22	31.22	61.35
MLK-4	7.1	124	162	29:51.0	14.21	14.21	47.83

According to IRI and RST Classification, more than 50% of road length have poor and worst surface roughness consisting of TST/DST, and remaining portion of road is kacha, /shingle. Due to increased surface roughness of the subject road, travel speed is affected as indicated by the above table.

It can be inferred from these observations that these roads need to be reconstructed for better mobility and access of people to basic livelihood necessities.

3.9.6 Traffic Analysis

3.9.6.1 Summary of Existing Average Daily Traffic (ADT)

The summary of traffic counts obtained is given in the following Table.

ADT's

Table 3.9.3 Existing ADT of Access Roads District Malakand

Road ID	Car	Motorcycle	Mazda Coaster	Rickshaw / Q.chi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	TOTAL Vehicles
N-MLK-2	378	592	12	239	30	100	30	0	0	0	0	0	69	91	1541
MLK-7	773	786	5	200	185	0	0	0	0	0	0	0	0	0	1949
N-MLK-1	836	1559	1	344	191	176	51	739	0	0	0	0	0	858	4755
CHR-4	68	140	0	70	0	65	0	0	0	0	0	0	53	46	441
MLK-4	787	821	3	204	147	0	0	0	0	0	0	0	0	200	2162

PCUs

Table 3.9.4 Existing PCUs of Access Roads District Malakand

Road ID	Car	Motorcycle	Mazda Coaster	Rickshaw / Qinggi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	Total PCUS
N-MLK-2	378	296	24	179	45	200	75	0	0	0	0	0	311	364	1872
MLK-7	773	393	10	150	278	0	0	0	0	0	0	0	0	0	1603
N-MLK-1	836	779	3	258	287	353	128	2216	0	0	0	0	0	3430	8290
CHR-4	68	70	0	53	0	130	0	0	0	0	0	0	236	185	741
MLK-4	787	411	6	153	221	-	-	-	-	-	-	-	-	800	2,377

3.9.6.2 Composition of Vehicle Types

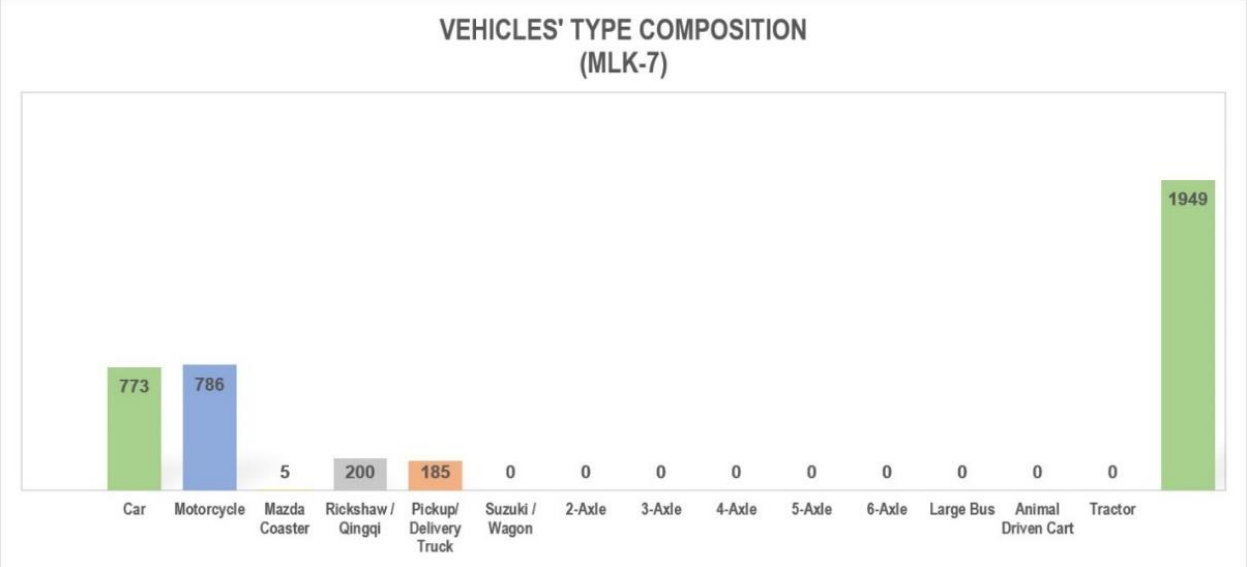


Figure 3.9.8 Vehicle Composition MLK-7

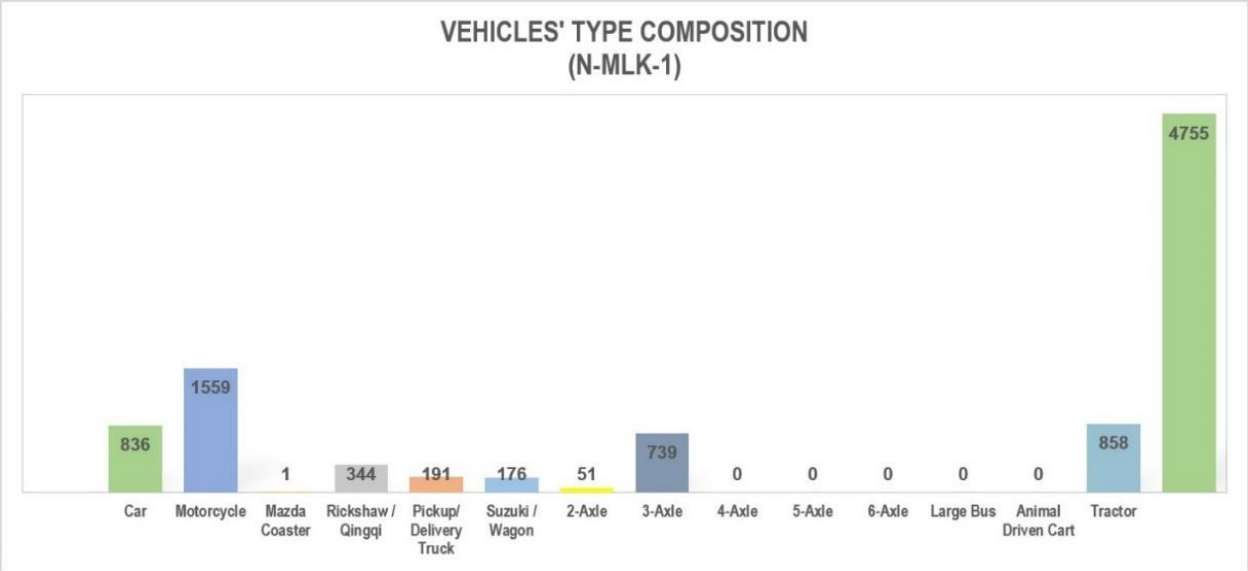


Figure 3.9.9 Vehicle Composition N-MLK-1

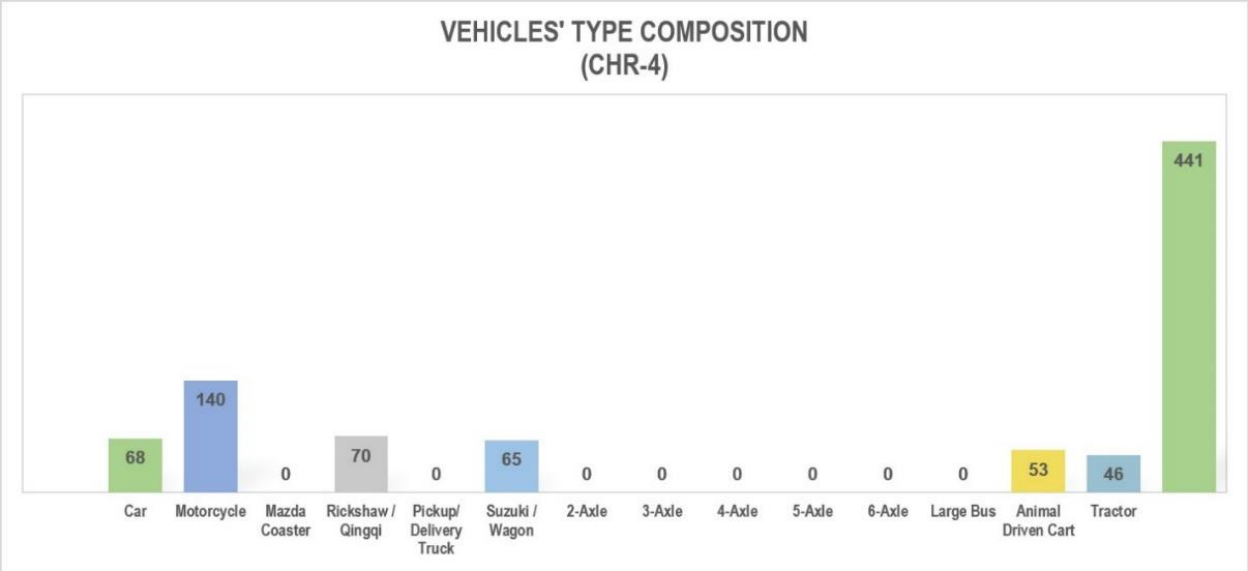


Figure 3.9.10 Vehicle Composition CHR-4

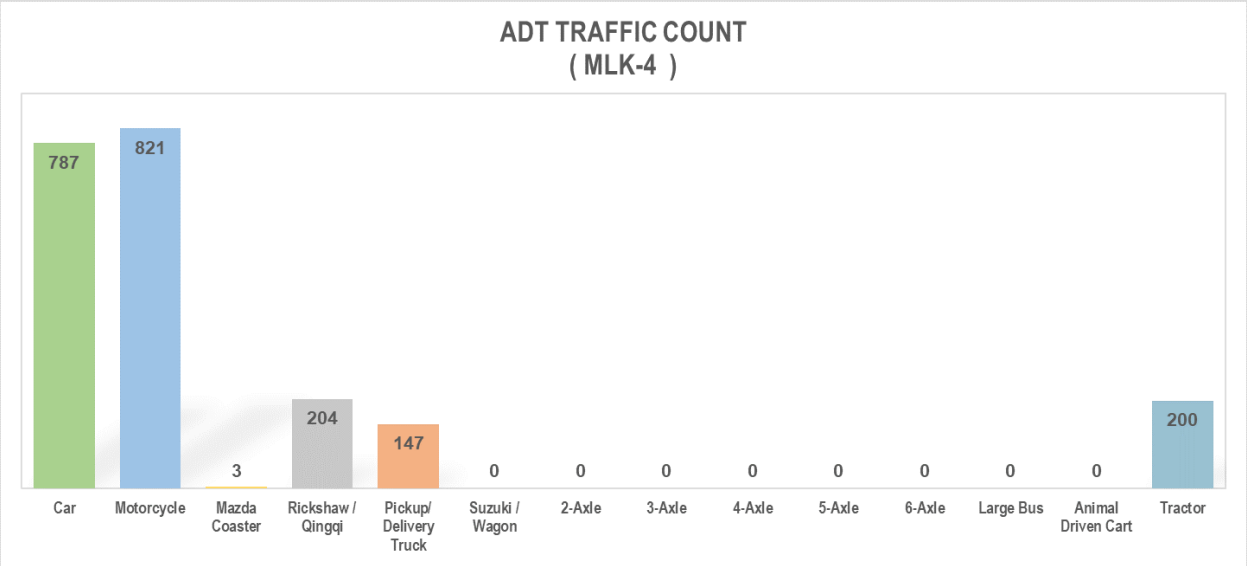


Figure 3.9.11 Vehicle Composition Chart MLK-4

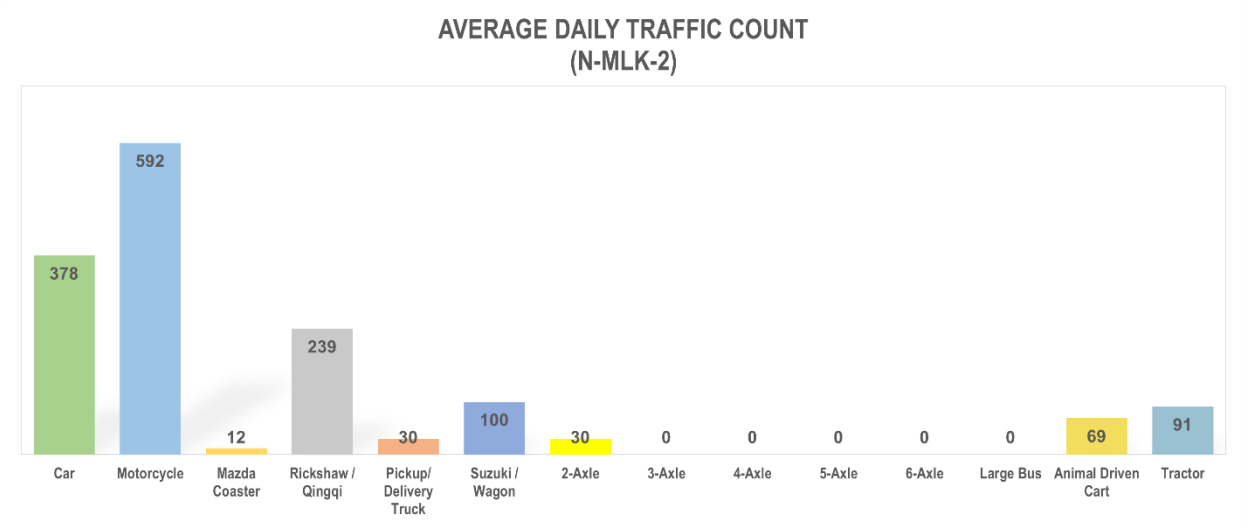


Figure 3.9.12 Vehicle Composition N-MLK-2

Most of the vehicles on the subject roads are Cars and Motorcycles. This Vehicle Composition can be attributed to the rural area type of the considered roads. Most of the people travel on these roads in their personal cars or motorcycles due to lack of proper public transport facilities.

The reason we have cars and motorcycles as the majority constituents of the vehicle mix, is because of the diversity of the road users utilizing the facility. Those people that have the available resources and own a car or motorcycle are reluctant of using public transport due to the poor services and condition of vehicles, whereas those people who do not own a private car or motorcycle have no other option then using public transport that constitutes of rickshaws and Suzuki/Wagons as seen in some roads.

3.9.6.3 Traffic Analysis Forecast

ADT:

The ADT Base Year is 2022 and ADT Forecast year is 2032 as can be seen in the table below.

The following table represents the annual daily traffic forecast (10 years).

Table 3.9.5 Forecast ADT of Access Roads District Malakand

Road ID	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
N-MLK-2	1541	1618	1699	1784	1873	1967	2065	2168	2277	2391	2510
MLK-7	**1,949**	2,046	2,148	2,256	2,369	2,487	2,612	2,742	2,879	3,023	3,174
N-MLK-1	**4,755**	4,993	5,242	5,505	5,780	6,069	6,372	6,691	7,025	7,377	7,745
CHR-4	**441**	463	486	511	536	563	591	621	652	685	719
MLK-4	2162	2,270	2,384	2,503	2,628	2,759	2,897	3,042	3,194	3,354	3,522

PCU:

The PCU Base Year is 2022 and PCU Forecast year is 2032 as can be seen in the table below.

Table 3.9.6 Forecast PCUs of Access Roads District Malakand

Road ID	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
N-MLK-2	1872	1965	2064	2167	2275	2389	2508	2634	2765	2904	3049
MLK-7	**1,613**	1,694	1,778	1,867	1,961	2,059	2,162	2,270	2,383	2,502	2,628
N-MLK-1	**7,955**	8,352	8,770	9,209	9,669	10,152	10,660	11,193	11,753	12,340	12,957
CHR-4	**724**	760	798	838	880	924	970	1,018	1,069	1,123	1,179
MLK-4	2,377	2,496	2,621	2,752	2,889	3,034	3,185	3,345	3,512	3,688	3,872

3.9.7 Discussion and Analysis

The analysis conducted on these roads indicates that the condition of these roads is affecting the traffic characteristic which consequently influences the access of people to necessities of life. The poor condition of these roads is reflected by the Road Surface Type (RST) and International Roughness Index (IRI) pie charts which indicates that these roads need immediate consideration with respect to construction and rehabilitation. The poor mobility of these roads is indicated by the lower speeds and high travel times. Reconstructing these roads will improve speeds and lower travel times of users.

The utility of these roads in providing access to necessities like education, health, and markets will be enhanced with the improvement in road condition after reconstruction.

3.10 Project Area- Shangla

Shangla is a district in Malakand Division of Khyber Pakhtunkhwa, Pakistan. The district headquarters are located at Alpuri, while the largest city and commercial center is Besham. The district was established in 1995, having previously been a subdivision of Swat District. The total area covered by shangla is around 1,586 km^2.

3.10.1 Priority Roads in District Shangla

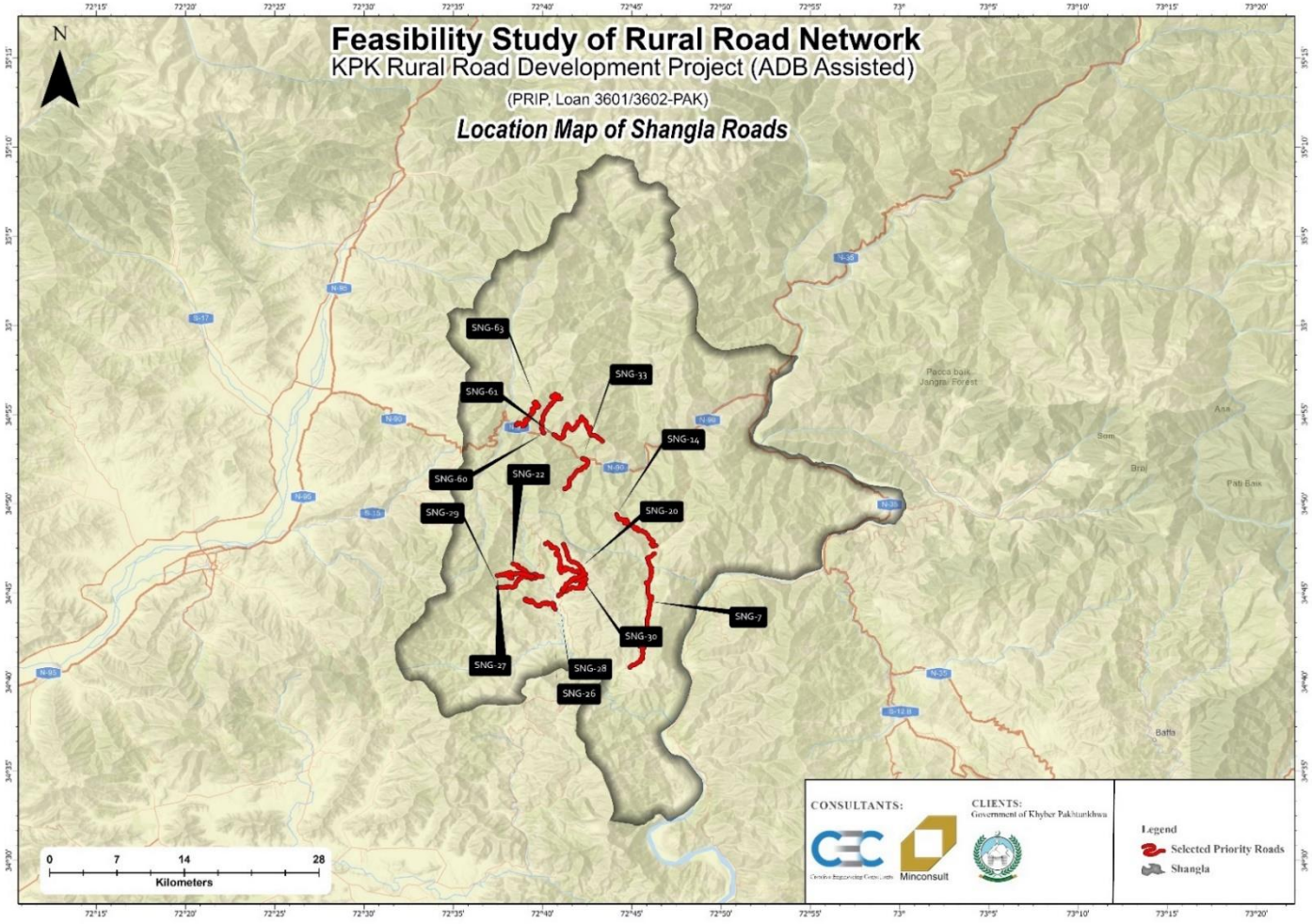
The following roads have been found feasible for Rural Road Development Project in District Shangla.

Table 3.10.1 Access Roads District Shangla

#	ID	Road Name	Districts	FL	Type
1	**SNG-14**	Chakesar Nebi More to Said Abad	Shangla	5.98	Access
2	**SNG-61**	Miankalay Pagorai Kas Road	Shangla	7.80	Access
3	**SNG-20**	Towa Chowkai Asharkot	Shangla	8.20	Access
4	**SNG-26**	Aluch Bunirwall Road	Shangla	5.00	Access
5	**SNG-28**	Bengalai Landai Balo Chawak	Shangla	6.90	Access
6	**SNG-30**	Dherai Faiza Sondvi	Shangla	8.64	Access
7	**SNG-27**	Main Dara	Shangla	5.00	Access
8	**SNG-29**	Chagum Gumbat Road	Shangla	5.00	Access
9	**SNG-63**	Alpurai Barkas Kag Road	Shangla	7.00	Access
10	**SNG-22**	Chagam Alamay	Shangla	5.00	Access
11	**SNG-7**	Martung Chakisar	Shangla	14.89	Access
12	**SNG-60**	Rahimabad Kas Basi Road	Shangla	8.00	Access
13	**SNG-33**	Zara Road	Shangla	5.00	Access

3.10.2 Location Map of Priority Roads

All the access roads selected for traffic study after scrutinization of the surveyed roads in the district are shown in the figure below.



Map 3.10.1 Location Map District Shangla

3.10.2.1 SNG-14 (Chakesar Nebi More to Said Abad)

SNG-14 is situated in the east side of district shangla. This road starts from Chakesar Nebi More and endsat Said Abad with an actual length of 5.98 km.

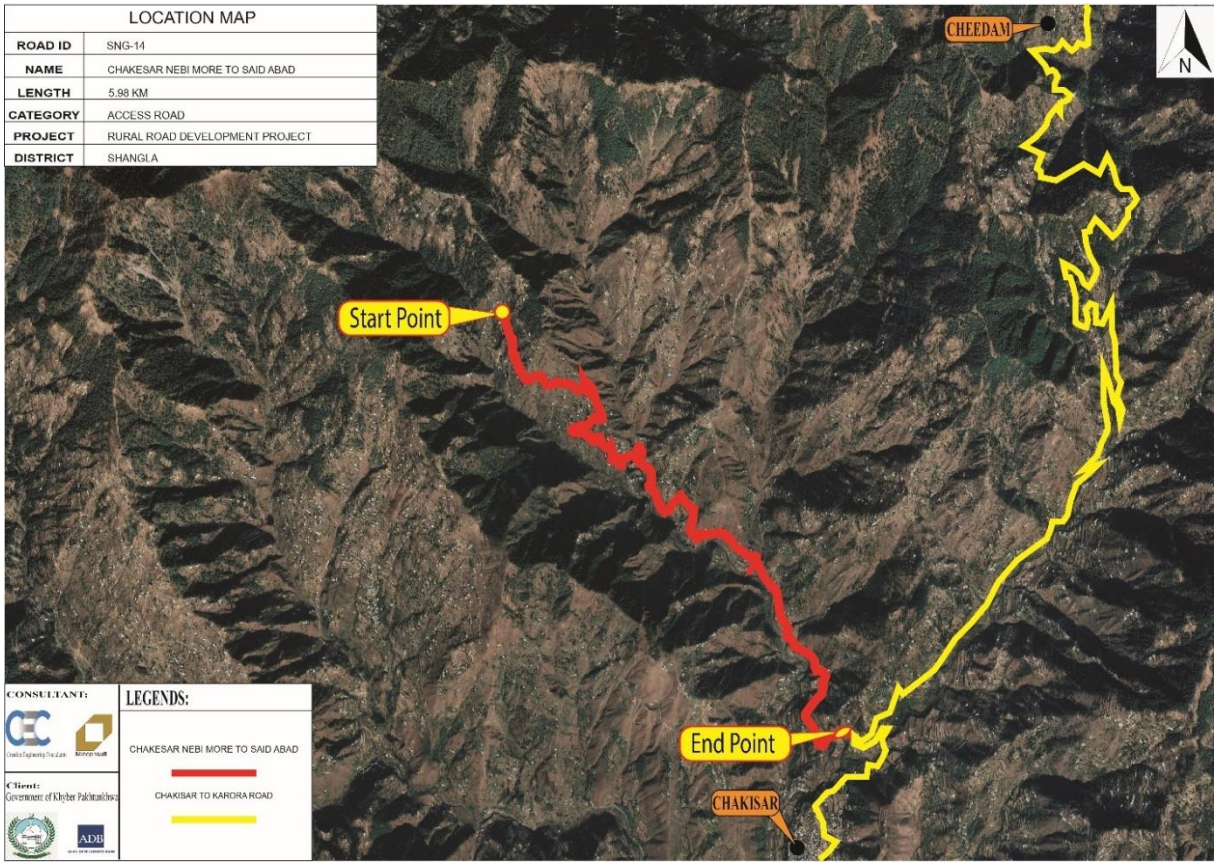


Figure 3.10.1 Location Map of SNG-14

3.10.2.2 SNG-7 (Martung Chakisar)

SNG-7 is situated in the north-east side of district shangla. This road starts from Martung Chakisar and ends at Martung village with an actual length of 14.89 km. Karindara, Kamar Hujra and Martung villages come in the vicinity of this road.

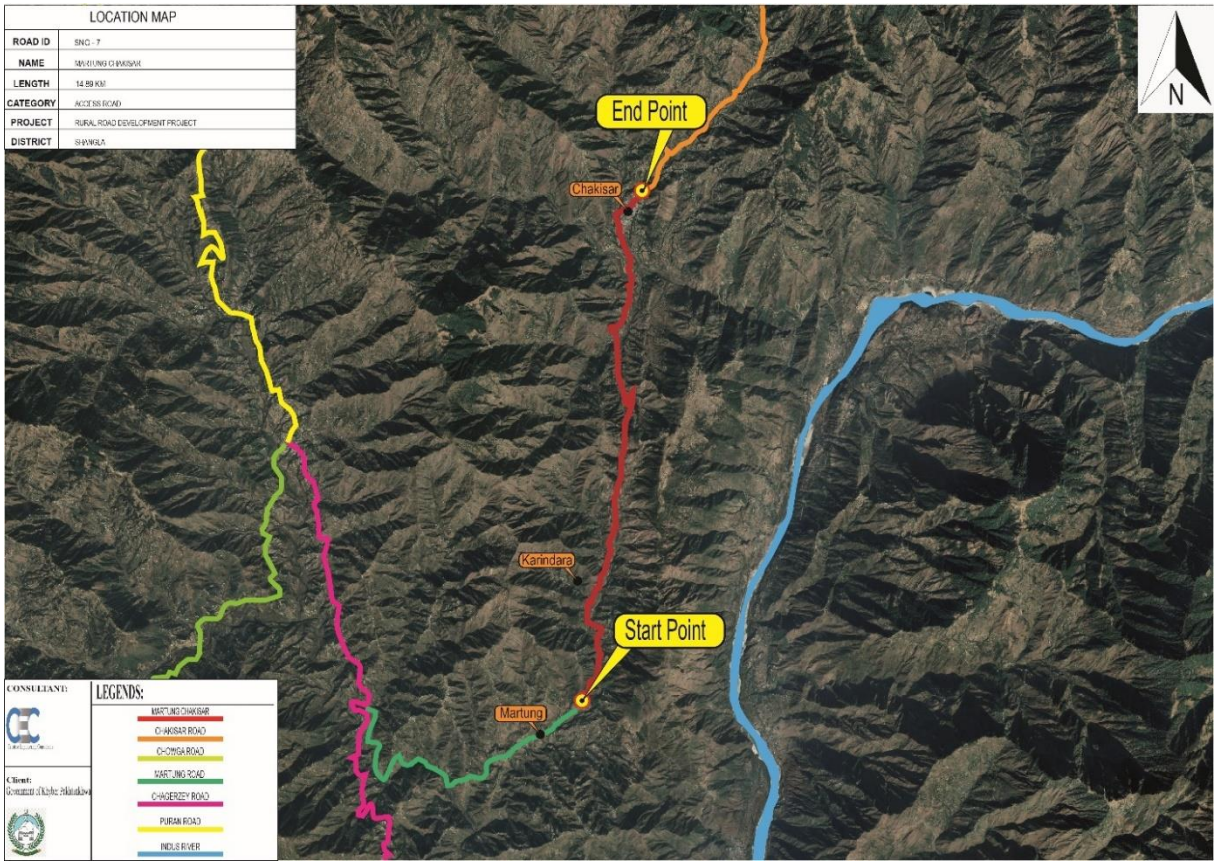


Figure 3.10.2 Location Map SNG-7

3.10.2.3 SNG-61 (Miankalay Pagorai Kas Road)

Spanning a distance of 7.8 kilometers, the Miankalay Pagorai Kas Road commences its journey in Miankalay and culminates at Kas Road. Unfortunately, the road is currently in a state of disrepair, making travel along this route a challenging endeavor.

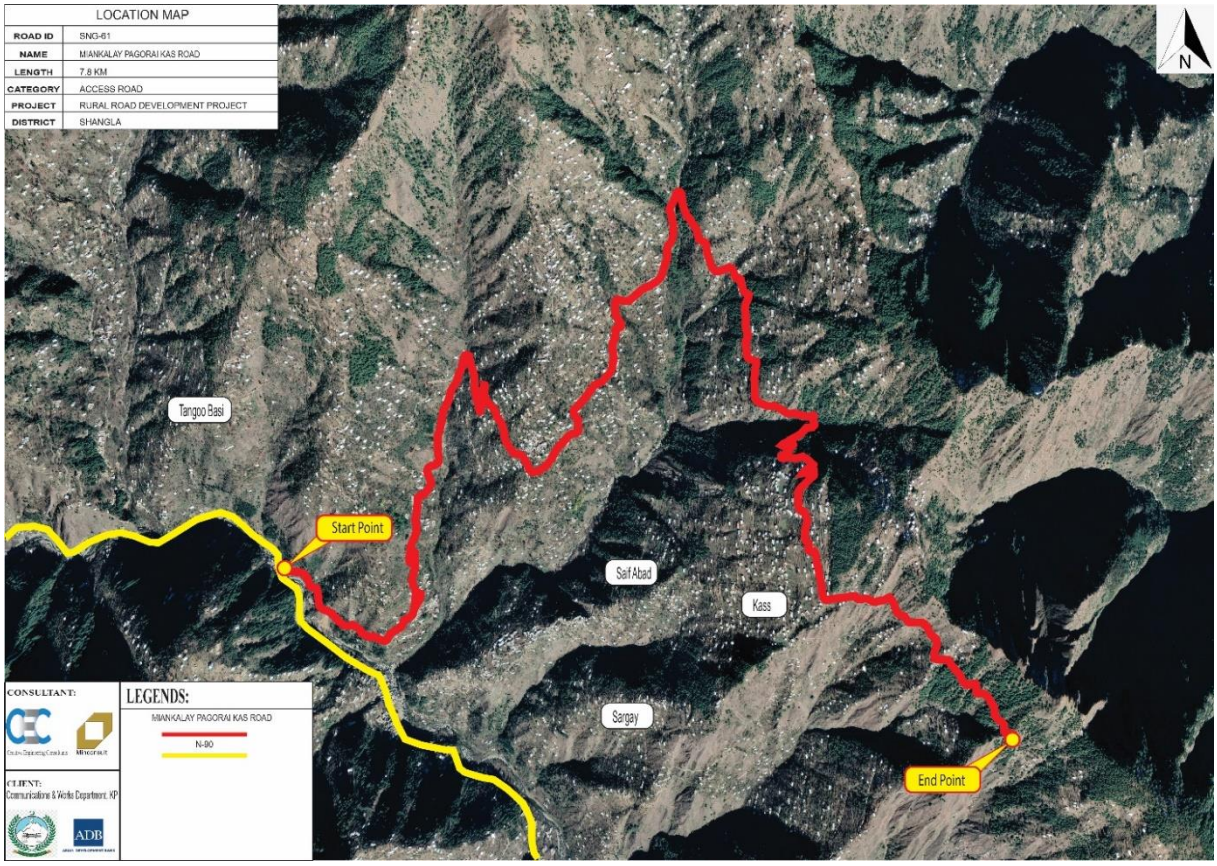


Figure 3.10.3 Location Map SNG-61

3.10.2.4 SNG-20 (Towa Chowkai Asharkot)

The Towa Chowkai Asharkot road spans a length of 8.2 kilometers, commencing its journey from the heart of Puran City and culminating at the charming destination of Towa. Regrettably, the road's dilapidated condition poses a significant challenge for the residents, rendering them bereft of essential amenities on both sides, including access to healthcare, education, and reliable transportation.

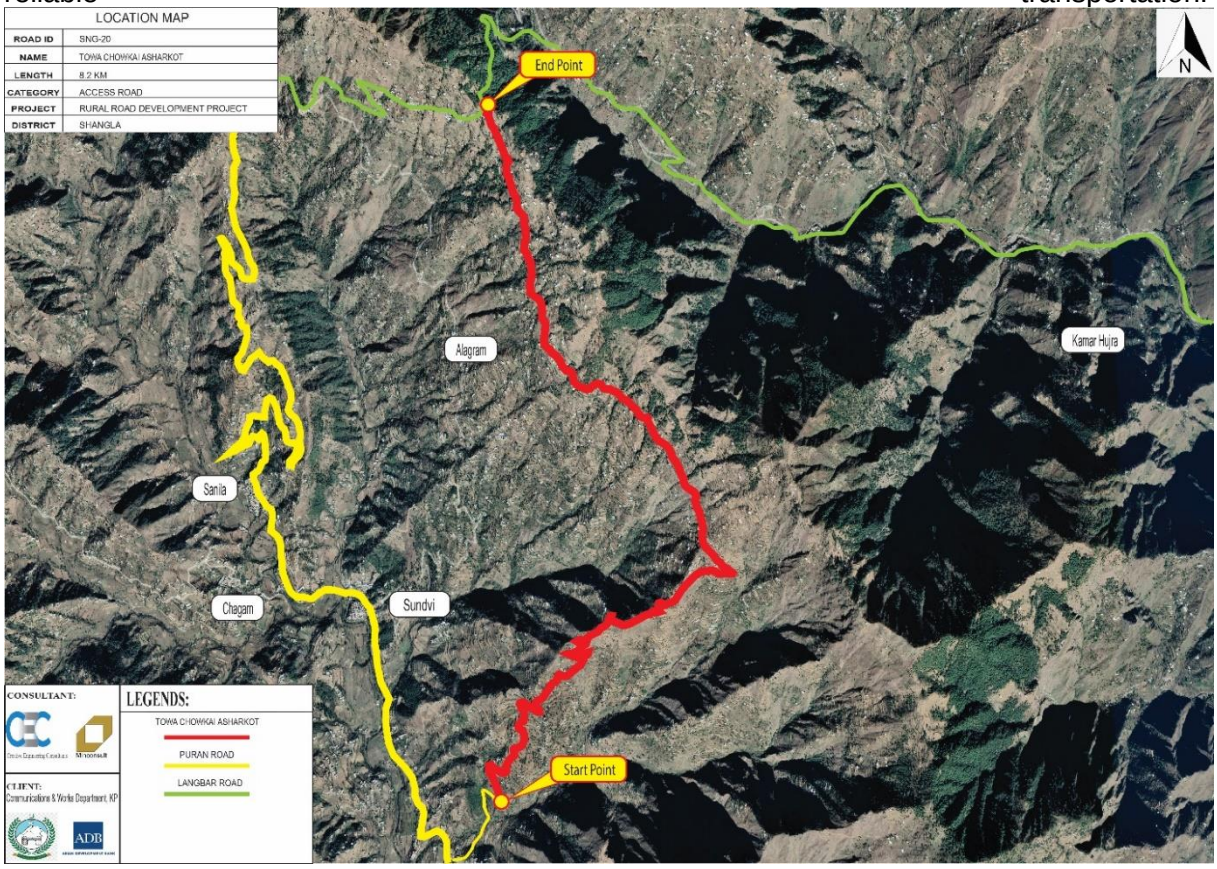


Figure 3.10.4 Location Map SNG-20

3.10.2.5 SNG-26 (Aluch Bunirwall Road)

Gracefully nestled within the verdant expanse of Shangla district, Khyber Pakhtunkhwa, Pakistan, the Aloch Bunirwall Road, though rural in essence, regrettably lacks essential provisions for healthcare and various vital purposes. Its path, marred by the wear of time, reflects the harsh reality of neglect. This vital conduit embarks on its journey from Bunirwall, culminating at the juncture with Chowga Road, a testament to its potential, yet a poignant reminder of its current state. Stretching across a modest expanse of 5 kilometers, it threads through the landscape, a symbol of untapped promise.

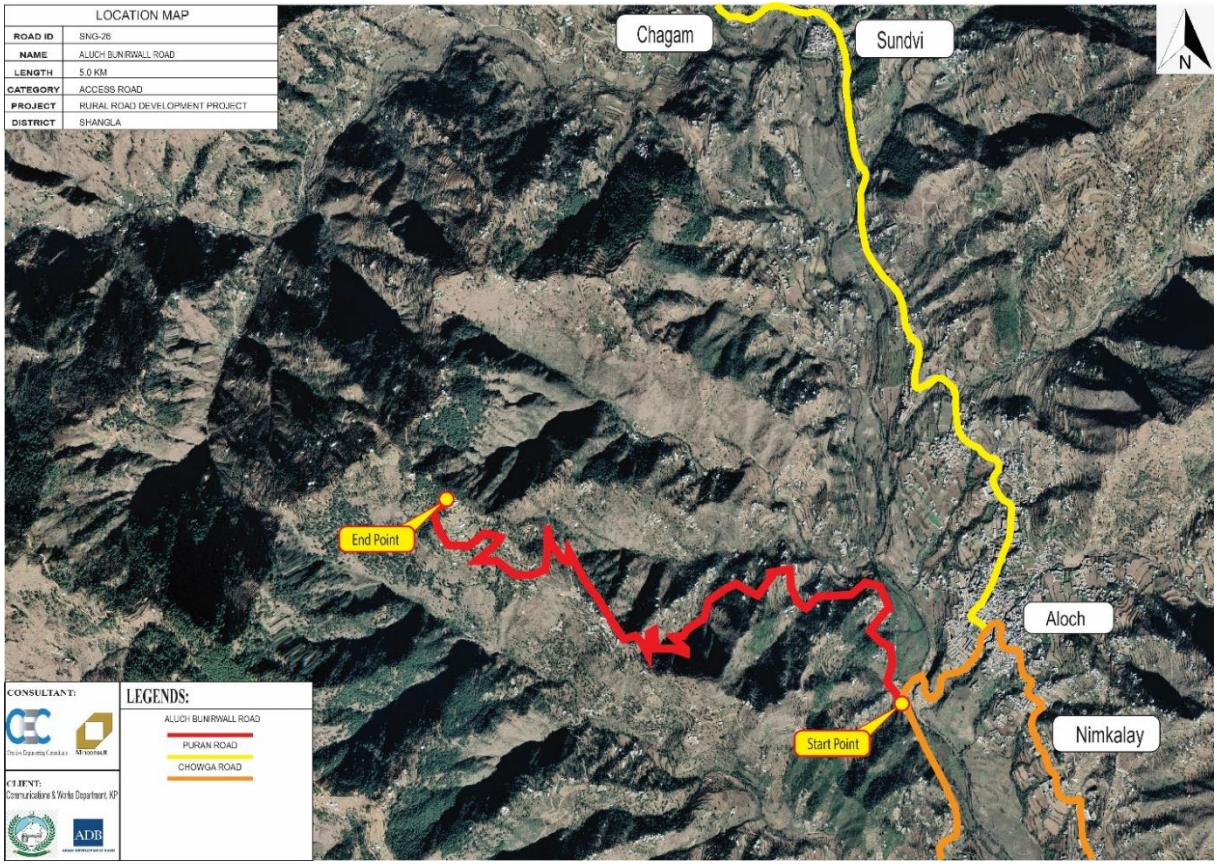


Figure 3.10.5 Location Map SNG-26

3.10.2.6 SNG-28 (Bengalai Landai Balo Chawak)

Embarking from the bustling heart of Puran City, the Bengalai Landai Balo Chawak Road leads the way, flanked by prominent hospitals catering to the community's health needs. Stretching across 6.9 kilometers, this road winds its course until it culminates in the village of Bengalai. Unfortunately, its current condition is far from ideal, beset by wear and deterioration, underscoring the pressing need for revitalization and attention.

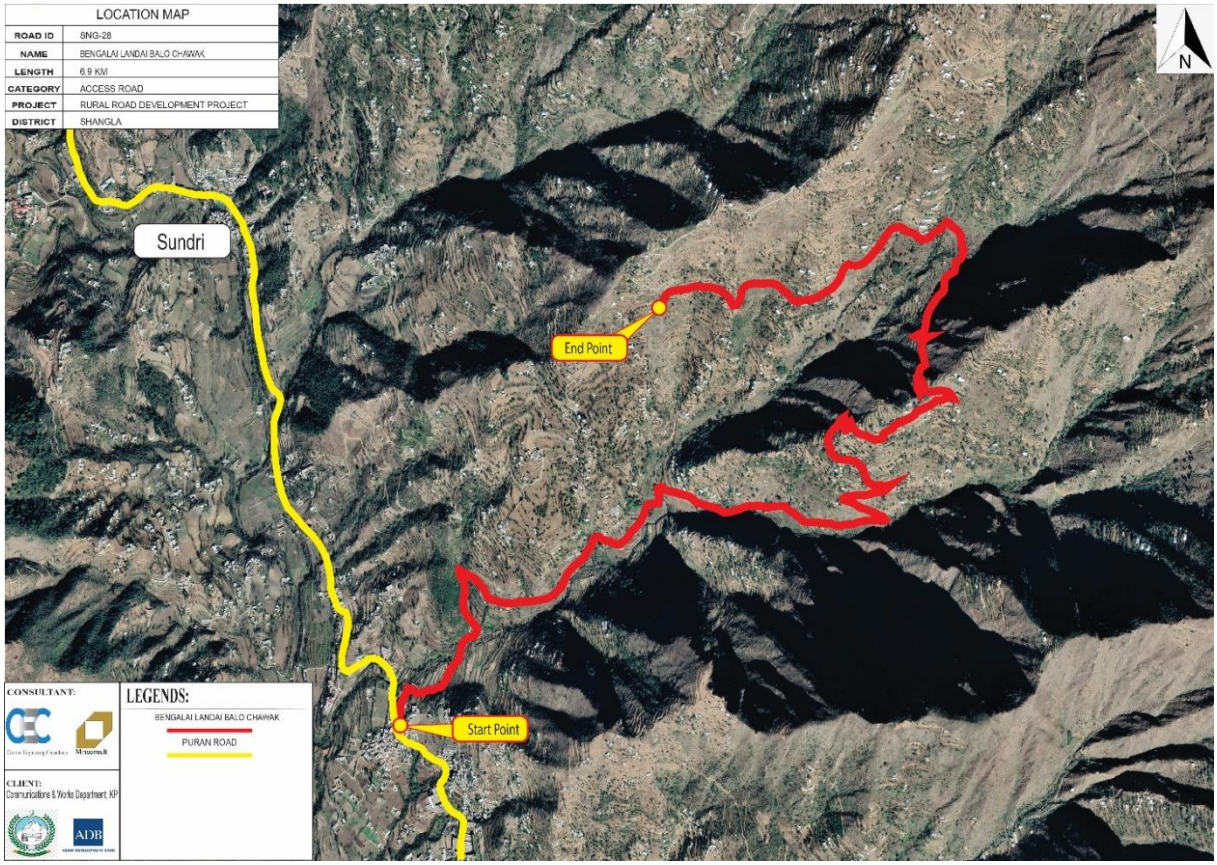


Figure 3.10.6 Location Map SNG-28

3.10.2.7 SNG-30 (Dherai Faiza Sondvi)

The Dherai Faiza Sondvi Road, stretching over 8.6 kilometers, commences its course from the vibrant hub of Puran City, traversing through Alagram, and concluding at the scenic Sundvi region. This vital thoroughfare serves as the linchpin, seamlessly connecting local communities with the essential amenities of Puran City.

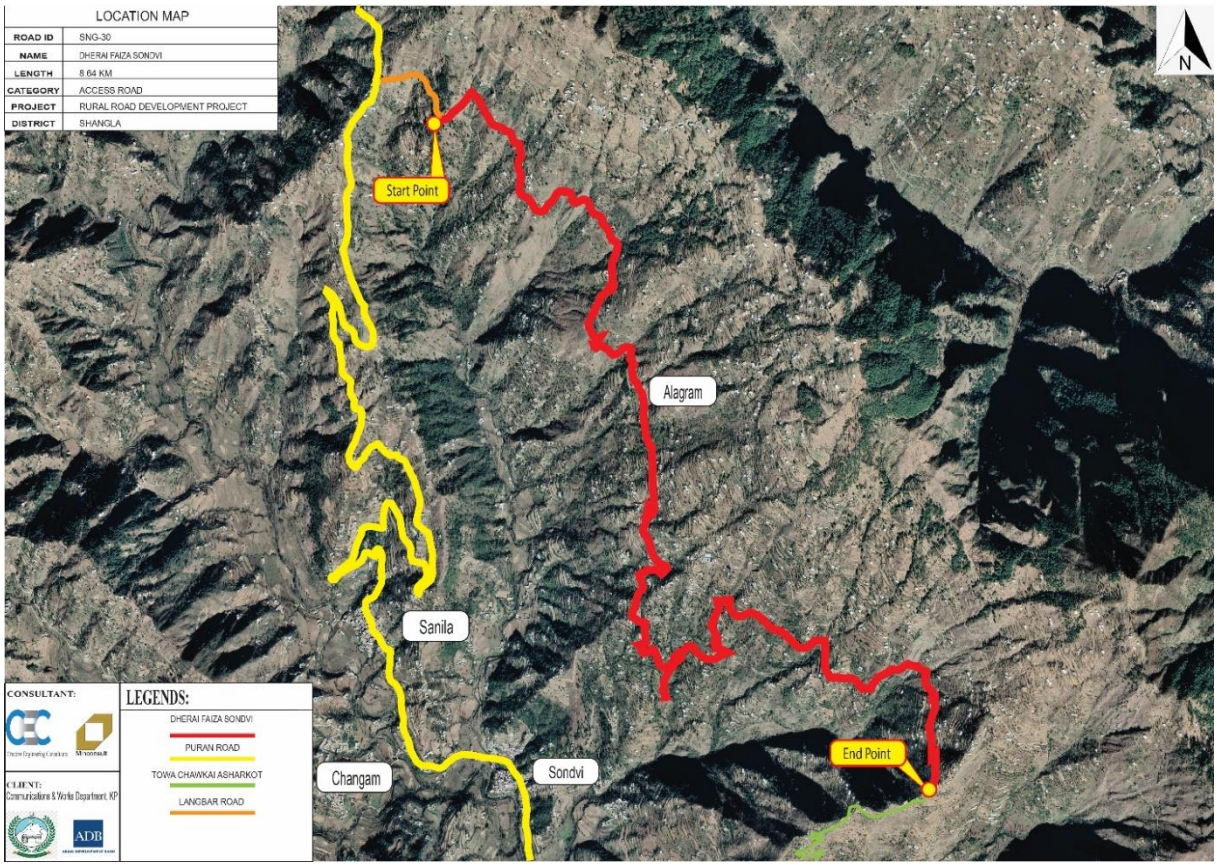


Figure 3.10.7 Location Map SNG-30

3.10.2.8 SNG-27 (Main Dara)

Emerging from the heart of Shangla, the Main Dara Road commences its journey in the thriving urban center of Puran City. This bustling hub boasts a comprehensive array of amenities, encompassing health, education, and various essential services. Spanning a modest 5 kilometers, this road winds its way to the village of Banglai. Regrettably, its current state leaves much to be desired, as wear and tear have taken their toll, emphasizing the pressing need for restoration and improvement.

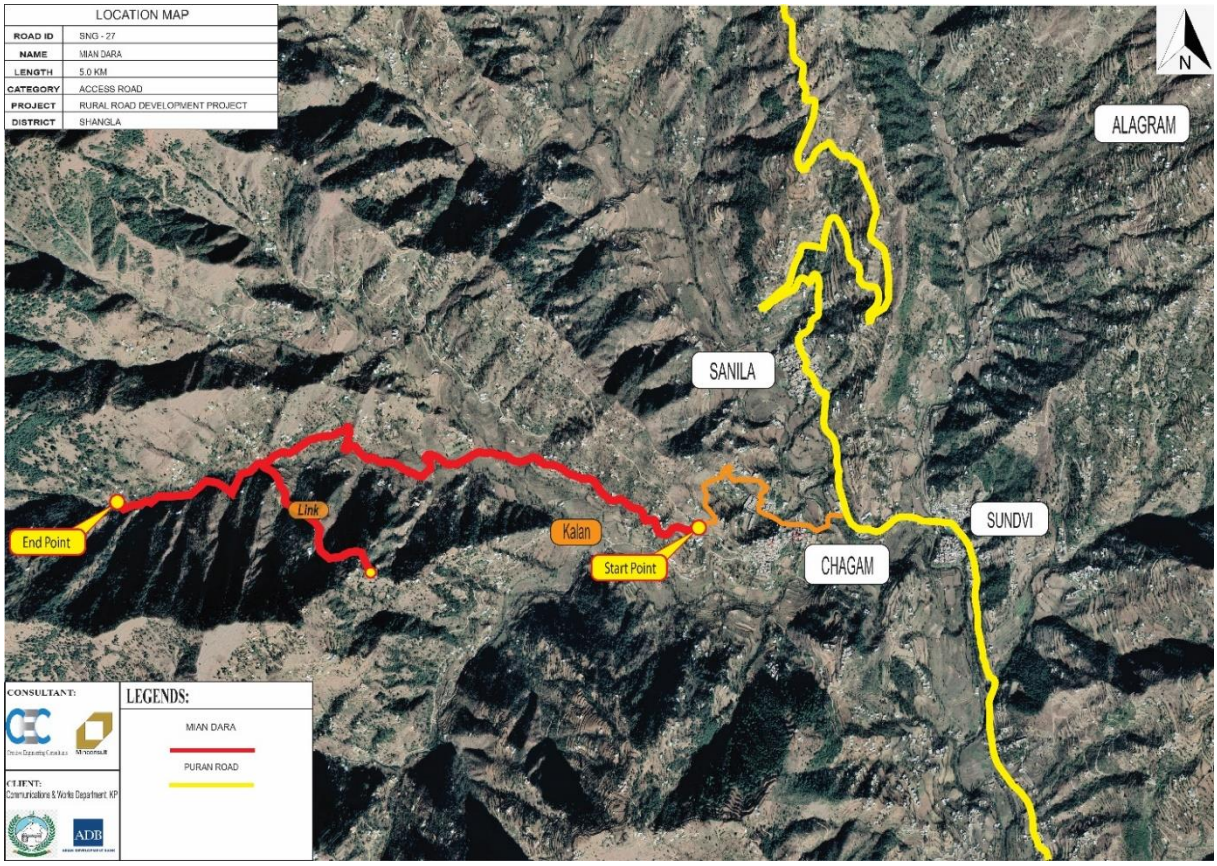


Figure 3.10.8 Location Map SNG-27

3.10.2.9 SNG-29 (Chagum Gumbat Road)

The Chagum Gumbat Road spans a length of 5 kilometers, serving as the central conduit to key facilities such as public health, transportation, and education. It commences its journey from the pivotal point of Chagum, ensuring vital connectivity for the community.

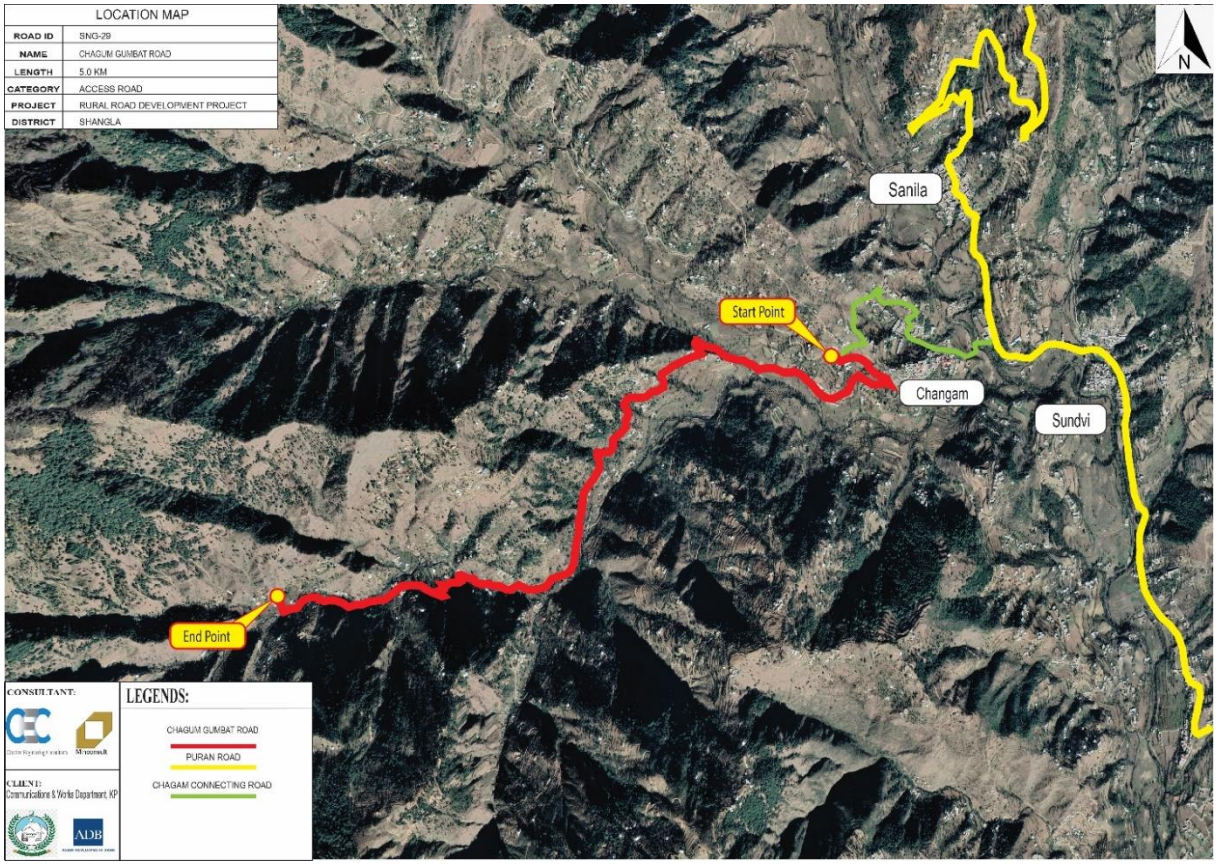


Figure 3.10.9 Location Map SNG-29

3.10.2.10 SNG-63 (Alpurai Barkas Kag Road)

The Alpurai Barkas Kag Road, spanning a significant 7 kilometers, holds a crucial place in the local infrastructure. This vital artery interlinks hospitals, educational institutions, and bustling markets, forming an essential lifeline for the community. Unfortunately, its current state is far from ideal, presenting a daunting challenge to travelers. Beginning its journey at the intersection of Besham Khwaza Khel Road, it persists in its deteriorated condition until it merges with Kag Road, underscoring the pressing need for revitalization.

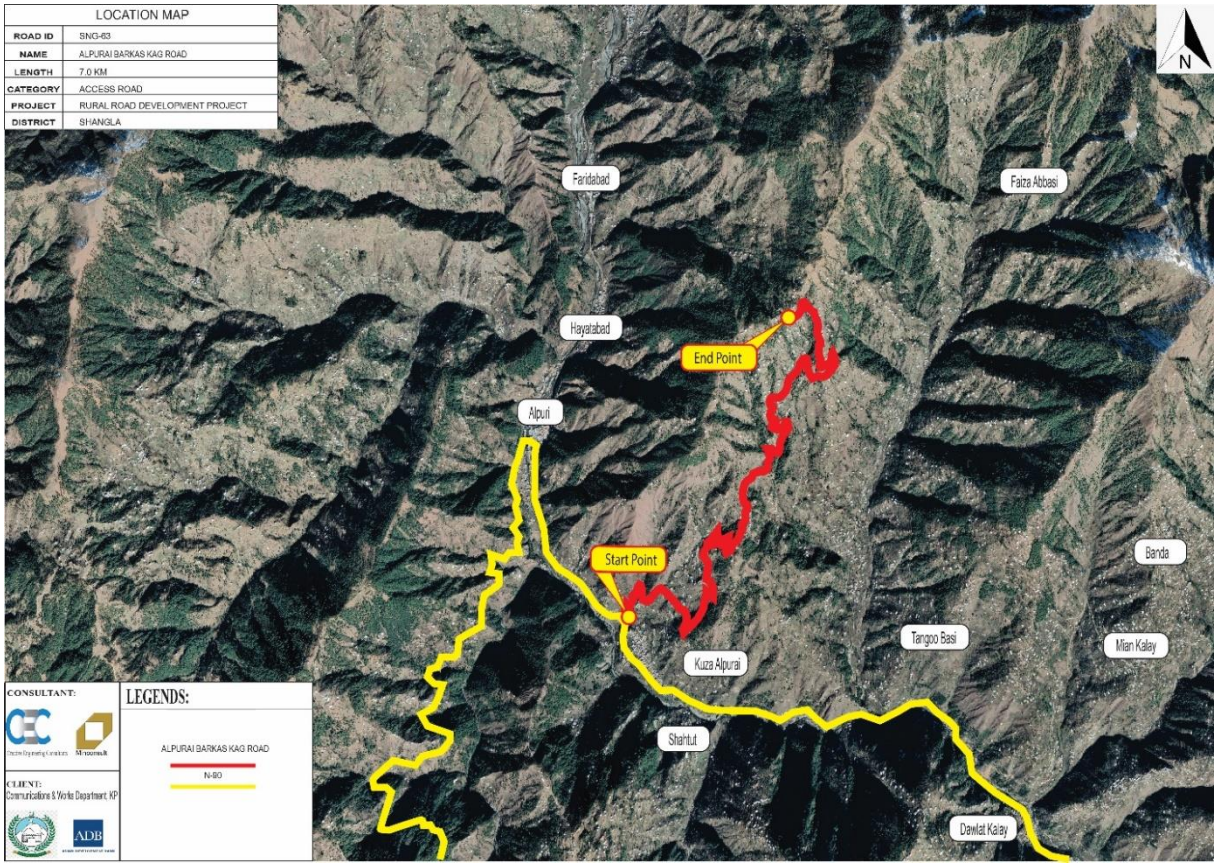


Figure 3.10.10 Location Map SNG-63

3.10.2.11 SNG-22 (Chagam Alamay)

The Chagam Alamay Road stands as the primary artery linking the local villagers to the essential facilities of the Chagam region. Spanning 5 kilometers, it commences its journey from the heart of Chagam, serving as a vital lifeline for the community.

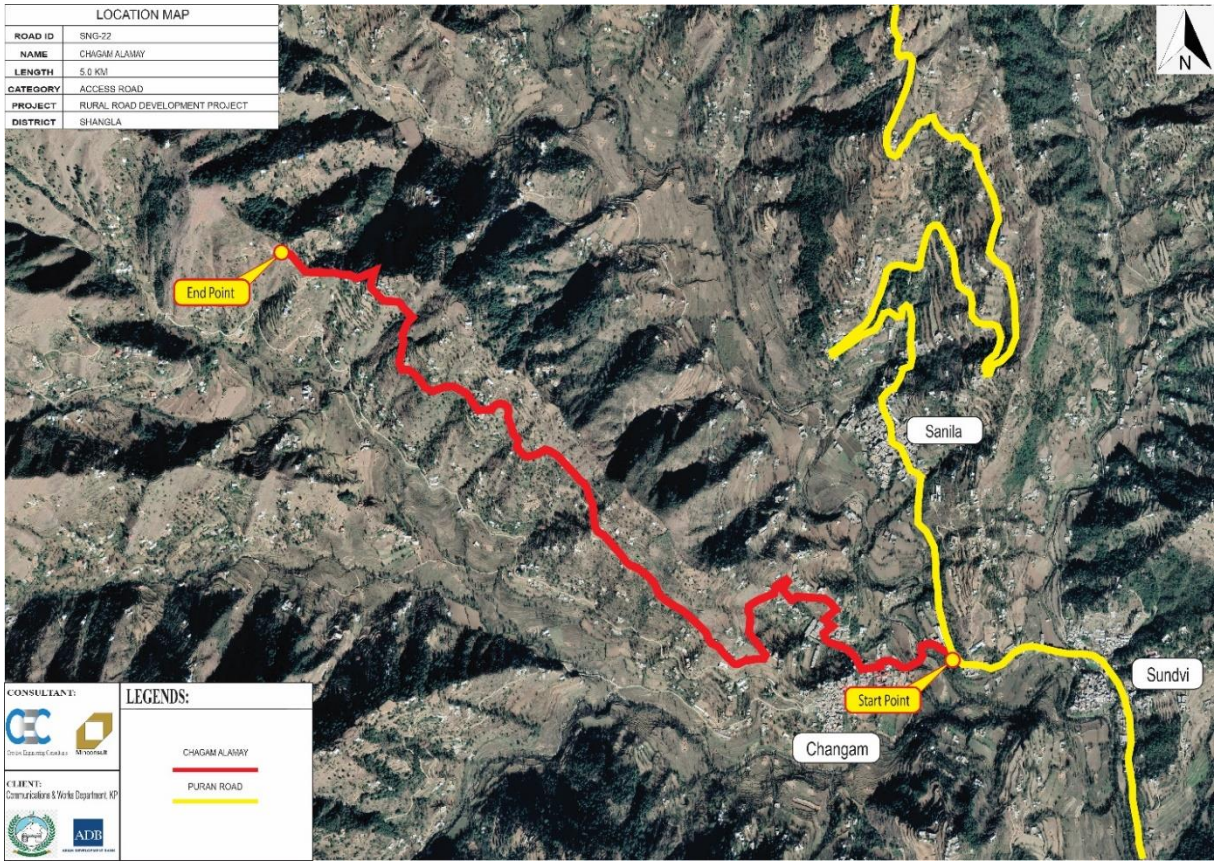


Figure 3.10.11 Location Map SNG-22

3.10.2.12 SNG-60 (Rahimabad Kas Basi Road)

The picturesque Rahimabad Kas Basi Road stretches gracefully over a span of 8 kilometers, commencing at the bustling intersection of the N_90 Besham Khwaza Khel Road in Rahimabad, and culminating at the tranquil Basi Road. This vital artery stands as the sole conduit for the local populace to fulfill their daily necessities. However, its lamentable state of disrepair constitutes a formidable obstacle, impeding the community's seamless access to essential services.

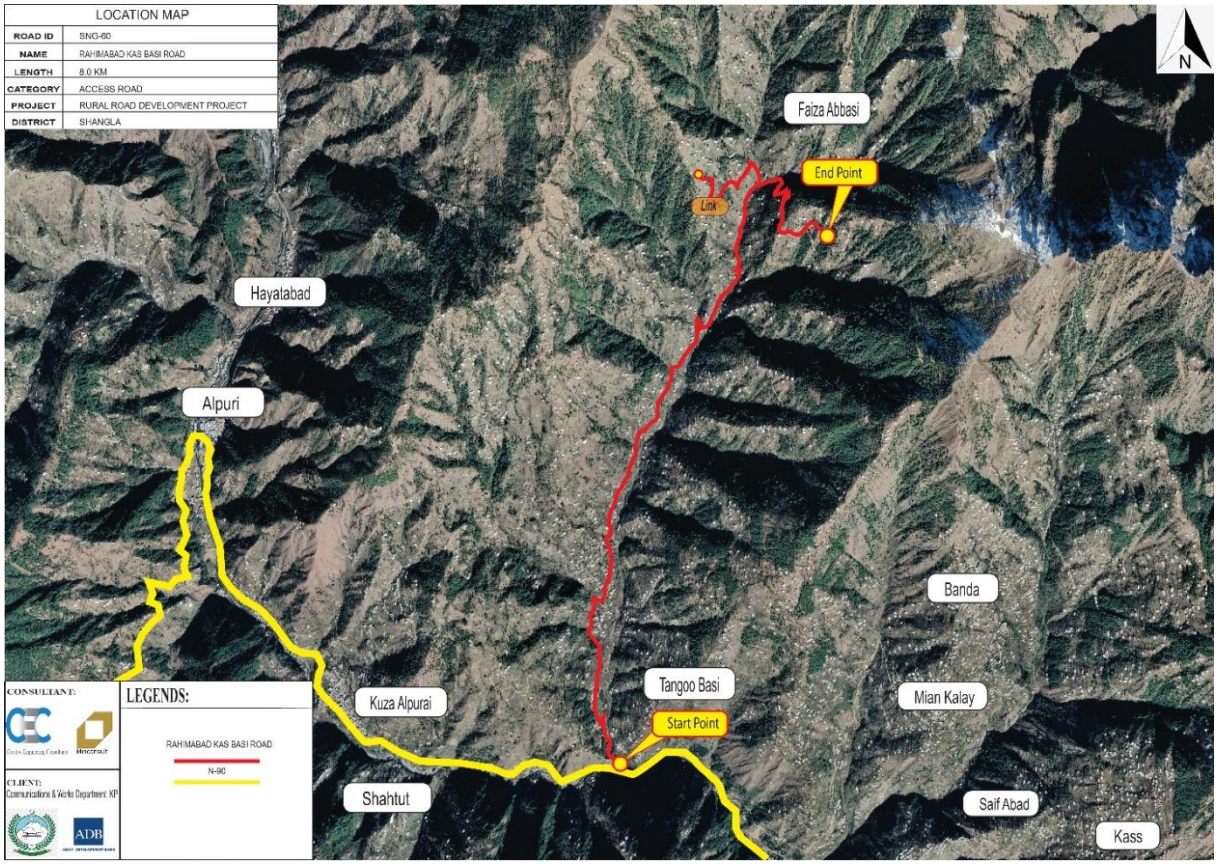


Figure 3.10.12 Location Map SNG-60

3.10.2.13 SNG-33 (Zara Road)

The illustrious Zara Road stretches gracefully over a 5-kilometer span, embarking from the bustling main thoroughfare of N-90 and winding its way into the breathtaking mountain vistas, offering a visual feast that holds significance not only for the local community but also bestows upon visiting tourists a truly special experience. This picturesque journey culminates at the captivating Zarai region, imparting a sense of enchantment to this cherished route.

Regrettably, the road's current state of disrepair casts a shadow over its splendor, necessitating urgent attention and repair. Addressing it1s deteriorated condition will not only restore its charm but also ensure safe and seamless passage for all who traverse its scenic expanse.

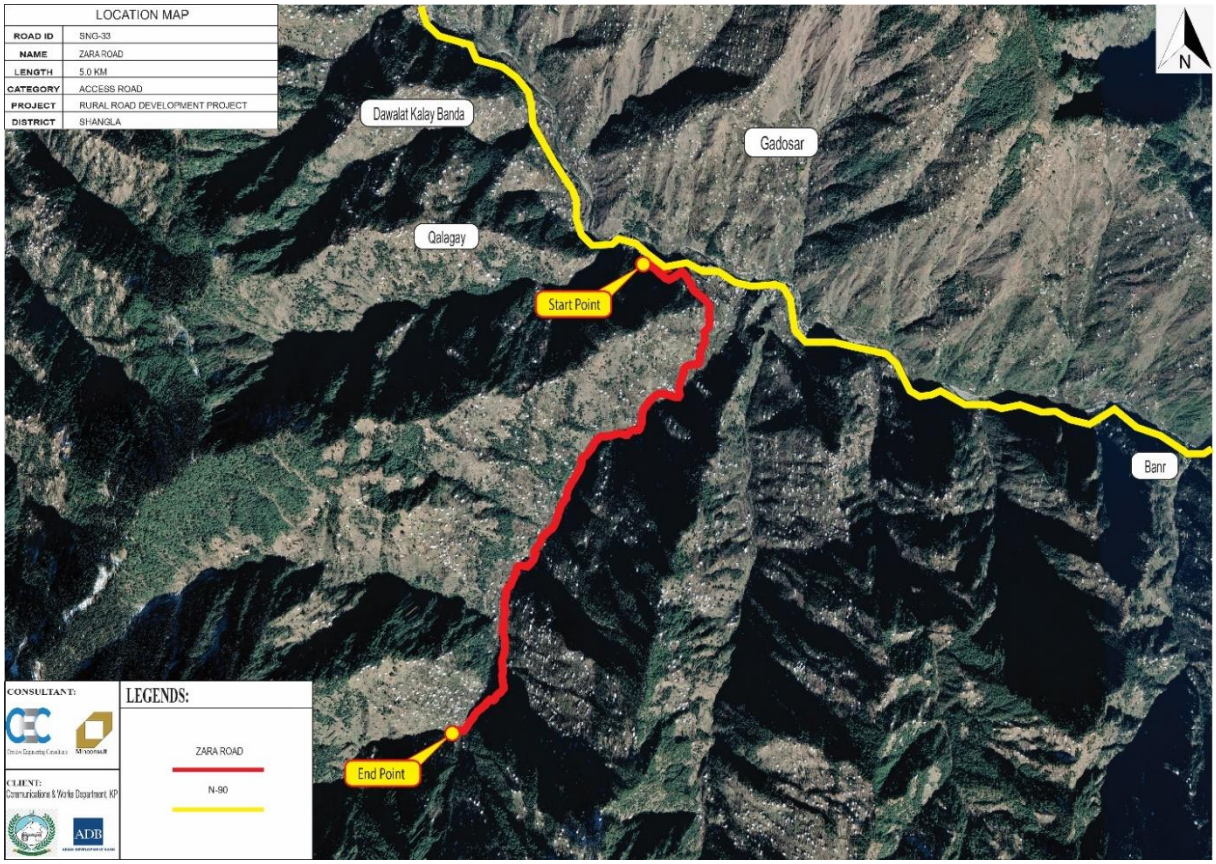
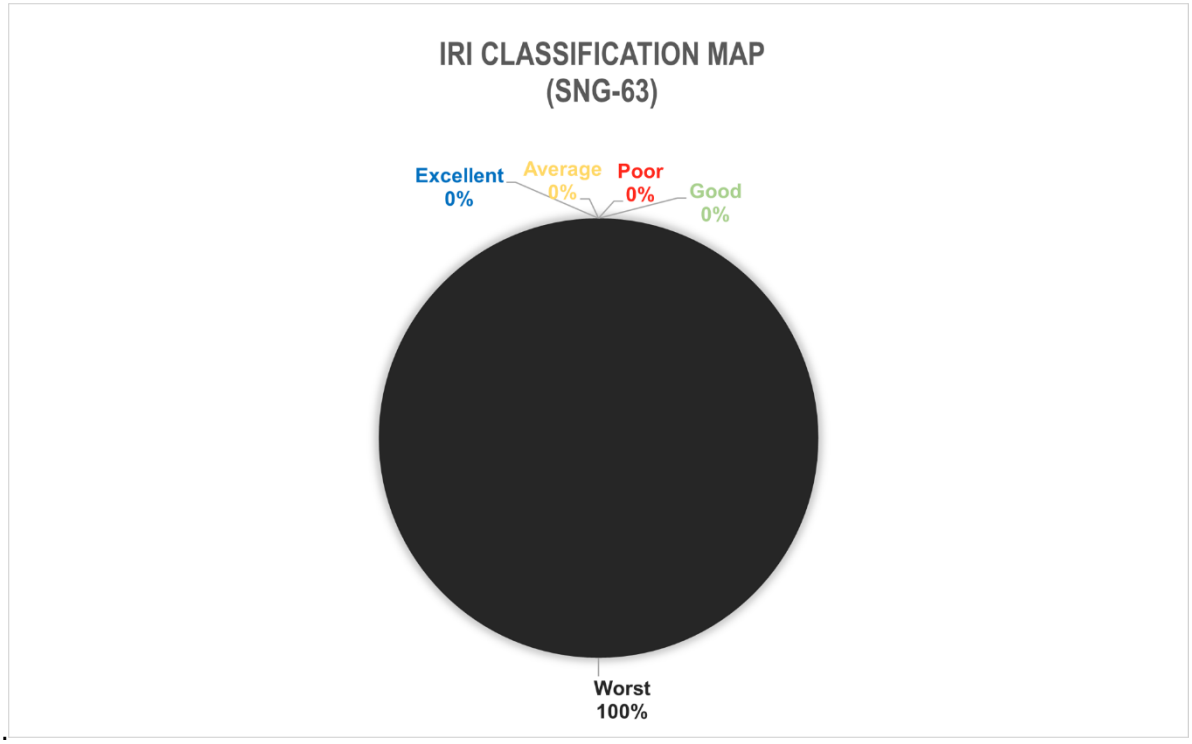


Figure 3.10.13 Location Map SNG-33

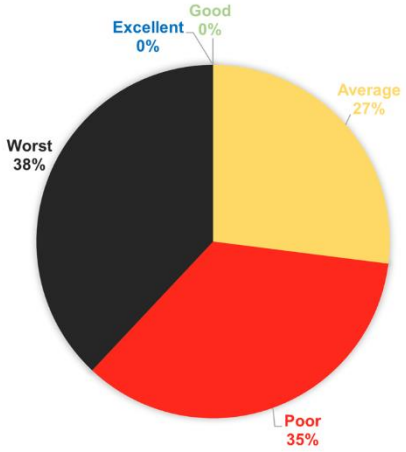
3.10.3 IRI Classification Pie Chart of Selected Roads

The International Roughness Index (IRI) is used by highway professionals throughout the world as a standard to quantify road surface roughness. A poor road surface roughness influences the traffic speeds and times. It also effects the mobility and accesibility of users traversing that road.

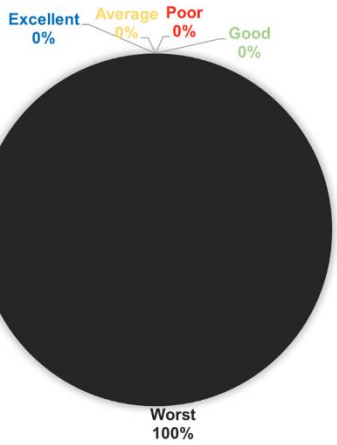
The IRI Classification Charts are given below



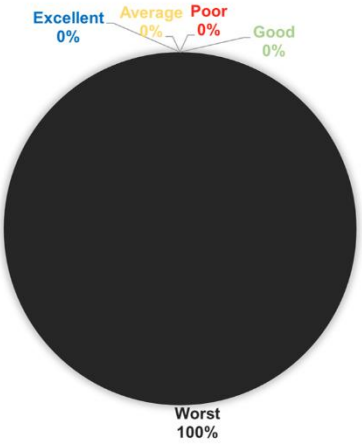
IRI CLASSIFICATION MAP
(SNG-7)



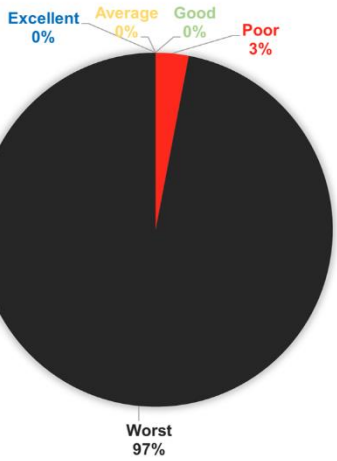
IRI CLASSIFICATION MAP
(SNG-14)



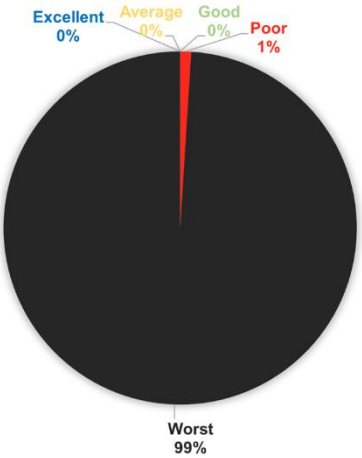
IRI CLASSIFICATION MAP
(SNG-20)



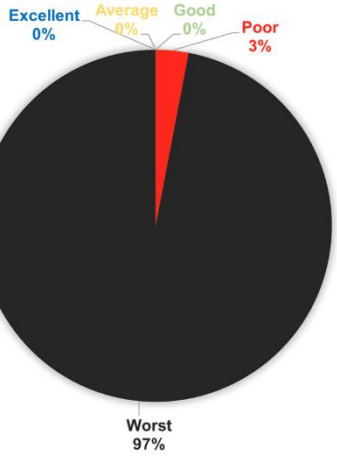
IRI CLASSIFICATION MAP
(SNG-22)



IRI CLASSIFICATION MAP
(SNG-26)



IRI CLASSIFICATION MAP
(SNG-27)



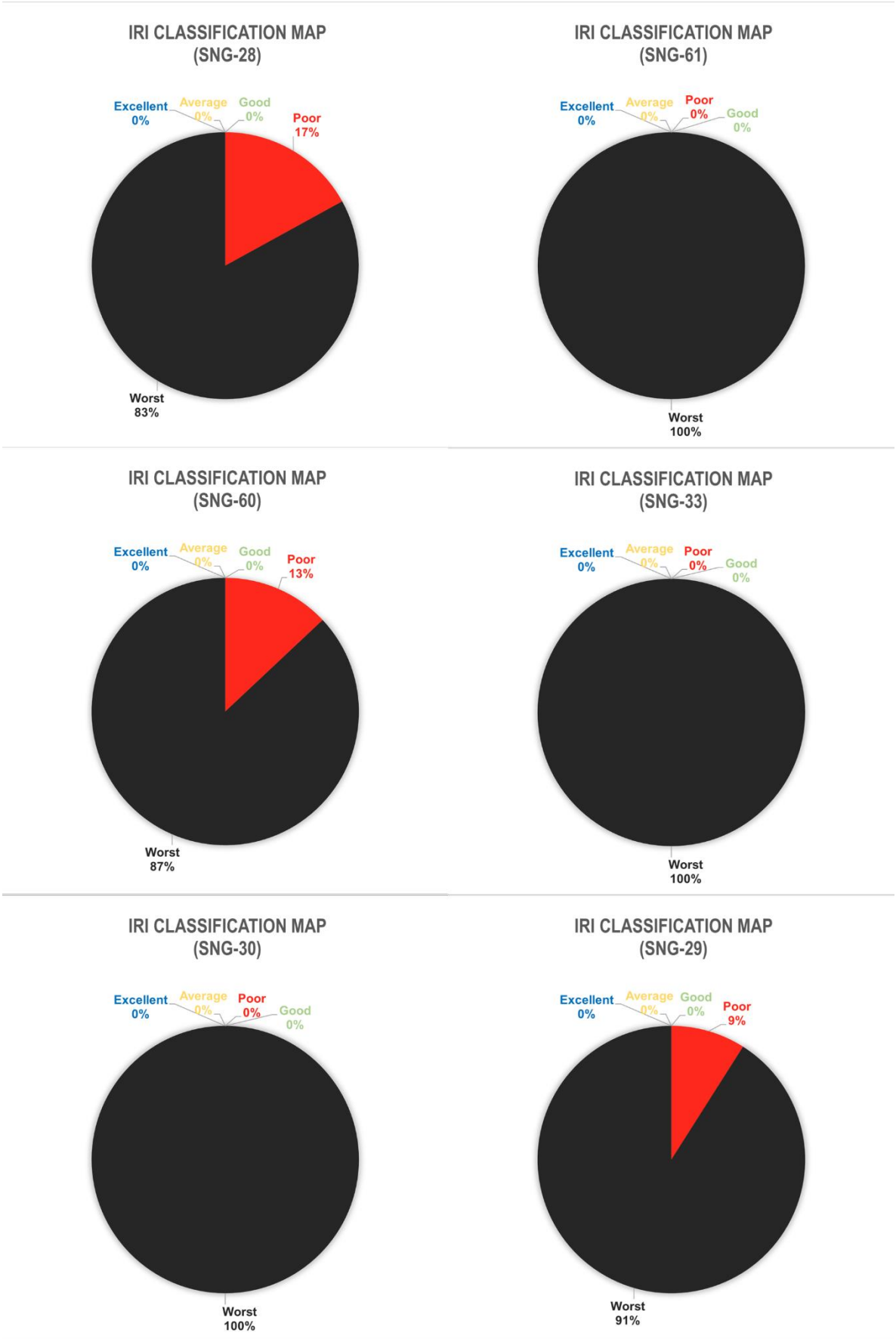
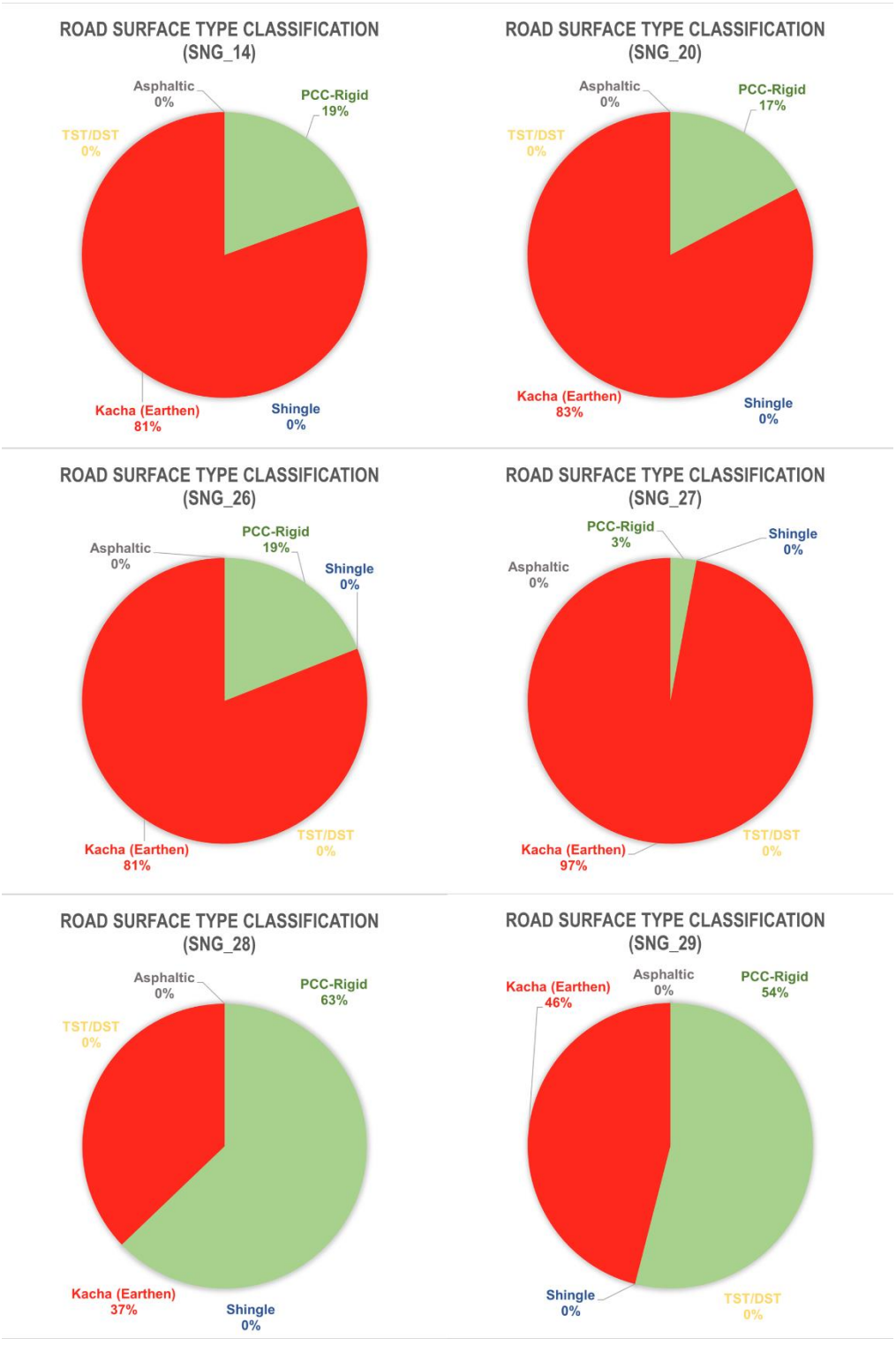


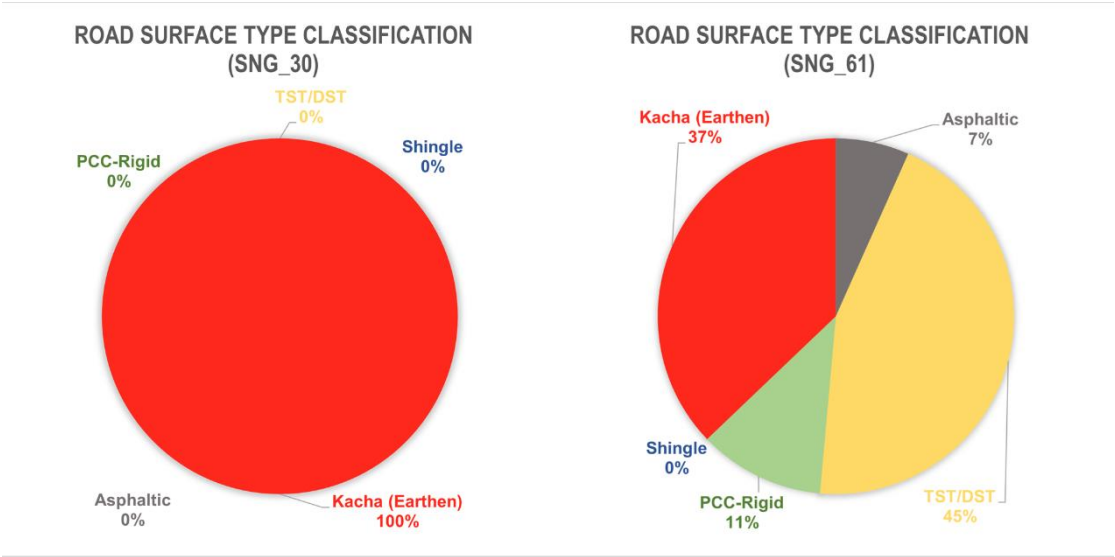
Figure 3.10.14 IRI Classification Charts of Access Roads District Shangla

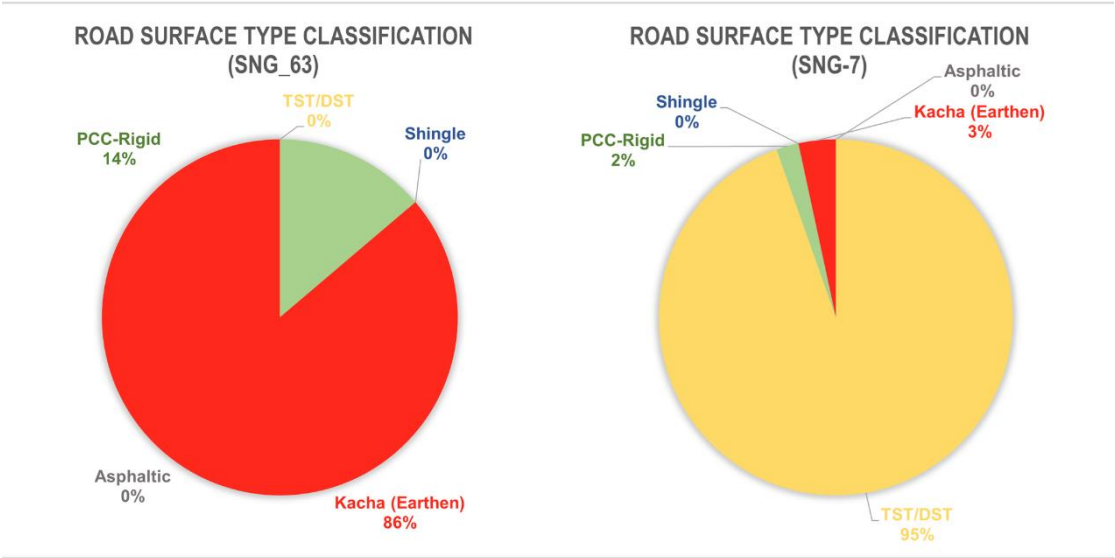
3.10.4 RST Pie Chart of Selected Roads

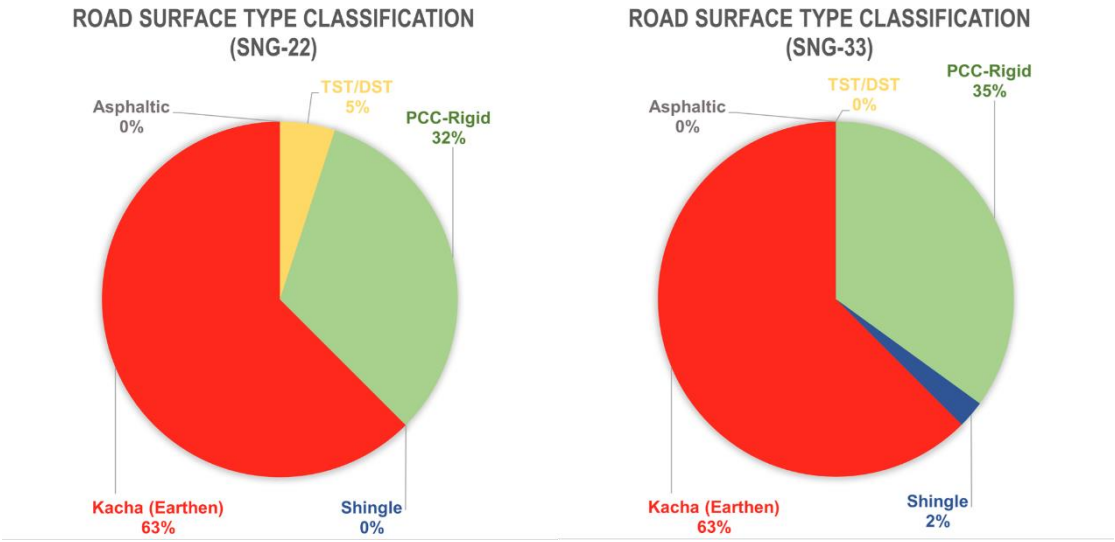
Road Surface type (RST) survey was conducted to investigate the actual condition and type of surface of the road under observation. In rural areas earthen or kacha tracks and TST/DST are common that affect the mobility of road users and accessibility to necessities.

The RST Classification Charts are given below.




ROAD SURFACE TYPE CLASSIFICATION
(SNG_30)
TST/DST
0%
Shingle
0%
PCC-Rigid
0%
Asphaltic
0%
Kacha (Earthen)
100%
ROAD SURFACE TYPE CLASSIFICATION
(SNG_61)
Kacha (Earthen)
37%
Asphaltic
7%
Shingle
0%
PCC-Rigid
11%
TST/DST
45%


ROAD SURFACE TYPE CLASSIFICATION
(SNG_63)
TST/DST
0%
PCC-Rigid
14%
Shingle
0%
Asphaltic
0%
Kacha (Earthen)
86%
ROAD SURFACE TYPE CLASSIFICATION
(SNG-7)
Asphaltic
0%
Shingle
0%
Kacha (Earthen)
3%
PCC-Rigid
2%
TST/DST
95%


ROAD SURFACE TYPE CLASSIFICATION
(SNG-22)
Asphaltic
0%
TST/DST
5%
PCC-Rigid
32%
Kacha (Earthen)
63%
Shingle
0%
ROAD SURFACE TYPE CLASSIFICATION
(SNG-33)
PCC-Rigid
35%
Asphaltic
0%
TST/DST
0%
Kacha (Earthen)
63%
Shingle
2%

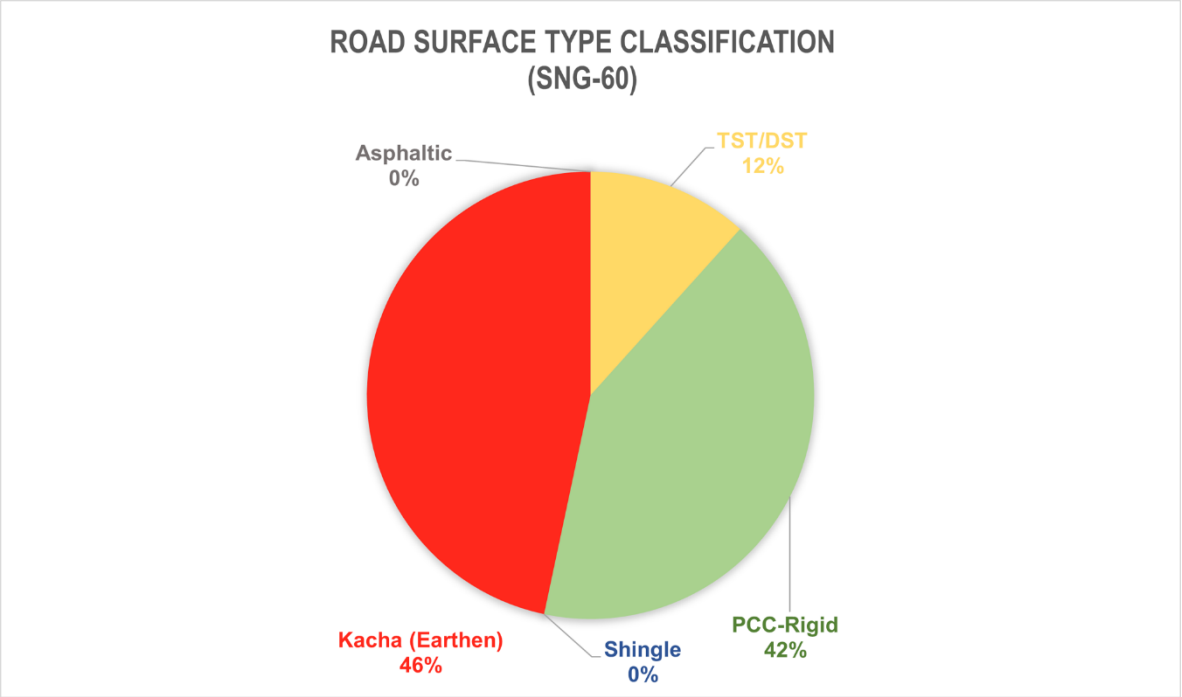


Figure 3.10.15 RST Classification Charts of Access Roads District Shangla

3.10.5 Travel Speed Survey

Table 3.10.2 Travel Speed Surveys of Access Roads District Shangla

Road ID	Distance (km)	Total Ascent (m)	Total Descent (m)	Total Time	Average Speed (km/h)	Avg. Moving Speed (km/h)	Maximum Speed (km/h)	Moving Time
SNG-14	7.54	82	652	44:07.0	10.26	10.26	23.88	44:07.0
SNG-7	14.41	584	704	42:03.0	20.57	20.57	41.93	43:03.0
SNG-61	6.06	69.00	129.00	20:31.0	17.71	19.07	33.19	41:02.0
SNG-20	6.9	21	680	24:34.0	16.79	16.95	45.97	49:03.0
SNG-26	5.1	63	506	00:03.0	5.11	6.91	67.61	45:03.0
SNG-28	5.86	53.00	165.00	21:33.0	16.32	18.52	37.47	51:57.0
SNG-30	7.15	146	113	18:26.0	23.29	23.29	51.13	38:26.0
SNG-27	5.71	9.667	36	08:47.7	12.457	13.857	25.863	07:57.3
SNG-29	5.46	39	39	15:12.0	21.58	22.57	47.9	5.46
SNG-63	6.22	16.00	84.00	19:44.0	18.91	21.82	48.03	48:26.0
SNG-22	1.50	27.00	99.00	09:46.0	9.20	9.20	36.58	37:26.0
SNG-60	6.51	26	17	10:49.5	18.085	18.085	36.585	58:35.0
SNG-33	5	53	446	00:03.0	10.11	7.91	27.61	41:03.0

The travel speeds for all roads are low due to the deteriorated road condition which is reflected from the RST and IRI pie charts. Mobility of the road users is affected as indicated by lower average speeds and higher travel times, which can be attributed to the poor road conditions.

It can be inferred from these observations that these roads need to be reconstructed for better mobility and access of people to basic livelihood necessities.

3.10.6 Traffic Analysis
3.10.6.1 Summary of Existing Average Daily Traffic (ADT)

The summary of traffic counts obtained is given in the following Table.

ADT's

Table 3.10.3 Existing ADT of Access Roads District Shangla

Road ID	Car	Motorcycle	Mazda Coaster	Rickshaw / Q.chi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	TOTAL Vehicles
SNG-14	459	181	0	0	0	0	0	0	0	0	0	0	5	3	648
SNG-61	6	12	0	0	28	20	0	0	0	0	0	0	0	0	66
SNG-20	0	6	0	0	16	4	0	0	0	0	0	0	0	0	26
SNG-26	0	13	0	0	26	15	0	0	0	0	0	0	0	0	54
SNG-28	7	19	0	0	21	17	0	0	0	0	0	0	0	0	64
SNG-30	0	4	0	0	12	0	0	0	0	0	0	0	0	0	16
SNG-27	5	11	0	0	29	23	0	0	0	0	0	0	0	0	68
SNG-29	0	10	0	0	15	9	0	0	0	0	0	0	0	0	34
SNG-63	0	8	0	0	14	4	0	0	0	0	0	0	0	0	26
SNG-22	0	8	0	0	18	11	0	0	0	0	0	0	0	0	37
SNG-7	563	150	0	0	0	0	0	0	0	0	0	0	10	1	724
SNG-60	0	7	0	0	12	8	0	0	0	0	0	0	0	0	27
SNG-33	8	22	0	0	29	8	0	0	0	0	0	0	0	0	67

PCUs

Table 3.10.4 Existing PCUs of Access Roads District Shangla

Road ID	Car	Motorcycle	Mazda Coaster	Rickshaw / Qingqi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	Total PCUS
SNG-14	459	91	0	0	0	0	0	0	0	0	0	0	23	12	584
SNG-61	6	6	0	0	42	40	0	0	0	0	0	0	0	0	94
SNG-20	0	3	0	0	24	8	0	0	0	0	0	0	0	0	35
SNG-26	0	7	0	0	39	30	0	0	0	0	0	0	0	0	76
SNG-28	7	10	0	0	32	34	0	0	0	0	0	0	0	0	82
SNG-30	0	2	0	0	18	0	0	0	0	0	0	0	0	0	20
SNG-27	5	6	0	0	44	46	0	0	0	0	0	0	0	0	100
SNG-29	0	5	0	0	23	18	0	0	0	0	0	0	0	0	46
SNG-63	0	4	0	0	21	8	0	0	0	0	0	0	0	0	33
SNG-22	0	4	0	0	27	22	0	0	0	0	0	0	0	0	53
SNG-7	563	75	0	0	0	0	0	0	0	0	0	0	45	4	687
SNG-60	0	4	0	0	18	16	0	0	0	0	0	0	0	0	38
SNG-33	8	11	0	0	44	16	0	0	0	0	0	0	0	0	79

3.10.6.2 Composition Of Vehicle Types

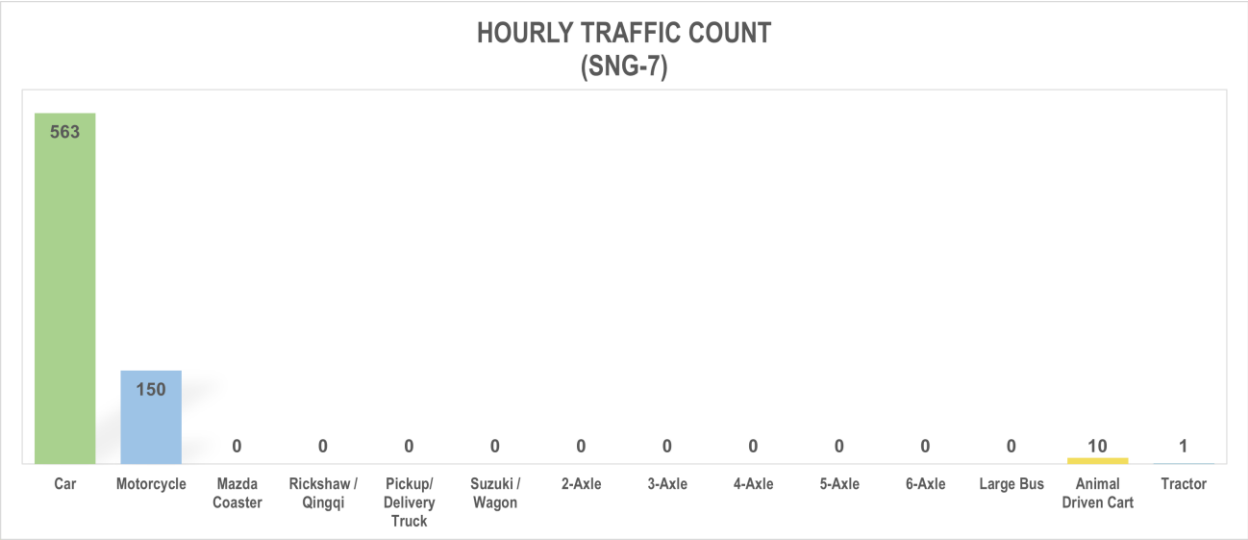


Figure 3.10.16 Vehicle Composition SNG-7

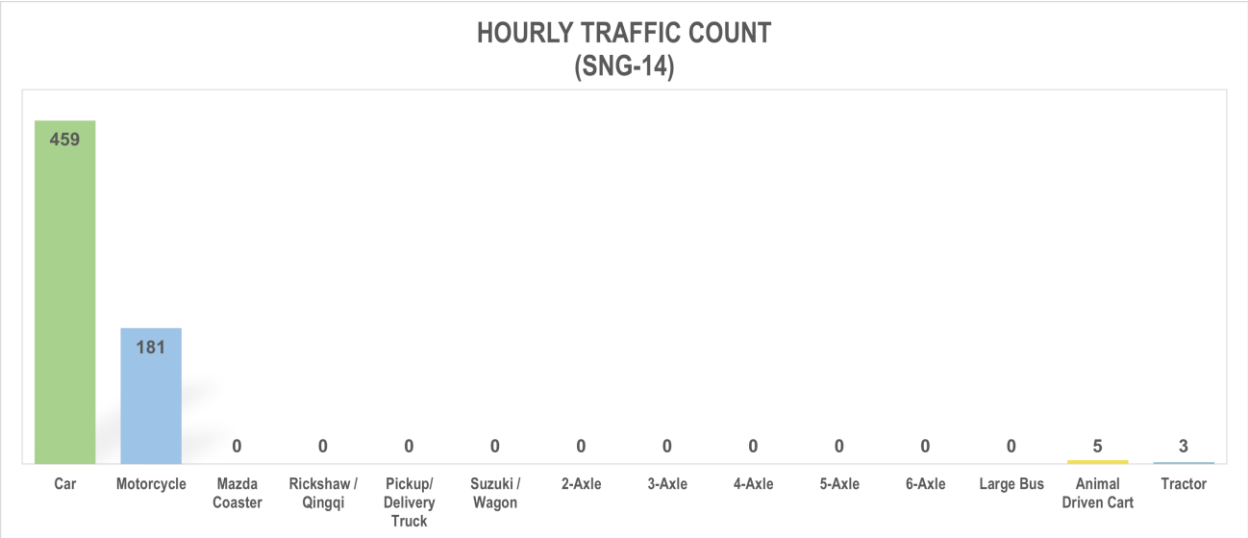


Figure 3.10.17 Vehicle Composition SNG-14

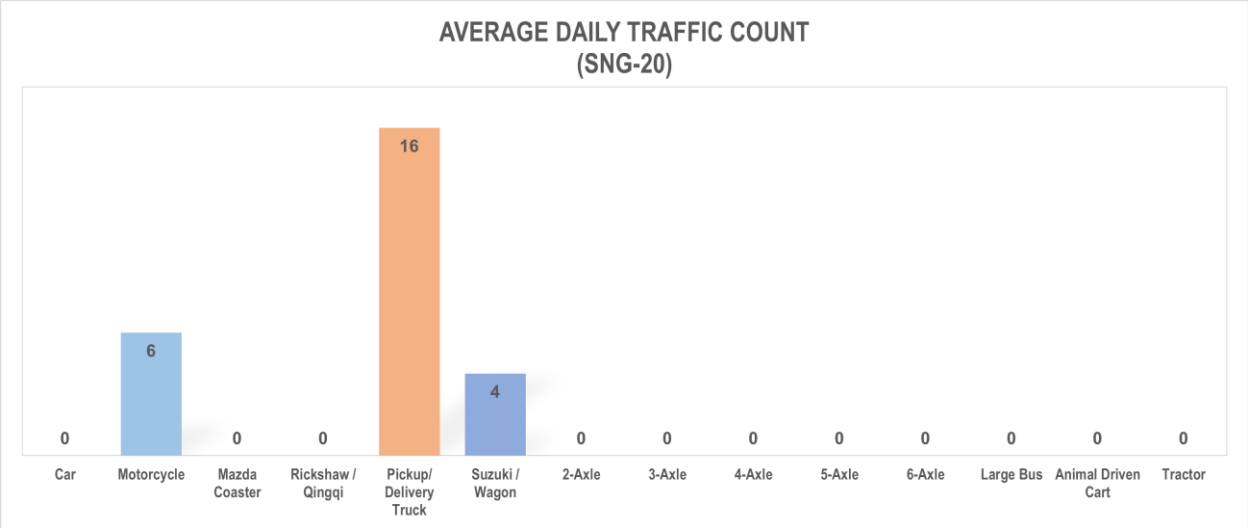


Figure 3.10.18 Vehicle Composition SNG-20

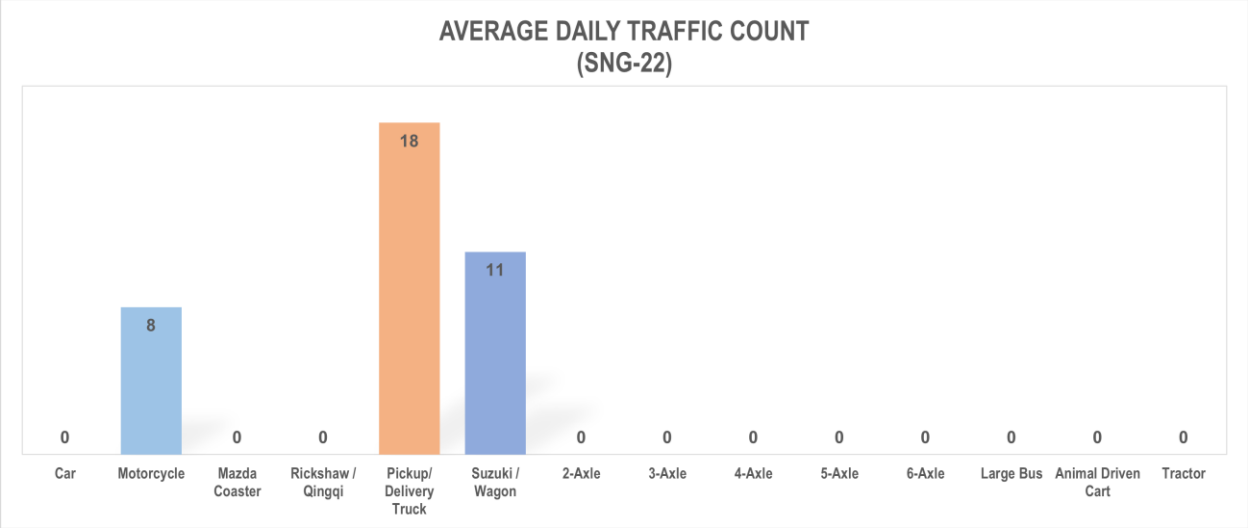


Figure 3.10.19 Vehicle Composition SNG-22

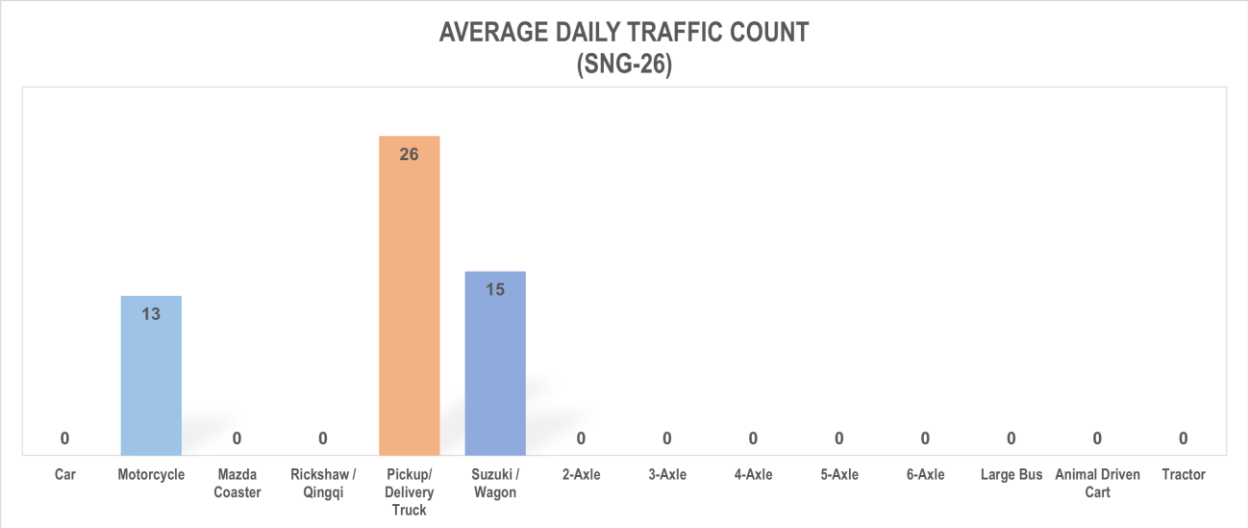


Figure 3.10.20 Vehicle Composition SNG-26

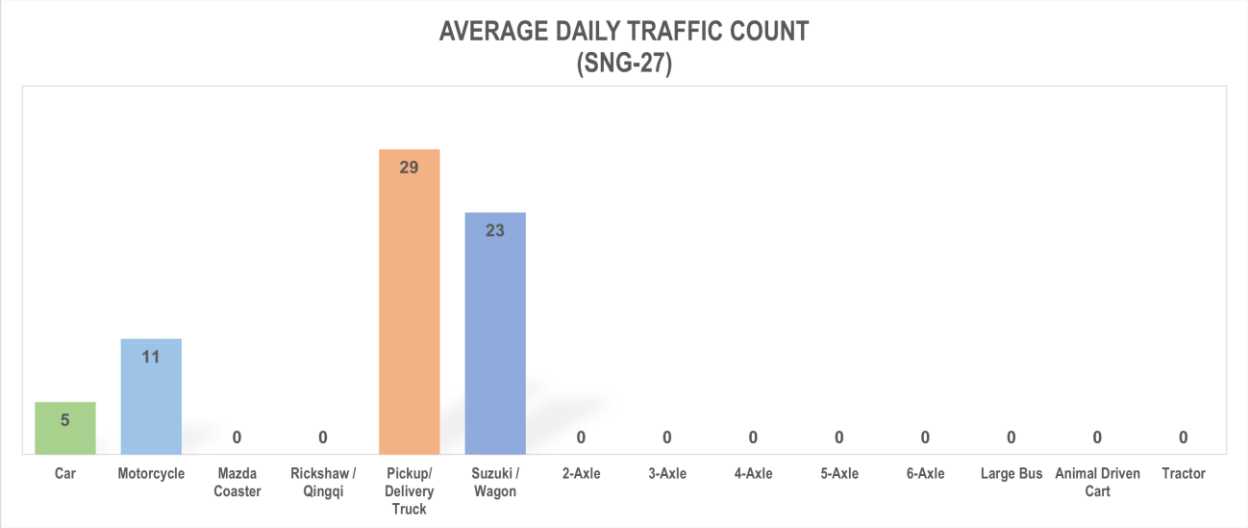


Figure 3.10.21 Vehicle Composition SNG-27

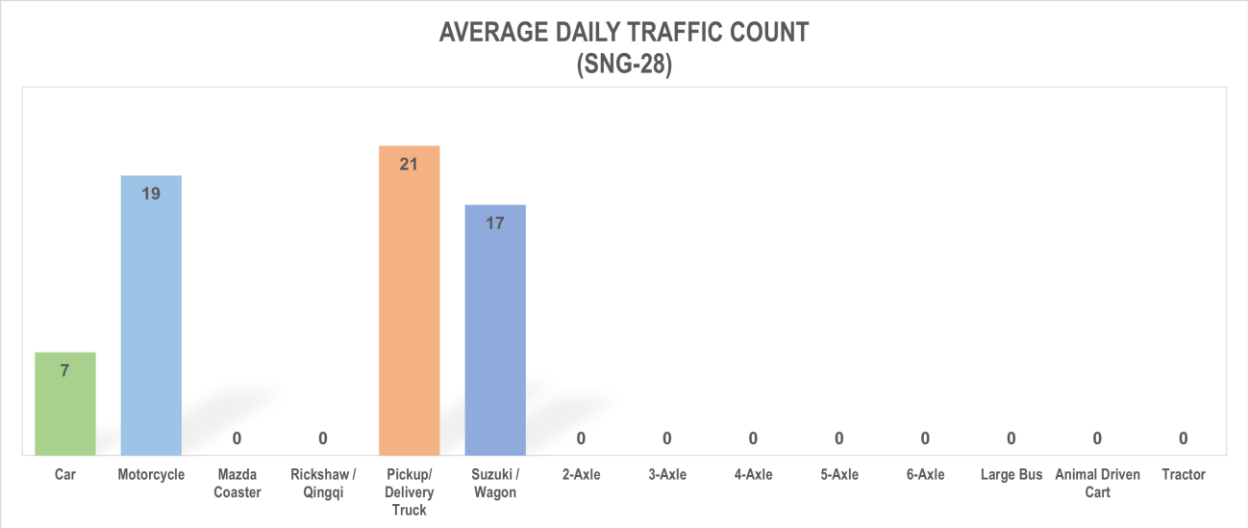


Figure 3.10.22 Vehicle Composition SNG-28

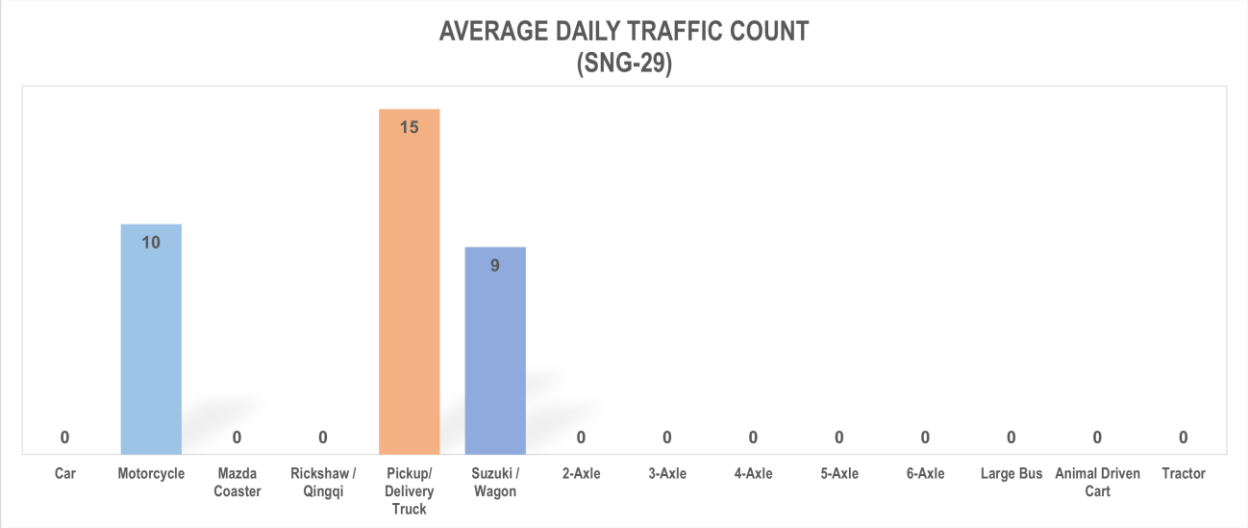


Figure 3.10.23 Vehicle Composition SNG-29

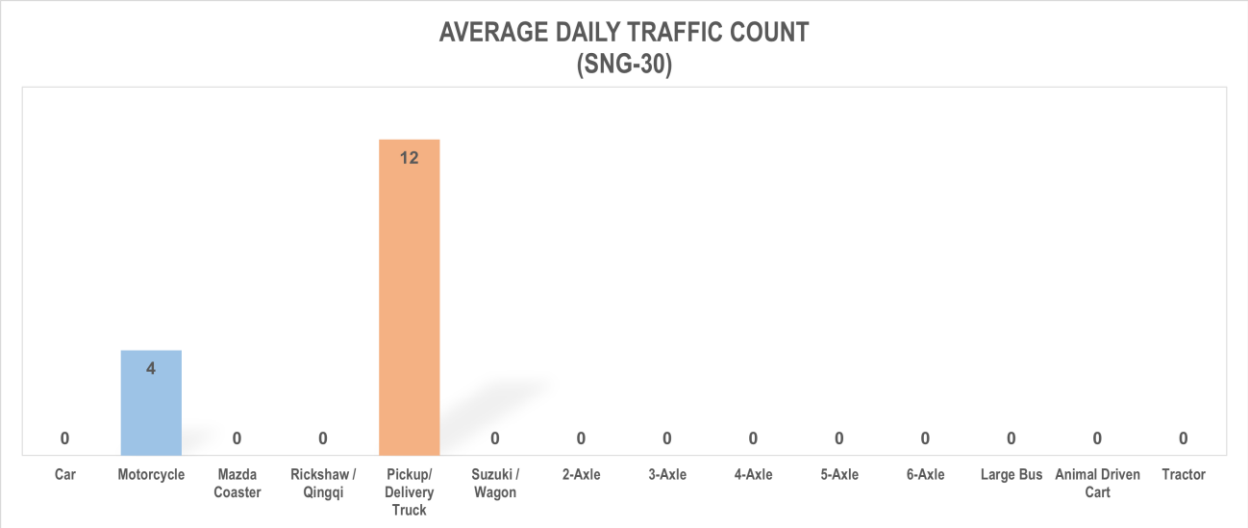


Figure 3.10.24 Vehicle Composition SNG-30

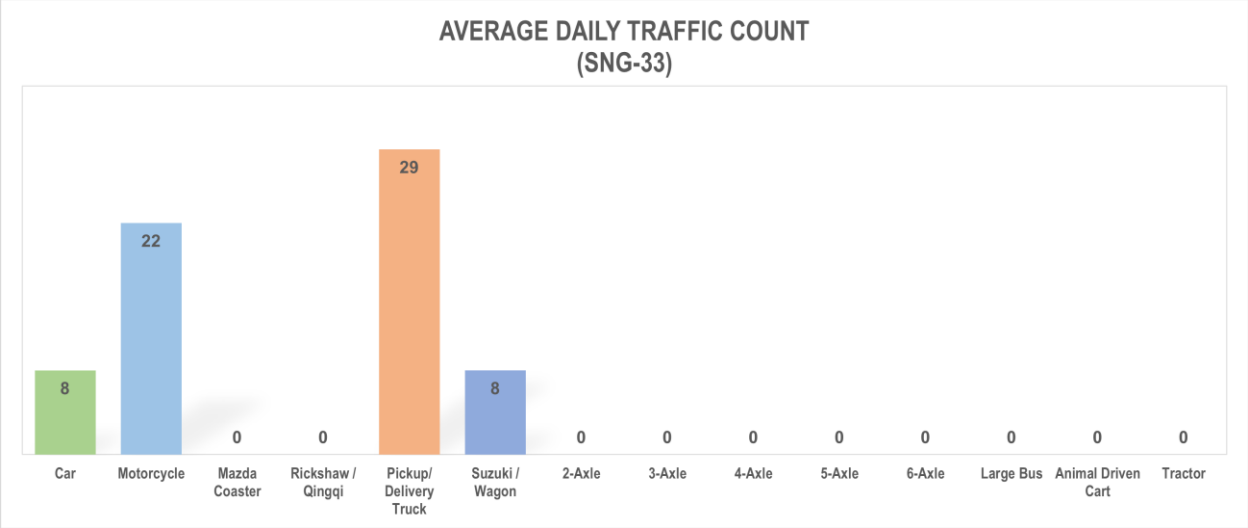


Figure 3.10.25 Vehicle Composition SNG-33

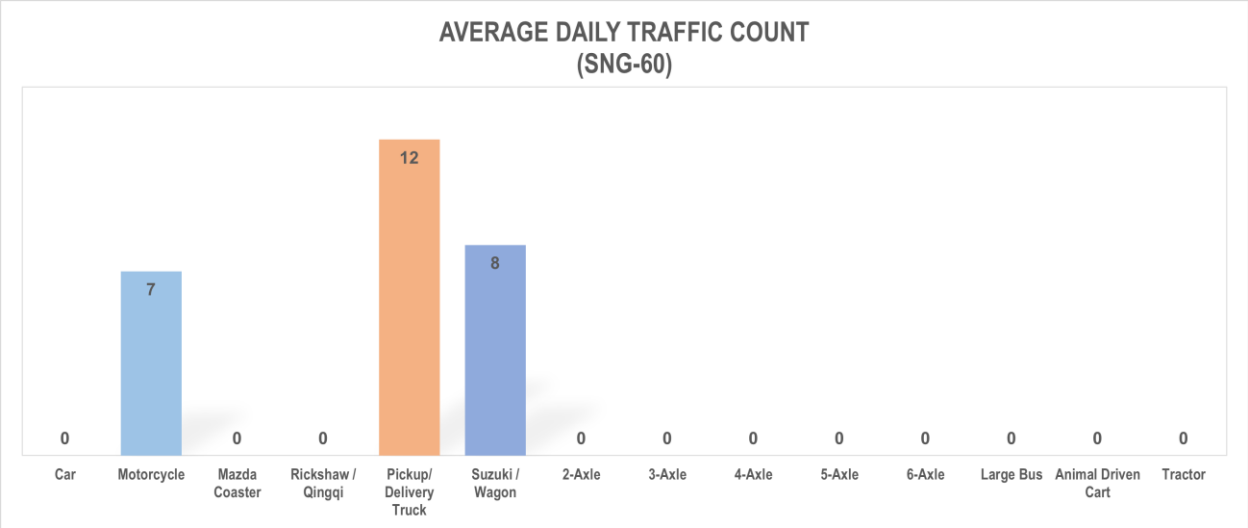


Figure 3.10.26 Vehicle Composition SNG-60

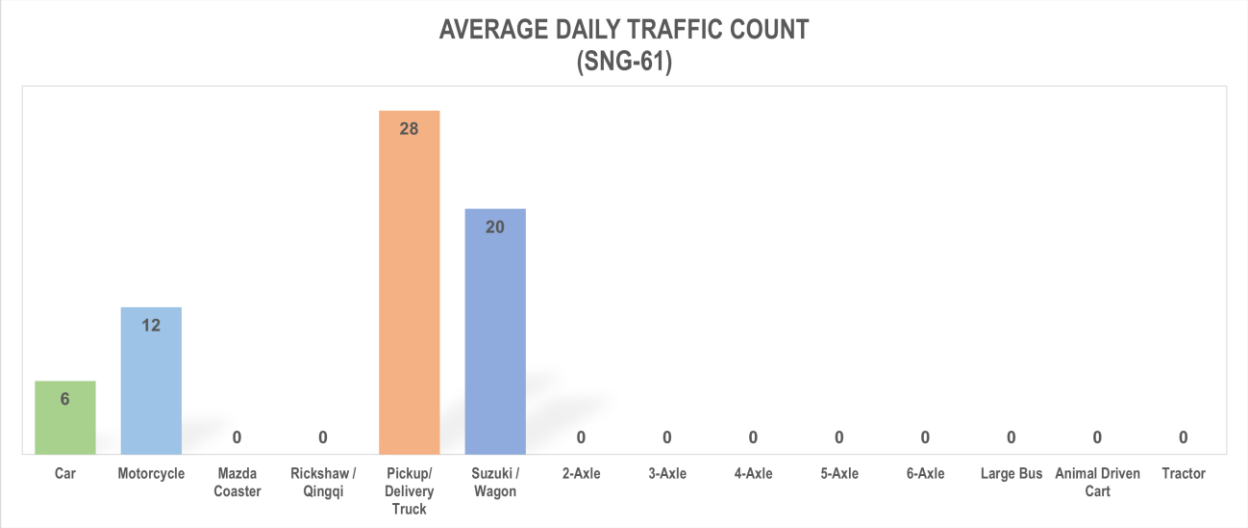


Figure 3.10.27 Vehicle Composition SNG-61

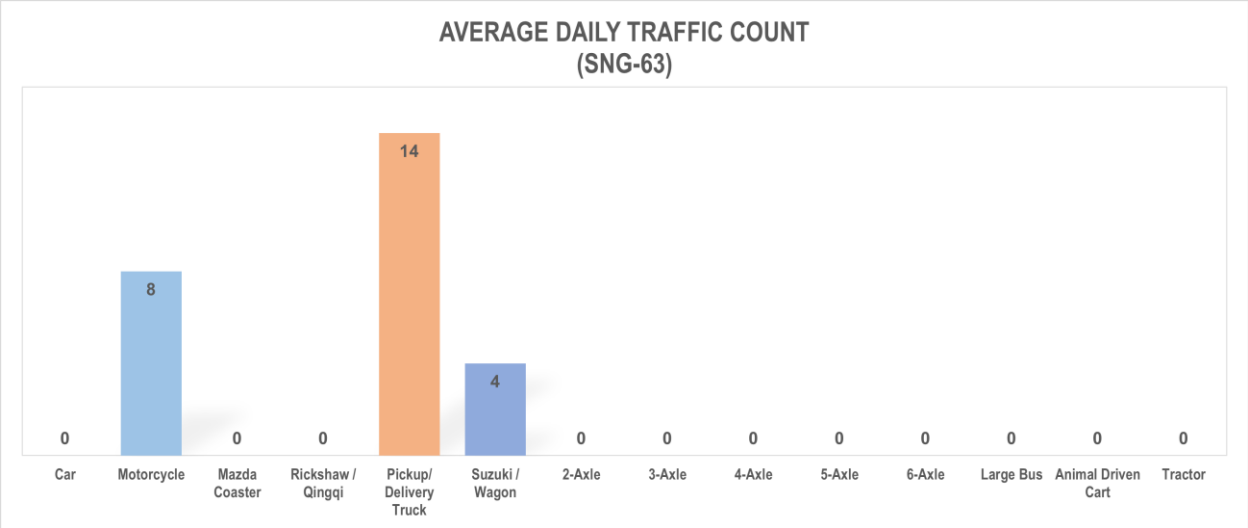


Figure 3.10.28 Vehicle Composition SNG-63

Most of the vehicles on the subject roads are Cars and Motorcycles. This Vehicle Composition can be attributed to the rural area type of the considered roads. Most of the people travel on these roads in their personal cars or motorcycles due to lack of proper public transport facilities.

The reason we have cars and motorcycles as the majority constituents of the vehicle mix, is because of the diversity of the road users utilizing the facility. Those people that have the available resources and own a car or motorcycle are reluctant of using public transport due to the poor services and condition of vehicles, whereas those people who do not own a private car or motorcycle have no other option then using public transport that constitutes of rickshaws and Suzuki/Wagons as seen in some roads.

3.10.6.3 Traffic Analysis Forecast

ADT:

The ADT Base Year is 2022 and ADT Forecast year is 2032 as can be seen in the table below.

The following table represents the annual daily traffic forecast (10 years).

Table 3.10.5 Forecast ADT of Access Roads District Shangla

Road ID	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
SNG-14	648	680	714	750	788	827	868	912	957	1005	1056
SNG-61	66	69	73	76	80	84	88	93	98	102	108
SNG-20	26	27	29	30	32	33	35	37	38	40	42
SNG-26	54	57	60	63	66	69	72	76	80	84	88
SNG-28	64	67	71	74	78	82	86	90	95	99	104
SNG-30	16	17	18	19	19	20	21	23	24	25	26
SNG-27	68	71	75	79	83	87	91	96	100	105	111
SNG-29	34	36	37	39	41	43	46	48	50	53	55
SNG-63	26	27	29	30	32	33	35	37	38	40	42
SNG-22	37	39	41	43	45	47	50	52	55	57	60
SNG-7	724	760	798	838	880	924	970	1019	1070	1123	1179
SNG-60	27	28	30	31	33	34	36	38	40	42	44
SNG-33	67	70	74	78	81	86	90	94	99	104	109

PCU:

The PCU Base Year is 2022 and PCU Forecast year is 2032 as can be seen in the table below.

Table 3.10.6 Forecast PCUs of Access Roads District Shangla

Road ID	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
SNG-14	584	613	644	676	710	745	783	822	863	906	951
SNG-61	94	99	104	109	114	120	126	132	139	146	153
SNG-20	35	37	39	41	43	45	47	49	52	54	57
SNG-26	76	79	83	87	92	96	101	106	112	117	123
SNG-28	82	86	90	95	100	105	110	115	121	127	134
SNG-30	20	21	22	23	24	26	27	28	30	31	33
SNG-27	100	105	110	116	122	128	134	141	148	155	163
SNG-29	46	48	50	53	55	58	61	64	67	71	74
SNG-63	33	35	36	38	40	42	44	46	49	51	54
SNG-22	53	56	58	61	64	68	71	75	78	82	86
SNG-7	687	721	757	795	835	877	921	967	1015	1066	1119
SNG-60	38	39	41	43	46	48	50	53	55	58	61
SNG-33	79	82	87	91	95	100	105	110	116	122	128

3.10.7 Discussion and Analysis

The analysis conducted on these roads indicates that the condition of these roads is affecting the traffic characteristic which consequently influences the access of people to necessities of life. The poor condition of these roads is reflected by the Road Surface Type (RST) and International Roughness Index (IRI) pie charts which indicates that these roads need immediate consideration with respect to construction and rehabilitation. The poor mobility of these roads is indicated by the lower speeds and high travel times. Reconstructing these roads will improve speeds and lower travel times of users.

The utility of these roads in providing access to necessities like education, health, and markets will be enhanced with the improvement in road condition after reconstruction.

3.11 Project Area- Tor Ghar

Torghar District or Tor Ghar (means "Black Mountain"), formerly Kala Dhaka, is the smallest district of Pakistan and one of the 26 districts of Khyber Pakhtunkhwa, Pakistan. Formerly a tribal area, it also became a settled area under Article 246 of the Constitution, when it officially became a district on 28th January 2011. Tor ghar is a district of Khyber Pakhtunkhwa. It covers an area of 497 km2 (25,8125 acres) and is divided into 11 Union Councils.

3.11.1 Priority Roads in District Tor Ghar

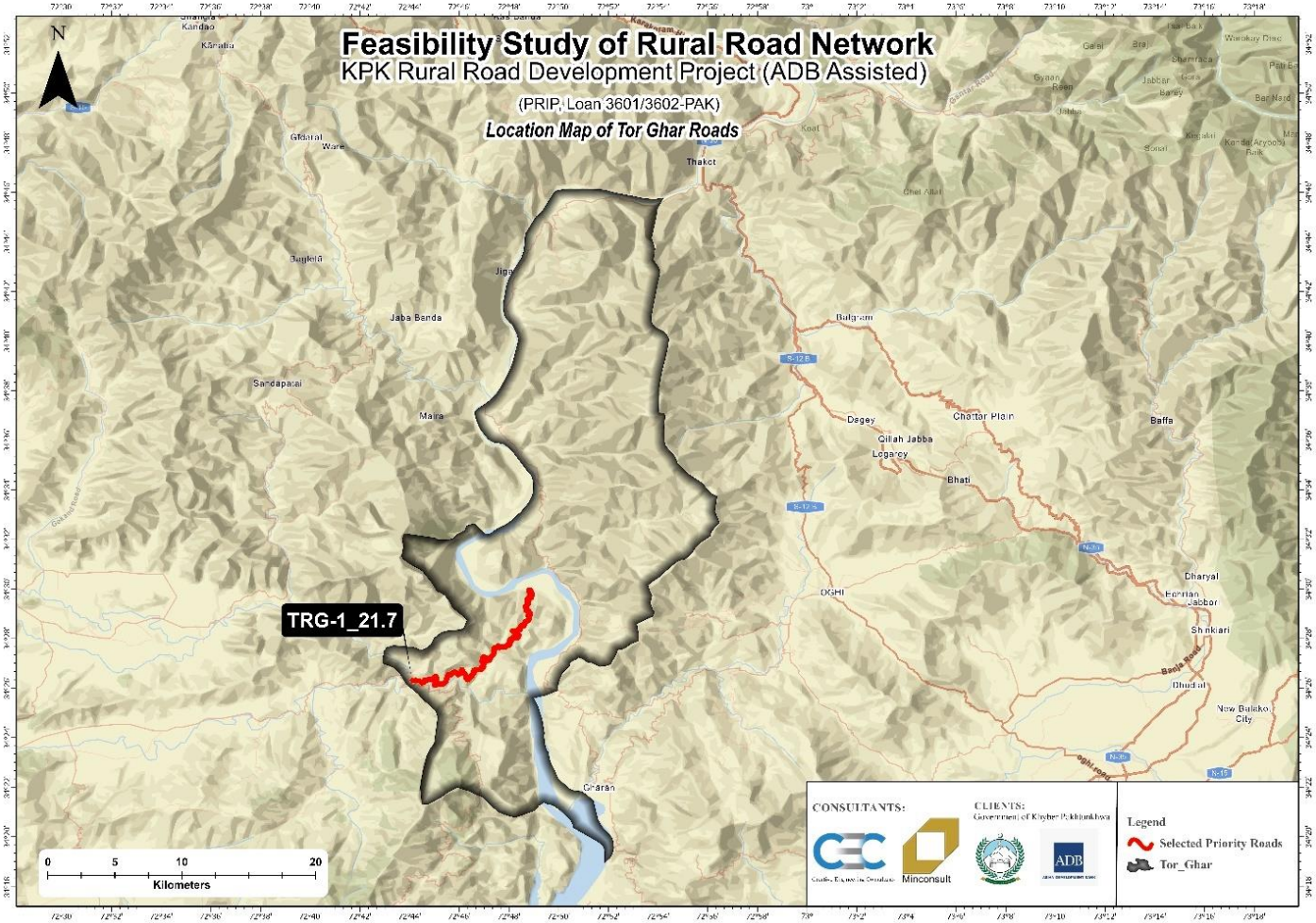
The following roads have been found feasible for Rural Road Development Project in District Tor Ghar.

Table 3.11.1 Access Roads District Torghar

#	ID	Road Name	Districts	FL	Type
1	TGH-1	Karrak Madakhel To Hasan Zai Road	Tor Ghar	22.1	Access

3.11.2 Location Map of Priority Roads

All the access roads selected for traffic study after scrutinization of the surveyed roads in the district are shown in the figure below.



Map 3.11.1 Location Map District Torghar

3.11.2.1 TGH-1 (Karrak Madakhel to Hasan Zai Road)

This road is located in torghar district. The length of road is 22.10 km. The road starts from Karrak madakhel and end point is Hasan zai. The road Karrak madakhel start point near along with Barandi river Bunner. Government Primary school come along with road side. This road connects with manjakot Village. The end point connects with palosa village.

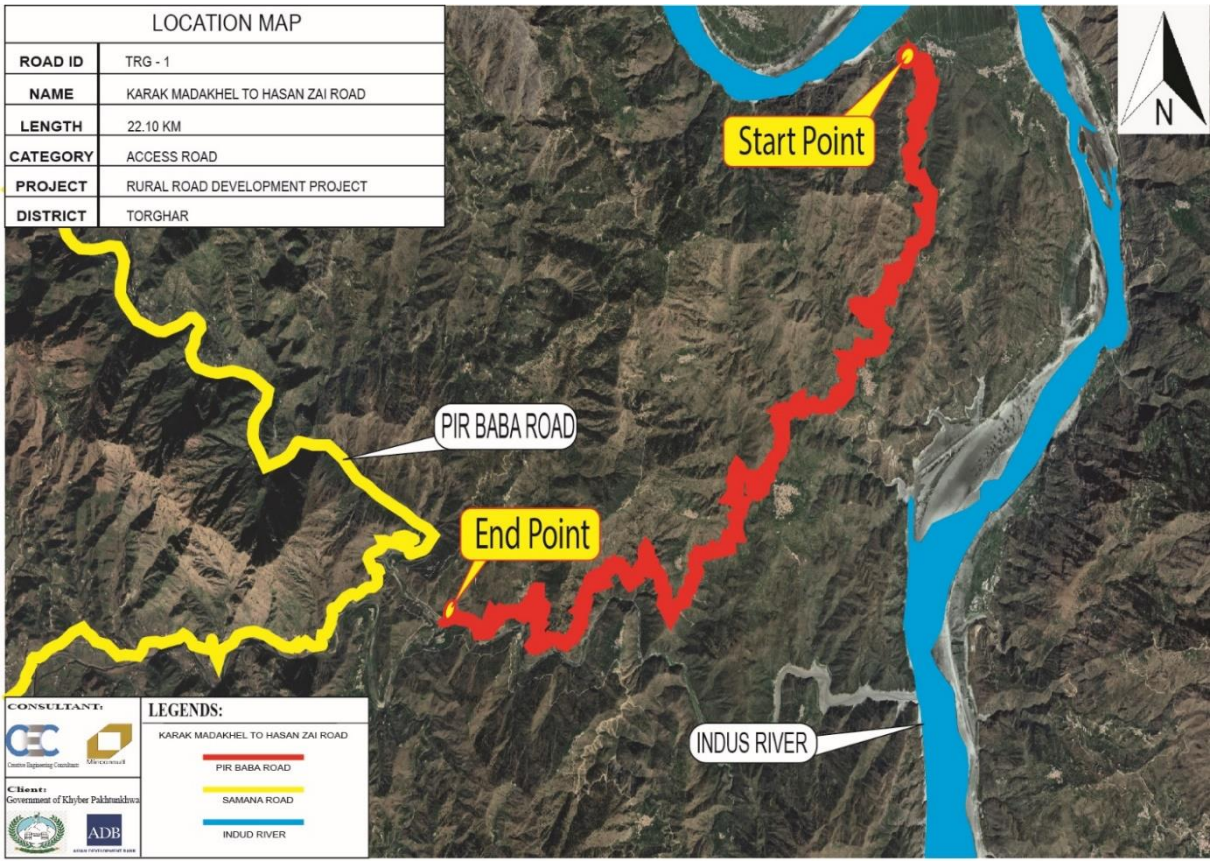


Figure 3.11.1 Location Map TGH-1

3.11.3 IRI Classification Pie Chart of Selected Roads

The International Roughness Index (IRI) is used by highway professionals throughout the world as a standard to quantify road surface roughness. A poor road surface roughness influences the traffic speeds and times. It also effects the mobility and accesibility of users traversing that road.

The IRI Classification Chart is given below.

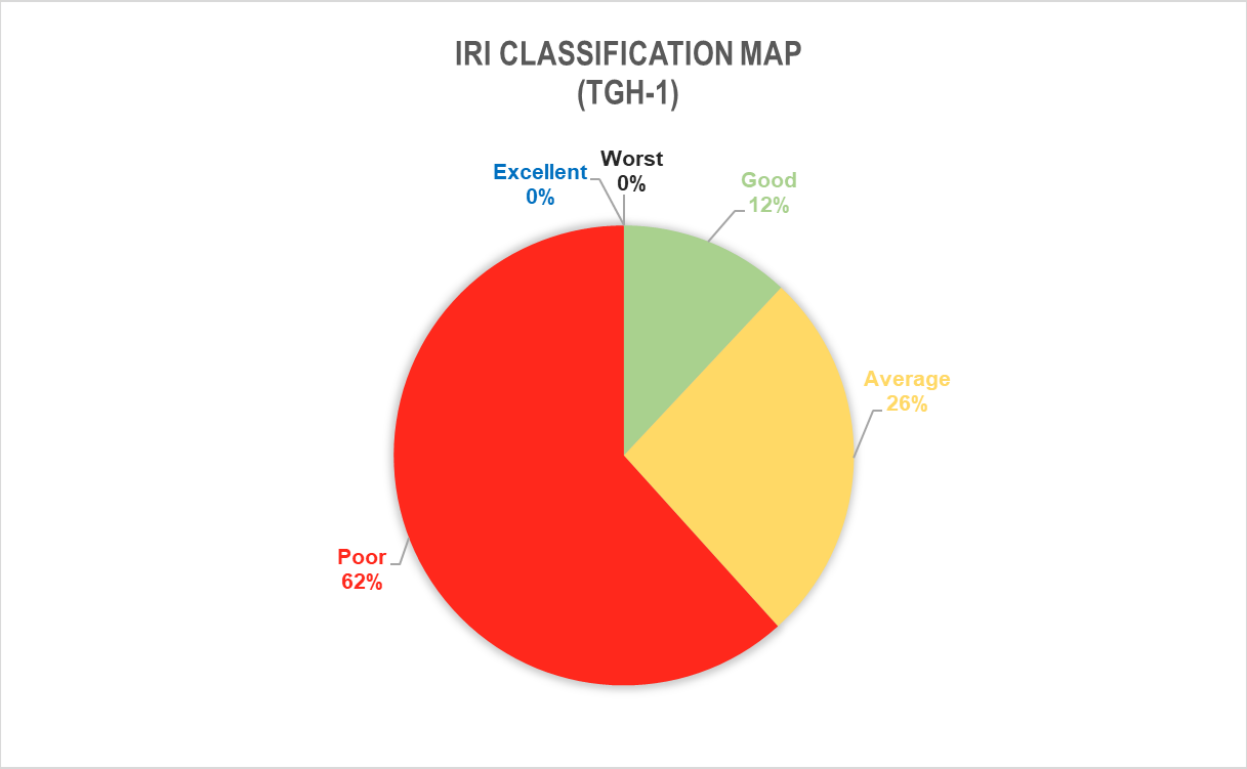


Figure 3.11.2 IRI Classification Chart of Access Roads District Torghar

3.11.4 RST Pie Chart of Selected Roads

Road Surface type (RST) survey was conducted to investigate the actual condition and type of surface of the road under observation. In rural areas earthen or kacha tracks and TST/DST are common that affect the mobility of road users and accessibility to necessities.

The RST Classification Chart is given below.

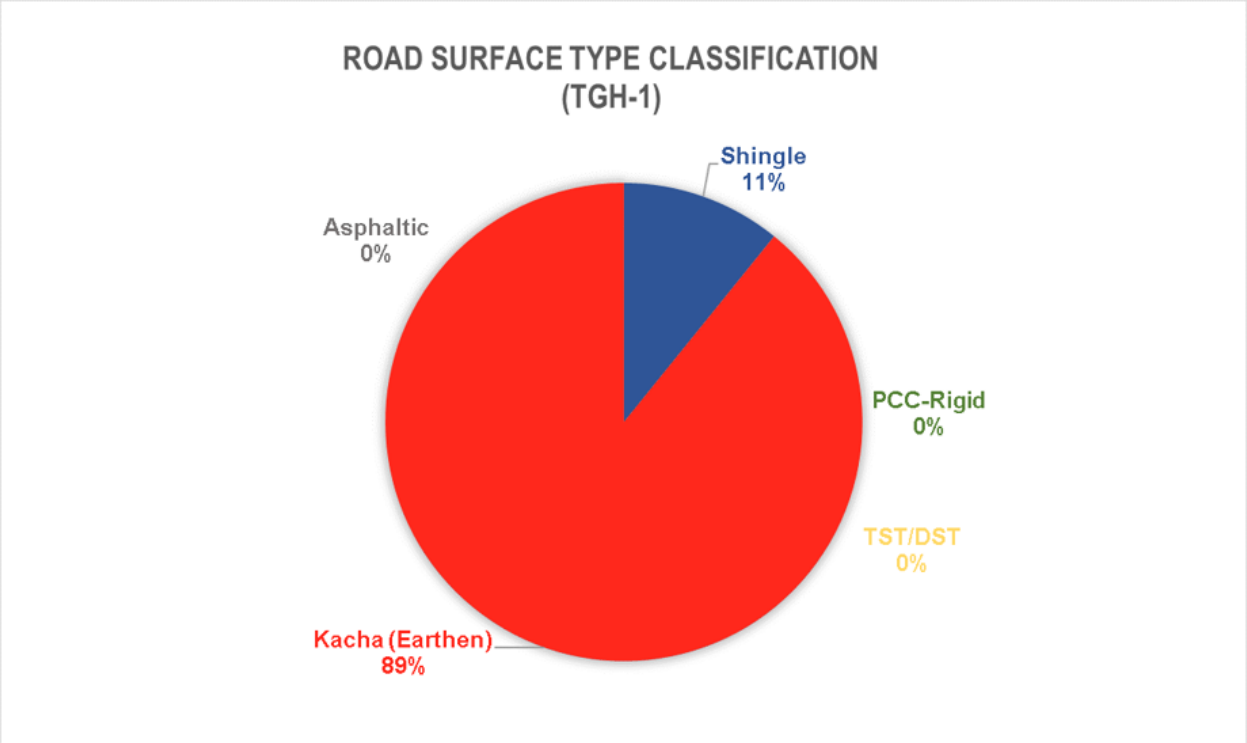


Figure 3.11.3 RST Classification Chart of Access Roads District Torghar

3.11.5 Travel Speed Survey

Table 3.11.2 Travel Speed Survey of Access Roads District Torghar

Road ID	Distance (km)	Total Ascent (m)	Total Descent (m)	Total Time	Average Speed (km/h)	Avg. Moving Speed (km/h)	Maximum Speed (km/h)	Moving Time
TGH-1	16.72	648	339	20:00.0	12.54	12.91	33.01	17:37.0

The travel speeds for all roads are low due to the deteriorated road condition which is reflected from the RST and IRI pie charts. Mobility of the road users is affected as indicated by lower average speeds and higher travel times, which can be attributed to the poor road conditions.

It can be inferred from these observations that these roads need to be reconstructed for better mobility and access of people to basic livelihood necessities.

3.11.6 Traffic Analysis
3.11.6.1 Summary of Existing Average Daily Traffic (ADT)

The summary of traffic counts obtained is given in the following Table.

ADT's

Table 3.11.3 Existing ADT of Access Roads District Torghar

Road ID	Car	Motorcycle	Mazda Coaster	Rickshaw / Q.chi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	TOTAL Vehicles
TGH-1	450	0	0	0	225	0	0	0	0	0	0	0	0	0	675

PCUs

Table 3.11.4 Existing PCUs of Access Roads District Torghar

Road ID	Car	Motorcycle	Mazda Coaster	Rickshaw / Qingqi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	Total PCUS
TGH-1	450	0	0	0	338	0	0	0	0	0	0	0	0	0	788

3.11.6.2 Composition Of Vehicle Types

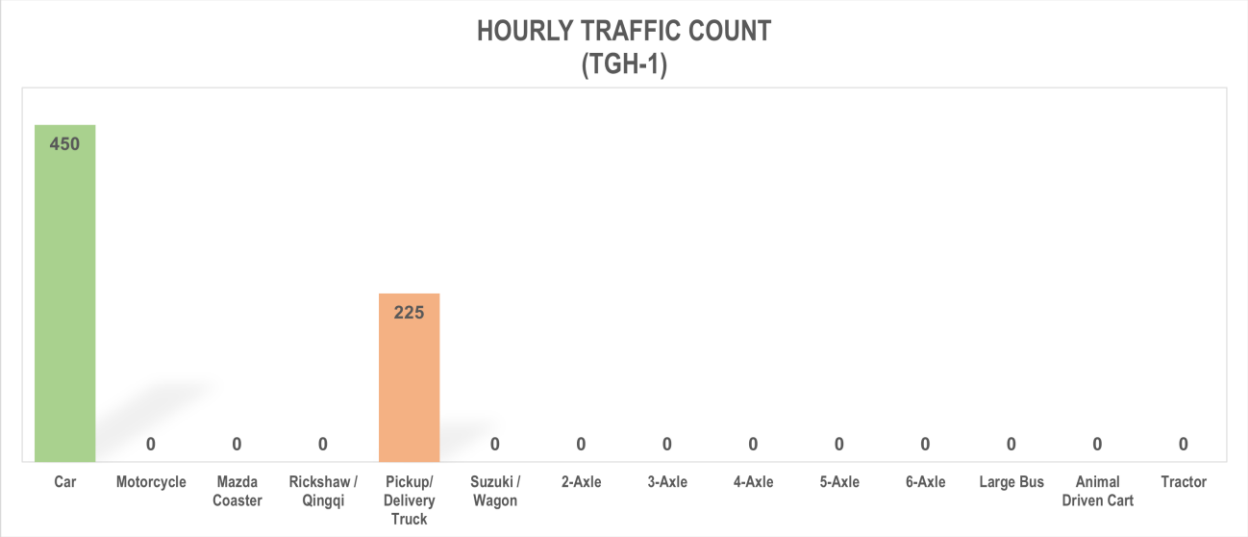


Figure 3.11.4 Vehicle Composition TGH-1

Most of the vehicles on the subject roads are Cars and Motorcycles. This Vehicle Composition can be attributed to the rural area type of the considered roads. Most of the people travel on these roads in their personal cars or motorcycles due to lack of proper public transport facilities.

The reason we have cars and motorcycles as the majority constituents of the vehicle mix, is because of the diversity of the road users utilizing the facility. Those people that have the available resources and own a car or motorcycle are reluctant of using public transport due to the poor services and condition of vehicles, whereas those people who do not own a private car or motorcycle have no other option then using public transport that constitutes of rickshaws and Suzuki/Wagons as seen in some roads.

3.11.6.3 Traffic Analysis Forecast

ADT:

The ADT Base Year is 2022 and ADT Forecast year is 2032 as can be seen in the table below.

The following table represents the annual daily traffic forecast (10 years).

Table 3.11.5 Forecast ADT of Access Roads District Torghar

Road ID	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
TGH-1	**675**	709	744	781	820	861	905	950	997	1,047	1,100

PCU:

The PCU Base Year is 2022 and PCU Forecast year is 2032 as can be seen in the table below.

Table 3.11.6 Forecast PCUs of Access Roads District Torghar

Road ID	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
TGH-1	**788**	827	868	912	957	1,005	1,055	1,108	1,163	1,222	1,283

3.11.7 Discussion and Analysis

The analysis conducted on these roads indicates that the condition of these roads is affecting the traffic characteristic which consequently influences the access of people to necessities of life. The poor condition of these roads is reflected by the Road Surface Type (RST) and International Roughness Index (IRI) pie charts which indicates that these roads need immediate consideration with respect to construction and rehabilitation. The poor mobility of these roads is indicated by the lower speeds and high travel times. Reconstructing these roads will improve speeds and lower travel times of users.

The utility of these roads in providing access to necessities like education, health, and markets will be enhanced with the improvement in road condition after reconstruction.

CHAPTER 4: FLOOD AFFECTED ROADS TRAFFIC ANALYSIS

4.1 Project Area - Chitral

District Chitral is the largest district in the Khyber-Pakhtunkhwa province of Pakistan, covering an area of 14,850 km². It is a part of the Malakand Division and is the northernmost district of Pakistan. It shares a border with Gilgit-Baltistan to the east, with Kunar, Badakshan and Nuristan provinces of Afghanistan to the north and west, and with the Khyber-Pakhtunkhwa districts of Swat and Dir to the south. A narrow strip of Wakhan Corridor separates Chitral from Tajikistan in the north.

4.1.1 Priority Roads in District Chitral

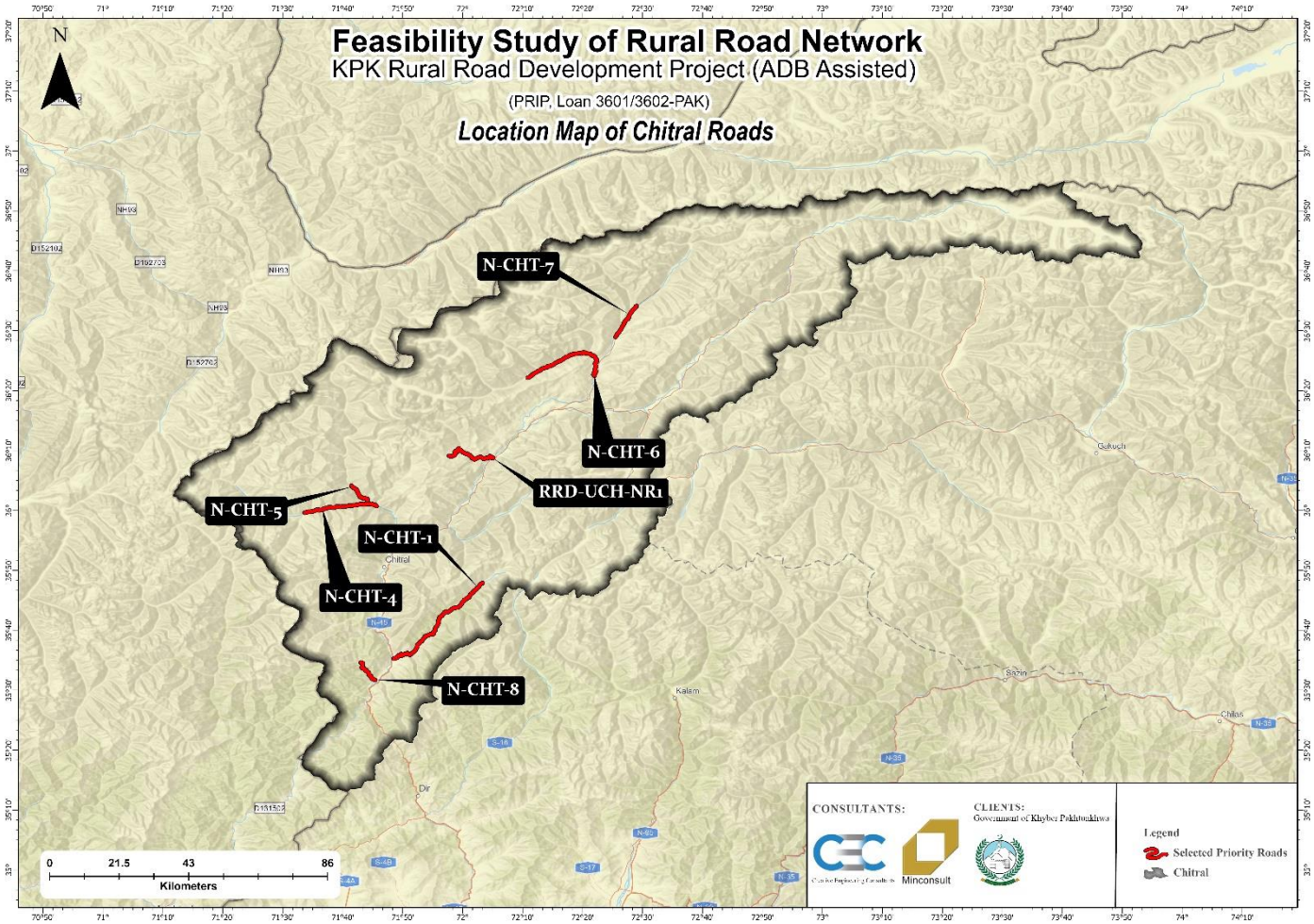
The following roads have been found feasible for Rural Road Development Project in District Chitral.

Table 4.1.1 Flood Affected Roads in Chitral

#	ID	Road Name	Districts	FL	Type
1	**RRD_UCH_NR1**	Oveer Road	Chitral	20.20	Flood Affected
2	**N-CHT-1**	Shesha To Madalcasht	Chitral	41.6	Flood Affected
3	**N-CHT-3**	Ramboor Valley Road	Chitral	8.0	Flood Affected
4	**N-CHT-4**	Shaghoor to Garam Chahsma Road	Chitral	21.9	Flood Affected
5	**N-CHT-5**	Arkari Valley Road	Chitral	10.1	Flood Affected
6	**N-CHT-6**	Tirch Road from Nishko Bridge to Shahgroom Tirch	Chitral	30.0	Flood Affected
7	**N-CHT-7**	Rech Road	Chitral	12.3	Flood Affected
8	**N-CHT-8**	Jin Jeratkoh Road	Chitral	8.9	Flood Affected

4.1.2 Location Map of Priority Roads

All the access roads selected for traffic study after scrutinization of the surveyed roads in the district are shown in the figure below.



Map 4.1.1 Location Map Chitral

4.1.2.1 RRD_UCH_NR1 (Oveer Road)

The road is named as Oveer Road located at Upper Chitral District of KP province, covering 20.2 km rout. The road starts from Oveer, crossing Shahbronz Owir and Nichagh all the way to the Riri Qwir.

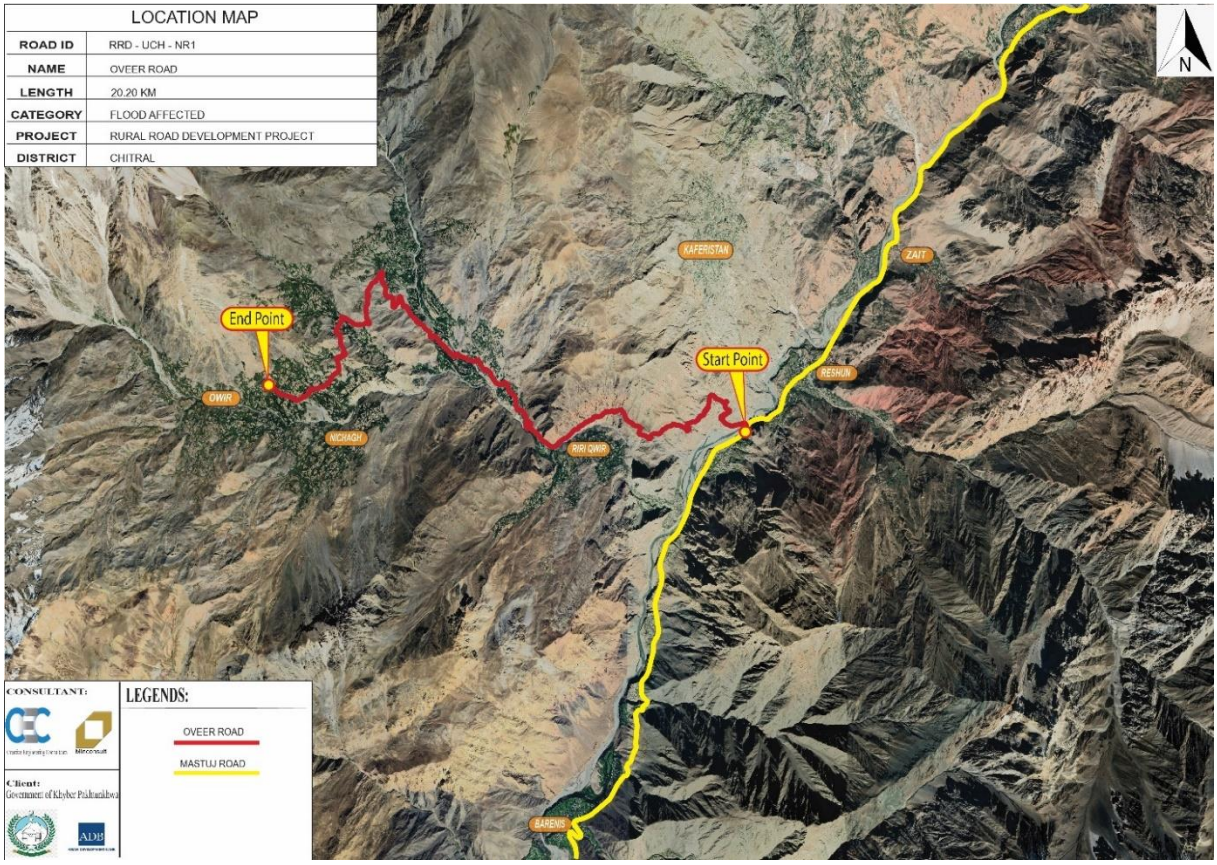


Figure 4.1.1 Location Map RRD_UCH_NR1

4.1.2.2 N-CHT-1 (Shesha to Madalcasht)

This road is situated to the east of Drosh and connects Madaklasht valley with Drosh. Madaklasht is a valley in the Lower Chitral District of Chitral. Madaklasht Valley is located about 2 Hours away from the town Drosh. It is one of the scenic valleys of Khyber Pakhtunkhwa and a picturesque spot for travelers.

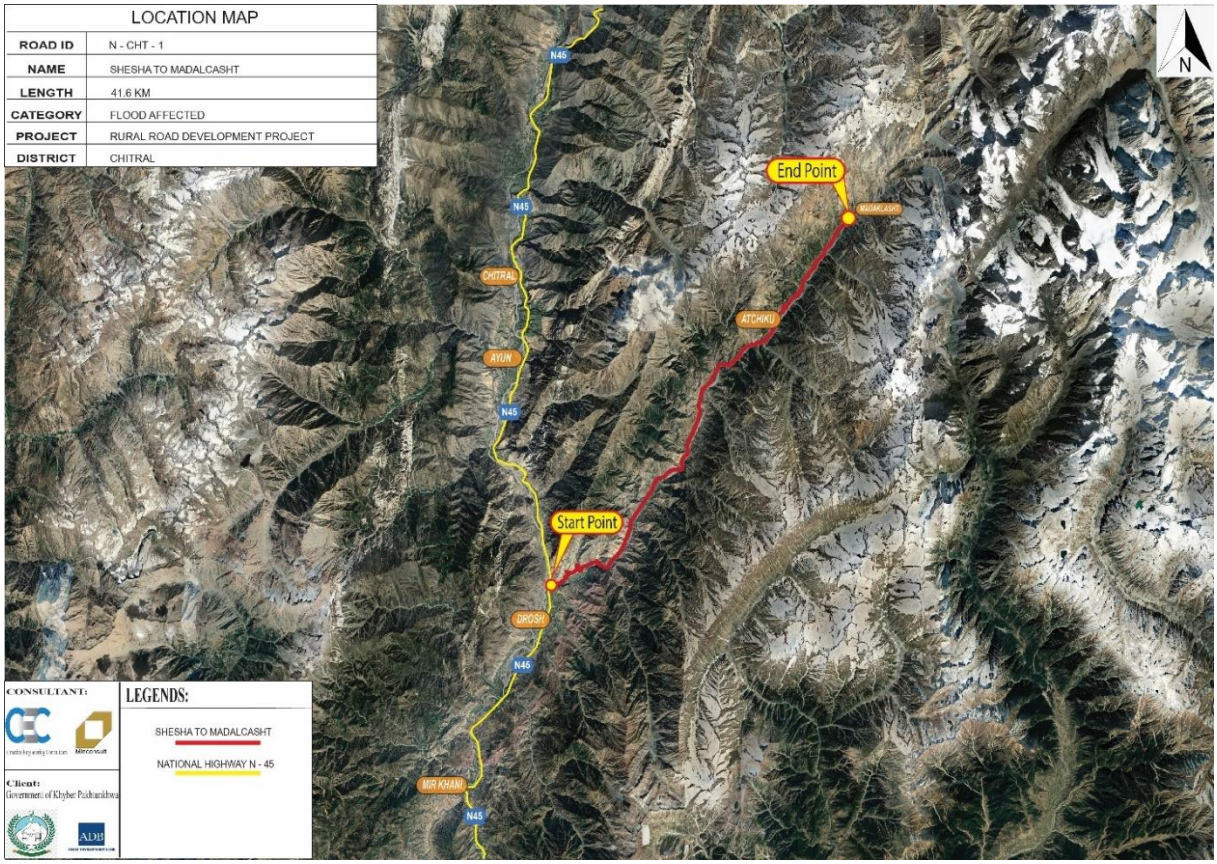


Figure 4.1.2 Location Map N-CHT-1

4.1.2.3 N-CHT-3 (Ramboor Valley Road)

The Ramboor Valley Road, an 8-kilometer stretch of enchantment, begins its journey in the idyllic Bumburet Valley, winding its way through the rugged embrace of Chitral's majestic mountains, before culminating in the serene beauty of Ramboor Valley. This road, nestled amidst the awe-inspiring terrain of District Chitral, offers not only a passage but a portal to a world of breathtaking vistas. It bridges the gap between Bumburet's vibrant heart and the tranquility of Ramboor Valley, welcoming both curious travelers and the cherished locals of these enchanting valleys. This road, woven into the very fabric of Chitral's natural grandeur, stands as a testament to accessibility and connection, beckoning all to embark on this unforgettable journey.

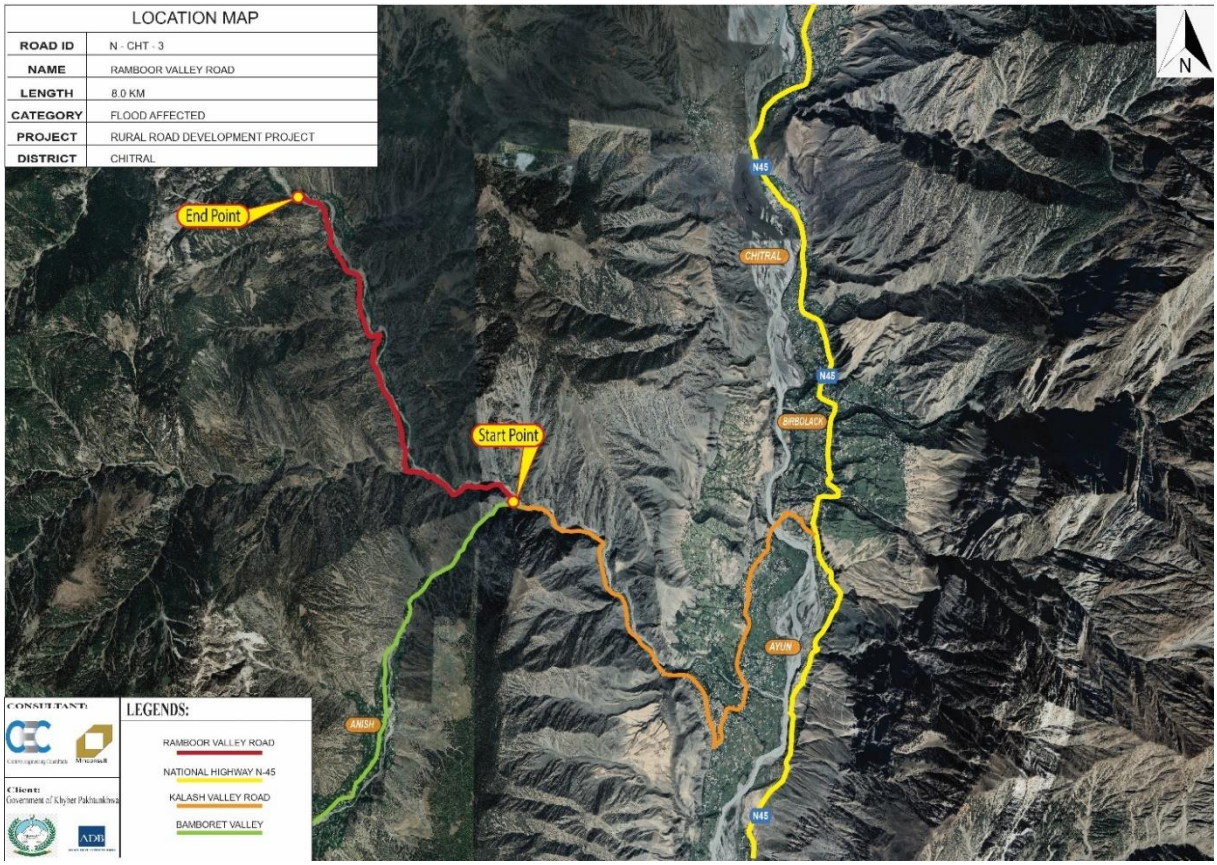


Figure 4.1.3 Location Map N-CHT-3

4.1.2.4 N-CHT-4 (Shaghoor to Garam Chahsma Road)

The Shaghoor to Garam Chashma Road, spanning a majestic 21.9 kilometres, embarks from the picturesque hamlet of Shaghoor and gracefully culminates at the awe-inspiring Garam Chashma. This scenic route promises more than just a journey; it offers a transformative experience. Nestled in the rugged embrace of a mountainous terrain, initially accessible only to intrepid jeeps, this road is poised to undergo a metamorphosis. Once expanded and enhanced, it will open its embrace to a wider array of motor vehicles, unlocking unparalleled vistas for both curious travellers and the cherished denizens of Chitral. The impact of this development will resonate far and wide, forever altering the landscape and accessibility of this enchanting region.

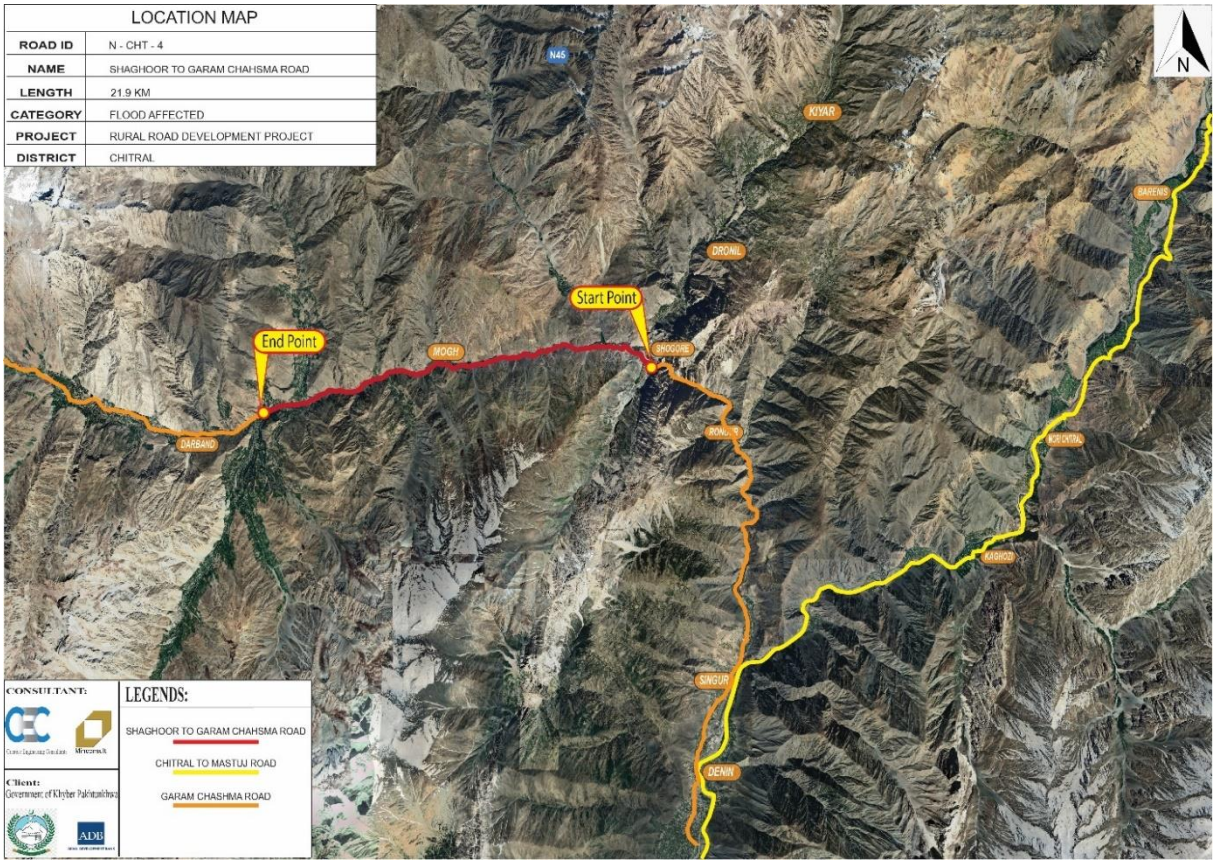


Figure 4.1.4 Location Map N-CHT-4

4.1.2.5 N-CHT-5 (Arkari Valley Road)

Nestled in the embrace of Chitral district, the Arkari Valley Road unfurls like a lyrical stanza, spanning 10.1 kilometers alongside the serenading Lutkho River, ultimately guiding wanderers to the fabled Garam Chashma. This picturesque pathway not only promises a sojourn through nature's grandeur but also holds the promise of breathing new life into local tourism. Beyond its scenic charm, this road stands as a beacon of progress, offering a seamless conduit to essential facets of life - be it the embrace of healthcare, the enlightenment of education, or the bustling energy of markets. With each winding curve, the road weaves a tapestry of connectivity, linking lives and dreams in the heart of Chitral.

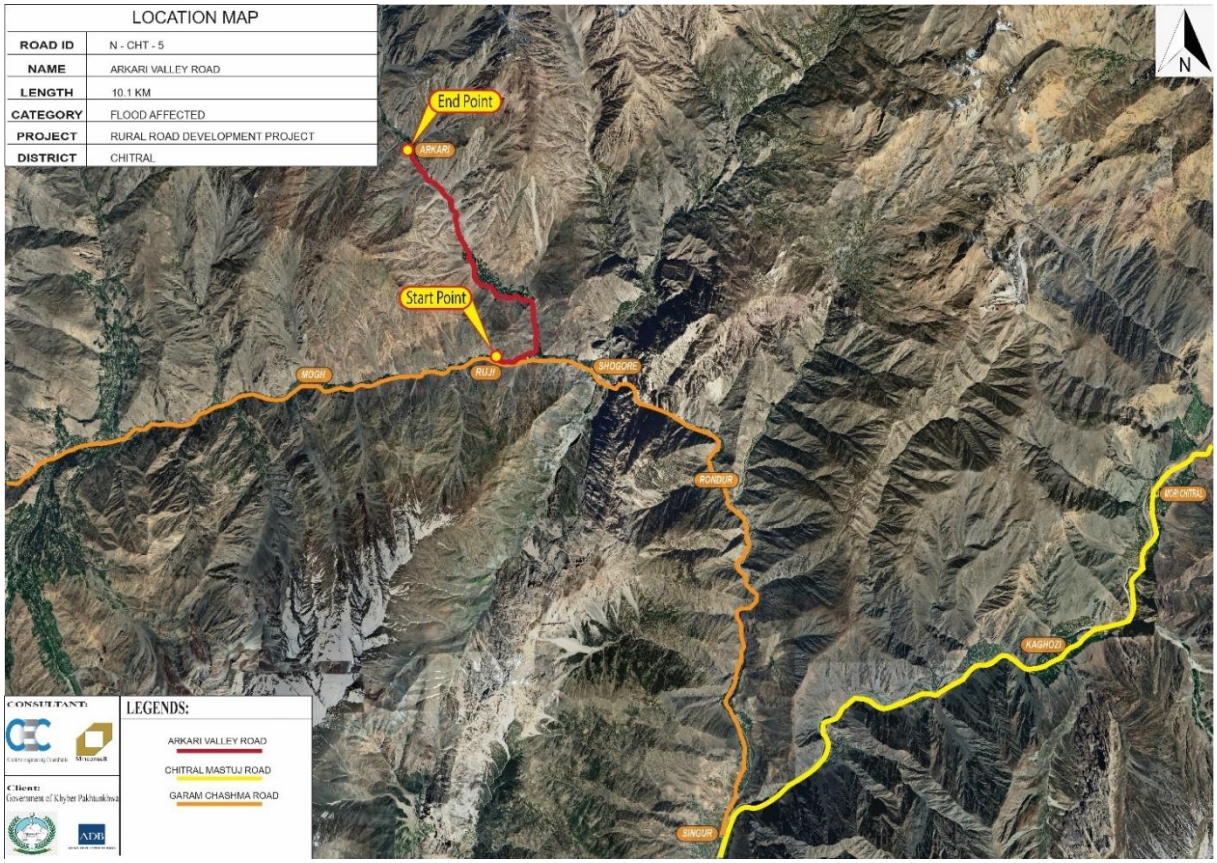


Figure 4.1.5 Location Map N-CHT-5

4.1.2.6 N-CHT-6 (Tirch Road from Nishko Bridge to Shahgroom Tirch)

The Tirch Road, a 30-kilometer odyssey, commences its journey at the Nishko Bridge, tracing a picturesque route until it reaches the charming destination of Shahgroom Tirch. This road, set against the dramatic backdrop of rugged hills, holds the promise of transformation for the quaint town of Tirch. Once a narrow passage accessible only to resilient jeeps, this road is on the cusp of a remarkable metamorphosis. With expansion and improvement, it will open its arms to a broader spectrum of vehicles - from stately cars to nimble motorcycles, ushering in a new era of accessibility and convenience. This development is poised to not only connect communities but also to bestow essential amenities like education, healthcare, and bustling markets upon the people of Tirch, heralding a brighter future for this serene enclave.

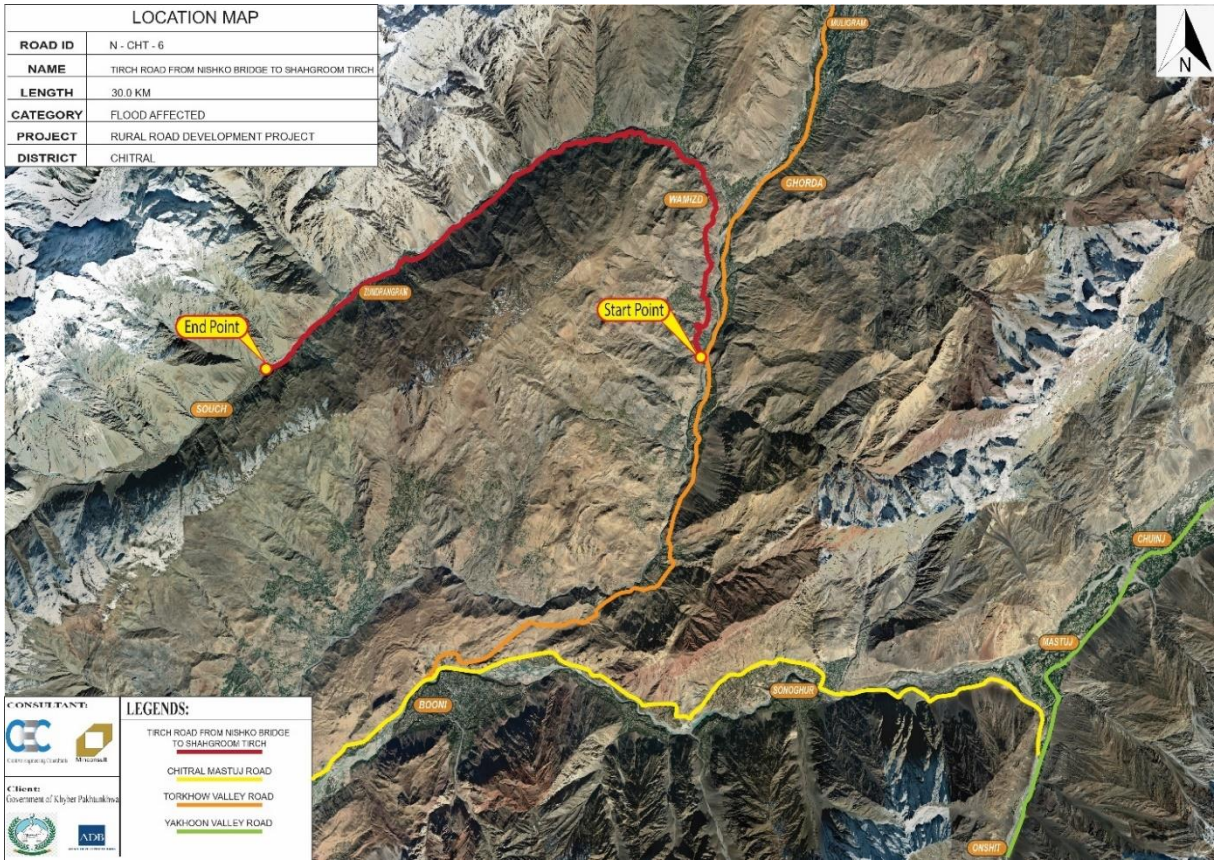


Figure 4.1.6 Location Map N-CHT-6

4.1.2.7 N-CHT-7 (Rech Road)

The Rech Road, nestled in the embrace of District Chitral, spans a scenic 12.3 kilometers, commencing its journey in the quaint hamlets of Buzund and Torkhow, and gracefully concluding at the picturesque Ujnu. This road is a testament to nature's artistry, flanked by the serenading melody of the Rech Gol River on one side and the stoic majesty of mountains on the other. Its purpose transcends its physical form, for it serves as a vital link, connecting not just places, but also the hearts and stories of the regions it touches. The Rech Road, more than a mere thoroughfare, is a bridge of shared experiences, weaving the tapestry of communities across this enchanting landscape.

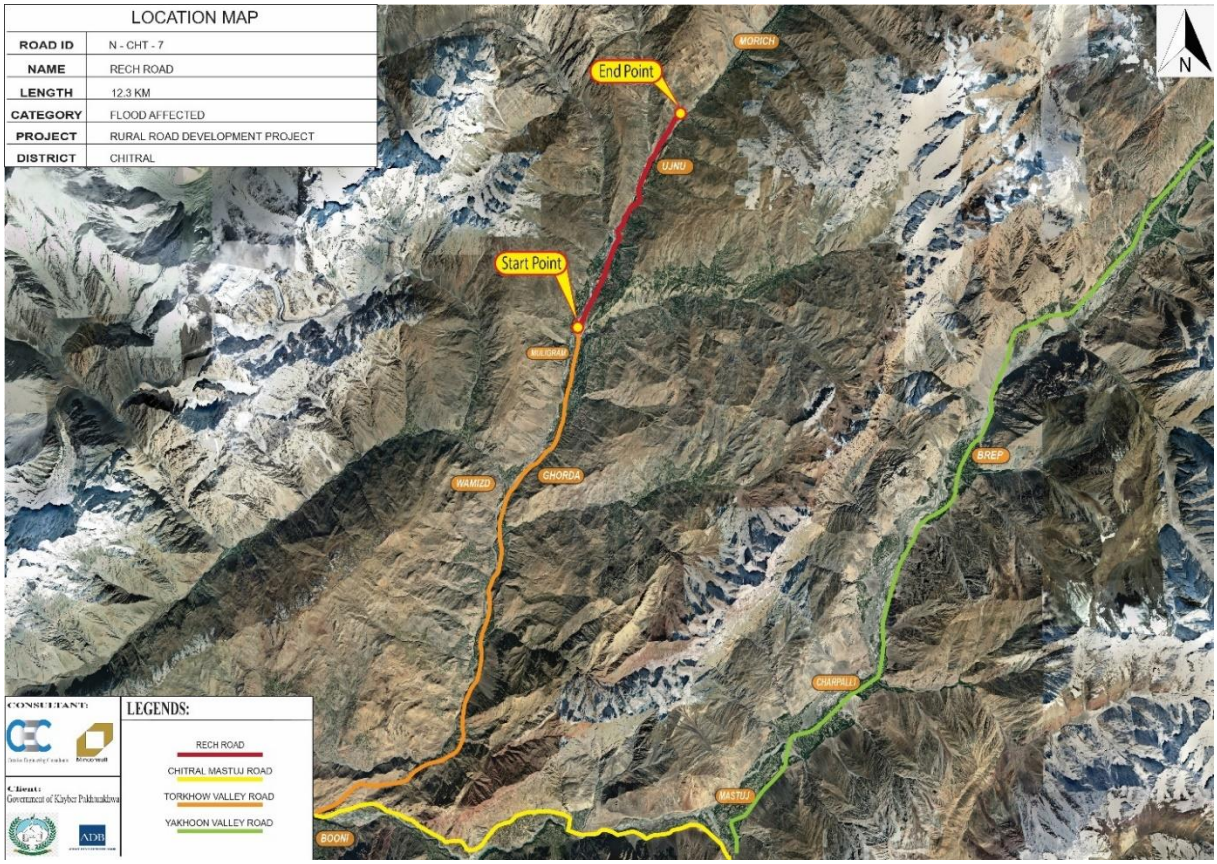


Figure 4.1.7 Location Map N-CHT-7

4.1.2.8 N-CHT-8 (Jin Jeratkoh Road)

The Jin Jeratkoh Road, nestled in the enchanting district of Chitral, gracefully spans 8.9 kilometers through a terrain of rolling hills, connecting the charming town of Drosh to the picturesque destination of Jinjirate Kuh. This scenic journey not only offers a passage through nature's undulating beauty but also promises to be a catalyst for enhanced accessibility. With this road's completion, the gift of easy travel will be bestowed upon the community, opening the door to vital amenities such as education and other essential facilities. It stands as a testament to progress, a ribbon of possibility, linking lives and aspirations amidst the rugged grandeur of Chitral's landscape.

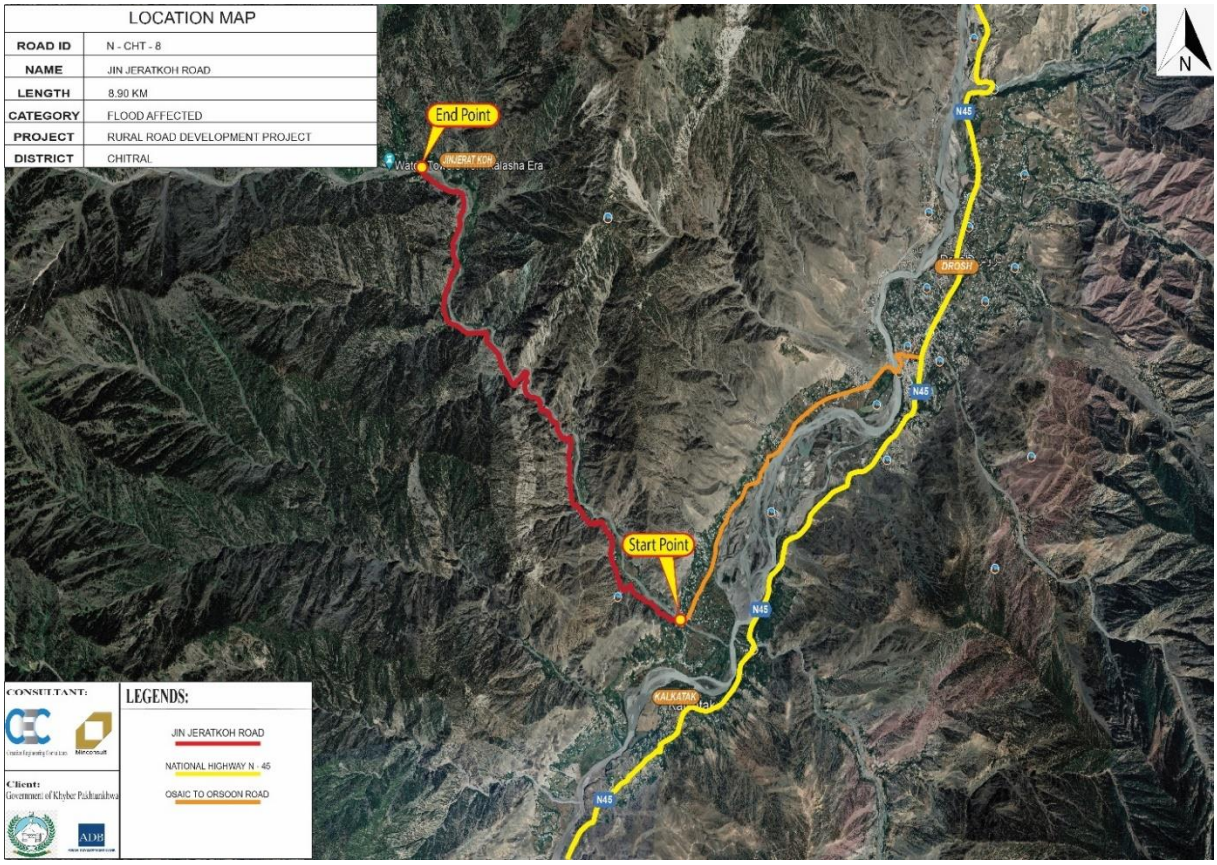
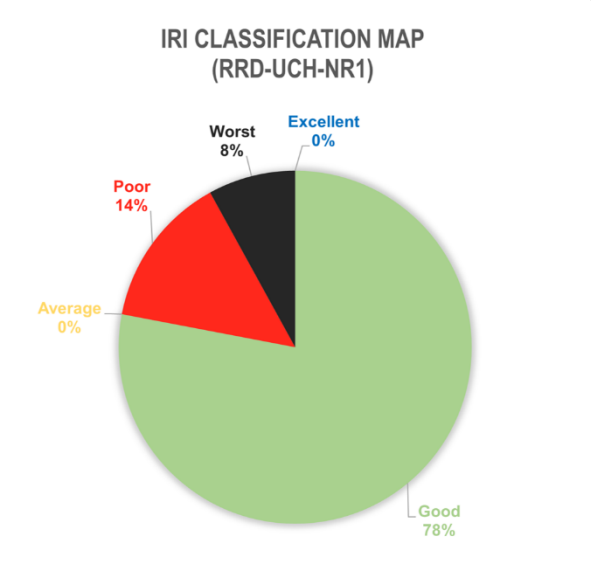


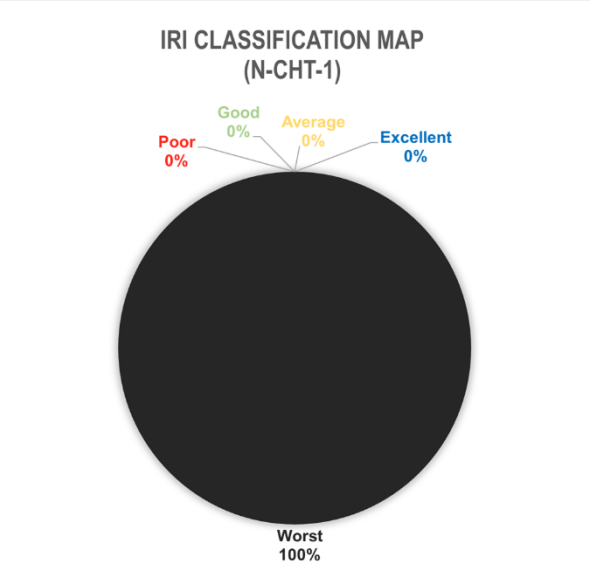
Figure 4.1.8 Location Map N-CHT-8

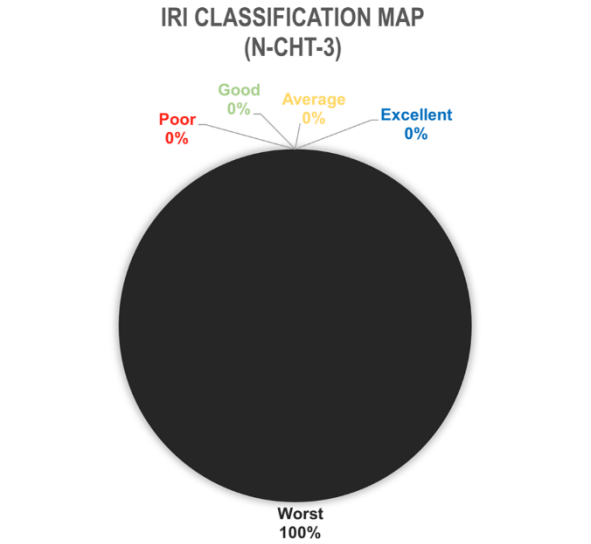
4.1.3 IRI Classification Pie Chart of Selected Roads

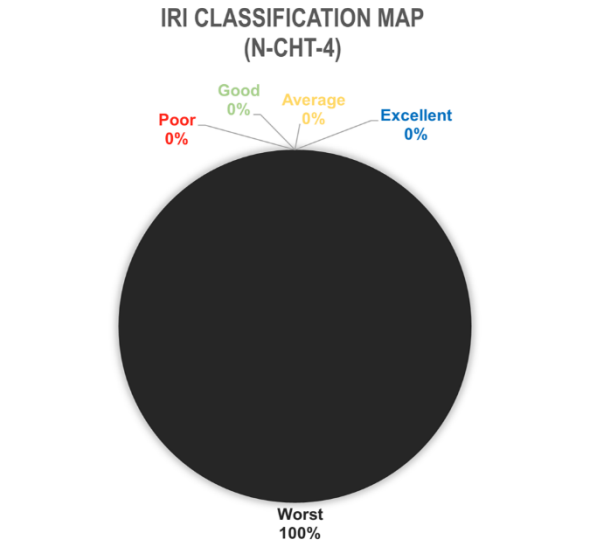
The International Roughness Index (IRI) is used by highway professionals throughout the world as a standard to quantify road surface roughness. A poor road surface roughness influences the traffic speeds and times. It also effects the mobility and accesibility of users traversing that road.

The IRI Classification Charts for are given below.









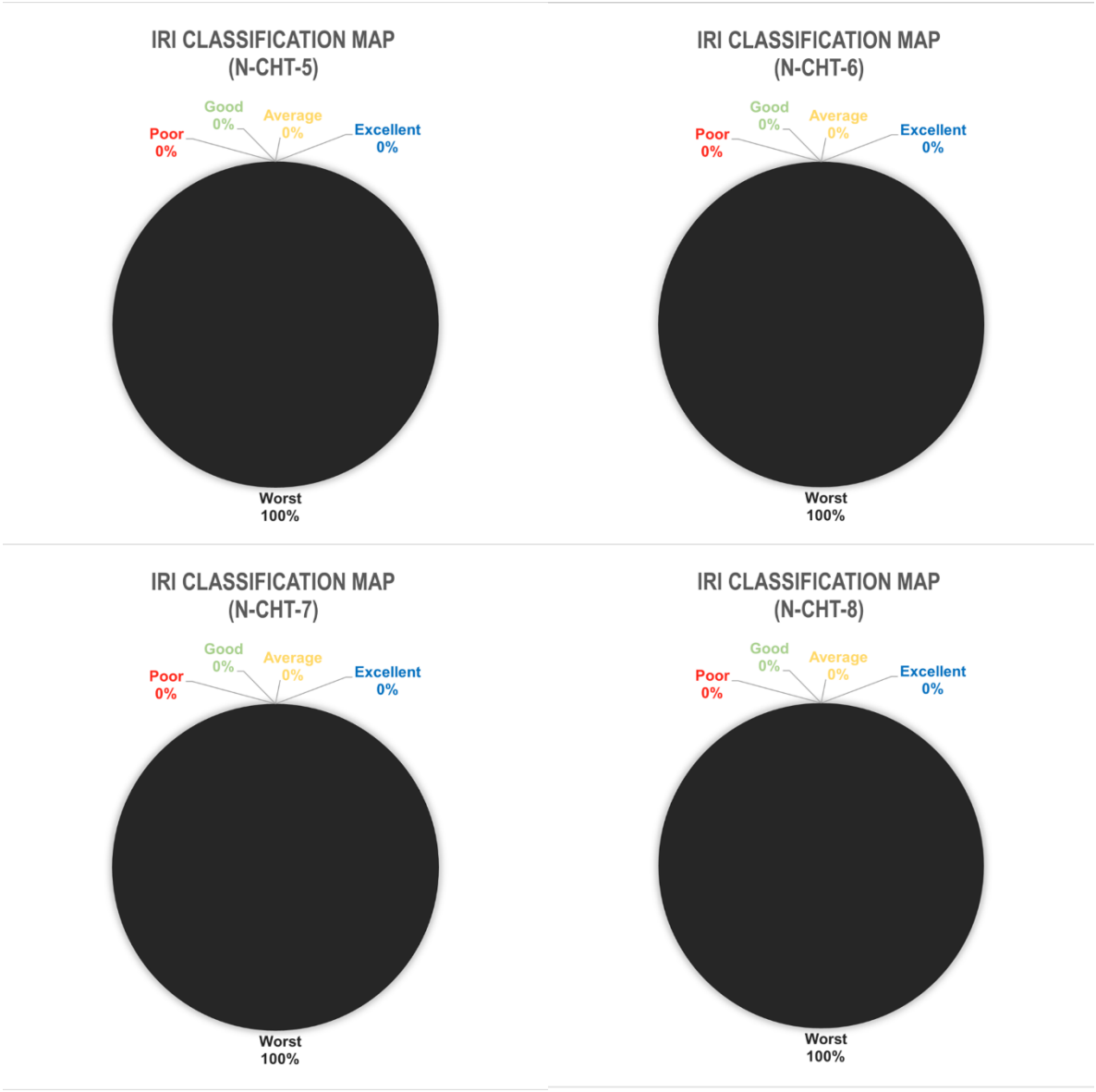
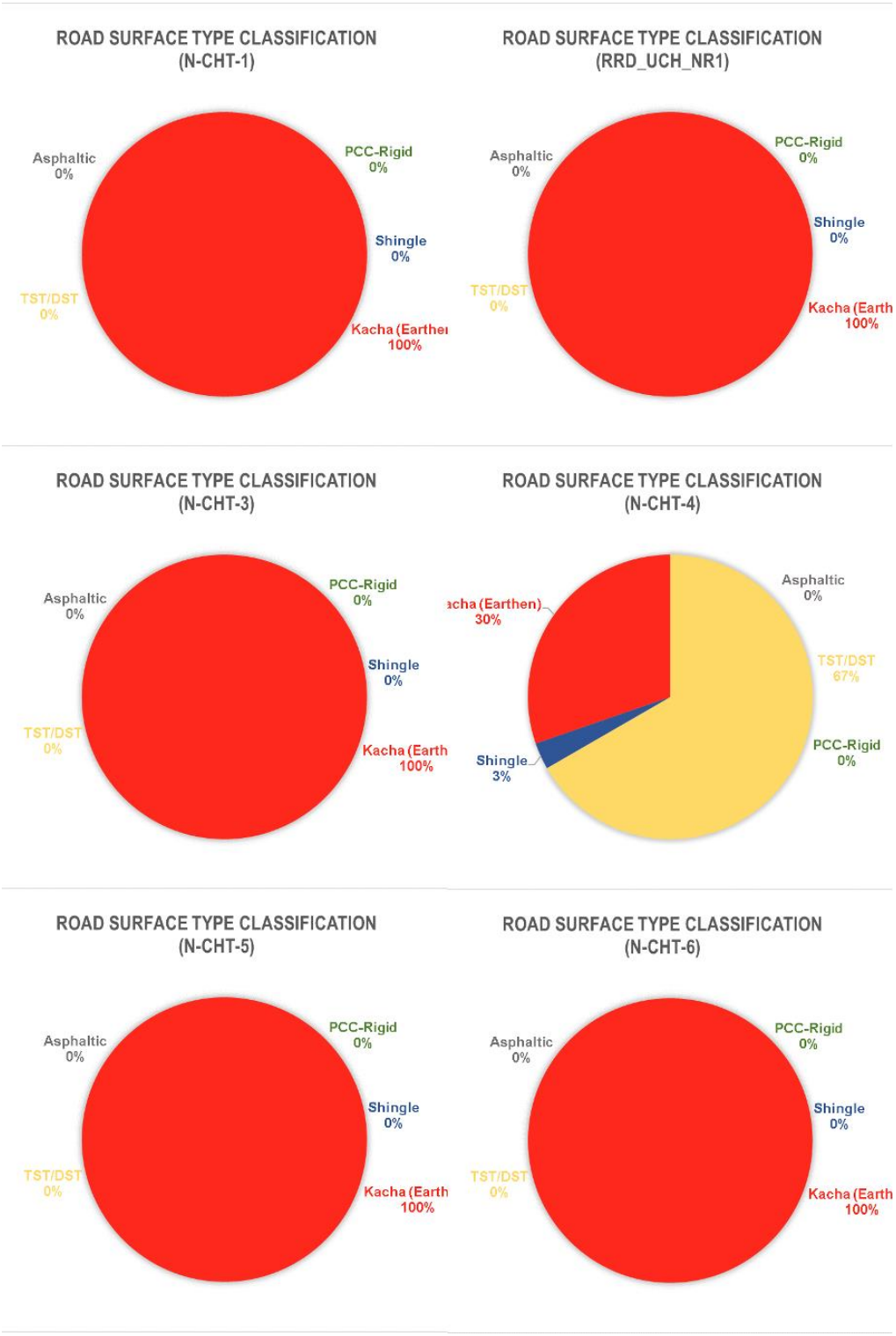


Figure 4.1.9 IRI Classification Chart of Flood Affected Roads District Chitral

4.1.4 RST Pie Chart of Selected Roads

Road Surface type (RST) survey was conducted to investigate the actual condition and type of surface of the road under observation. In rural areas earthen or kacha tracks and TST/DST are common that affect the mobility of road users and accessibility to necessities.

The RST Classification Charts for are given below.



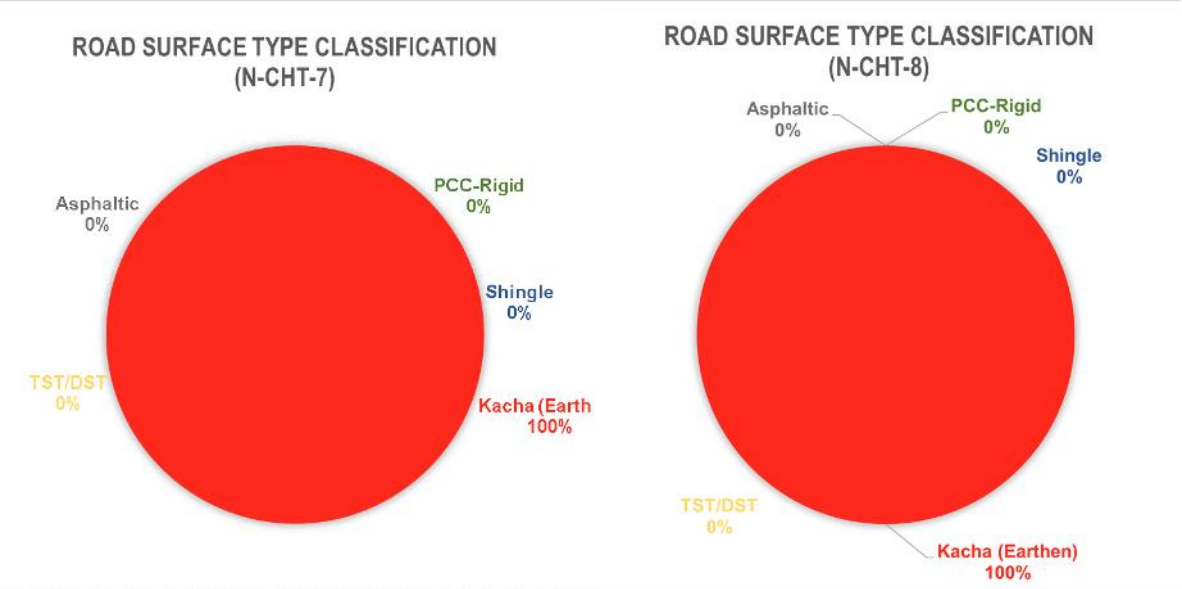


Figure 4.1.10 RST Classification Chart of Flood Affected Roads District Chitral

4.1.5 Travel Speed Survey

Table 4.1.2 Travel Speed Survey of Flood Affected Roads District Chitral

Road ID	Distance (km)	Total Ascent (m)	Total Descent (m)	Total Time	Average Speed (km/h)	Avg. Moving Speed (km/h)	Maximum Speed (km/h)
RRD_UCH_NR1	10	170	215	38:54.0	14	13.3	25.3
N-CHT-1	16.7	168	220	48:54.0	5.6	13.7	25.3
N-CHT-3	7.5	7.54	7.54	7.54	15.38	16.27	28.26
N-CHT-4	20.96	876	404	06:53.0	9.91	13.33	32.34
N-CHT-5	8.02	33.333	151.667	10:22.3	12.37	12.6567	23.333
N-CHT-6	21.51	107	945	58:59.0	21.89	23.87	47.26
N-CHT-7	11.60	763.00	42.00	30:04.0	23.15	23.93	42.93
N-CHT-8	7.15	146	113	18:26.0	23.29	23.29	51.13

The travel speeds for all roads are low due to the deteriorated road condition which is reflected from the RST and IRI pie charts. Mobility of the road users is affected as indicated by lower average speeds and higher travel times, which can be attributed to the poor road conditions.

It can be inferred from these observations that these roads need to be reconstructed for better mobility and access of people to basic livelihood necessities.

4.1.6 Traffic Analysis

4.1.6.1 Summary of Existing Average Daily Traffic (ADT)

The summary of traffic counts obtained is given in the following Table.

ADT's

Table 4.1.3 Existing ADT of Flood Affected Roads District Chitral

Road ID	Car	Motorcycle	Mazda Coaster	Rickshaw / Q.chi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	TOTAL Vehicles
RRD_UCH_NR1	31	19	0	26	0	0	0	0	0	0	0	0	0	6	82
N-CHT-1	16	31	19	0	26	0	0	0	0	0	0	0	0	6	98
N-CHT-3	12	21	17	0	16	0	0	0	0	0	0	0	0	1	67
N-CHT-4	18	17	11	0	11	0	0	0	0	0	0	0	0	0	57
N-CHT-5	13	19	8	0	9	0	0	0	0	0	0	0	0	3	52
N-CHT-6	19	25	15	0	14	0	0	0	0	0	0	0	0	0	73
N-CHT-7	8	11	17	0	10	0	0	0	0	0	0	0	0	2	48
N-CHT-8	17	15	11	0	8	0	0	0	0	0	0	0	0	0	51

PCUs

Table 4.1.4 Existing PCUs of Flood Affected Roads District Chitral

Road ID	Car	Motorcycle	Mazda Coaster	Rickshaw / Qinggi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	Total PCUS
RRD_UCH_NR1	31	10	0	20	0	0	0	0	0	0	0	0	0	24	84
N-CHT-1	16	16	38	0	39	0	0	0	0	0	0	0	0	24	133
N-CHT-3	12	11	34	0	24	0	0	0	0	0	0	0	0	4	85
N-CHT-4	18	9	22	0	17	0	0	0	0	0	0	0	0	0	65
N-CHT-5	13	10	16	0	14	0	0	0	0	0	0	0	0	12	64
N-CHT-6	19	13	30	0	21	0	0	0	0	0	0	0	0	0	83
N-CHT-7	8	6	34	0	15	0	0	0	0	0	0	0	0	8	71
N-CHT-8	17	8	22	0	12	0	0	0	0	0	0	0	0	0	59

4.1.6.2 Composition Of Vehicle Types

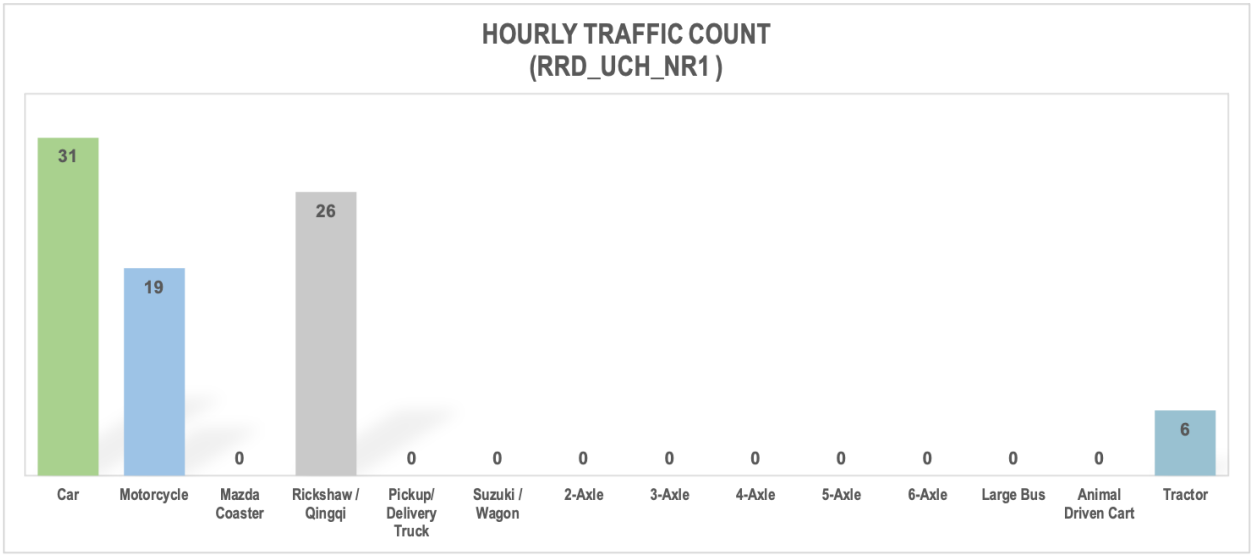


Figure 4.1.11 Vehicle Composition RRD-UCH-NR1

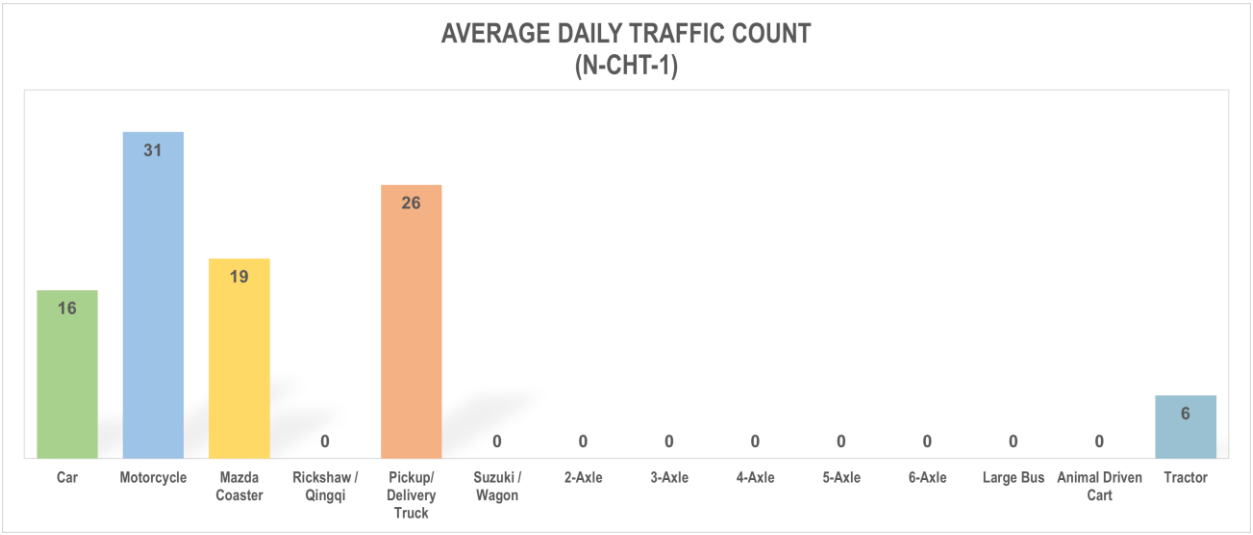


Figure 4.1.12 Vehicle Composition N-CHT-1

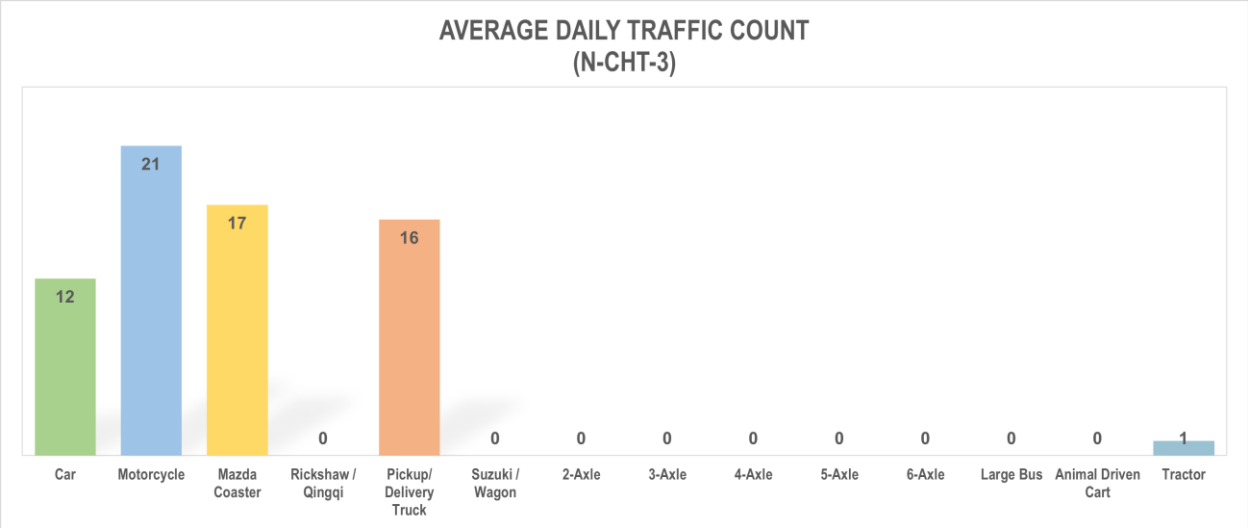


Figure 4.1.13 Vehicle Composition N-CHT-3

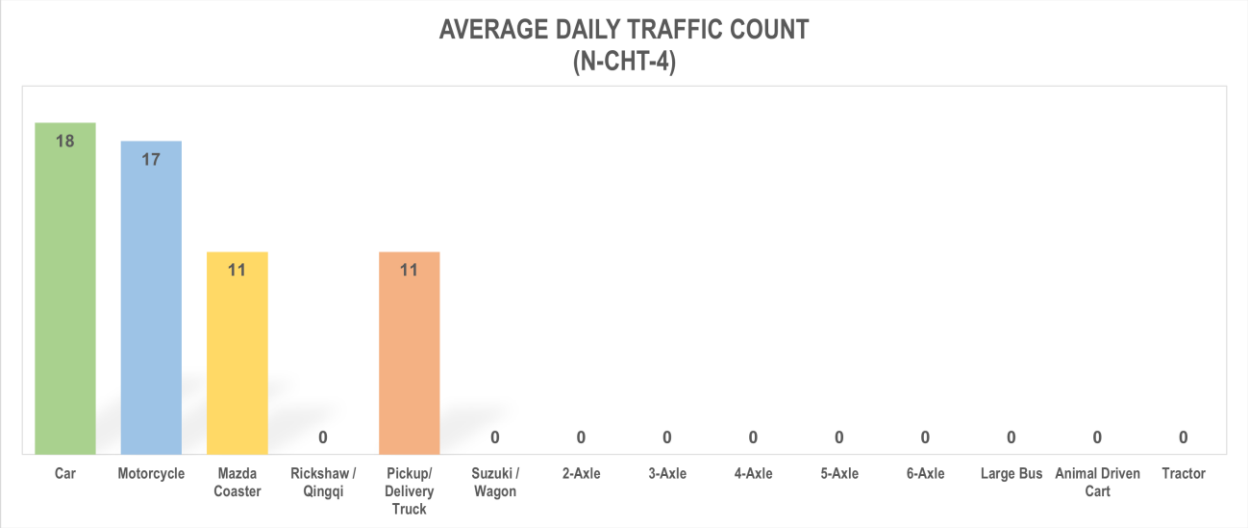


Figure 4.1.14 Vehicle Composition N-CHT-4

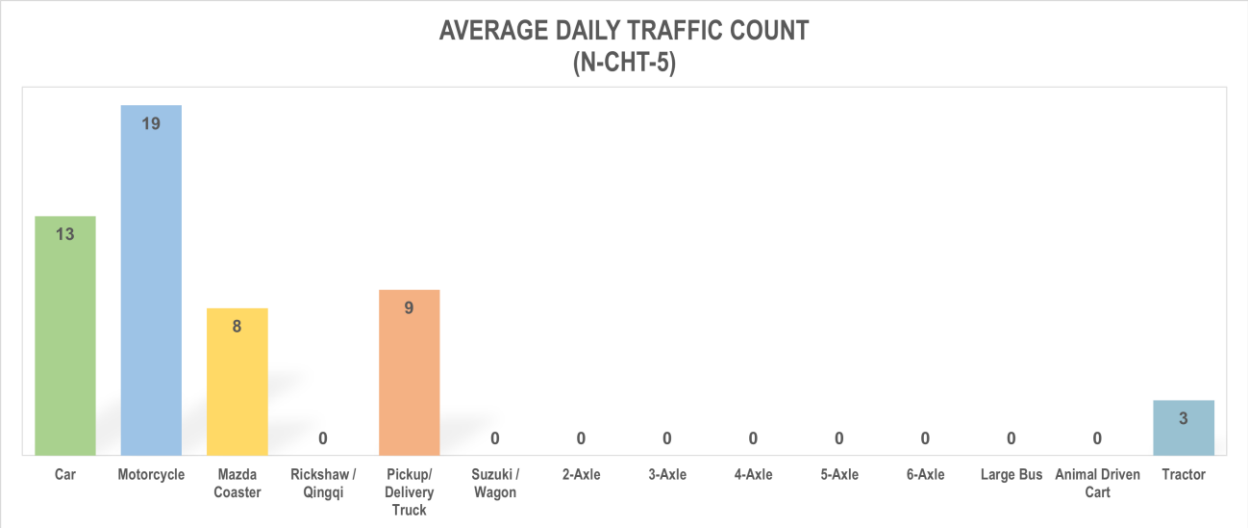


Figure 4.1.15 Vehicle Composition N-CHT-5

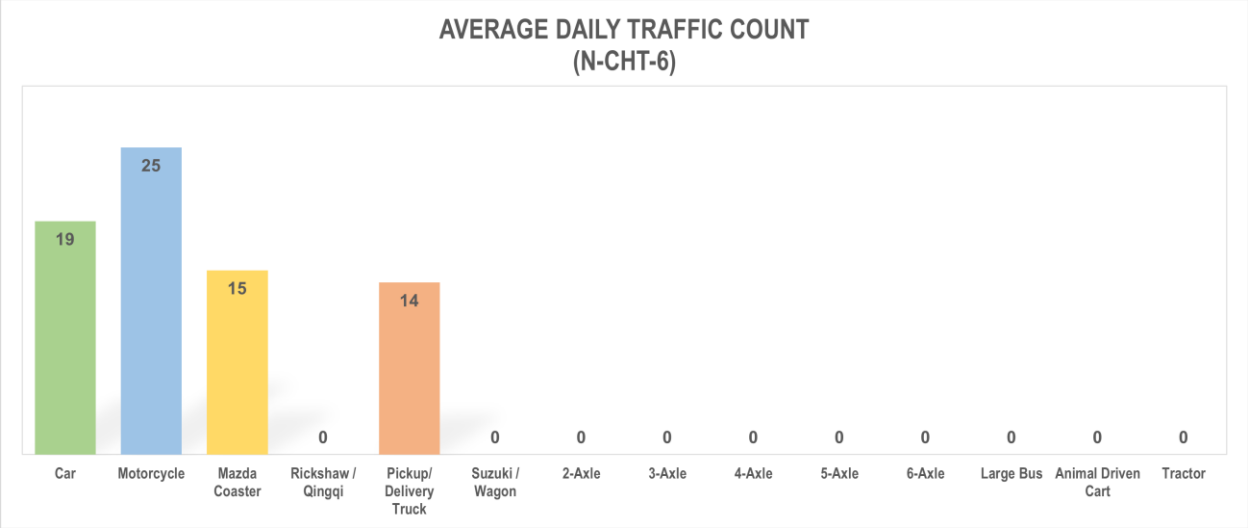


Figure 4.1.16 Vehicle Composition N-CHT-6

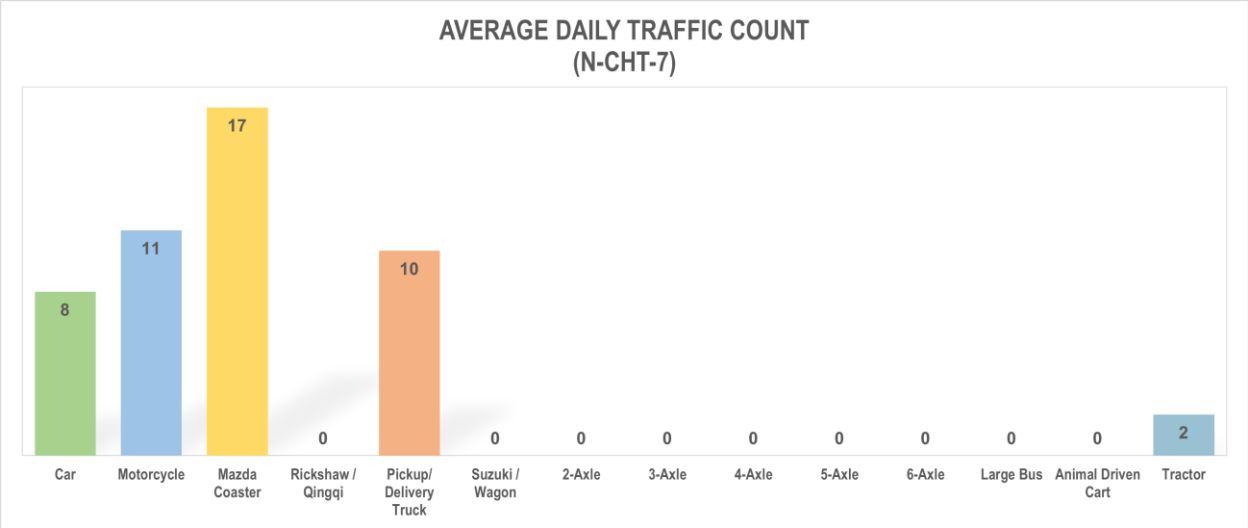


Figure 4.1.17 Vehicle Composition N-CHT-7

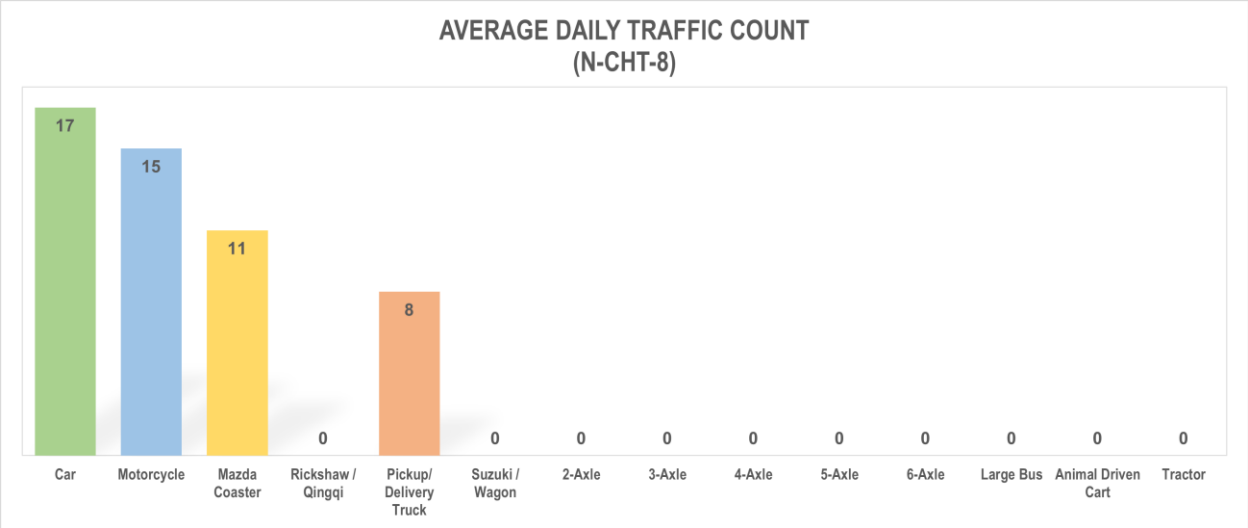


Figure 4.1.18 Vehicle Composition N-CHT-8

Most of the vehicles on the subject roads are Cars and Motorcycles. This Vehicle Composition can be attributed to the rural area type of the considered roads. Most of the people travel on these roads in their personal cars or motorcycles due to lack of proper public transport facilities.

The reason we have cars and motorcycles as the majority constituents of the vehicle mix, is because of the diversity of the road users utilizing the facility. Those people that have the available resources and own a car or motorcycle are reluctant of using public transport due to the poor services and condition of vehicles, whereas those people who do not own a private car or motorcycle have no other option then using public transport that constitutes of rickshaws and Suzuki/Wagons as seen in some roads.

4.1.6.3 Traffic Analysis Forecast

ADT:

The ADT Base Year is 2022 and ADT Forecast year is 2032 as can be seen in the table below.

The following table represents the annual daily traffic forecast (10 years).

Table 4.1.5 Forecast ADT of Flood Affected Roads District Chitral

Road ID	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
RRD_UCH_NR1	82	86	90	95	100	105	110	115	121	127	134
N-CHT-1	98	103	108	113	119	125	131	138	145	152	160
N-CHT-3	67	70	74	78	81	86	90	94	99	104	109
N-CHT-4	57	60	63	66	69	73	76	80	84	88	93
N-CHT-5	52	55	57	60	63	66	70	73	77	81	85
N-CHT-6	73	77	80	85	89	93	98	103	108	113	119
N-CHT-7	48	50	53	56	58	61	64	68	71	74	78
N-CHT-8	51	54	56	59	62	65	68	72	75	79	83

PCU:

The PCU Base Year is 2022 and PCU Forecast year is 2032 as can be seen in the table below.

Table 4.1.6 Forecast PCUs of Flood Affected Roads District Chitral

Road ID	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
RRD_UCH_NR1	84	88	93	97	102	107	113	118	124	130	137
N-CHT-1	133	139	146	153	161	169	178	186	196	206	216
N-CHT-3	85	89	93	98	103	108	113	119	125	131	138
N-CHT-4	65	68	72	75	79	83	87	91	96	101	106
N-CHT-5	64	67	71	74	78	82	86	90	95	99	104
N-CHT-6	83	87	91	96	100	105	111	116	122	128	134
N-CHT-7	71	74	78	82	86	90	94	99	104	109	115
N-CHT-8	59	61	64	68	71	75	78	82	86	91	95

4.1.7 Discussion and Analysis

The analysis conducted on these roads indicates that the condition of these roads is affecting the traffic characteristics which consequently influence the access of people to necessities of life. The poor condition of these roads is reflected by the Road Surface Type (RST) and International Roughness Index (IRI) pie charts which indicates that these roads need immediate consideration with respect to construction and rehabilitation. The poor mobility of these roads is indicated by the lower speeds and high travel times. Reconstructing these roads will improve speeds and lower travel times of users.

The utility of these roads in providing access to necessities like education, health, and markets will be enhanced with the improvement in road condition after reconstruction.

4.2 Project Area: Dera Ismail Khan

Dera Ismail Khan abbreviated as D.I. Khan, is a city and capital of Dera Ismail Khan District, located in Khyber Pakhtunkhwa, Pakistan. It is the 37th largest city of Pakistan and fifth largest in the province of Khyber Pakhtunkhwa by population. Dera Ismail Khan is situated on the west bank of the Indus River, at its junction with the Gomal River. It is 300 kilometers (190 mi) south of the provincial capital Peshawar, and 230 kilometers (140 mi) northwest of Multan, Punjab.

4.2.1 Priority Roads in District DI Khan

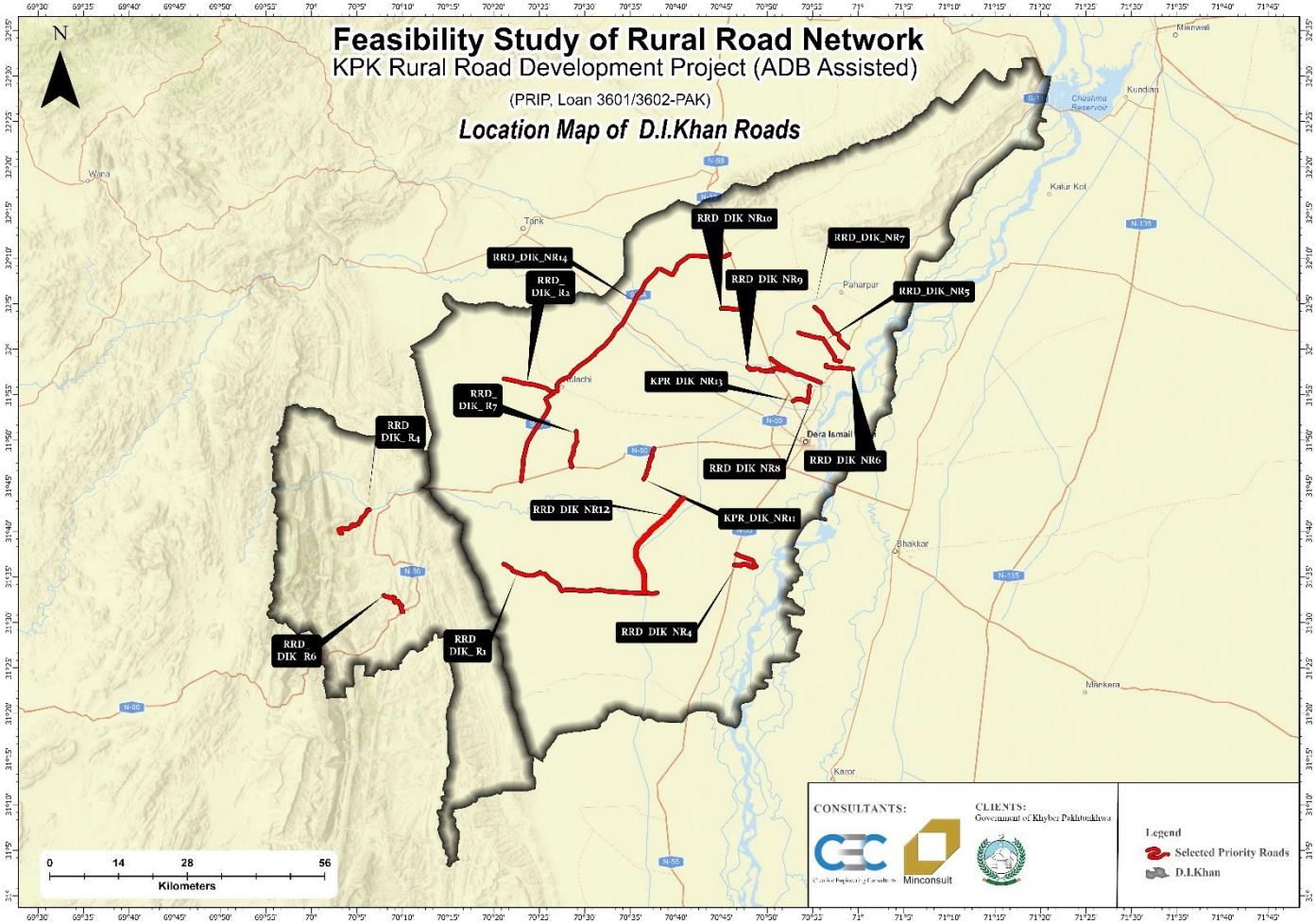
The following roads have been found feasible for Rural Road Development Project in District DI Khan.

Table 4.2.1 Flood Affected Roads in District D.I. Khan

#	ID	Road Name	Districts	FL	Type
1	KPR_DIK_NR11	Main N-50 to Shero Kuhna Road	D.I. Khan	6.83	Flood Affected
2	KPR_DIK_NR13	Main N-55 road to Diyal Via Airport Road and CRBC colony	D.I. Khan	6.1	Flood Affected
3	RRD_ DIK_ R1	Restoration & Rehabilitation of Prova to Chowdwan Road	D.I. Khan	29.6	Flood Affected
4	RRD_ DIK_ R2	Restoration & Rehabilitation of Kulachi to Luni Road	D.I. Khan	6.2	Flood Affected
5	RRD_ DIK_ R4	Restoration & Rehabilitation of Mian Kasirai Shareef Road **(Darazinda)**	D.I. Khan	10.0	Flood Affected
6	RRD_ DIK_ R6	Restoration & Rehabilitation of Main Parwara jalal Khell Road **(Darazinda)**	D.I. Khan	7.26	Flood Affected
7	RRD_ DIK_ R7	Restoration & Rehabilitation of Main Daraban Road to Kot Wali's dad via Garah Khan	D.I. Khan	8.0	Flood Affected
8	RRD_DIK_NR4	From Indus highway to dhok Rabnawaz and Chah Hussain (9.2 KM)	D.I. Khan	9.1	Flood Affected
9	RRD_DIK_NR5	Main chashma road, Thathal Adda to Phahar pur old canal road Via Mubarak shah & Thatha...	D.I. Khan	10.4	Flood Affected
10	RRD_DIK_NR6	From chashma road to village Musa khar and Jabbar wala (5.05 KM)	D.I. Khan	5.05	Flood Affected
11	RRD_DIK_NR7	Awan Nala Civil Minor Road (10.5 KM)	D.I. Khan	10.5	Flood Affected
12	RRD_DIK_NR8	From CRBC Canal to Diyal Pahar pur canal road & Rehmat Abad Link (12.56 KM)	D.I. Khan	12.5	Flood Affected
13	RRD_DIK_NR9	Pusha Pul To Garrah Rehman	D.I. Khan	5.3	Flood Affected
14	RRD_DIK_NR10	Main N-55 road to Sadra Sharif Road	D.I. Khan	5.0	Flood Affected
15	RRD_DIK_NR12	Jhandi Sewaag Road	D.I. Khan	7.5	Flood Affected
16	RRD_DIK_NR14	Giloti Road	D.I. Khan	68	Flood Affected

4.2.2 Location Map of Priority Roads

All the access roads selected for traffic study after scrutinization of the surveyed roads in the district are shown in the figure below.



Map 4.2.1 Location Map D.I. Khan

4.2.2.1 KPR_DIK_NR11 (Main N-50 to Shero Kuhna Road)

The road is in Sheru Kohna, D.I. Khan district. It Starts from Zhob – DI Khan Highway, covering 6.84 km route.

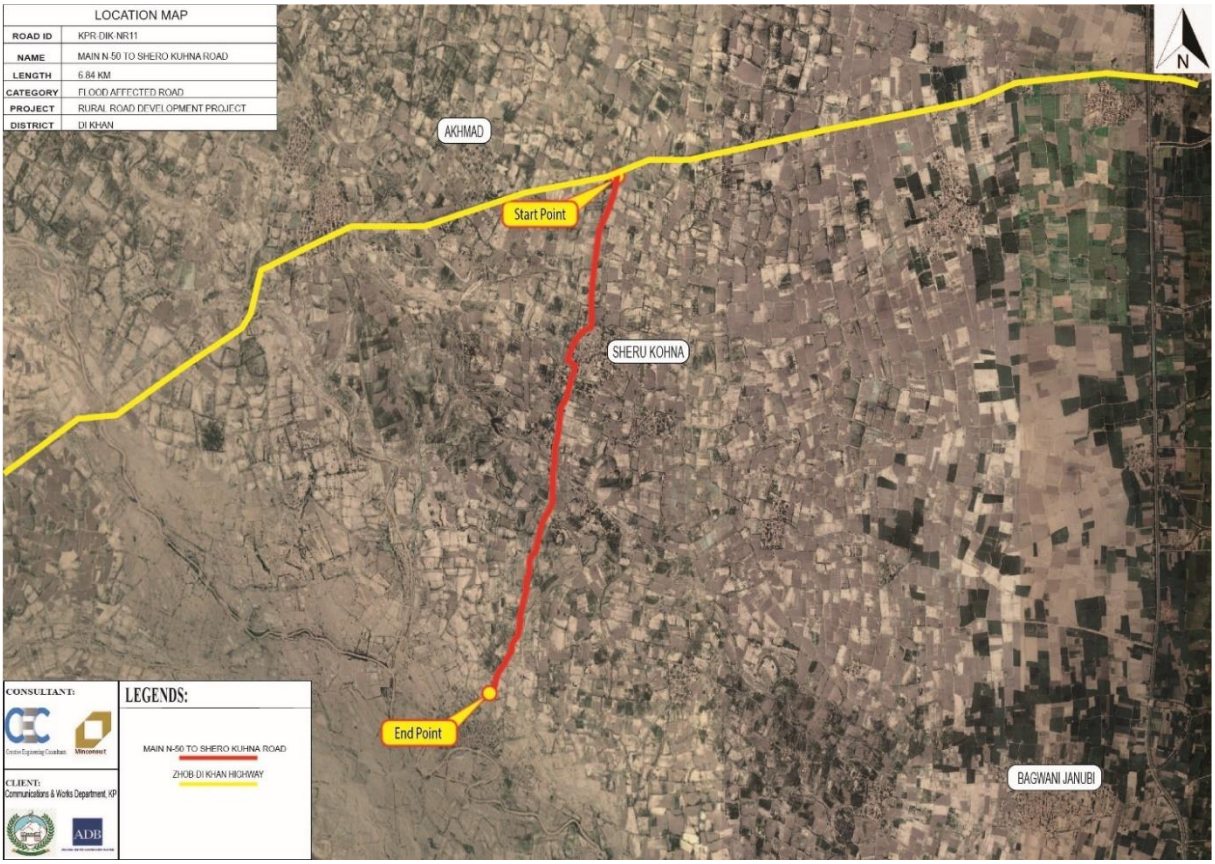


Figure 4.2.1 Location Map KPR_DIK_NR11

4.2.2.2 KPR_DIK_NR13 (Main N-55 road to Diyal Via Airport Road and CRBC colony)

The road is in D.I. Khan district. It starts from Bannu Road, covering the Airport access road and Dyal road, ending at Dyal village. The length of the road is 6.1 km long.

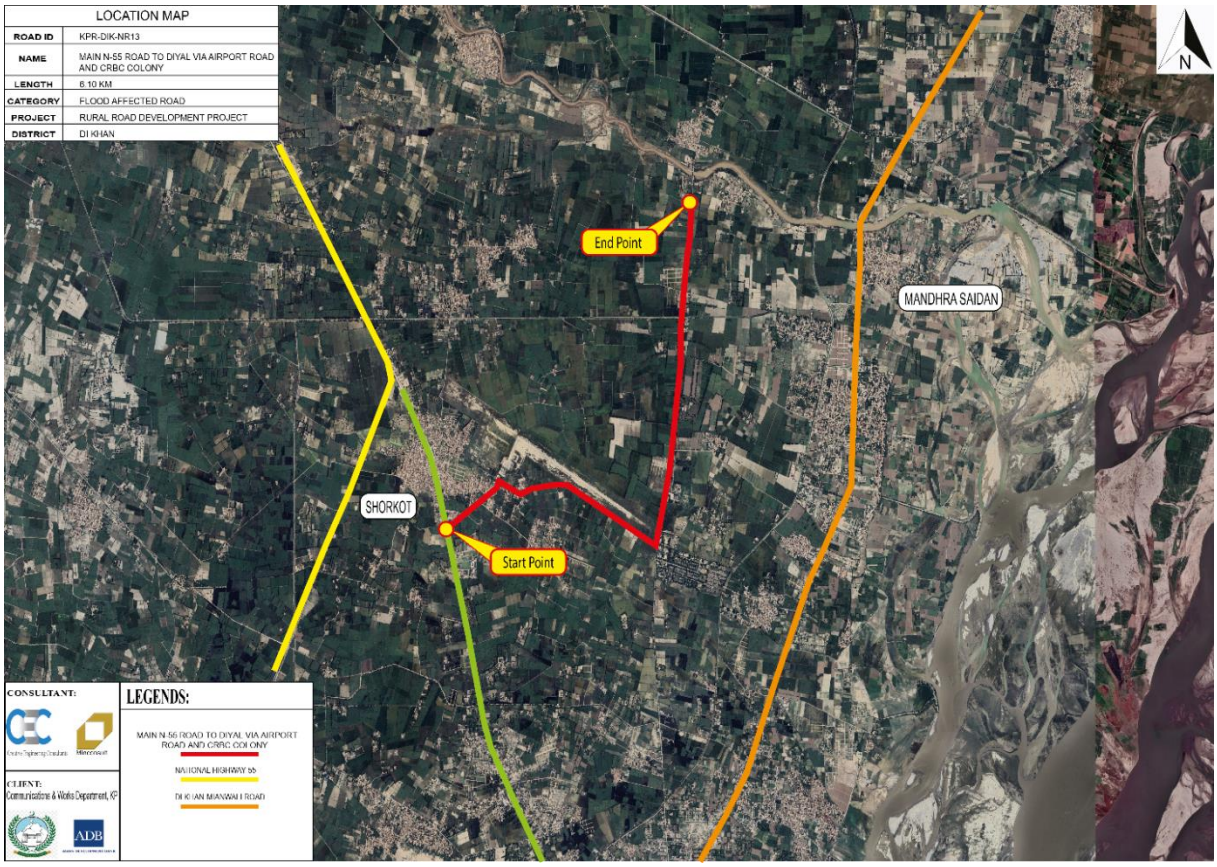


Figure 4.2.2 Location Map KPR_DIK_NR13

4.2.2.3 RRD_ DIK_ R1 (Restoration & Rehabilitation of Prova to Chowdwan Road)

The road is in the DI Khan district of KP province, covering 29.62 km route. It starts from Sikandar Janubi town, crossing Jandi, Daraban, Chaudhwan, towns, going all the way to Chaudhwan town.

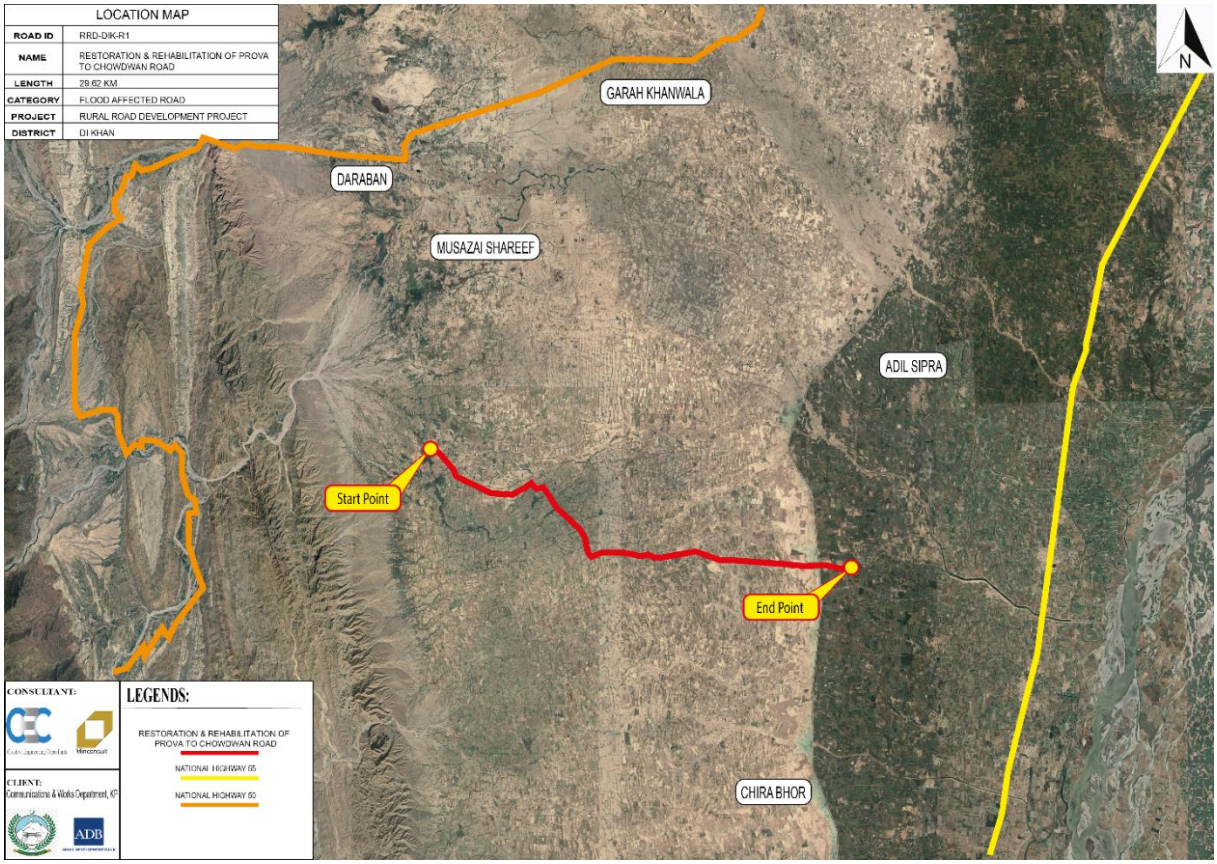


Figure 4.2.3 Location Map RRD_DIK_R1

4.2.2.4 RRD_ DIK_ R2 (Restoration & Rehabilitation of Kulachi to Luni Road)

The road is names as Kulachi Link Road, located at Kulachi tehsil of D.I. Khan district of KP province, covering 6.2 km rout. The Road connects Luni to Kulachi.

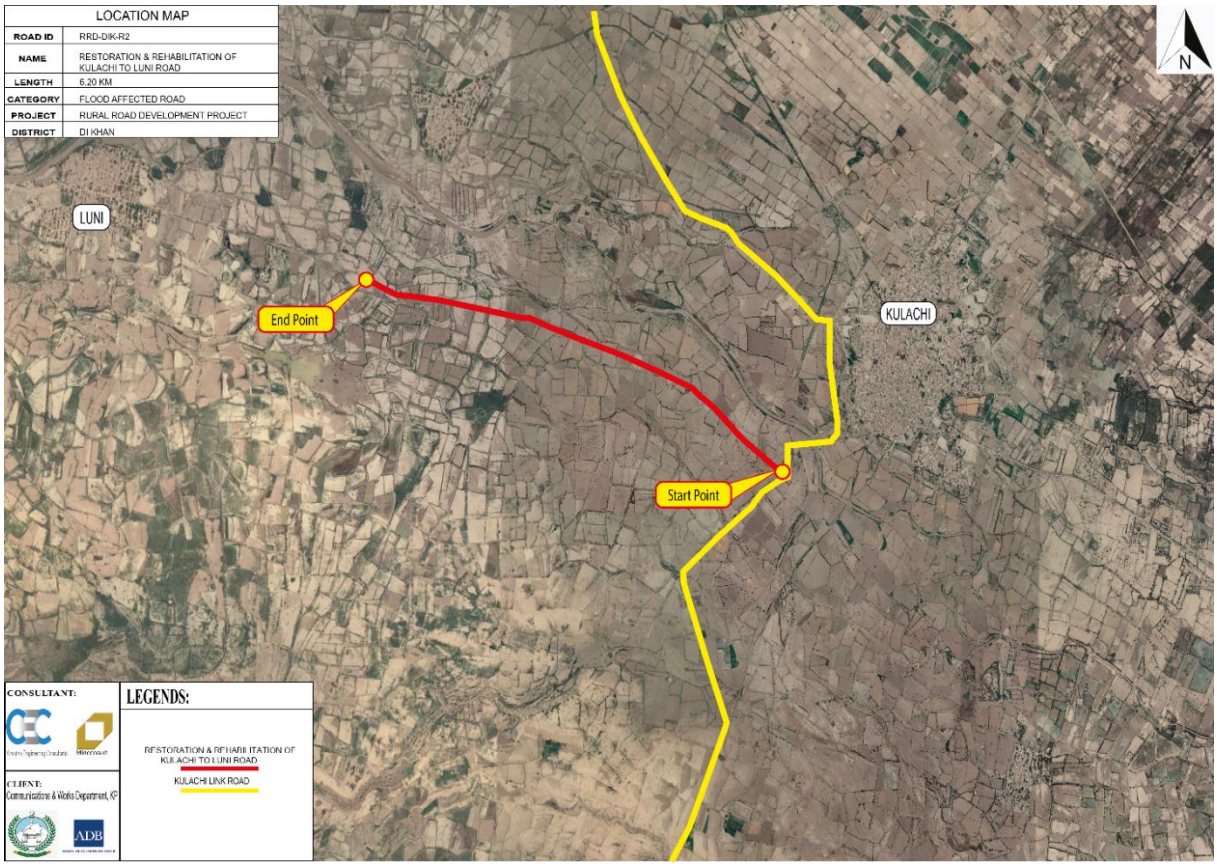


Figure 4.2.4 Location Map RRD_DIK_R2

4.2.2.5 RRD_ DIK_ R4 (Restoration & Rehabilitation of Mian Kasirai Shareef Road

The road is named Mian Kasirai Shareef Road, located near Darazinda village in D.I. Khan district of KP province. The Road starts from the Khora river near Darazinda village, covering 10 km rout.

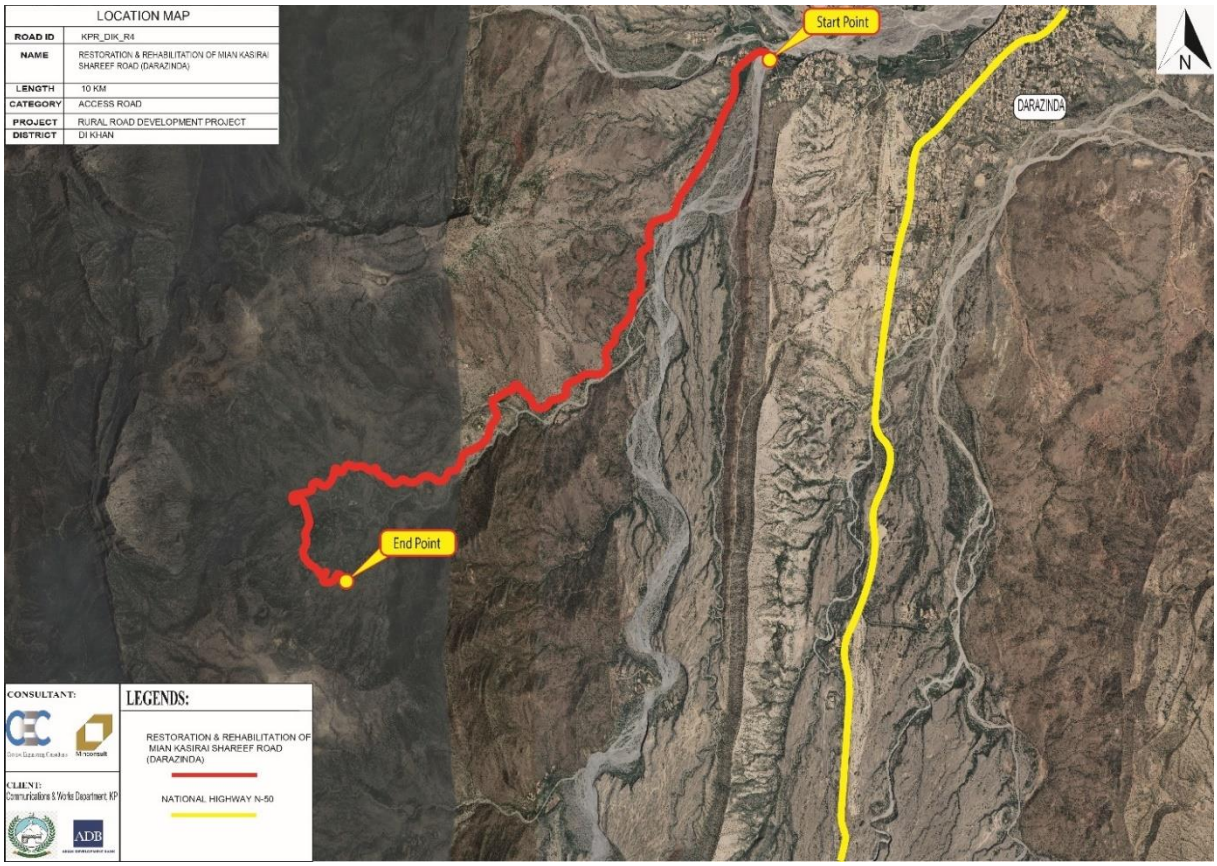


Figure 4.2.5 Location Map RRD_DIK_R4

4.2.2.6 RRD_ DIK_ R6 (Restoration & Rehabilitation of Main Parwara jalal Khell Road

The road is named Mian Parwara jalal Khell Road, located near D.I. Khan district of KP province. The Road starts from the Zhob DI Khan Highway and crosses Khamistani river, covering a 7.26 km route.

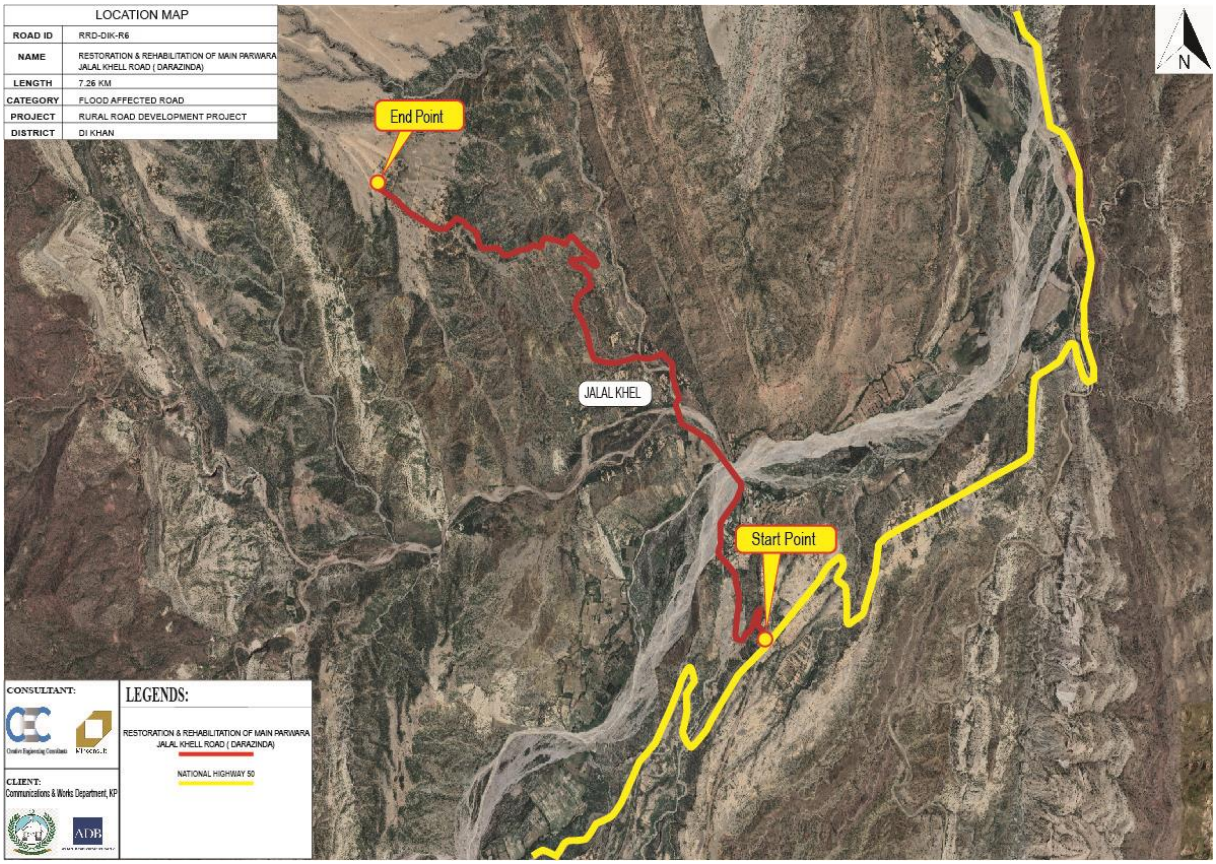


Figure 4.2.6 Location Map RRD_DIK_R6

4.2.2.7 RRD_ DIK_ R7 (Restoration & Rehabilitation of Main Daraban Road to Kot Wali's Dad Via Garah Khan

The road is names as Daraban Road, located near Kulachi tehsil of D.I. Khan district of KP province. The Road starts from the Zhob DI Khan Highway near Garah Khanwala and goes all the way near to Kulachi city, covering an 8 km route.

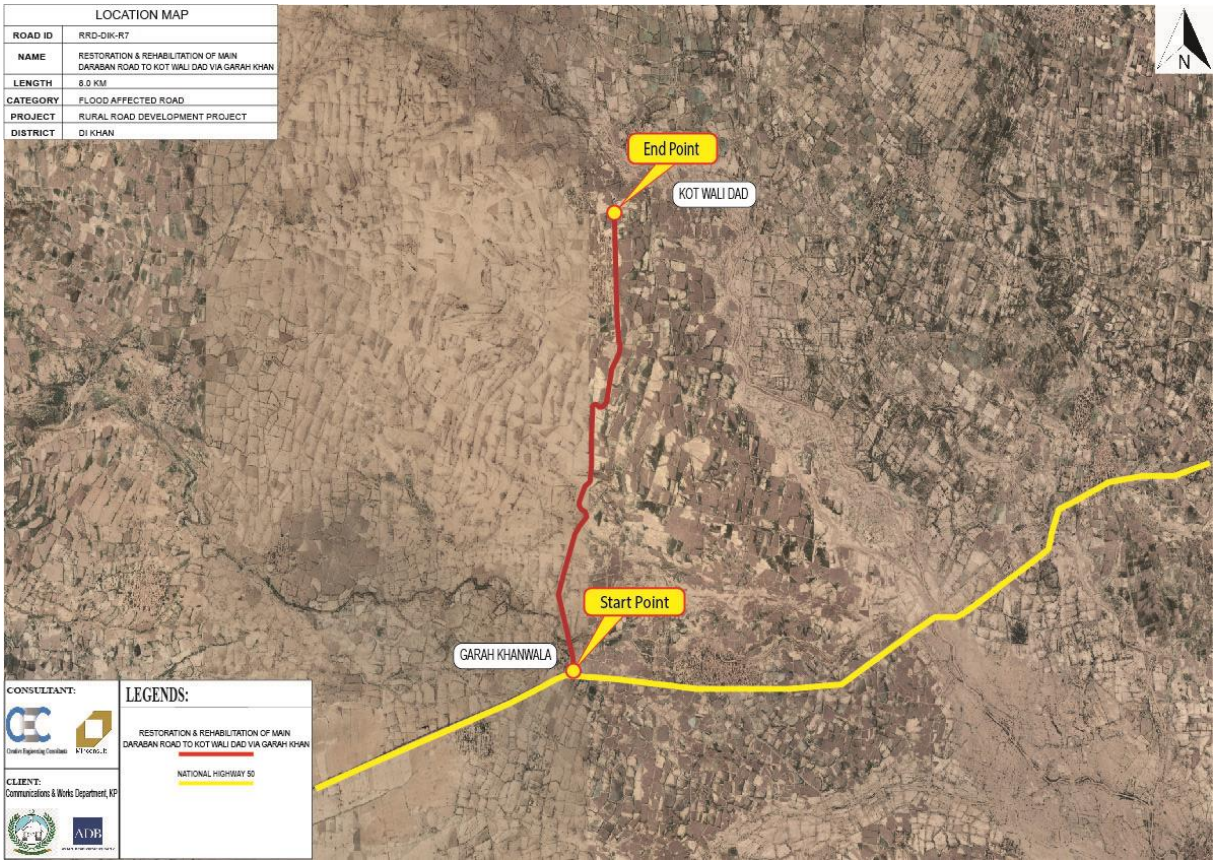


Figure 4.2.7 Location Map RRD_DIK_R7

4.2.2.8 RRD_ DIK_ NR4 (From Indus Highway to Dhok Rabnawaz and Chah Hussain (9.2 KM)

The road is located at the Paroa tehsil of D.I. Khan district. It starts from Indus highway, near to the Nai Vela town and ending at the Paroa town, Covering 9.1 km rout.

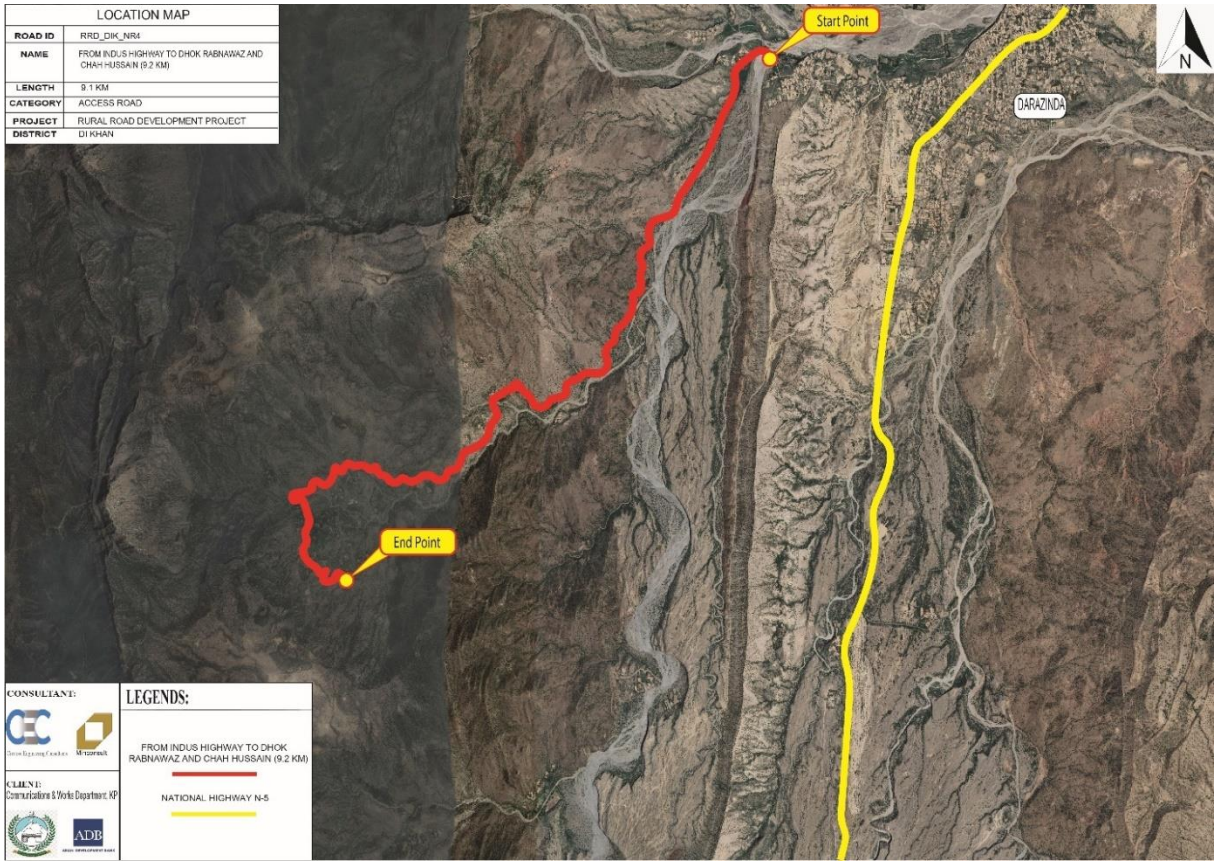


Figure 4.2.8 Location Map RRD_DIK_NR4

4.2.2.9 RRD_ DIK_ NR5 (Main Chashma Road, Thathal Adda to Phahar Pur Old Canal Road Via Mubarak Shah & Thatha...)

The road starts from the Dera Ismael Khan Mianwali Road, crossing towns naming Paharpur, Jabbar Wala, Kech, and Band Kurai, and ending at the Thatha Road. The road is 10.4 km long.

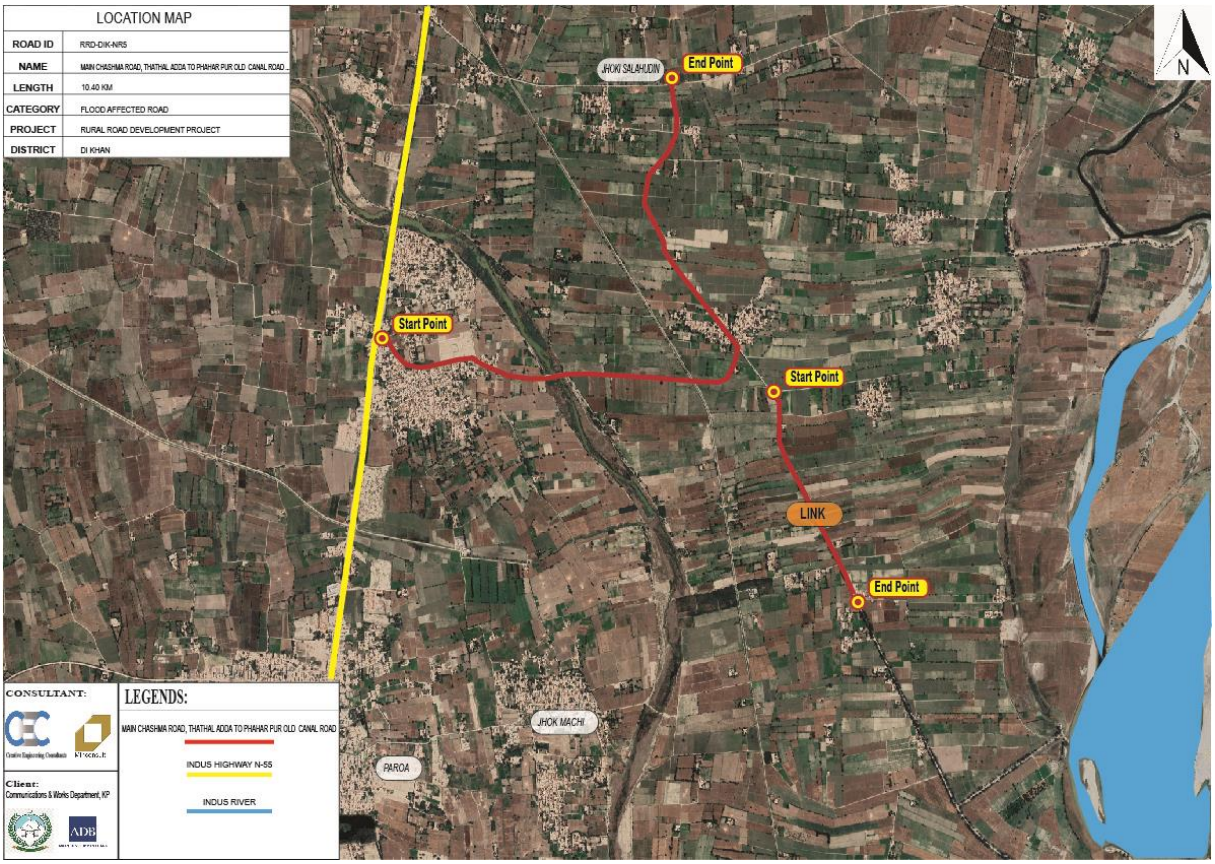


Figure 4.2.9 Location Map RRD_DIK_NR5

4.2.2.10 RRD_ DIK_ NR6 (From Chashma Road to Village Musa Khar and Jabbar Wala (5.05 KM)

The road is in Dera Ismael Khan district of KP province. It connects Jabbar Wala town with Musa Khan town. The road is 5.05 km long.

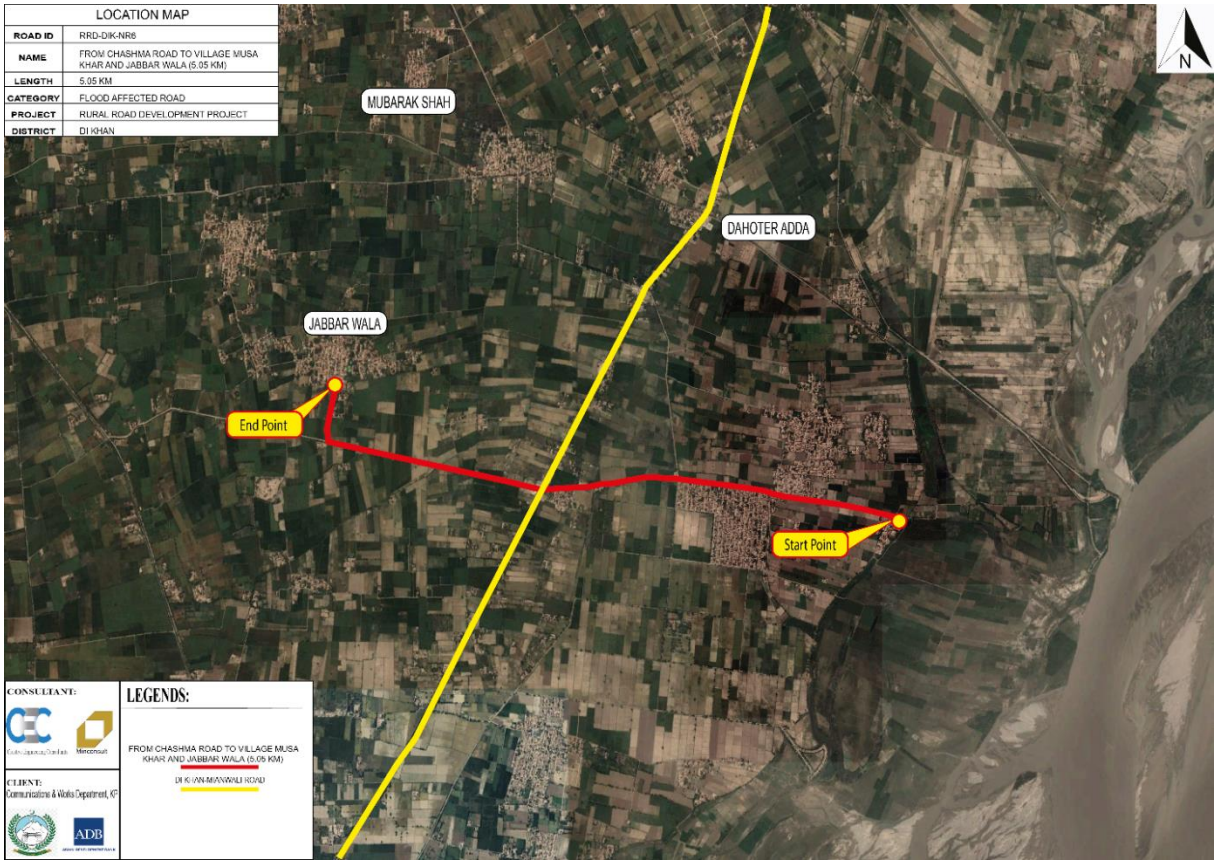


Figure 4.2.10 Location Map RRD_DIK_NR6

4.2.2.11 RRD_ DIK_ NR7 (Awan Nala Civil Minor Road (10.5 KM))

The road is named Awan Nala Civil Minor Road that starts from the Dera Ismael Khan Mianwali Road near to the Dhap Shumali town and ends near to the Paharpur town. The road covers a 10.5 km route.

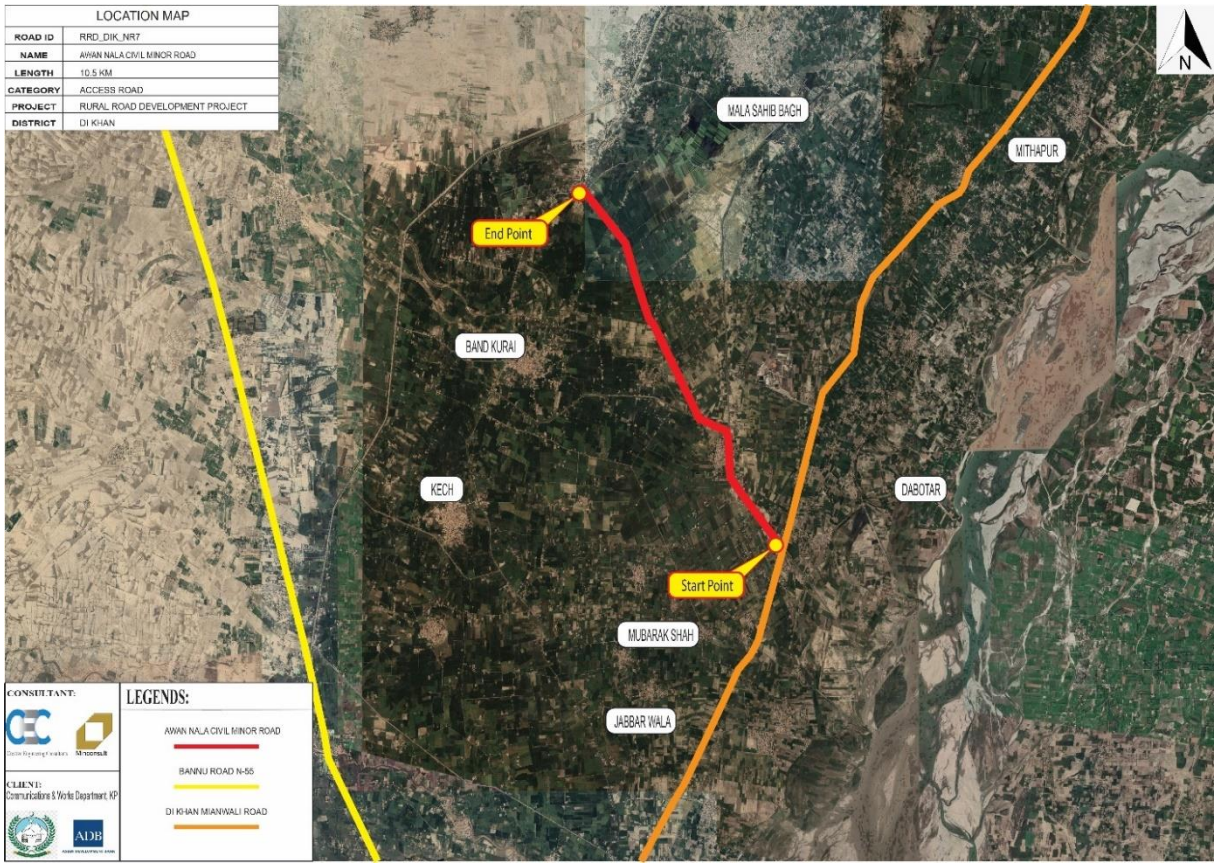


Figure 4.2.11 Location Map RRD_DIK_NR7

4.2.2.12 RRD_ DIK_ NR8 (From CRBC Canal to Diyal Pahar Pur Canal Road & Rehmat Abad Link (12.56 KM)

The road is named Dial Pahar Pur Canal Road which starts from Chashma Right Bank Canal. It is also named as Chashma Right Bank Canal Raod. The road ends at the Rakh Mangan Minor. Furthermore, it has a link which starts from Bannu Road in D.I. Khan near to the Pusha Pul. Both the road and its link cover a 12.56 km route.

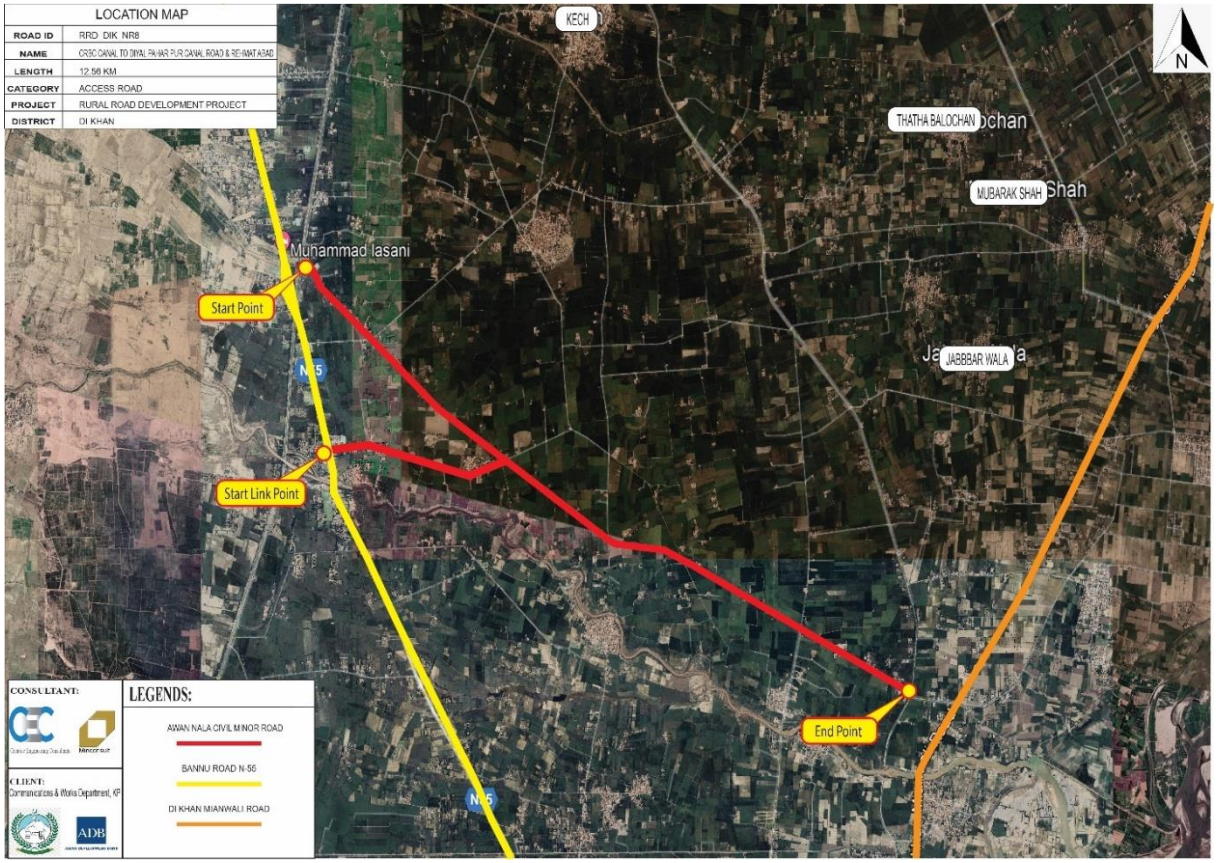


Figure 4.2.12 Location Map RRD_DIK_NR8

4.2.2.13 RRD_ DIK_ NR9 (Pusha Pul to Garrah Rehman)

The road is located at D.I. Khan district of KP province, covering a 5.3 km route.

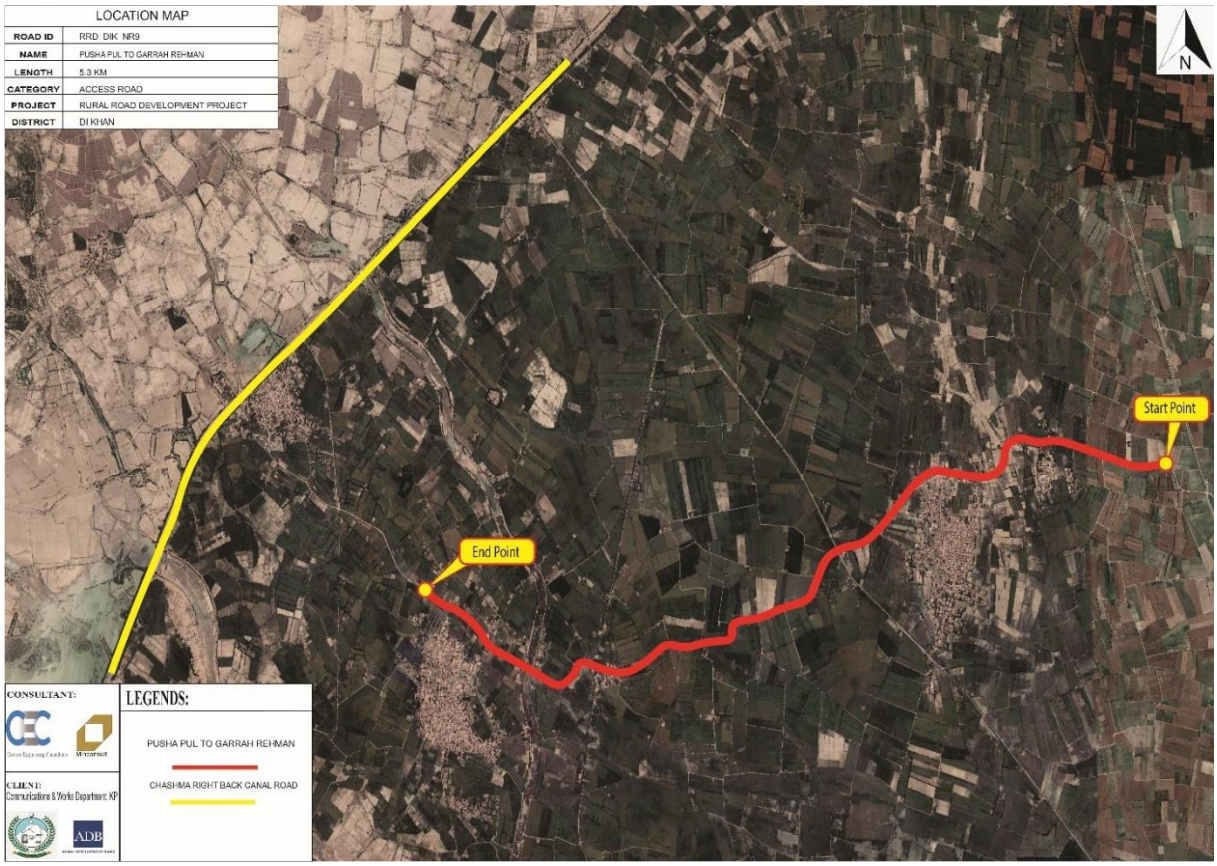


Figure 4.2.13 Location Map RRD_DIK_NR9

4.2.2.14 RRD_ DIK_ NR10 (Main N-55 road to Sadra Sharif Road)

The road is named Sidra Shareef Road which starts from the Sidra Shareef Morr, located at Yarik town of Dera Ismail Khan district. It is a 5 km long route.

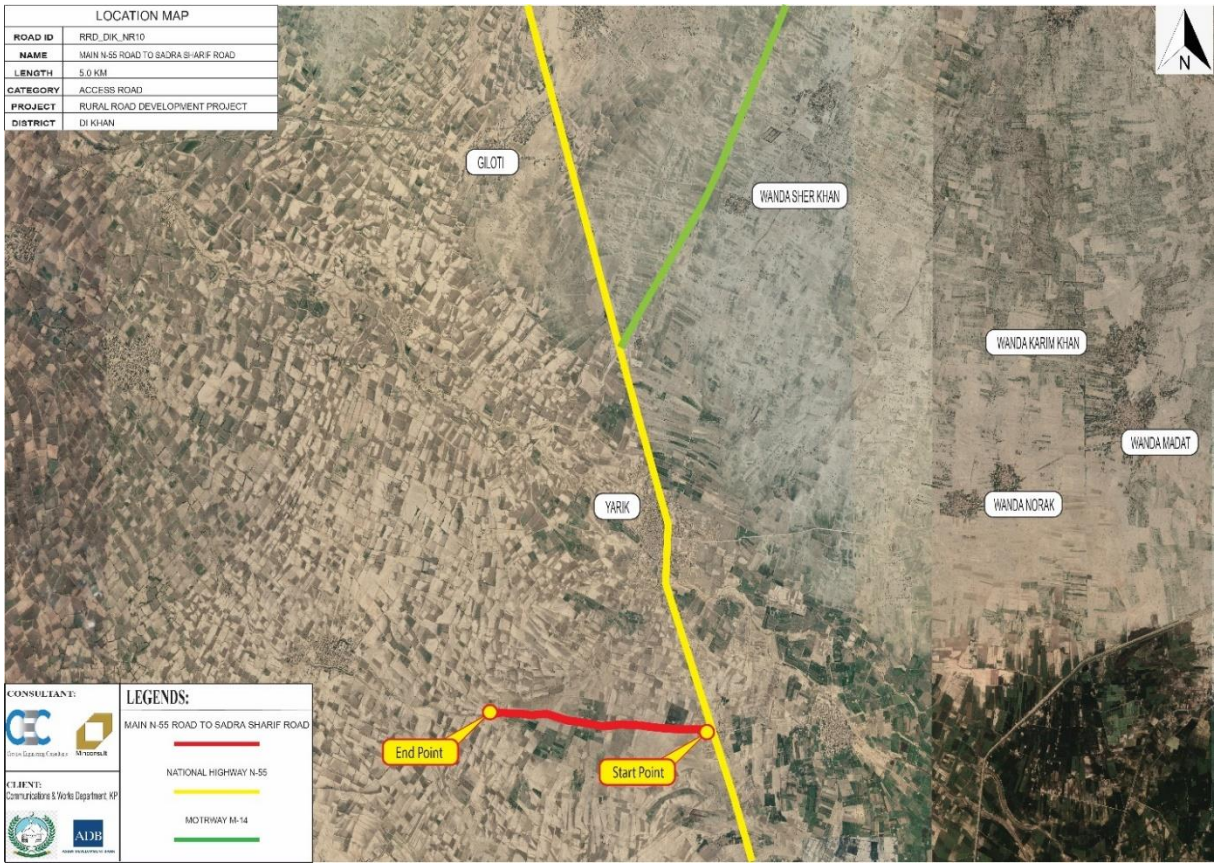


Figure 4.2.14 Location Map RRD_DIK_NR10

4.2.2.15 RRD_ DIK_ NR14 (Giloti Road)

The construction of Giloti Road holds paramount significance as it serves as a crucial link, seamlessly connecting diverse rural and urban areas within Dera Ismail Khan. This vital thoroughfare stretches impressively from the N-50 to the N-55, encompassing a total length of 68 kilometers. Once realized, this road promises to enhance accessibility and foster socio-economic development across the region, demonstrating its pivotal role in bolstering connectivity and facilitating progress in the area.

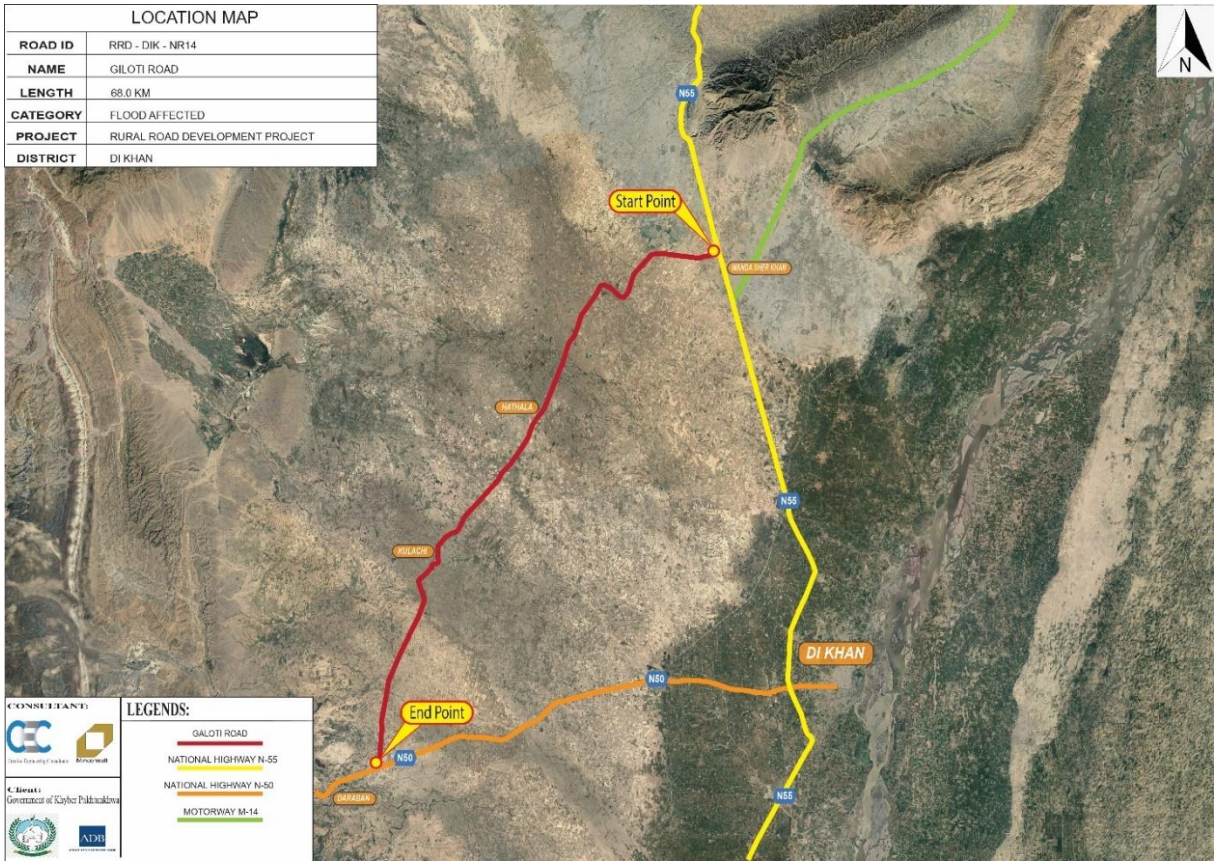


Figure 4.2.15 Location Map RRD_DIK_NR14

4.2.2.16 RRD_ DIK_ NR12 (Jindi Swaag)

The Jindi Sewaag Road, spanning 7.5 kilometers, is a vital yet problematic route connecting Jindi to surrounding areas. Plagued by poor maintenance, the road suffers from potholes, narrow lanes, and limited signage, making travel difficult. Overgrown vegetation and the absence of streetlights add to safety concerns, especially at night. This road is crucial for local accessibility, affecting emergency services, commerce, and regional connectivity. Upgrading it is essential for improving the lives of Jindi residents and enhancing overall area development..

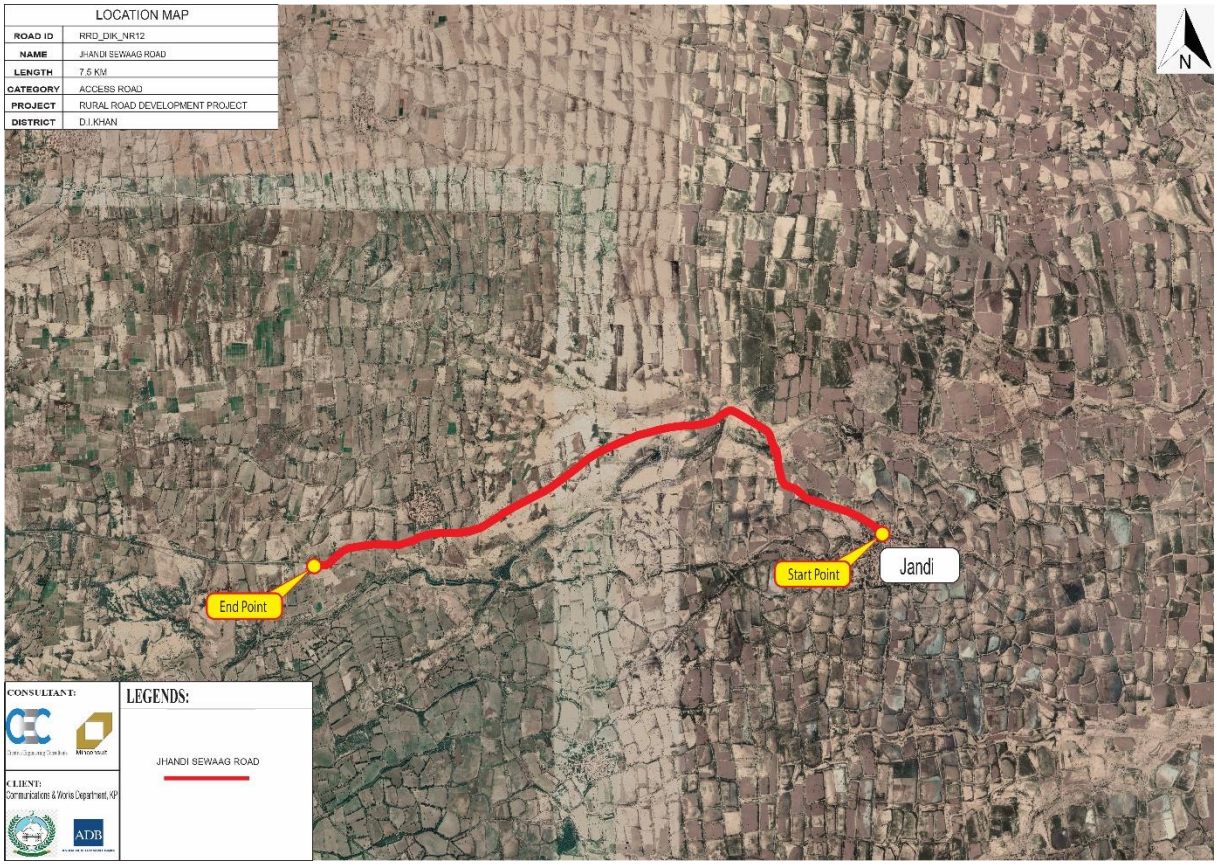
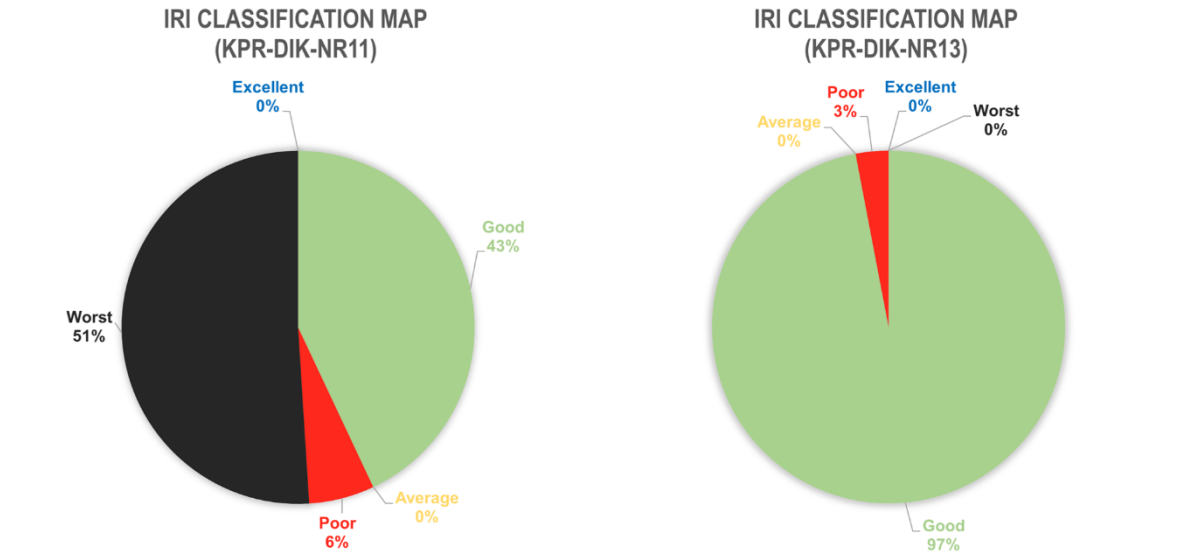


Figure 4.2.16 Location Map RRD_DIK_NR12

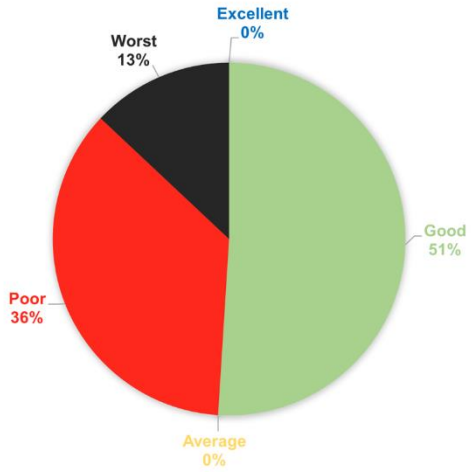
4.2.3 IRI Classification Pie Chart of Selected Roads

The International Roughness Index (IRI) is used by highway professionals throughout the world as a standard to quantify road surface roughness. A poor road surface roughness influences the traffic speeds and times. It also effects the mobility and accesibility of users traversing that road.

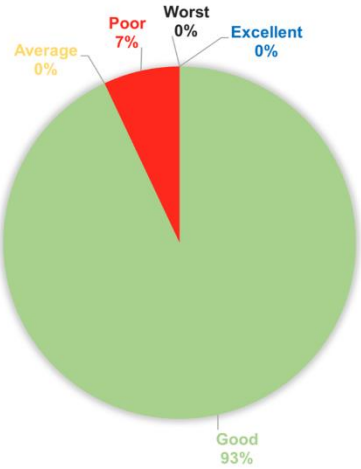
The IRI Classification Charts for are given below.



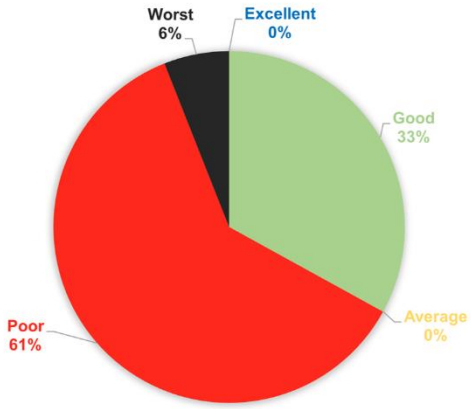
IRI CLASSIFICATION MAP
(RRD-DIK-R4)



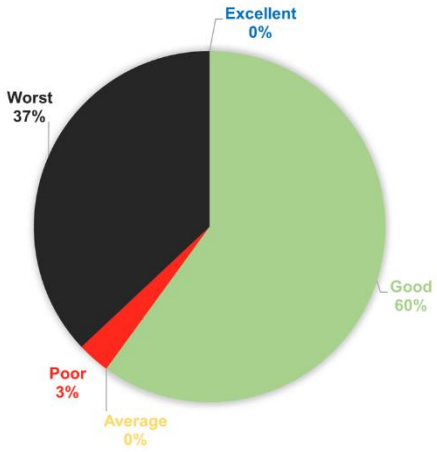
IRI CLASSIFICATION MAP
(RRD-DIK-R6)



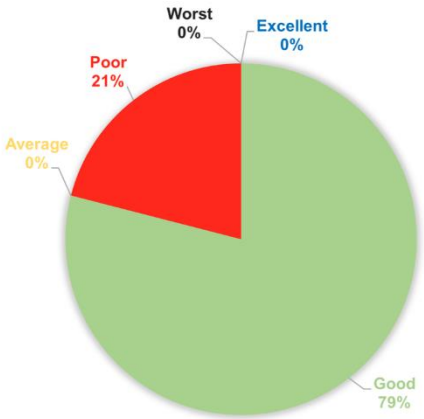
IRI CLASSIFICATION MAP
(RRD-DIK-R7)



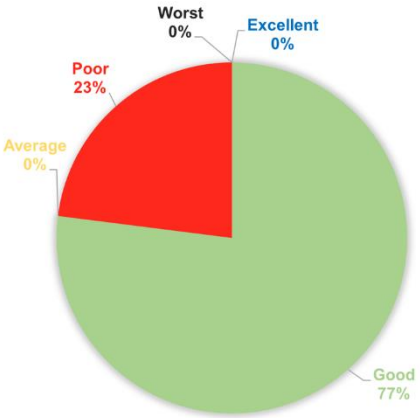
IRI CLASSIFICATION MAP
(RRD-DIK-NR4)



IRI CLASSIFICATION MAP
(RRD-DIK-NR5)



IRI CLASSIFICATION MAP
(RRD-DIK-NR6)



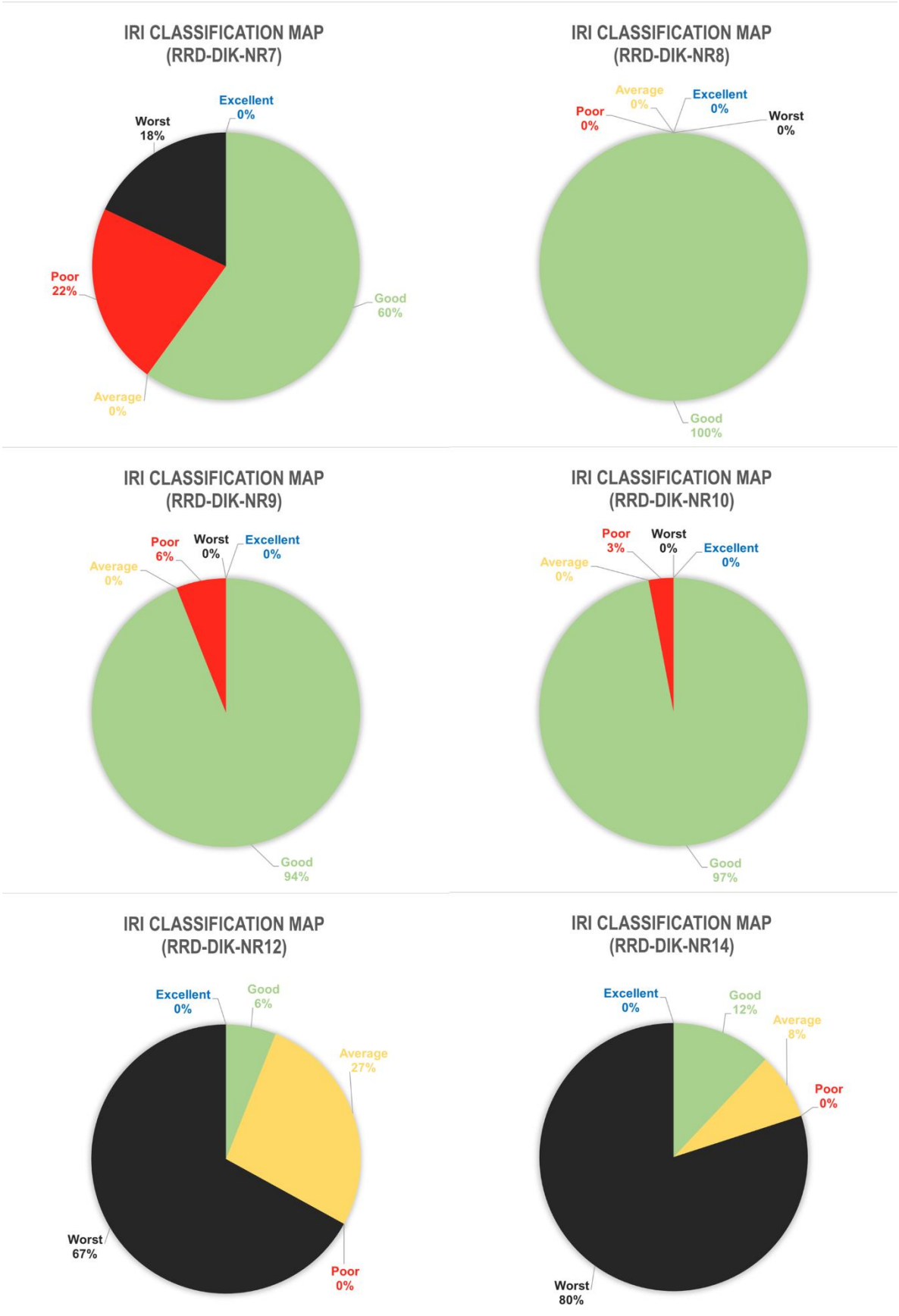
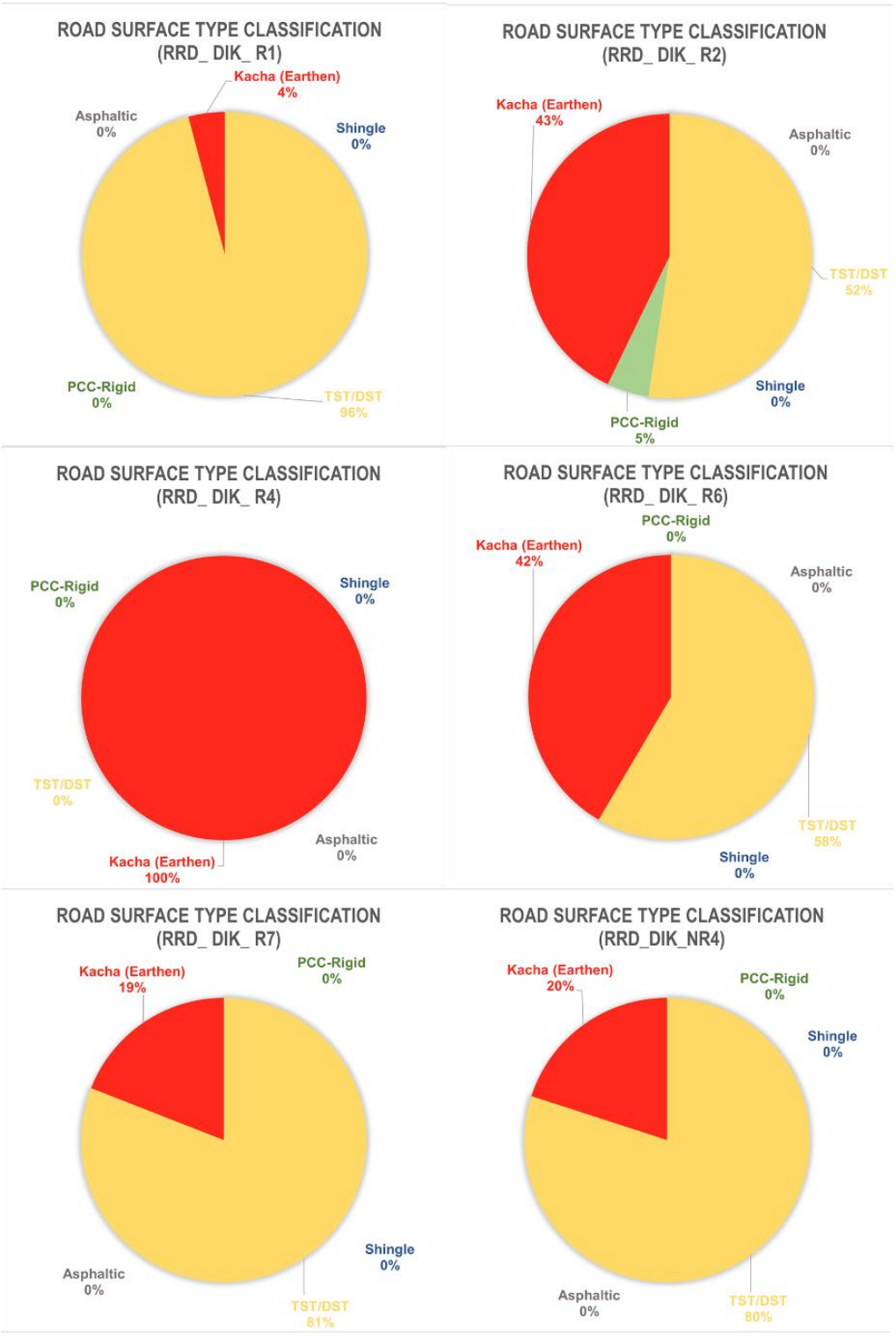


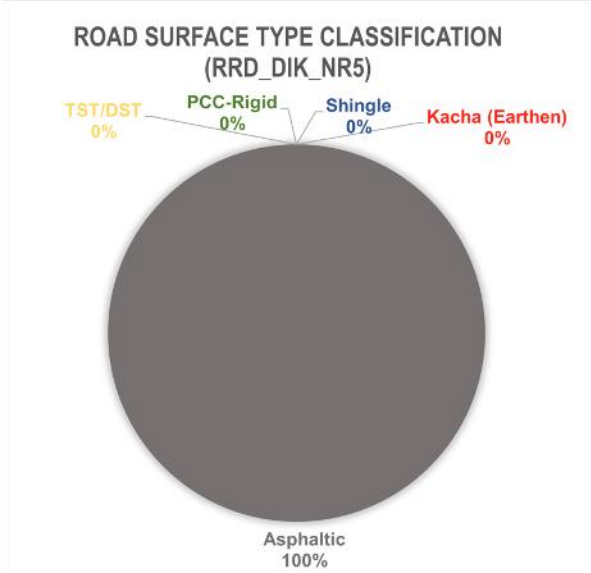
Figure 4.2.17 IRI Classification Chart of Flood Affected Roads District DI Khan

4.2.4 RST Pie Chart of Selected Roads

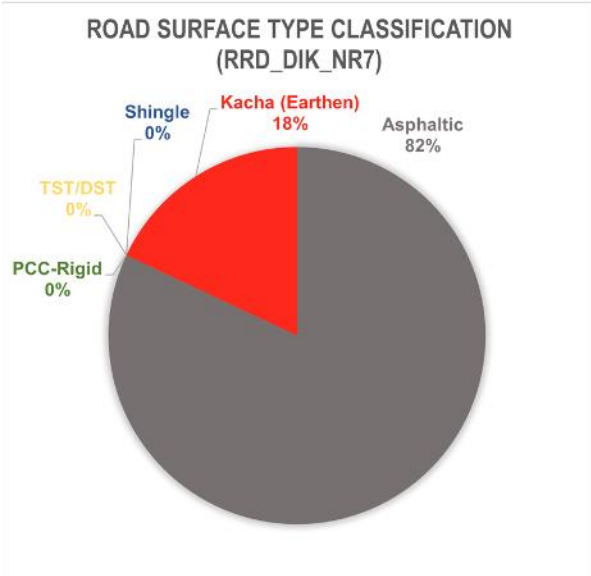
Road Surface type (RST) survey was conducted to investigate the actual condition and type of surface of the road under observation. In rural areas earthen or kacha tracks and TST/DST are common that affect the mobility of road users and accessibility to necessities.

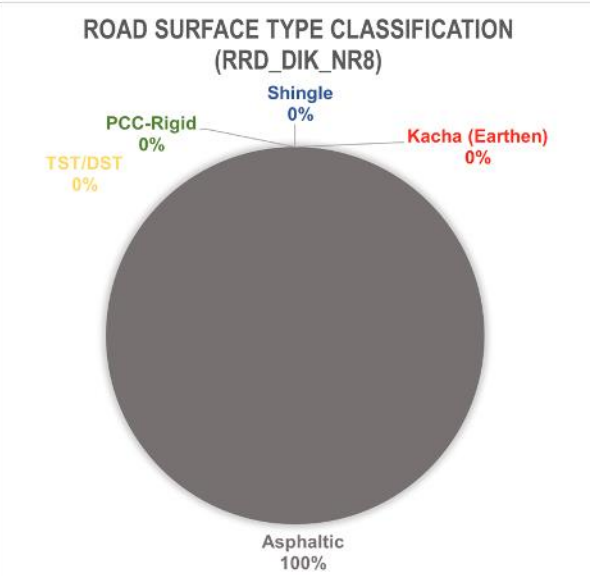
The RST Classification Charts for are given below.

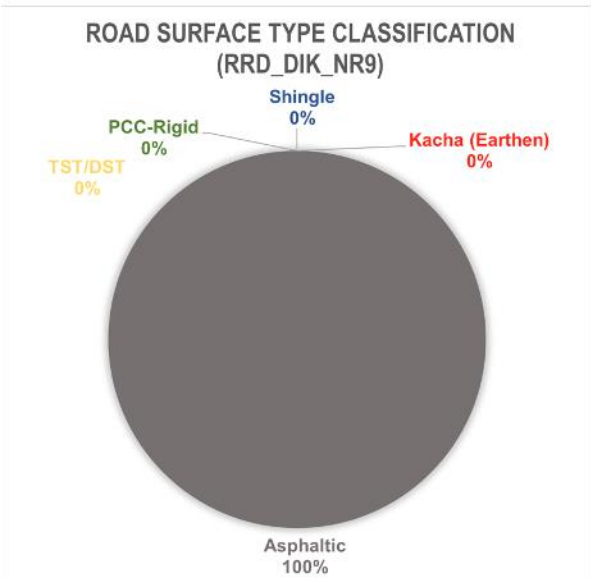


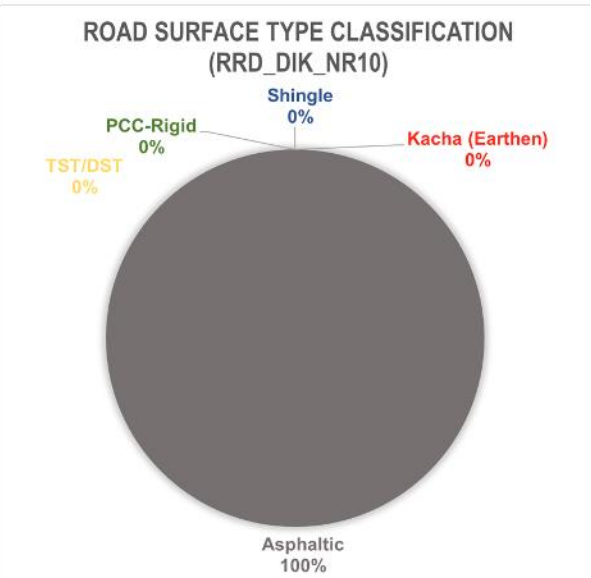

ROAD SURFACE TYPE CLASSIFICATION
(RRD_DIK_NR5)
TST/DST 0%
PCC-Rigid 0%
Shingle 0%
Kacha (Earthen) 0%
Asphaltic 100%


ROAD SURFACE TYPE CLASSIFICATION
(RRD_DIK_NR6)
TST/DST 0%
PCC-Rigid 0%
Shingle 0%
Kacha (Earthen) 0%
Asphaltic 100%


ROAD SURFACE TYPE CLASSIFICATION
(RRD_DIK_NR7)
Shingle 0%
Kacha (Earthen) 18%
Asphaltic 82%
TST/DST 0%
PCC-Rigid 0%


ROAD SURFACE TYPE CLASSIFICATION
(RRD_DIK_NR8)
Shingle 0%
PCC-Rigid 0%
Kacha (Earthen) 0%
TST/DST 0%
Asphaltic 100%


ROAD SURFACE TYPE CLASSIFICATION
(RRD_DIK_NR9)
Shingle 0%
PCC-Rigid 0%
Kacha (Earthen) 0%
TST/DST 0%
Asphaltic 100%


ROAD SURFACE TYPE CLASSIFICATION
(RRD_DIK_NR10)
Shingle 0%
PCC-Rigid 0%
Kacha (Earthen) 0%
TST/DST 0%
Asphaltic 100%

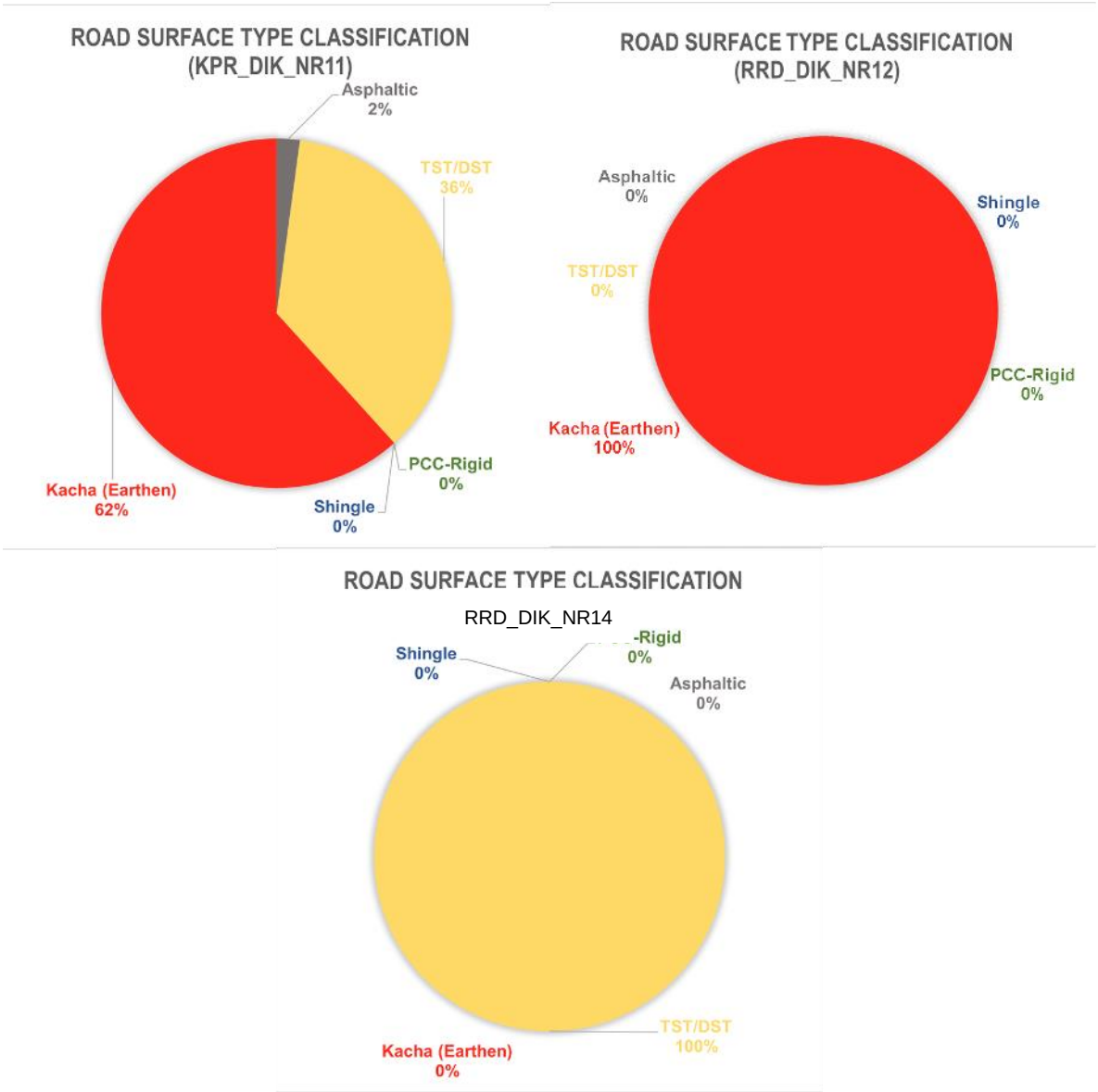


Figure 4.2.18 RST Classification Chart of Flood Affected Roads District DI Khan

4.2.5 Travel Speed Survey

Table 4.2.2 Travel Speed Survey of Flood Affected Roads District DI Khan

Road ID	Distance (km)	Total Ascent (m)	Total Descent (m)	Total Time	Average Speed (km/h)	Avg. Moving Speed (km/h)	Maximum Speed (km/h)
KPR_DIK_NR11	6.84	120	211	11:34.0	12	12	24.6
KPR_DIK_NR13	6.1	123	215	35:02.0	10	10.1	22.5
RRD_ DIK_ R1	29.62	140	221	19:41.0	8	8.3	22.6
RRD_ DIK_ R2	6.2	152	210	41:19.0	12	12.6	18.9
RRD_ DIK_ R4	10	160	203	29:51.0	14.3	14.3	16.3
RRD_ DIK_ R6	7.26	145	202	09:46.0	12.8	12.8	14.3
RRD_ DIK_ R7	8	123	201	18:58.0	11.6	11.6	18.9
RRD_DIK_NR4	9.1	125	213	19:44.0	5.6	5.6	25.3
RRD_DIK_NR5	10.4	145	241	22:47.0	7.9	7.9	26.3
RRD_DIK_NR6	5.05	112	215	11:07.0	8.3	8.3	19.3
RRD_DIK_NR7	10.5	114	264	30:59.0	4.5	4.5	12.6
RRD_DIK_NR8	12.56	116	231	41:22.0	7.9	7.9	9.6
RRD_DIK_NR9	5.3	126	254	11:07.0	12.3	12.3	10.9
RRD_DIK_NR10	5	125	221	13:07.0	11.3	11.3	11.6
RRD_DIK_NR14	67.5	310	240	145:06.0	30.9	36.7	40.1

The travel speeds for all roads are low due to the deteriorated road condition which is reflected from the RST and IRI pie charts. Mobility of the road users is affected as indicated by lower average speeds and higher travel times, which can be attributed to the poor road conditions.

It can be inferred from these observations that these roads need to be reconstructed for better mobility and access of people to basic livelihood necessities.

4.2.6 Traffic Analysis

ADT

Table 4.2.3 Existing ADT of Flood Affected Roads District DI Khan

vehicle type	Car	Motorcycle	Mazda Coaster	Rickshaw / Qinggi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	TOTAL Vehicles
KPR_DIK_NR11	15	28	0	0	0	1	0	3	0	0	0	0	0	4	50
KPR_DIK_NR13	19	25	0	0	0	3	0	3	0	0	0	0	0	4	53
RRD_ DIK_ R1	19	25	0	0	0	3	0	3	0	0	0	0	0	4	53
RRD_ DIK_ R2	20	35	0	0	0	3	0	3	0	0	0	0	0	3	63
RRD_ DIK_ R4	31	124	83	0	9	8	0	0	0	0	0	0	0	11	265
RRD_ DIK_ R6	154	70	0	0	0	0	0	0	0	0	0	0	0	0	224
RRD_ DIK_ R7	140	98	0	0	0	0	0	0	0	0	0	0	0	0	238
RRD_DIK_NR4	54	35	0	0	0	0	0	0	0	0	0	0	0	0	89
RRD_DIK_NR5	51	44	0	0	0	0	0	0	0	0	0	0	0	0	95
RRD_DIK_NR6	473	231	0	0	30	0	0	0	0	0	0	0	5	0	739
RRD_DIK_NR7	570	139	0	0	0	0	0	0	0	0	0	0	8	4	720
RRD_DIK_NR8	180	36	0	0	0	0	0	0	0	0	0	0	0	4	220
RRD_DIK_NR9	398	125	0	0	120	58	0	0	0	0	0	0	0	8	708
RRD_DIK_NR10	31	19	0	26	0	0	0	0	0	0	0	0	0	6	83
RRD_DIK_NR12	60	61	0	0	0	0	0	0	0	0	0	0	0	0	121
RRD_DIK_NR14	1013	1980	56	543	67	111	16	10	0	0	0	0	76	98	3970

PCUs

Table 4.2.4 Existing PCUs of Flood Affected Roads District DI Khan

vehicle type	Car	Motorcycle	Mazda Coaster	Rickshaw / Qinggi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	Tota PCUS
KPR_DIK_NR11	15	14	0	0	0	3	0	8	0	0	0	0	0	15	54
KPR_DIK_NR13	19	13	0	0	0	5	0	8	0	0	0	0	0	15	59
RRD_ DIK_ R1	19	13	0	0	0	5	0	8	0	0	0	0	0	15	59
RRD_ DIK_ R2	20	18	0	0	0	5	0	8	0	0	0	0	0	10	60
RRD_ DIK_ R4	31	62	165	0	13	15	0	0	0	0	0	0	0	45	331
RRD_ DIK_ R6	154	35	0	0	0	0	0	0	0	0	0	0	0	0	189
RRD_ DIK_ R7	140	49	0	0	0	0	0	0	0	0	0	0	0	0	189
RRD_DIK_NR4	54	18	0	0	0	0	0	0	0	0	0	0	0	0	72
RRD_DIK_NR5	51	22	0	0	0	0	0	0	0	0	0	0	0	0	73
RRD_DIK_NR6	473	116	0	0	45	0	0	0	0	0	0	0	23	0	656
RRD_DIK_NR7	570	69	0	0	0	0	0	0	0	0	0	0	34	15	688
RRD_DIK_NR8	180	18	-	-	-	-	-	-	-	-	-	-	-	15	213
RRD_DIK_NR9	398	63	0	0	180	115	0	0	0	0	0	0	0	30	785
RRD_DIK_NR10	31	9	0	20	0	0	0	0	0	0	0	0	0	25	85
RRD_DIK_NR12	60	31	0	0	0	0	0	0	0	0	0	0	0	0	91
RRD_DIK_NR14	1013	990	112	407	101	222	40	30	0	0	0	0	342	392	3649

4.2.6.1 Composition Of Vehicle Types

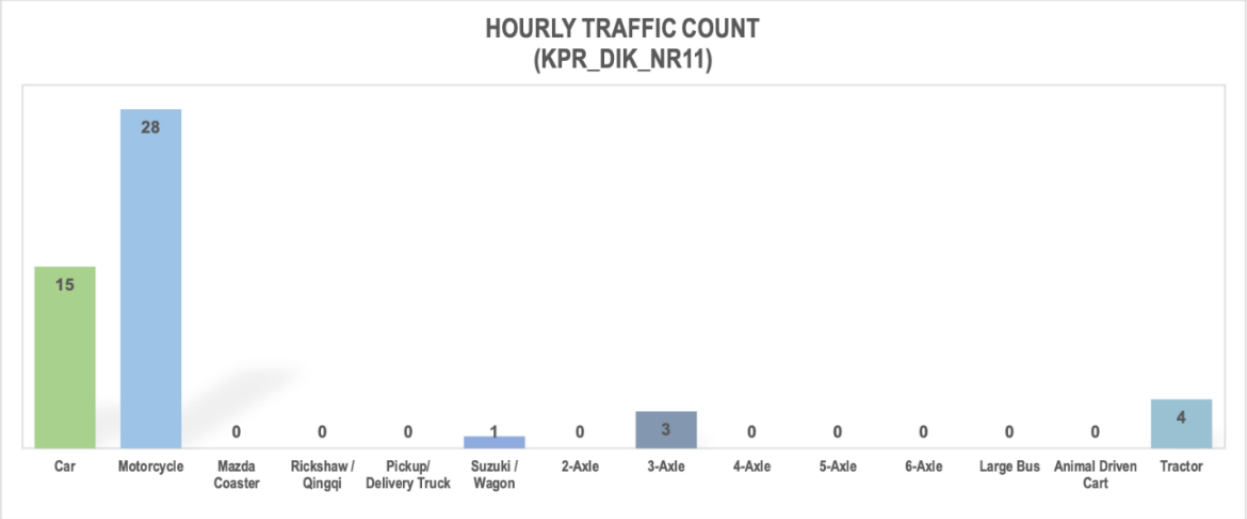


Figure 4.2.19 Vehicle Composition KPR-DIK-NR11

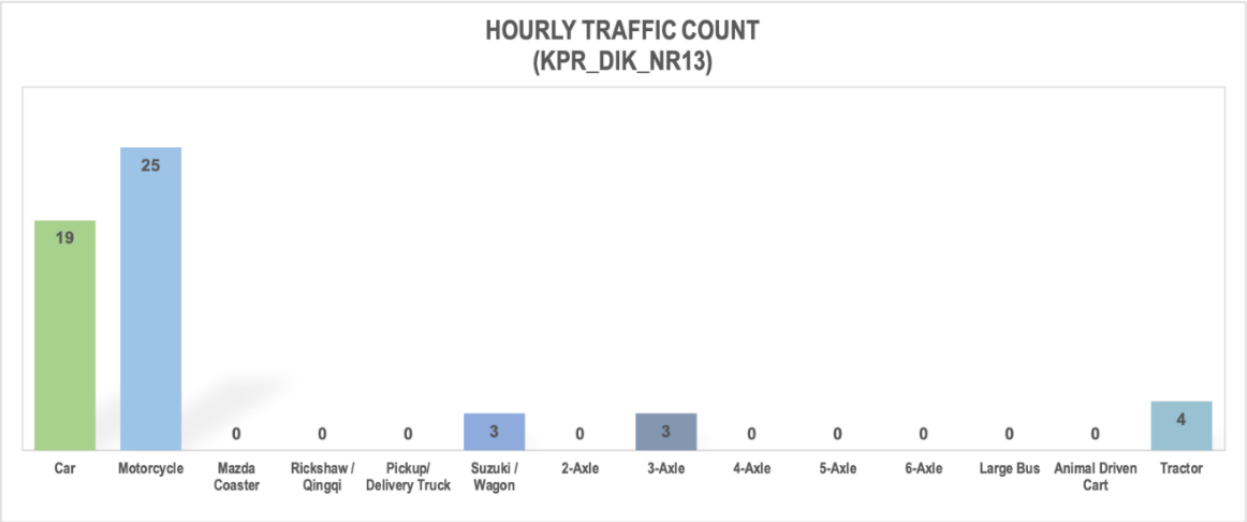


Figure 4.2.20 Vehicle Composition KPR-DIK-NR13

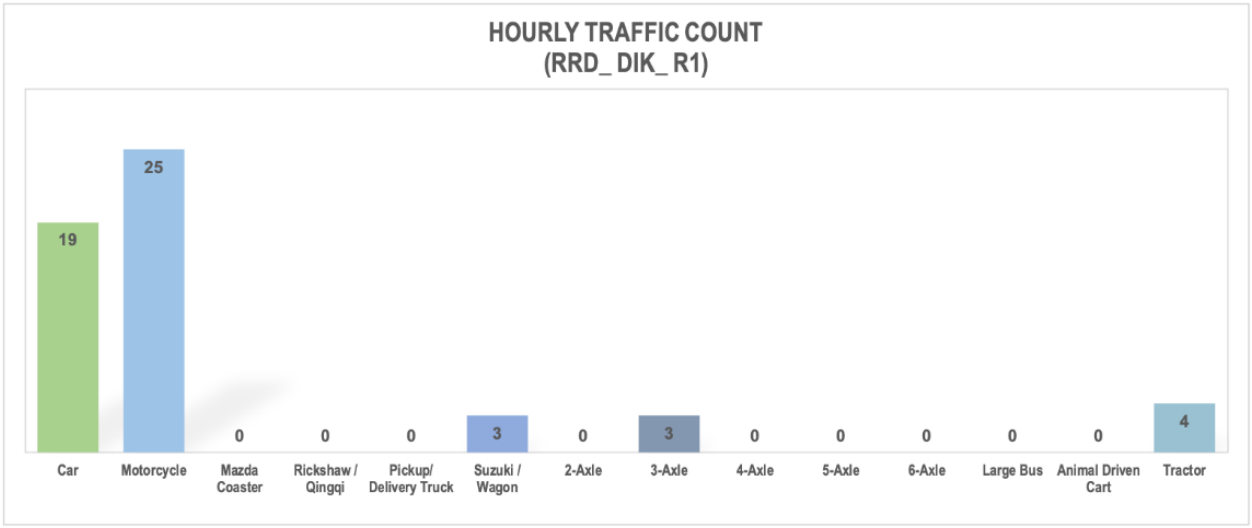


Figure 4.2.21 Vehicle Composition RRD-DIK-R1

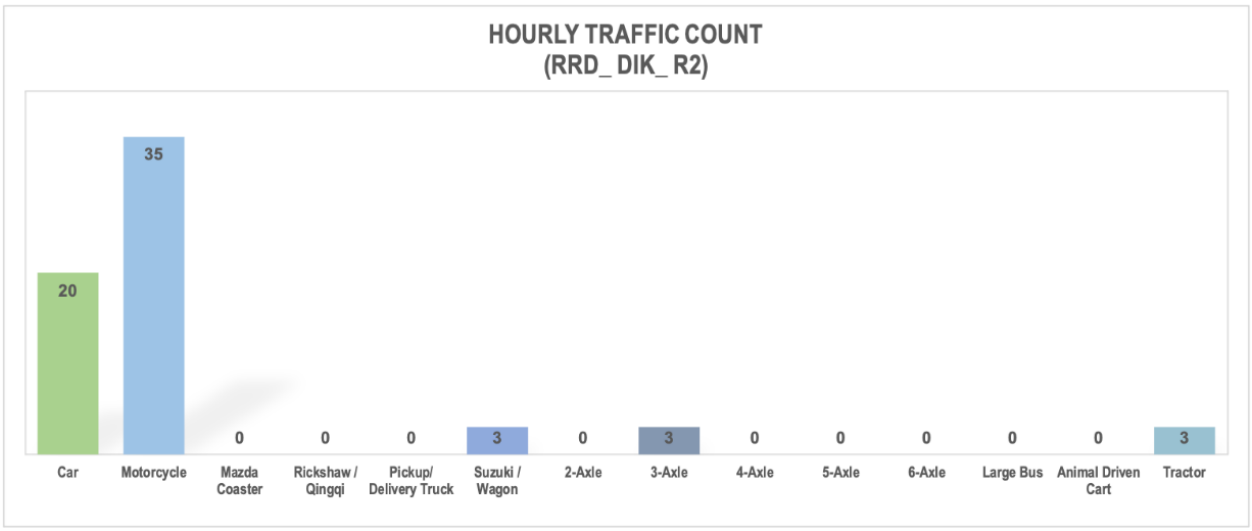


Figure 4.2.22 Vehicle Composition RRD-DIK-R2

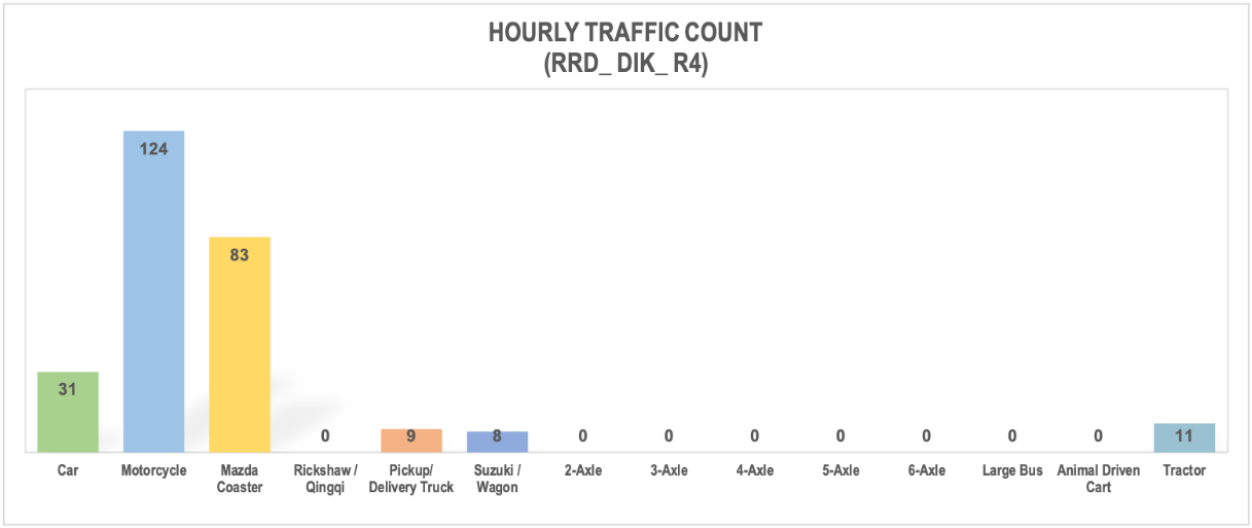


Figure 4.2.23 Vehicle Composition RRD-DIK-R4

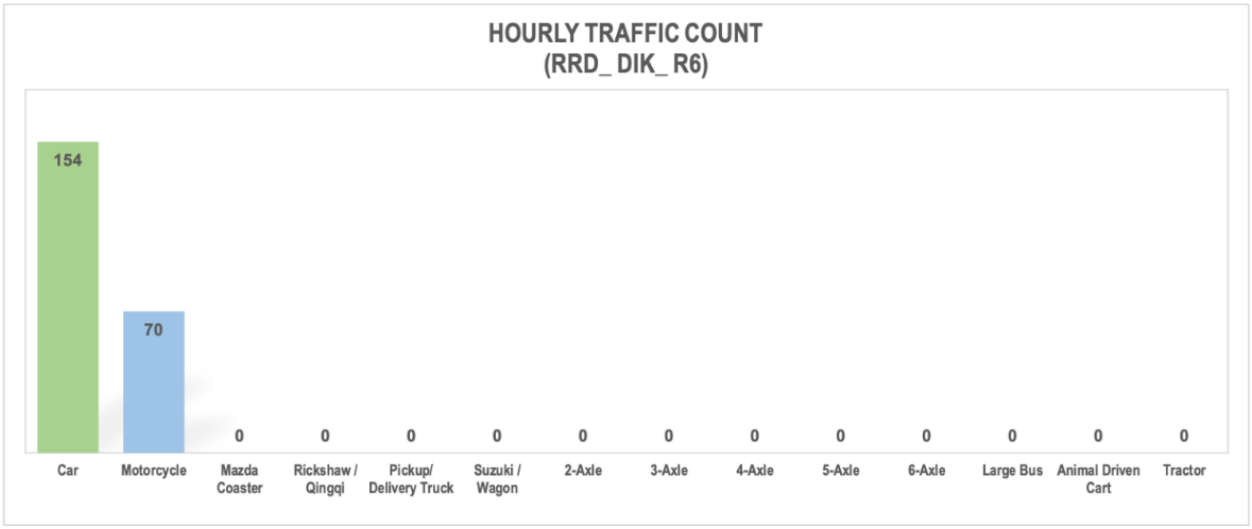


Figure 4.2.24 Vehicle Composition RRD-DIK-R6

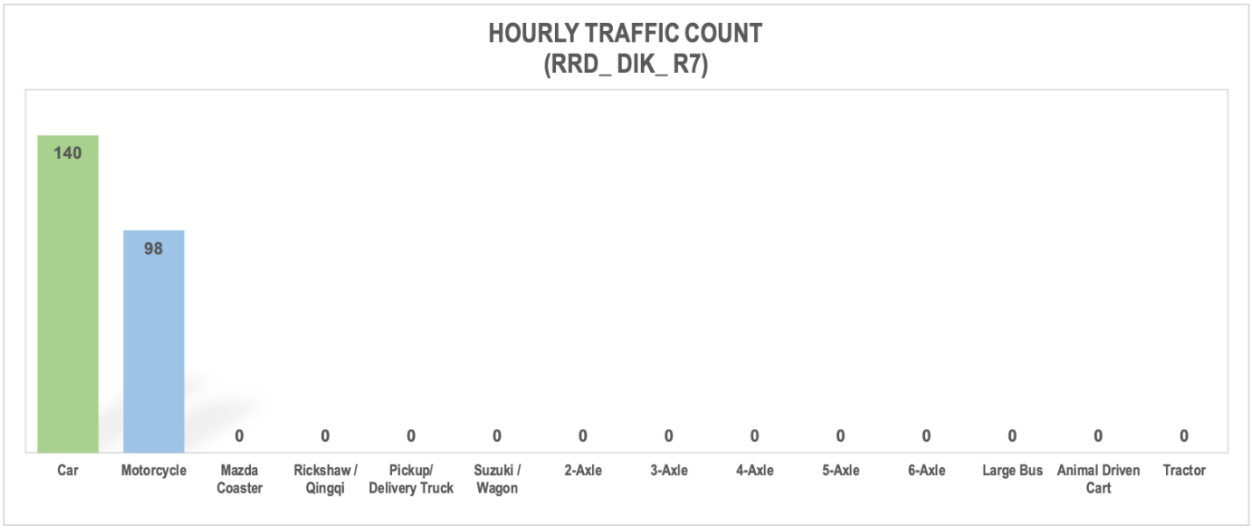


Figure 4.2.25 Vehicle Composition RRD-DIK-R7

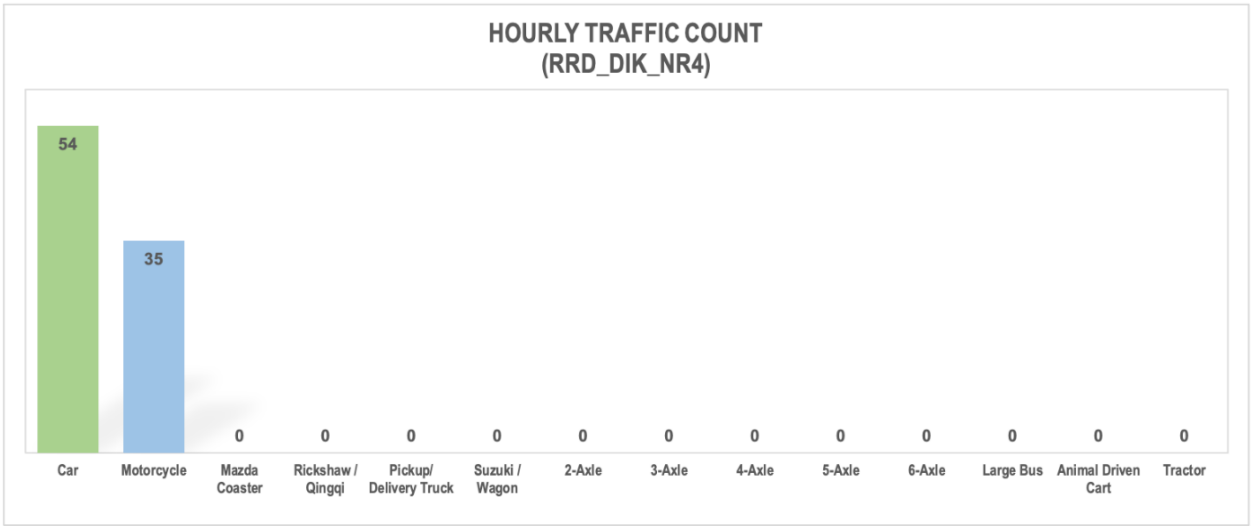


Figure 4.2.26 Vehicle Composition RRD-DIK-NR4

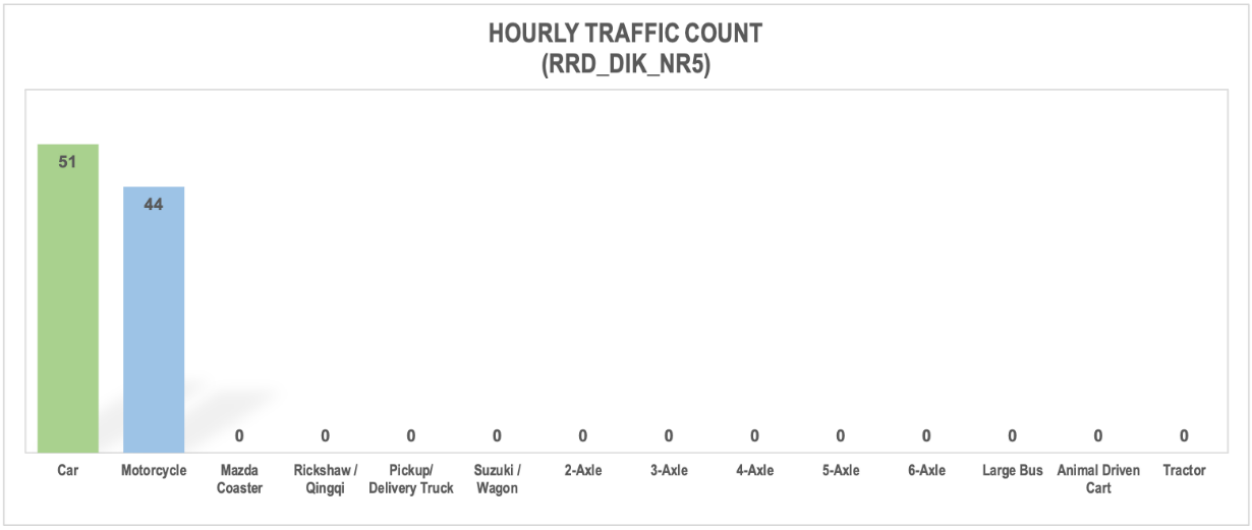


Figure 4.2.27 Vehicle Composition RRD-DIK-NR5

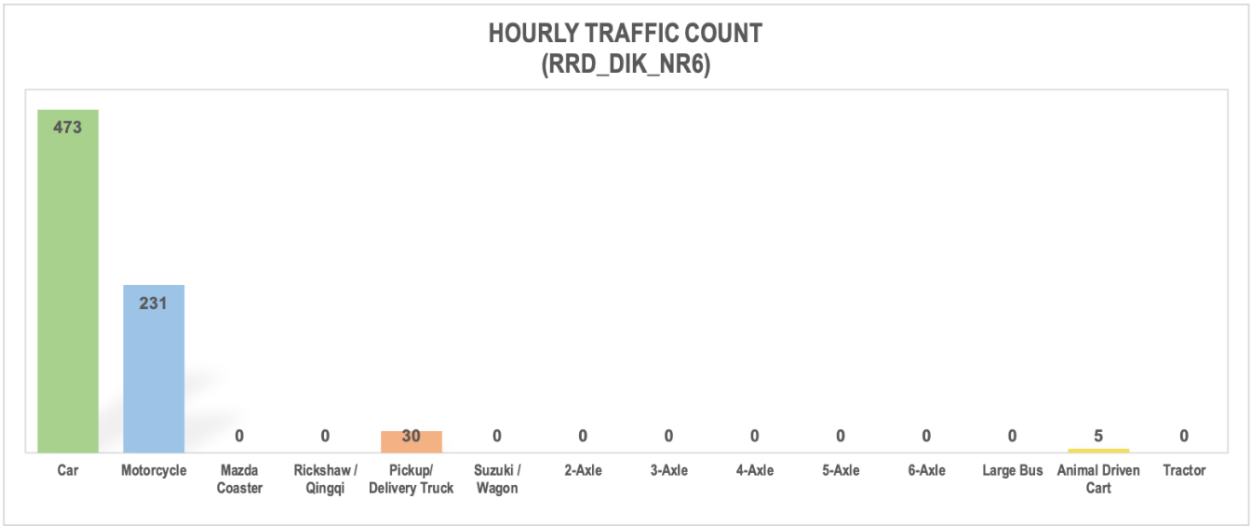


Figure 4.2.28 Vehicle Composition RRD-DIK-NR6

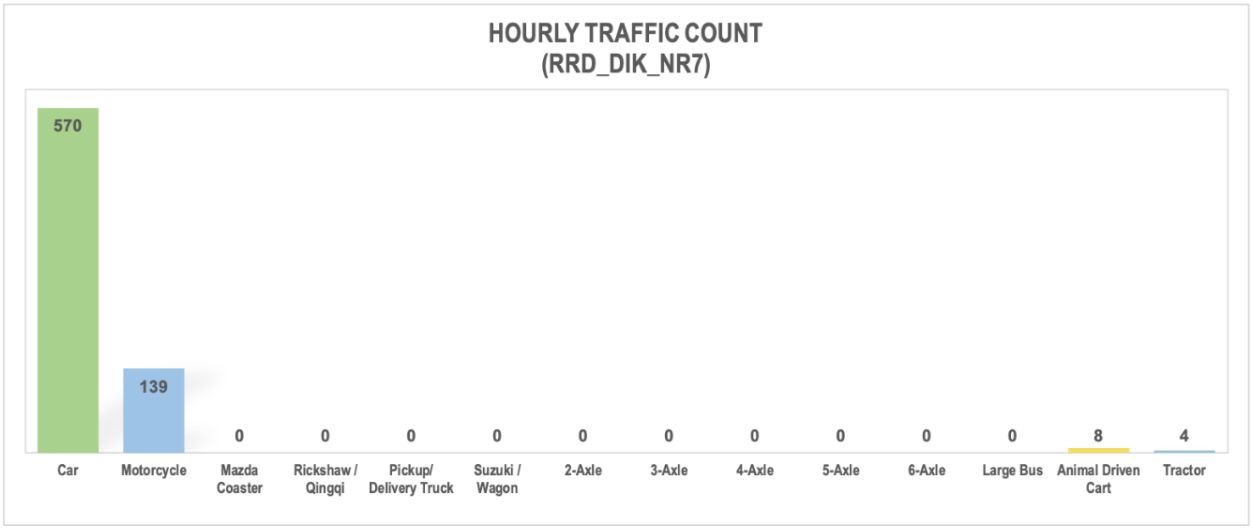


Figure 4.2.29 Vehicle Composition RRD-DIK-NR7

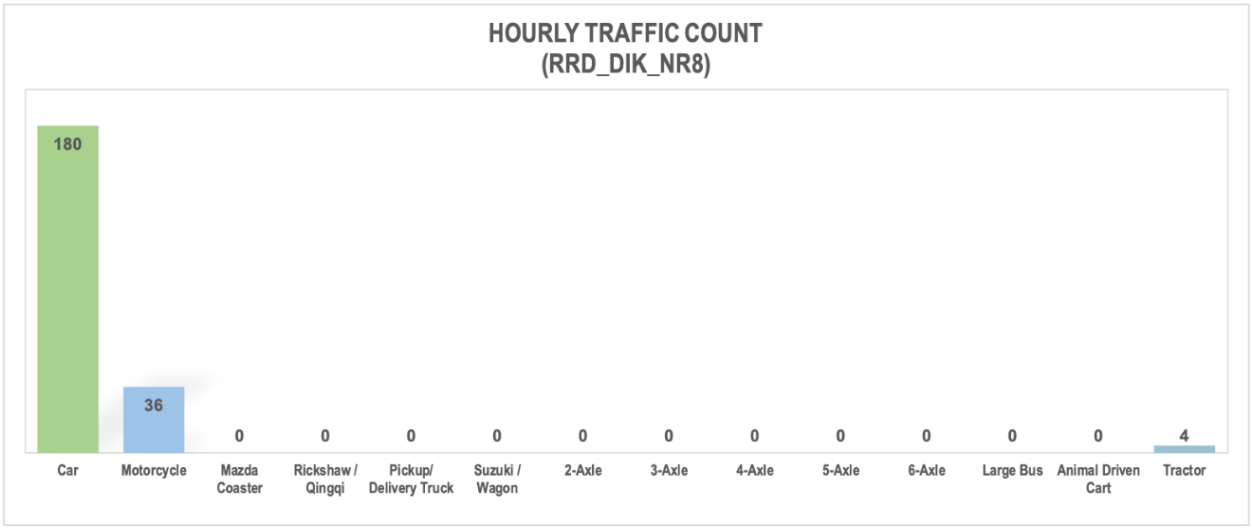


Figure 4.2.30 Vehicle Composition RRD-DIK-NR8

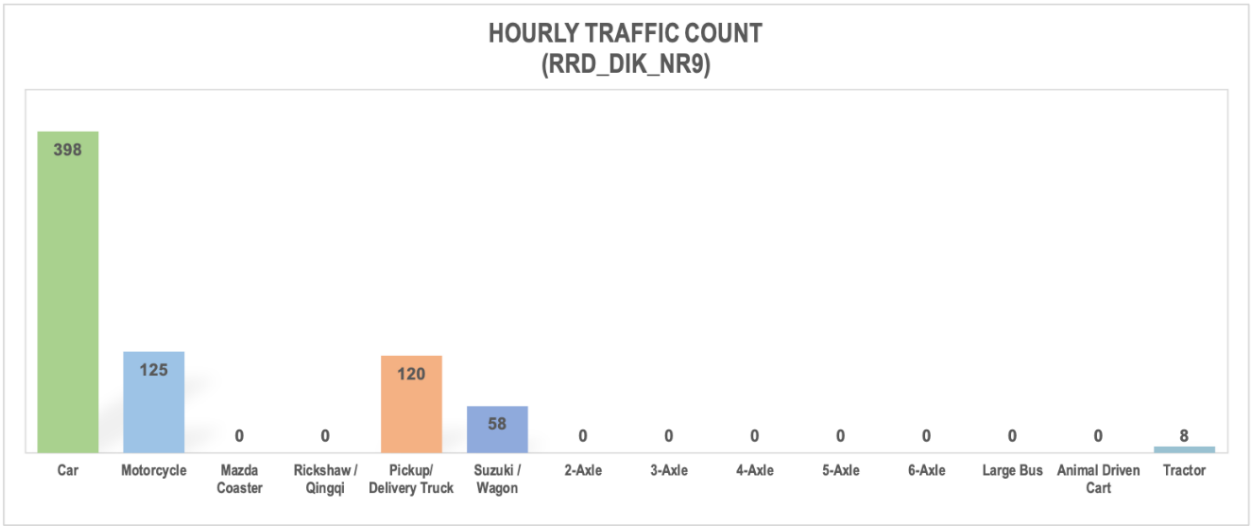


Figure 4.2.31 Vehicle Composition RRD-DIK-NR9

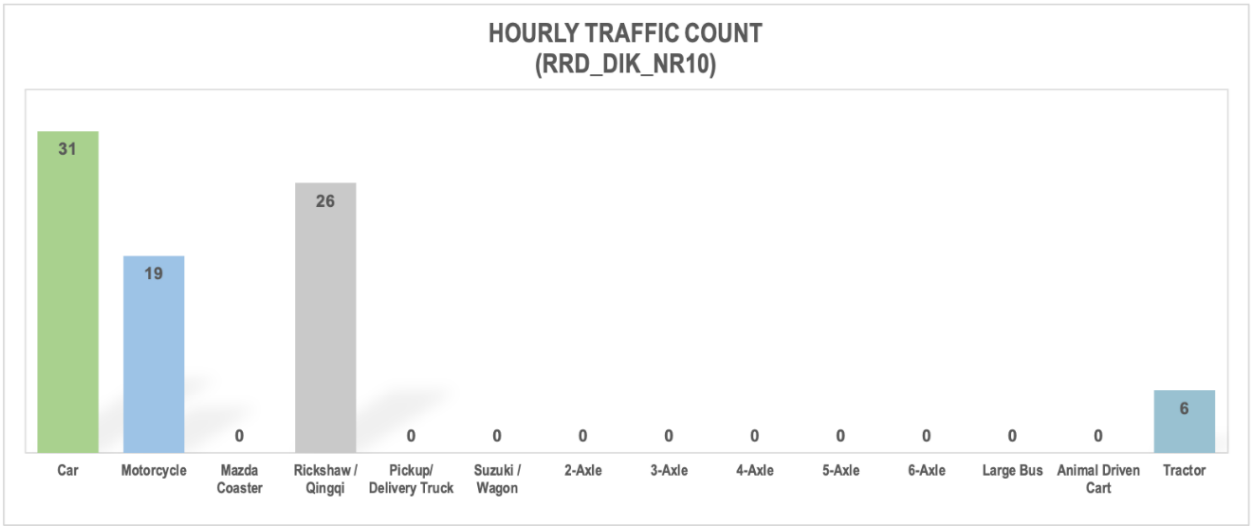


Figure 4.2.32 Vehicle Composition RRD-DIK-NR10

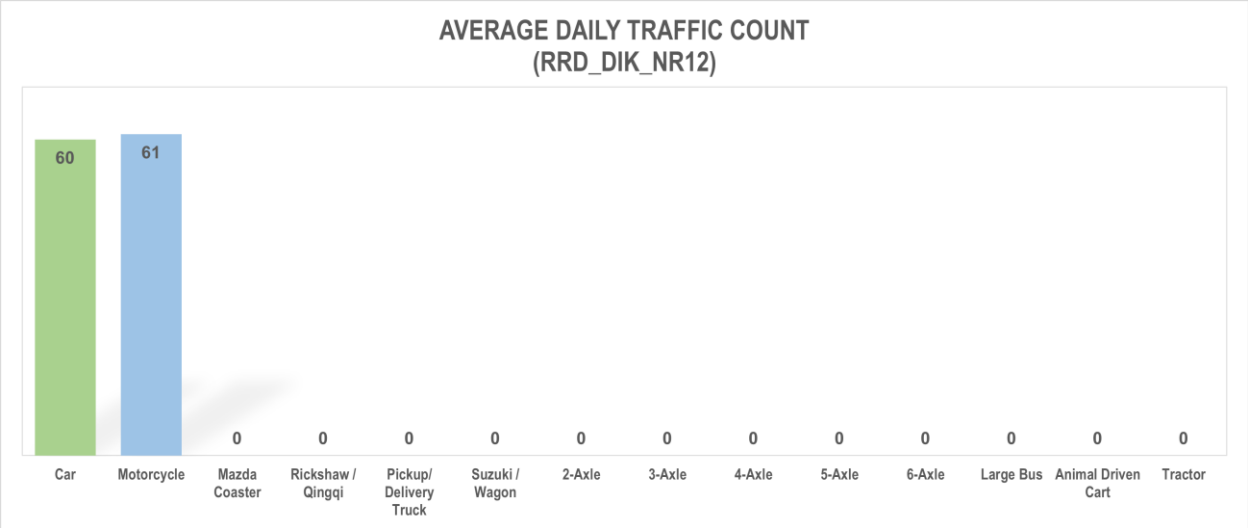


Figure 4.2.33 Vehicle Composition RRD_DIK_NR12

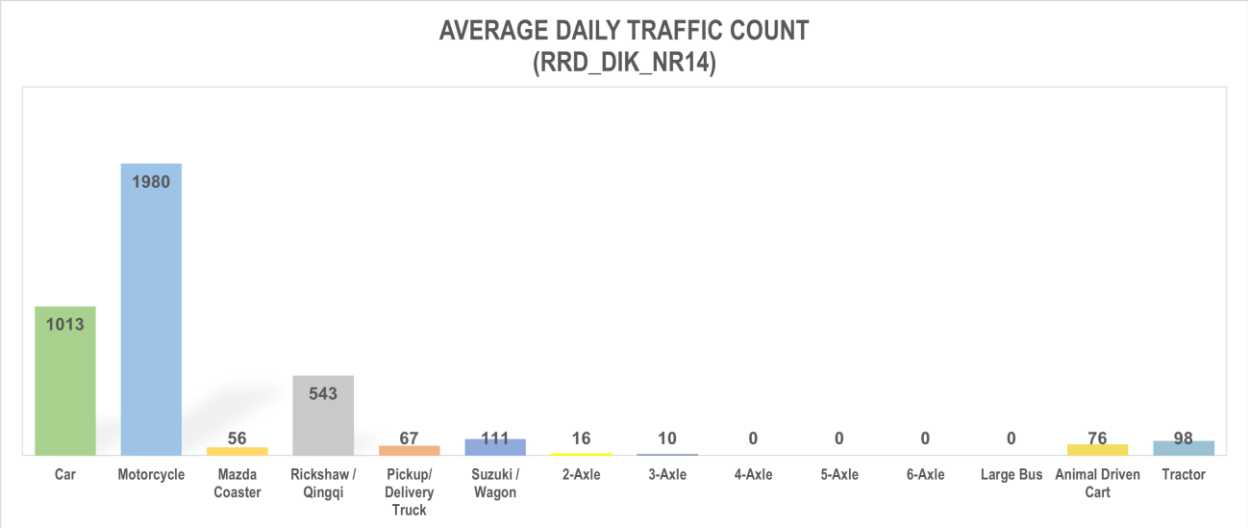


Figure 4.2.34 Vehicle Composition RRD_DIK_NR14

Most of the vehicles on the subject roads are Cars and Motorcycles. This Vehicle Composition can be attributed to the rural area type of the considered roads. Most of the people travel on these roads in their personal cars or motorcycles due to lack of proper public transport facilities.

The reason we have cars and motorcycles as the majority constituents of the vehicle mix, is because of the diversity of the road users utilizing the facility. Those people that have the available resources and own a car or motorcycle are reluctant of using public transport due to the poor services and condition of vehicles, whereas those people who do not own a private car or motorcycle have no other option then using public transport that constitutes of rickshaws and Suzuki/Wagons as seen in some roads.

4.2.6.2 Traffic Analysis Forecast

ADT:

The ADT Base Year is 2022 and ADT Forecast year is 2032 as can be seen in the table below.

Table 4.2.5 Forecast ADT of Flood Affected Roads District DI Khan

Year	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
KPR_DIK_NR11	**50**	53	55	58	61	64	67	70	74	78	81
KPR_DIK_NR13	**53**	55	58	61	64	67	70	74	78	81	86
RRD_ DIK_ R1	**53**	55	58	61	64	67	70	74	78	81	86
RRD_ DIK_ R2	**224**	235	247	259	272	286	300	315	331	347	364
RRD_ DIK_ R4	**238**	249	262	275	289	303	318	334	351	368	387
RRD_ DIK_ R6	**63**	66	69	72	76	80	84	88	92	97	102
RRD_ DIK_ R7	**265**	278	292	307	322	338	355	373	392	411	432
RRD_DIK_NR4	**90**	95	99	104	109	115	121	127	133	140	147
RRD_DIK_NR5	**544**	571	599	629	661	694	729	765	803	844	886
RRD_DIK_NR6	**739**	776	814	855	898	943	990	1,039	1,091	1,146	1,203
RRD_DIK_NR7	**892**	937	983	1,033	1,084	1,138	1,195	1,255	1,318	1,384	1,453
RRD_DIK_NR8	**220**	231	243	255	267	281	295	310	325	341	358
RRD_DIK_NR9	**708**	743	780	819	860	903	948	996	1,045	1,098	1,152
RRD_DIK_NR10	**104**	109	114	120	126	133	139	146	153	161	169
RRD_DIK_NR12	121	127	133	140	147	154	162	170	179	188	197
RRD_DIK_NR14	3970	4169	4377	4596	4826	5067	5320	5586	5865	6159	6467

PCU:

The PCU Base Year is 2022 and PCU Forecast year is 2032 as can be seen in the table below.

Table 4.2.6 Forecast PCUs of Flood Affected Roads District DI Khan

Year	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
KPR_DIK_NR11	**54**	56	59	62	65	69	72	76	79	83	88
KPR_DIK_NR13	**59**	62	65	68	71	75	79	83	87	91	96
RRD_ DIK_ R1	**59**	62	65	68	71	75	79	83	87	91	96
RRD_ DIK_ R2	**236**	248	260	273	287	301	316	332	349	366	384
RRD_ DIK_ R4	**236**	248	260	273	287	301	316	332	349	366	384
RRD_ DIK_ R6	**60**	63	66	69	73	77	80	84	89	93	98
RRD_ DIK_ R7	331	348	365	383	403	423	444	466	489	514	540
RRD_DIK_NR4	**71**	74	78	82	86	90	95	99	104	110	115
RRD_DIK_NR5	**597**	627	658	691	726	762	800	840	882	926	972
RRD_DIK_NR6	**656**	688	723	759	797	837	879	923	969	1,017	1,068
RRD_DIK_NR7	**688**	723	759	797	836	878	922	968	1,017	1,068	1,121
RRD_DIK_NR8	**213**	224	235	247	259	272	286	300	315	331	347
RRD_DIK_NR9	**785**	824	865	909	954	1,002	1,052	1,105	1,160	1,218	1,279
RRD_DIK_NR10	**85**	90	94	99	104	109	114	120	126	132	139
RRD_DIK_NR12	91	95	100	105	110	116	121	127	134	140	147
RRD_DIK_NR14	3649	3831	4023	4224	4435	4657	4890	5134	5391	5660	5943

4.2.7 Discussion and Analysis

The analysis conducted on these roads indicates that the condition of these roads is affecting the traffic characteristic which consequently influences the access of people to necessities of life. The poor condition of these roads is reflected by the Road Surface Type (RST) and International Roughness Index (IRI) pie charts which indicates that these roads need immediate consideration with respect to construction and rehabilitation. The poor mobility of these roads is indicated by the lower speeds and high travel times. Reconstructing these roads will improve speeds and lower travel times of users.

The utility of these roads in providing access to necessities like education, health, and markets will be enhanced with the improvement in road condition after reconstruction.

4.3 Project Area- Dir Lower

Lower Dir is a district in Malakand Division of Khyber Pakhtunkhwa province in Pakistan covering an area of 1583 km². The town of Timergara is the district headquarter. It shares border with upper Dir to the north, Swat to the east and Afghanistan to the west.

4.3.1 Priority Roads in District Dir Lower

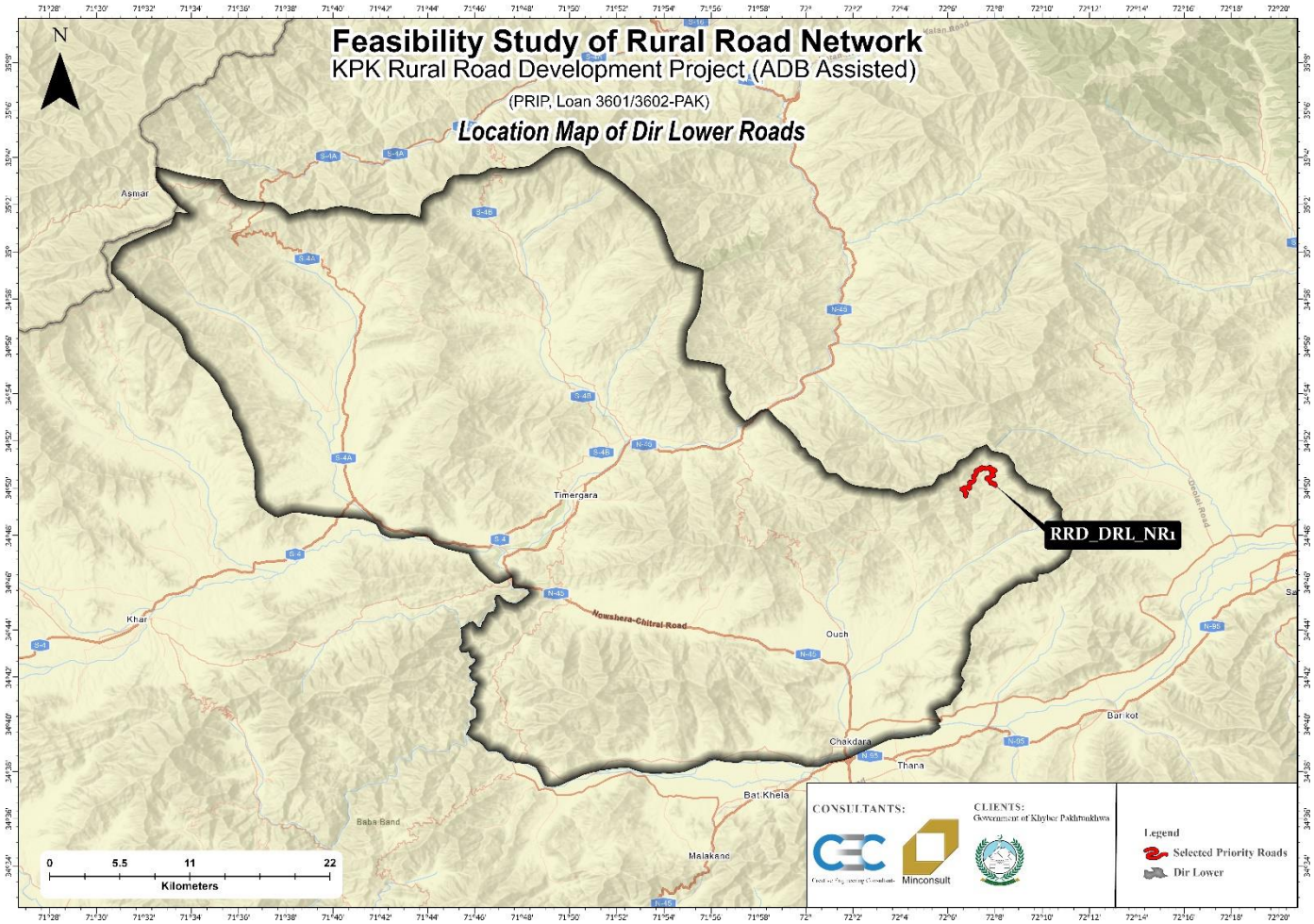
The following roads have been found feasible for Rural Road Development Project in District Dir Lower.

Table 4.3.1 Flood Affected Roads in Dir Lower

#	ID	Road Name	District	FL	Type
1	**RRD_DRL_NR1**	Zanri To Soori Paaon Banda	Dir Lower	8.00	Flood Affected

4.3.2 Location Map of Priority Roads

All the access roads selected for traffic study after scrutinization of the surveyed roads in the district are shown in the figure below.



Map 4.3.1 Location Map of Dir Lower

4.3.2.1 RRD_DRL_NR1 (Shorshing Jakra Baba Road)

The road is in Asbanr union council of Lower Dir district, covering an 8.03 km route.

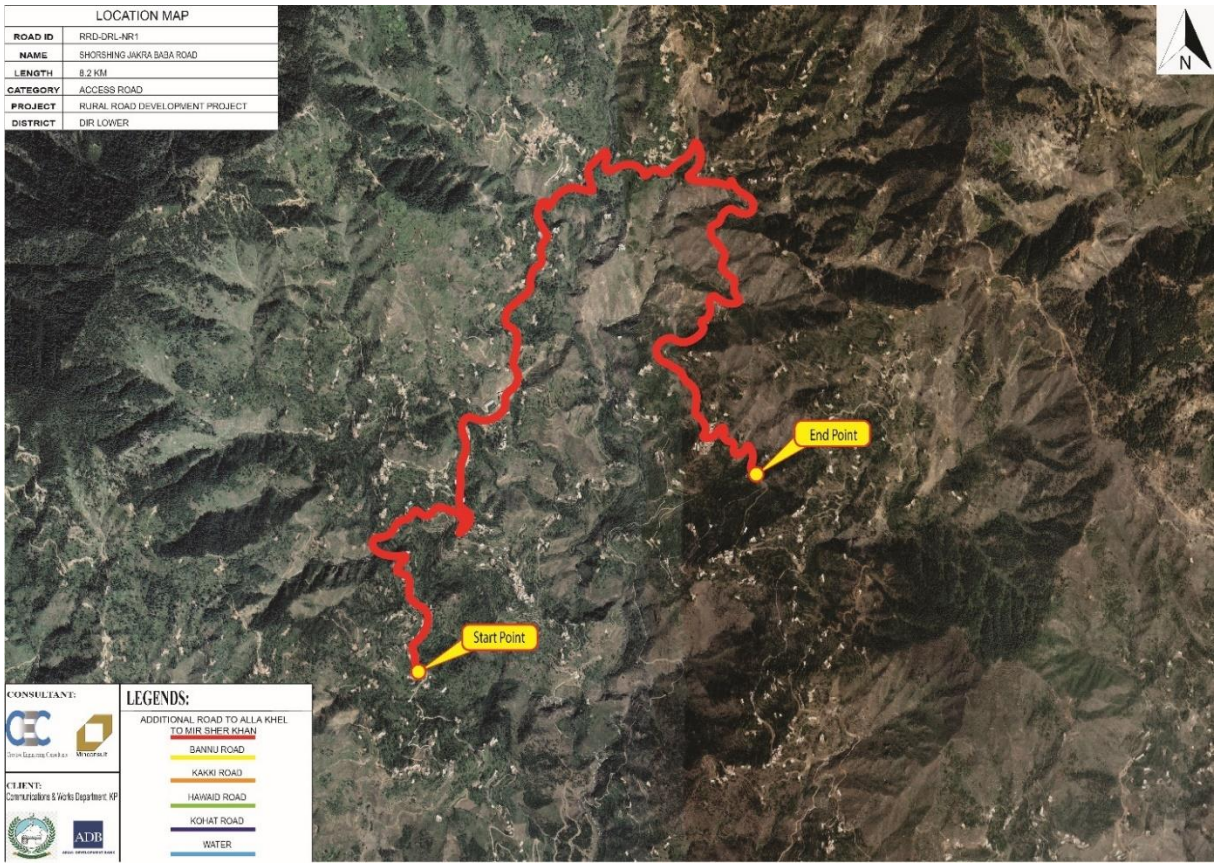


Figure 4.3.1 Location Map RRD_DRL_NR1

4.3.3 IRI Classification Pie Chart of Selected Roads

The International Roughness Index (IRI) is used by highway professionals throughout the world as a standard to quantify road surface roughness. A poor road surface roughness influences the traffic speeds and times. It also effects the mobility and accesibility of users traversing that road.

The IRI Classification Charts for are given below.

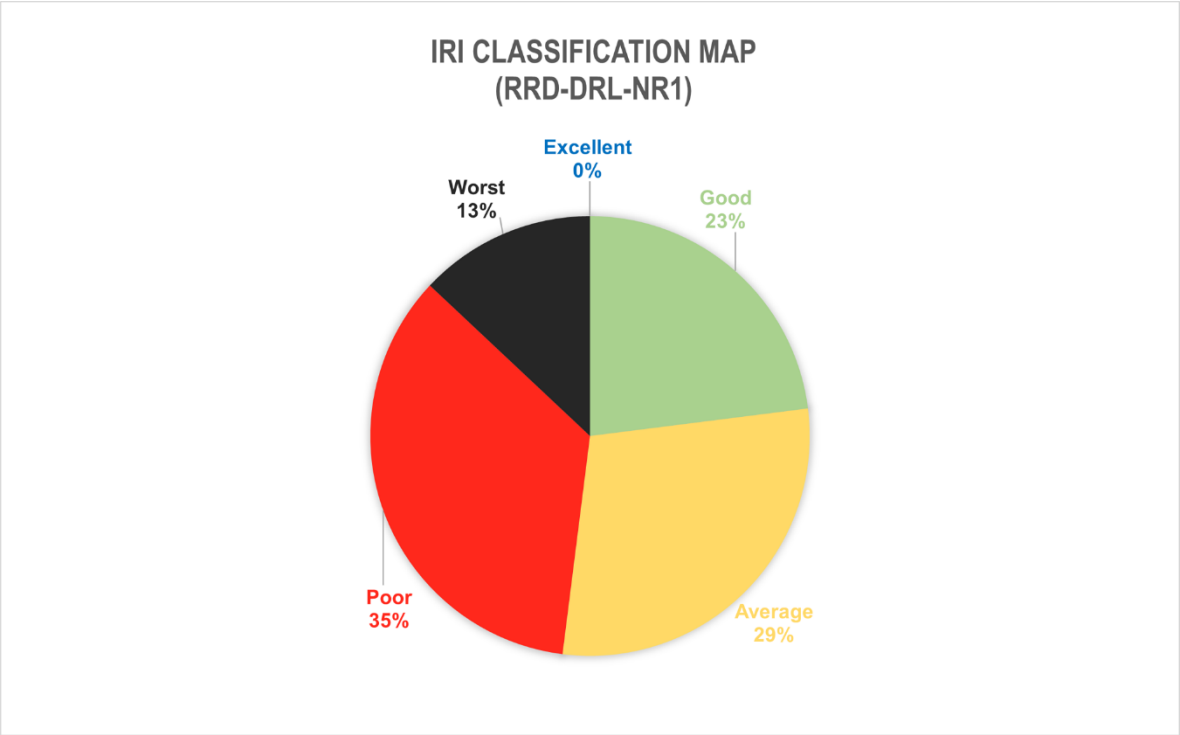


Figure 4.3.2 IRI Classification Chart of Flood Affected Roads District Dir Lower

4.3.4 RST Pie Chart of Selected Roads

Road Surface type (RST) survey was conducted to investigate the actual condition and type of surface of the road under observation. In rural areas earthen or kacha tracks and TST/DST are common that affect the mobility of road users and accessibility to necessities.

The RST Classification Charts for are given below.

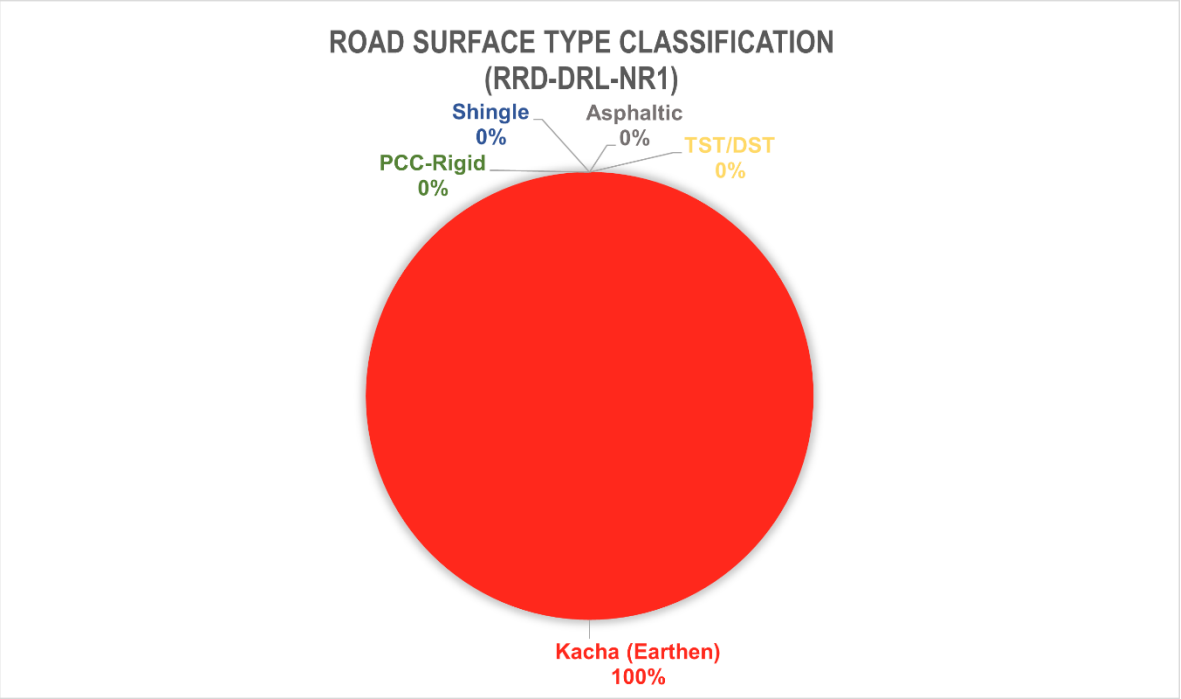


Figure 4.3.3 RST Classification of Flood Affected Roads Chart District Dir Lower

4.3.5 Travel Speed Survey

Table 4.3.2 Travel Speed Survey of Flood Affected Roads District Dir Lower

Road ID	Distance (km)	Total Ascent (m)	Total Descent (m)	Total Time	Average Speed (km/h)	Avg. Moving Speed (km/h)	Maximum Speed (km/h)
RRD_DRL_NR1	8.0	111	320	33:14.0	9.8	8.21	19.6

The travel speeds for all roads are low due to the deteriorated road condition which is reflected from the RST and IRI pie charts. Mobility of the road users is affected as indicated by lower average speeds and higher travel times, which can be attributed to the poor road conditions.

It can be inferred from these observations that these roads need to be reconstructed for better mobility and access of people to basic livelihood necessities.

4.3.6 Traffic Analysis

4.3.6.1 Summary of Existing Average Daily Traffic (ADT)

The summary of traffic counts obtained is given in the following Table.

ADT's

Table 4.3.3 Existing ADT of Flood Affected Roads District Dir Lower

Road ID	Car	Motorcycle	Mazda Coaster	Rickshaw / Q.chi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	TOTAL Vehicles
RRD_DRL_NR1	5	8	0	0	0	0	0	0	0	0	0	0	0	3	15

PCUs

Table 4.3.4 Existing PCUs of Flood Affected Roads District Dir Lower

Road ID	Car	Motorcycle	Mazda Coaster	Rickshaw / Qingqi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	Total PCUS
RRD_DRL_NR1	5	4	0	0	0	0	0	0	0	0	0	0	0	10	19

4.3.6.2 Composition Of Vehicle Types

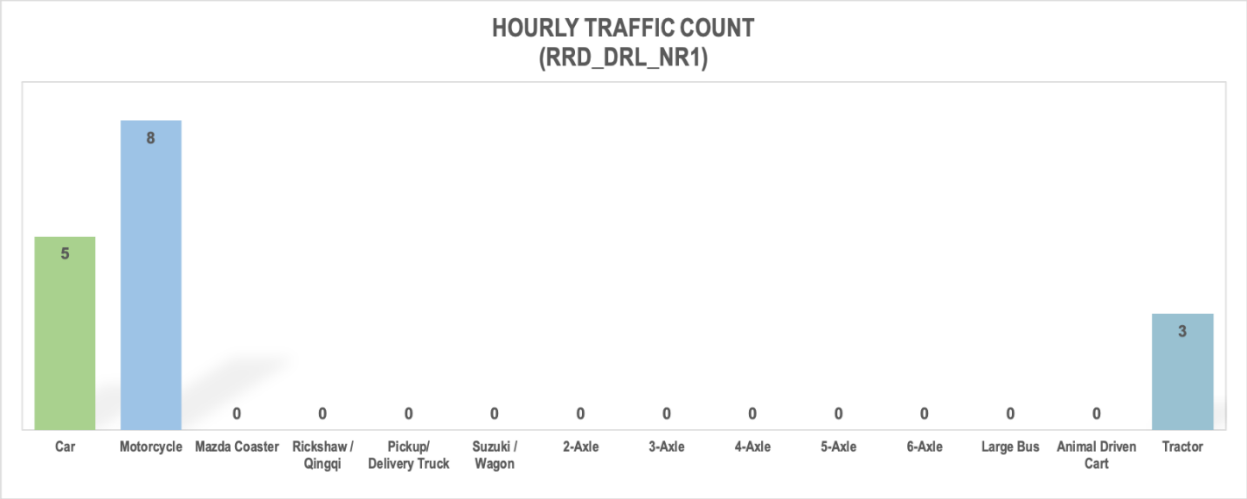


Figure 4.3.4 Vehicle Composition RRD-DRL-NR1

Most of the vehicles on the subject roads are Cars and Motorcycles. This Vehicle Composition can be attributed to the rural area type of the considered roads. Most of the people travel on these roads in their personal cars or motorcycles due to lack of proper public transport facilities.

The reason we have cars and motorcycles as the majority constituents of the vehicle mix, is because of the diversity of the road users utilizing the facility. Those people that have the available resources and own a car or motorcycle are reluctant of using public transport due to the poor services and condition of vehicles, whereas those people who do not own a private car or motorcycle have no other option then using public transport that constitutes of rickshaws and Suzuki/Wagons as seen in some roads.

4.3.6.3 Traffic Analysis Forecast

ADT:

The ADT Base Year is 2022 and ADT Forecast year is 2032 as can be seen in the table below.

The following table represents the annual daily traffic forecast (10 years).

Table 4.3.5 Forecast ADT of Flood Affected Roads District Dir Lower

Road ID	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
RRD_DRL_NR1	**15**	16	17	17	18	19	20	21	22	23	24

PCU:

The PCU Base Year is 2022 and PCU Forecast year is 2032 as can be seen in the table below.

Table 4.3.6 Forecast PCUs of Flood Affected Roads District Dir Lower

Road ID	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
RRD_DRL_NR1	**19**	20	21	22	23	24	25	26	28	29	31

4.3.7 Discussion and Analysis

The analysis conducted on these roads indicates that the condition of these roads is affecting the traffic characteristic which consequently influences the access of people to necessities of life. The poor condition of these roads is reflected by the Road Surface Type (RST) and International Roughness Index (IRI) pie charts which indicates that these roads need immediate consideration with respect to construction and rehabilitation. The poor mobility of these roads is indicated by the lower speeds and high travel times. Reconstructing these roads will improve speeds and lower travel times of users.

The utility of these roads in providing access to necessities like education, health, and markets will be enhanced with the improvement in road condition after reconstruction.

4.4 Project Area- Dir Upper

Upper Dir is a district in Malakand Division of Khyber Pakhtunkhwa province in Pakistan covering an area of 3699 sq. km. The city of Dir is the district headquarters. This district is situated in the northern part of Pakistan. It borders Chitral district and Afghanistan on the north and northwest and Swat district to the east, and on the south by Lower Dir District

4.4.1 Priority Roads in District Dir Upper

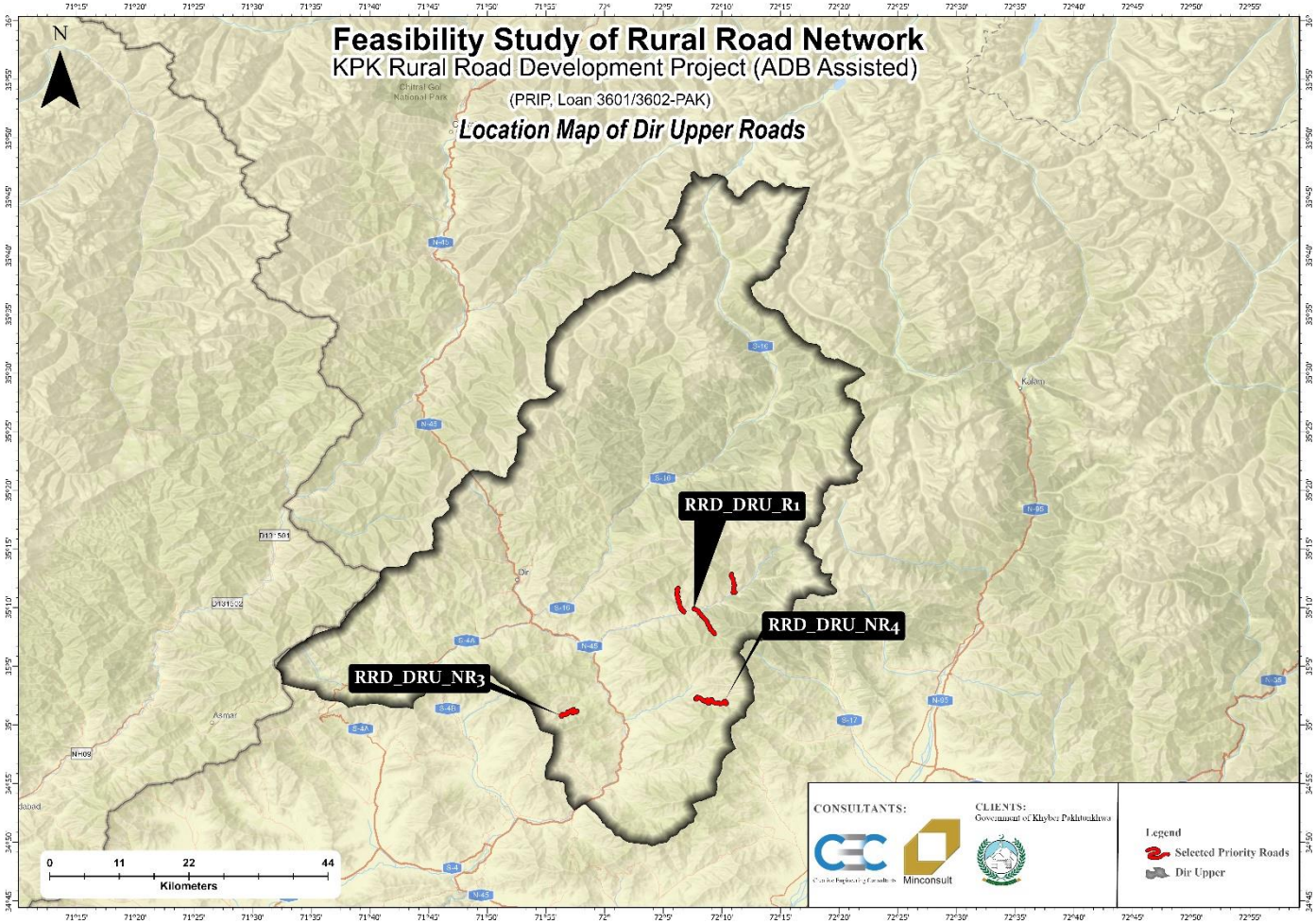
The following roads have been found feasible for Rural Road Development Project in District Dir Upper.

Table 4.4.1 Flood Affected Roads Dir Upper

#	ID	Road Name	District	FL	Type
1	**RRD_DRU_R1**	Link Roads Usherai Dara	Dir Upper	15.35	Access
2	**RRD_DRU_NR3**	Katigram To Shagai U/C Kotke	Dir Upper	5.1	Access
3	**RRD_DRU_NR4**	Sundrai To Qadarkandow Road (Nehag Dara)	Dir Upper	8.20	Access

4.4.2 Location Map of Priority Roads

All the access roads selected for traffic study after scrutinization of the surveyed roads in the district are shown in the figure below.



Map 4.4.1 Location Map Dir Upper

4.4.2.1 RRD_DRU_R1 (Link Roads Usherai Dara)

RRD_DRU_R1 is comprised of three roads which are links of Usherai filling station road, and they are located at Ushirai valley, 25 km away from the main town of Darora, Upper Dir district. The first link starts from Galkor Bazar. The second link starts near to the Government Girls Primary School Usheri. And the third link starts near to the Government Primary School Nashnamal. The length of all three links is 15.35 km.

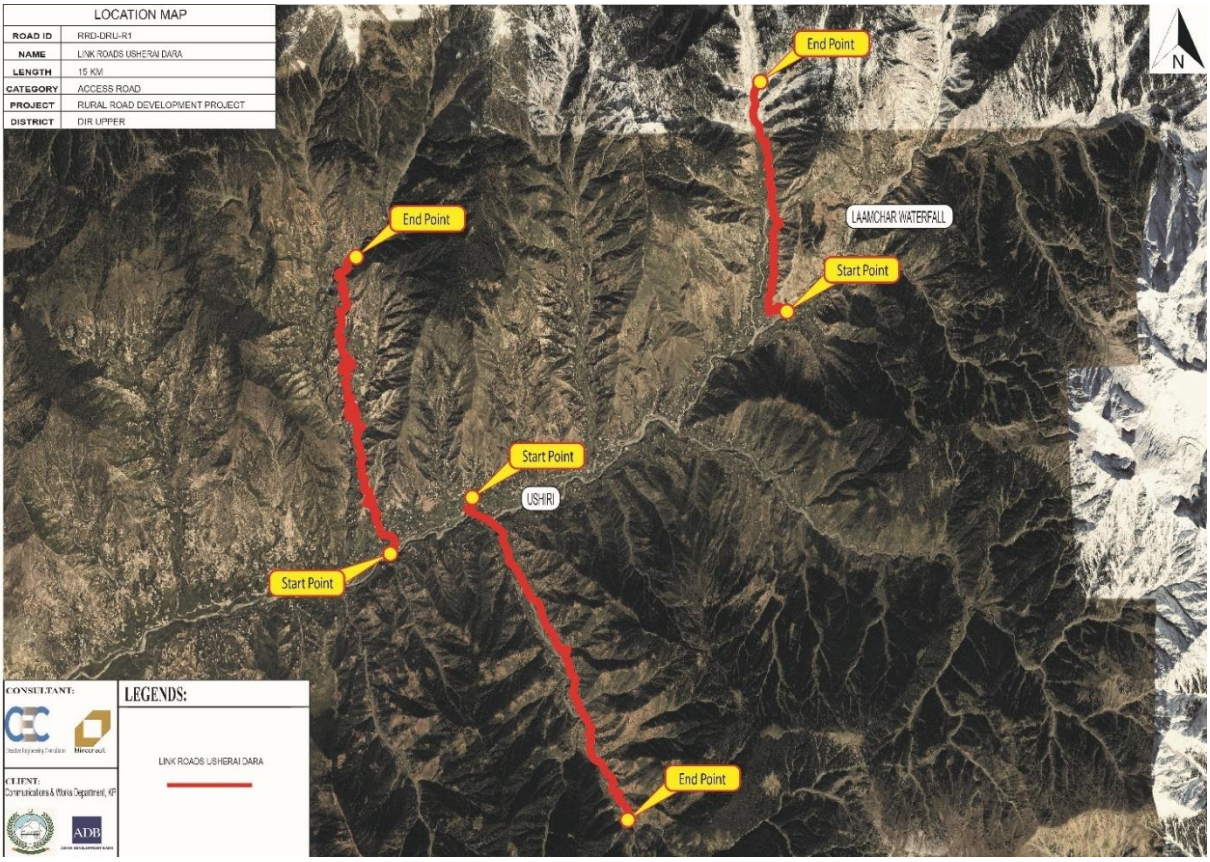


Figure 4.4.1 Location Map RRD_DRU_R1

4.4.2.2 RRD_DRU_NR3 (Katigram to Shagai U/C Kotke

The road is located at Sahib Abad Town near to the Panjkora Darra in Upper Dir district, covering 5.10 km route.

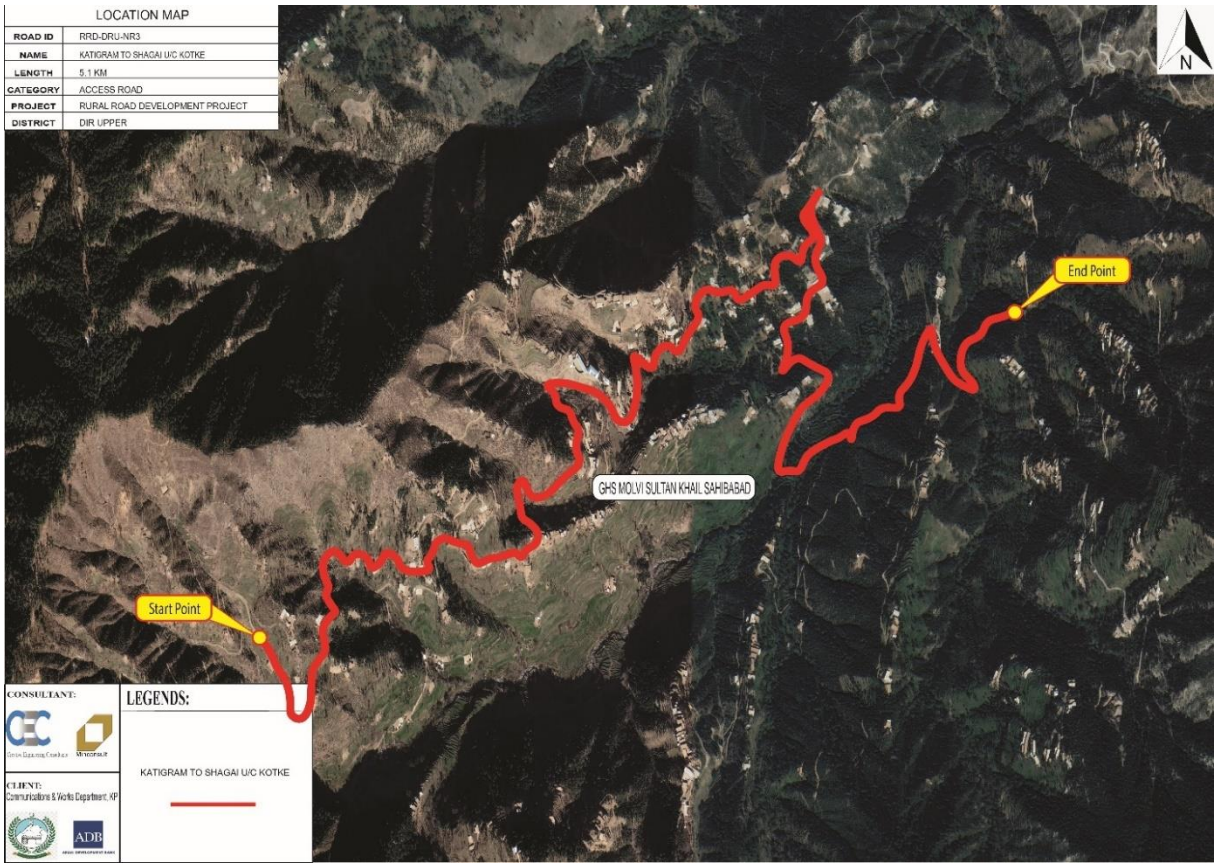


Figure 4.4.2 Location Map RRD_DRU_NR3

4.4.2.3 RRD_DRU_NR4 (Sundrai to Qadarkandow Road (Nehag Dara))

The road is in the Upper Dir district of KP. It starts from Wari union council, crossing, Nehag, union council, Kwana, Badalai, going up all the way to the Nehag dara. The road covers an 8.20 km route.

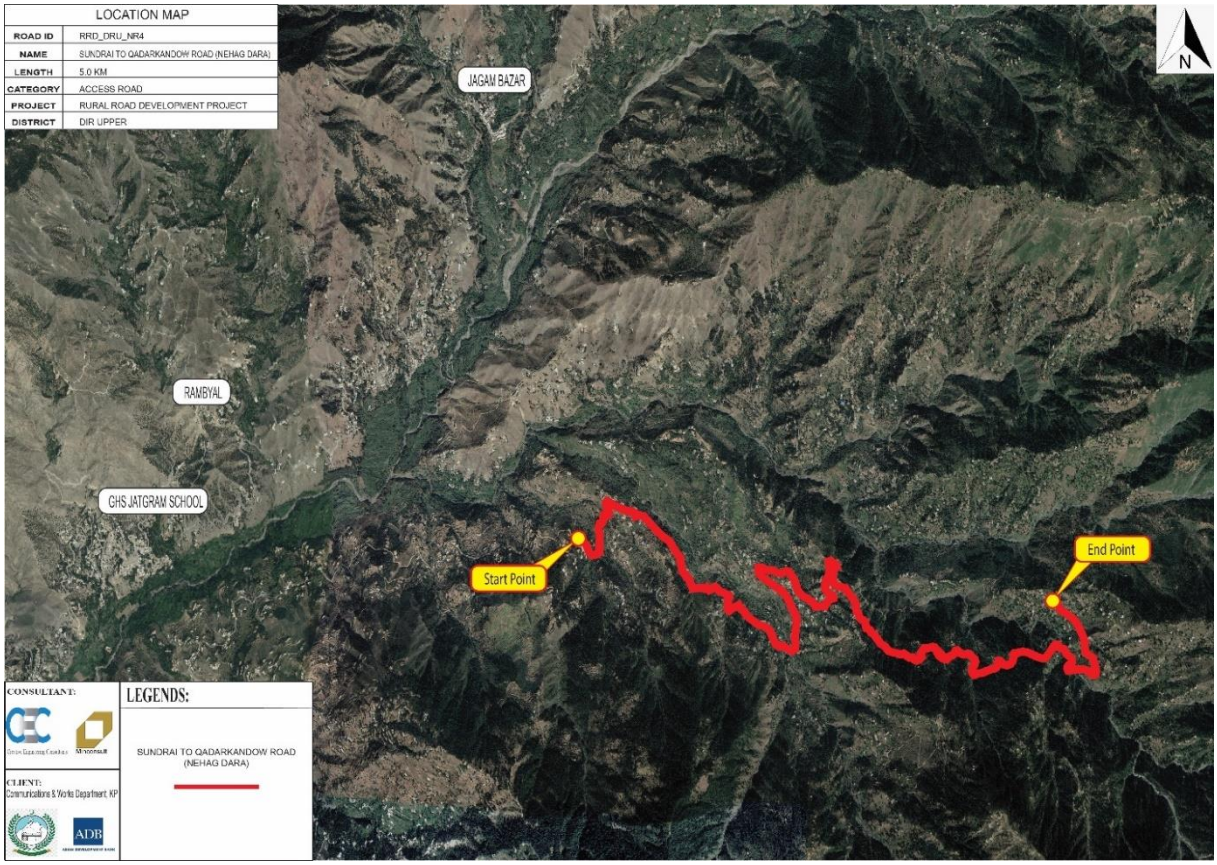


Figure 4.4.3 Location Map RRD_DRU_NR4

4.4.3 IRI Classification Pie Chart of Selected Roads

The International Roughness Index (IRI) is used by highway professionals throughout the world as a standard to quantify road surface roughness. A poor road surface roughness influences the traffic speeds and times. It also effects the mobility and accesibility of users traversing that road.

The IRI Classification Charts for are given below.

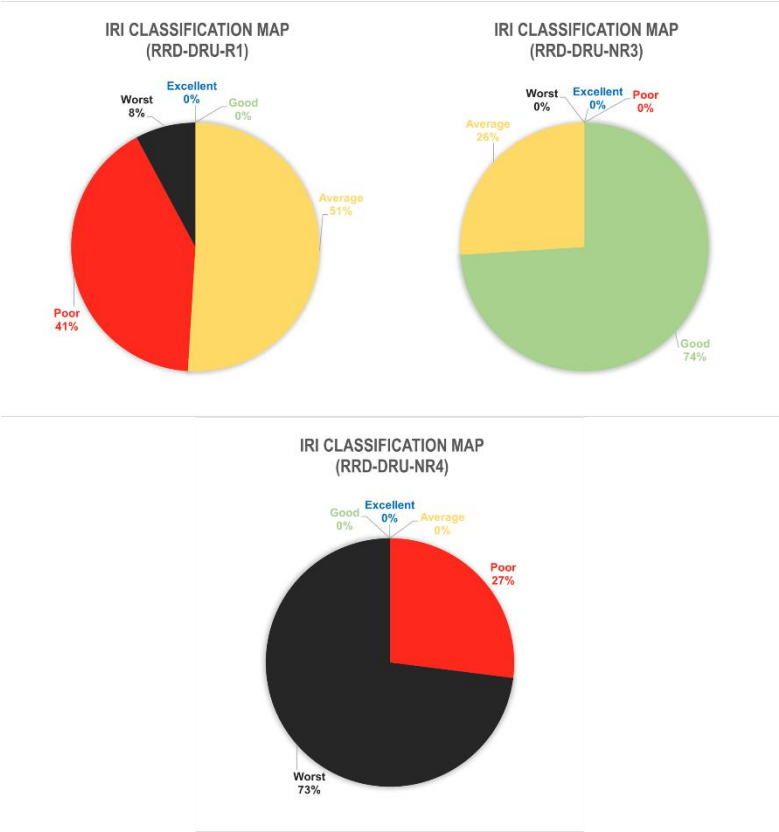


Figure 4.4.4 IRI Classification Chart of Flood Affected Roads District Dir Upper

4.4.4 RST Pie Chart of Selected Roads

Road Surface type (RST) survey was conducted to investigate the actual condition and type of surface of the road under observation. In rural areas earthen or kacha tracks and TST/DST are common that affect the mobility of road users and accessibility to necessities.

The RST Classification Charts for are given below.

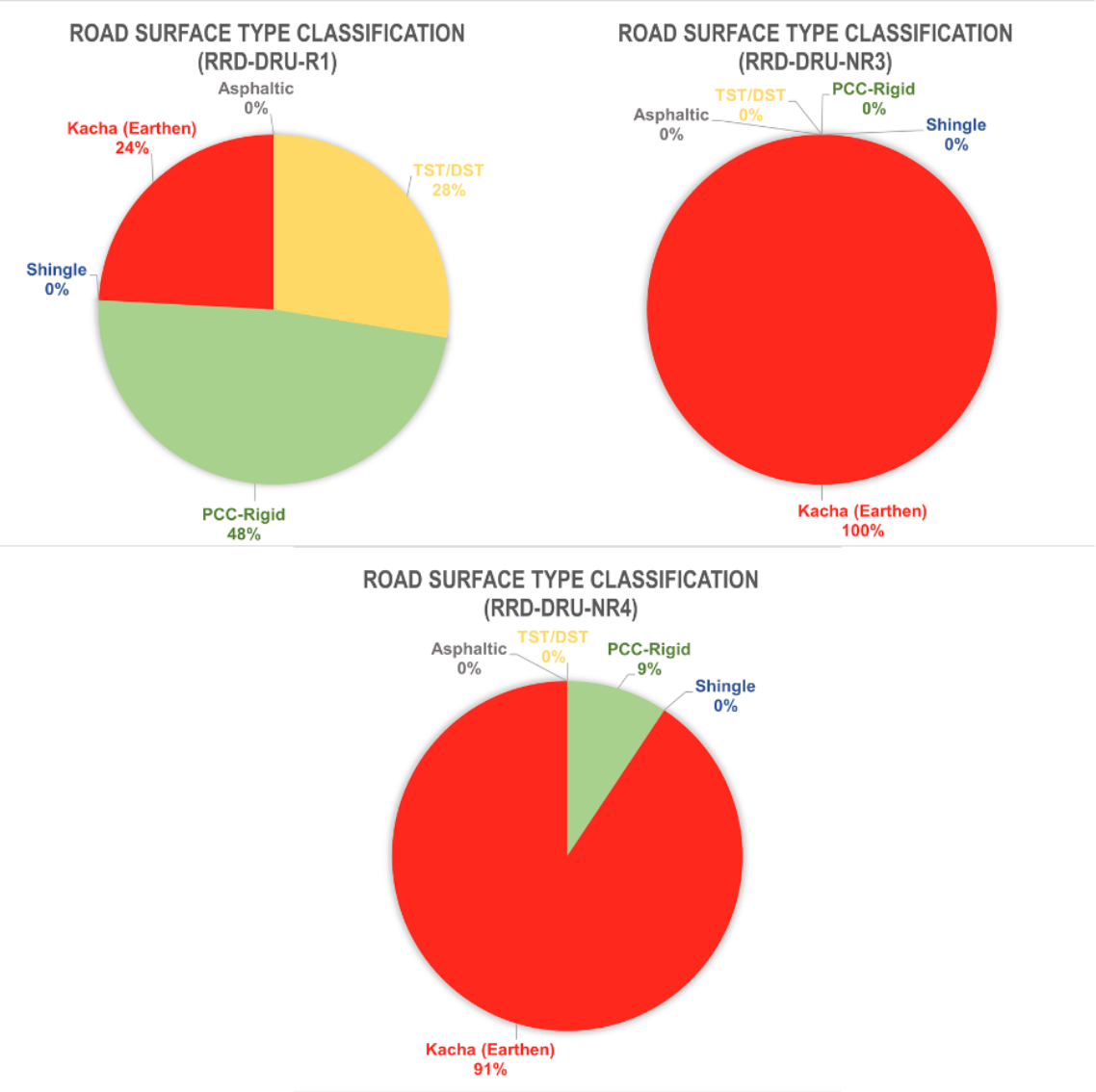


Figure 4.4.5 RST Classification Chart of Flood Affected Roads District Dir Upper

4.4.5 Travel Speed Survey

Table 4.4.2 Travel Speed Survey of Flood Affected Roads District Dir Upper

Road ID	Distance (km)	Total Ascent (m)	Total Descent (m)	Total Time	Average Speed (km/h)	Avg. Moving Speed (km/h)	Maximum Speed (km/h)
RRD_DRU_R1	15.0	54	178	58:23.0	7.8	7.8	22.1
RRD_DRU_NR3	5.1	59	212	13:07.0	9.6	9.6	20.9
RRD_DRU_NR4	5.0	23	222	11:07.0	5.3	5.3	14.3

The travel speeds for all roads are low due to the deteriorated road condition which is reflected from the RST and IRI pie charts. Mobility of the road users is affected as indicated by lower average speeds and higher travel times, which can be attributed to the poor road conditions.

It can be inferred from these observations that these roads need to be reconstructed for better mobility and access of people to basic livelihood necessities.

4.4.6 Traffic Analysis

4.4.6.1 Summary of Existing Average Daily Traffic (ADT)

The summary of traffic counts obtained is given in the following Table.

ADT's

Table 4.4.3 Existing ADT of Flood Affected Roads District Dir Upper

Road ID	Car	Motorcycle	Mazda Coaster	Rickshaw / Q.chi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	TOTAL Vehicles
RRD_DRU_R1	128	109	0	0	86	48	15	0	0	0	0	0	0	0	385
RRD_DRU_NR3	39	86	5	14	30	4	8	1	0	0	0	0	9	19	214
RRD_DRU_NR4	5	8	0	0	0	0	0	0	0	0	0	0	0	3	15

PCUs

Table 4.4.4 Existing PCUs of Flood Affected Roads District Dir Upper

Road ID	Car	Motorcycle	Mazda Coaster	Rickshaw / Qingqi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	Total PCUS
RRD_DRU_R1	128	54	0	0	129	95	38	0	0	0	0	0	0	0	444
RRD_DRU_NR3	39	43	10	10	45	8	19	4	0	0	0	0	39	75	292
RRD_DRU_NR4	5	4	0	0	0	0	0	0	0	0	0	0	0	10	19

4.4.6.2 Composition Of Vehicle Types

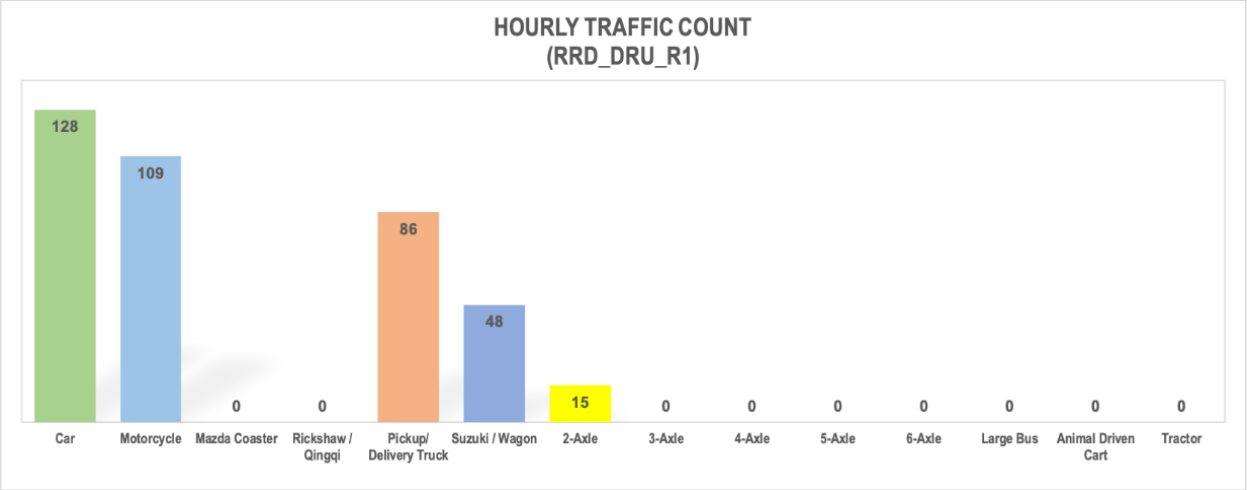


Figure 4.4.6 Vehicle Composition Chart RRD-DRU-R1

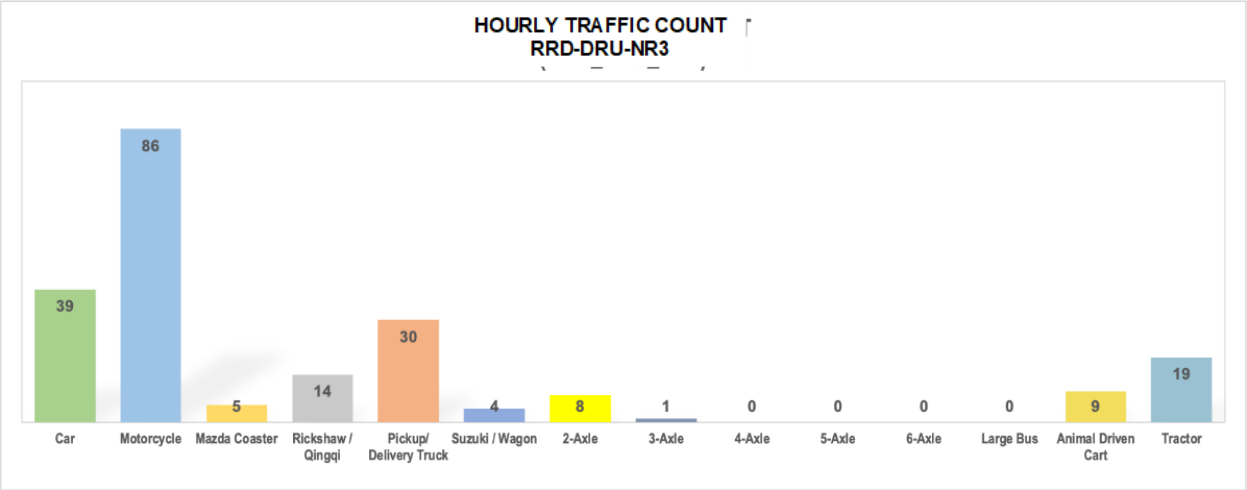


Figure 4.4.7 Vehicle Composition Chart RRD-DRU-NR3

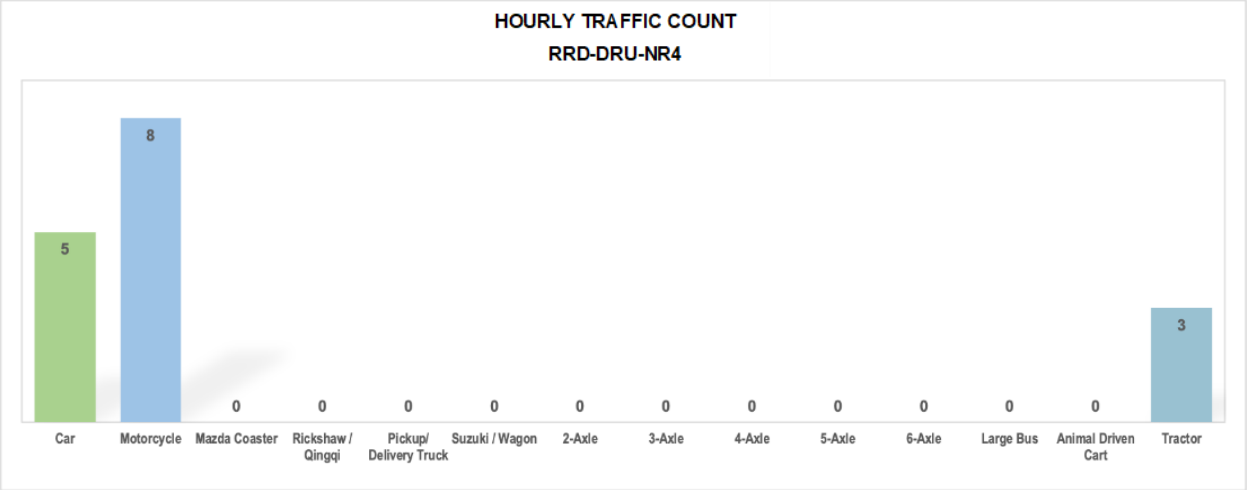


Figure 4.4.8 Vehicle Composition Chart RRD-DRU-NR4

Most of the vehicles on the subject roads are Cars and Motorcycles. This Vehicle Composition can be attributed to the rural area type of the considered roads. Most of the people travel on these roads in their personal cars or motorcycles due to lack of proper public transport facilities.

The reason we have cars and motorcycles as the majority constituents of the vehicle mix, is because of the diversity of the road users utilizing the facility. Those people that have the available resources and own a car or motorcycle are reluctant of using public transport due to the poor services and condition of vehicles, whereas those people who do not own a private car or motorcycle have no other option then using public transport that constitutes of rickshaws and Suzuki/Wagons as seen in some roads.

4.4.6.3 Traffic Analysis Forecast

ADT:

The ADT Base Year is 2022 and ADT Forecast year is 2032 as can be seen in the table below.

The following table represents the annual daily traffic forecast (10 years).

Table 4.4.5 Forecast ADT of Flood Affected Roads District Dir Upper

Year	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
RRD_DRU_R1	**385**	404	424	446	468	491	516	542	569	597	627
RRD_DRU_NR3	**151**	159	167	175	184	193	203	213	223	235	246
RRD_DRU_NR4	**15**	16	17	17	18	19	20	21	22	23	24

PCU:

The PCU Base Year is 2022 and PCU Forecast year is 2032 as can be seen in the table below.

Table 4.4.6 Forecast PCUs of Flood Affected Roads District Dir Upper

Year	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
RRD_DRU_R1	**444**	466	489	514	539	566	595	624	656	688	723
RRD_DRU_NR3	**180**	189	198	208	219	230	241	253	266	279	293
RRD_DRU_NR4	**19**	20	21	22	23	24	25	26	28	29	31

4.4.7 Discussion and Analysis

The analysis conducted on these roads indicates that the condition of these roads is affecting the traffic characteristic which consequently influences the access of people to necessities of life. The poor condition of these roads is reflected by the Road Surface Type (RST) and International Roughness Index (IRI) pie charts which indicates that these roads need immediate consideration with respect to construction and rehabilitation. The poor mobility of these roads is indicated by the lower speeds and high travel times. Reconstructing these roads will improve speeds and lower travel times of users.

The utility of these roads in providing access to necessities like education, health, and markets will be enhanced with the improvement in road condition after reconstruction.

4.5 Project Area- Karak

Karak is a district in Kohat Division of Khyber Pakhtunkhwa province in Pakistan. It is situated to the south of Kohat District and on the north side of Bannu and Lakki Marwat districts on the main Indus Highway between Peshawar and Karachi – it is 123 km from the provincial capital Peshawar.

4.5.1 Priority Roads in District Karak

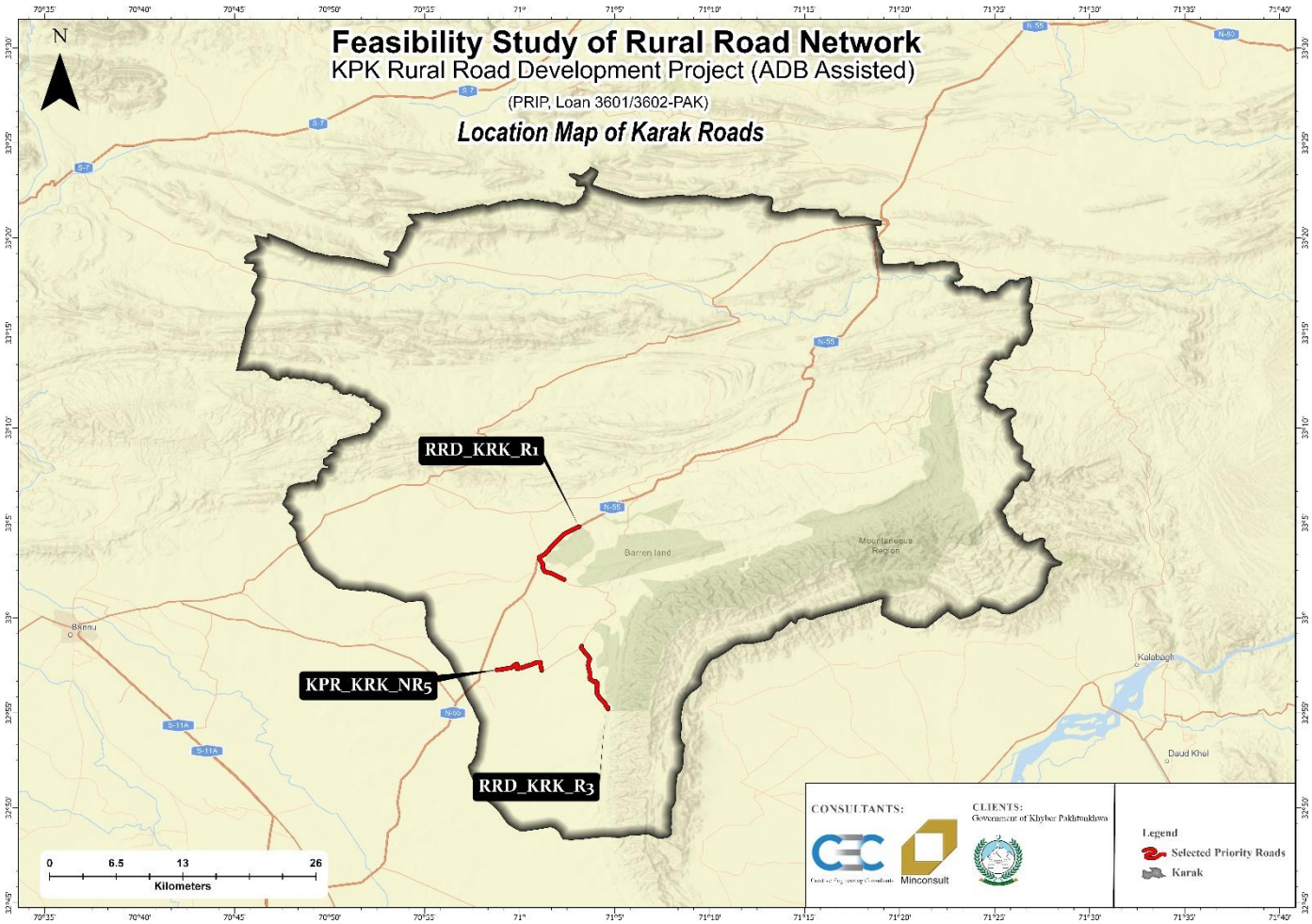
The following roads have been found feasible for Rural Road Development Project in District Karak.

Table 4.5.1 Flood Affected Roads in Karak

#	ID	Road Name	Districts	FL	Type
1	**KPR_KRK_NR5**	Hamdan to Inzar More	Karak	5.8	Flood Affected
2	**RRD_KRK_R1**	Indus Highway to Nari Khawar	Karak	7.1	Flood Affected
3	**RRD_KRK_R3**	Construction from Guddikhel Road to Indus Highway Link Road	Karak	10.4	Flood Affected

4.5.2 Location Map of Priority Roads

All the access roads selected for traffic study after scrutinization of the surveyed roads in the district are shown in the figure below.



Map 4.5.1 Location Map of Karak

4.5.2.1 KPR_KRK_NR5 (Hamdan to Inzar More)

The road is named Hamidan road that starts from Inzer More, crossing banda town, Ibrahim khel town and Hamidan town. It is in the Karak district of KP, covering 5.83 km route.

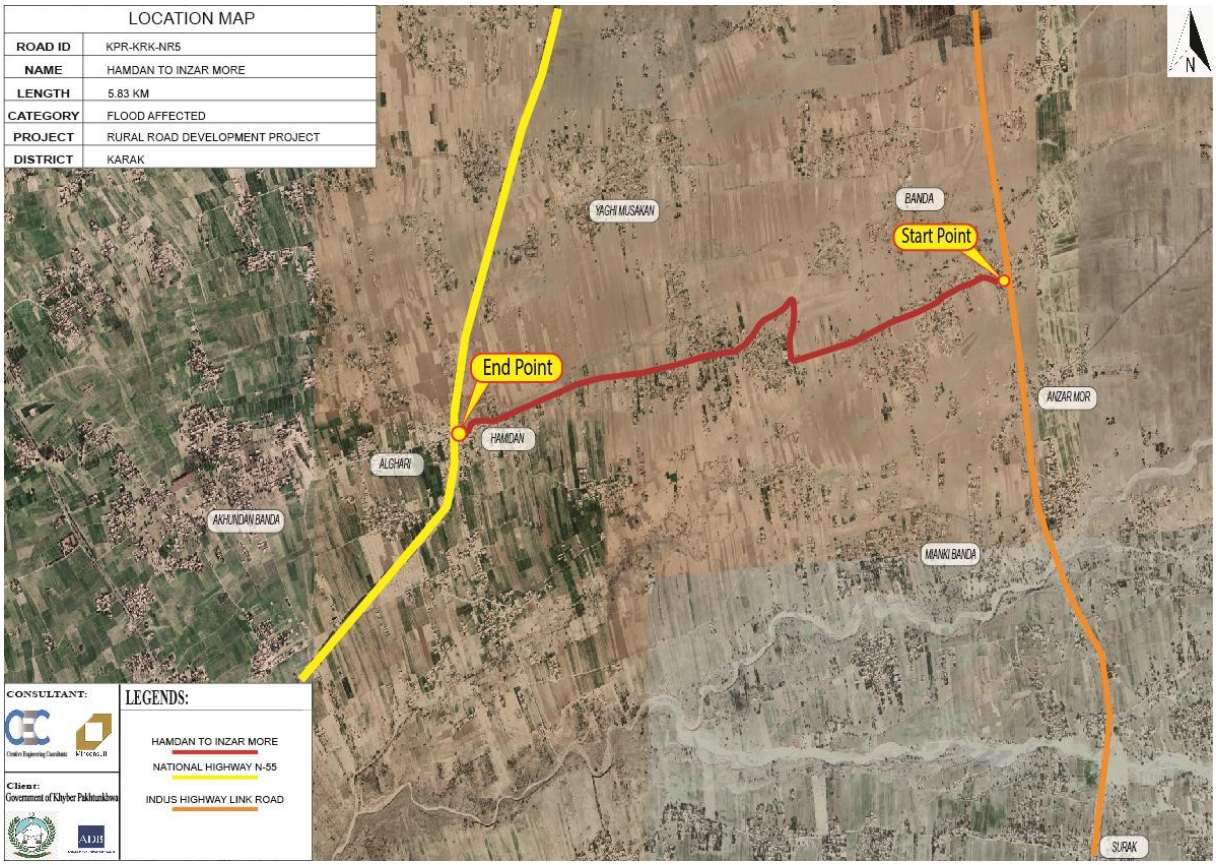


Figure 4.5.1 Location Map KPR_KRK_NR5

4.5.2.2 RRD_KRK_R1 (Indus Highway to Nari Khawar)

The road covers a portion of Takhte Nasrati Road and Indus Highway, starting from Chokara town, crossing ambiri kala, Industrial Town, all the way to the Toordand village. The length of the road is 7.15 km.

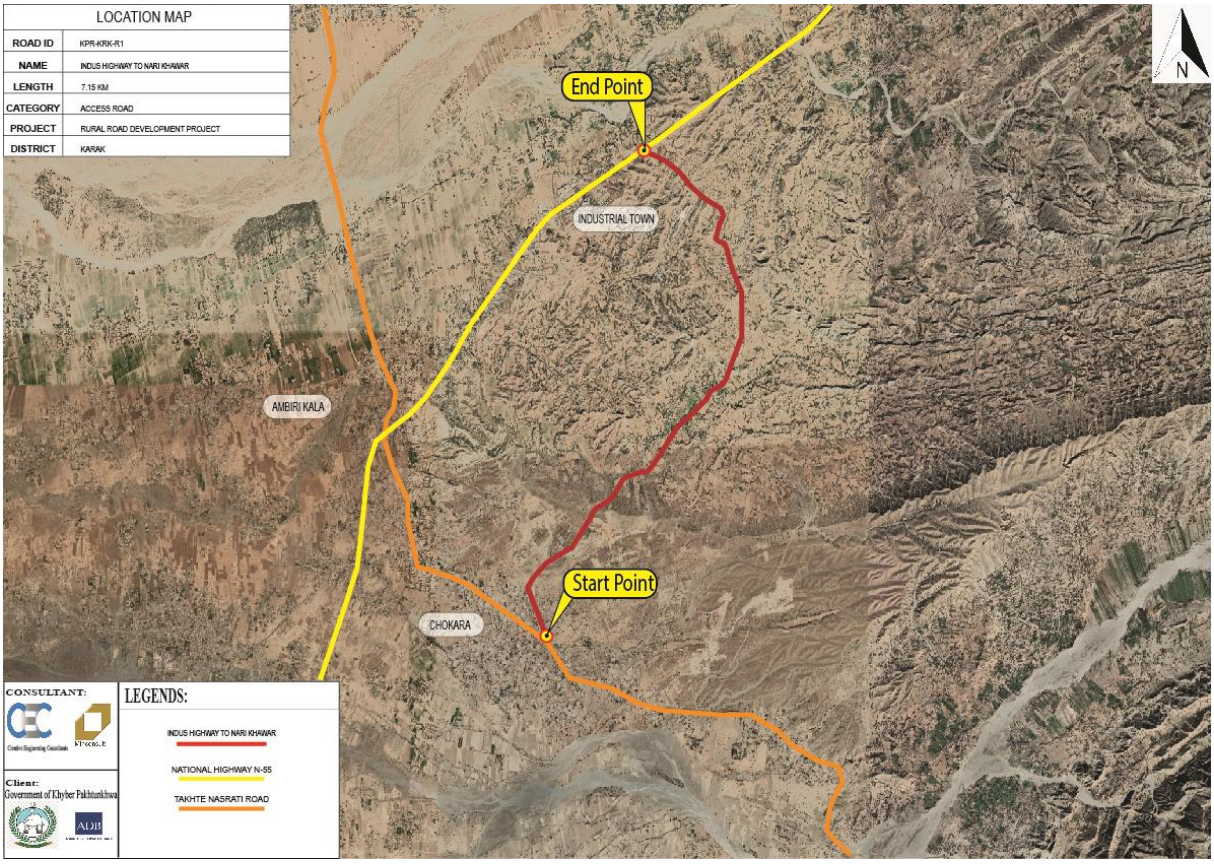


Figure 4.5.2 Location Map RRD_KRK_R1

4.5.2.3 RRD_KRK_R3 (Construction from Guddikhel Road to Indus Highway Link Road)

The road is located at Karak district of KP, covering a 10.4 km route. The road connects Ganderi Khattak town to the Shahidan Banda.

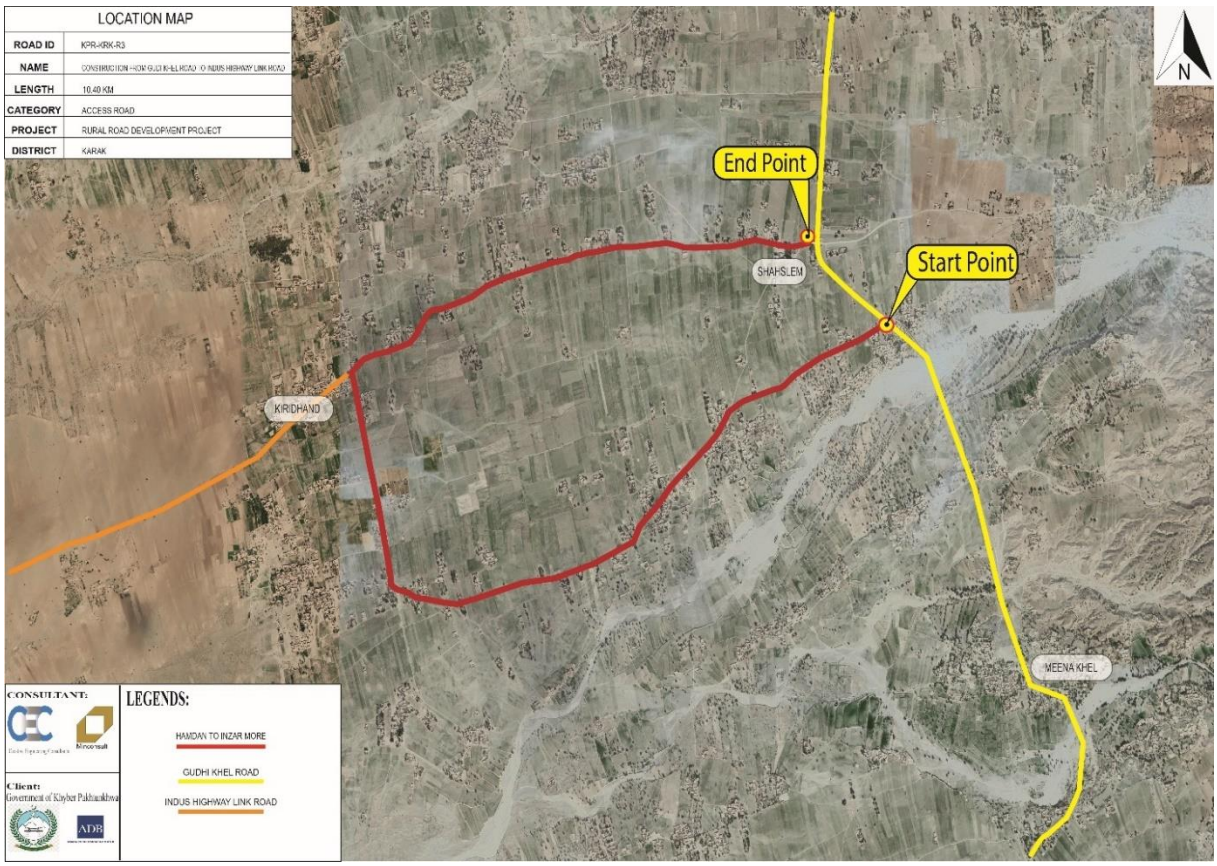


Figure 4.5.3 Location Map RRD_KRK_R3

4.5.3 IRI Classification Pie Chart of Selected Roads

The International Roughness Index (IRI) is used by highway professionals throughout the world as a standard to quantify road surface roughness. A poor road surface roughness influences the traffic speeds and times. It also effects the mobility and accesibility of users traversing that road.

The IRI Classification Charts for are given below.

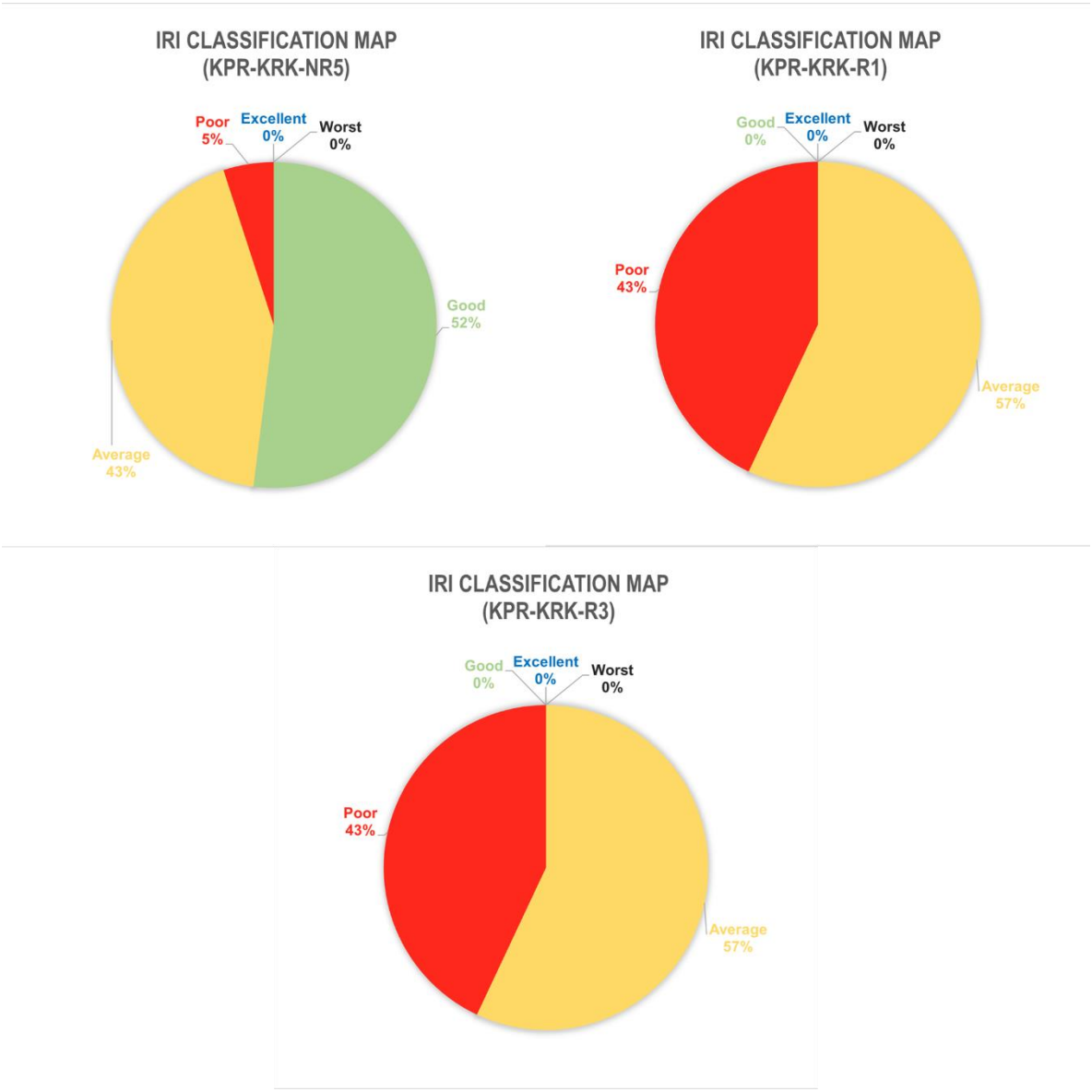


Figure 4.5.4 IRI Classification Chart of Flood Affected Roads District Karak

4.5.4 RST Pie Chart of Selected Roads

Road Surface type (RST) survey was conducted to investigate the actual condition and type of surface of the road under observation. In rural areas earthen or kacha tracks and TST/DST are common that affect the mobility of road users and accessibility to necessities.

The RST Classification Charts for are given below.

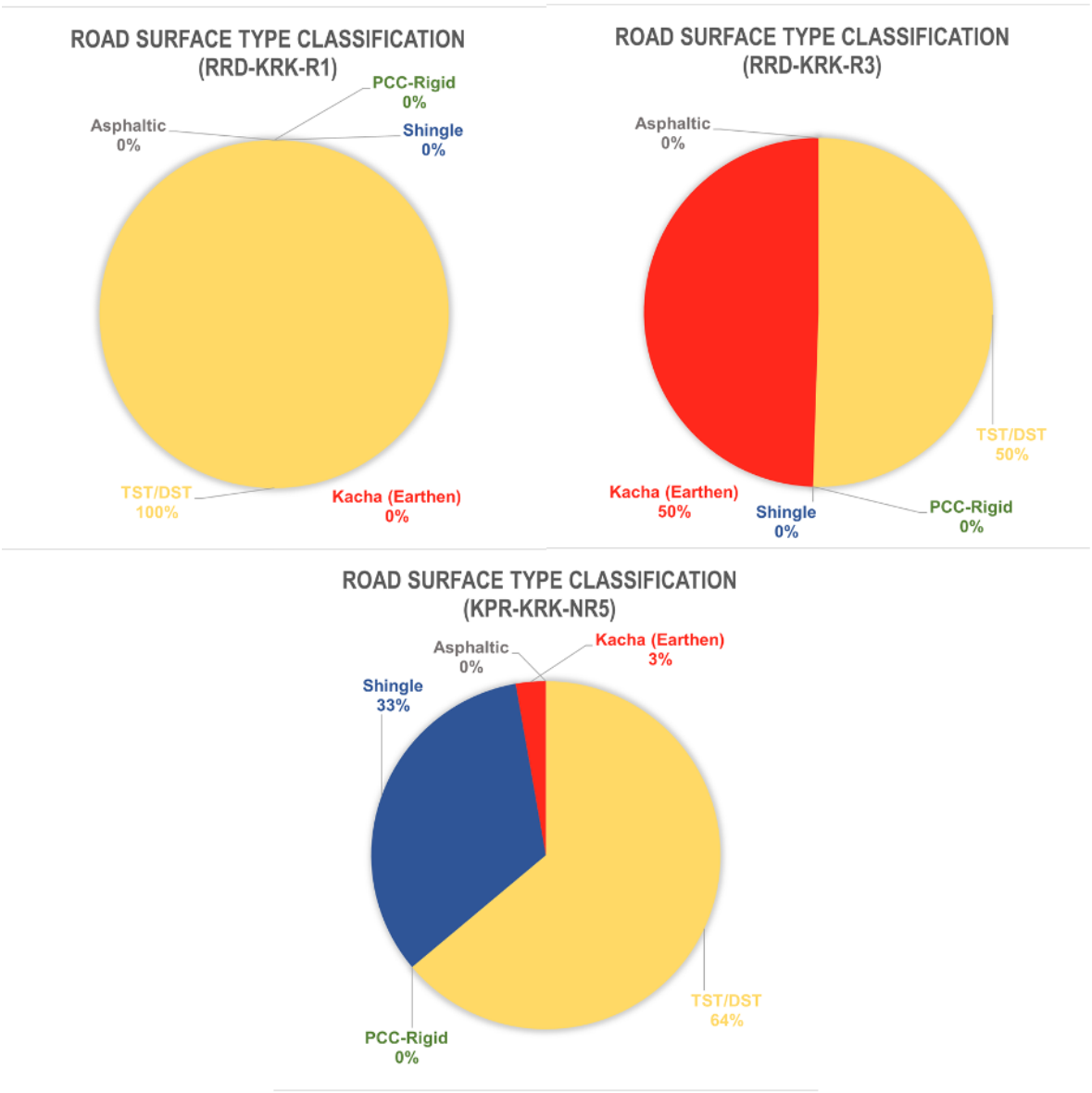


Figure 4.5.5 RST Classification Chart of Flood Affected Roads District Karak

4.5.5 Travel Speed Survey

Table 4.5.2 Travel Speed Survey of Flood Affected Roads District Karak

Road ID	Distance (km)	Total Ascent (m)	Total Descent (m)	Total Time	Average Speed (km/h)	Avg. Moving Speed (km/h)	Maximum Speed (km/h)
KPR_KRK_NR5	5.0	112	198	18:32.0	11.2	11.2	16.3
RRD_KRK_R1	7.2	145	225	19:32.0	10.8	10.8	17.2
RRD_KRK_R3	6.9	125	224	28:32.0	8.6	8.6	16.3

The travel speeds for all roads are low due to the deteriorated road condition which is reflected from the RST and IRI pie charts. Mobility of the road users is affected as indicated by lower average speeds and higher travel times, which can be attributed to the poor road conditions.

It can be inferred from these observations that these roads need to be reconstructed for better mobility and access of people to basic livelihood necessities.

4.5.6 Traffic Analysis

4.5.6.1 Summary of Existing Average Daily Traffic (ADT)

The summary of traffic counts obtained is given in the following Table.

ADT's

Table 4.5.3 Existing ADT of Flood Affected Roads District Karak

Road ID	Car	Motorcycle	Mazda Coaster	Rickshaw / Q.chi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	TOTAL Vehicles
KPR_KRK_NR5	214	123	3	19	14	4	3	0	0	0	0	0	0	11	389
RRD_KRK_R1	151	95	11	1	26	44	9	1	0	0	0	0	0	10	349
RRD_KRK_R3	165	85	5	33	26	6	3	0	0	0	0	0	0	9	331

PCUs

Table 4.5.4 Existing PCUs of Flood Affected Roads District Karak

Road ID	Car	Motorcycle	Mazda Coaster	Rickshaw / Qinggi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	Total PCUS
KPR_KRK_NR5	214	61	5	14	21	8	6	0	0	0	0	0	0	45	373
RRD_KRK_R1	151	48	23	1	39	88	22	4	0	0	0	0	0	40	415
RRD_KRK_R3	165	43	10	24	39	13	6	0	0	0	0	0	0	35	335

4.5.6.2 Composition Of Vehicle Types

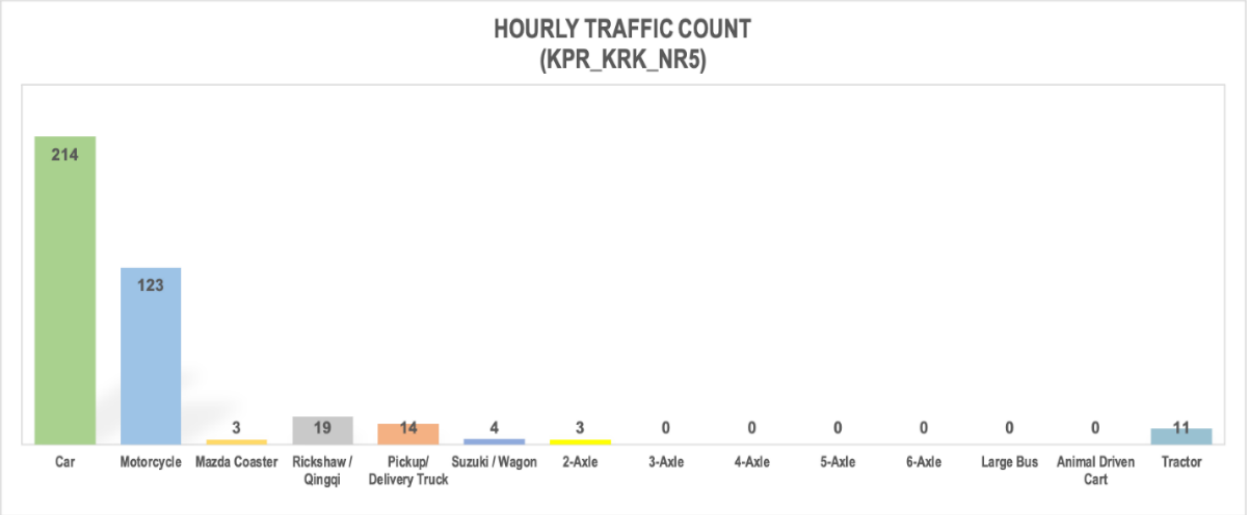


Figure 4.5.6 Vehicle Composition Chart KPR-KRK-NR5

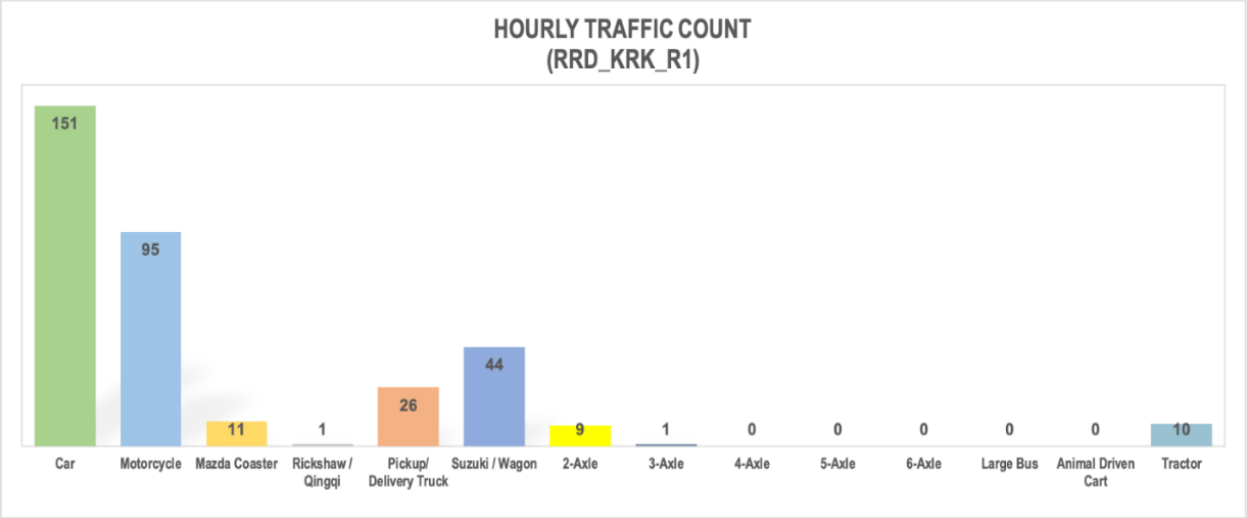


Figure 4.5.7 Vehicle Composition Chart RRD-KRK-R1

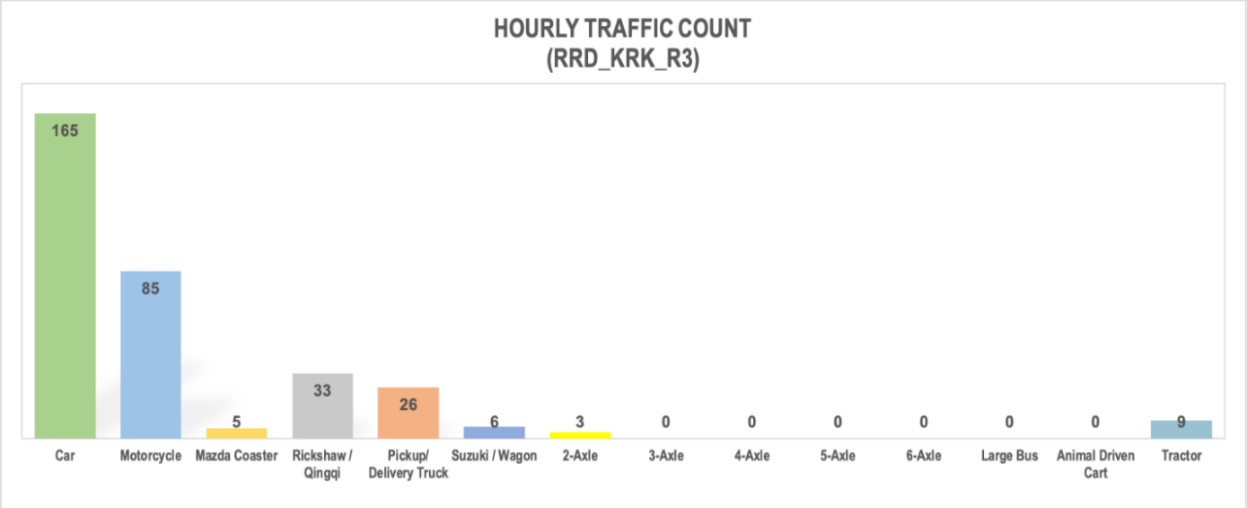


Figure 4.5.8 Vehicle Composition Chart RRD-KRK-R3

Most of the vehicles on the subject roads are Cars and Motorcycles. This Vehicle Composition can be attributed to the rural area type of the considered roads. Most of the people travel on these roads in their personal cars or motorcycles due to lack of proper public transport facilities.

The reason we have cars and motorcycles as the majority constituents of the vehicle mix, is because of the diversity of the road users utilizing the facility. Those people that have the available resources and own a car or motorcycle are reluctant of using public transport due to the poor services and condition of vehicles, whereas those people who do not own a private car or motorcycle have no other option then using public transport that constitutes of rickshaws and Suzuki/Wagons as seen in some roads.

4.5.6.3 Traffic Analysis Forecast

ADT:

The ADT Base Year is 2022 and ADT Forecast year is 2032 as can be seen in the table below.

The following table represents the annual daily traffic forecast (10 years).

Table 4.5.5 Forecast ADT of Flood Affected Roads District Karak

Road ID	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
KPR_KRK_NR5	**389**	408	429	450	473	496	521	547	574	603	633
RRD_KRK_R1	**476**	500	525	551	579	608	638	670	704	739	776
RRD_KRK_R3	**331**	348	365	383	403	423	444	466	489	514	540

PCU:

The PCU Base Year is 2022 and PCU Forecast year is 2032 as can be seen in the table below.

Table 4.5.6 Forecast PCUs of Flood Affected Roads District Karak

Road ID	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
KPR_KRK_NR5	**373**	392	412	432	454	477	500	525	552	579	608
RRD_KRK_R1	**415**	435	457	480	504	529	556	584	613	643	675
RRD_KRK_R3	**335**	352	369	388	407	428	449	471	495	520	546

4.5.7 Discussion and Analysis

The analysis conducted on these roads indicates that the condition of these roads is affecting the traffic characteristic which consequently influences the access of people to necessities of life. The poor condition of these roads is reflected by the Road Surface Type (RST) and International Roughness Index (IRI) pie charts which indicates that these roads need immediate consideration with respect to construction and rehabilitation. The poor mobility of these roads is indicated by the lower speeds and high travel times. Reconstructing these roads will improve speeds and lower travel times of users.

The utility of these roads in providing access to necessities like education, health, and markets will be enhanced with the improvement in road condition after reconstruction.

4.6 Project Area- Kohistan

Kohistan "Land of Mountains" is also called Indus Kohistan. It was an administrative district within the Hazara region of Khyber Pakhtunkhwa Province in Pakistan that was bifurcated into Upper Kohistan and Lower Kohistan in 2014, and Kolai-Palas in 2017. It covered an area of 7,492 square kilometers (2,893 sq mi) and had a population of 472,570 at the 1998 Census. Geographically, Kohistan stretched from the border with Gilgit-Baltistan in the north, to the east by Mansehra District, in the south by Battagram District, and on the west by Shangla and Swat districts.

4.6.1 Priority Roads in District Kohistan

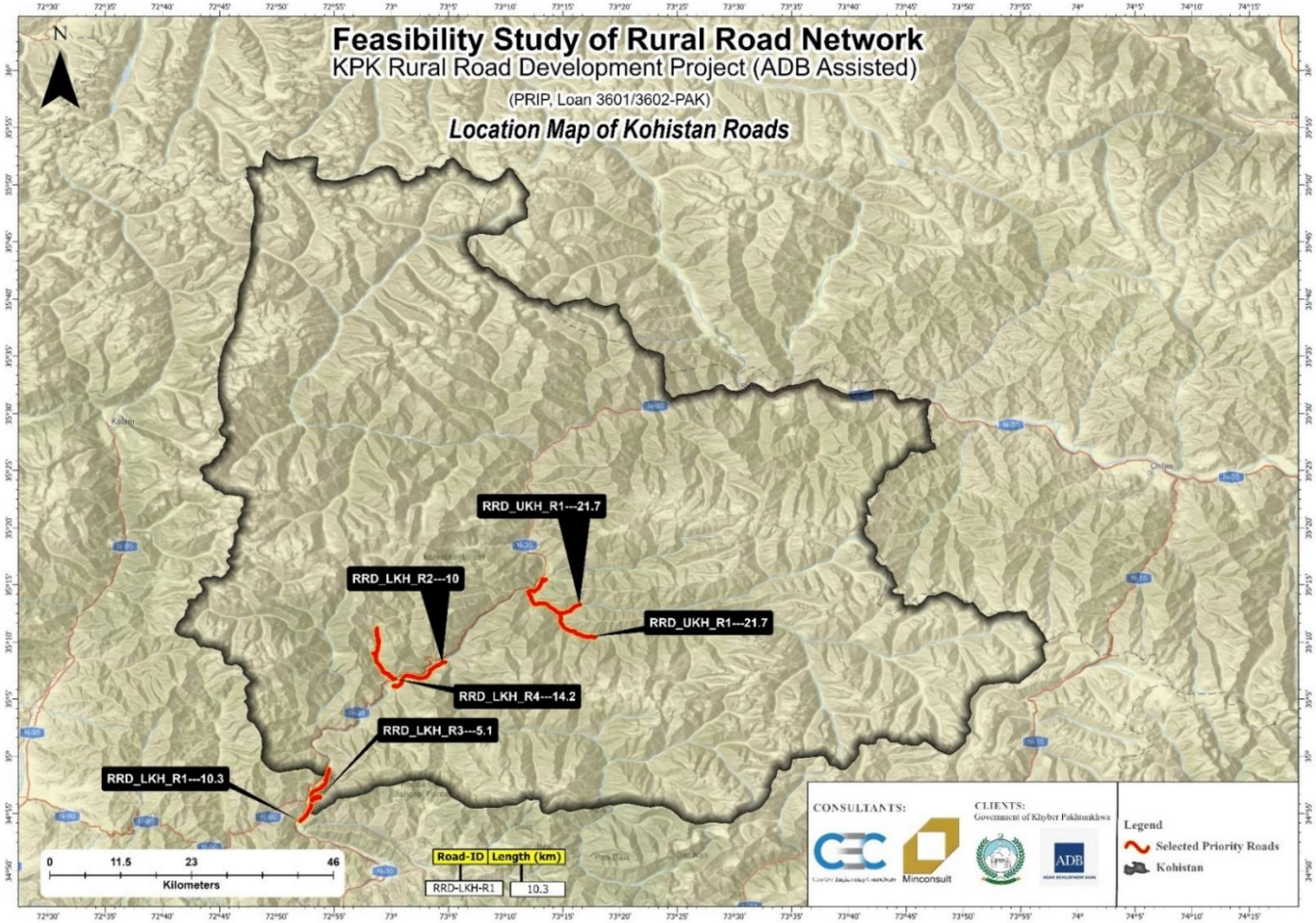
The following roads have been found feasible for Rural Road Development Project in District Kohistan.

Table 4.6.1 Flood Affected Roads in Kohistan

#	ID	Road Name	District	FL	Type
1	**RRD_LKH_R1**	Restoration/Rehablitation of Batera Road	Kohistan	10.3	Flood Affected
2	**RRD_LKH_R2**	Restoration/Rehablitation Pattan Ziarat Road (Seer Gazi Abad to Kharat)	Kohistan	10.0	Flood Affected
3	**RRD_LKH_R3**	Restoration/Rehablitation of Masham Road	Kohistan	5.1	Flood Affected
4	**RRD_LKH_R4**	Restoration/Rehablitation of Chawa Darra Road	Kohistan	13.8	Flood Affected
5	**RRD_UKH_R1**	Jalkot Goshali Road 1: Gabber Nullah Road	Kohistan	14.4	Flood Affected

4.6.2 Location Map of Priority Roads

All the access roads selected for traffic study after scrutinization of the surveyed roads in the district are shown in the figure below.



Map 4.6.1 Location Map District Kohistan

4.6.2.1 RRD_LKH_R1 (Restoration/Rehablitation of Batera Road)

This road is located along the Indus River, in the lower Kohistan district. It starts from Besham city, from the Indus River bridge. The length of the road is 10.32 km long.

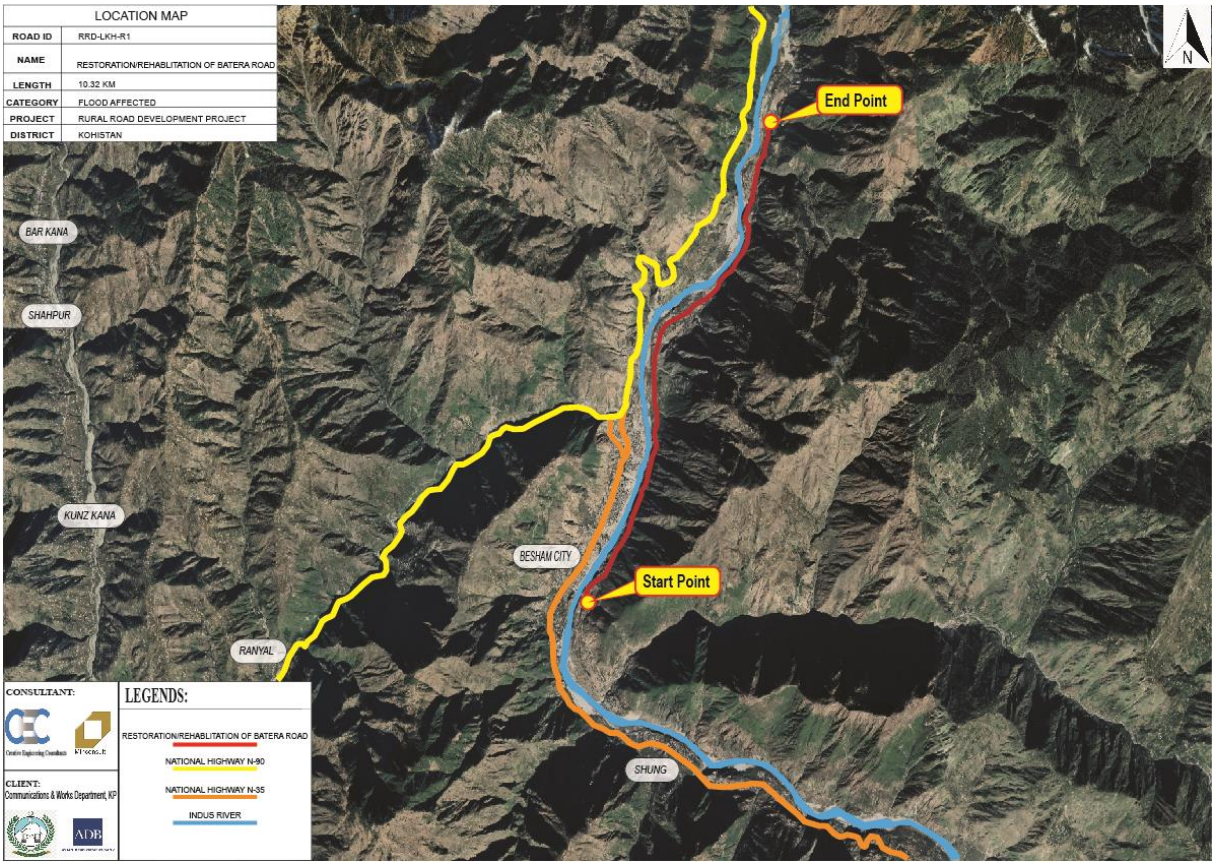


Figure 4.6.1 Location Map RRD_LKH_R1

4.6.2.2 RRD_LKH_R2 (Restoration/Rehablitation Pattan Ziarat Road (Seer Gazi Abad to Kharat))

It is named Pattan Ziarat Road, located in the Lower Kohista district, starting from Palas tehsil to the Palas river. The road covers a 10 km route.

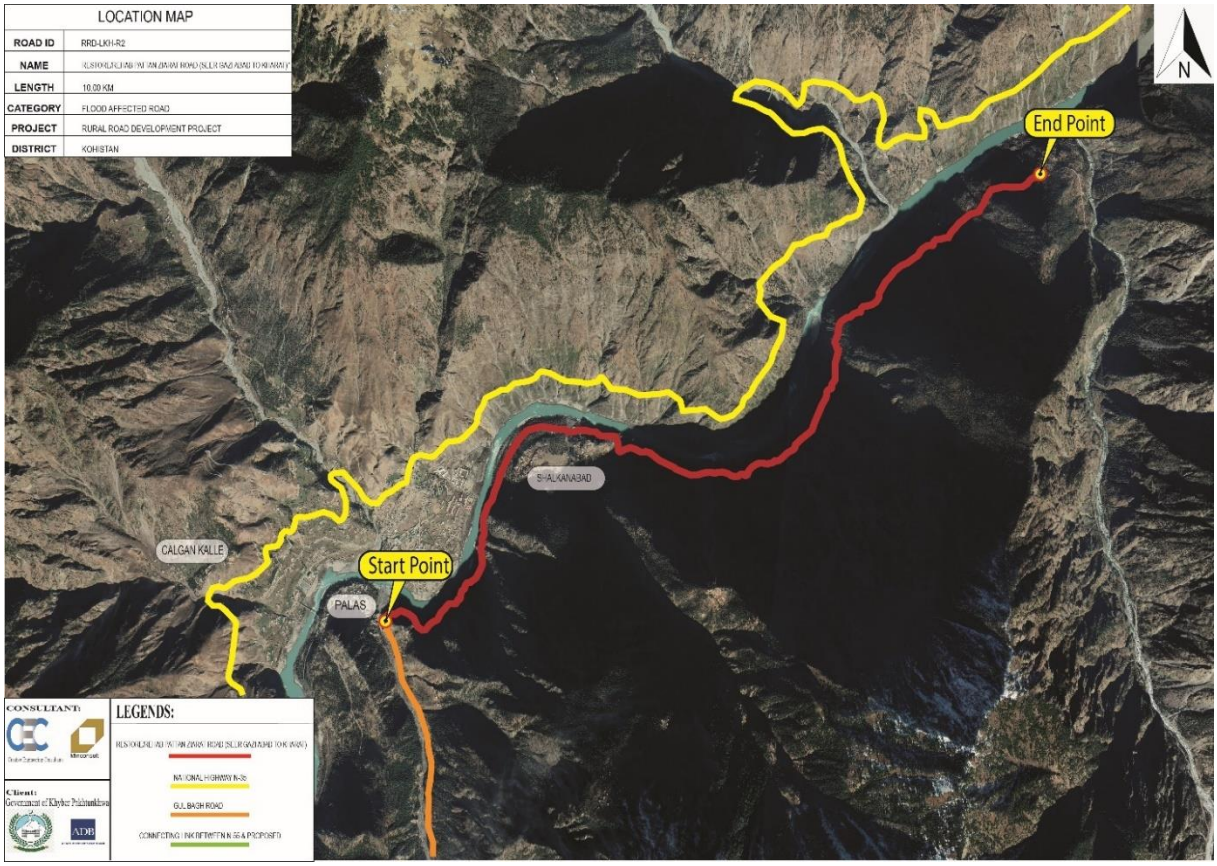


Figure 4.6.2 Location Map RRD_LKH_R2

4.6.2.3 RRD_LKH_R3 (Restoration/Rehablitation of Masham Road)

The raod is in the Lower Kohista district of KP. It starts from the road near to the Indus River going all the way up to the mountain top Barsharyal. The road is 5.1 km long.

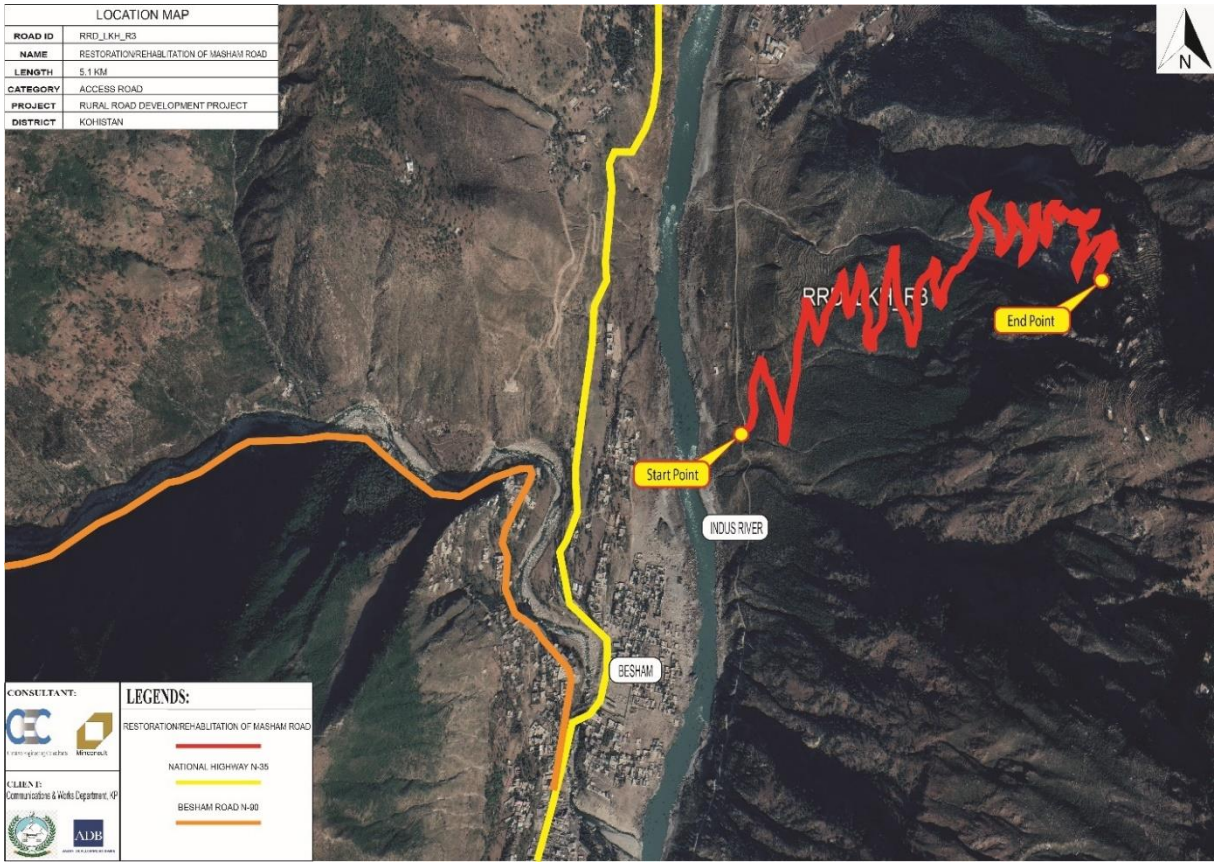


Figure 4.6.3 Location Map RRD_LKH_R3

4.6.2.4 RRD_LKH_R4 (Restoration/Rehablitation of Chawa Darra Road)

The road is named Pattan valley road, starting from the Pattan town, crossing Banil Banda, Mazo Kale, Chilari, Datol Banda, all the way up to the Yazai. The road is 13.78 km long.

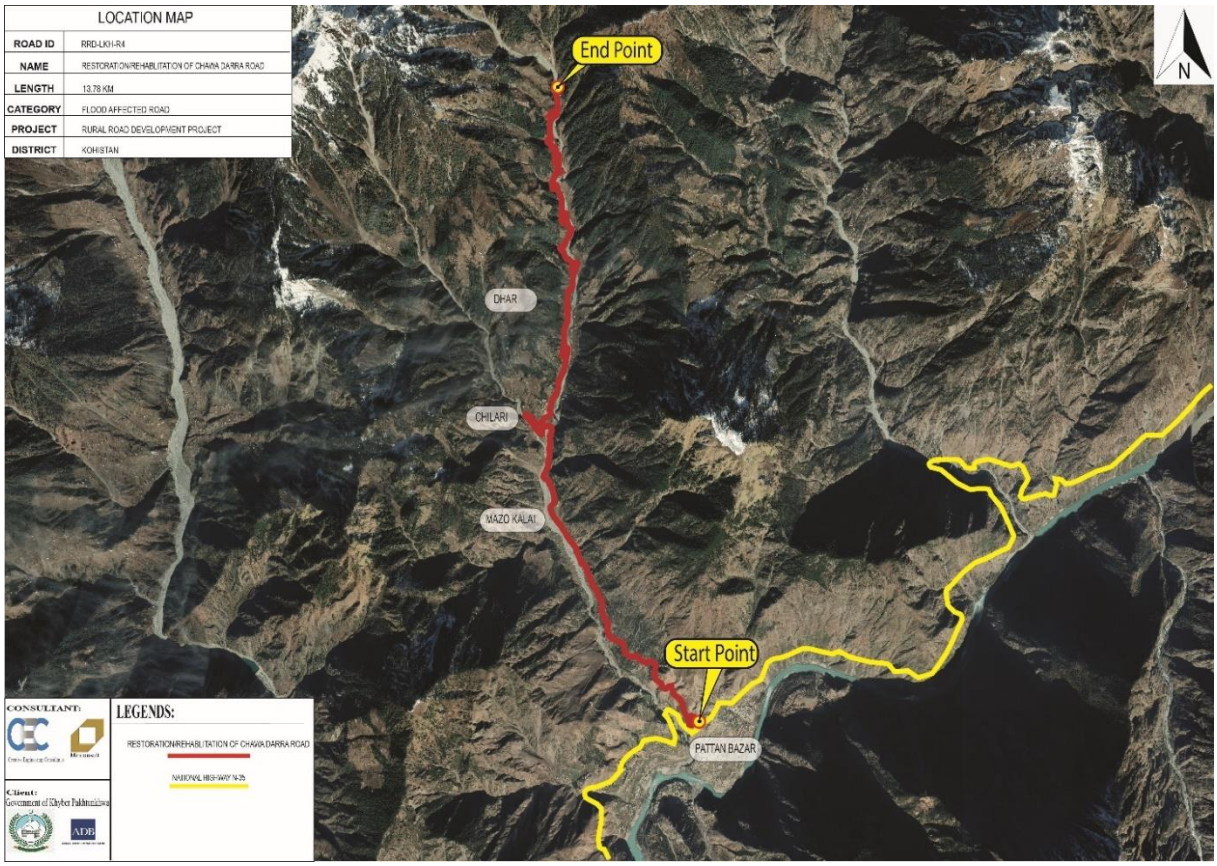


Figure 4.6.4 Location Map RRD_LKH_R4

4.6.2.5 RRD_UKH_R1 (Jalkot Goshali Road 1: Gabber Nullah Road)

It is comprised of two roads that are located along the Indus River, in the upper Kohistan district. The first road starts from Dasu tehsil, Jalkot Road. And the second road is the link to the first road. The length of both roads is 14.40 km long.

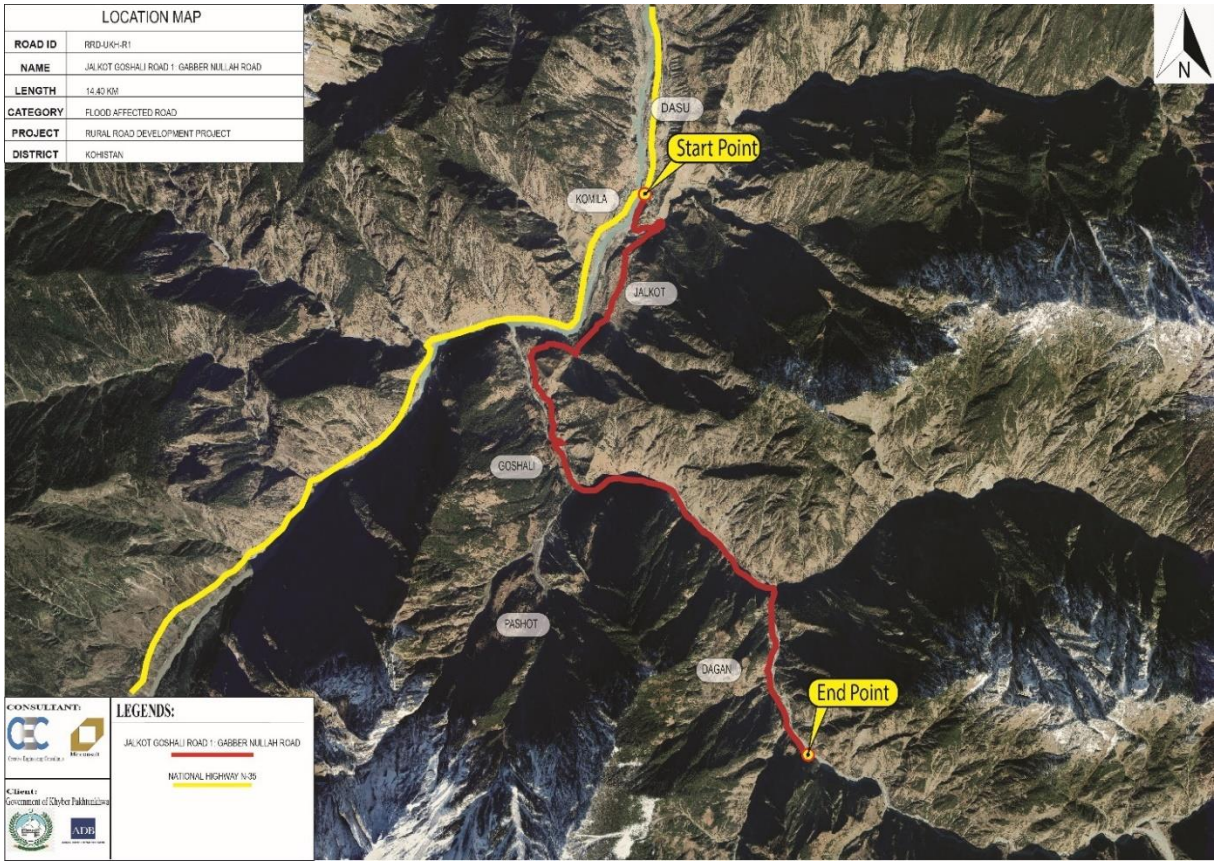
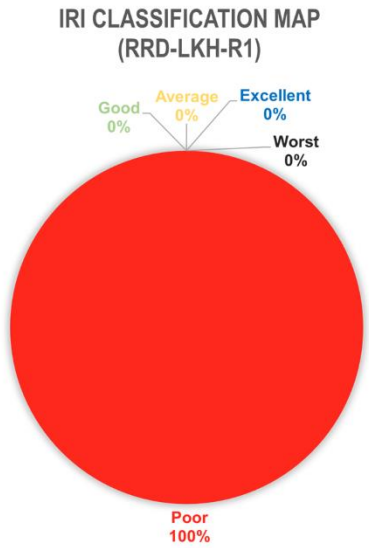


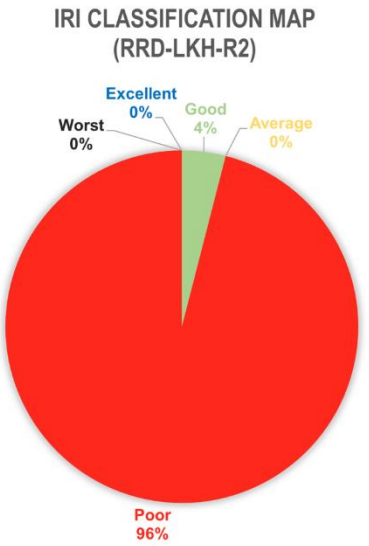
Figure 4.6.5 Location Map RRD_UKH_R1

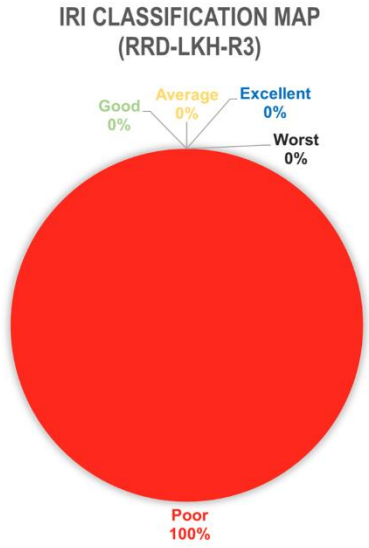
4.6.3 IRI Classification Pie Chart of Selected Roads

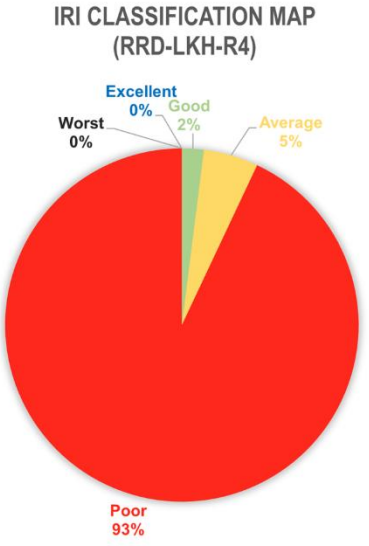
The International Roughness Index (IRI) is used by highway professionals throughout the world as a standard to quantify road surface roughness. A poor road surface roughness influences the traffic speeds and times. It also effects the mobility and accesibility of users traversing that road.

The IRI Classification Charts are given below.









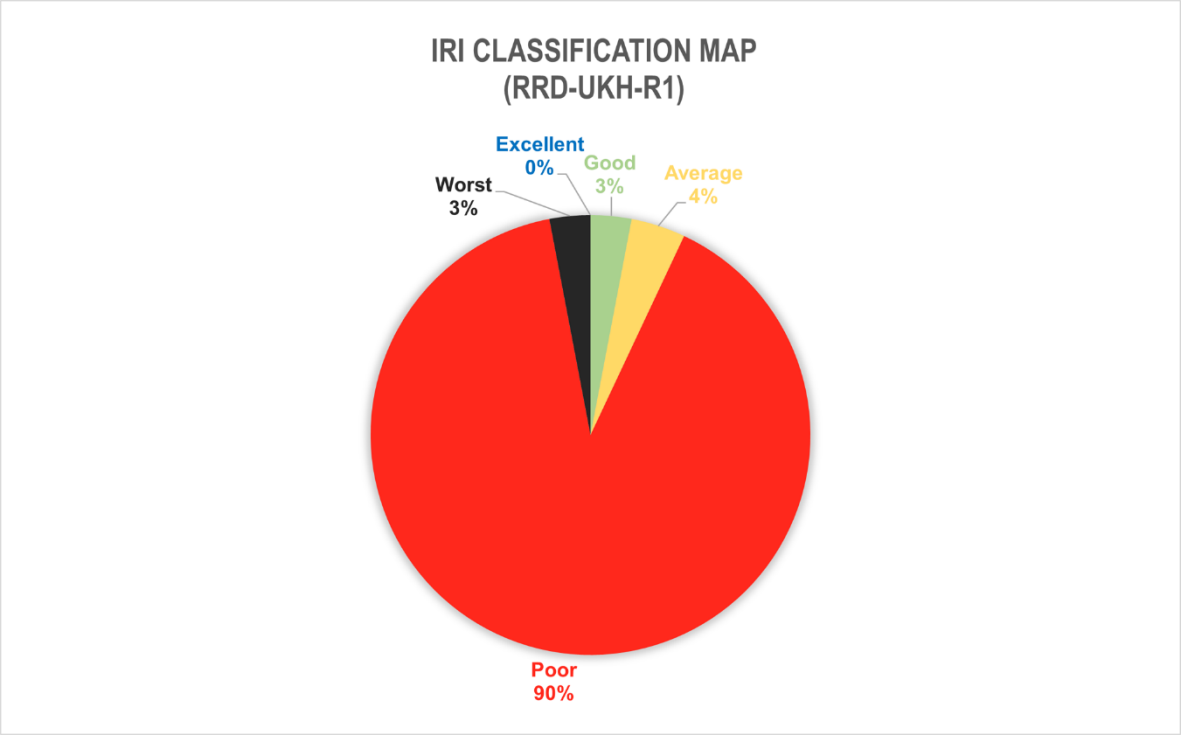


Figure 4.6.6 IRI Classification Charts of Flood Affected Roads District Kohistan

4.6.4 RST Pie Chart of Selected Roads

Road Surface type (RST) survey was conducted to investigate the actual condition and type of surface of the road under observation. In rural areas earthen or kacha tracks and TST/DST are common that affect the mobility of road users and accessibility to necessities.

The RST Classification Charts are given below.

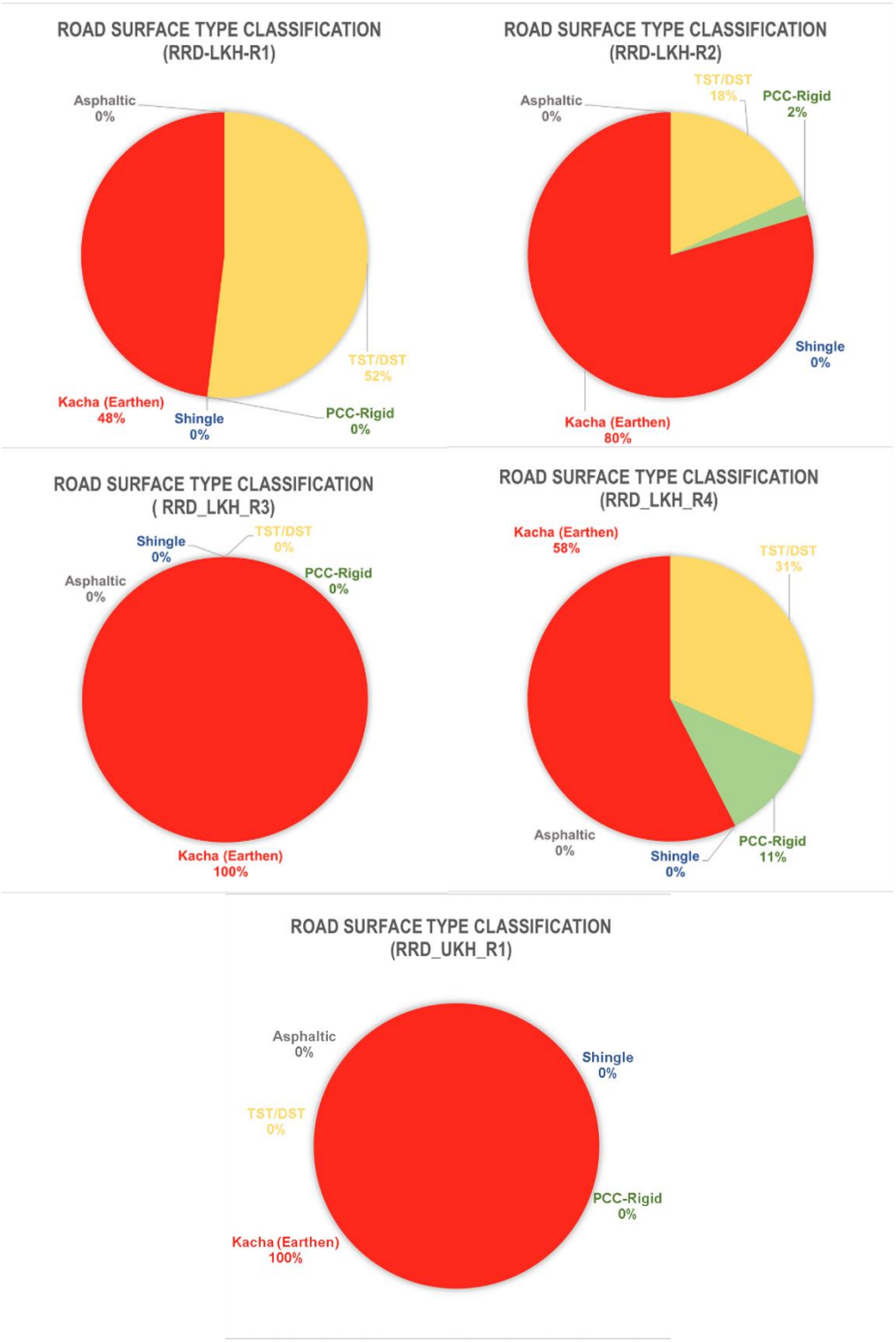


Figure 4.6.7 RST Classification Chart of Flood Affected Roads District Kohistan

4.6.5 Travel Speed Survey

Table 4.6.2 Travel Speed Survey of Flood Affected Roads District Kohistan

Road ID	Distance (km)	Total Ascent (m)	Total Descent (m)	Total Time	Average Speed (km/h)	Avg. Moving Speed (km/h)	Maximum Speed (km/h)
RRD_LKH_R1	10.3	78	69	21:44.0	12.3	12.3	19.3
RRD_LKH_R2	10.0	72	62	19:44.0	11	11	17.3
RRD_LKH_R3	5.1	24	21	15:12.0	10.3	10.3	16.8
RRD_LKH_R4	14.2	89	83	24:32.0	9.6	9.6	20.8
RRD_UKH_R1	21.7	114	111	34:56.0	8.3	8.3	22.1

The travel speeds for all roads are low due to the deteriorated road condition which is reflected from the RST and IRI pie charts. Mobility of the road users is affected as indicated by lower average speeds and higher travel times, which can be attributed to the poor road conditions.

It can be inferred from these observations that these roads need to be reconstructed for better mobility and access of people to basic livelihood necessities.

4.6.6 Traffic Analysis

4.6.6.1 Summary of Existing Average Daily Traffic (ADT)

The summary of traffic counts obtained is given in the following Table.

ADT's

Table 4.6.3 Existing ADT of Flood Affected Roads District Kohistan

Road ID	Car	Motorcycle	Mazda Coaster	Rickshaw / Q.chi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	TOTAL Vehicles
RRD_LKH_R1	245	83	1	4	49	30	0	0	0	0	0	0	1	6	419
RRD_LKH_R2	426	61	4	0	201	3	0	0	0	0	0	0	0	13	708
RRD_LKH_R3	378	61	0	0	0	0	0	0	0	0	0	0	0	5	444
RRD_LKH_R4	156	41	0	0	0	0	0	0	0	0	0	0	0	3	200
RRD_UKH_R1	363	30	0	0	0	0	0	0	0	0	0	0	0	3	395

PCUs

Table 4.6.4 Existing PCUs of Flood Affected Roads District Kohistan

Road ID	Car	Motorcycle	Mazda Coaster	Rickshaw / Qingqi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	Total PCUS
RRD_LKH_R1	245	41	3	3	73	60	0	0	0	0	0	0	6	25	455
RRD_LKH_R2	426	31	8	0	302	5	0	0	0	0	0	0	0	50	821
RRD_LKH_R3	378	31	0	0	0	0	0	0	0	0	0	0	0	20	428
RRD_LKH_R4	156	21	0	0	0	0	0	0	0	0	0	0	0	12	189
RRD_UKH_R1	363	15	0	0	0	0	0	0	0	0	0	0	0	12	390

4.6.6.2 Composition Of Vehicle Types

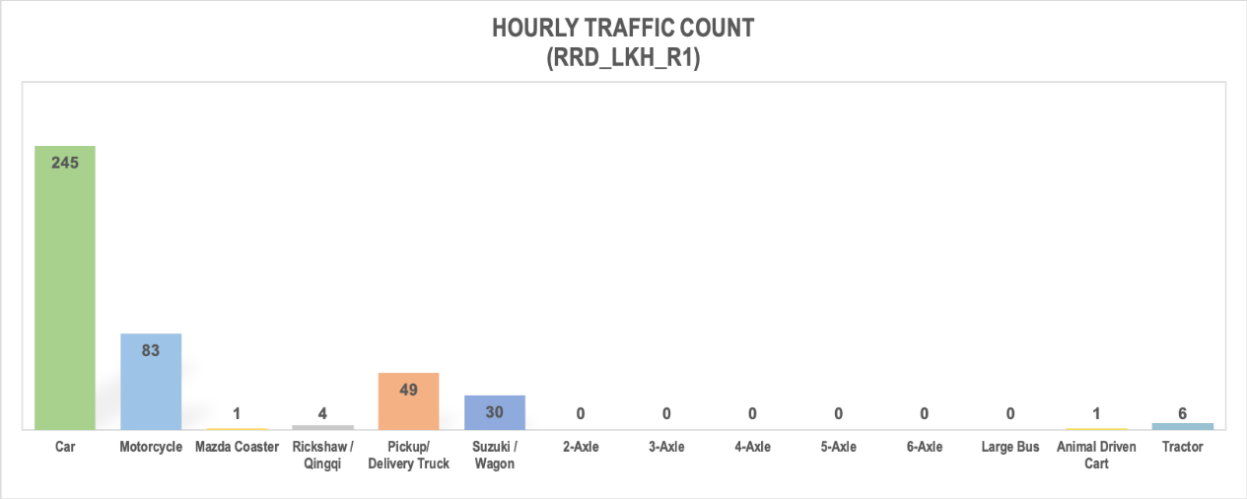


Figure 4.6.8 Vehicle Composition Chart RRD-LKH-R1

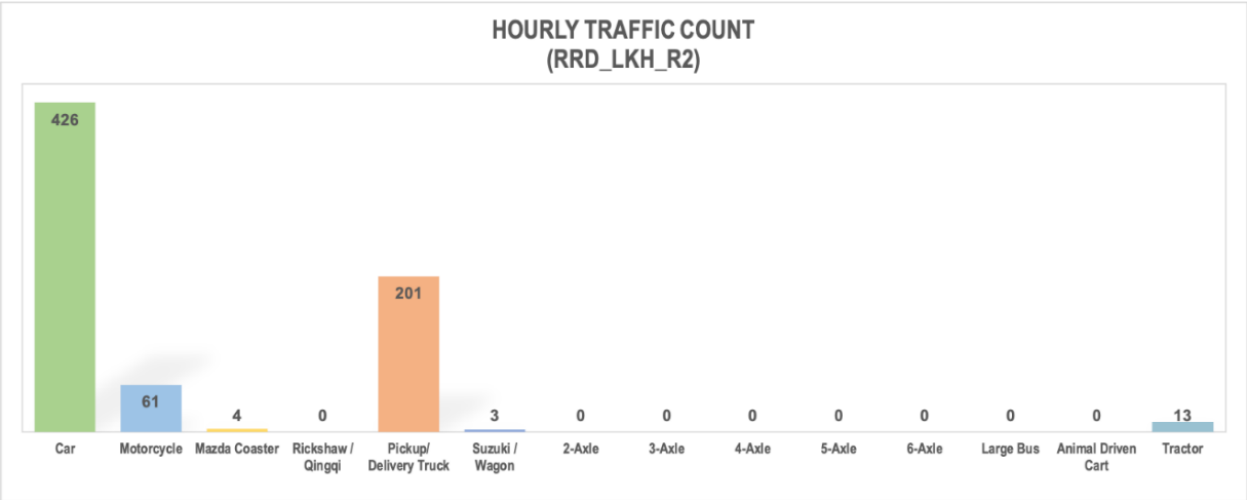


Figure 4.6.9 Vehicle Composition Chart RRD-LKH-R3

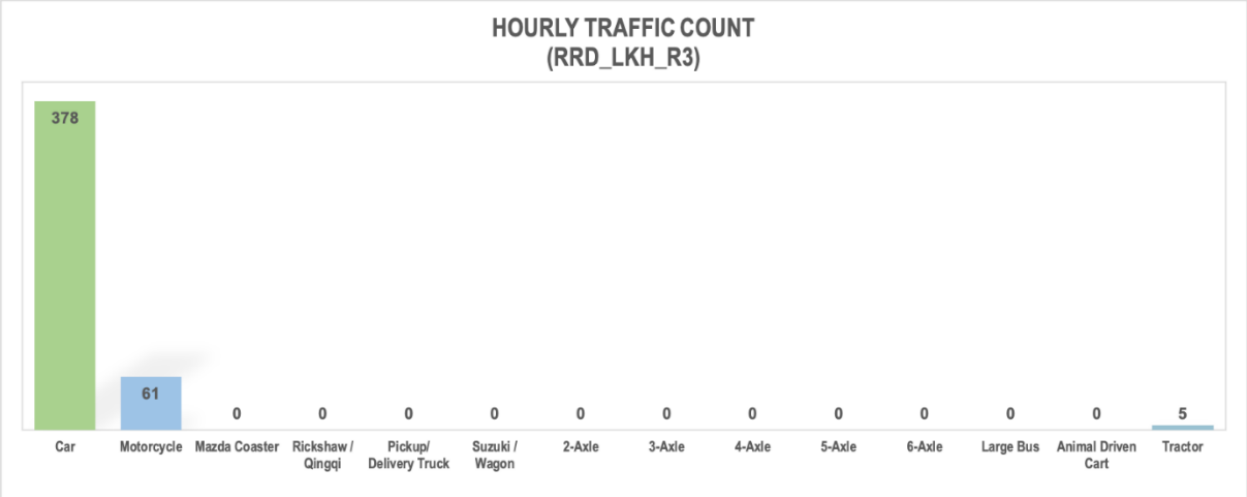


Figure 4.6.10 Vehicle Composition Chart RRD-LKH-R3

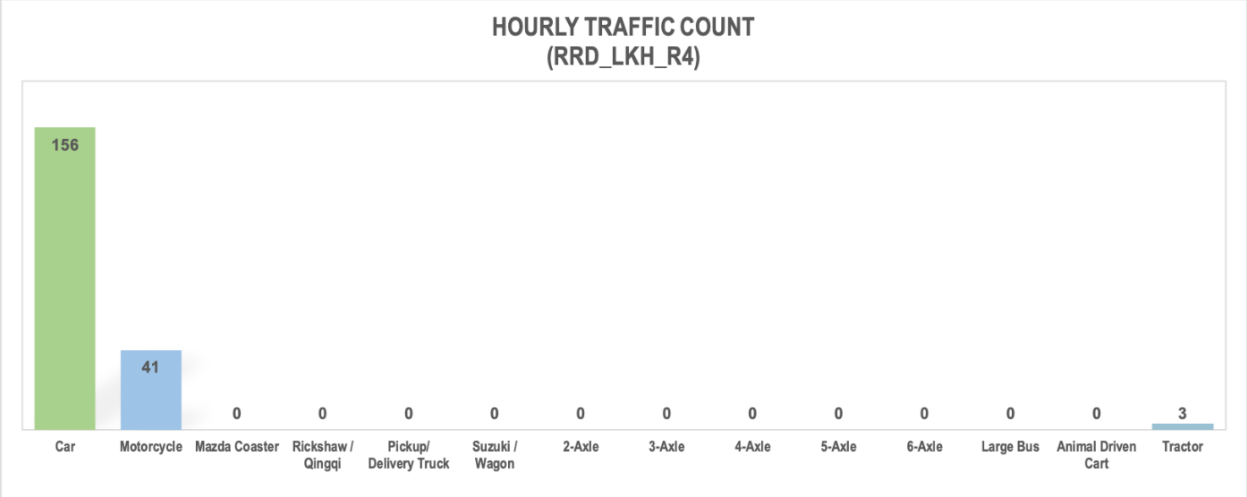


Figure 4.6.11 Vehicle Composition Chart RRD-LKH-R4

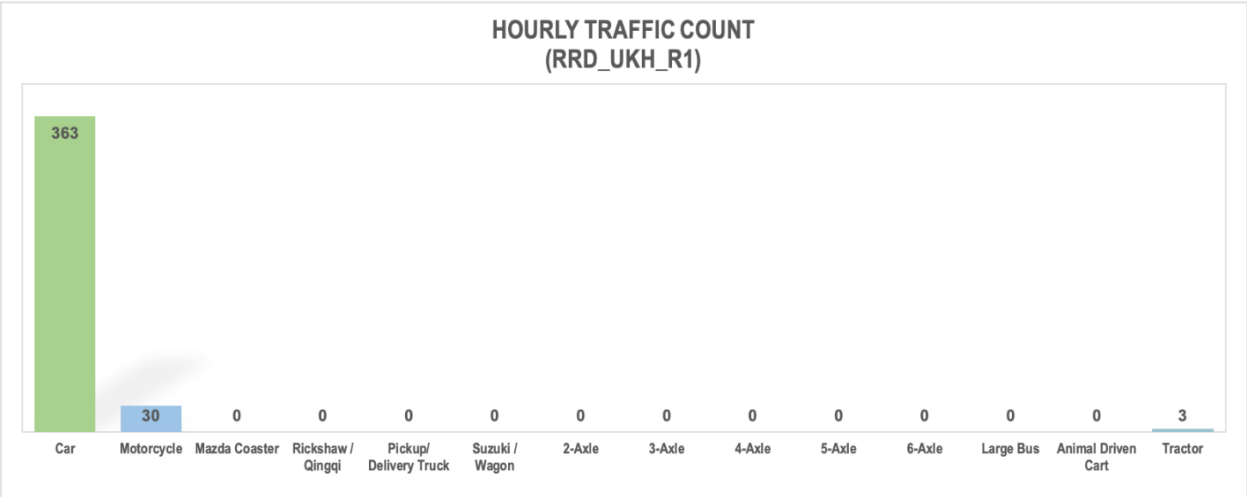


Figure 4.6.12 Vehicle Composition Chart RRD-UKH-R1

Most of the vehicles on the subject roads are Cars and Motorcycles. This Vehicle Composition can be attributed to the rural area type of the considered roads. Most of the people travel on these roads in their personal cars or motorcycles due to lack of proper public transport facilities.

The reason we have cars and motorcycles as the majority constituents of the vehicle mix, is because of the diversity of the road users utilizing the facility. Those people that have the available resources and own a car or motorcycle are reluctant of using public transport due to the poor services and condition of vehicles, whereas those people who do not own a private car or motorcycle have no other option then using public transport that constitutes of rickshaws and Suzuki/Wagons as seen in some roads.

4.6.6.3 Traffic Analysis Forecast

ADT:

The ADT Base Year is 2022 and ADT Forecast year is 2032 as can be seen in the table below.

The following table represents the annual daily traffic forecast (10 years).

Table 4.6.5 Forecast ADT of Flood Affected Roads District Kohistan

Road ID	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
RRD_LKH_R1	**419**	440	462	485	509	534	561	589	619	650	682
RRD_LKH_R2	**709**	744	781	820	861	904	949	997	1,047	1,099	1,154
RRD_LKH_R3	**444**	466	489	514	539	566	595	624	656	688	723
RRD_LKH_R4	**200**	210	221	232	243	255	268	281	295	310	326
RRD_UKH_R1	**200**	210	221	232	243	255	268	281	295	310	326

PCU:

The PCU Base Year is 2022 and PCU Forecast year is 2032 as can be seen in the table below.

Table 4.6.6 Forecast PCUs of Flood Affected Roads District Kohistan

Road ID	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
RRD_LKH_R1	**455**	478	502	527	553	581	610	641	673	706	742
RRD_LKH_R2	**821**	862	905	951	998	1,048	1,101	1,156	1,213	1,274	1,338
RRD_LKH_R3	**428**	450	472	496	520	546	574	602	633	664	697
RRD_LKH_R4	**187**	196	206	216	227	239	250	263	276	290	304
RRD_UKH_R1	**388**	407	427	449	471	495	519	545	573	601	631

4.6.7 Discussion and Analysis

The analysis conducted on these roads indicates that the condition of these roads is affecting the traffic characteristic which consequently influences the access of people to necessities of life. The poor condition of these roads is reflected by the Road Surface Type (RST) and International Roughness Index (IRI) pie charts which indicates that these roads need immediate consideration with respect to construction and rehabilitation. The poor mobility of these roads is indicated by the lower speeds and high travel times. Reconstructing these roads will improve speeds and lower travel times of users.

The utility of these roads in providing access to necessities like education, health, and markets will be enhanced with the improvement in road condition after reconstruction.

CHAPTER 5: TOURISM ROADS TRAFFIC ANALYSIS

5.1 Project Area- Bunner

Bunner is a district in Malakand Division of Khyber Pakhtunkhwa province in Pakistan. Before becoming a district in 1991, it was a tehsil within Swat District. The Bunner Valley lies between Swabi in the South and Swat in the North. It is a mountain valley, dotted with villages and divided into four sub-divisions. The Mora Hills and the Ilam range divide it from the Swat Valley, the Sinawar range from Yusafzai, the Guru mountains from the Mardan Valley, and the Duma range from the Puran Valley.

5.1.1 Tourism Roads in District Bunner

The following roads have been found feasible for Rural Road Development Project in District Bunner.

Table 5.1.1 Tourism Roads District Bunner

#	ID	Road Name	Districts	FL	Type
1	T-1	Rani Ghat	BUNNER	4.0	Tourism

5.1.2 Location Map of Priority Roads

The figure below shows the Location Map of the District Bunner that has eight (8) Access Roads, and two (2) roads have been selected for tourism roads that is T-1 and SWT-20.

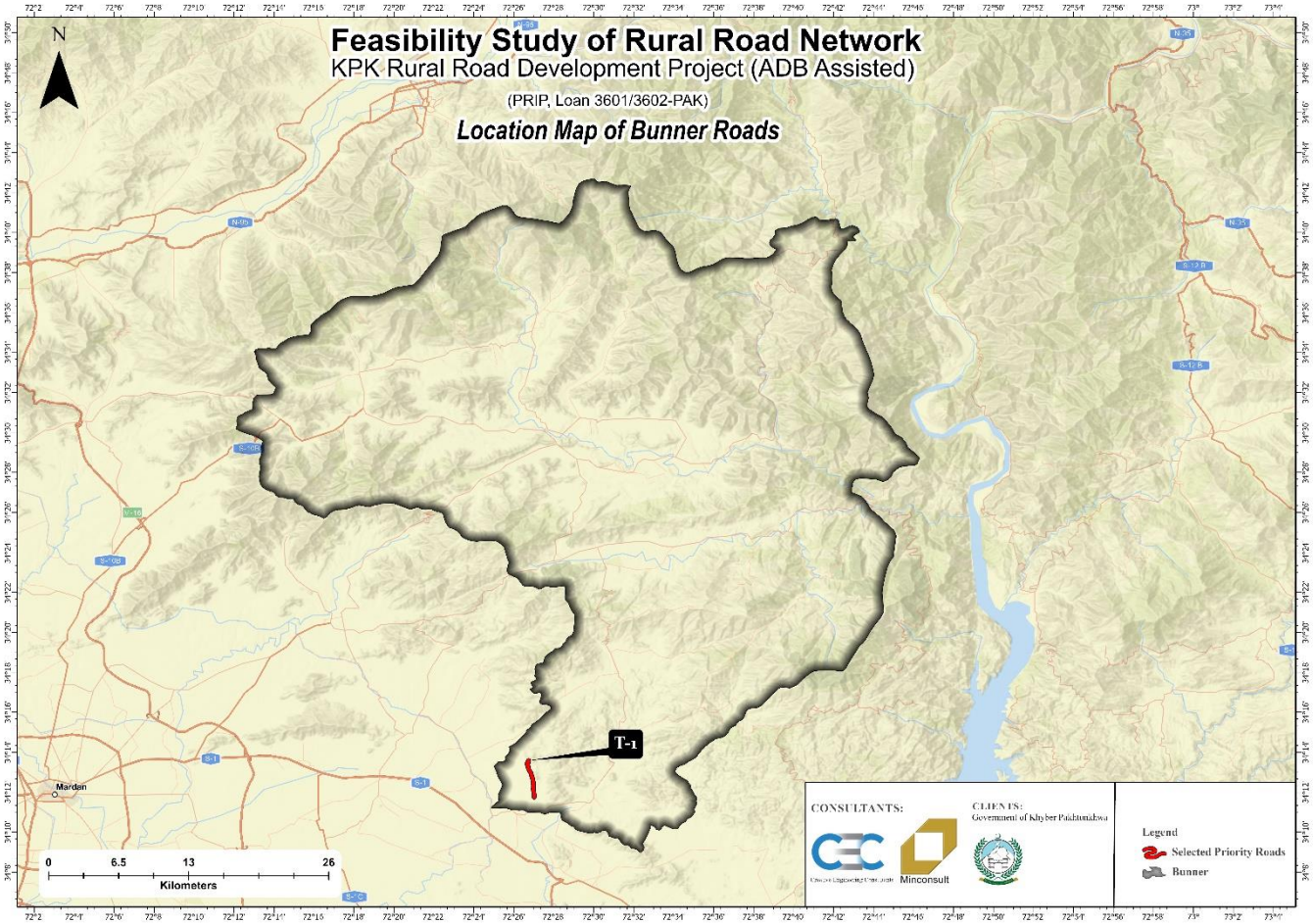


Figure 5.1.1 Location Map District Bunner

5.1.2.1 T-1 (Rani Ghat):

The road connects **Janak** to **Nogram Kili** having length of 4.0 km. Road link along its length also connects areas such as Mughdara, Kas Kooroona etc. Road surrounding environment possess charming countryside scenic view landscapes.

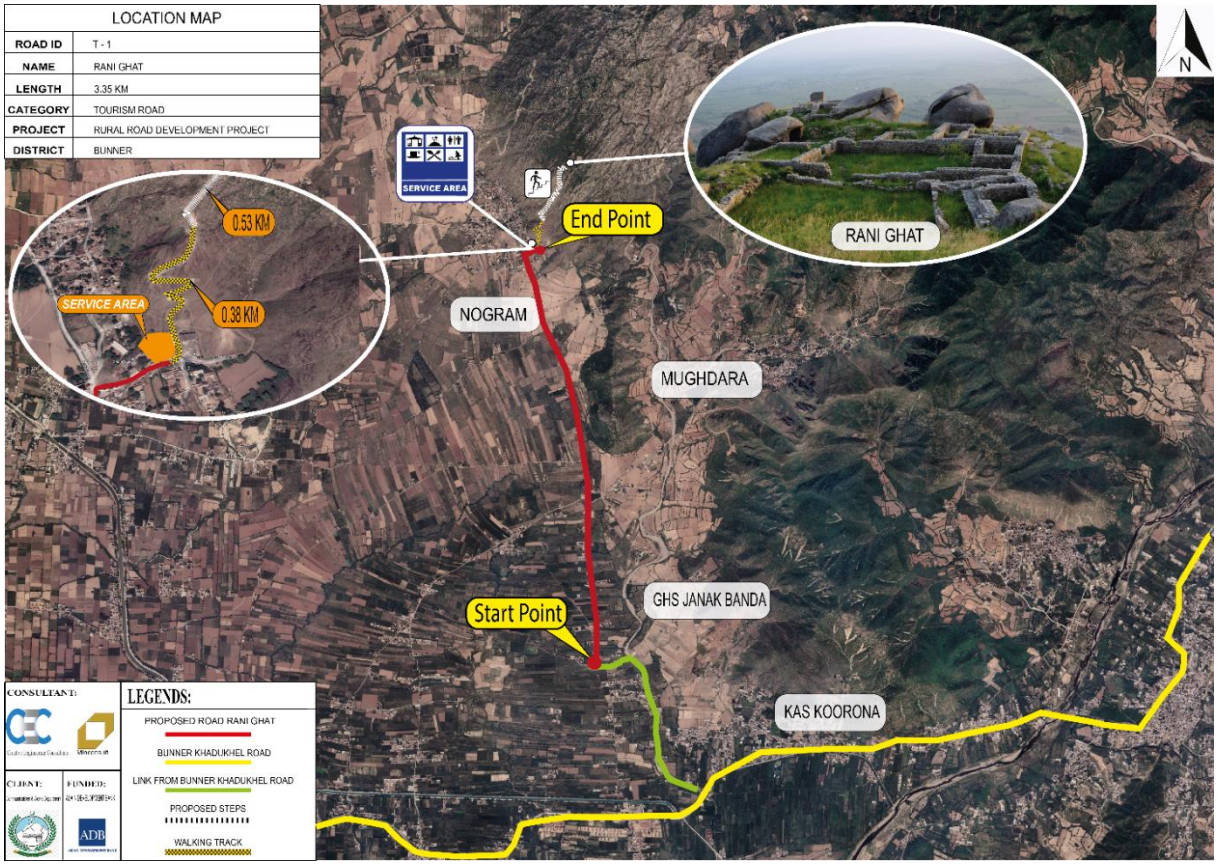


Figure 5.1.2 Location Map T-1

5.1.3 IRI Classification Pie Chart of Selected Roads

The International Roughness Index (IRI) is used by highway professionals throughout the world as a standard to quantify road surface roughness. A poor road surface roughness influences the traffic speeds and times. It also effects the mobility and accesibility of users traversing that road.

The IRI Classification Charts are given below.

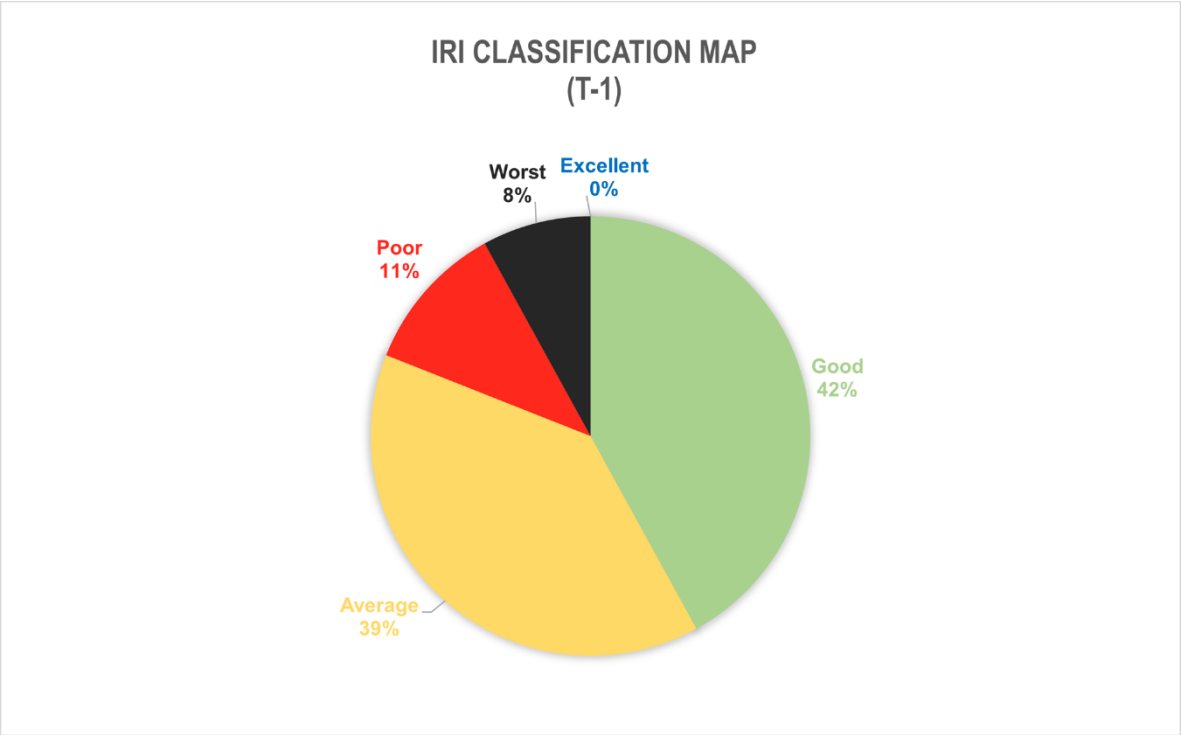


Figure 5.1.3 IRI Classification Charts Tourism Road District Bunner

5.1.4 RST Pie Chart of Selected Roads

Road Surface type (RST) survey was conducted to investigate the actual condition and type of surface of the road under observation. In rural areas earthen or kacha tracks and TST/DST are common that affect the mobility of road users and accessibility to necessities.

The RST Classification Charts are given below.

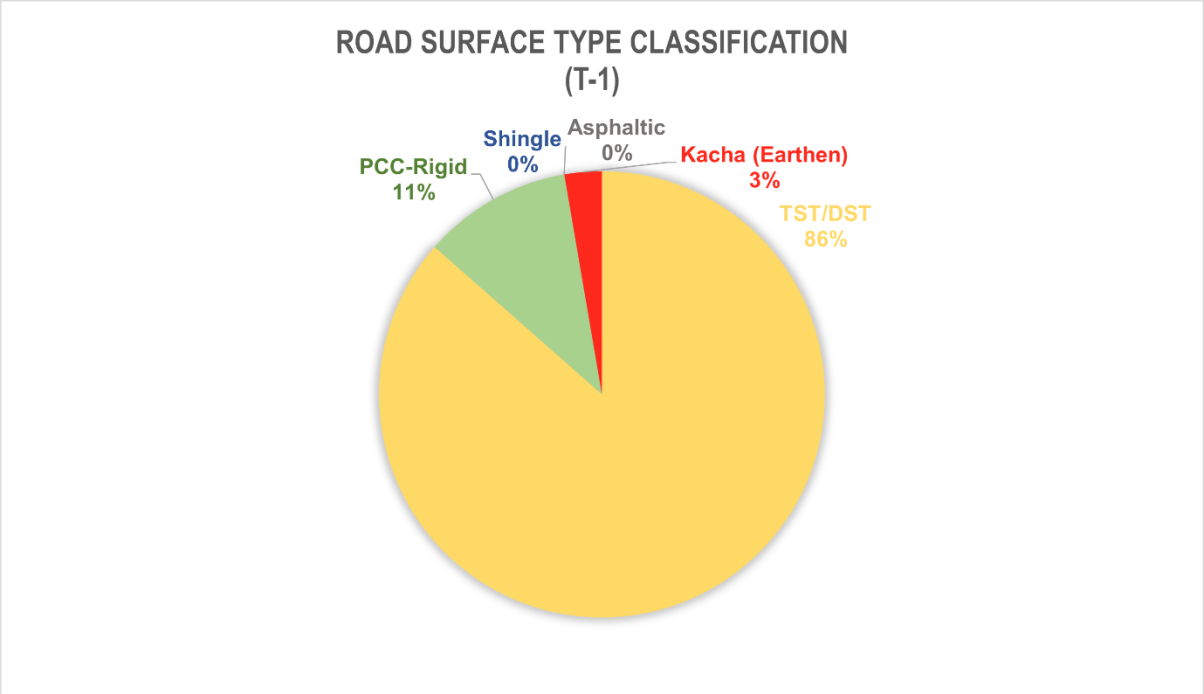


Figure 5.1.4 RST Classification Charts Tourism Road District Bunner

5.1.5 Travel Speed Survey

Table 5.1.2 Travel Speed Survey Tourism Road District Bunner

Road ID	Distance (km)	Total Ascent (m)	Total Descent (m)	Total Time	Average Speed (km/h)	Avg. Moving Speed (km/h)	Maximum Speed (km/h)
T-1	3	36	114	15:20.0	15.34	22.85	27.34

The travel speeds for all roads are low due to the deteriorated road condition which is reflected from the RST and IRI pie charts. Mobility of the road users is affected as indicated by lower average speeds and higher travel times, which can be attributed to the poor road conditions.

It can be inferred from these observations that these roads need to be reconstructed for better mobility and access of people to basic livelihood necessities.

5.1.6 Traffic Analysis

ADT

Table 5.1.3 Existing ADT Tourism Road District Bunner

Vehicle type	Car	Motorcycle	Mazda Coaster	Rickshaw / Qingqi	Pickup/ Delivery T...	Suzuki / Wagon	2-Axle	3-Axle		4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	TOTAL Vehicles
T-1	100	131	4	73	18	15	6	5		0	0	0	0	13	23	386

PCUs

Table 5.1.4 Existing PCUs Tourism Road District Bunner

vehicle type	Car	Motorcycle	Mazda Coaster	Rickshaw / Qingqi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	Total PCUS
T-1	20	63	910	39	8	30	135	138	196	260	24	0	56	90	1968

5.1.6.1 Composition Of Vehicle Types

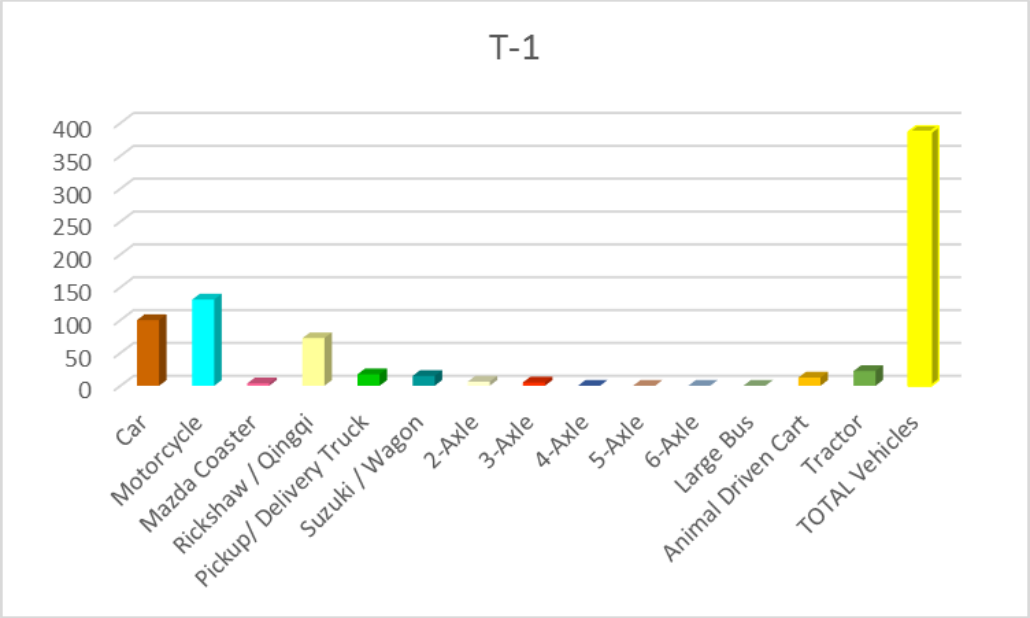


Figure 5.1.5 Vehicle Composition T-1

The bar charts show that the highest proportion of vehicles on the roads are motorcycles and cars.

5.1.6.2 Traffic Analysis Forecast

ADT:

The ADT Base Year is 2022 and ADT Forecast year is 2032 as can be seen in the table below.

The following table represents the annual daily traffic forecast (10 years).

Table 5.1.5 Forecast ADT Tourism Road District Bunner

Year	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
T-1	**386**	406	426	447	469	493	518	543	571	599	629

PCU:

The PCU Base Year is 2022 and PCU Forecast year is 2032 as can be seen in the table below.

Table 5.1.6 Forecast PCUs Tourism Road District Bunner

Year	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
T-1	**459**	482	506	532	558	586	616	646	679	713	748

5.1.7 Discussion and Analysis

The analysis conducted on these roads indicates that the condition of these roads is affecting the traffic characteristic which consequently influences the access of people to necessities of life. The poor condition of these roads is reflected by the Road Surface Type (RST) and International Roughness Index (IRI) pie charts which indicates that these roads need immediate consideration with respect to construction and rehabilitation. The poor mobility of these roads is indicated by the lower speeds and high travel times. Reconstructing these roads will improve speeds and lower travel times of users. The utility of these roads in the tourism sector will be enhanced by reconstructing these roads as more people will prefer to travel on them. This will boost tourism in the region and provide numerous opportunities for the locals in different sectors.

Two roads have been identified as Tourism Roads in District Bunner. The traffic study shows that the existing roads are in deplorable condition. However, due to the attraction of the spots people still tend to reach the locations. The main traffic on the roads is cars and motorcycles as it is not accessible for other types of vehicles. After the completion of the project, it will attract more tourists on the project roads.

5.2 Project Area- Chitral

District Chitral is the largest district in the Khyber-Pakhtunkhwa province of Pakistan, covering an area of 14,850 km². It is a part of the Malakand Division and is the northernmost district of Pakistan. It shares a border with Gilgit-Baltistan to the east, with Kunar, Badakshan and Nuristan provinces of Afghanistan to the north and west, and with the Khyber-Pakhtunkhwa districts of Swat and Dir to the south. A narrow strip of Wakhan Corridor separates Chitral from Tajikistan in the north.

5.2.1 Tourism Roads in District Chitral

The following roads have been found feasible for Rural Road Development Project in District Chitral.

Table 5.2.1 Tourism Roads District Chitral

#	ID	Road Name	Districts	FL (Km)	Type
1	N-CHT-9	Pashty Road, Pret to Pashty Valley	Chitral	17.1	Tourism

5.2.2 Location Map of Priority Roads

All the tourism roads selected for traffic study after scrutinization of the surveyed roads in the district are shown in the figure below.

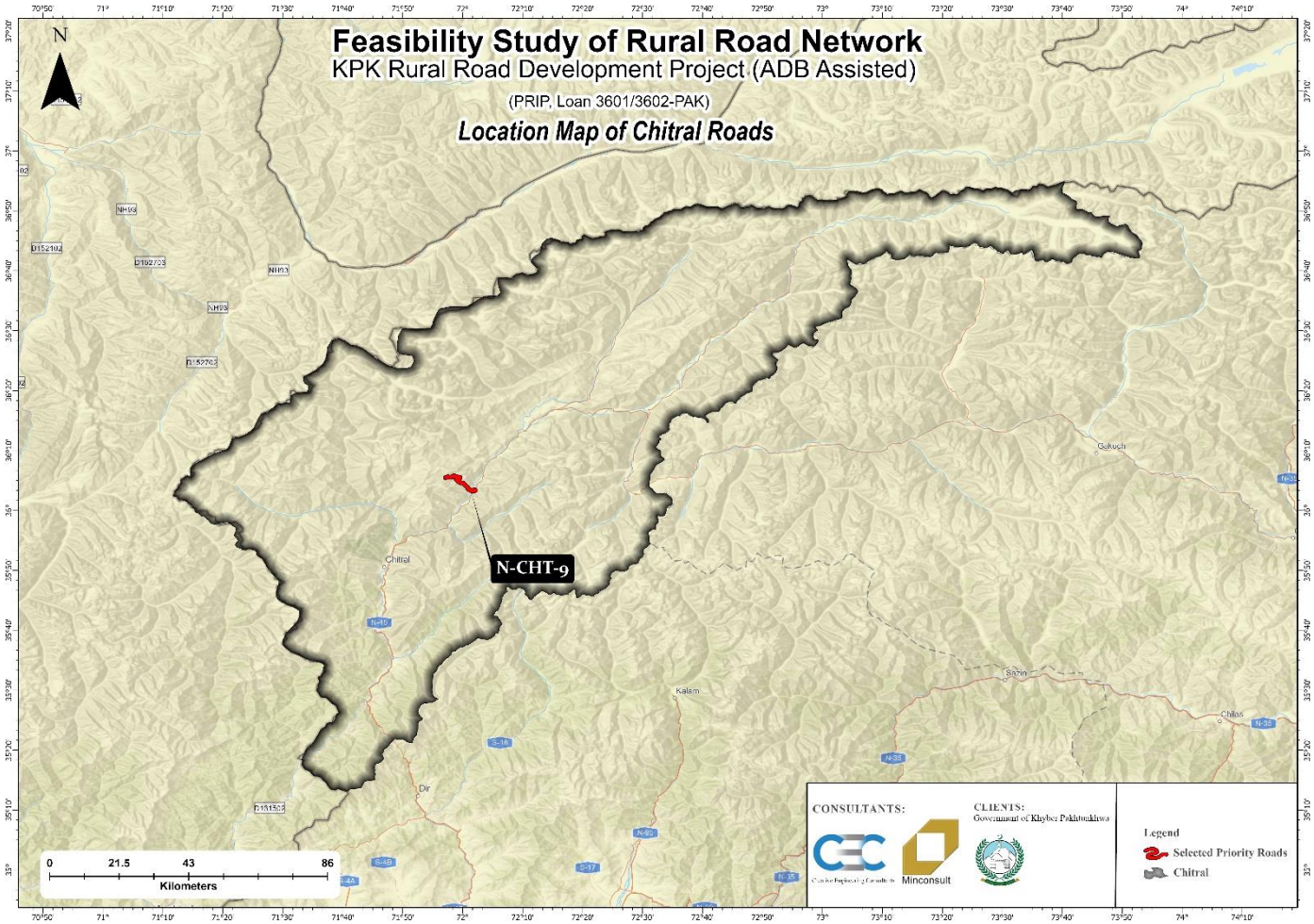


Figure 5.2.1 Location Map District Chitral

5.2.2.1 N-CHT-9 (Pashty Road, Pret to Pashty Valley):

Pashty Road, located in the enchanting District Chitral, is a 17.1-kilometer-long tourism road that offers an unforgettable journey through some of Pakistan's most breathtaking natural landscapes. This road is more than just a means of transportation; it's a gateway to the pristine beauty of Pashty Valley.

The adventure begins near Pret, where Pashty Road branches off from the Chitral-Mastuj Road. As you embark on this scenic route, you'll find yourself immersed in a world of natural wonders. Towering mountains, lush green valleys, and meandering rivers accompany you on your journey, making it a paradise for nature enthusiasts and photographers.

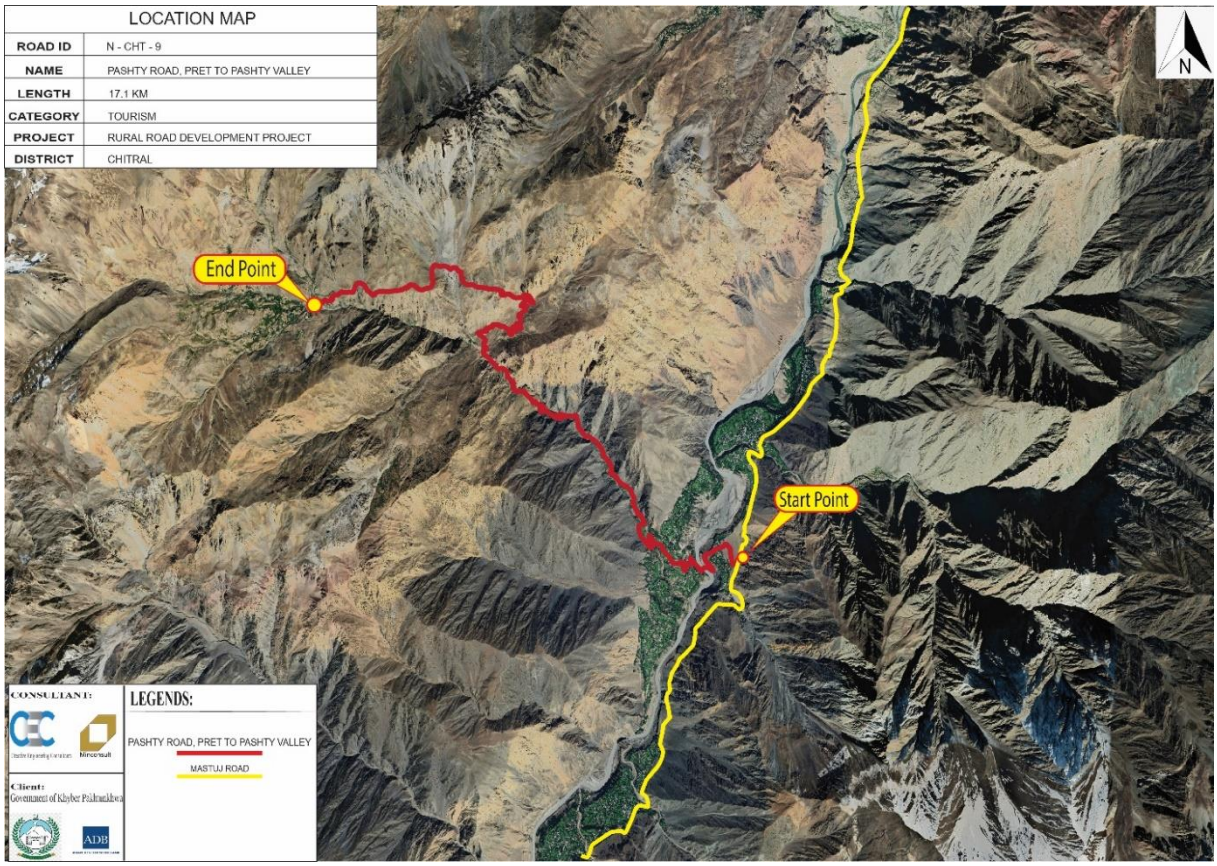


Figure 5.2.2 Location Map N-CHT-9

5.2.3 IRI Classification Pie Chart of Selected Roads

The International Roughness Index (IRI) is used by highway professionals throughout the world as a standard to quantify road surface roughness. A poor road surface roughness influences the traffic speeds and times. It also effects the mobility and accesibility of users traversing that road.

The IRI Classification Charts are given below.

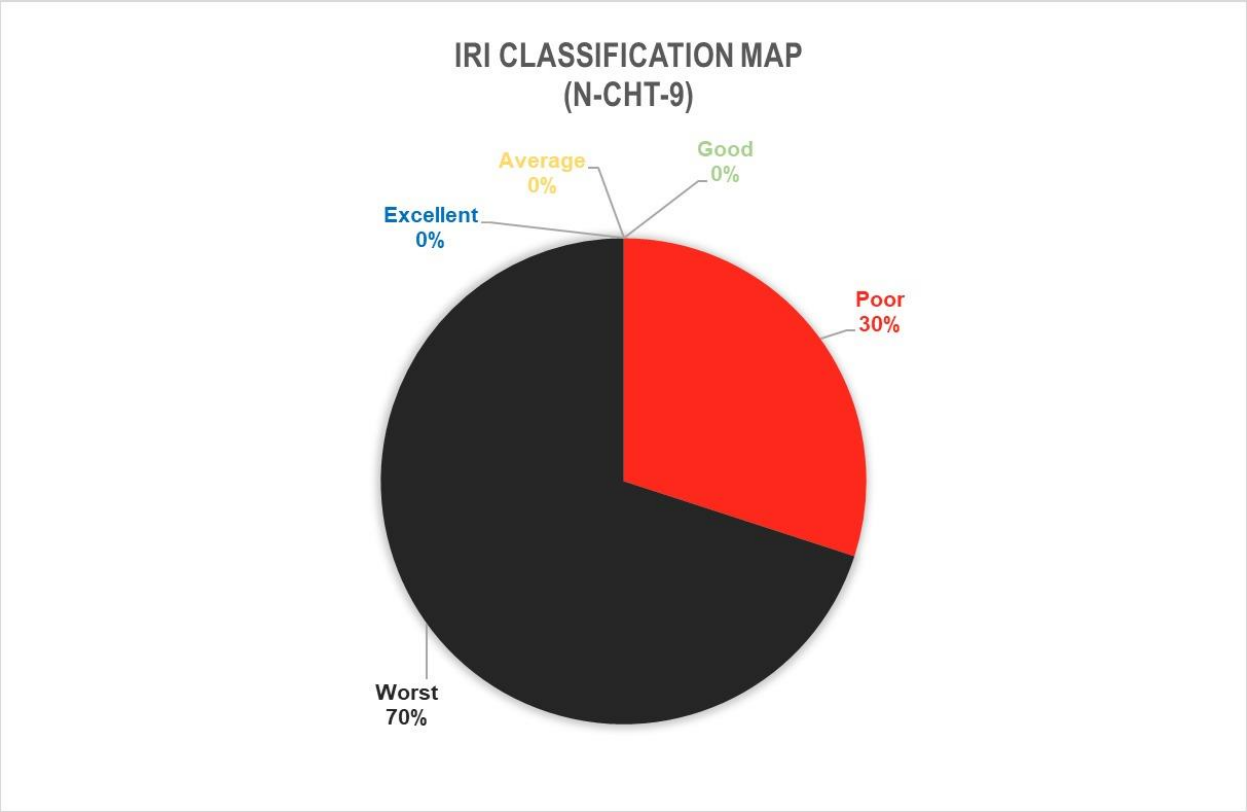


Figure 5.2.3 IRI Classification Charts Tourism Road District Chitral

5.2.4 RST Pie Chart of Selected Roads

Road Surface type (RST) survey was conducted to investigate the actual condition and type of surface of the road under observation. In rural areas earthen or kacha tracks and TST/DST are common that affect the mobility of road users and accessibility to necessities.

The IRI Classification Charts are given below.

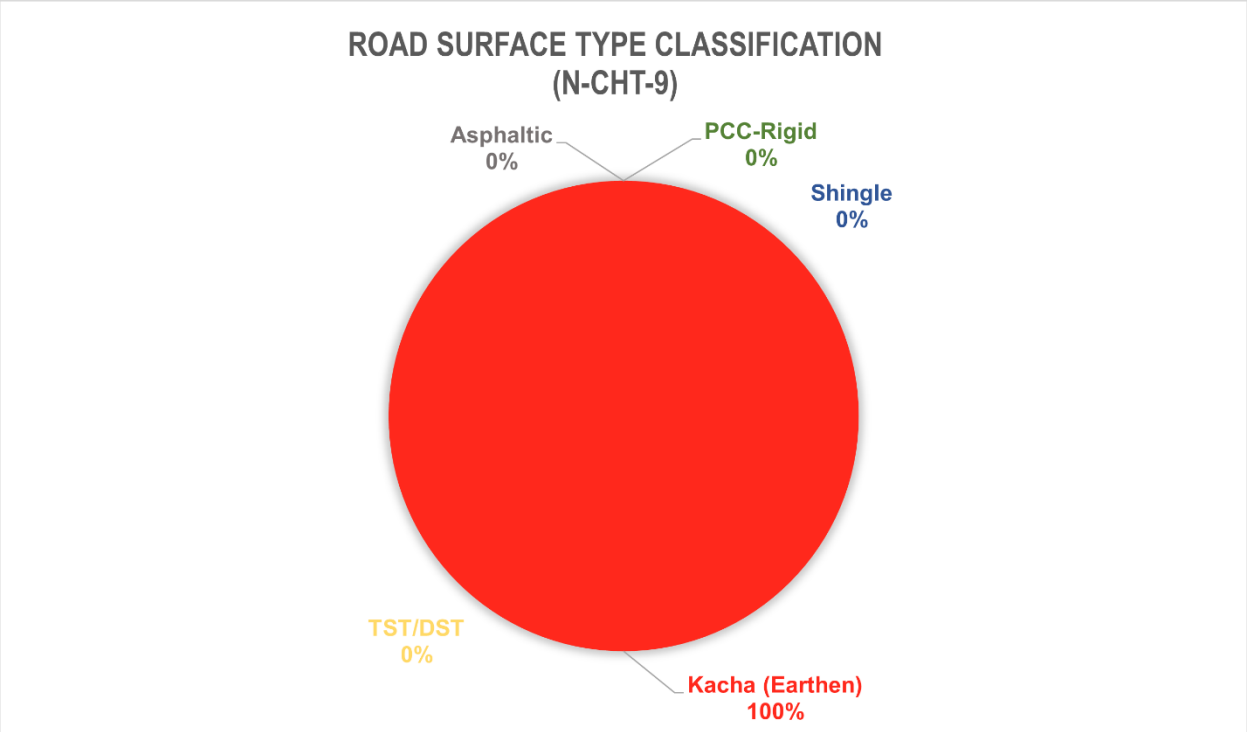


Figure 5.2.4 RST Classification Charts Tourism Road District Chitral

5.2.5 Travel Speed Survey

Table 5.2.2 Travel Speed Survey Tourism Road District Chitral

Road ID	Distance (km)	Total Ascent (m)	Total Descent (m)	Total Time	Average Speed (km/h)	Avg. Moving Speed (km/h)	Maximum Speed (km/h)
N-CHT-9	16.2	171	212	50:56.0	7.5	15.1	26.7

The travel speeds for all roads are low due to the deteriorated road condition which is reflected from the RST and IRI pie charts. Mobility of the road users is affected as indicated by lower average speeds and higher travel times, which can be attributed to the poor road conditions.

It can be inferred from these observations that these roads need to be reconstructed for better mobility and access of people to basic livelihood necessities.

5.2.6 Traffic Analysis

ADT

Table 5.2.3 Existing ADT Tourism Road District Chitral

Road id	Car	Motorcycle	Mazda Coaster	Rickshaw / Qinggi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	TOTAL Vehicles
N-CHT-9	38	130	0	0	12	0	0	0	0	0	0	0	15	2	197

PCUs

Table 5.2.4 Existing PCUs Tourism Road District Chitral

Road ID	Car	Motorcycle	Mazda Coaster	Rickshaw / Qinggi	Pickup/ Delivery [illegible]	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	Tota PCUS
N-CHT-9	38	65	0	0	18	0	0	0	0	0	0	0	68	8	197

5.2.6.1 Composition Of Vehicle Types

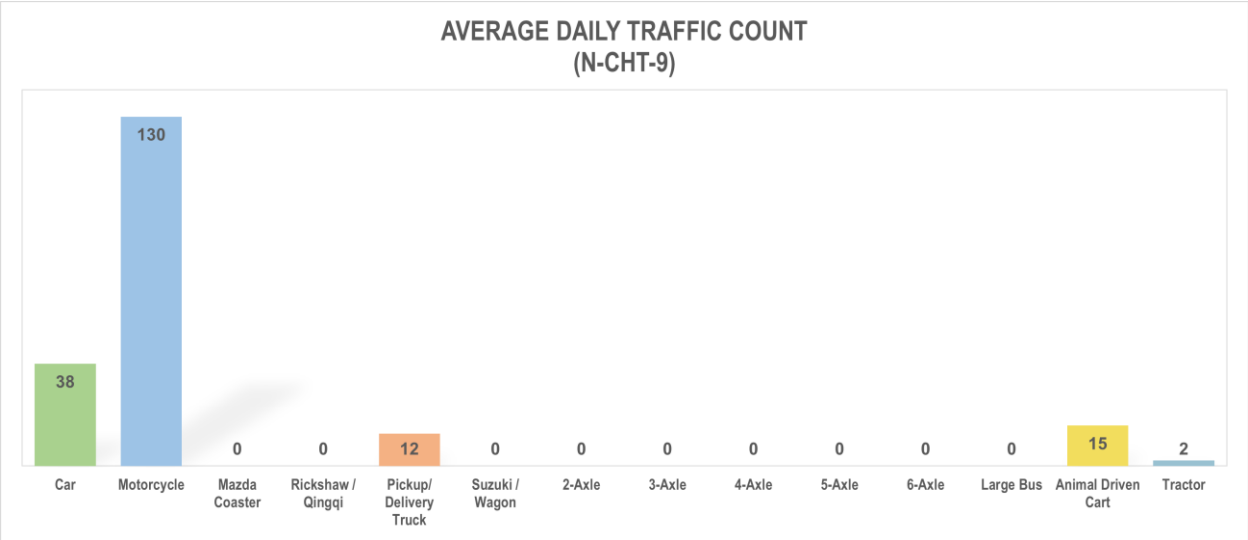


Figure 5.2.5 Vehicle Composition N-CHT-9

Most of the vehicles on the subject roads are Cars and Motorcycles. This Vehicle Composition can be attributed to the rural area type of the considered roads. Most of the people travel on these roads in their personal cars or motorcycles due to lack of proper public transport facilities.

The reason we have cars and motorcycles as the majority constituents of the vehicle mix, is because of the diversity of the road users utilizing the facility. Those people that have the available resources and own a car or motorcycle are reluctant of using public transport due to the poor services and condition of vehicles, whereas those people who do not own a private car or motorcycle have no other option then using public transport that constitutes of rickshaws and Suzuki/Wagons as seen in some roads.

5.2.6.2 Traffic Analysis Forecast

ADT:

The ADT Base Year is 2022 and ADT Forecast year is 2032 as can be seen in the table below.

The following table represents the annual daily traffic forecast (10 years).

Table 5.2.5 Forecast ADT Tourism Road District Chitral

Road ID	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
N-CHT-9	197	207	217	228	239	251	264	277	291	306	321

PCU:

The PCU Base Year is 2022 and PCU Forecast year is 2032 as can be seen in the table below.

Table 5.2.6 Forecast PCUs Tourism Road District Chitral

Road ID	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
N-CHT-9	197	206	217	227	239	251	263	276	290	305	320

5.2.7 Discussion and Analysis

The analysis conducted on these roads indicates that the condition of these roads is affecting the traffic characteristic which consequently influences the access of people to necessities of life. The poor condition of these roads is reflected by the Road Surface Type (RST) and International Roughness Index (IRI) pie charts which indicates that these roads need immediate consideration with respect to construction and rehabilitation. The poor mobility of these roads is indicated by the lower speeds and high travel times. Reconstructing these roads will improve speeds and lower travel times of users. The utility of these roads in the tourism sector will be enhanced by reconstructing these roads as more people will prefer to travel on them. This will boost tourism in the region and provide numerous opportunities for the locals in different sectors.

The traffic study shows that the existing roads are in deplorable condition. However, due to the attraction of the spots people still tend to reach the locations. The main traffic on the roads is cars and motorcycles as it is not accessible for other types of vehicles. After the completion of the project, it will attract more tourists on the project roads.

5.3 Project Area- Dir Lower

Lower Dir is a district in Malakand Division of Khyber Pakhtunkhwa province in Pakistan covering an area of 1583 km². The town of Timergara is the district headquarters. It shares border with upper Dir to the north, Swat to the east and Afghanistan to the west.

5.3.1 Tourism Roads in District Dir Lower

The following roads have been found feasible for Rural Road Development Project in District Dir Lower.

Table 5.3.1 Tourism Roads Dir Lower

#	ID	Road Name	Districts	FL (Km)	Type
1	DRL-4	Ouch Kotigram Local Road	Dir Lower	12.5	Tourism
2	T-3	To Laram Top	Dir Lower	5.7	Tourism

5.3.2 Location Map of Priority Roads

All the tourism roads selected for traffic study after scrutinization of the surveyed roads in the district are shown in the figure below.

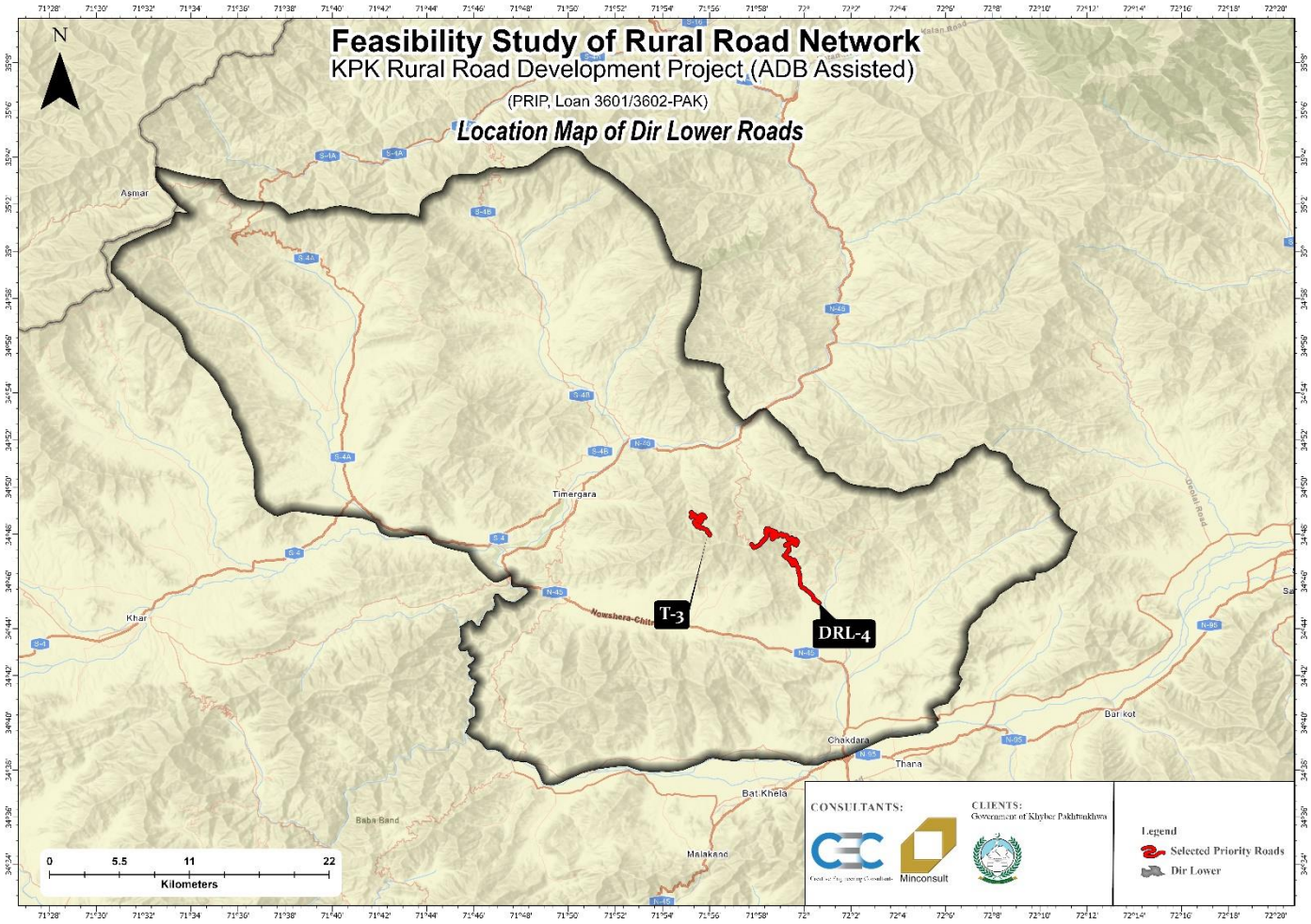


Figure 5.3.1 Location Map Dir Lower

5.3.2.1 DRL-4 (Ouch Kotigram Local Road)

This road is situated in southern part of district lower dir. It provides access to Laram Qilla. The road is used by inhabitants of ouch and Kodigram to reach to Laram top. The length of this road is 12.5 km. Survey conducted to assess road condition shows that the road condition is very poor and has many potholes. More than 50% of the road is in poor to worst condition. About 60% of the road is TST. This road is also susceptible to land sliding.

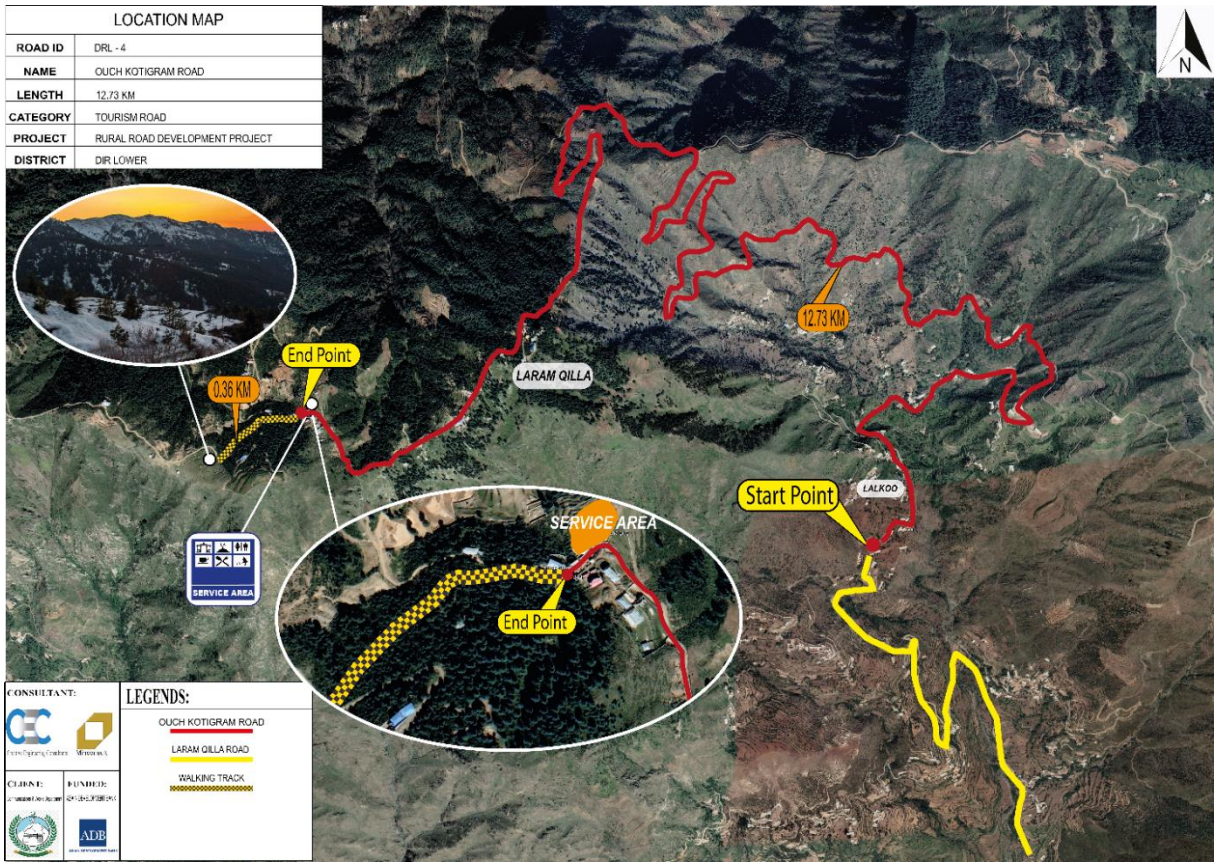


Figure 5.3.2 Location Map DRL-4

5.3.2.2 (T-3) To Laram Top

This road is situated in southern part of district lower dir. This road leads to a tourist spot named Laram top also known as "Laram Sar". It is a hill station in the Lower Dir District of Khyber Pakhtunkhwa, at 30 km from Chakdara and 180 km from Peshawar. It is located at elevation of 7345 ft above the sea level. The length of the road is 5.2 km. Survey conducted to assess road condition shows that the existing condition of the road is very rough with more than 80% of the road in worst condition. More than 70% of the road section is earthen and a small section of approximately 23% of the total road length is asphaltic.

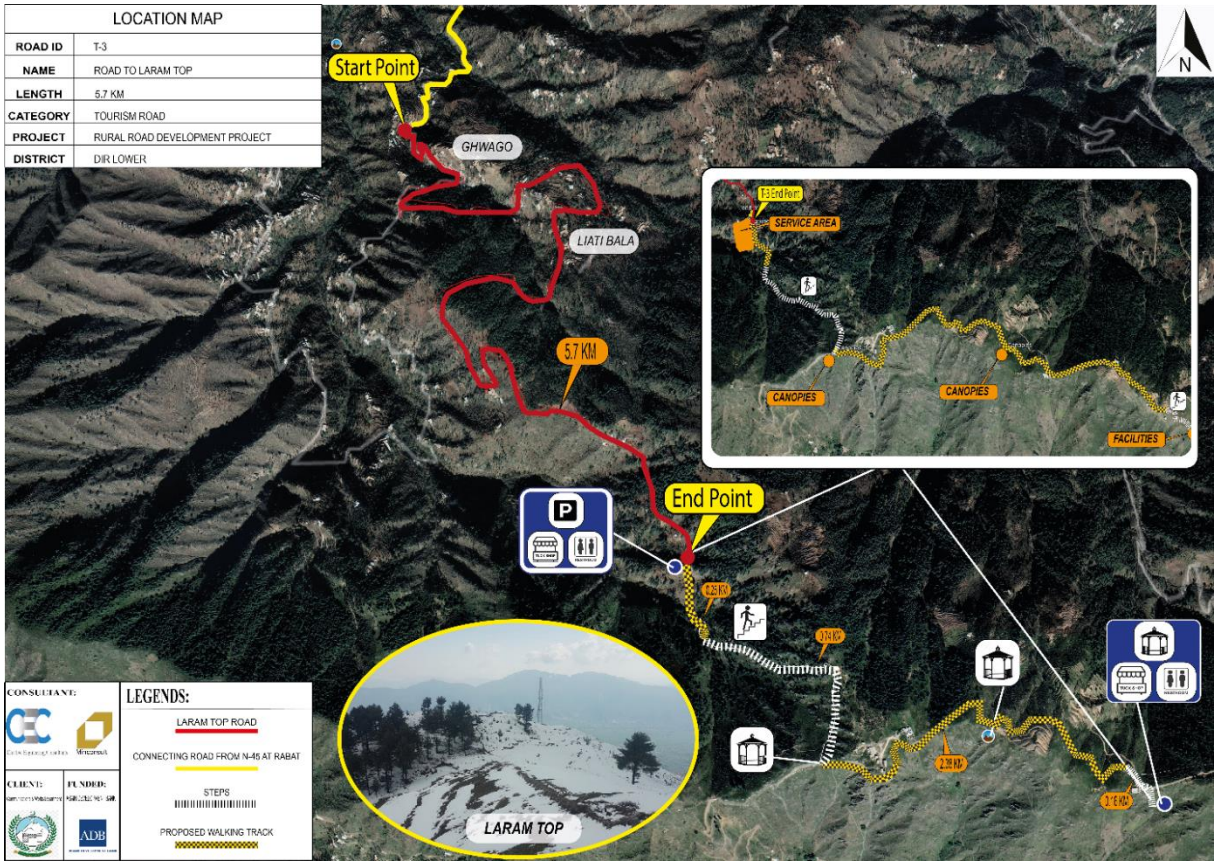


Figure 5.3.3 Location Map T-3

5.3.3 IRI Classification Pie Chart of Selected Roads

The International Roughness Index (IRI) is used by highway professionals throughout the world as a standard to quantify road surface roughness. A poor road surface roughness influences the traffic speeds and times. It also effects the mobility and accesibility of users traversing that road.

The IRI Classification Charts are given below.

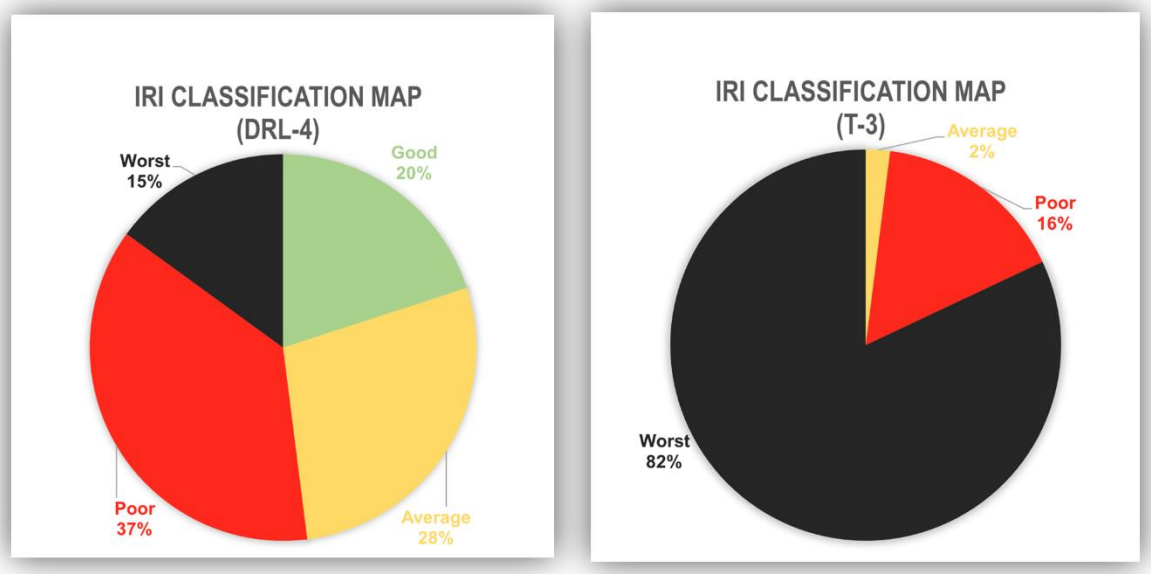


Figure 5.3.4 IRI Classification Charts Tourism Roads District Dir Lower

5.3.4 RST Pie Chart of Selected Roads

Road Surface type (RST) survey was conducted to investigate the actual condition and type of surface of the road under observation. In rural areas earthen or kacha tracks and TST/DST are common that affect the mobility of road users and accessibility to necessities.

The RST Classification Charts are given below.

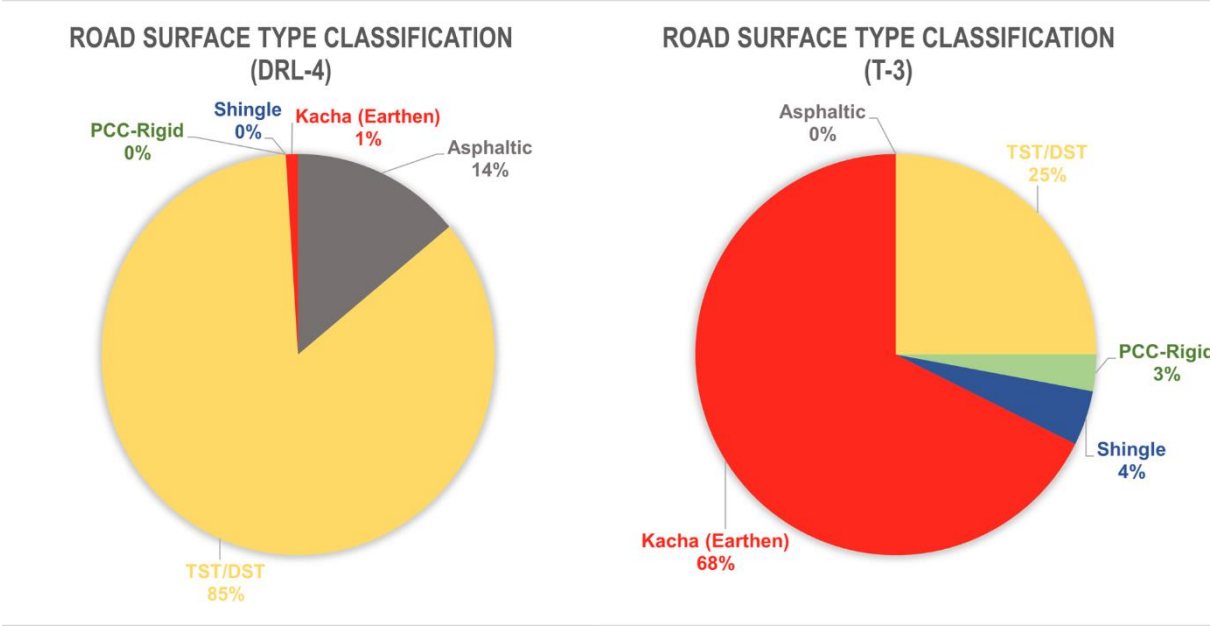


Figure 5.3.5 RST Classification Charts Tourism Roads District Dir Lower

5.3.5 Travel Speed Survey

Table 5.3.2 Travel Speed Survey Tourism Roads District Dir Lower

Road ID	Distance (km)	Total Ascent (m)	Total Descent (m)	Total Time	Average Speed (km/h)	Avg. Moving Speed (km/h)	Maximum Speed (km/h)
T-3	5.7	36	641	43:26.0	7.94	7.98	20.75
DRL-4	12.731	71	1183	58:23.0	15.01	16.24	40.87

The travel speeds for all roads are low due to the deteriorated road condition which is reflected from the RST and IRI pie charts. Mobility of the road users is affected as indicated by lower average speeds and higher travel times, which can be attributed to the poor road conditions.

It can be inferred from these observations that these roads need to be reconstructed for better mobility and access of people to basic livelihood necessities.

5.3.6 Traffic Analysis

ADT

Table 5.3.3 Existing ADT Tourism Roads District Dir Lower

vehicle type	Car	Motorcycle	Mazda Coaster	Rickshaw / Qingqi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	TOTAL Vehicles
T-3	15	28	0	0	0	1	0	3	0	0	0	0	0	4	50
DRL-4	37	21	0	3	6	0	2	0	0	0	0	0	0	5	74

PCUs

Table 5.3.4 Existing PCUs Tourism Roads District Dir Lower

vehicle type	Car	Motorcycle	Mazda Coaster	Rickshaw / Qingqi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	Tota PCUS
T-3	15	14	0	0	0	3	0	8	0	0	0	0	0	15	54
DRL-4	37	11	-	2	9	-	5	-	-	-	-	-	-	20	84

5.3.6.1 Composition Of Vehicle Types

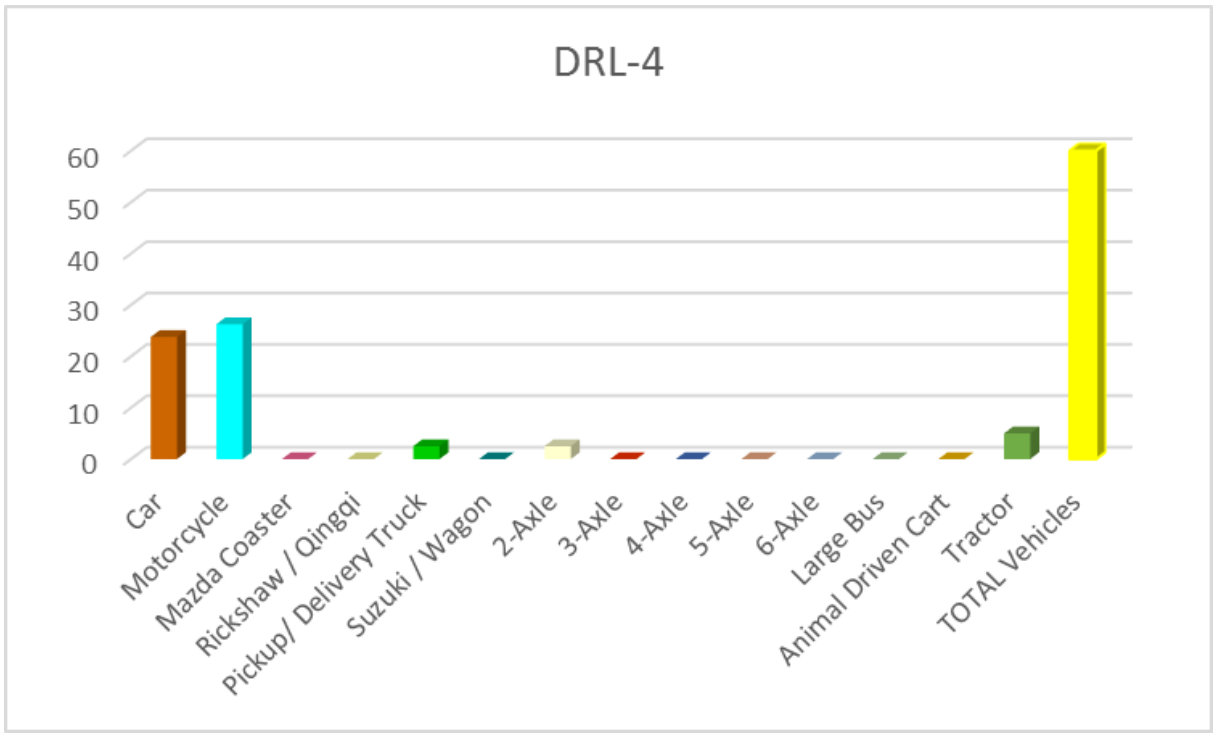


Figure 5.3.6 Vehicle Composition DRL-4

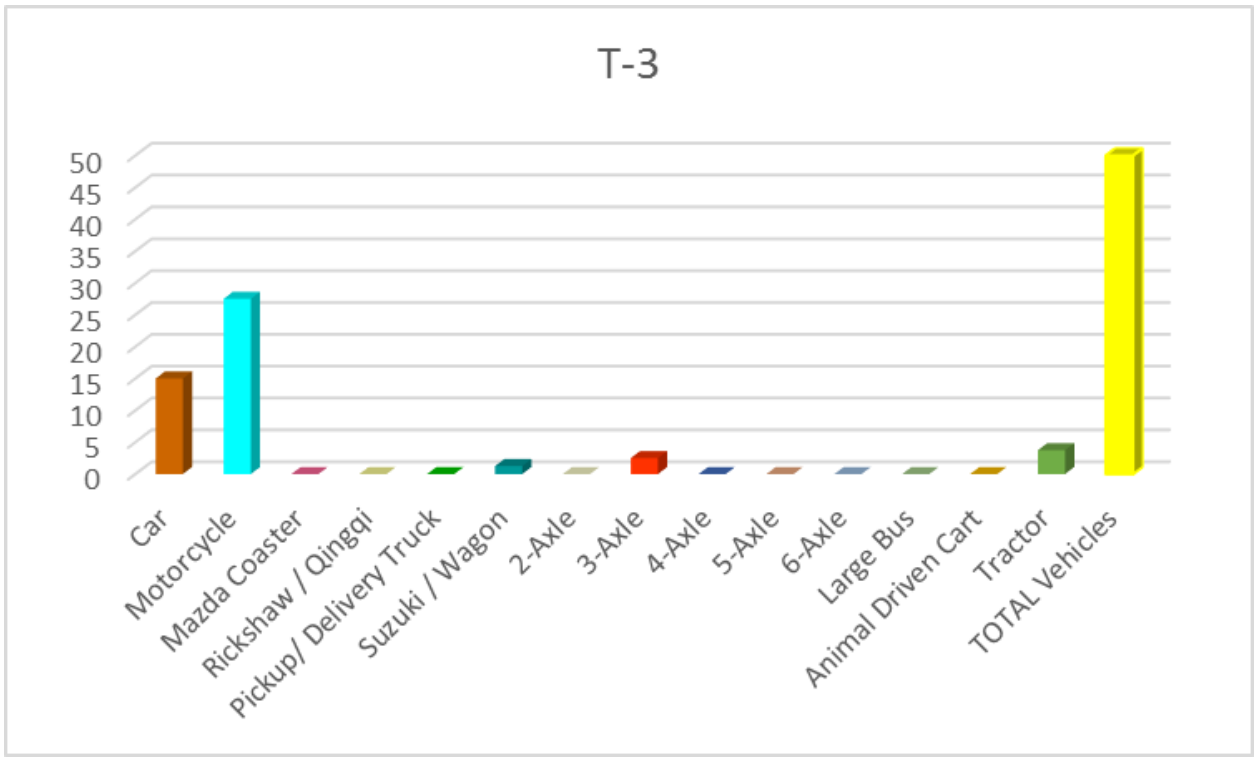


Figure 5.3.7 Vehicle Composition T-3

Most of the vehicles on the subject roads are Cars and Motorcycles. This Vehicle Composition can be attributed to the rural area type of the considered roads. Most of the people travel on these roads in their personal cars or motorcycles due to lack of proper public transport facilities.

The reason we have cars and motorcycles as the majority constituents of the vehicle mix, is because of the diversity of the road users utilizing the facility. Those people that have the available resources and own a car or motorcycle are reluctant of using public transport due to the poor services and condition of vehicles, whereas those people who do not own a private car or motorcycle have no other option then using public transport that constitutes of rickshaws and Suzuki/Wagons as seen in some roads.

5.3.6.2 Traffic Analysis Forecast

ADT:

The ADT Base Year is 2022 and ADT Forecast year is 2032 as can be seen in the table below.

Table 5.3.5 Forecast ADT Tourism Roads District Dir Lower

Year	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
T-3	**50**	53	55	58	61	64	67	70	74	78	81
DRL-4	74	78	82	86	90	94	99	104	109	115	121

PCU:

The PCU Base Year is 2022 and PCU Forecast year is 2032 as can be seen in the table below.

Table 5.3.6 Forecast PCUs Tourism Roads District Dir Lower

Year	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
T-3	**54**	56	59	62	65	69	72	76	79	83	88
DRL-4	**74**	84	88	92	97	102	107	112	118	124	130

5.3.7 Discussion and Analysis

The analysis conducted on these roads indicates that the condition of these roads is affecting the traffic characteristic which consequently influences the access of people to necessities of life. The poor condition of these roads is reflected by the Road Surface Type (RST) and International Roughness Index (IRI) pie charts which indicates that these roads need immediate consideration with respect to construction and rehabilitation. The poor mobility of these roads is indicated by the lower speeds and high travel times. Reconstructing these roads will improve speeds and lower travel times of users. The utility of these roads in the tourism sector will be enhanced by reconstructing these roads as more people will prefer to travel on them. This will boost tourism in the region and provide numerous opportunities for the locals in different sectors.

The traffic study shows that the existing roads are in deplorable condition. However, due to the attraction of the spots people still tend to reach the locations. The main traffic on the roads is cars and motorcycles as it is not accessible for other types of vehicles. After the completion of the project, it will attract more tourists on the project roads.

5.4 Project Area- Dir Upper

Upper Dir District is a district in Malakand Division of Khyber Pakhtunkhwa province in Pakistan covering an area of 3699 sq. km. The city of Dir is the district headquarters. This district is situated in the northern part of Pakistan. It borders Chitral district and Afghanistan on the north and northwest and Swat district to the east, and on the south by Lower Dir District

5.4.1 Tourism Roads in District Dir Upper

The following roads have been found feasible for Rural Road Development Project in District Dir Upper.

Table 5.4.1 Tourism Roads District Dir Upper

#	ID	Road Name	Districts	FL (Km)	Type
1	T-42	Sheen Ghar Top	Dir Upper	16.1	Tourism
2	T-43	Uthror to Thal via Badgoi Top	Dir Upper	20.0	Tourism

5.4.2 Location Map of Priority Roads

All the tourism roads selected for traffic study after scrutinization of the surveyed roads in the district are shown in the figure below.

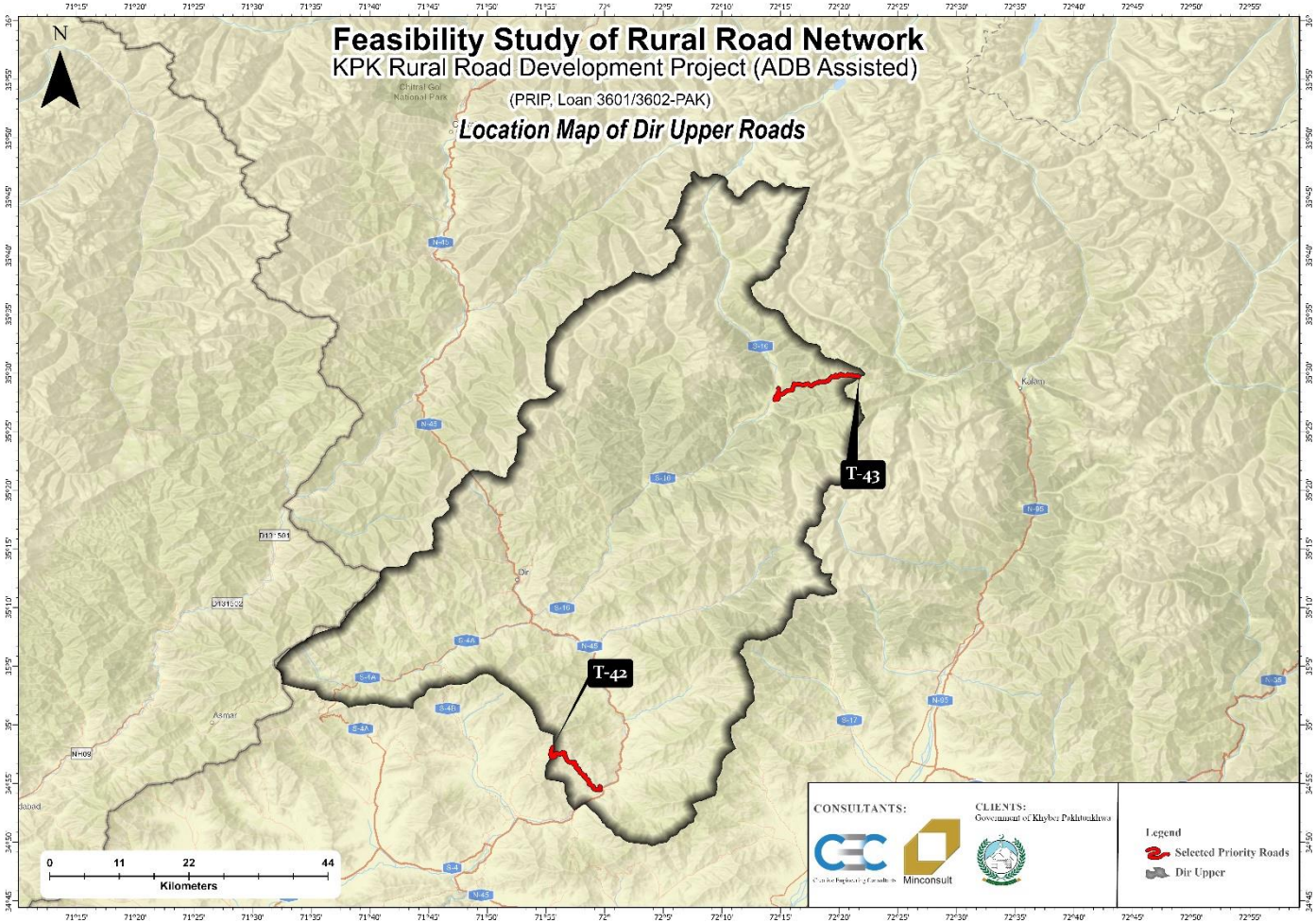


Figure 5.4.1 Location Map Dir Upper

5.4.2.1 T-42 (Sheen Ghar Top)

This road is situated in southern part of district upper dir. This road connects Shalfalam and Sheenghar top. This road provides access to Sheenghar top which is a tourist destination and provides economic opportunities to the locals. The length of the road is 18 km. Survey conducted to assess road condition shows that 100% of the road is in worst condition. The road surface type is 20% asphaltic, 36% TST, 4% PCC and 41% earthen.

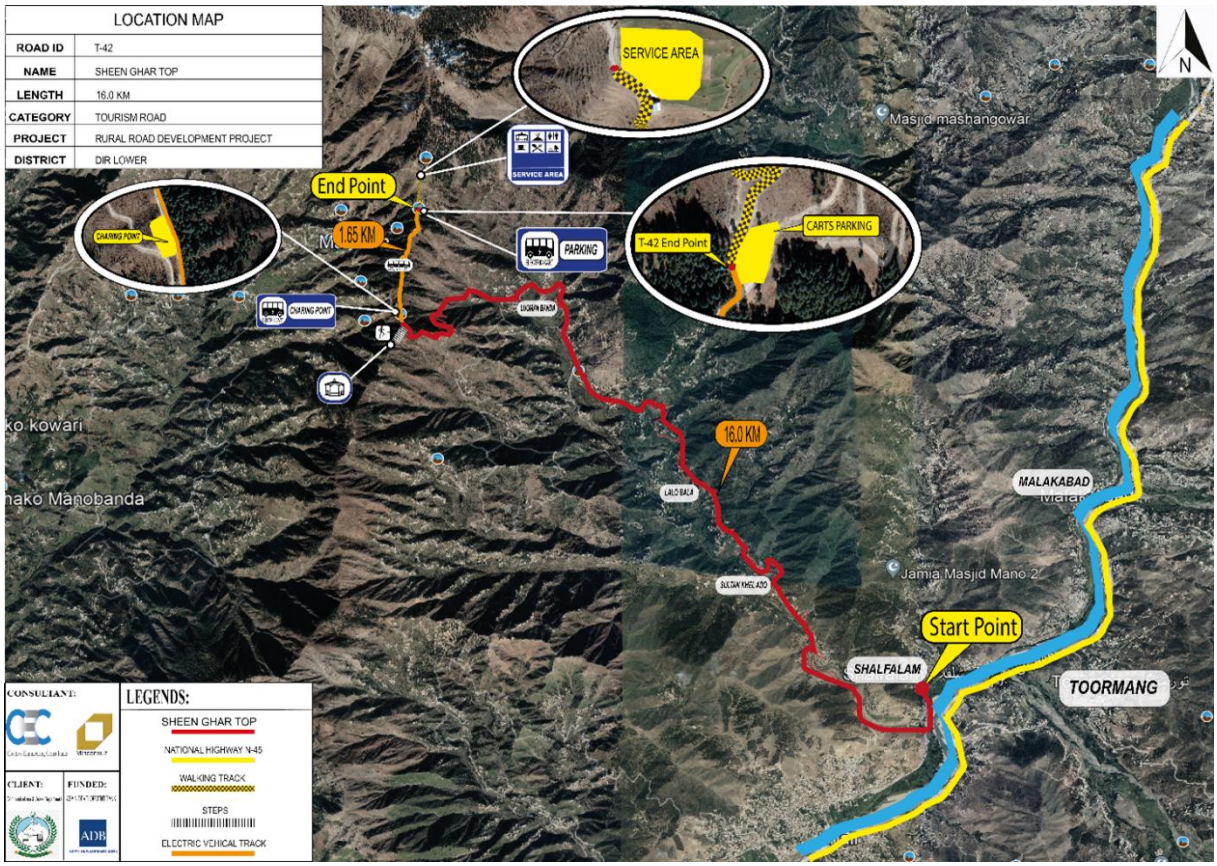


Figure 5.4.2 Location Map T-42

5.4.2.2 T-43 (Uthror to Thal via Badgoi Top)

The Dir Upper portion of the Uthror to Thal via Badgoi Top Road spans 20 km, offering a captivating journey through the pristine landscapes of District Dir. This section of the road continues the adventure that began in Swat, showcasing Dir's scenic beauty and cultural heritage.

Starting at the Swat-Dir border, the road takes you deeper into the heart of Dir district, a region known for its lush green valleys and rugged mountains. As you travel along this 20 km stretch, you'll be greeted by the natural wonders that make Dir such a sought-after destination for nature enthusiasts and adventure seekers.

The Uthror to Thal via Badgoi Top Road serves as a vital link between these two culturally rich districts, facilitating not only tourism but also trade and connectivity for the local communities. It's an invitation to explore the hidden gems of Dir Upper and experience the warm hospitality of its people.Embark on this scenic journey, and let Dir Upper's natural splendor unfold before you, creating lasting memories of your visit to this enchanting region.

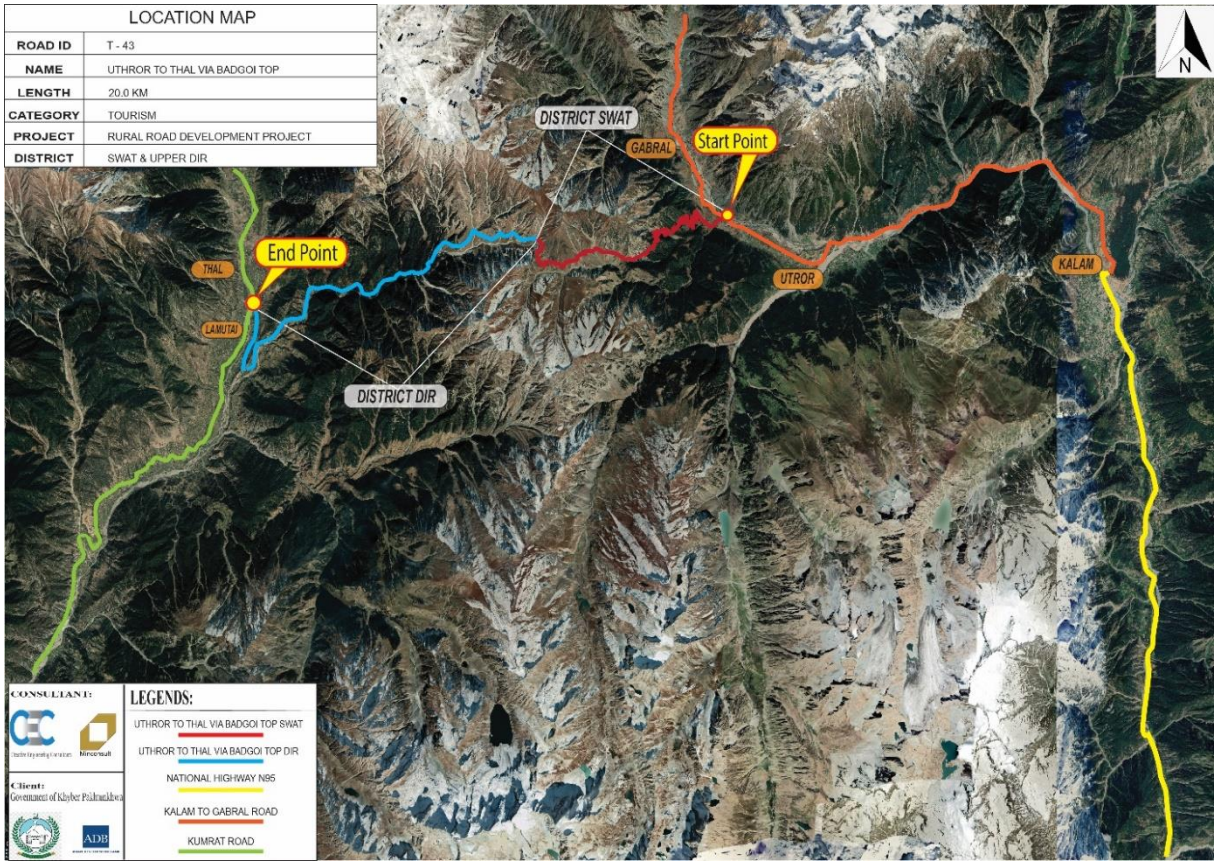


Figure 5.4.3 Location Map T-42

5.4.3 IRI Classification Pie Chart of Selected Roads

The International Roughness Index (IRI) is used by highway professionals throughout the world as a standard to quantify road surface roughness. A poor road surface roughness influences the traffic speeds and times. It also effects the mobility and accesibility of users traversing that road.

The IRI Classification Charts are given below.

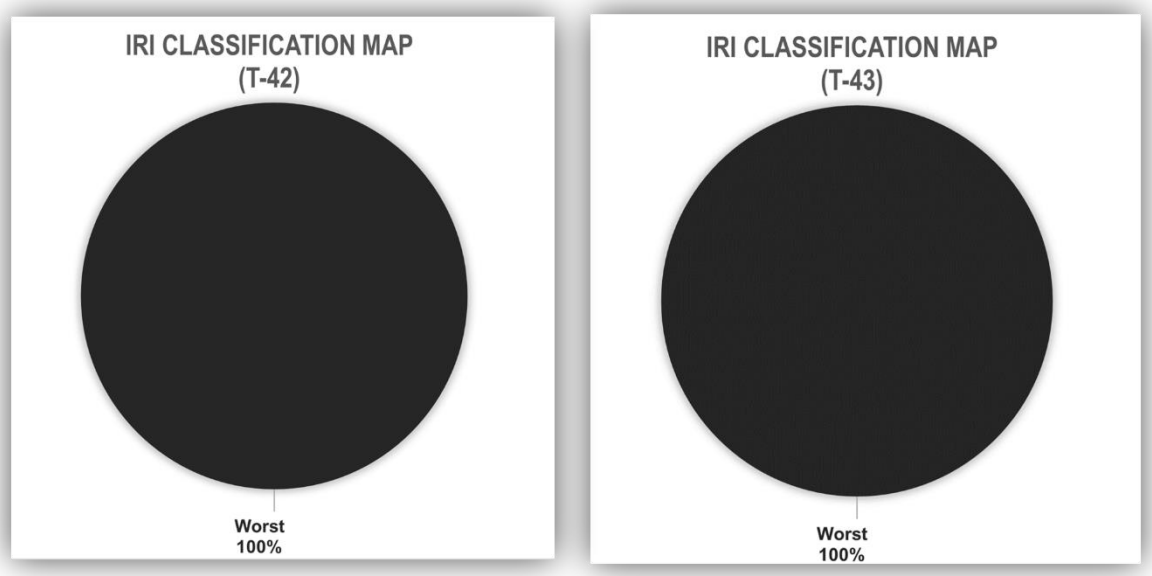


Figure 5.4.4 IRI Classification Charts Tourism Roads District Dir Upper

5.4.4 RST Pie Chart of Selected Roads

Road Surface type (RST) survey was conducted to investigate the actual condition and type of surface of the road under observation. In rural areas earthen or kacha tracks and TST/DST are common that affect the mobility of road users and accessibility to necessities.

The RST Classification Charts are given below.

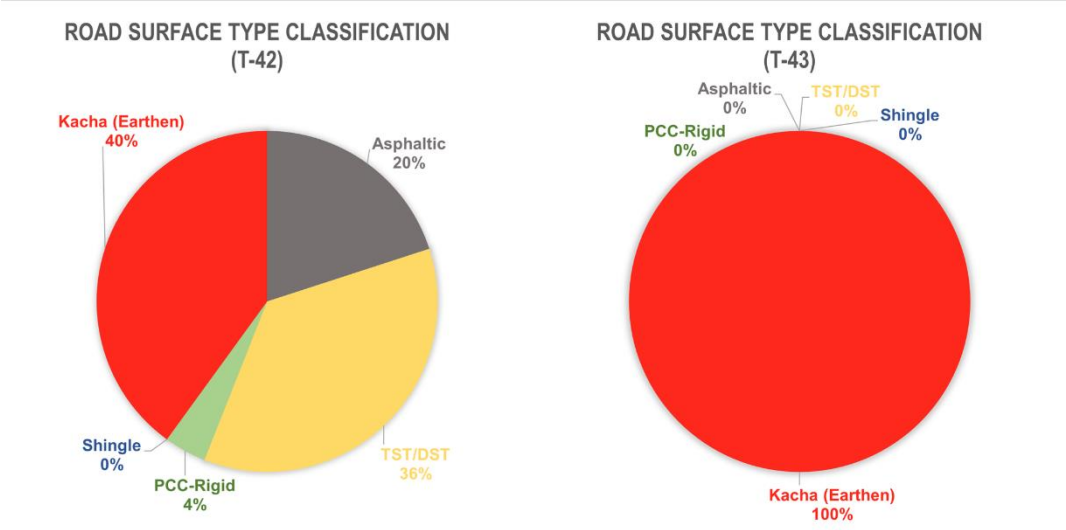


Figure 5.4.5 RST Classification Charts Tourism Roads District Dir Upper

5.4.5 Travel Speed Survey

Table 5.4.2 Travel Speed Survey Tourism Roads District Dir Upper

Road ID	Distance (km)	Total Ascent (m)	Total Descent (m)	Total Time	Average Speed (km/h)	Avg. Moving Speed (km/h)	Maximum Speed (km/h)
T-42	16	68	221	35:32.0	20.45	20.45	32.1
T-43	19.3	71	225	40:38.0	19.20	20.31	29.1

The travel speeds for all roads are low due to the deteriorated road condition which is reflected from the RST and IRI pie charts. Mobility of the road users is affected as indicated by lower average speeds and higher travel times, which can be attributed to the poor road conditions.

It can be inferred from these observations that these roads need to be reconstructed for better mobility and access of people to basic livelihood necessities.

5.4.6 Traffic Analysis

ADT

Table 5.4.3 Existing ADT Tourism Roads District Dir Upper

Road ID	Car	Motorcycle	Mazda Coaster	Rickshaw / Qinggi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	TOTAL Vehicles
T-42	20	35	0	0	0	3	0	3	0	0	0	0	0	3	63
T-43	0	0	0	0	30	0	0	0	0	0	0	0	0	10	40

PCUs

Table 5.4.4 Existing PCUs Tourism Roads District Dir Upper

Road ID	Car	Motorcycle	Mazda Coaster	Rickshaw / Qinggi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	Total PCUS
T-42	20	18	0	0	0	6	0	9	0	0	0	0	0	12	65
T-43	0	0	0	0	45	0	0	0	0	0	0	0	0	40	85

5.4.6.1 Composition Of Vehicle Types

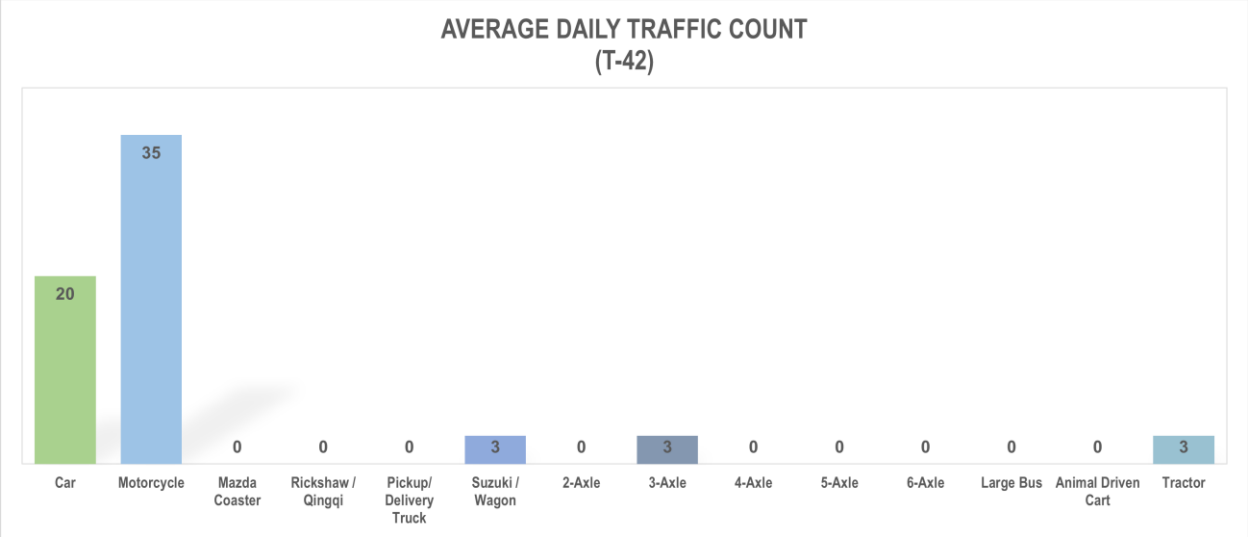


Figure 5.4.6 Vehicle Composition T-42

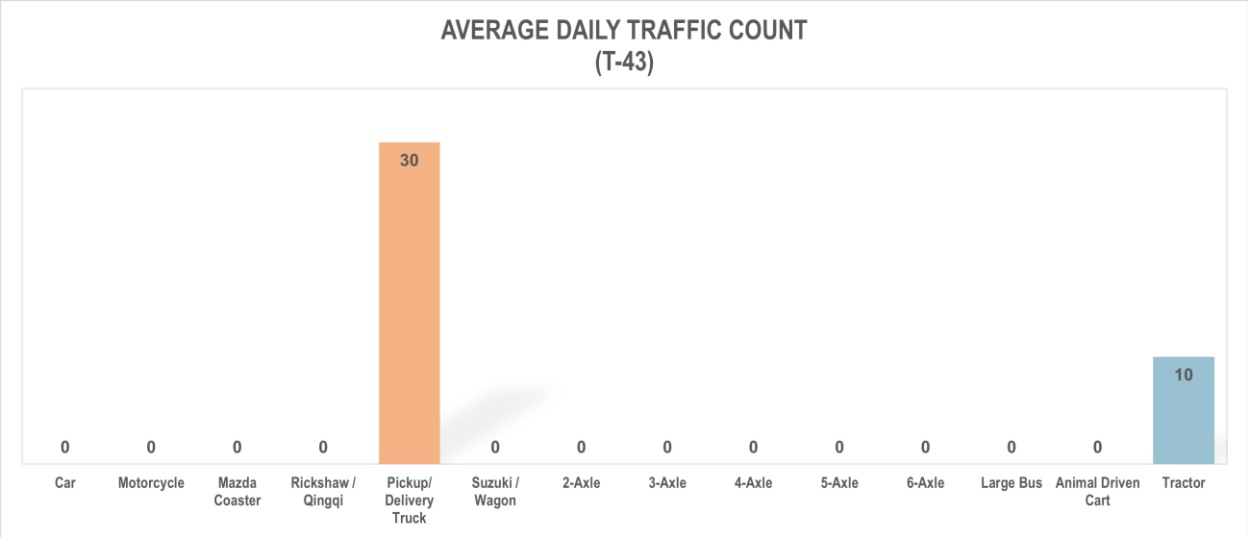


Figure 5.4.7 Vehicle Composition T-43

Most of the vehicles on the subject roads are Cars and Motorcycles. This Vehicle Composition can be attributed to the rural area type of the considered roads. Most of the people travel on these roads in their personal cars or motorcycles due to lack of proper public transport facilities.

The reason we have cars and motorcycles as the majority constituents of the vehicle mix, is because of the diversity of the road users utilizing the facility. Those people that have the available resources and own a car or motorcycle are reluctant of using public transport due to the poor services and condition of vehicles, whereas those people who do not own a private car or motorcycle have no other option then using public transport that constitutes of rickshaws and Suzuki/Wagons as seen in some roads.

5.4.6.2 Traffic Analysis Forecast

ADT:

The ADT Base Year is 2022 and ADT Forecast year is 2032 as can be seen in the table below.

The following table represents the annual daily traffic forecast (10 years).

Table 5.4.5 ADT Forecast Tourism Roads District Dir Upper

Road ID	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
T-42	64	67	71	74	78	82	86	90	95	99	104
T-43	40	42	44	46	49	51	54	56	59	62	65

PCU:

The PCU Base Year is 2022 and PCU Forecast year is 2032 as can be seen in the table below.

Table 5.4.6 PCU Forecast Tourism Roads District Dir Upper

Road ID	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
T-42	65	68	71	75	78	82	86	91	95	100	105
T-43	85	89	94	98	103	108	114	120	126	132	138

5.4.7 Discussion and Analysis

The analysis conducted on these roads indicates that the condition of these roads is affecting the traffic characteristic which consequently influences the access of people to necessities of life. The poor condition of these roads is reflected by the Road Surface Type (RST) and International Roughness Index (IRI) pie charts which indicates that these roads need immediate consideration with respect to construction and rehabilitation. The poor mobility of these roads is indicated by the lower speeds and high travel times. Reconstructing these roads will improve speeds and lower travel times of users. The utility of these roads in the tourism sector will be enhanced by reconstructing these roads as more people will prefer to travel on them. This will boost tourism in the region and provide numerous opportunities for the locals in different sectors.

The traffic study shows that the existing roads are in deplorable condition. However, due to the attraction of the spots people still tend to reach the locations. The main traffic on the roads is cars and motorcycles as it is not accessible for other types of vehicles. After the completion of the project, it will attract more tourists on the project roads.

5.5 Project Area- Haripur

Haripur is the main city of the Haripur District in Hazara, Khyber Pakhtunkhwa in Pakistan, with Swabi and Bunner to the west, some65 km north of Islamabad and 35 km Khanpur Road Tofkian Valley Taxila and 35 km south of Abbottabad. It is in a hilly plain area at an altitude of 520 m. Before becoming a district in 1991, Haripur had the status of a tehsil in Abbottabad District. Its headquarters is the city of Haripur. At the time of the 2017 census the district had a population of 1,001,515, of which 498,202 were males and 503,266 females. The rural population was 868,415 (86.71%) while the urban population was 133,100 (13.29%). 1,193 people in the district were from religious minorities, mainly Christians.

5.5.1 Priority Roads in District Haripur

The following roads have been found feasible for Rural Road Development Project in District Haripur.

Table 5.5.1 Tourism Roads in District Haripur

#	ID	Road Name	Districts	FL (Km)	Type
1	T-35	Nara Akhoonkhail Waterfall	Haripur	9.0	Tourism
2	T-7	Noori Waterfall	Haripur	5.3	Tourism
1	HRI-17	Anar Gah	Haripur	4.1	Tourism

5.5.2 Location Map of Priority Roads

All the tourism roads selected for traffic study after scrutinization of the surveyed roads in the district are shown in the figure below.

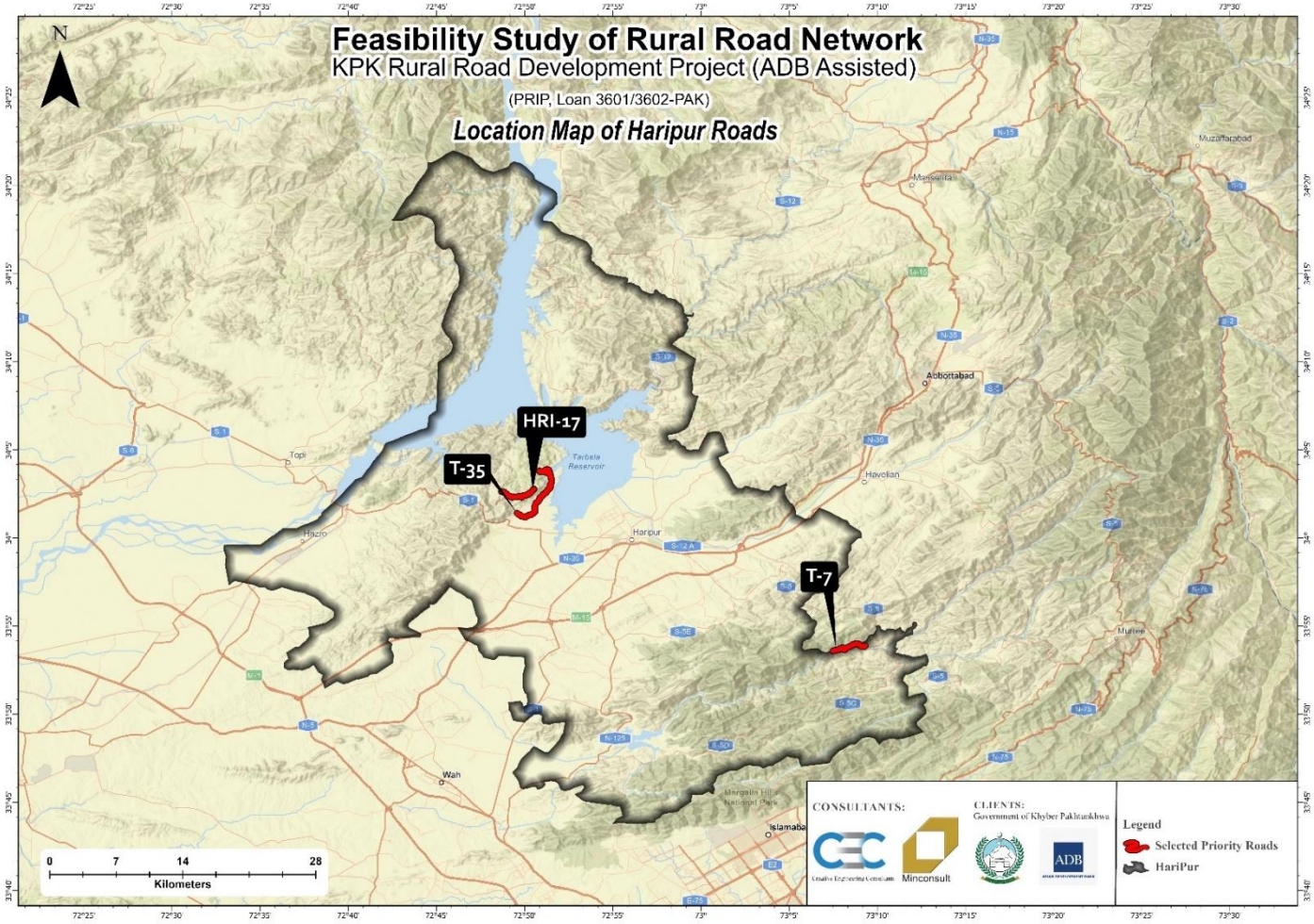


Figure 5.5.1 Location Map District Haripur

5.5.2.1 T-35 (NARA AKHOONKHAIL WATERFALL)

T-35 is situated in the northeast side of district Haripur. This road starts from Haripur Sirikot Ghazi Road and ends at Nara Akhoonkhail Waterfall with an actual length of 9km. Sarri village comes in the vicinity of this road. The condition of this road is 3.26% good, 5.43% average, 19.57% poor and 71.74% worst and the surface type of this road is 87% TST/DST, 6% PCC Rigid, 1% shingle and 5% earthen.

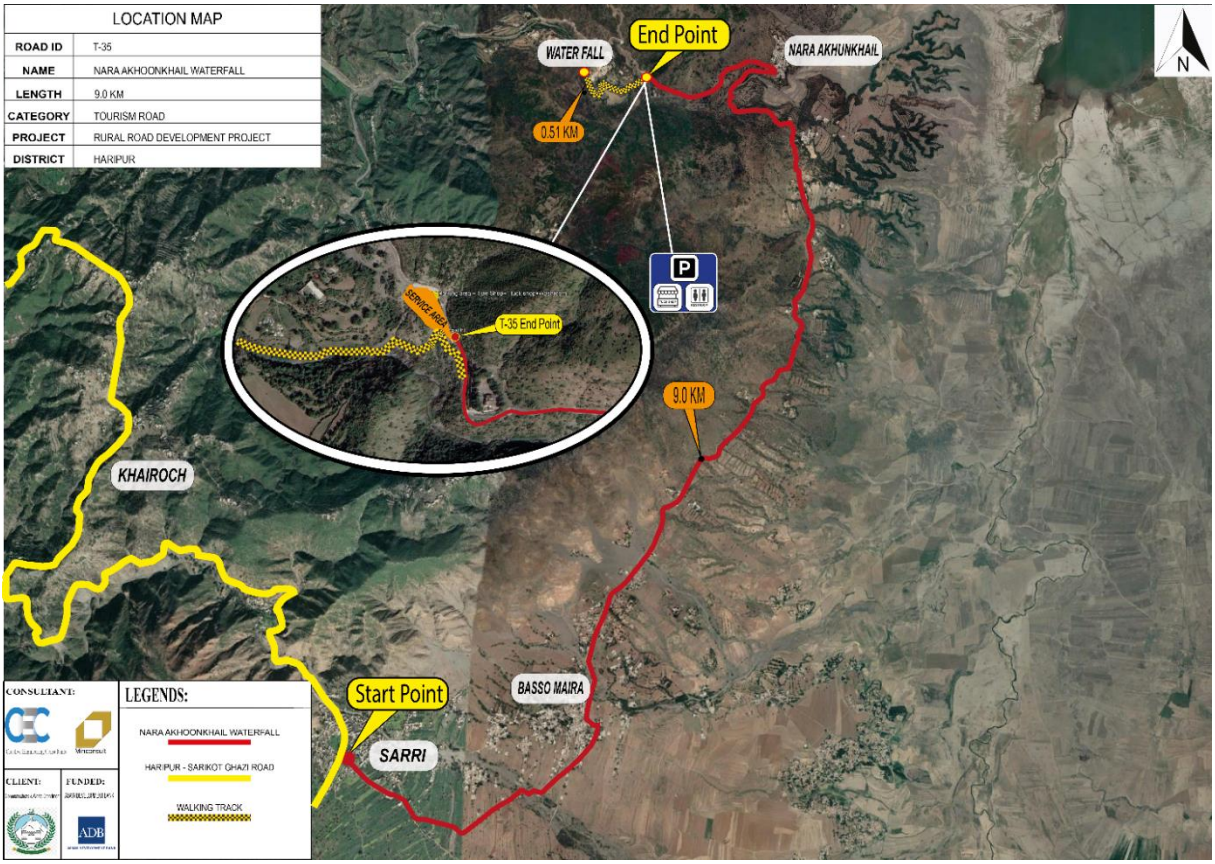


Figure 5.5.2 Location Map of T-35

5.5.2.2 T-7 (NOORI WATERFALL)

T-7 is situated in the Southeast side of district Haripur. This road starts from Akhora Village and ends at Noori Waterfall with an actual length of 5.3 km. Tail Village comes in the vicinity of this road. The condition of this road is 100% worst, and the surface type of this road is 14% TST/DST, 41% PCC Rigid, 2% shingle and 43% earthen.

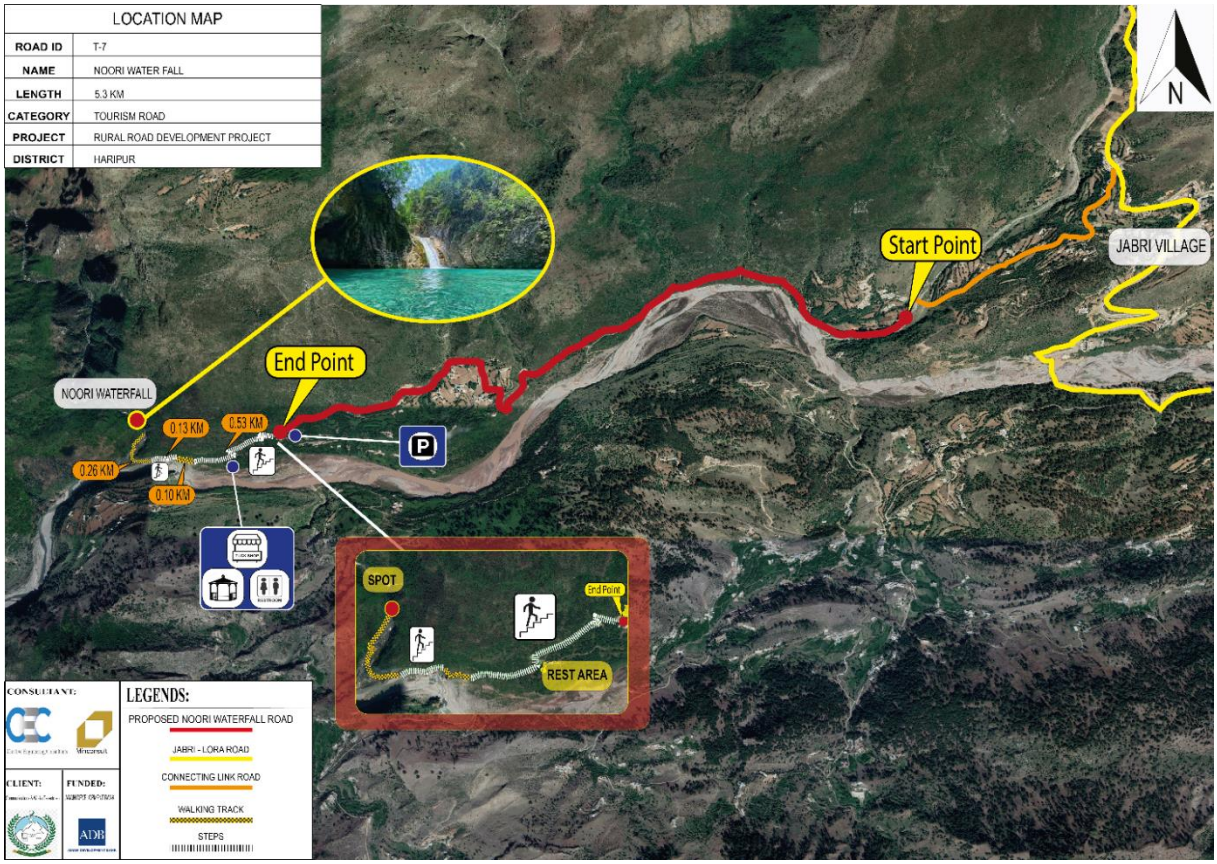


Figure 5.5.3 Location Map of T-7

5.5.2.3 HRI-17 Anar Garh

The road is in the mountainous areas of Haripur. It starts from Ghazi Road, near Gudwalian village, and goes up to the mountains. The length of the road is 4.1 km long.

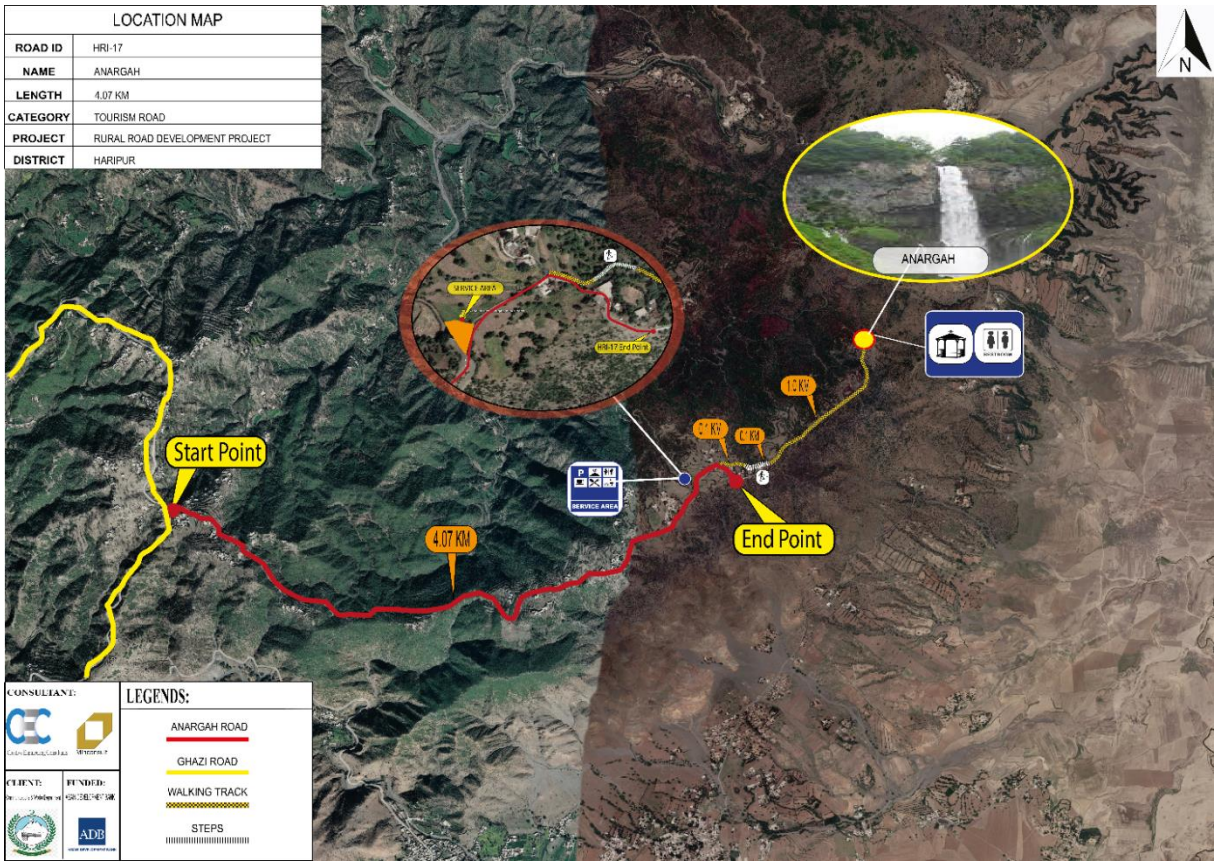


Figure 5.5.4 Location Map HRI-17

5.5.3 IRI Classification Pie Chart of Selected Roads

The International Roughness Index (IRI) is used by highway professionals throughout the world as a standard to quantify road surface roughness. A poor road surface roughness influences the traffic speeds and times. It also effects the mobility and accesibility of users traversing that road.

The IRI Classification Charts are given below.

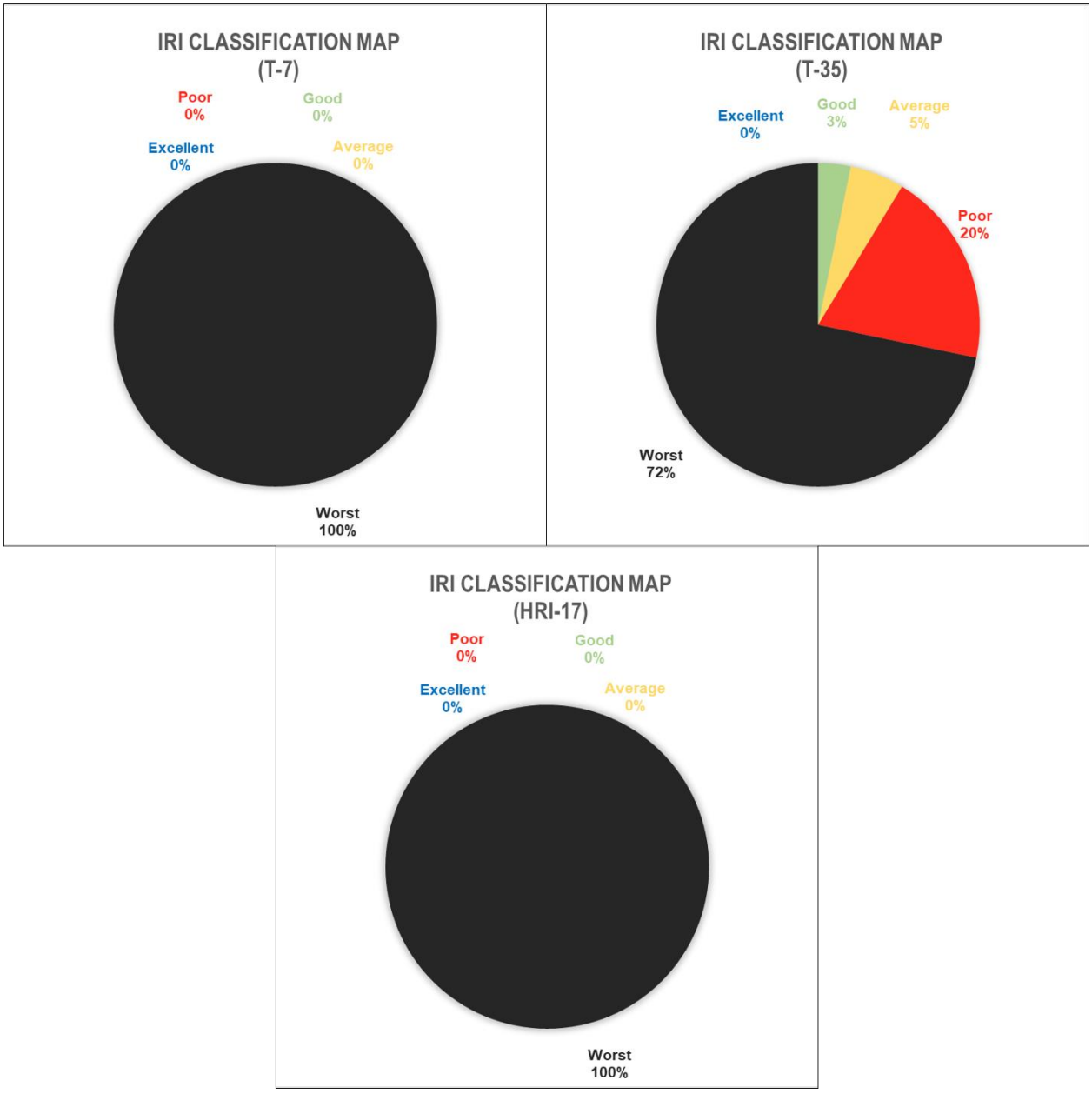


Figure 5.5.5 IRI Classification Charts Tourism Roads District Haripur

5.5.4 RST Pie Chart of Selected Roads

Road Surface type (RST) survey was conducted to investigate the actual condition and type of surface of the road under observation. In rural areas earthen or kacha tracks and TST/DST are common that affect the mobility of road users and accessibility to necessities.

The RST Classification Charts are given below.

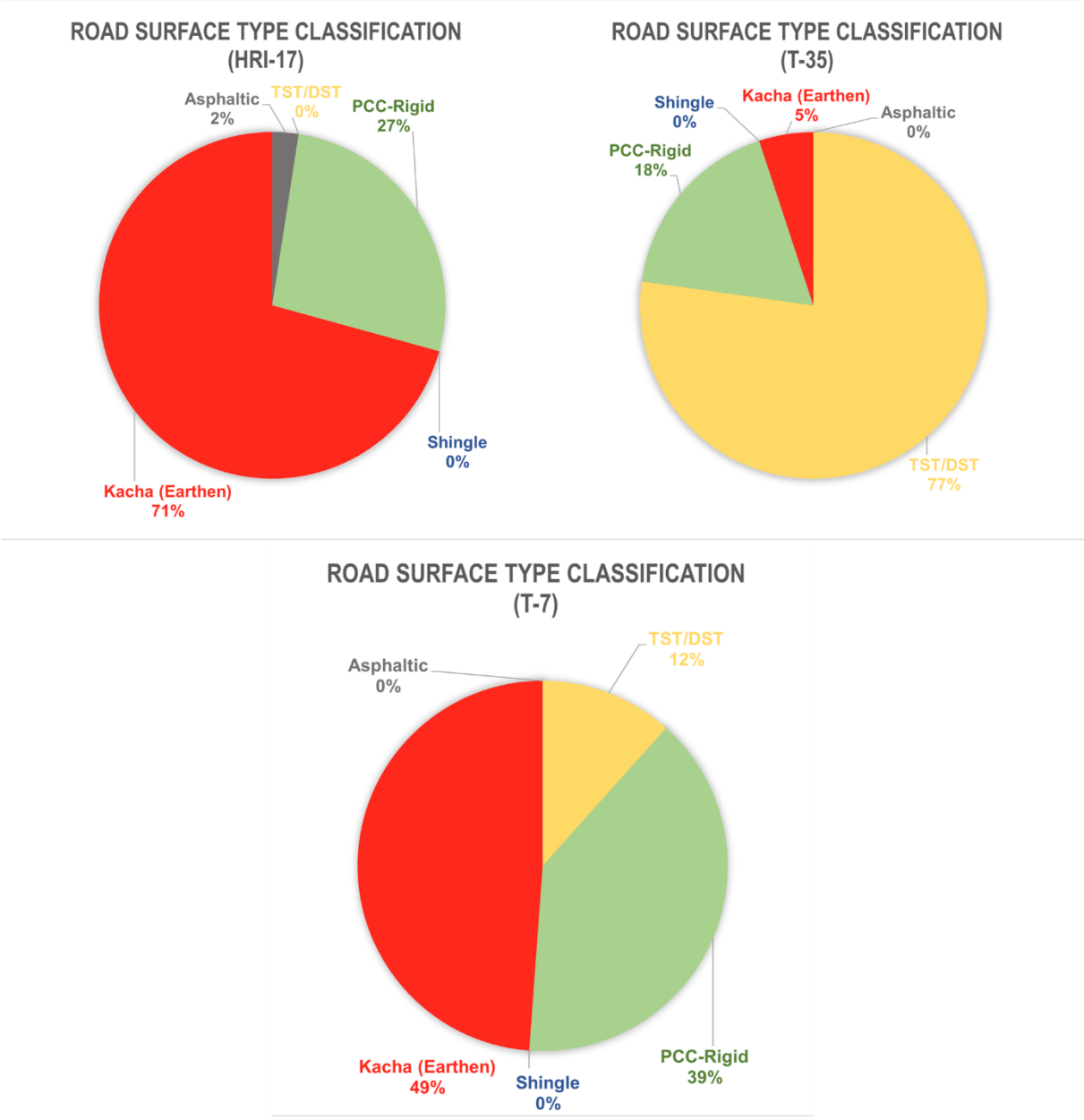


Figure 5.5.6 RST Classification Charts Tourism Roads District Haripur

5.5.5 Travel Speed Survey

Table 5.5.2 Travel Speed Survey Tourism Roads District Haripur

Road ID	Distance (km)	Total Ascent (m)	Total Descent (m)	Total Time	Average Speed (km/h)	Avg. Moving Speed (km/h)	Maximum Speed (km/h)
T-35	9.0	126	111	26:51.0	20.19	20.78	48.26
T-7	5.3	55	00:00.0	18:32.0	12.37	13.54	39.9
HRI-17	5.1	129	70	22:10.0	10.6	11.5	20.46

The travel speeds for all roads are low due to the deteriorated road condition which is reflected from the RST and IRI pie charts. Mobility of the road users is affected as indicated by lower average speeds and higher travel times, which can be attributed to the poor road conditions.

It can be inferred from these observations that these roads need to be reconstructed for better mobility and access of people to basic livelihood necessities.

5.5.6 Traffic Analysis

ADT

Table 5.5.3 Existing ADT Tourism Roads District Haripur

vehicle type	Car	Motorcycle	Mazda Coaster	Rickshaw / Qinggi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	TOTAL Vehicles
T-7	154	70	0	0	0	0	0	0	0	0	0	0	0	0	224
T-35	140	98	0	0	0	0	0	0	0	0	0	0	0	0	238
HRI-17	163	102	2	0	3	6	0	0	0	0	0	0	0	0	276

PCUs

Table 5.5.4 Existing PCUs Tourism Roads District Haripur

vehicle type	Car	Motorcycle	Mazda Coaster	Rickshaw / Qinggi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	Total PCUS
T-7	154	35	0	0	0	0	0	0	0	0	0	0	0	0	189
T-35	140	49	0	0	0	0	0	0	0	0	0	0	0	0	189
HRI-17	163	51	4	-	5	12	-	-	-	-	-	-	-	-	235

5.5.6.1 Composition Of Vehicle Types

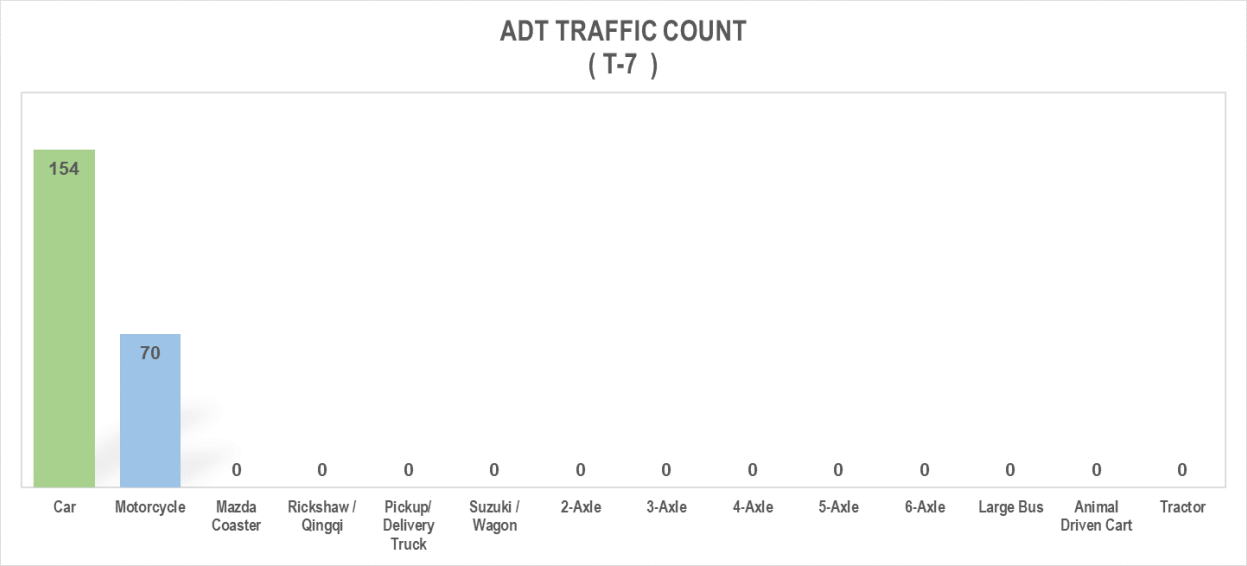


Figure 5.5.7 Vehicle Composition T-7

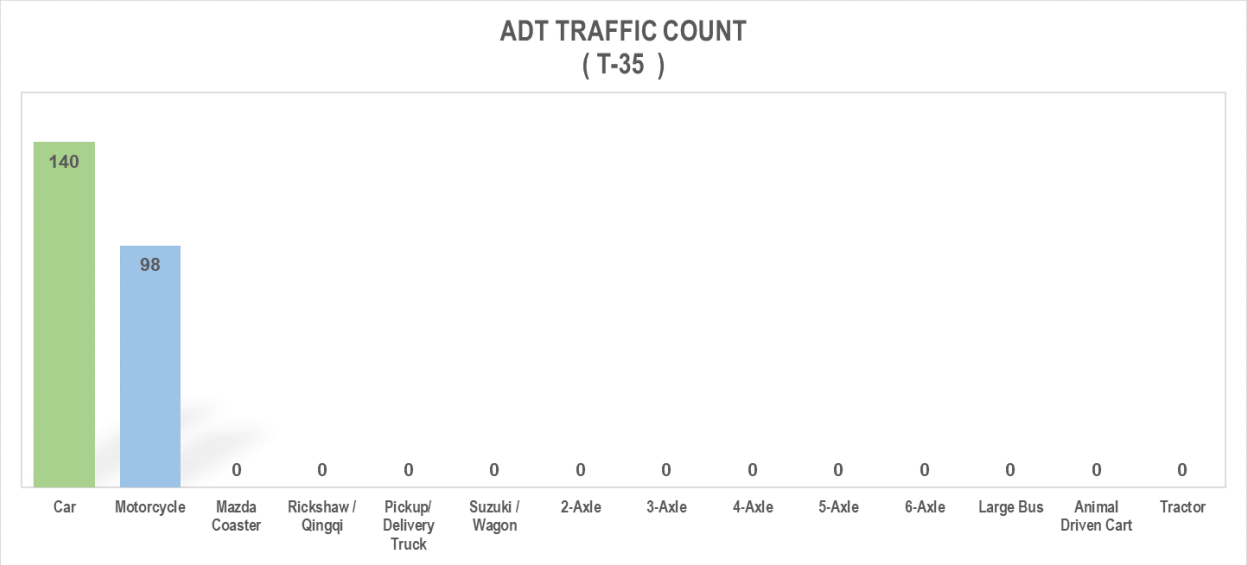


Figure 5.5.8 Vehicle Composition T-35

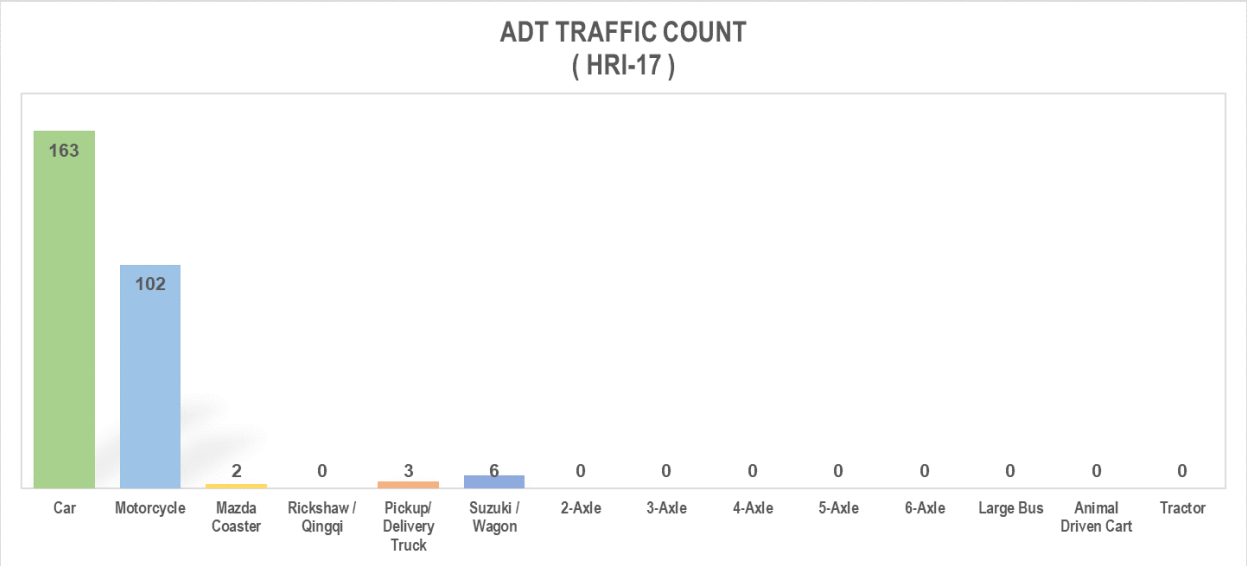


Figure 5.5.9 Vehicle Composition HRI-17

Most of the vehicles on the subject roads are Cars and Motorcycles. This Vehicle Composition can be attributed to the rural area type of the considered roads. Most of the people travel on these roads in their personal cars or motorcycles due to lack of proper public transport facilities.

The reason we have cars and motorcycles as the majority constituents of the vehicle mix, is because of the diversity of the road users utilizing the facility. Those people that have the available resources and own a car or motorcycle are reluctant of using public transport due to the poor services and condition of vehicles, whereas those people who do not own a private car or motorcycle have no other option then using public transport that constitutes of rickshaws and Suzuki/Wagons as seen in some roads.

5.5.6.2 Traffic Analysis Forecast

ADT:

The ADT Base Year is 2022 and ADT Forecast year is 2032 as can be seen in the table below.

The following table represents the annual daily traffic forecast (10 years).

Table 5.5.5 Forecast ADT Tourism Roads District Haripur

Year	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
T-7	**224**	235	247	259	272	286	300	315	331	347	364
T-35	**238**	249	262	275	289	303	318	334	351	368	387
HRI-17	276	290	304	320	335	352	370	388	408	428	450

PCU:

The PCU Base Year is 2022 and PCU Forecast year is 2032 as can be seen in the table below.

Table 5.5.6 Forecast PCUs Tourism Roads District Haripur

Year	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
T-7	**236**	248	260	273	287	301	316	332	349	366	384
T-35	**236**	248	260	273	287	301	316	332	349	366	384
HRI-17	235	246	259	271	285	299	314	330	346	364	382

5.5.7 Discussion and Analysis

The analysis conducted on these roads indicates that the condition of these roads is affecting the traffic characteristic which consequently influences the access of people to necessities of life. The poor condition of these roads is reflected by the Road Surface Type (RST) and International Roughness Index (IRI) pie charts which indicates that these roads need immediate consideration with respect to construction and rehabilitation. The poor mobility of these roads is indicated by the lower speeds and high travel times. Reconstructing these roads will improve speeds and lower travel times of users. The utility of these roads in the tourism sector will be enhanced by reconstructing these roads as more people will prefer to travel on them. This will boost tourism in the region and provide numerous opportunities for the locals in different sectors.

The traffic study shows that the existing roads are in deplorable condition. However, due to the attraction of the spots people still tend to reach the locations. The main traffic on the roads is cars and motorcycles as it is not accessible for other types of vehicles. After the completion of the project, it will attract more tourists on the project roads.

5.6 Project Area- Mansehra

Mansehra District of Khyber Pakhtunkhwa consists of three tehsils – Mansehra, Oghi, and Balakot and provincially administers tribal area (PATA) of Kala Dhaka. The district is located from 34º - 14´ to 35º - 11´ north latitudes and 72º - 49´ to 74º - 08´east longitudes. Its total area is 4,579 square kilometers. Mansehra makes its boundary on the north to Kohistan and Battagram districts, on the east to Muzaffarabad district of Azad Jammu & Kashmir, on the south to Abbottabad and Haripur districts and on the west to Shangla and Bunner districts.

5.6.1 Priority Roads in District Mansehra

The following roads have been found feasible for Rural Road Development Project in District Mansehra.

Table 5.6.1 Tourism Roads District Mansehra

#	ID	Road Name	Districts	FL (Km)	Type
1	T-12	To Saiful Maluk Lake	Mansehra	8.4	Tourism
2	T-22	Sharan Forest	Mansehra	15.3	Tourism
3	MAN-2	Shingri Road	Mansehra	4.5	Tourism

5.6.2 Location Map of Priority Roads

All the tourism roads selected for traffic study after scrutinization of the surveyed roads in the district are shown in the figure below.

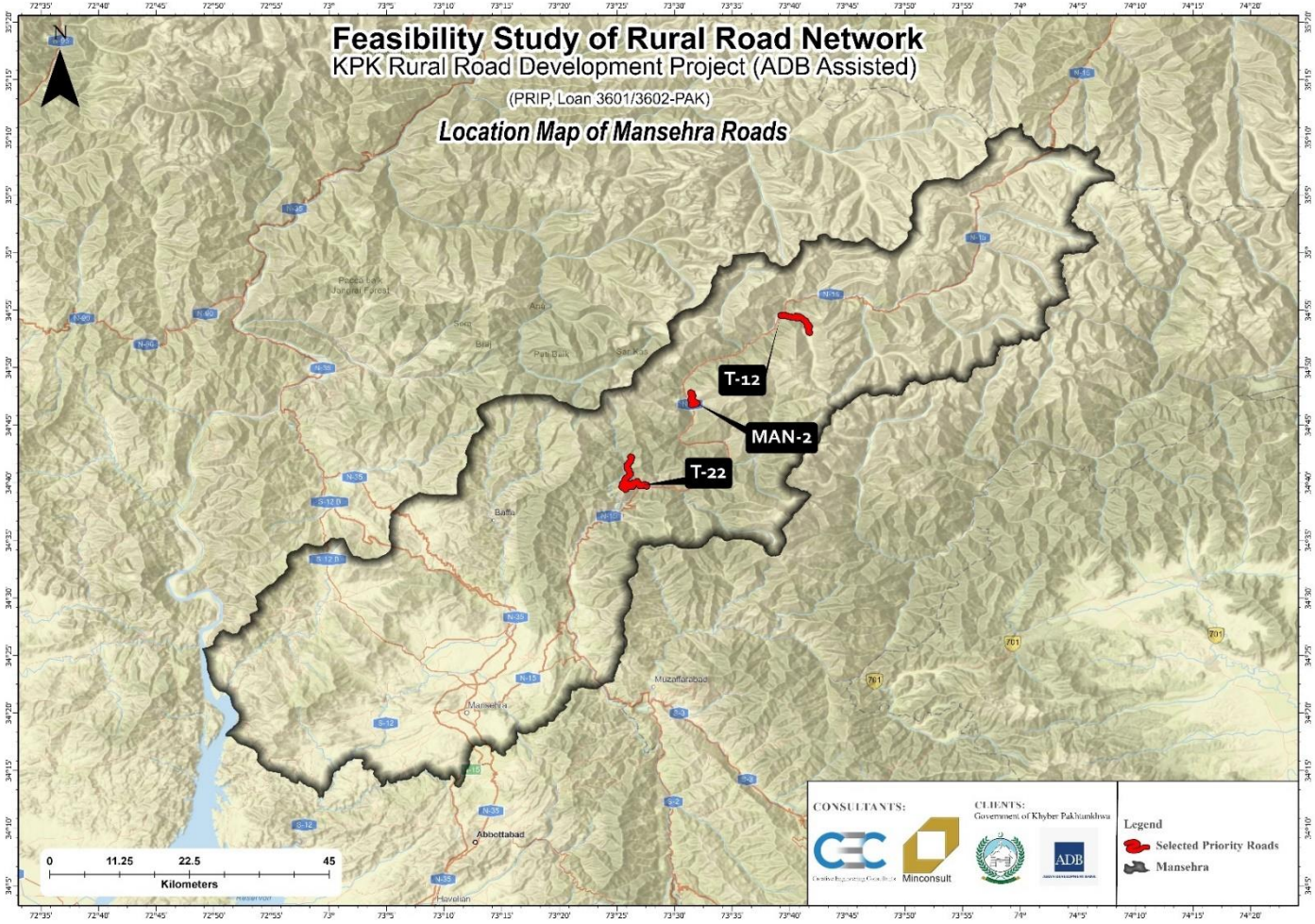


Figure 5.6.1 Location Map District Mansehra

5.6.2.1 T-12 (To Saiful Maluk Lake)

T-12 saif ul malook tourism road it is located 9km north of naran in district mansehra. The length of this road is 8.4 Km. the start points of a road link with naran bypass road. The road end point is near saif ul malook lake. Saif ul Malook is perhaps the most well-known lake in Naran Kaghan Valley, Mansehra. It's a beautiful clean water lake that has the slightest hint of green situated at an elevation of 3.224m (10,578ft) above sea level. Many of the tourists come to this lake in the summer season. This road gives a safe destination to tourists. The road connects many hotels on the travel length. The road connects mountain village of naran.

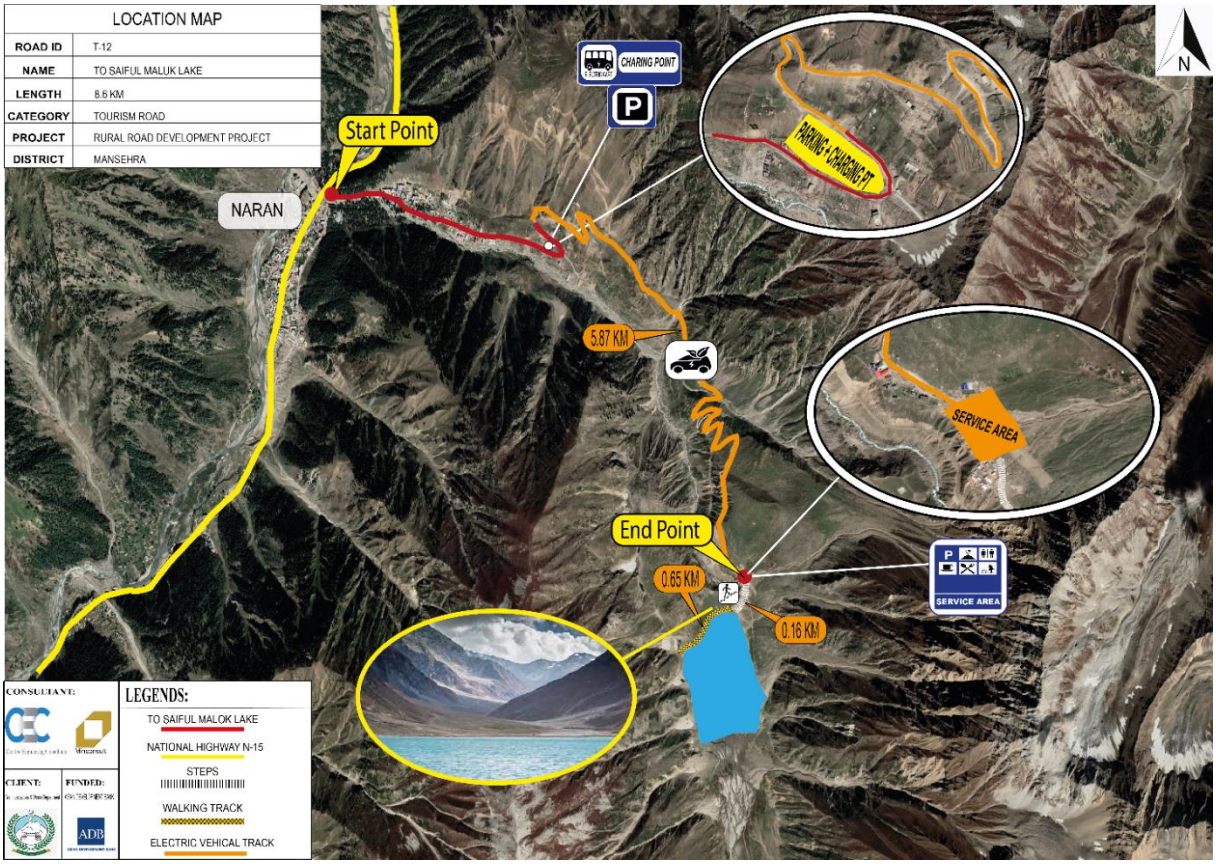


Figure 5.6.2 Location Map T-12

5.6.2.2 T-22 (Sharan Forest)

T-22 sharan tourisim road is in district Mansehra. The length of road is 15.3 Km. the road start from paras N-15 and end point is sharan forest resort. The road starts at along with kunar river. Many tourists come every year to sharan forest.

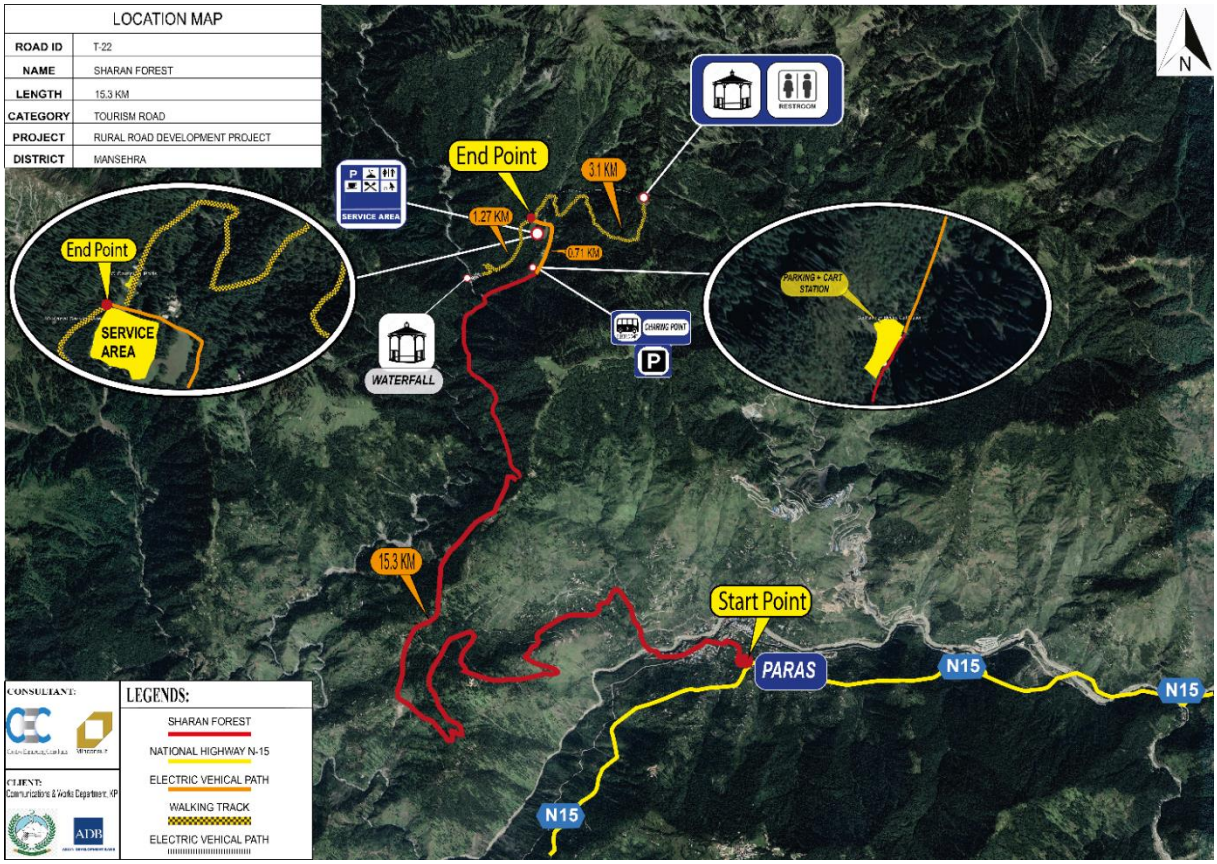


Figure 5.6.3 Location Map T-22

5.6.2.3 MAN-2 (Shingri Road)

The road is in the Kaghan valley of Mansehra district. It starts from Kaghan Naran road, and goes up to the mountain, covering a 4.5 km route.

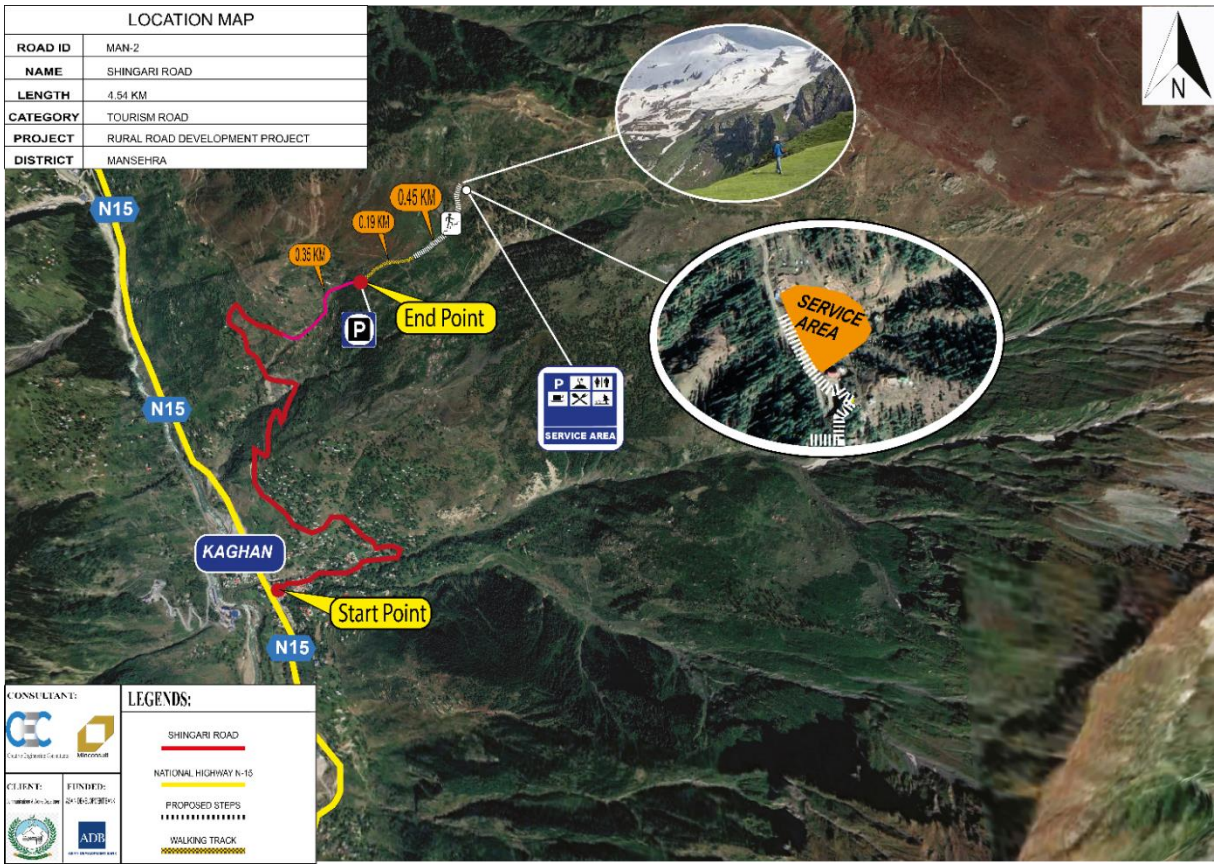


Figure 5.6.4 Location Map MAN-2

5.6.3 IRI Classification Pie Chart of Selected Roads

The International Roughness Index (IRI) is used by highway professionals throughout the world as a standard to quantify road surface roughness. A poor road surface roughness influences the traffic speeds and times. It also effects the mobility and accesibility of users traversing that road.

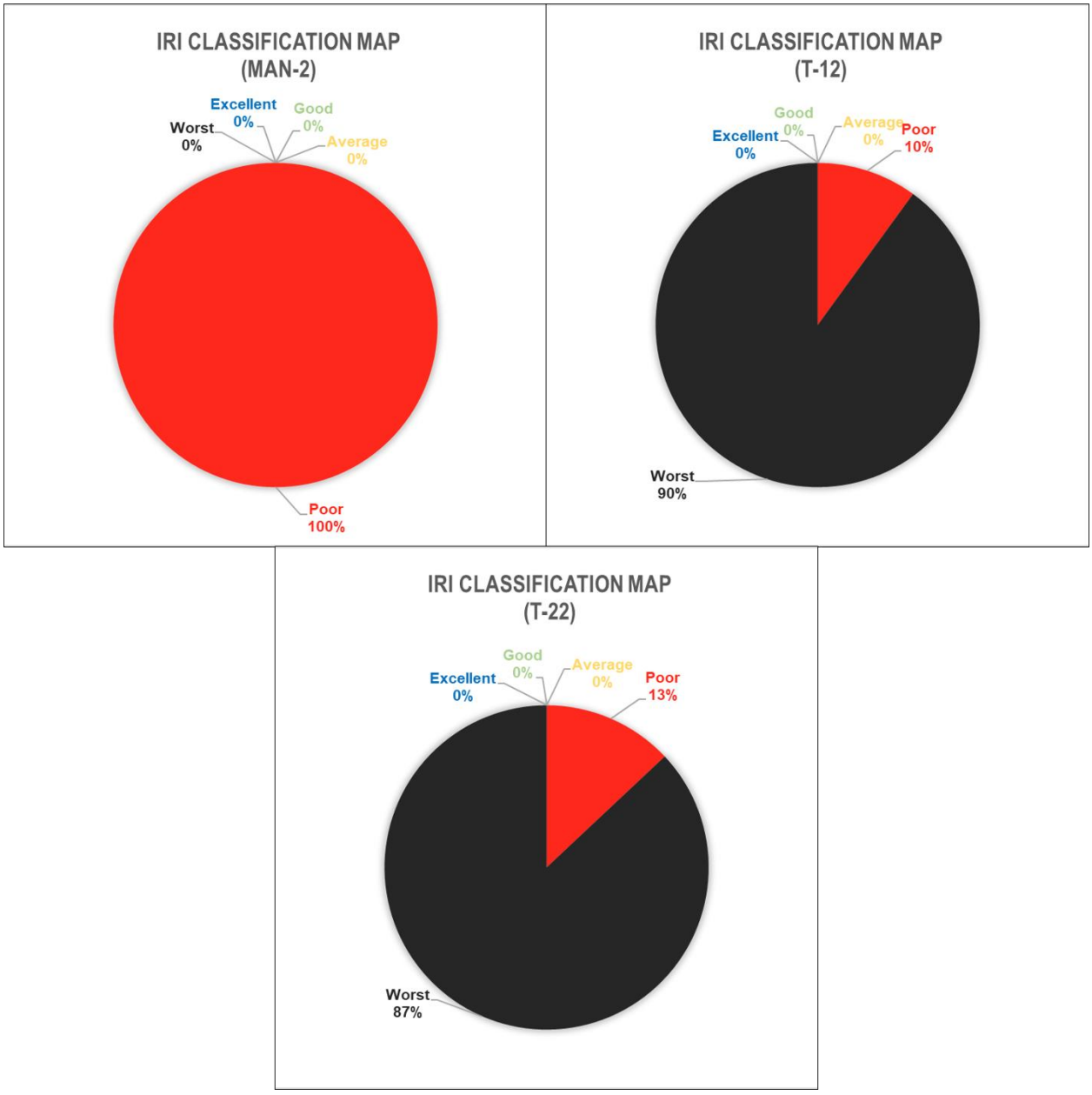


Figure 5.6.5 IRI Classification Chart Tourism Roads District Mansehra

5.6.4 RST Pie Chart of Selected Roads

Road Surface type (RST) survey was conducted to investigate the actual condition and type of surface of the road under observation. In rural areas earthen or kacha tracks and TST/DST are common that affect the mobility of road users and accessibility to necessities.

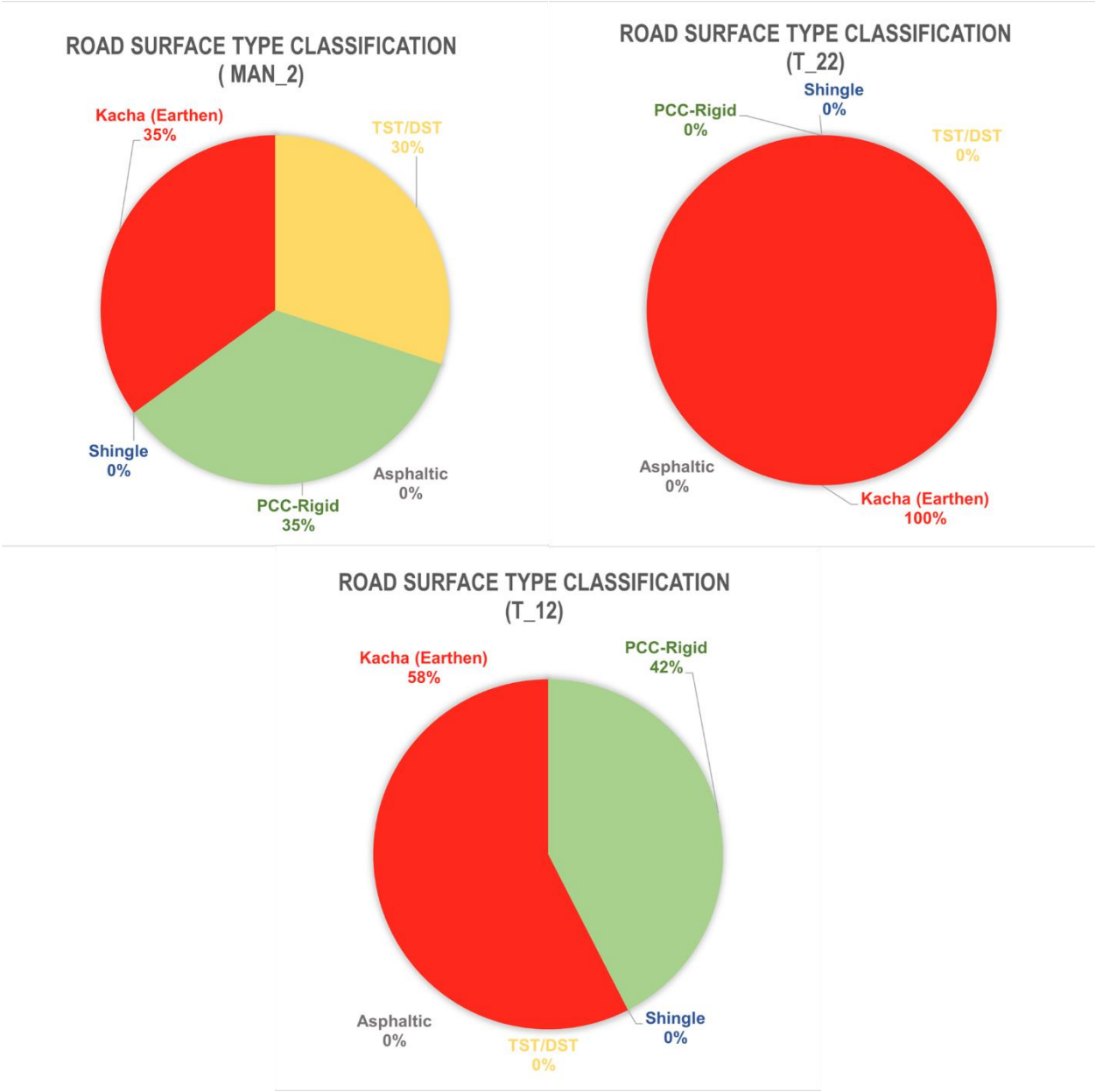


Figure 5.6.6 RST Classification Chart Tourism Roads District Mansehra

5.6.5 Travel Speed Survey

Table 5.6.2 Travel Speed Survey Tourism Roads District Mansehra

Road ID	Distance (km)	Total Ascent (m)	Total Descent (m)	Total Time	Average Speed (km/h)	Avg. Moving Speed (km/h)	Maximum Speed (km/h)
T-12	8.6	35	722	22:47.0	21.94	22.03	73.35
T-22	15.3	45	180	11:07.0	12.69	12.69	30.07
MAN-2	4.5	25	74	3:05:08	11:49	12:45	28:06

The travel speeds for all roads are low due to the deteriorated road condition which is reflected from the RST and IRI pie charts. Mobility of the road users is affected as indicated by lower average speeds and higher travel times, which can be attributed to the poor road conditions.

It can be inferred from these observations that these roads need to be reconstructed for better mobility and access of people to basic livelihood necessities.

5.6.6 Traffic Analysis

ADT

Table 5.6.3 Existing ADT Tourism Roads District Mansehra

vehicle type	Car	Motorcycle	Mazda Coaster	Rickshaw / Qingqi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	TOTAL Vehicles
T-12	54	35	0	0	0	0	0	0	0	0	0	0	0	0	89
T-22	51	44	0	0	0	0	0	0	0	0	0	0	0	0	95
MAN-2	655	356	15	210	40	303	2	21	0	0	0	0	0	17	1619

PCUs

Table 5.6.4 Existing PCUs Tourism Roads District Mansehra

vehicle type	Car	Motorcycle	Mazda Coaster	Rickshaw / Qingqi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	Total PCUS
T-12	54	18	0	0	0	0	0	0	0	0	0	0	0	0	72
T-22	51	22	0	0	0	0	0	0	0	0	0	0	0	0	73
MAN-2	655	178	30	158	60	606	5	63	-	-	-	-	-	68	1,823

5.6.6.1 Composition Of Vehicle Types

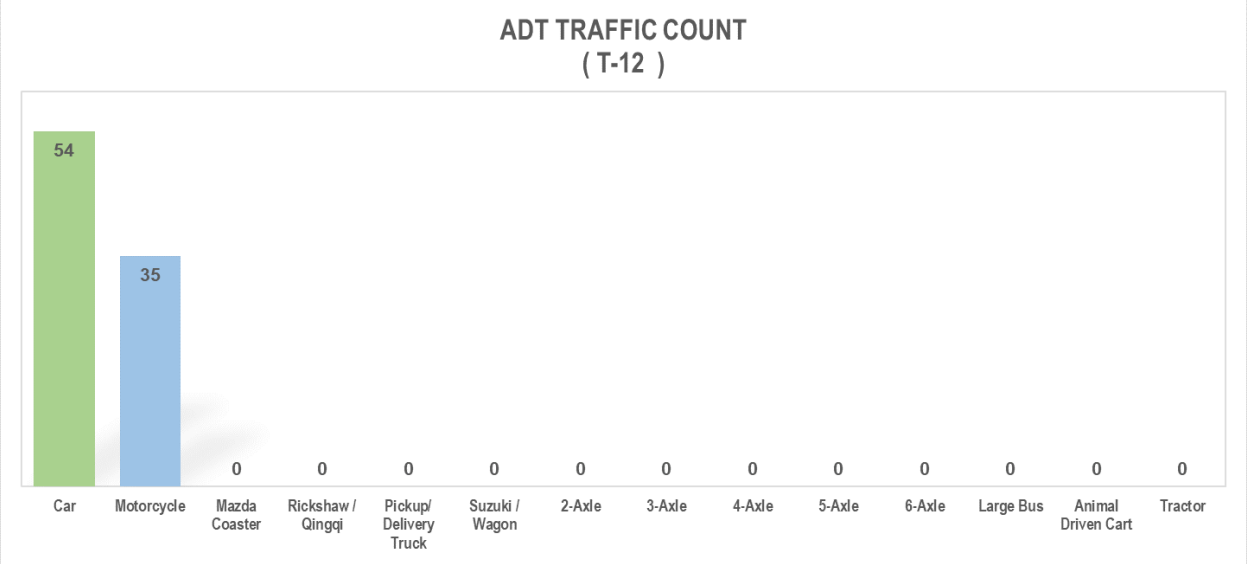


Figure 5.6.7 Vehicle Composition T-12

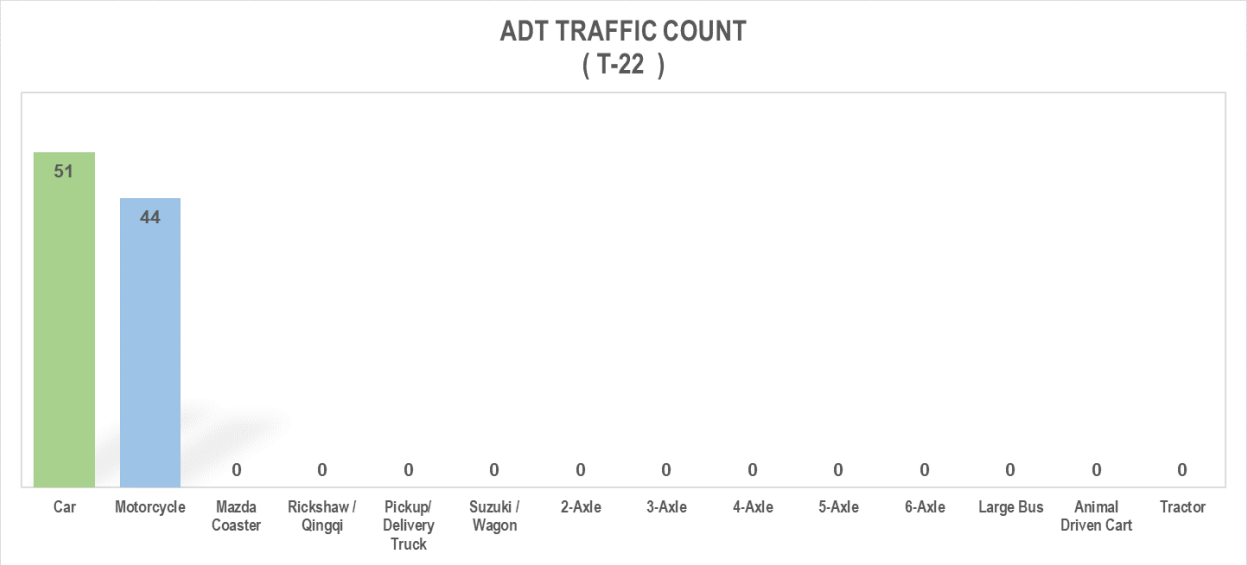


Figure 5.6.8 Vehicle Composition T-22

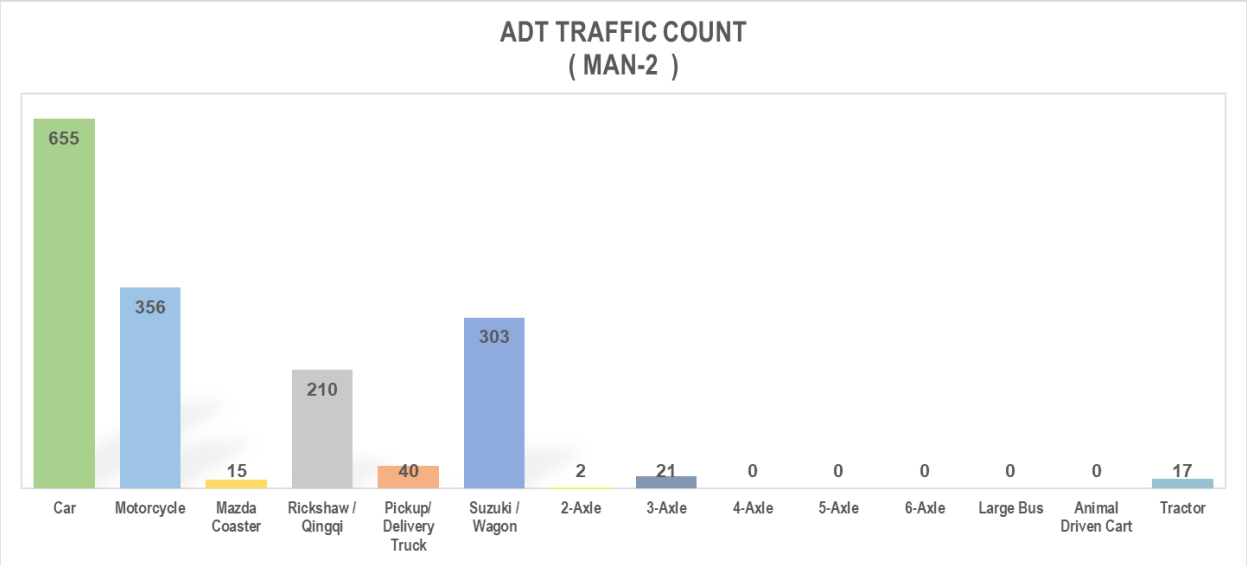


Figure 5.6.9 Vehicle Composition MAN-2

Most of the vehicles on the subject roads are Cars and Motorcycles. This Vehicle Composition can be attributed to the rural area type of the considered roads. Most of the people travel on these roads in their personal cars or motorcycles due to lack of proper public transport facilities.

The reason we have cars and motorcycles as the majority constituents of the vehicle mix, is because of the diversity of the road users utilizing the facility. Those people that have the available resources and own a car or motorcycle are reluctant of using public transport due to the poor services and condition of vehicles, whereas those people who do not own a private car or motorcycle have no other option then using public transport that constitutes of rickshaws and Suzuki/Wagons as seen in some roads.

5.6.6.2 Traffic Analysis Forecast

ADT:

The ADT Base Year is 2022 and ADT Forecast year is 2032 as can be seen in the table below.

The following table represents the annual daily traffic forecast (10 years).

Table 5.6.5 Forecast ADT Tourism Roads District Mansehra

Year	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
T-12	**90**	95	99	104	109	115	121	127	133	140	147
T-22	**544**	571	599	629	661	694	729	765	803	844	886
MAN-2	1619	1,700	1,785	1,874	1,968	2,066	2,170	2,278	2,392	2,512	2,637

PCU: The PCU Base Year is 2022 and PCU Forecast year is 2032 as can be seen in the table below.

Table 5.6.6 Forecast PCUs Tourism Roads District Mansehra

Year	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
T-12	**71**	74	78	82	86	90	95	99	104	110	115
T-22	**597**	627	658	691	726	762	800	840	882	926	972
MAN-2	1,823	1,914	2,009	2,110	2,215	2,326	2,442	2,564	2,693	2,827	2,969

5.6.7 Discussion and Analysis

The analysis conducted on these roads indicates that the condition of these roads is affecting the traffic characteristic which consequently influences the access of people to necessities of life. The poor condition of these roads is reflected by the Road Surface Type (RST) and International Roughness Index (IRI) pie charts which indicates that these roads need immediate consideration with respect to construction and rehabilitation. The poor mobility of these roads is indicated by the lower speeds and high travel times. Reconstructing these roads will improve speeds and lower travel times of users. The utility of these roads in the tourism sector will be enhanced by reconstructing these roads as more people will prefer to travel on them. This will boost tourism in the region and provide numerous opportunities for the locals in different sectors.

The traffic study shows that the existing roads are in deplorable condition. However, due to the attraction of the spots people still tend to reach the locations. The main traffic on the roads is cars and motorcycles as it is not accessible for other types of vehicles. After the completion of the project, it will attract more tourists on the project roads.

5.7 PROJECT AREA- SWABI

Swabi is a city in Khyber Pakhtunkhwa province of Pakistan, located near the bank of the Indus River. It is the 73rd largest city of Pakistan and eighth largest in the province of Khyber Pakhtunkhwa. Swabi is also a key city in Mardan Division, where it is the second-largest city.

5.7.1 Priority Roads in District Swabi

The following roads have been found feasible for Rural Road Development Project in District Shangla.

Table 5.7.1 Tourism Roads District Swabi

#	ID	Road Name	Districts	FL (Km)	Type
1	T-2	Beer Gali	Swabi	9.2	Tourism

5.7.2 Location Map of Priority Roads

All the tourism roads selected for traffic study after scrutinization of the surveyed roads in the district are shown in the figure below.

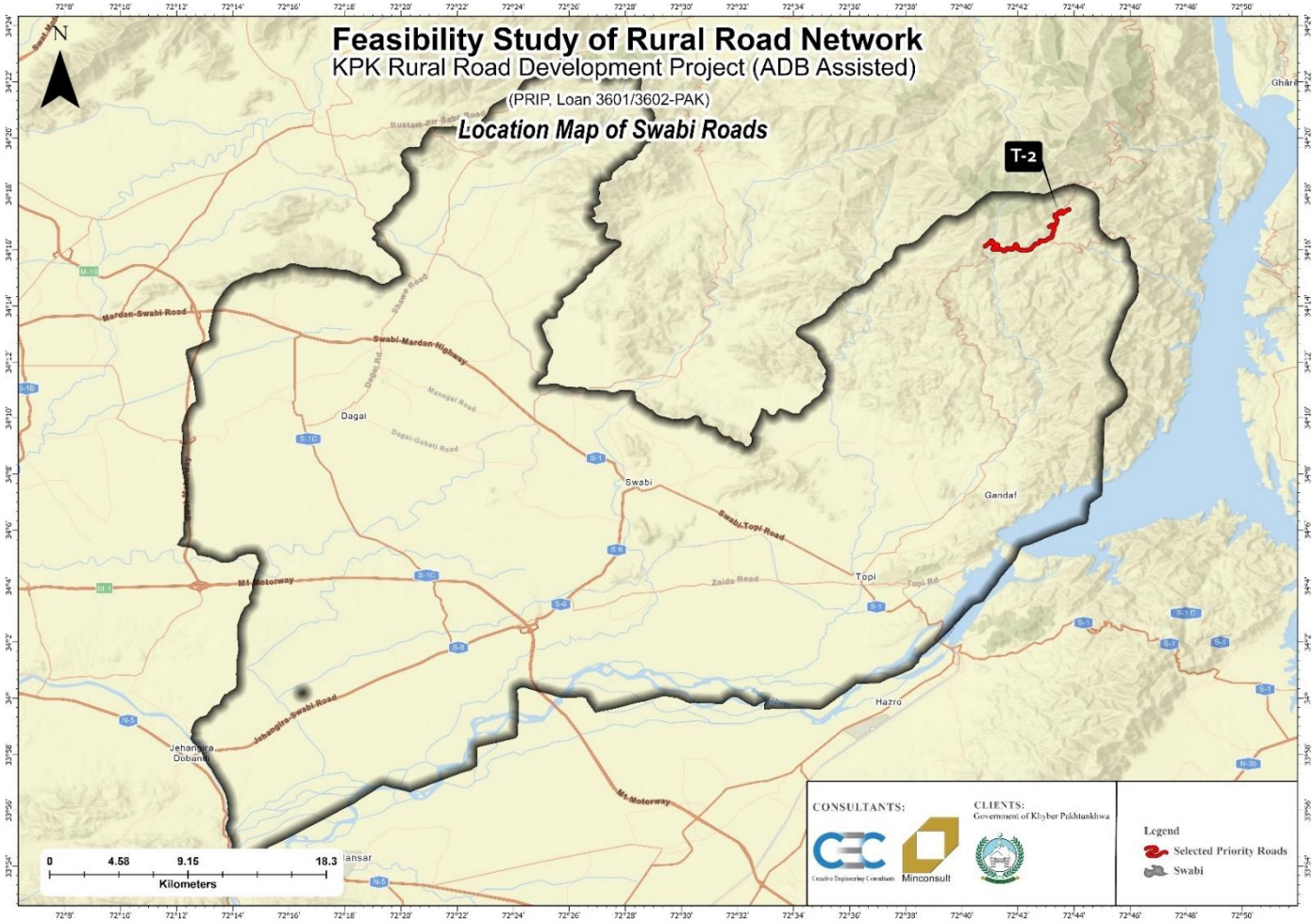


Figure 5.7.1 Location Map District Swabi

5.7.2.1 T-2 (Beer Gali)

The road is in the mountainous areas of the Swabi District of KP and leads to tourist sites. It is 9.2 km long.

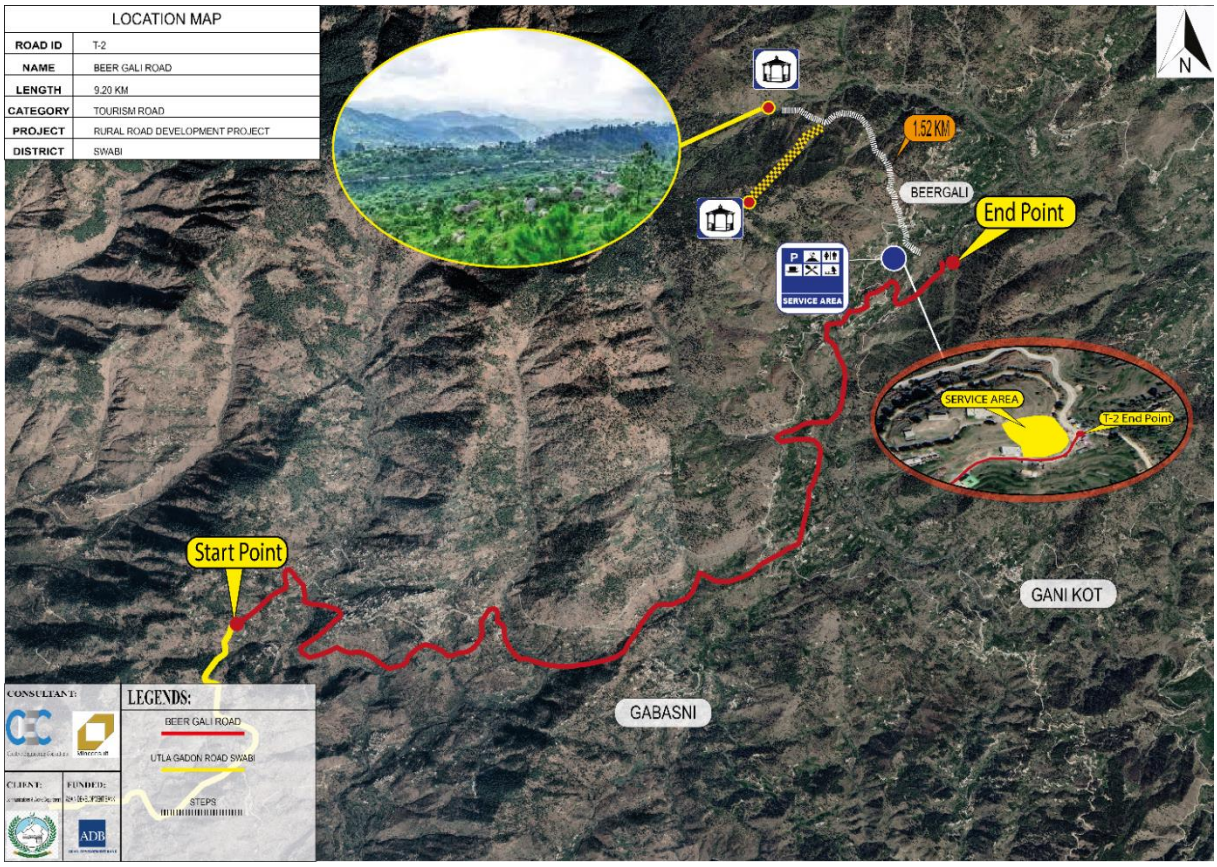


Figure 5.7.2 Location Map T-2

5.7.3 IRI Classification Pie Chart of Selected Roads

The International Roughness Index (IRI) is used by highway professionals throughout the world as a standard to quantify road surface roughness. A poor road surface roughness influences the traffic speeds and times. It also effects the mobility and accesibility of users traversing that road.

The IRI Classification Charts are given below.

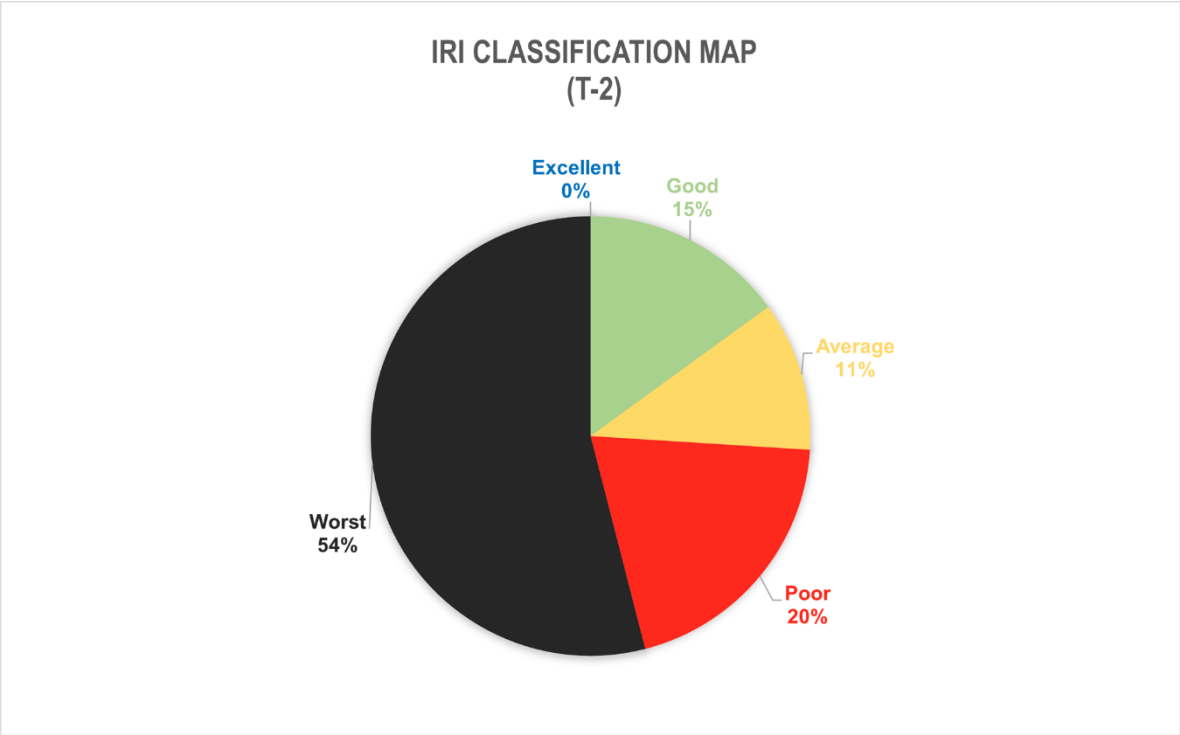


Figure 5.7.3 IRI Classification Charts Tourism Road District Swabi

5.7.4 RST Pie Chart of Selected Roads

Road Surface type (RST) survey was conducted to investigate the actual condition and type of surface of the road under observation. In rural areas earthen or kacha tracks and TST/DST are common that affect the mobility of road users and accessibility to necessities.

The RST Classification Charts are given below.

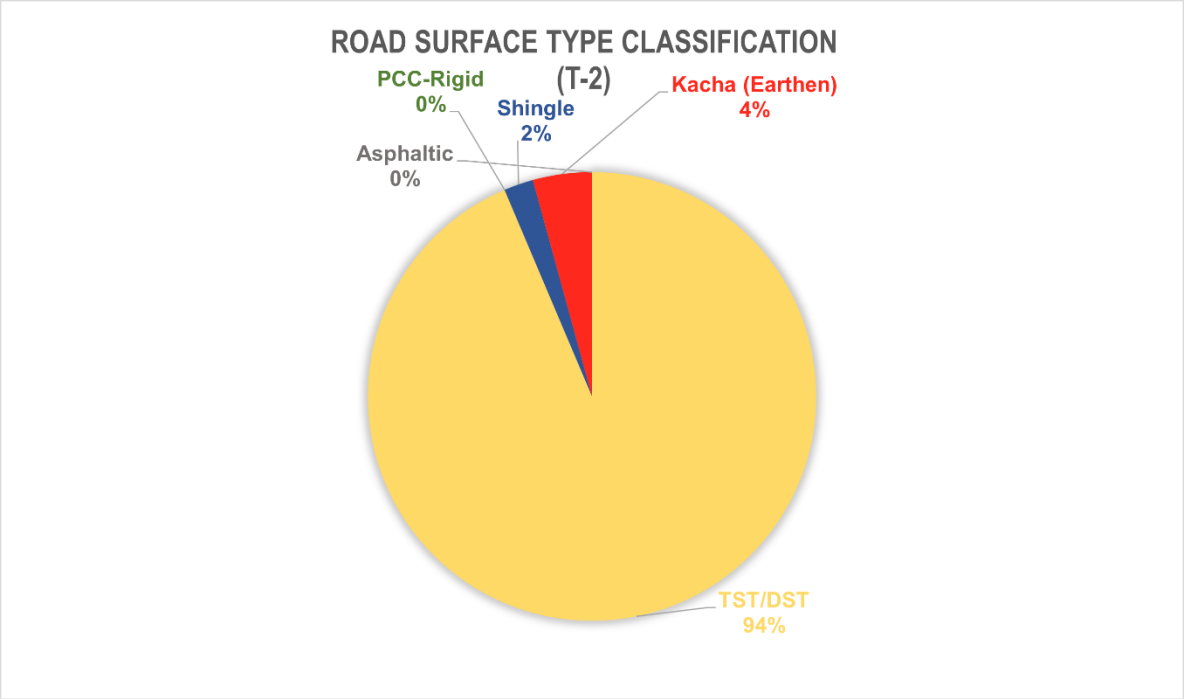


Figure 5.7.4 RST Classification Charts Tourism Road District Swabi

5.7.5 Travel Speed Survey

Table 5.7.2 Travel Speed Survey Tourism Road District Swabi

Road ID	Distance (km)	Total Ascent (m)	Total Descent (m)	Total Time	Average Speed (km/h)	Avg. Moving Speed (km/h)	Maximum Speed (km/h)
T-2	9.2	412	18	29:24.0	19.36	19.36	46.03

The travel speeds for all roads are low due to the deteriorated road condition which is reflected from the RST and IRI pie charts. Mobility of the road users is affected as indicated by lower average speeds and higher travel times, which can be attributed to the poor road conditions.

It can be inferred from these observations that these roads need to be reconstructed for better mobility and access of people to basic livelihood necessities.

5.7.6 Traffic Analysis

ADT

Table 5.7.3 Existing ADT Tourism Road District Swabi

vehicle type	Car	Motorcycle	Mazda Coaster	Rickshaw / Qingqi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	TOTAL Vehicles
T-2	39	126	11	15	7	2	0	2	0	1	0	0	13	15	231

PCUs

Table 5.7.4 Existing PCUs Tourism Road District Swabi

vehicle type	Car	Motorcycle	Mazda Coaster	Rickshaw / Qingqi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	Total PCUS
T-2	39	63	22	11	11	4	-	6	-	4	-	-	59	60	278

5.7.6.1 Composition Of Vehicle Types

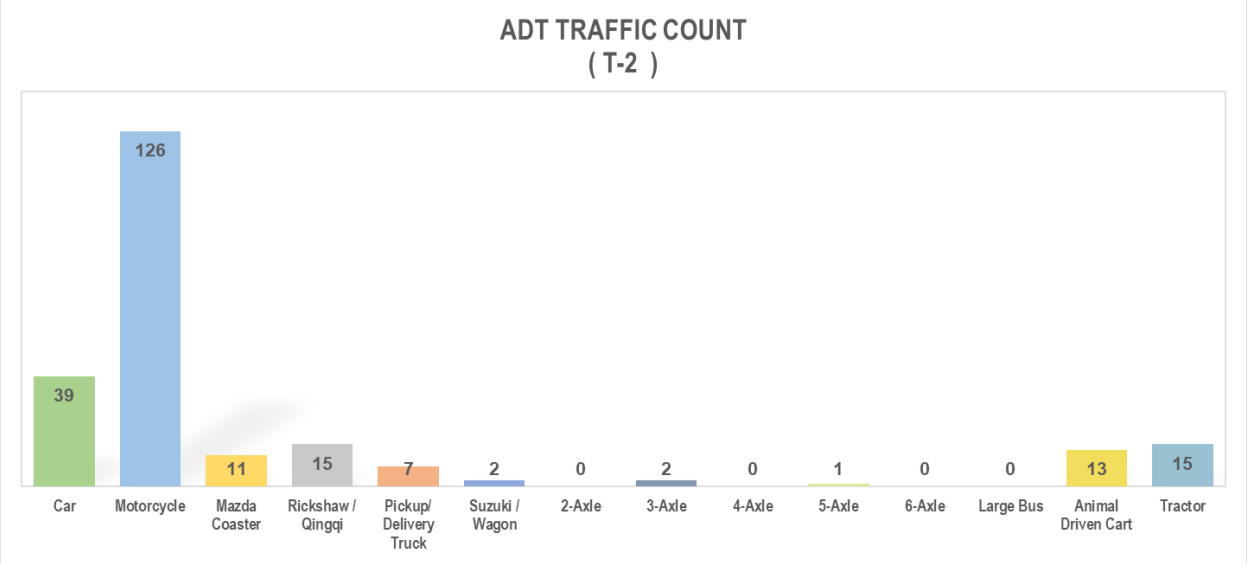


Figure 5.7.5 Vehicle Composition T-2

Most of the vehicles on the subject roads are Cars and Motorcycles. This Vehicle Composition can be attributed to the rural area type of the considered roads. Most of the people travel on these roads in their personal cars or motorcycles due to lack of proper public transport facilities.

The reason we have cars and motorcycles as the majority constituents of the vehicle mix, is because of the diversity of the road users utilizing the facility. Those people that have the available resources and own a car or motorcycle are reluctant of using public transport due to the poor services and condition of vehicles, whereas those people who do not own a private car or motorcycle have no other option then using public transport that constitutes of rickshaws and Suzuki/Wagons as seen in some roads.

5.7.6.2 Traffic Analysis Forecast

ADT:

The ADT Base Year is 2022 and ADT Forecast year is 2032 as can be seen in the table below.

The following table represents the annual daily traffic forecast (10 years).

Table 5.7.5 Forecast ADT Tourism Road District Swabi

Year	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
T-2	231	243	255	267	281	295	310	325	341	358	376

PCU:

The PCU Base Year is 2022 and PCU Forecast year is 2032 as can be seen in the table below.

Table 5.7.6 Forecast PCUs Tourism Road District Swabi

Year	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
T-2	278	292	307	322	338	355	373	392	411	432	453

5.7.7 Discussion and Analysis

The analysis conducted on these roads indicates that the condition of these roads is affecting the traffic characteristic which consequently influences the access of people to necessities of life. The poor condition of these roads is reflected by the Road Surface Type (RST) and International Roughness Index (IRI) pie charts which indicates that these roads need immediate consideration with respect to construction and rehabilitation. The poor mobility of these roads is indicated by the lower speeds and high travel times. Reconstructing these roads will improve speeds and lower travel times of users. The utility of these roads in the tourism sector will be enhanced by reconstructing these roads as more people will prefer to travel on them. This will boost tourism in the region and provide numerous opportunities for the locals in different sectors.

The traffic study shows that the existing roads are in deplorable condition. However, due to the attraction of the spots people still tend to reach the locations. The main traffic on the roads is cars and motorcycles as it is not accessible for other types of vehicles. After the completion of the project, it will attract more tourists on the project roads.

5.8 PROJECT AREA- SWAT

Swat District is a district in the Malakand Division of Khyber Pakhtunkhwa, Pakistan. With a population of 2,309,570 per the 2017 national census, Swat is the 15th-largest district of Khyber Pakhtunkhwa province. The total area covered by District Swat is around 5,337 km^2 and its largest city is Mingora.

5.8.1 Tourism Roads in District Swat

The following roads have been found feasible for Rural Road Development Project in District Swat.

Table 5.8.1 Tourism Roads District Swat

#	ID	Road Name	Districts	FL (Km)	Type
1	SWT-5	Kalam Banr Shahoo Road	Swat	4.9	Tourism
2	T-19	Beshai Meadows	Swat	6.9	Tourism
3	T-4	Kandol Lake Paristan Lake	Swat	10.6	Tourism
4	N-SWT-T-2	Taip Banda Road	Swat	10.0	Tourism
5	N-SWT-T4	Uthror to Thal via Badgoi Top	Swat	14.0	Tourism
6	N-SWT-T3	Desan Meadows to Kalam	Swat	5.0	Tourism

5.8.2 Location Map of Priority Roads

All the tourism roads selected for traffic study after scrutinization of the surveyed roads in the district are shown in the figure below.

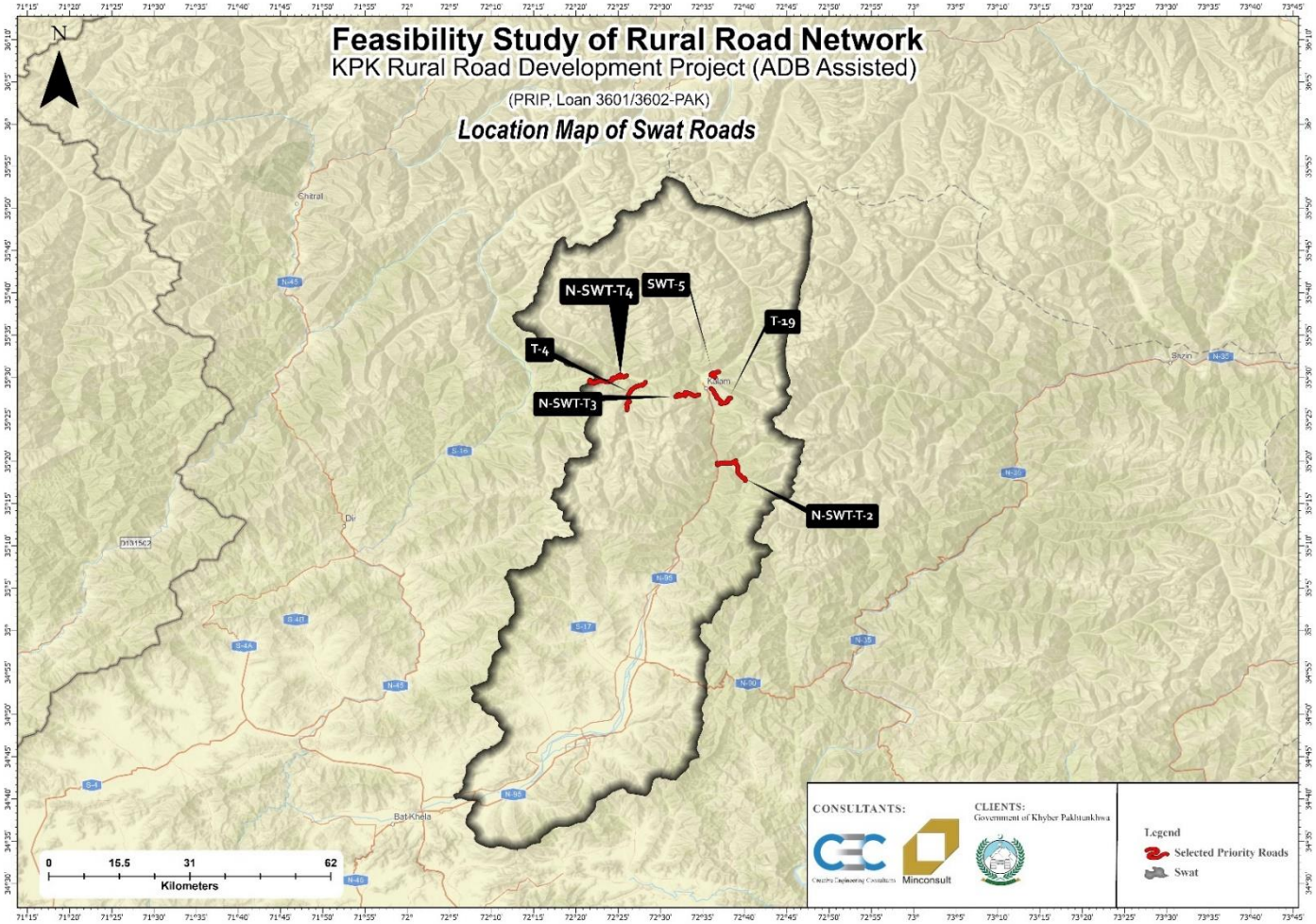


Figure 5.8.1 Location Map District Swat

5.8.2.1 T-19 (Beshai Meadows)

T-19 is situated in the north side of district Swat. This road starts from national highway N-95 (Utrar Road) and connects to a tourist spot called Beshai medows with an actual length of 6.9 km. Boyun village is near to this road.

Figure 5.8.2 Location Map T-19

5.8.2.2 T-4 (Kandol Lake Paristan Lake)

T-4 is situated in the north side of district Swat. This road starts from Kandol Lake Paristan Lake and ends on a main road called utrar road with an actual length of 10.6 km. It connects Kundol lake and Spinkhor waterfall to the main road.

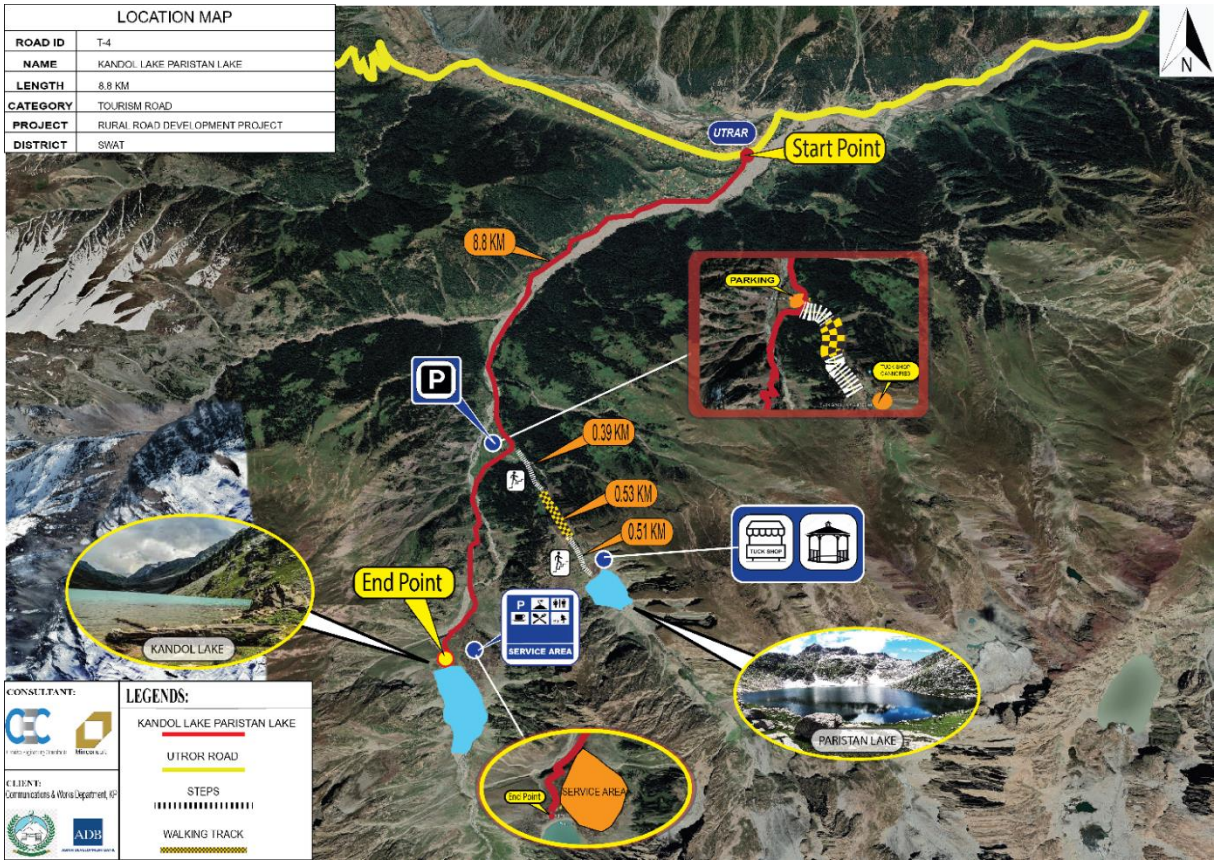


Figure 5.8.3 Location Map T-4

5.8.2.3 SWT-5 (Kalam Banr Shahoo Road)

The road is in Shahu village, in the Swat District. The road is 4.9 km long.

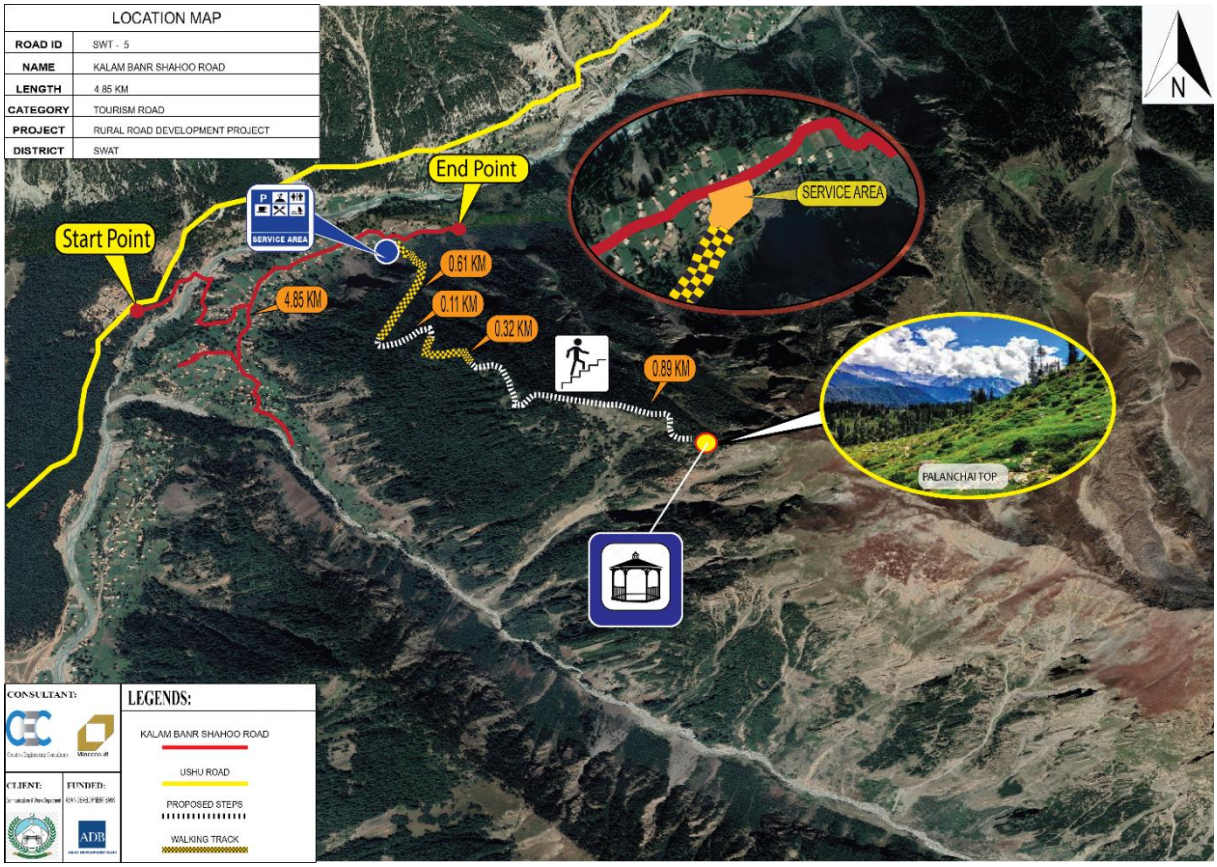


Figure 5.8.4 Location Map SWT-5

5.8.2.4 N-SWT-T2 Taip Banda Road

This road is situated in Mankial region of district swat covering distance of 10 kilometers. This road provides access to an attractive tourist destination ‘’Taip Banda’’.

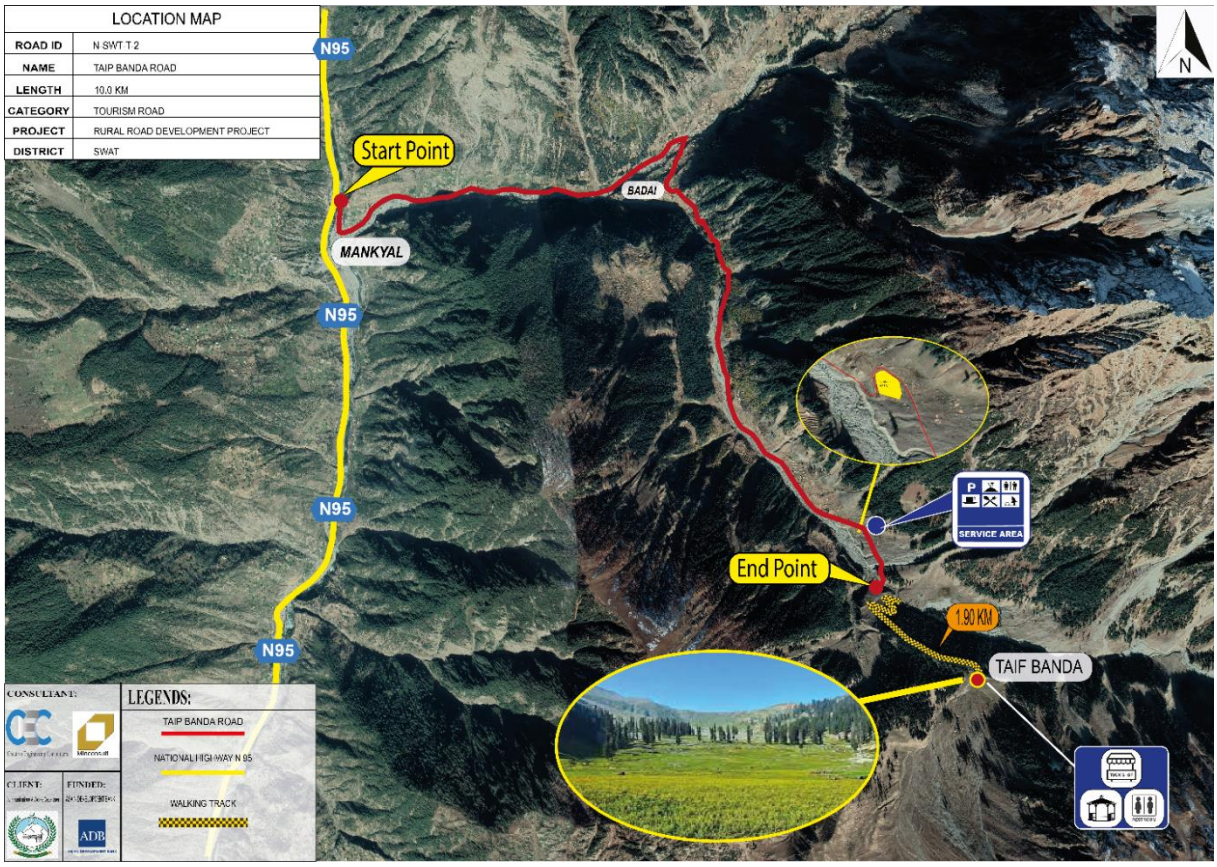


Figure 5.8.5 Location Map N-SWT-T2

5.8.2.5 N-SWT-T4 (Uthror to Thal via Badgoi Top)

The Swat stretch of the Uthror to Thal via Badgoi Top Road, spanning 14 km, is a mesmerizing journey through the heart of District Swat's natural beauty. Beginning at the famed tourist destination of Gabral in Kalam, this portion of the road treats travelers to Swat's lush valleys, majestic mountains, and cultural treasures.

As you traverse this section of the road, you'll immerse yourself in the captivating landscapes and rich heritage of Swat. The route not only offers access to the stunning natural wonders of the region but also serves as a vital connection for local communities, fostering economic activities and social interactions.

The Swat stretch of the Uthror to Thal via Badgoi Top Road is an invitation to explore the unmatched beauty and cultural richness of Swat district, making it an unforgettable part of your journey.

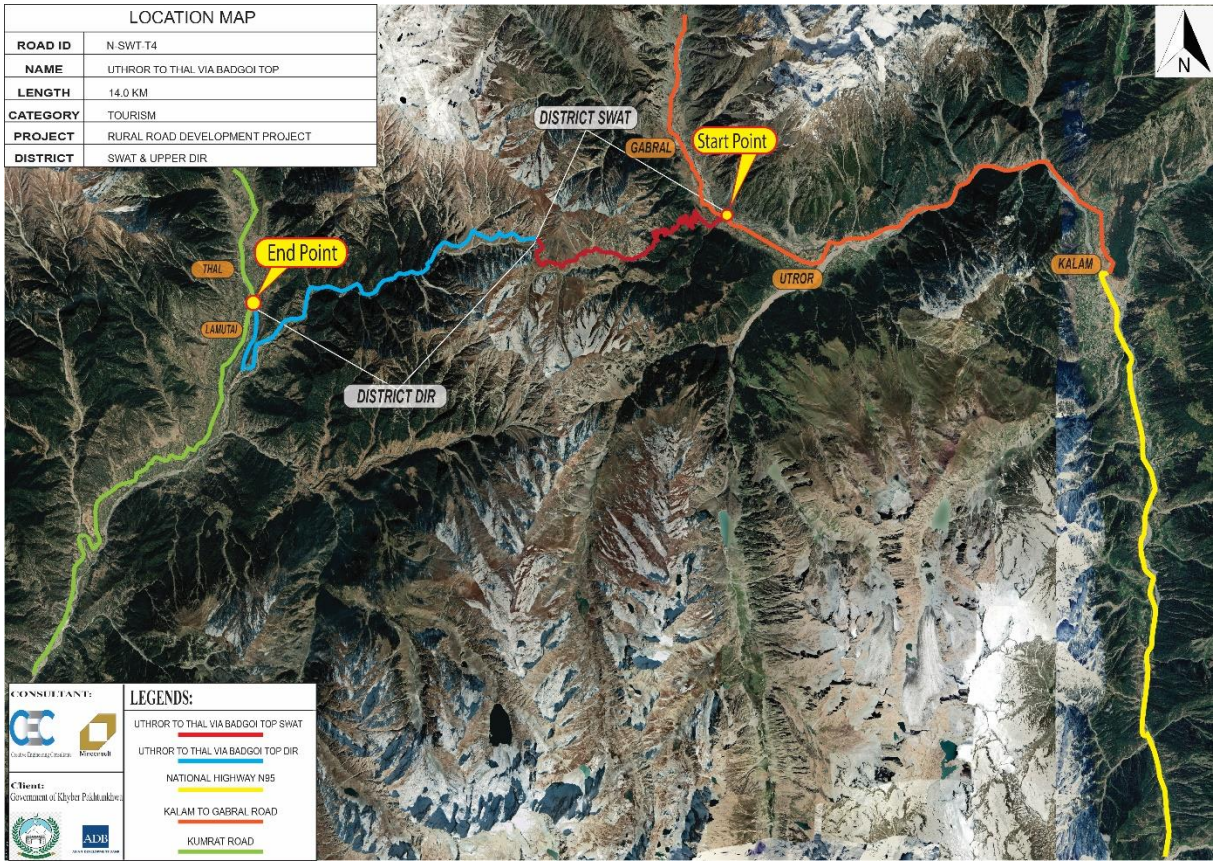


Figure 5.8.6 Location Map N-SWT-T4

5.8.2.6 N-SWT-T3 (Desan Meadows to Kalam)

The Desan Meadows to Kalam Road, nestled in the breathtaking landscapes of Swat, stretches gracefully for 5 kilometers. Desan Meadows, adorned with its captivating beauty, has long been a jewel in Swat's crown, yet its allure remains inaccessible to many. However, with the introduction of this road, a transformative era dawn. It promises to unfurl the gates of Desan Meadows to a wider audience, breathing new life into the tourism sector and fostering an economy that thrives on the wonders of this pristine haven. This road is not just a pathway; it is a gateway to a flourishing future for Swat's tourism industry.

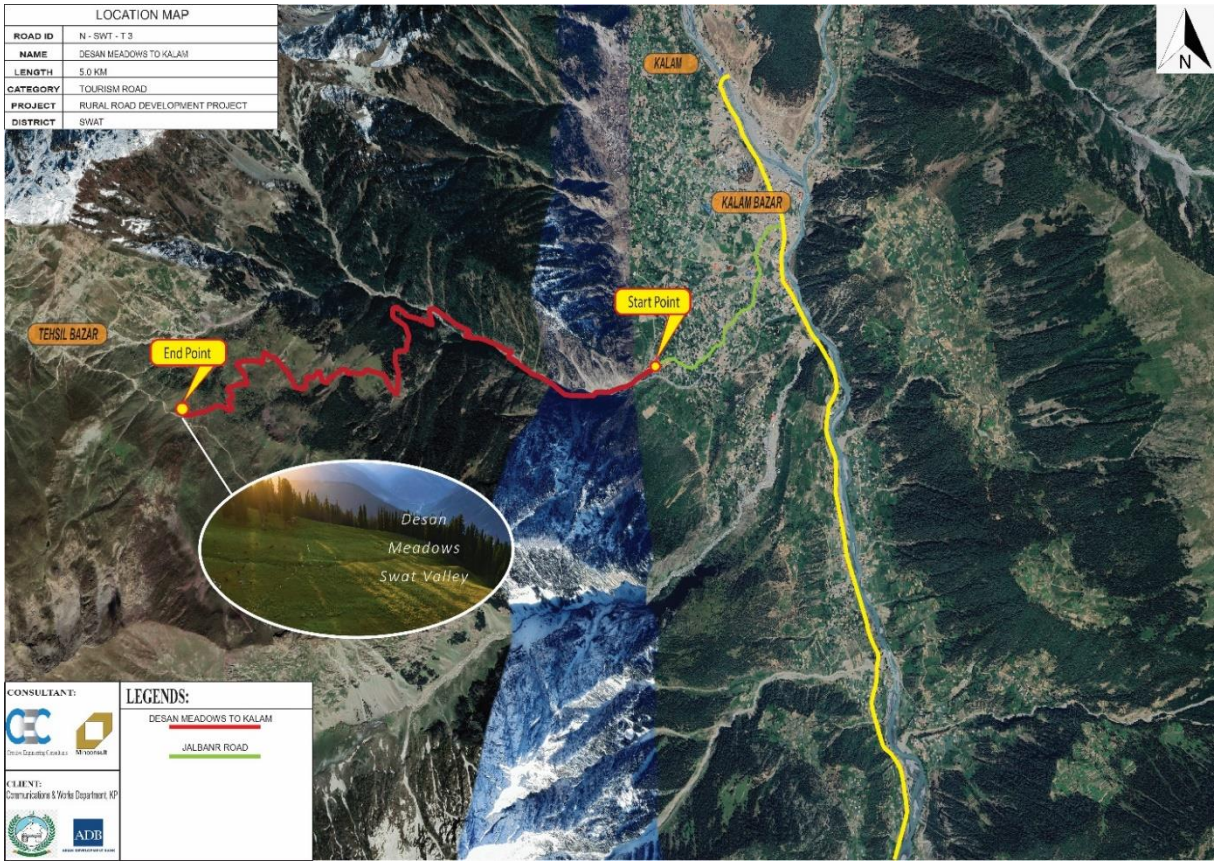


Figure 5.8.7 Location Map N-SWT-T3

5.8.3 IRI Classification Pie Chart of Selected Roads

The International Roughness Index (IRI) is used by highway professionals throughout the world as a standard to quantify road surface roughness. A poor road surface roughness influences the traffic speeds and times. It also effects the mobility and accesibility of users traversing that road.

The IRI Classification Charts are given below.

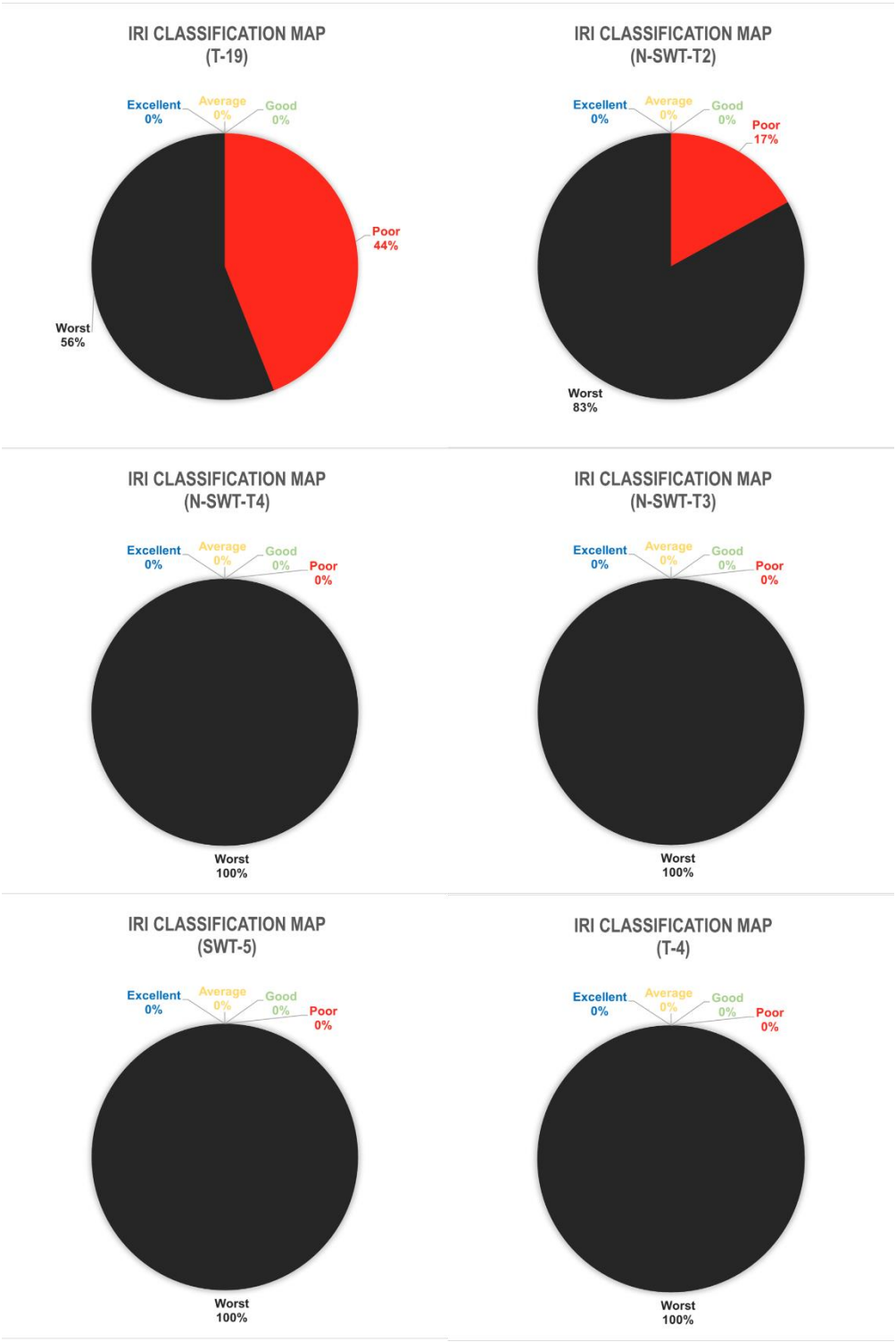


Figure 5.8.8 IRI Classification Charts Tourism Roads District Swat

5.8.4 RST Pie Chart of Selected Roads

Road Surface type (RST) survey was conducted to investigate the actual condition and type of surface of the road under observation. In rural areas earthen or kacha tracks and TST/DST are common that affect the mobility of road users and accessibility to necessities.

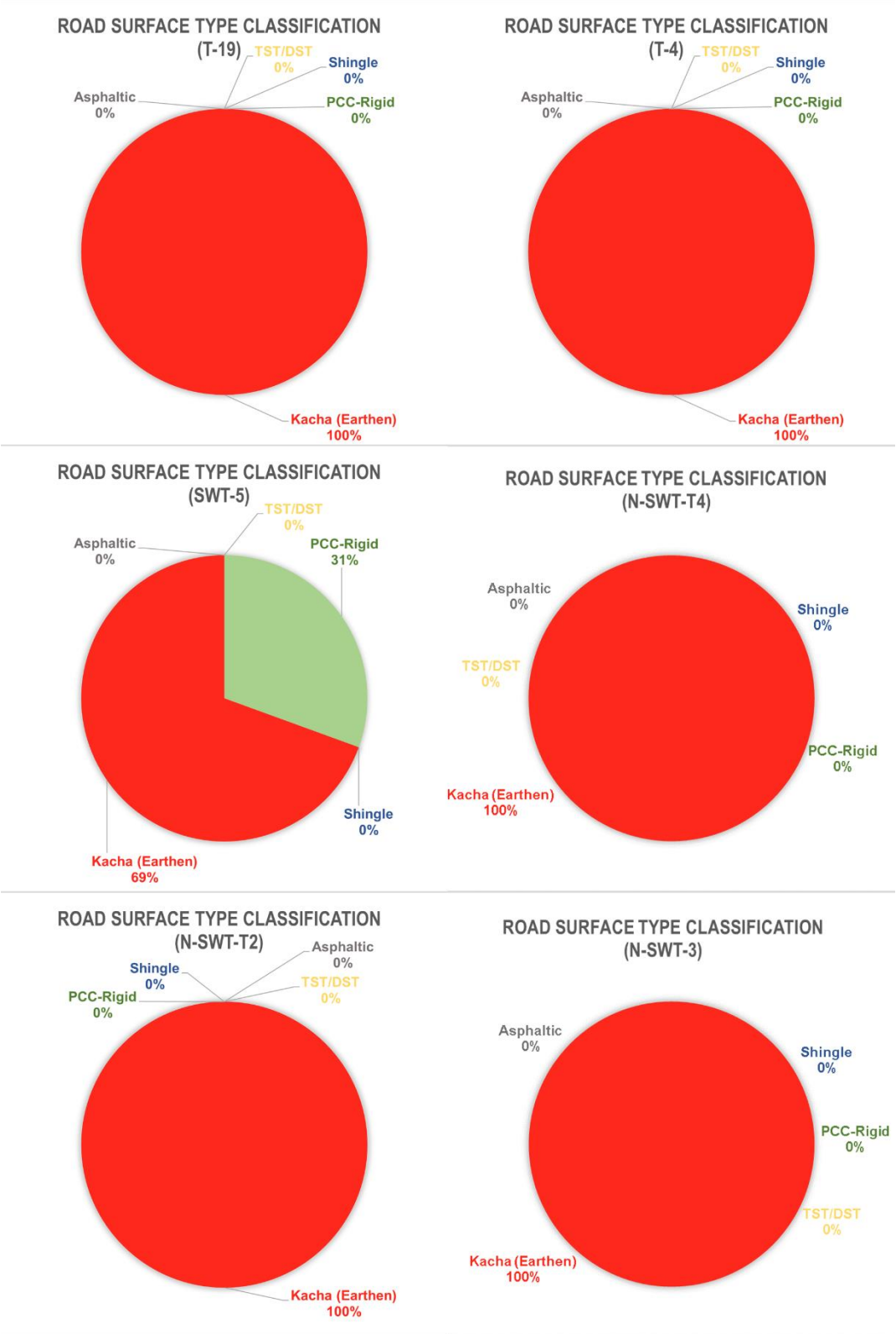


Figure 5.8.9 RST Classification Charts Tourism Roads District Swat

5.8.5 Travel Speed Survey

Table 5.8.2 Travel Speed Survey Tourism Roads District Swat

Road ID	Distance (km)	Total Ascent (m)	Total Descent (m)	Total Time	Average Speed (km/h)	Avg. Moving Speed (km/h)	Maximum Speed (km/h)
SWT-5	4.85	212	45	24:39.0	12.3	12.3	26.3
T-19	6.92	102	87	39:27.0	6.9	6.9	14.6
T-4	8.8	113	45	20:50.0	8.1	8.1	19.3
N-SWT-T-2	8.02	33.333	151.667	10:22.3	12.37	12.6567	23.333
N-SWT-T4	20.333	45.234	162:22.3	58.37	12.6567	23.333	30.48
N-SWT-T3	5.09	15.25	153.5	12:05.8	6.445	7.035	15.2775

The travel speeds for all roads are low due to the deteriorated road condition which is reflected from the RST and IRI pie charts. Mobility of the road users is affected as indicated by lower average speeds and higher travel times, which can be attributed to the poor road conditions.

It can be inferred from these observations that these roads need to be reconstructed for better mobility and access of people to basic livelihood necessities.

5.8.6 Traffic Analysis

ADT

Table 5.8.3 Existing ADT Tourism Roads District Swat

vehicle type	Car	Motorcycle	Mazda Coaster	Rickshaw / Qinggi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	TOTAL Vehicles
SWT-5	289	156	4	0	244	45	0	0	0	0	0	0	3	8	749
T-19	378	61	0	0	0	0	0	0	0	0	0	0	0	5	444
T-4	398	125	0	0	120	58	0	0	0	0	0	0	0	8	709
N-SWT-T-2	79	28	0	0	0	0	0	0	0	0	0	0	12	12	131
N-SWT-T4	0	10	0	0	25	0	0	0	0	0	0	0	0	8	43
N-SWT-T3	0	15	0	0	10	0	0	0	0	0	0	0	0	0	25

PCUs

Table 5.8.4 Existing PCUs Tourism Roads District Swat

vehicle type	Car	Motorcycle	Mazda Coaster	Rickshaw / Qinggi	Pickup/ Delivery Truck	Suzuki / Wagon	2-Axle	3-Axle	4-Axle	5-Axle	6-Axle	Large Bus	Animal Driven Cart	Tractor	Total PCUS
SWT-5	289	78	8	0	366	90	0	0	0	0	0	0	14	32	877
T-19	378	31	0	0	0	0	0	0	0	0	0	0	0	20	429
T-4	398	63	0	0	180	116	0	0	0	0	0	0	0	32	789
N-SWT-T-2	79	14	0	0	0	0	0	0	0	0	0	0	54	48	195
N-SWT-T4	0	5	0	0	38	0	0	0	0	0	0	0	0	32	75
N-SWT-T3	0	8	0	0	15	0	0	0	0	0	0	0	0	0	23

5.8.6.1 Composition Of Vehicle Types

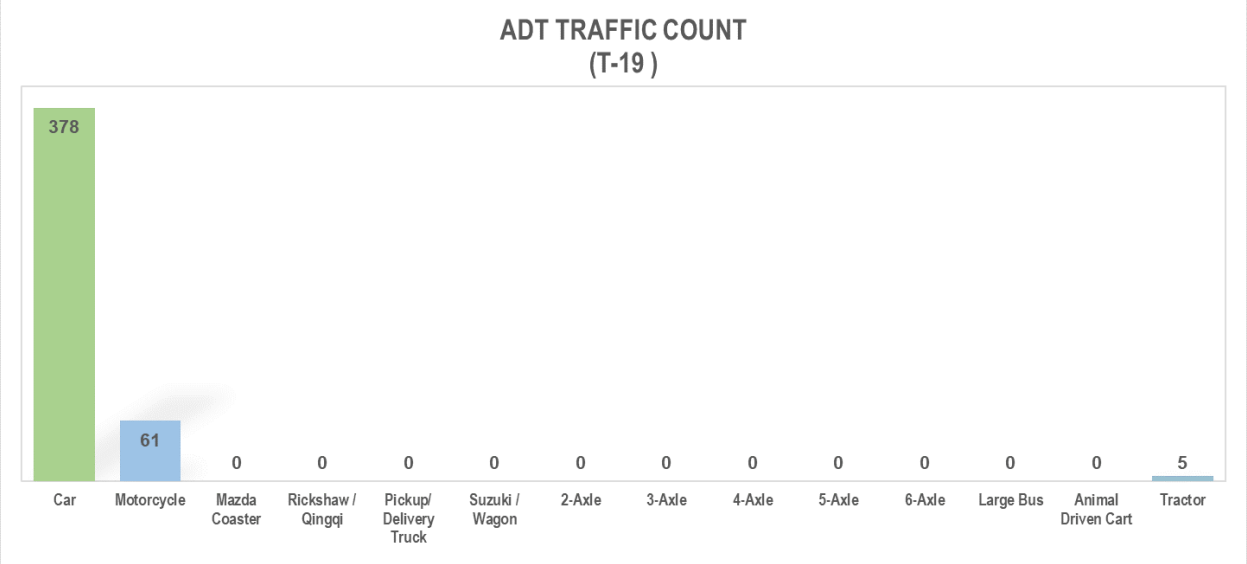


Figure 5.8.10 Vehicle Composition T-19

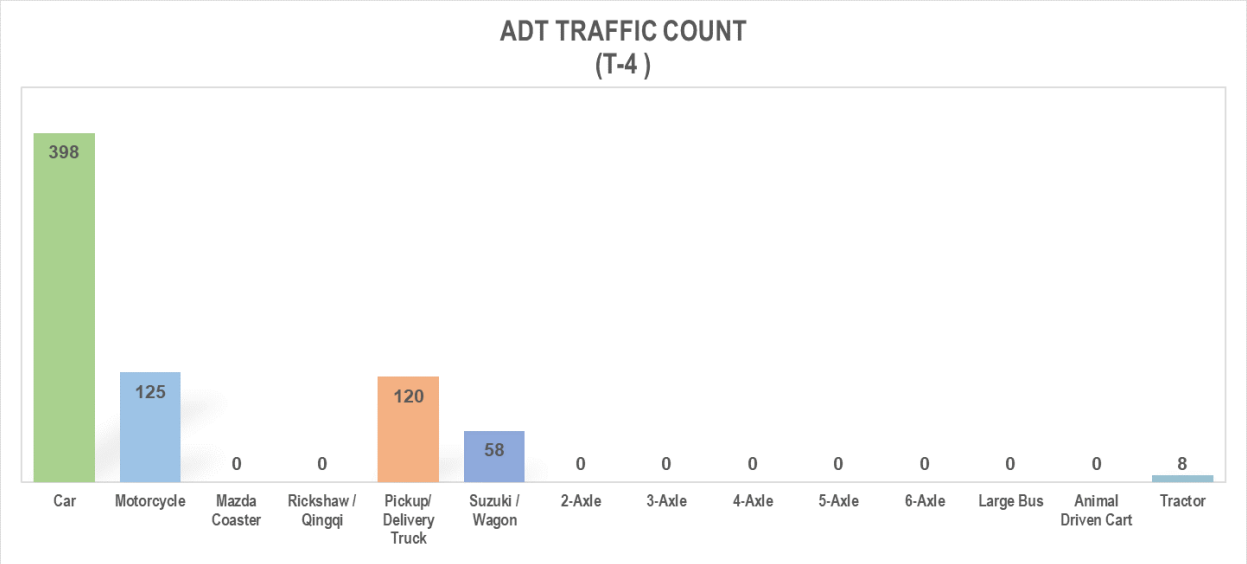


Figure 5.8.11 Vehicle Composition T-4

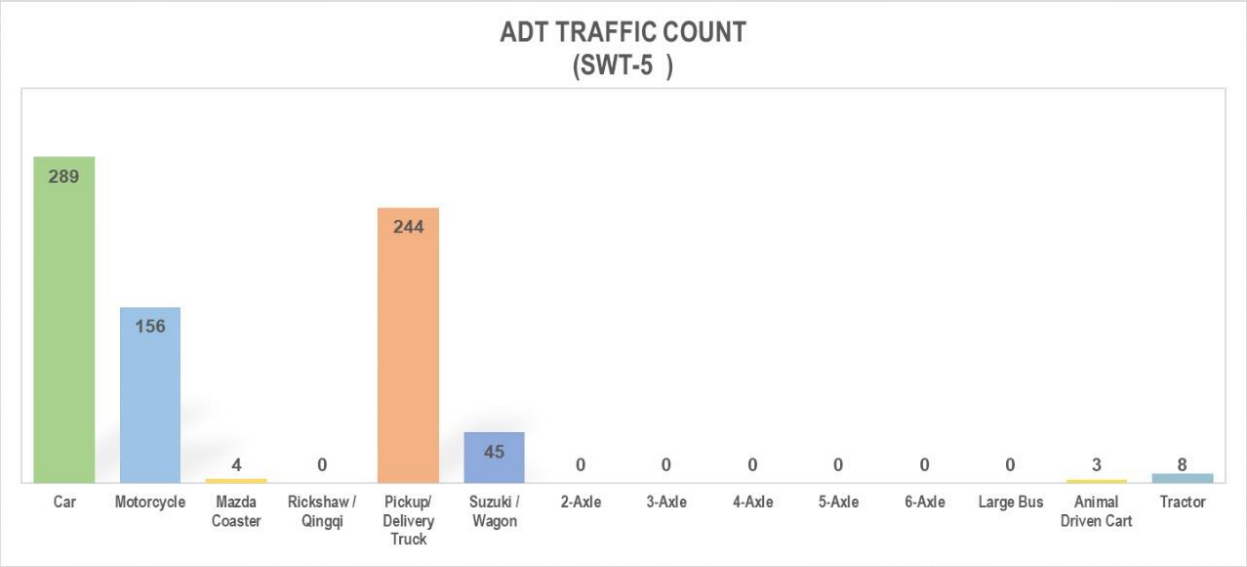


Figure 5.8.12 Vehicle Composition SWT-5

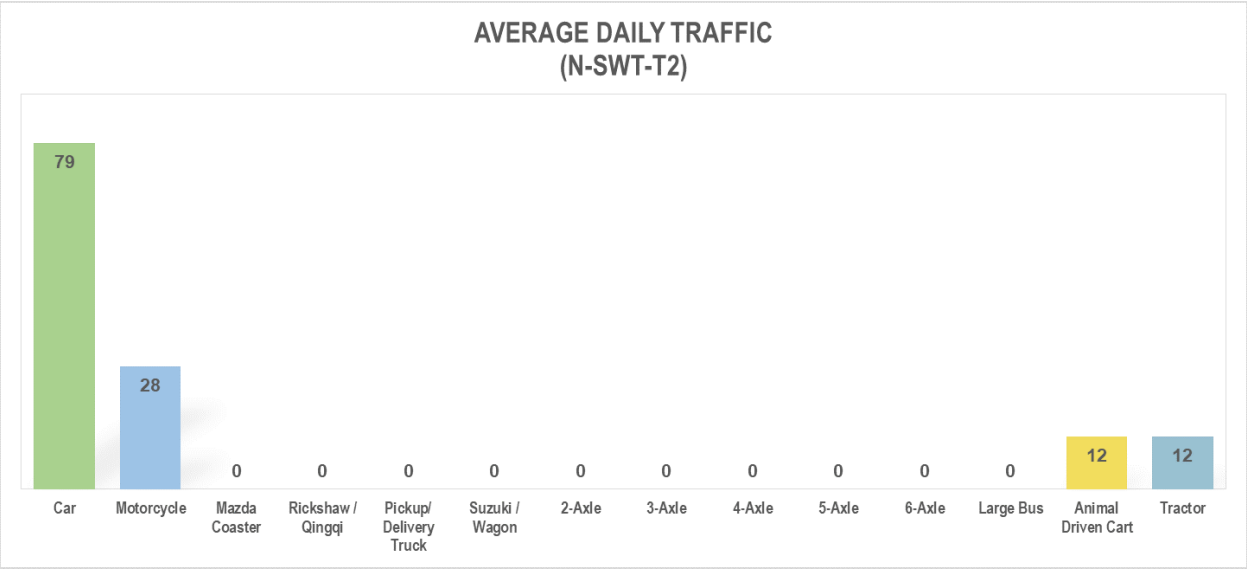


Figure 5.8.13 Vehicle Composition N-SWT-2

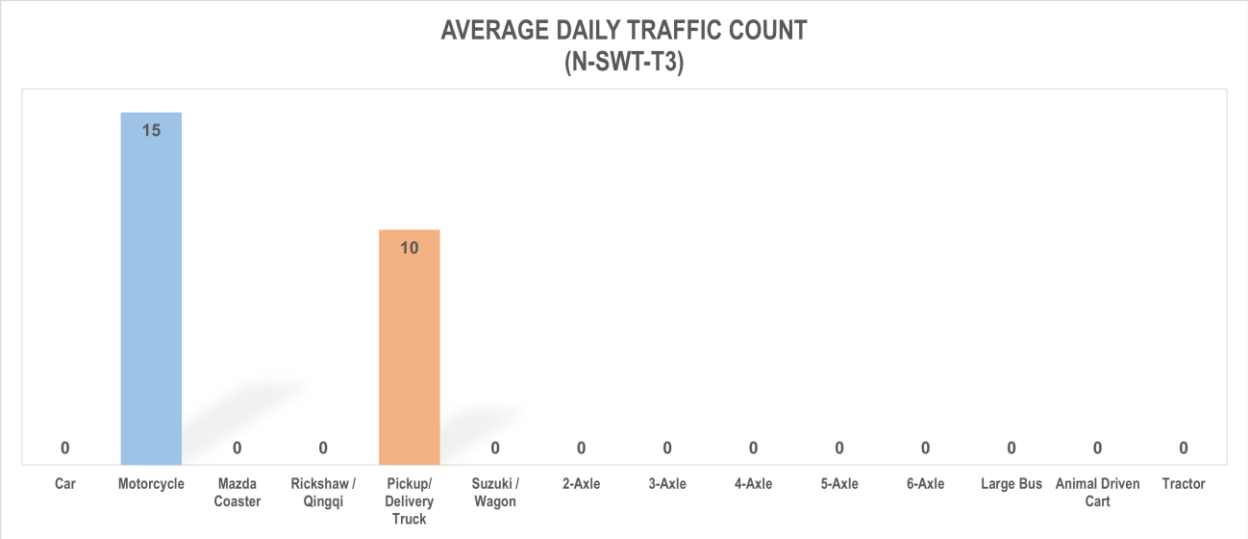


Figure 5.8.14 Vehicle Composition N-SWT-T3

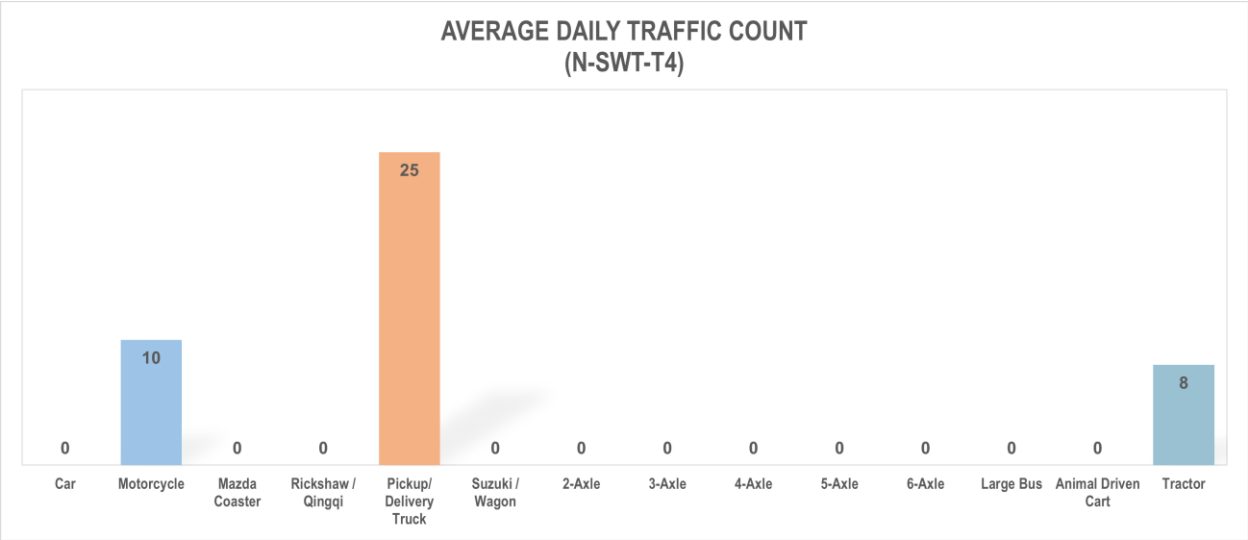


Figure 5.8.15 Vehicle Composition N-SWT-T4

Most of the vehicles on the subject roads are Cars and Motorcycles. This Vehicle Composition can be attributed to the rural area type of the considered roads. Most of the people travel on these roads in their personal cars or motorcycles due to lack of proper public transport facilities.

The reason we have cars and motorcycles as the majority constituents of the vehicle mix, is because of the diversity of the road users utilizing the facility. Those people that have the available resources and own a car or motorcycle are reluctant of using public transport due to the poor services and condition of vehicles, whereas those people who do not own a private car or motorcycle have no other option then using public transport that constitutes of rickshaws and Suzuki/Wagons as seen in some roads.

5.8.6.2 Traffic Analysis Forecast

ADT:

The ADT Base Year is 2022 and ADT Forecast year is 2032 as can be seen in the table below.

The following table represents the annual daily traffic forecast (10 years).

Table 5.8.5 Forecast ADT Tourism Roads District Swat

Year	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
T-19	**444**	466	489	514	539	566	595	624	656	688	723
T-4	**708**	743	780	819	860	903	948	996	1,045	1,098	1,152
SWT-5	749	786	826	867	910	956	1,004	1,054	1,107	1,162	1,220
N-SWT-T2	131	138	144	152	159	167	176	184	194	203	213
N-SWT-T4	43	45	47	50	52	55	58	61	64	67	70
N-SWT-T3	25	26	28	29	30	32	34	35	37	39	41

PCU:

The PCU Base Year is 2022 and PCU Forecast year is 2032 as can be seen in the table below.

Table 5.8.6 Forecast PCUs Tourism Roads District Swat

Year	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
T-19	**428**	450	472	496	520	546	574	602	633	664	697
T-4	**785**	824	865	909	954	1,002	1,052	1,105	1,160	1,218	1,279
SWT-5	877	920	966	1,015	1,065	1,119	1,175	1,233	1,295	1,360	1,428
N-SWT-T2	195	205	215	226	237	249	261	274	288	303	318
N-SWT-T4	75	78	82	86	91	95	100	105	110	116	121
N-SWT-T3	23	24	25	26	27	29	30	32	33	35	37

5.8.7 Discussion and Analysis

The analysis conducted on these roads indicates that the condition of these roads is affecting the traffic characteristic which consequently influences the access of people to necessities of life. The poor condition of these roads is reflected by the Road Surface Type (RST) and International Roughness Index (IRI) pie charts which indicates that these roads need immediate consideration with respect to construction and rehabilitation. The poor mobility of these roads is indicated by the lower speeds and high travel times. Reconstructing these roads will improve speeds and lower travel times of users. The utility of these roads in the tourism sector will be enhanced by reconstructing these roads as more people will prefer to travel on them. This will boost tourism in the region and provide numerous opportunities for the locals in different sectors.

The traffic study shows that the existing roads are in deplorable condition. However, due to the attraction of the spots people still tend to reach the locations. The main traffic on the roads is cars and motorcycles as it is not accessible for other types of vehicles. After the completion of the project, it will attract more tourists on the project roads.

CHAPTER 6: PAVEMENT DESIGN

6.1 Pavement Design

For the design of pavement components, site-specific data including the traffic, the roadbed strength, condition of existing pavement, and environment was collected, through field surveys, investigations, lab testing, and available data.

The process of Pavement Design involved the following activities:

I. Traffic Studies.
II. Estimation of Total Equivalent Standard Axles (ESAL).
III. Geotechnical Investigation for obtaining the roadbed soil value (% CBR).
IV. Determination of properties of the existing pavement components.
V. Computation of Pavement structure thickness.

6.2 ESAL

Vehicle and load distributions grouped by axle type are used to transform mixed traffic into a unified traffic parameter that can be used in the design equation. Traffic loading is a heterogeneous mix of vehicles, axle types, and axle loads with distributions that vary with time throughout the day. The mixed traffic is converted into one parameter called the Equivalent Single Axle Load (ESAL). ESALs are defined as the number of 18-kip single axles that cause the same pavement damage as caused by the actual mixed axle load and axle configuration traffic. The damage associated with the equivalent axle can be defined in numerous ways; according to the 1993 AASHTO Guide, it is defined in terms of serviceability. The 18-kip single axle load was chosen because it was the maximum legal load permitted in many states as per AASHO Road Test. The Equation-Based on AASHTO Design Guide used for the computation of ESALs is as follows:

$$ESALs = (AADT)_0 \ (T)(Tf)(G)(D_d)(L_d)(Y)$$

(365) Where,

AADT= Annual average daily Traffic

T= Percentage of Trucks in ADT

T_f= Truck Factor, Equivalent Axle Load Factor (EALF): G= Growth rate

D_d= A directional distribution factor

L_d= Lane distribution factor

Y= Design Life

CHAPTER 7: Overall Summary

Access to education, health and markets is a basic life necessity and right of every individual. This project is a dire need of the province now to scientifically select the road network to enhance overall accessibility to Education, Health, and Markets as well as reduce the maintenance backlog on the CWD to some extent.

Traffic study is considered as the prime data source required for estimating present and future needs of a transport and justifies the provision of new links within the existing road network. Traffic volume data collection is the first and most important step leading towards a successful traffic demand and supply analysis of any proposed project. Therefore, it has become imperative to carry out data collection with higher accuracy to achieve the given objectives.

The main objective of the study was to perform a travel demand forecast for the selected roads in the above-given districts. This report also covers various other objectives which are briefly given as follows:

- Classified Traffic Count
- Travel speed Study
- Future Growth Projection
- The IRI and Road Surface Type (RST) survey
- Travel demand forecasting

The travel speeds for all roads are low due to the deteriorated road condition which is reflected from the RST and IRI pie charts. Mobility of the road users is affected as indicated by lower average speeds and higher travel times, which can be attributed to the poor road conditions. Road Surface type (RST) survey was conducted to investigate the actual condition and type of surface of the road under observation. In rural areas earthen or kacha tracks and TST/DST are common that affect the mobility of road users and accessibility to necessities. The International Roughness Index (IRI) is used by highway professionals throughout the world as a standard to quantify road surface roughness. A poor road surface roughness influences the traffic speeds and times. It also affects the mobility and accessibility of users traversing that road.

The traffic counts of these rural roads reflect the poor condition of these roads as very low volumes are recorded. Low volumes on these roads are subject to the deterioration of surface and poor surface types like Shingle or Katcha in rural areas. Commuters avoid these roads, as can be inferred from the low volumes of these roads, due to lower average speeds and higher travel times. Reconstructing these roads will attract traffic on these roads as users will prefer them over other alternatives. Smoother surfaces after reconstruction will improve speeds and lower travel times which will benefit the commuters.

Most of the vehicles on the subject roads are Cars and Motorcycles. This Vehicle Composition can be attributed to the rural area type of the considered roads. Most of the people travel on these roads in their personal cars or motorcycles due to lack of proper public transport facilities.

The reason we have cars and motorcycles as the majority constituents of the vehicle mix, is because of the diversity of the road users utilizing the facility. Those people that have the available resources and own a car or motorcycle are reluctant of using public transport due to

the poor services and condition of vehicles, whereas those people who do not own a private car or motorcycle have no other option then using public transport that constitutes of rickshaws and Suzuki/Wagons as seen in some roads.

It can be inferred from these observations that these roads need to be reconstructed for better mobility and access of people to basic livelihood necessities. The analysis conducted on these roads indicates that the condition of these roads is affecting the traffic characteristics which consequently influence the access of people to necessities of life. The poor condition of these roads is reflected by the Road Surface Type (RST) and International Roughness Index (IRI) pie charts which indicates that these roads need immediate consideration with respect to construction and rehabilitation. The poor mobility of these roads is indicated by the lower speeds and high travel times. Reconstructing these roads will improve speeds and lower travel times of users.

The utility of these roads in providing access to necessities like education, health, and markets will be enhanced with the improvement in road condition after reconstruction. The utility roads in the tourism sector will be enhanced by reconstructing these roads as more people will prefer to travel on them. This will boost tourism in the region and provide numerous opportunities for the locals in different sectors. The traffic study shows that the existing roads are in deplorable condition. However, due to the attraction of the spots people still tend to reach the locations. The main traffic on the roads is cars and motorcycles as it is not accessible for other types of vehicles. After the completion of the project, it will attract more tourists on the project roads.