Japan International Cooperation Agency (JICA)

Earthquake Reconstruction and Rehabilitation Authority (ERRA)

Urgent Rehabilitation Project: West Bank Bypass Design

Under the Urgent Development Study on

Rehabilitation and Reconstruction in Muzaffarabad City

In the Islamic Republic of Pakistan

FINAL REPORT

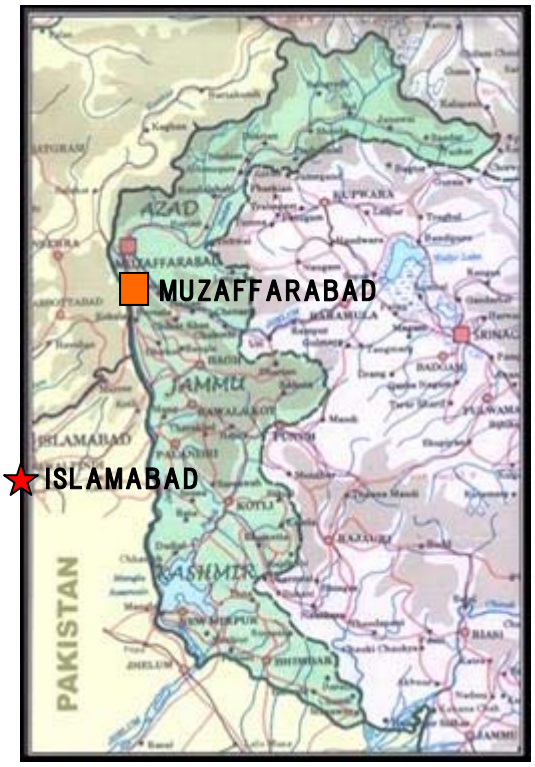
APPENDIX I

REPORT ON ENVIRONMENTAL IMPACT ASSESSMENT

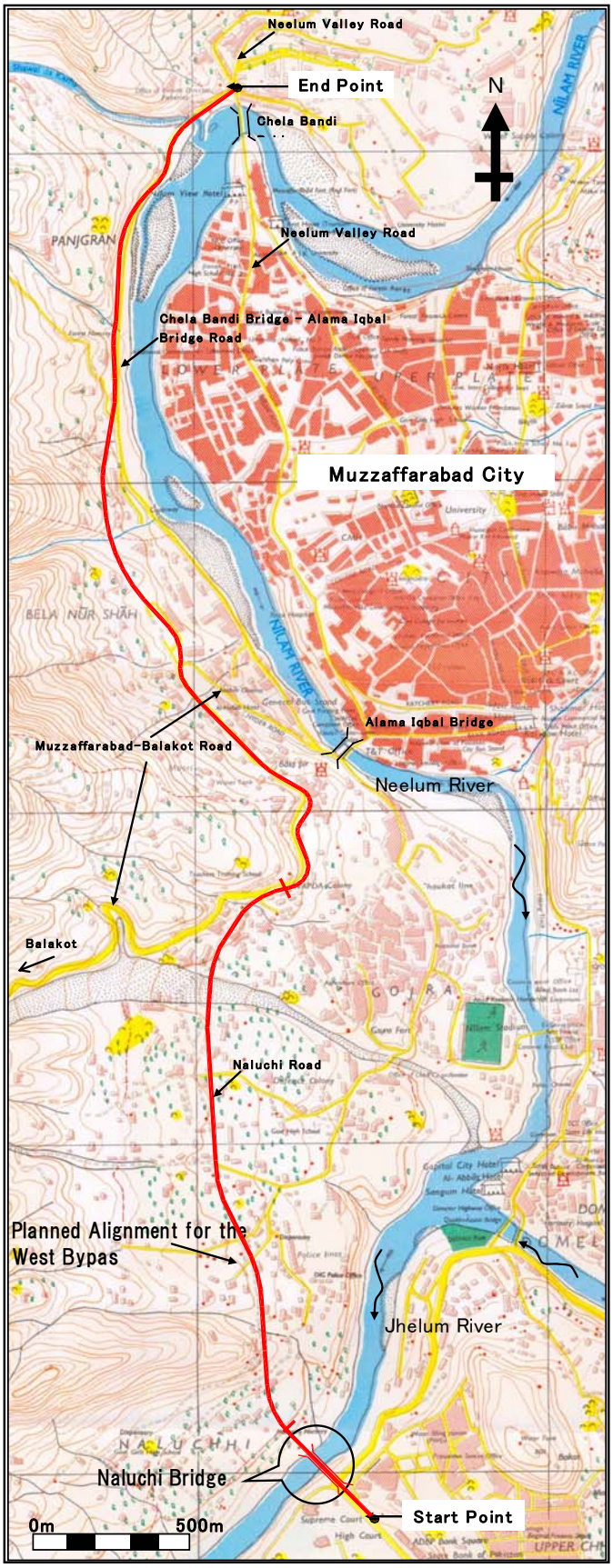
March 2008

NIPPON KOEI CO., LTD.

LOCATION MAP OF THE PROJECT



Key Map



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ACRONYMS AND ABBREVIATIONS

ADDT	annual average daily traffic
AJK	Azad Jammu and Kashmir
AP	affected person
B/C	Benefit Cost Ratio
BOD	biological oxygen demand
CBO	community-based organization
CE	Chief Engineer
CL	centre line
COD	chemical oxygen demand
CO	carbon monoxide
COI	Corridor of Impact
DC	Design Consultant
EIA	Environmental Impact Assessment
EMMP	Environmental Monitoring and Management Plan
EPA	Environmental Protection Agency
IEE	Initial Environmental Examination
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
km	kilometre
LAA	Land Acquisition Act
LARP	Land Acquisition and Resettlement Plan
LNG	Liquefied Natural Gas
NAAQS	National Air Quality Standards
NEQS	National Environmental Quality Standards
NHA	National Highway Authority
NGO	non-governmental organization
NO_2	nitrogen dioxide
NPV	Net Present Value
MC	Monitoring Consultant
MCM	Municipal Corporation Muzaffarabad
MM	Modified Mercalli
PHED	Public Health Engineering Division
PWD	Public Works Department
PM_{10}	Particulate matter 10
ppm	part per million
ROW	Right of Way
Rs.	Pakistani Rupee
SC	Supervision Consultant
SO_2	sulfur dioxide
TP	Traffic Police
USEPA	United States Environmental Protection Agency
WHO	World Health Organisation

EXECUTIVE SUMMARY

Background of the Project

After the earthquake on 8 October 2005, Japan International Cooperation Agency (JICA) conducted "Master Plan Study of Rehabilitation and Reconstruction in Muzaffarabad City" from February to August 2006 in order to propose appropriate measures for rehabilitating and reconstructing the city. The master plan selected "the West Bank Bypass Construction Project" (hereinafter referred to "the Project") as an urgent and the highest priority project among nine proposed projects.

National Highway Authority (NHA) is the implementing agency of the Project with the counterpart fund of Japan International Bank for Cooperation (JBIC) Emergency Earthquake Recovery Loan.

The main existing road in Muzaffarabad city is the Neelum Valley road, which is congested during day time and has reached the capacity of the road, it is expected to increase traffic volume when the reconstruction and rehabilitation work start in full scale.

The Project intends to provide additional capacity through by a new bypass road in the western part of the city. The project expects to enhance rehabilitation and reconstruction activities in the damaged area not only inside the city but also outside the city in terms of providing an alternative corridor to ease congestion as well as improving the transporting convenience between the periphery and the city to reduce travel time.

The Project involves construction of a bridge on River Jehlum at Naluchi and construction of 5.0km road from Naluchi to Chela Bandi. The implementation of the Project is expected to start in 2008 and complete in 2010.

The EIA Report presents the environmental assessment for the Project. The objectives of this environmental assessment are (i) to determine at an early stage potential environmental impacts, (ii) propose suitable mitigation measures for environmental protection and/or enhancement, (iii) conduct public consultations with respect to environmental concerns, and (iv) prepare an environmental management and monitoring plan (EMMP), including the operational procedures, institutional responsibilities and cost estimates in accordance with EPA screening procedures.

Relevant Legislations and Guidelines

The Pakistan Environmental Protection Act, 1997 makes it mandatory for project proponent to carry out an Initial Environmental Examination (IEE) or Environmental Impact Assessment (EIA) of development projects and incorporate environmental and social mitigation measures as part of the project planning. The same has been acknowledged by AJK government through AJK Environmental Protection Act 2000.

Pakistan Environmental Protection Agency (Review of IEE/EIA) Regulations 2000 defines and

regulates the procedure of IEE and EIA for projects in the country.

As for the limits for pollutants in industrial and municipal effluents, and in gaseous emissions from industries and vehicles, these are defined in the National Environmental Quality Standards (NEQS).

The Land Acquisition Act (LAA), 1894, regulates the acquisition of land and built-up property, and damage to other assets such as crops, trees, and infrastructure.

Efforts have been made to satisfy the environmental appraisal requirements of the Environmental Protection Agency AJK procedures and format. The EIA Report also follows the required JICA procedure and format, as set out in the JICA Guidelines for Environmental and Social Considerations, April 2004.

Components of the EIA Report

The EIA report contains the identified environmental impacts and their mitigation measures. It also includes an Environmental Management and Monitoring Plan for the implementation of the proposed mitigation measures and monitoring mechanism by the concerned institutions at all stages.

Description of the Project

The Project expects to enhance rehabilitation and reconstruction activities, and the main objectives of the Project are as follows.

- Urgently enhancing rehabilitation and reconstruction activities in the damaged areas;
- Facilitating the general public, particularly the people of the western part of the city to easy and efficient access to main city area;
- Minimising the heavy traffic load on main Muzaffarabad road;
- Enhancing the efficiency of the urban road network; and
- Reducing the probability of traffic jams.

The proposed road runs through the western river terrace of the Neelum Valley ascending north from the intersection of Muzaffarabad – Kohala Road near the Supreme Court, AJK, through a proposed Naluchi Bridge to Chela Bandi, its end point.

Description of the Environment

The Information on the natural environment of the Project Area is collected from various secondary sources to understand the current conditions.

In order to obtain true picture of the environmental condition of the Project Area, the EIA consultant carried out water, air and noise monitoring.

The socio-economic environment of the Project Area was studied in detail for developing the baseline information about the affected persons of the Project. Detailed surveys were carried out for this purpose. Section 3 describes the findings of this exercise in detail.

Project Alternatives

Five alternatives of the Project were considered those included "No project", "Alternate transport modes", "Improvement of the existing carriageway in the city", "Eastern Bypass" and "Western Bypass". These have been discussed in detail in Section 4 of this EIA Report. The last option was selected because it fulfils the Project's requirements in the best way.

Environmental Impacts and Mitigation Measures

Various probable impacts on the existing resources due to the Project were studied under the parameters of social and natural environments.

As a result of the EIA Study, contribution to rehabilitation and reconstructing activities which increase long-term economic activity and uplift of the standard of life of the people is visualised as a major positive impact of the Project. It was also observed that there would be negative impacts related to the Project in all stages. Those include land acquisition and resettlement, soil erosion, improper disposal of waste, loss of vegetation, disturbance to the residents, disruption of traffic and impacts on the health and safety of general public and workers.

Land acquisition and resettlement is the major negative impact. The total number of affected households is 180 and the affected people is 993. The area of the land to be acquired for the Project is 6.81 ha, along the proposed Bypass. Construction activities will result in relocation/rearrangement of various utilities within the ROW, including culverts, bridges, gas pipe line, fibre optic cable and electrical poles.

The mitigation measures to eliminate/minimise those negative impacts have been proposed to bring them to an acceptable level through implementation of the Environmental Management and Monitoring Plan. Land Acquisition and Resettlement Plan will be separately prepared to deal with the issue.

The mitigation measures have been suggested for the design, construction and operational stages of the Project, taking into consideration the environmental impacts of the Project.

Economic Assessment

The Economic Assessment describes economic benefits of the Project. Economic Internal Rate of Return (EIRR) is provided, and it comes out as 14.06%, which is above 12%, the assumed opportunity cost of capital in Pakistan.

Environmental Monitoring and Management Plan (EMMP)

An EMMP provides an approach for managing and monitoring environment related issues and describes the institutional framework and resource allocation. The Environmental Management and Monitoring Plan has accordingly been devised to monitor various activities during the construction and operation stages of the Project, considering all the sensitive issues during the execution. The EMMP will be implemented by PWD with the assistance of consultants. PWD will appoint Deputy Director Environment to deal with the environmental related issues. Total estimated environmental mitigation cost will be around Rs. 326 million.

Public Consultations and Information Disclosure

The EIA Study Team identified the stakeholders of the Project and discussed the Project with them during the detailed field surveys and other visits. Their views and concerns were noted, and after reviewing their concerns, the mitigation measures have been suggested for giving them due compensation. They have also been incorporated into the design as much as possible.

Conclusion

The Project involves upgrading of a single carriageway from Naluchi to Chela Bandi and construction of bridge and viaduct at Jehlum River. It is foreseen that it will cause negative environmental impacts. These impacts will be avoided and minimised at the pre-construction stage and will be mitigated and managed by properly implementing the EMMP. The major issue is land acquisition and resettlement and it will be dealt by Land Acquisition and Resettlement Plan. Some long-term adverse environmental impacts are, however, envisaged for the operation stage of the Project. Hence, the Project is environmentally feasible provided that the mitigation measures are properly implemented during the Project execution.

SECTION 1: INTRODUCTION

1.1 Brief Introduction

Main Muzaffarabad valley road is an important and main road of Muzaffarabad City, the state capital. During peak hours the traffic volume crosses its design capacity which causes traffic jams leads noise and air pollution in Muzaffarabad city.

AJK with the technical assistance of JICA designs the West Bank Bypass to improve the existing two-lane carriageway and construct a bridge and a viaduct at Naluchi to provide easy access to the western part of Muzaffarabad City.

This Report presents the EIA Study for the Project. At present the existing road section is only a dual carriageway, having a width varying from 2.5 metres to 5.0 metres. The Project aims to improve the existing carriageway from Naluchi to Chela Bandi with 600 m length of new construction part, and to construct bridge and viaduct over Jhelum River, at Naluchi.

During the EIA Study, the EIA Team maintained close coordination with the Design Team regarding any modification and their comments/suggestions were incorporated for assessing environmental issues and vice versa.

1.2 Proponent of the Project

Considering the present institutional frameworks for rehabilitation and reconstruction of the earthquake damages and the memorandum from ERRA, overall institutional framework fo the Project implementation is depicted in **Figure1.1**.

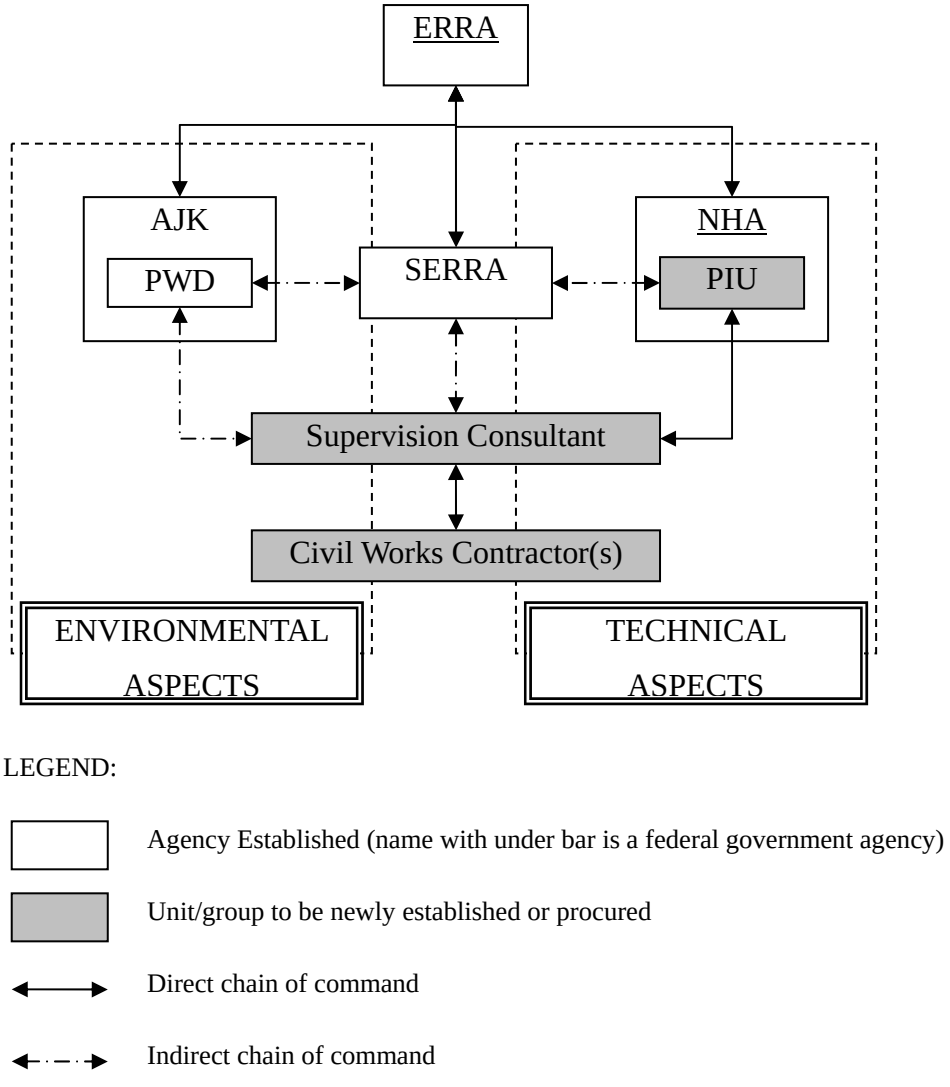

Figure 1.1 Institutional Framework of Project Implementation

The government agencies involved in the Project implementation are ERRA, SERRA, AJK and NHA. The role and tasks of the agencies are tentatively drafted as the following:

Earthquake Reconstruction and Rehabilitation Authority (ERRA) is a sponsoring agency in the Project and responsible for overseeing the Project implementation and coordinating various issues if any among agencies concerned including Ministry of Economic Affairs and Statistics and Ministry of Finance.

State Earthquake Reconstruction and Rehabilitation Agency (SERRA) represents ERRA through delegated powers at the state level for the Project implementation.

Public Works Department (PWD) in AJK is responsible for undertaking all environmental matters of the project including finalization and implementation of EIA and LARP and coordination of interests at field level if any among between local communities and government agencies.

National Highway Authority (NHA) is a project implementation agency and responsible for implementation of the civil works including procurement of supervision consultant and civil works contractor(s). NHA shall provide technical supervision and ensure compliance and oversee the construction works. In this regard, it is proposed that Project. Project Implementation Unit (PIU) shall be established at the state level to closely oversee and monitor the Project implement on the ground. National Highway Authority (NHA) is the proponent of the Project with the following address:

National Highway Authority
27 Mauve Avenue, G-9/1
Islamabad

1.3 Overview of the Project

The length of this section is about 5.0 km including a bridge and a viaduct at Naluchi. The Project section consists of the following major components:

- Construction of a dual carriageway from Naluchi to Chela Bandi;
- Construction of a bridge and a viaduct over Jehlum River at Naluchi.

1.4 Scope and Limitation of EIA Study

The scope of the EIA Study is to scrutinise the possible impacts of the Project on its immediate surroundings on both short and long term basis. Then based on the nature and levels of those impacts, mitigation measures are delineated by the Study Team and accordingly the EIA Report has been prepared. After the approval of the EIA Report from the EPA AJK, contractor of the construction will be bound to follow the recommendations of the EIA Report during the execution of engineering activities on site.

In order to investigate the environmental features of the Project Area, the Study Team carried out detailed site visits for collecting primary and secondary data to identify and establish the Corridor of Impact (COI) and mitigations required to avoid and minimise the adverse impacts.

1.5 Relevant laws, Standards and Guidelines

Environmental issues and control in Pakistan are governed by Pakistan Environmental Protection Act, 1997. The act is applicable in AJK through AJK Environment Protection Ordinance 2001. The act defines the terms of environmental issues including EIA. The act makes it mandatory for the project proponents to carry out an IEE or EIA of development projects and incorporate environmental mitigation measures as part of the project planning. Since the AJK Environmental Protection Act 2000 is still in a stage of draft, the act, a federal law, is in power to regulate the process in AJK.

Pakistan Environmental Protection Agency (Review of IEE/EIA) Regulations 2000 defines and regulates the procedure of IEE and EIA for projects in the country. **Figure 1.2** shows the flow of IEE and EIA for development projects.

As for the limits for pollutants in industrial and municipal effluents, and in gaseous emissions from industries and vehicles, these are defined in the NEQS. Since NEQS does not have environmental standards, other international standards are referred to in the EIA Report.

Efforts have been made also to satisfy the environmental appraisal requirements of the EPA procedures and format. The EIA Report has also been prepared in compliance with the requirements of the Japan International Cooperation Agency Guidelines for Environmental and Social Considerations, 2004.

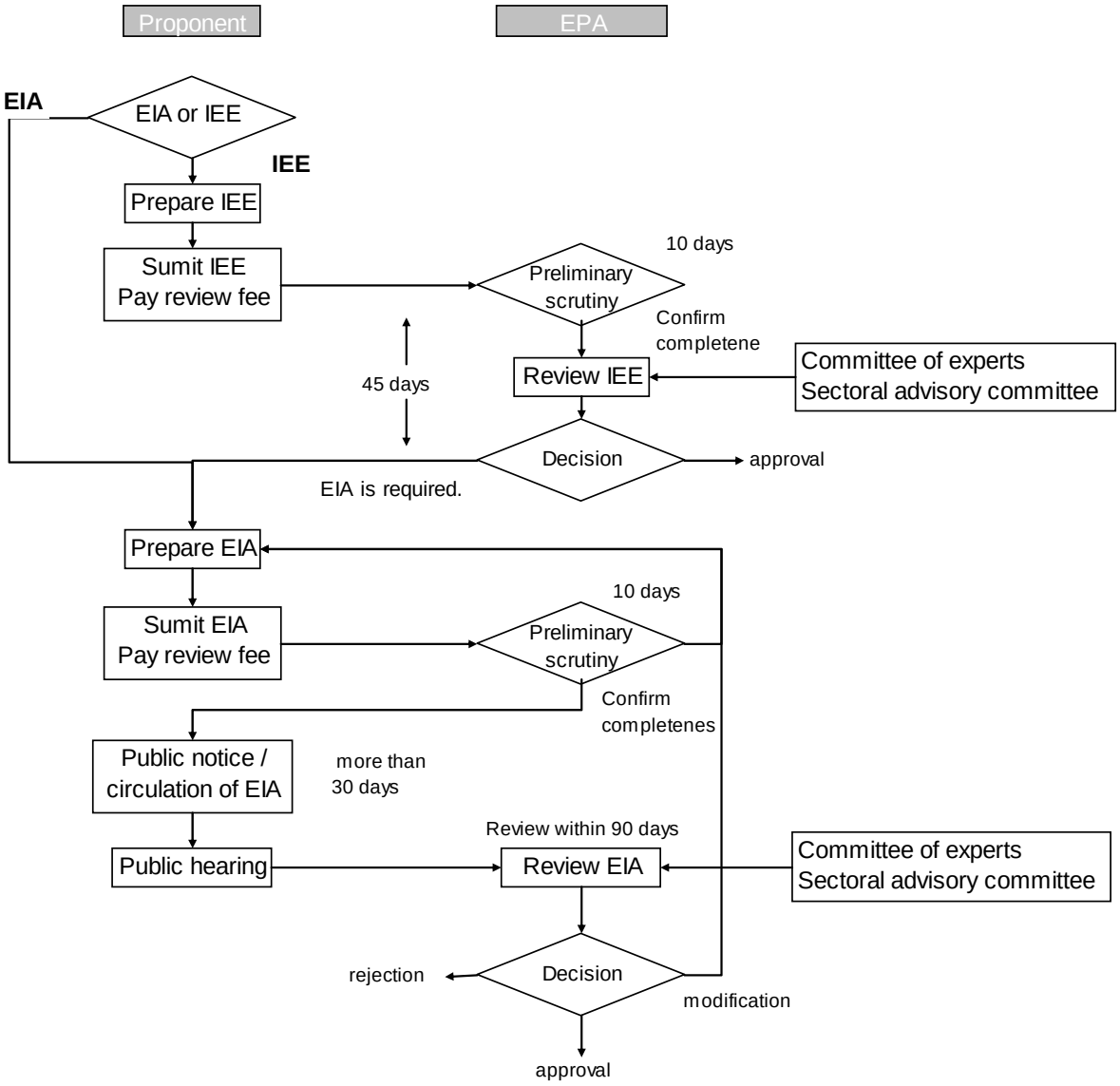

Figure 1.2 Flow of an IEE and EIA for a Development Project

The LAA 1894 with its successive amendments is the main law regulating land acquisition for public purpose. The LAA 1894 is the most commonly used law for acquisition of land and other properties for development projects. It comprises of 55 sections pertaining to area notifications and surveys, acquisition, compensation and apportionment awards and disputes resolution, penalties and exemptions. A few relevant sections from the LAA1894 are summarized in **Table 1.1** in the next page.

The Project Implementation and Resettlement of the Affected Persons Ordinance 2002 is a comprehensive legislation that provides detailed procedures and definitions for land acquisition and resettlement of affected persons by development projects. It is, however, in a draft stage, and it is only referred to in a LARP.

Table 1.1 Relevant Sections of the Land Acquisition Act 1894

Sections of the Act	Salient Features of the Sections
Section 6	The Government makes a more formal declaration of intent to acquire land.
Section 7	The Land Commissioner shall direct the Land Acquisition Collector (LAC) to take order for the acquisition of the land.
Section 8	The LAC has then to direct the land to be marked out and measured.
Section 9	The LAC gives notice to all APs that the Government intends to take possession of the land and if they have any claims for compensation that should to be made to him at an appointed time.
Section 10	Delegates power to the LAC to record statements of APs in the land or any part thereof as co-proprietor, sub-proprietor, mortgagee, and tenant or otherwise.
Section 11	Enables the Collector to make enquiry into "measurements, value and claim and issue the final “award". Included in the award is the land's marked area, his view of what compensation is warranted to all APs.
Section 16	When the LAC has made an award under Section 11, he will then take possession and the land shall thereupon vest absolutely in the Government, free from all encumbrances.
Section 18	Pertains to persons still dissatisfied with the award who may request the LAC to refer the case to the court for determination and decision. This does not affect the taking possession of the land.
Section 23	The Collector announces the award of compensation for the owners after necessary enquiries and compensation for acquired land is determined at its market value plus 15% in consideration of compulsory nature of the acquisition for public purposes.
Section 31	The Section 31 provides that the LAC can, instead of awarding cash compensation in respect of any land, make any arrangement with a person having an interest in such land, including the grant of other lands in exchange.[1]

1.6 Project Categorisation

Pakistan Environmental Protection Agency (Review of IEE/EIA) Regulations 2000, Schedule II, lists down projects requiring an EIA study as under:

“The Projects in schedule-II are generally major Projects and have the potential to affect a

[1] Nevertheless in this Project, “land for land” option will not be applied due to non-availability of the government land in the close proximity and affected persons are not willing to be relocated for away from their existing localities.

large number of people. They also include Projects in environmentally sensitive areas. The impact of such Projects may be irreversible and could lead to significant changes in land use and the social, physical and biological environment."

Schedule-II describes the requirements of EIA for transportation projects as under:

"Federal or Provincial highways or major roads (except maintenance, rebuilding or reconstruction of existing roads) with total cost of Rs. 50 million and above" require an EIA.

As per EPA Guidelines, the present Project is classified as "Schedule-II" project that requires an EIA study and approval from the concerned authority, prior to the construction.

It is also strongly recommended that an EIA should be conducted since it involves significant environmental impacts such as resettlement of people.

1.7 Components of the EIA Report

Section 1: Introduction

This section briefly introduces of the EIA Report. It provides information and the scope of overview of the Project and the EIA Study. The section also discusses the Project categorisation as per EPA criteria.

Besides, it provides information about the standards and guidelines that have to be followed.

Section 2: Description of the Project

In this section salient features of the Project are presented. It provides information about the following:

a) Overview of the existing road;
b) Location of the Project;
c) Project Right of Way (ROW);
d) Construction schedule;
e) Construction materials;
f) Construction yards and camps; and
g) Workforce and machinery requirements.

Section 3: Description of the Environment

It provides an overview of the present environment of the Project Area/site. It discusses the following:

a) Methodology of the Study;
b) Physical environment;
c) Ecological resources; and

d) Socio-economic environment.

Section 4: Alternatives

This section briefly discusses the Project alternatives, and proposes the best possible alternative for the Project.

Section 5: Environmental Impacts and Mitigation Measures

This section provides the information on the anticipated environmental impacts and mitigation measures. It discusses the following:

a) Project corridor;
b) Pre construction/design stage;
c) Construction stage; and
d) Operation stage.

Section 6: Economic Assessment

This section describes the economic analysis of the Project.

Section 7: Environmental Monitoring and Management Plan (EMMP)

This section describes the measures suggested for executing the EMMP at the Project site. It elaborates the following in detail:

a) Objectives of the EMMP;
b) Key environmental components;
c) Role of functionaries;
d) Specific implementation responsibilities;
e) Environmental monitoring;
f) Environmental and management plan;
g) Environmental mitigation cost; and
h) Environmental technical assistance and training plan.

Section 8: Public Consultation and Information Disclosure

This section consists of the information based on public consultation and information disclosure to them about the Project. It comprises of the following:

a) Identification of main stakeholders;
b) Consultation meetings;
c) Stakeholders' concerns;
d) Proposed measures for incorporating the stakeholders' concerns; and
e) Future information disclosure plan.

Section 9: Conclusions

This section presents the conclusion of the whole study. It explains the following in detail:

a) Feasibility of the Project;
b) Various options considered for the Project;
c) Workforce and machinery requirements
d) Identification of the main issues and concerns;
e) Findings and recommendations;
f) Benefits of the Project
g) Environmental Monitoring and Management Plan;
h) Surveillance and maintenance of the road after construction; and
i) Proposed measures for incorporating the stakeholders concerns.

SECTION 2: DESCRIPTION OF THE PROJECT

2.1 General

After the earthquake on 8 October 2005, JICA conducted "Master Plan Study of Rehabilitation and Reconstruction in Muzaffarabad City" from February to August 2006 in order to propose appropriate measures for rehabilitating and reconstructing the city. The master plan selected the Project as an urgent and the highest priority project among nine proposed projects.

The main existing road in Muzaffarabad city is the Neelum Valley road, which is congested during day time and has reached the capacity of the road, it is expected to increase traffic volume when the reconstruction and rehabilitation work start in full scale.

The project intends to provide additional capacity through by a new bypass road in the western part of the city. The project expects to enhance rehabilitation and reconstruction activities in the damaged area not only inside the city but also outside the city in terms of providing an alternative corridor to ease congestion as well as improving the transporting convenience between the periphery and the city to reduce travel time.

AJK has the population of 2.92 Million, the majority of which lives in rural areas. AJK has seven districts namely Muzaffarabad, Bagh, Poonch, Sudhnuti, Kotli, Mirpur and Bhimbhar. Muzaffarabad District is almost half of AJK in terms of land, area and houses, and has one quarter of the total population.

The proposed bypass mainly passes through residential and commercial areas. Main settlements are Naluchi, Bela Noor Shah and Chela Bandi.

The main objectives of the Project are as follows:

- Urgently enhancing rehabilitation and reconstruction activities in the damaged areas;
- Facilitating the general public, particularly the people of western part of city to easy and efficient access to main city area;
- Minimising the heavy traffic load on main Muzaffarabad road;
- Enhancing the efficiency of the urban road network; and
- Reducing the probability of traffic jams.

The existing road is insufficient for the inter city transport needs of the present population of Project Area. To meet the requirements of increasing traffic volume, which will have a remarkable increase after the rehabilitation of Muzaffarabad city as per Master Plan[2], PWD planned to upgrade the existing road and to construct a new road section into a dual

[2] PACET Corp., and Nippon Koei Co., Ltd. (2007). *The Urgent Development Study on Rehabilitation and Reconstruction in Muzaffarabad City, AJK. The Islamic Republic of Pakistan*. JICA, Tokyo, Japan.

carriageway with a bridge and a viaduct at Naluchi, which is about 5.0 Kilometres long. The exiting road will be widened from about 8m to 11.3 m.

2.2 Overview of the Existing Road

There is already a non-standard road with a paved width of 2 meters without shoulders, footpaths and drainages. The ROW of the road is about 8 m (24 ft). The geometrical alignment of this road is in poor shape. This road was not designed as per the standards and only at slope the protection walls were designed. The overall conditions of the road are good, however wear and tear is considerable due to traffic passing through the road. Repair/patch works have been done on affected portions. Due to the increasing traffic volume and absence of any physical medium on the road, accidents are common, which result in a number of casualties. The entire road is being maintained and taken care by PWD.

2.3 Location of the Project

The Project falls under the administrative jurisdiction of PWD, Government of AJK. The Project road is situated in Muzaffarabad City. The proposed road runs through the western river terrace of the Neelum Valley ascending north from the intersection of Muzaffarabad – Kohala Road near the Supreme Court, AJK, through a proposed Naluchi Bridge to Chela Bandi, its end point.

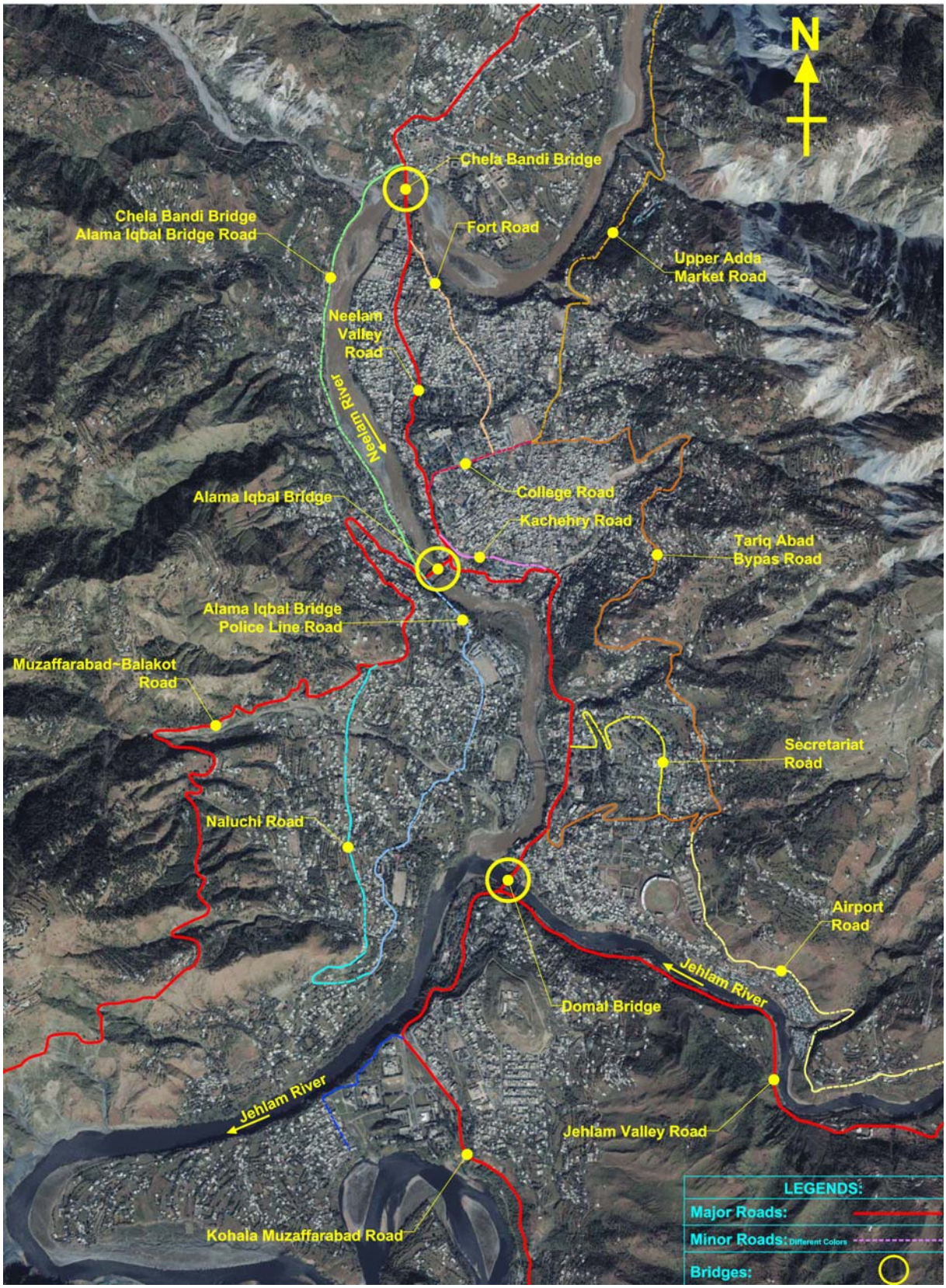

Figure 2.1 Existing Road Network in Muzaffarabad Area

2.4 Project Components

The Project includes improving of the existing road section from Naluchi to Chela Bandi with some new construction portion and the construction of a new bridge and a viaduct at Jehlum River at Naluchi. After the completion of the Project, the existing road will be improved to a dual carriageway.

The Bypass provides an important communication link to meet the growing traffic demand and enhance road safety. The construction and rehabilitation will comprise: (i) widening and improvement of 3.79 km of the existing road section; (ii) construction of new alignment section 700 meters (m) (iii) construction of Naluchi Bridge and a viaduct of 470 m; (iv) rehabilitation and construction of small size bridges at three (3) locations; (v) counter measures for land slide sections; (vi) slope stability measure at climbing section; (vii) intersection improvements at four (4) locations.

There was a plan to construct a bridge over Jhelum River at Naluchi, and part of foundation works of a Naluchi bridge across the Jehlum River had been carried out. However, since the said bridge was not designed to consider large-scale seismic force, the construction of the bridge was cancelled after the October 8 Earthquake in 2005.

The Project proposes a new Naluchi Bridge and a Viaduct, and it should be a core component in the Project.

The following table shows the main specification of the bypass. In the typical cross section design, the formation width of the Project road is 11.3 m consisting of 7.3 m wide carriageway, and 1.0 m shoulder and 1.0 soft shoulder both side.

Table 2.1 Main Specifications of the Road

Name	Road Category	Road Length	Design Speed	Traffic Lane	Lane Width
West Bank Bypass Road	Provincial road Primary Road	5 km	50 km/hr	2 lanes	3.65 meters

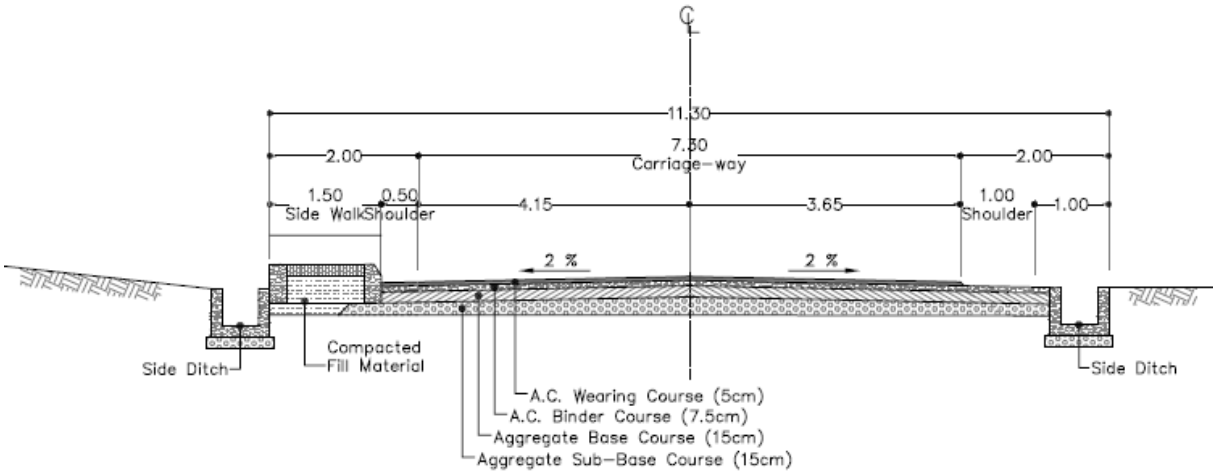

Figure 2.2 Typical Cross Section with Sidewalk

2.5 Project Right of Way

The existing road has the ROW of about 8 metres (24 ft).

The Project road, in the typical cross section design, has the formation width of 11.3 m consisting of 7.3 m wide carriageway, and 1.0 m shoulder and 1.0 m soft shoulder both side. Figure 2.2 shows a typical cross section of the Project road.

Major construction works will generally remain within the ROW.

2.6 Construction Schedule

The implementation of the Project is expected to commence in 2008 and the estimated completion date will be the end of 2010. Approximate time of completion of the Project is 34 months.

2.7 Construction Materials

The materials used in construction and up-gradation of the road include coarse aggregates (crush), fine aggregates (sand), soil, water, asphalt, reinforcement, cement. Almost all these raw materials are locally available in the country. Some of the aggregate waste material of the existing road will be reused in up gradation of the bypass. However the other steer girders and cables are to be imported from abroad.

The northern section along the Neelum River needs high fill. The fill material requires huge quantity of soil, and the borrowing works shall meet all legal requirements. It must acquire an approval from the government. The legal arrangement shall be made with the local land owner (possession holder), and natural rangeland or virgin area within five (5) km shall not be opened.

2.8 Construction Yards and Camps

Construction yard and camp sites will be selected keeping in view the availability of an adequate area for establishing the sites, including parking areas for machinery, stores and workshops, access to communication and local markets, and an appropriate distance from sensitive areas in the vicinity. Final locations will be selected by the contractor after the approval from the local authorities.

The area requirement for construction yards and camps will depend upon the workforce deployed and the type and quantity of machinery mobilized. In view of the area required, two camp site locations are tentatively identified during screening session of EIA. One is at the old piling area of previous Naluchi Bridge which can be used for the construction of the bridge and the viaduct, and the other is at Km 1+700.

2.9 Workforce and Machinery Requirements

Table 2.2 gives the typical workforce requirement for project for managerial staff, engineers and labourers.

00 labourers will be required during construction of the road, out of which 00 will be skilled, 00 will be semi-skilled and 00 will be unskilled labourers.

Table 2.2 Workforce Requirement for the Western Bypass

No.	Contractors Staff	Package I Number of person	Package II Number of person
Managerial Staff			
1	Site agent	1	1
2	Deputy site agent	1	0
3	Account	1	1
4	Quantity surveyor	1	1
5	Civil engineer	3	1
6	Bridge engineer	3	1
7	Material engineer	1	1
8	Office manager	1	1
9	Store keeper	1	1
Site Staff			
1	General foreman	1	0
2	Foreman	2	2
3	Laboratory technician	2	2
4	Chainman	2	2
5	Driver	10	6
6	Security	12	6
7	Attendant labour (plant yard, office)	12	6
8	Skilled labour	30	15
9	Un-skilled labour	30	50

Source: JICA Study Team

Table 2.3 gives the number of different types of machinery likely to be deployed on site. However, any other machinery/equipment can be used according to requirement.

Table 2.3 Estimated Equipment Requirements for the Western Bypass

No.	Major Equipment	Package I Number of equipment	Package II Number of equipment
1	Bulldozer 15t	1	1
2	Bulldozer 20t	1	1
3	Tire roller 8-20t	0	1
4	Vibrating roller 12t	0	1
5	Grader 3.7m	0	1
6	Rough terrain crane 35t	2	0
7	Concrete batching plant $30m^3/h$	1	0
8	Excavator $0.6m^3$	2	1
9	Excavator $0.2m^3$ wheel type	1	2
10	Concrete transit mixer $4.5m^3$	3	2
11	Concrete pump $90m^3/h$	1	0
12	Tower crane H=75m	1	0
13	Form traveller 610tm	2	0
14	Elevator 1t, 50m	1	0
15	Flat truck 10t	1	0
16	Wheel loader $2.1m^3$	2	1
17	Dump truck 10t	3	3
18	4t truck with crane	1	1
19	Generator 45kW	2	1
20	Weighing hopper/ conveyor	0	1
21	Static concrete mixer $0.2m^3$	0	3
22	Air compressor	1	0
23	Gantry crane 80t	0	1
24	PC equipment	1 unit	1 unit
25	Equipment for shotcrete	1 unit	1 unit
26	Percussion drill	1	0

Source: JICA Study Team

SECTION 3: DESCRIPTION OF THE ENVIRONMENT

3.1 General

The existing environment in the Project Area has been studied with respect to physical, biological, cultural and socio-economic aspects.

The direct COI due to construction of the Road is about 38 ft. (12 metres), which is within the ROW of the proposed road. However effect of the loads generating from the moving traffic can be felt beyond the design ROW. Therefore indirect COI is beyond the proposed ROW.

Social impacts such as road safety, traffic noise, vehicular emissions and other types of associated pollution are already present along the road. These factors are therefore discussed as part of the existing environmental and socio-economic conditions in the Project Area. This will allow the determination of baseline conditions against that the Project gives impacts can be assessed.

3.2 Methodology

In order to obtain first had information and asses the impacts of the Project on the people living in the vicinity of the Project Area, a detailed survey was conducted and existing environmental /socio-economic conditions and features of the area were duly observed. In addition, the relevant secondary data were also obtained from the District Census Reports for Muzaffarabad District. During the site visits, relevant government agencies/departments were also consulted for the relevant data.

To collect baseline data on ambient air, noise, and surface and groundwater conditions of the area; air and water samples for laboratory analysis were collected from locations in the Project Area. Locations for conducting air and water sampling, and conducting noise measurements were selected according to their likeliness to be affected from the Project. Baseline data collection was carried out with the technical assistance of SGS Pakistan Limited.

3.3 Physical Environment

3.3.1 Climate

Muzaffarabad District is classified as having a moist temperature climate. The mean maximum temperature during the month of July are about 35 and 23°C respectively. The mean maximum and minimum temperature during the month of January are about 16 and 3°C respectively. Average annual precipitation of the district is 1,511mm. In winter 30% of precipitation occurs in the form of snow.

Table 3.1 Month-wise Mean Maximum and Minimum Temperature and Mean Precipitation

Month	Mean Temperature °C		Mean Total Rainfall (mm)
	Daily Minimum	Daily Maximum	
January	3.2	15.9	93.7
February	5.2	17.6	134.7
March	9.6	22.3	156.5
April	14.1	28.1	111.1
May	18.3	33.1	79.1
June	22.1	37.6	103.3
July	22.8	34.8	327.6
August	22.4	33.8	249.2
September	19.4	33.3	108.0
October	13.6	29.8	51.0
November	7.8	23.9	35.4
December	4.0	17.7	76.9

Source: Pakistan Meteorological Department, November 2006

The area has two distinct rainfall seasons. The summer season from July to September and the winter season from December to April. The bulk of monsoon precipitation occurs in July and August, with monthly averages of 327.6 and 249.2 mm respectively. Minimum rainfall occurs in the month of November, which is 35.4 mm.

Throughout the year, the winds blow predominantly from the north or the south-east, but in summer there are short spells of wind from these directions and morning breeze is mostly from the west.

3.3.2 Air Quality

There is no major air quality issue in the Project Area except for suspended particulate matters, however gaseous emissions from the poorly maintained vehicles create air pollution. Trucks, buses and other passenger vehicles passing on the existing roads are normally poorly maintained. Un-burnt fuel also adds to air pollution. Significant amount of suspended particulate matters is generated when the vehicles move (to overtake other vehicles) on unpaved shoulders.

For establishing baseline air quality conditions, monitoring sites were selected after detailed visit and ambient air samples were collected from:

1. Start Point at Naluchi Bridge;
2. Pakistan Voluntary Health and Nutrition Office; and
3. End point Near Chela Bandi.

Sampling locations were selected in areas with settlements. Sampling was conducted for 24-hour period. Samples were taken from 5 – 10 metres from the edge of the road. The analysis of air quality parameters are given in **Table 3.2** and the meteorological data at each sampling are shown in **Table 3.3**.

One hour average value of CO for all the three locations ranges from 0.96 to 0.54 ppm and peak hourly value from 1 to 2 ppm, which is within the permissible limit. 24-hour average value of SO_2 and NO_2 is below 0.02 ppm. These values are within the permissible limit.

24-hour average values of PM_{10} at these locations are 112.5, 143.8, and 285 $\mu g/m^3$ respectively. Two of these values are within limit. However in Chela Bandi, 24-hour average of PM_{10} is 285$\mu g/m^3$ which exceeds the USEPA limits of 150 $\mu g/m^3$.

It is clear from the analysis of air quality that in the late afternoon the pollution level is higher as compared to the other day timings. The reason behind this may be that people prefer to travel during these hours. In the late night, people avoid travelling due to safety concerns.

Due to increase in the traffic with the passage of time, it is estimated that average values of CO, SO_2, NO_2 and PM_{10} will also increase.

Table 3.2 Analysis of Ambient Air Quality

S. No.	Start Point at Naluchi Bridge					Pakistan Voluntary Health and Nutrition					End Point Near Chela Bandi				
	Time	CO	SO_2	NO_2	PM_{10}	Time	CO	SO_2	NO_2	PM_{10}	Time	CO	SO_2	NO_2	PM_{10}
	Hour	ppm	ppm	ppm	µg/m^3	Hour	ppm	ppm	ppm	µg/m^3	Hour	ppm	ppm	ppm	µg/m^3
1	9:00	1				9:00	1				9:00	1			
2	10:00	BDL				10:00	1				10:00	2			
3	11:00	1				11:00	2				11:00	1			
4	12:00	2				12:00	1				12:00	1			
5	13:00	1				13:00	1				13:00	1			
6	14:00	BDL				14:00	1				14:00	BDL			
7	15:00	BDL				15:00	1				15:00	1			
8	16:00	BDL				16:00	1				16:00	1			
9	17:00	1				17:00	BDL				17:00	BDL			
10	18:00	1				18:00	1				18:00	2			
11	19:00	BDL				19:00	BDL				19:00	BDL			
12	20:00	1				20:00	BDL				20:00	2			
13	21:00	BDL				21:00	1				21:00	1			
14	22:00	1				22:00	1				22:00	1			
15	23:00	1				23:00	BDL				23:00	1			
16	0:00	BDL				0:00	BDL				0:00	BDL			
17	1:00	BDL				1:00	BDL				1:00	BDL			
18	2:00	1				2:00	BDL				2:00	BDL			
19	3:00	BDL				3:00	1				3:00	1			
20	4:00	BDL				4:00	1				4:00	1			
21	5:00	1				5:00	1				5:00	1			
22	6:00	BDL				6:00	2				6:00	1			
23	7:00	BDL				7:00	1				7:00	2			
24	8:00	1				8:00	2				8:00	3			
24 Hours Average		0.54	<0.01	<0.01	112.5		0.83	0.01	<0.01	143.8		0.96	0.02	0.02	285
USEPA (NAAQS)		35 ppm*1	0.14 ppm*2	*3	150*4		35 ppm*1	0.14 ppm*2	*3	150*4		35 ppm*1	0.14 ppm*2	*3	150*4

BDL= Below Detection Limit; USEPA (NAAQS) = United States Environmental Protection Agency (National Air Quality Standards). As air quality standards have not yet been developed in Pakistan, therefore for comparison, USEPA standards are referred. *1: one h

Table 3.3 Meteorological Data

Sample Points																				
Naluchi Bridge							Pakistan Voluntary Health and Nutrition Association Office							End Point (Near Chela Chowk)						
Date	Time	Temp. (°C)	Wind		Hum. (%)	Press. (mm/Hg)	Date	Time	Temp. (°C)	Wind		Hum. (%)	Press. (mm/Hg)	Date	Time	Temp. (°C)	Wind		Hum. (%)	Press. (mm/Hg)
			Dir	Speed (m/s)						Dir	Speed (m/s)						Dir	Speed (m/s)		
07Mar. 2007	10:00	16	E	0.9	46	720.6	05Mar. 2007	9:00	10	SE	0.4	70	721.5	06Mar. 2007	9:00	12	NE	0.4	56	721.1
	11:00	18	S	2.2	40	720.1		10:00	11	SE	0.9	69	721.5		10:00	15	ESE	1.9	37	722.3
	12:00	20	NEE	0.4	26	720		11:00	14	SW	2.2	47	722.3		11:00	15	ESE	3.1	34	721.1
	13:00	22	NE	2.2	21	719.2		12:00	17	SW	2.2	44	720.6		12:00	18	E	1.8	25	720.6
	14:00	23	NE	0.4	21	717.6		13:00	18	NEE	0.3	32	719.8		13:00	21	NEE	0.9	24	719.9
	15:00	24	SE	0.4	19	716.8		14:00	20	SE	0.4	28	718.8		14:00	21	ESE	0.4	19	719
	16:00	24	S	0.9	19	716.8		15:00	21	SSE	0.4	24	719.1		15:00	22	E	1.8	17	719
	17:00	23	S	1.3	15	717.6		16:00	22	SSE	2.7	24	717.8		16:00	23	SE	2.8	19	718.7
	18:00	21	SW	0.4	20	716		17:00	18	W	1.8	42	717.4		17:00	21	ESE	1.3	20	718.4
	19:00	16	SW	0.9	35	716.2		18:00	17	WNW	0.9	47	717.1		18:00	18	NE	0	28	718.5
	20:00	15	NW	0.8	42	716.6		19:00	14	WNW	0.8	54	717.4		19:00	17	SSW	0.4	41	718.7
	21:00	14	NE	0.4	60	716.8		20:00	13	WNW	0.4	63	717.8		20:00	14	SW	0.4	52	719.1
	22:00	12	NE	0.9	68	717		21:00	12	WNW	0.4	65	718		21:00	12	SSW	0.4	62	719.1
	23:00	11	NE	0	70	717		22:00	11	WNW	0.6	69	718.2		22:00	11	SSW	0.6	64	719.1
	24:00:00	10	NE	1.8	72	717.1		23:00	9	WNW	0.4	74	717.8		23:00	11	WNW	0.9	66	719.1
08Mar. 2007	1:00	8	NE	1.4	76	717.2		24:00:00	9	WNW	0.2	76	717.6		24:00:00	10	WNW	0.4	68	719.1
	2:00	8	NE	1.2	80	717.4	06Mar. 2007	100	8	WNW	0.4	78	717.1	07Mar. 2007	1:00	10	SSW	0.9	70	719.1
	3:00	7	NNW	0	84	717.6		2:00	8	WSW	0.9	80	716.5		2:00	9	SSW	0.6	71	719.2
	4:00	6	NNW	0.9	86	717.9		3:00	7	WSW	1.3	80	716		3:00	9	SE	1.8	72	719.2
	5:00	6	SW	0.8	87	718		4:00	6	WSW	0.9	81	715.6		4:00	8	SE	0.9	75	719.2
	6:00	6	NNW	0.4	88	718		5:00	6	WSW	1.8	81	715.5		5:00	8	SE	1.8	75	719.2
	7:00	6	NNW	0.4	88	718		6:00	6	WSW	0.9	80	715.5		6:00	8	WNW	0.9	78	719.2
	8:00	8	NW	0.7	76	718.1		7:00	6	NWN	0.8	83	716.3		7:00	8	WNW	1.8	78	719.4
	9:00	10	NW	1.1	72	718.1		8:00	7	NW	0.7	81	716.4		8:00	9	WN	0.9	72	719.4

3.3.3 Noise

Noise along the existing road is a serious issue. Roadside noise levels were measured at a distance of about 6 metres from the edge of the road (about 7.5 m from the source). Noise levels were measured at three locations, namely Start Point at Naluchi Bridge, Pakistan Voluntary Health and Nutrition Office, End point Near Chela Bandi. Average noise level along the road is between 102.5-46.1 dB (A), whereas peak noise level is between 102.5 – 75.7 dB (A). **Table 3.4** presents the peak and average noise levels recorded at different locations. Average values for the section are all within the NEQS limit of 85 dB(A). The levels are rather high and the Government of AJK needs to pay attention to this fact. **Table 3.5** shows the Guidelines for Community Noise by World Health Organisation (WHO) for a reference.

NEQS do not prescribe a noise level limit for the receptors. However, these values may reach excessive levels in areas where new construction will be initiated and also during operation when traffic levels reach operating design volumes.

Table 3.4 Analysis of Noise Level

Sample Points																	
Naluchi Bridge						Pakistan Voluntary Health and Nutrition Association Office						End Point (Near Chela Chowk)					
Date	No	Time	Leq	Lmax	Lmin	Date	No.	Time	Leq	Lmax	Lmin	Date	No.	Time	Leq	Lmax	Lmin
07 March, 2007	1	10:00	67.7	79.2	62.2	05 March, 2007	1	9:00	68.3	85.7	54.5	06 March, 2007	1	9:00	78.8	96.9	66
	2	11:00	66.8	83.3	60.2		2	10:00	71	92.1	58.8		2	10:00	76.6	89.5	63.6
	3	12:00	67.2	82.1	61.3		3	11:00	69.5	88.5	59.3		3	11:00	78.9	100.1	67.7
	4	13:00	67.1	83.9	62.3		4	12:00	70.2	85.5	58.3		4	12:00	78.3	94.8	67
	5	14:00	66.3	88.2	60.5		5	13:00	69.7	91.5	59.5		5	13:00	76.4	89.5	70.8
	6	15:00	65.5	80.9	60.4		6	14:00	72.5	96.4	55.9		6	14:00	77.9	95.6	66.4
	7	16:00	66.4	83.6	60		7	15:00	71.1	91.4	65.5		7	15:00	79	93.9	66.4
	8	17:00	71.2	89.5	59.5		8	16:00	72.2	91.6	53.4		8	16:00	79.1	96.6	67.6
	9	18:00	70.3	87.9	60.9		9	17:00	73	94.5	57.5		9	17:00	77.8	95.6	66
	10	19:00	66.5	89.7	59.6		10	18:00	71.2	90.7	54		10	18:00	79	95.5	66.6
	11	20:00	66.4	85.1	57.8		11	19:00	71	91.1	53.9		11	19:00	77.5	99.1	63.3
	12	21:00	66.5	89.6	59.5		12	20:00	64.2	87.5	53.3		12	20:00	76.8	95.4	67.3
	13	22:00	66.8	83.3	60.2		13	21:00	73.5	102.5	50.4		13	21:00	79.1	96.6	67.6
	14	23:00	63.4	84.1	57.8		14	22:00	73	93.5	58.5		14	22:00	77.5	99.2	63.2
	15	24:00:00	60.6	82	46.4		15	23:00	60.7	82.2	46.2		15	23:00	60.7	82.2	46.2
08 March, 2007	16	1:00	60.7	82.2	46.2		16	0:00	60.6	82	46.4		16	0:00	60.6	82	46.4
	17	2:00	59.2	75.7	46.3	06 March, 2007	17	1:00	63.2	85.5	52.3	07 March, 2007	17	1:00	59.2	75.6	46.5
	18	3:00	60.5	81.1	47.1		18	2:00	60.5	82.1	46.1		18	2:00	60.5	82.1	46.1
	19	4:00	59.5	75.9	47.4		19	3:00	60.6	82	46.4		19	3:00	59.2	75.8	46.3
	20	5:00	63.2	85.5	52.3		20	4:00	59.2	75.8	46.3		20	4:00	60.6	82.2	46.2
	21	6:00	77.7	95.1	63		21	5:00	60.7	82.2	46.2		21	5:00	63	95.8	61.2
	22	7:00	71.2	89.5	59.5		22	6:00	59.1	75.7	46.3		22	6:00	60.4	88.8	57.2
	23	8:00	72.3	85.4	61.4		23	7:00	77.7	95.1	63		23	7:00	77.8	95.6	66
	24	9:00	73.4	86.2	60.5		24	8:00	75.9	94.3	61.4		24	8:00	78.2	95.7	67.3

Table 3.5 Guidelines for Community Noise by WHO

Specific environment	Critical health effect(s)	LAeq [dB]	Time base [hours]	LAmax fast [dB]
Outdoor living area	Serious annoyance, daytime and evening Moderate annoyance, daytime and evening	55 50	16 16	- -
Dwelling, indoors Inside bedrooms	Speech intelligibility & moderate annoyance, daytime and evening Sleep disturbance, night-time	35 30	16 8	 45
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45	8	60
School class rooms &pre-schools, indoor	Speech intelligibility, disturbance of information extraction, message communication	35	During class	-
Pre-school bedrooms, indoor	Sleep disturbance	30	Sleeping time	45
School, playground outdoor	Annoyance (external source)	55	During play	-
Hospital, ward rooms, indoors	Sleep disturbance, night-time Sleep disturbance, daytime and evenings	30 30	8 16	40 -
Hospitals, treatment rooms, indoors	Interference with rest and recovery	#1		
Industrial, commercial shopping and traffic areas, indoors and outdoors	Hearing impairment	70	24	110

#1: as low as possible

3.3.4 Surface and Groundwater

The Project Area has sufficient water bodies in shapes of streams and river, agricultural fields are irrigated by the rain water.

Potable water samples (surface and ground water) were collected from the advised sampling points by the EIA Team. The collected samples were analysed for both microbiological and chemical parameters as per requirement.

In order to evaluate the surface water quality, samples were collected from both of these water bodies. Groundwater samples were also collected from three locations in spring water near Naluchi Bridge, Greenwood High School, Ground water Bala Peer while surface water samples were taken from Shawai Nallah, Neelum River, Jehlum River (Naluchi Bridge). **Table 3.6** and **Table 3.7** show the surface water and groundwater analyses respectively.

Table 3.6 Chemical Analysis of the Sampling Water

Chemical Analysis			Test Results						WHO Guidelines
Sampling Site			SS1	SS2	SS3	SS4	SS5	SS6	
Sample Description			Surface Water	Spring Water	Ground Water	Ground Water	Surface Water	Surface Water	
Sample Date			8-Mar-07	4-Mar-07	3-Mar-07	8-Mar-07	8-Mar-07	8-Mar-07	
Parameters	LDL	Unit							
Temperature	-	^{0}C	11	22	21	20	12	11	--
pH	-	-	8.13	8.17	9.23	8.2	8.14	8.22	6.5-8.5
Biochemical Oxygen Demand (BOD)	5	mg/L	5	ND	ND	ND	30	ND	--
Chemical Oxygen Demand (COD)	5	mg/L	12	ND	ND	ND	65	ND	--
Total suspended solids (TSS)	5	mg/L	90	ND	ND	7	490	45	--
Total dissolved solids (TDS)	5	mg/L	206.5	536	268	654	588	193	1000
Turbidity	--	NTU	49	ND	ND	2	213	18	5
Total Hardness (as $CaCO_3$)	5	mg/L	109.4	364.8	165.1	374.4	355.2	101.7	--
Chloride (Cl)	5	mg/L	8.6	18.6	10.9	43.4	9.3	9.3	250
Fluoride (F)	--	mg/L	ND	ND	0.4	0.81	ND	ND	1.5
Calcium (Ca)	5	mg/L	34.5	96	30.7	106.76	73.7	28.4	--
Magnesium (Mg)	5	mg/L	5.5	29.9	21.1	25.8	41	7.4	--
Sulphate (SO_4)	1	mg/L	25.1	32.9	24.3	42.38	134.6	23	250
Alkalinity (as $CaCO_3$)	5	mg/L	100	300	175	240	235	75	--
Cadmium (Cd)	0.003	mg/L	<0.003	<0.003	<0.003	<0.003	< 0.003	<0.003	0.003
Chromium (Cr)	0.02	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.05
Copper (Cu)	0.02	mg/L	<0.02	<0.02	<0.02	<0.02	0.04	<0.02	2-Jan
Lead (Pb)	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	0.08	<0.01	0.01
Mercury (Hg)	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001
Cobalt (Co)	0.03	mg/L	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	--
Sodium (Na)	1	mg/L	3	11	13	18	10.5	2	200
Potassium (K)	0.3	mg/L	1	0.6	8.4	0.8	3.2	0.8	--
Nitrate (NO_3)	0.003	mg/L	4.5	26	8.1	72	6.1	3.8	50
Arsenic (As)	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01
Iron (Fe)	0.02	mg/L	1	0.04	0.04	<0.02	14.2	0.52	0.3

- -: Not Defined, ND: Not Detected, LDL: Lowest detection Limit
SS1: Jehlum River near Naluchi Bridge, SS2: Near Naluchi Bridge, SS3: Greenwood High School
SS4: Bala Peer, SS5: Shawai Nallah, SS6: Neelam River
Source: SGS

Table 3.7 Microbiological Analysis of the Sampling Water

Parameters	Procedure	Permissible Limits	Sampling site	Test Results					
			Date	08 March, 2007	04 March, 2007	03 March, 2007	08 March, 2007	08 March, 2007	08 March, 2007
			Description	Surface Water	Spring Water	Ground Water	Ground Water	Surface Water	Surface Water
Total Colony Count	APHA	< 500 cfu / ml		TNTC / ml	TNTC / ml	TNTC / ml	TNTC / ml	TNTC / ml	TNTC / ml
Total Coli Forms	APHA: 9222B	0 / 100 ml		TNTC / 100 ml	10 / 100 ml	01 / 100 ml	Absent / 100 ml	TNTC / 100ml	TNTC / 100ml
Faecal Coli Forms (E. Coli)	APHA: 9222B	0 / 100 ml		07 / 100 ml	Absent / 100 ml	Absent / 100 ml	Absent / 100 ml	02 / 100 ml	TNTC / 100ml
Faecal Streptococci/ Enterococc	APHA: 9230C	0 / 100 ml		Absent / 100 ml	Absent / 100 ml	Absent / 100 ml	Absent / 100 ml	Absent / 100 ml	Absent / 100 ml

TNTC-too numerous to count, Source: SGS

Aquifer sources of groundwater are available in the Project Area. They are an important source of water supply throughout the area with the use of wells, tube wells. Groundwater in the Project Area is generally of good quality and tends to be non-saline. Aquifers are recharged by means of seepage during the rainy season. However E-coli was found in the water sample collected from the Project Area, which leads a serious health hazard and needs immediate attention.

3.3.5 Topography, Geology and Soil

The entire district has an undulating topography, with Neelum River serving as the main source of drainage. The topography is mainly hilly and mountainous, with valleys and some stretches of alluvial plains. The proposed road traverses through the gentle to moderate slope areas inhabited and cultivated by the local people.

Geologically the rocks exposed in the area are mainly sedimentary and meta-sedimentary.

Regarding soil, in the area, soils are residual and colluvial, and their thickness varies in different parts. The valley soils are fertile and alluvial, and are therefore able to support productive agriculture. However, the hilly soils are shallow and prone to erosion.

3.3.6 Seismology

According to the seismic zone map of Pakistan, the Project Area lies in Zone 1 of Modified Mercalli (MM) Intensity Scale 1973, i.e. minor damage, distant earthquakes may cause damage to structures with fundamental period greater than 1.0 second, corresponds to intensity V and VI on the MM scale as given in **Figure 3.1**.

The city is located in one of the most geologically active terrains in the world. The active fault has the potential to cause future earthquakes and seismic ground motion.

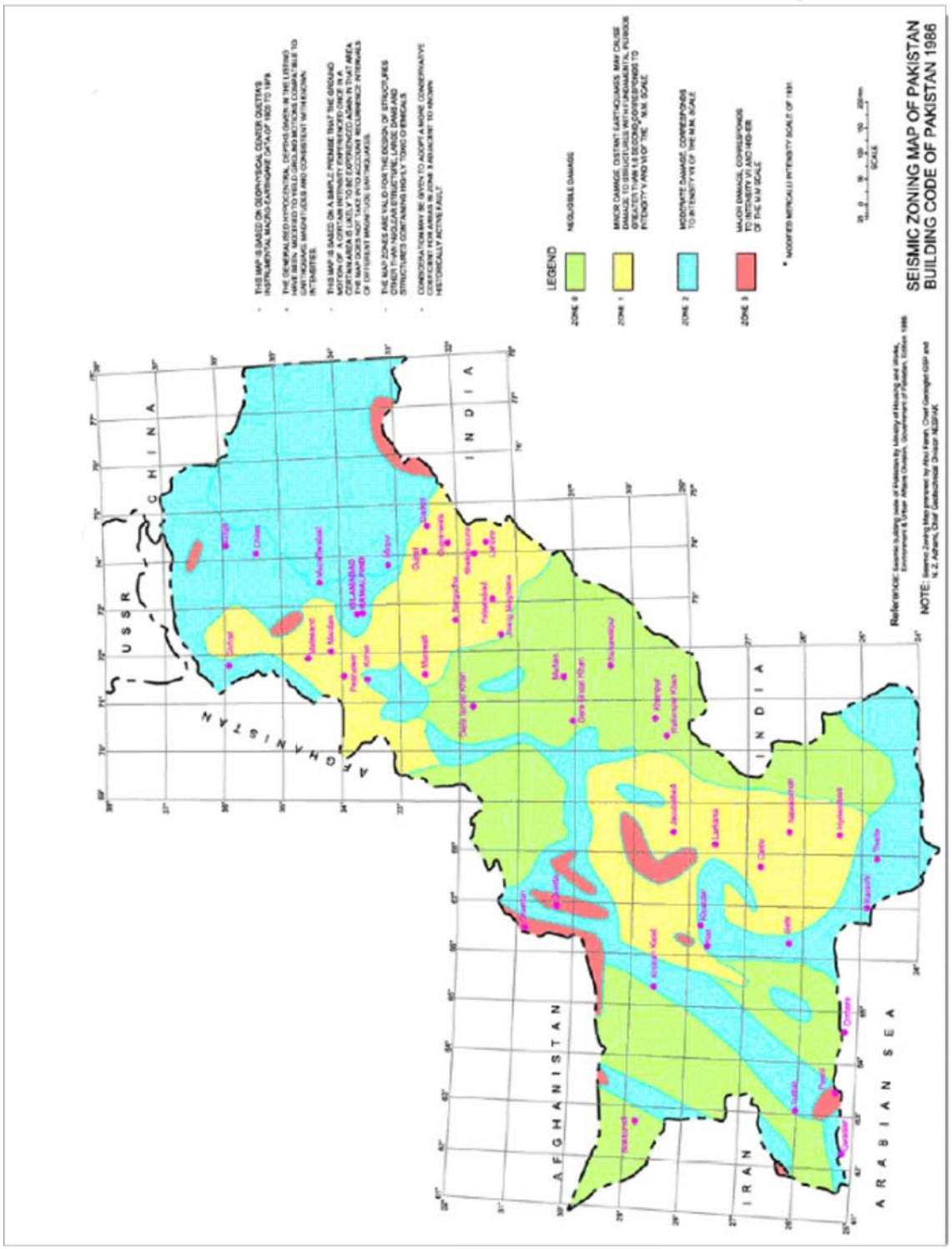

Figure 3.1 MM Scale in Pakistan

3.4 Ecological Resources

3.4.1 Important Ecosystems

Regarding internationally important ecosystems, there is neither Ramsar site nor World Heritage site in the district [3,4].

3.4.2 Forest

Although Muzaffarabad District has about over 59% of their total area under forest cover, the area is predominately covered by residential area and there is no "forest".

3.4.3 Protected Areas

AJK is home to 11 protected areas, comprising of seven game reserves and four national parks, but there is no protected area within the area.

3.4.4 Important Species

Although there is not an appropriate reference on important species in the area, it seems that there is neither important nor threatened species in the Project Area. This is because the area does not have an intact natural environment and there is not an Important Bird Areas[5], which is a good indicator of this issue.

3.4.5 Archaeological and cultural sites

In the vicinity of the Bypass, there are no archaeological sites, monuments, antiquities, cultural heritage sites.

3.5 Socio-economic Environment of Muzaffarabad City and its surrounding areas

3.5.1 Demography

According to the census data, the city had the population of 37, 445 persons in 1981 and 80,355 persons in 1998. Since then, the city's population has increased significantly and reached 114,864 persons in 2005 (pre-earthquake period) and the average annual growth rate was 5.2% from 1998 to 2005. **Table 3.8** shows the population trend of the city.

[3] http://www.ramsar.org/ The web site was accessed on 21 March 2007.
[4] http://whc.unesco.org/pg.cfm The web site was accessed on 21 March 2007.
[5] BirdLife International, an international bird conservation NGO, proposes important areas for conservation of threatened and important bird species. Bird species are believed to be a good indicator of existence of other important fauna and flora in the concerned area.

Table 3.8 Population Trend in Muzaffarabad City[6]

Year	Population	Average annual growth rate
1981	37,445	
1998	80,355	4.6% (1981-1998)
2005	114,864	5.2% (1998-2005)
2006	103,487	

3.5.2 Social Settings

Social organisations in AJK are molded around *biradaris* (clans). The *biradri* is the overriding determinant of identity and power relationships within the socio-political landscape. The 2005 earthquake immensely gave damages to community ties together with the buildings and social infrastructures. The strong bonds between relatives and close neighbours in the area witnessed prior to the disaster were disrupted. Social activities that sustained the community solidarities are currently in difficult situation to continue, because many facilities are not suitable for use and additionally, some people are still dislocated.

3.5.3 Ethnic Compositions

The city is multi-ethnic and cosmopolitan in nature. There are about 25 social groups (castes or ethnic groups) in the area. Members of these social groups would be reluctant to shift to other places in case of any resettlement. Main languages spoken in the area are Kashmiri, Hindko, Punjabi and Urdu. Urdu is the official language.

Religion plays a vital role in people's life. Majority of the population is Muslim. Cultural festivals are mostly related with religious traditional events. The visit to shrines (termed as Ziarat) is very common among the people. The minority is Christian (less than 1%) who mostly live in cities, and their proportion in rural areas is very small.

3.5.4 Gender Perspective

Compared to the rest of Pakistan women in the area are much more aware and vocal. Social roles and responsibilities are more or less similar for men and women with the exception of leadership function, which rests with men. Female primary education facility is available in area. Education and skill development facilities for women are limited, which restricts women's entry into professions and business enterprises. Generally, sources of income earning for women include health work, teaching and home based crafts making.

3.5.5 Education

In AJK at present, 27% of the total recurring budget is spent on education. As a result of the high priority of the Government of AJK on education, the literacy rate in AJK rose to 60%

[6] Data from Municipal Corporation Muzaffarabad (MCM).

after the 1998 census. This means that the area enjoys education levels higher than the Pakistani average7. However, Muzaffarabad district's literacy rate is lower than that the State average. Muzaffarabad's overall literacy level is 46.95%.

3.5.6 Health

In the city there are five Government Hospitals. These include District Health Office, Civil Hospital, Combined Military Hospital and Leprosy Centre. However, these buildings were damaged completely. The only hospital with the least damage is Abbas Medical Institute. Residents suffer from a range of diseases caused by polluted drinking water, poor sanitation, and inadequate provision of health care. Seasonal illnesses, like colds and flu, as well as malaria, diarrhea and dysentery are common.

3.5.7 Housing

The data provided by Municipal Corporation Muzaffarabad (MCM) regarding housing in the project area and its surrounding areas is given below in **Table 3.9**.

Table 3.9 Present Housing Profiles of the Project Area

Ward No	No. of Buildings	Type of Shelters and No. of Families			Total No. of Families
		In house	In tent	Migrated	
Ward 18	1528	220	1231	77	2023
Ward 19	1299	1060	191	48	1267
Ward 20	1143	690	402	51	1387
Total	**3970**	**1970**	**1824**	**176**	**4677**

Source: Statistical Section, MCM

Many people are still living in the tents which they personally set up in their land or in the tents provided by the Camp Management Organisation and donors. People living in such tents include those who lost their residences and those having residences but damaged to certain degree that they are uneasy to live inside. Many people are, however, refusing to migrate out to other places, because they feel strong ties with their neighbourhoods, and additionally, they are afraid of losing their lands and/or jobs.

3.5.8 Economic Profile

AJK is considered as one of the poorest states in the country, with annual per capita income about half the national average. Being a remoter place with harsher climate, the district has even less to offer to its inhabitants. Women have had to undertake many tasks previously performed by men and, in spite of external remittances, the average annual per capita income in AJK is only between US$ 185 and 200, half the average income of a Pakistani.

[7] Total adult literacy rate, 2000-2004, is 50% according to UNICEF. http://www.unicef.org/infobycountry/pakistan_pakistan_statistics.html The web site was accessed on 21 March 2007.

There is very little industrial activity in the area. The industries in private sector in Muzaffarabad are known for soap making, furniture making, wood carving and Kashmiri handicrafts. There are also a few textiles centres for making bed sheets, pillow covers and coarse cloth. These industries have also been affected tremendously by the earthquake; often forcing them to stop operation.

3.5.9 Occupation

The Social Condition Survey[8] has reported the following characteristics of the area located in the city. Around 67 % of 29,418 people in the area are involved in the service sector. Only 2% of the people depend on farming and livestock for their livelihood. Unemployment remains a major problem, ranging between 30 and 35%.

3.5.10 Drinking Water

Despite the abundance of water throughout the year in streams and river tributaries, almost all urban centres face water scarcity. Residents of unserved settlements have to rely on unsafe sources, such as rivers, contaminated open wells, springs, and natural streams.

Most of the water supply schemes in AJK rural areas are gravity based, and in the urban areas source are either perennial streams or rivers, using pumping systems. In Muzaffarabad City Public Health Engineering Division (PHED) of PWD is responsible for water supply in the municipal area.

3.5.11 Power Supply

Electricity is available in all the areas. Firewood and kerosene oil are the major sources of energy in case of non-availability of electricity. Fire wood is used solely for cooking. There is no piped gas network system in Muzaffarabad City. In Muzaffarabad City, most of the households use Liquefied Natural Gas (LNG).

3.5.12 Land Use

According to the existing land use map of the city prepared by the JICA[9], the total administrative area of the city is 2,133 ha[10] and more than half of the total area is occupied by agricultural land (1,177 ha) and river (74 ha). Historically, the city has grown along the Neelum and Jhelum Rivers and existing urban areas are located in the river terraces and gentle slope areas in the mountain. Recently, however, many people have lived in steep slope areas without proper infrastructures and access roads. The total residential area including scattered

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[8] PACET Corp., and Nippon Koei Co., Ltd. (2006). *Findings of the Social Condition Survey of West Bank Bypass Road Project.*

[9] PACET Corp., and Nippon Koei Co., Ltd. (2007). *The Urgent Development Study on Rehabilitation and Reconstruction in Muzaffarabad City, AJK. The Islamic Republic of Pakistan*. JICA, Tokyo, Japan.

[10] Data are from MCM.

settlement in mountain amounts to 658 ha and occupy 31% of the city's administrative area.

Agriculture in the vicinity of the area is not present in major, since it is an urban area. For the gardening and horticulture, some people have gardens in a small scale not on commercial basis.

3.5.13 Roads and Communication

Communication network is a fundamental prerequisite for economic activity to take place. Muzaffarabad District has a total metalled road network of 813 km and an un-metalled network of 758 km. **Figure 2.1** shows the existing road network in the area.

Muzaffarabad City has the following main roads.

- College Road
- Road and Upper Adda
- Fort Road
- Upper Adda – Makri Road
- Katchery Road
- Neelum Valley Road
- Tariq Abad Bypass Road
- Secretariat Road

3.6 Socio-economic Environment of the Project Area

3.6.1 3.6.1 Socio-economic Survey of the Project Area

Total 125 questionnaires were filled at different locations in the Project Area. Among the respondents, 75 were males and 50 were females. Respondents were randomly selected from all the villages situated along the route.

3.6.2 Respondents' Profile

Out of the 125 respondents 60% were males while 40% were females, 71% were married, 29% were unmarried, 55% were literate, 45% were illiterate, 38% were employed and 62% were unemployed (including housewives and students). **Table 3.10** presents the general profile of the Project Area.

Table 3.10 General Profiles

Item	Respondents	Number	Percentage (%)
Sex	Male	75	60
	Female	50	40
Marriage status	Married	89	71
	Unmarried	36	29
Literacy	Literate	69	55
	Illiterate	56	45

Source: Field Survey Team, March 2007

3.6.3 Respondents' Age Group

Field investigation shows that none of the respondents was below 15 years of age. Significant majority (53%) of the respondents belonged to the age group of 41-60 years. 20 out of the total surveyed men belonged to the age group of 36-45, whereas similar number of the respondents fell in the age group of 26-35 years. Only 6% of the respondents belonged to the age group of 15-25.

3.6.4 Educational Facilities

Education has significant impact on the life of an individual, which enhances its quality and productivity. It also serves as key indicator of any socio-economic development. The District Census 1998, shows that matriculate women in rural areas is 32.5% of total matriculates. Smaller number of female matriculates is indicative of lesser number of high schools for girls (143) as compared to boys (300), and that generally education beyond primary level is not attained by a majority of females. Furthermore, enrollment ratio of girls is 45.6% while that of boys is around 56%. On the whole, functional female literacy has increased from 10% in 1981 to 45% in 1998, and is common among the younger (less than 15 years) age groups. **Table 3.11** provides information about the educational facilities in the Project Area.

Table 3.11 Education Facilities

No.	School	Number of school	
		Male	Female
1	Primary school	7	12
2	Middle school	4	6
3	High school	2	3
4	Private school	7 (co-education)	
5	Institute	2 (co-education)	

Source: Field Survey Team, March 2007

3.6.5 Literacy and Education Level

Literate respondents had different education levels. Out of 69 literate respondents, 32% had primary level of education, 38% had education up to middle and 21.5% had qualification up to intermediate. Only 8.5% were graduate or postgraduate. **Table 3.12** represents education level of the respondents.

Table 3.12 Literacy and Education Level

No.	Sex	Primary	Middle	Matric / Intermediate	Graduation/ Post Graduation	Total
1	Male	18	21	12	4	55
2	Female	4	5	3	2	14
Total		22	26	15	6	69
Percentage (%)		32	38	21.5	8.5	100

Source: Field Survey Team, March 2007

3.6.6 Professional Status

Table 3.13 presents the professional status of the respondents. This indicates that 20% of the respondents were government servants and same number of the respondents was engaged in business activities. Among the total, 9% conduct labour works, 33% were housewives and 10% were unemployed.

Table 3.13 Professional Status

No.	Profession	Number	Percentage (%)
1	Government employee	25	20
2	Business	25	20
3	Labour work	11	9
4	Service	10	8
5	Housewife	42	33
6	Unemployed	12	10
Total		**125**	**100**

Source: Field Survey Team, March 2007

3.6.7 Household Income Levels

During the socio-economic survey, respondents were inquired about their total monthly income from all sources. Household cash income was calculated on the basis of monthly, business, job/services, business enterprises, labour work and remittances, which is reflected in **Table 3.14** below.

Table 3.14 Income Levels

No.	Monthly income (Pakistan Rupee)	Number	Percentage (%)
1	Up to 5,000	38	30
2	5,001 – 10,000	52	42
3	10,001 – 15,000	19	15
4	15,001 and above	16	13
Total		**125**	**100**

Source: Field Survey Team, March 2007

3.6.8 House utilities

The respondents were inquired about the utilities in their homes. The significant majority of 98% (123) respondents have electricity in their homes whereas 28% had the facility of water supply in their homes. On the other hand 20%, 265% and 15% of the respondents respectively had the facility of gas, landline telephone and sewerage system in their homes. **Table 3.15** presents the detail of social amenities available in the area.

Table 3.15 Social Facilities at Home

No.	Social facility	Number	Percentage (%)
1	Electricity	123	98
2	Water Supply	32	26
3	Gas (Sui Gas: LNG)	25	20
4	Telephone	32	26
5	Sewerage system	19	15

Source: Field Survey Team, March 2007

3.6.9 Housing Characteristics

2% of the respondents had *kacha* (mud-structured) houses while 80% respondents had *pacca* (solid-structured) houses and 18% were residing in the semi-*pacca* houses. **Table 3.16** shows the characteristics and percentage of houses in the Project Area.

Table 3.16 Types of Construction

No.	Construction type	Percentage (%)
1	*Kacha*	2
2	Semi-*pacca*	18
3	*Pacca*	80
Total		**100**

Source: Field Survey Team, March 2007

3.6.10 Gender Component

A total of 30 women were interviewed. The following are the highlights of this activity.

Women were asked if they were doing any work other than the household chores. A significant percentage of the respondents did nothing other than household chores and only few of the interviewed women were doing some sort of additional work. Such respondents were mostly involved in animal rearing, working at the agriculture farms, embroidery and helping their male counterparts in the agriculture. Additional works, other than mentioned earlier, included gardening, sewing clothes, managing shop and working as lady health visitor.

The women were asked whether they were authorized to spend their money or not. Most of them (72%) said that they had no compulsion and could spend as per their wishes while rest of them responded that they could spend the money with the consultation of male family members only.

The respondents were also inquired about the most pressing needs of women of the area. Provision of basic health facilities was ranked as the most pressing need of women of the area. The second most perceived pressing need was educational facilities for the girls of the area. Public water supply, availability of gas and transportation facilities from the respective villages to the city were also identified as vital need of the women.

Regarding the level of awareness about the Project, women obtained information from their male members of the families. They know the Project but do not have detailed information.

The women respondents were asked to express their views about the duality of the Project. One third of the respondents apprehended that their residential areas would suffer and they would be homeless. Similarly, some also had a view that the frequency of accidents would increase with the Project due to higher speeds. On the other hand, majority showed positive attitude towards the road widening and were optimistic about the positive effects and abundant benefits like more employment opportunities, better transportation facilities, reduction in the rate of accidents, and uplifting of the socio-economic conditions of the Project Area.

3.6.11 Concerns Regarding the Project

Based on the results of the consultation meetings with the residents of the Project Area, Table 3.15 shows their concerns and expectations regarding the Project.

Table 3.17 Concerns and Expectations from the Local People

S. No.	Village Name/ Venue	Date	No of Participants	Main Concerns	Expectations
1	Nalucchi	25 Feb. 2007	10	Compensation will not be given as per average of two years sale record of Revenue Board. This may be based on the current market value. During road construction the chance of accidents increases, it should be avoided by stopping heavy traffic during construction. Median drains will be designed with outlets leading into either natural streambeds or open areas when no natural streams are located nearby. Noise barriers should be provided at bridge. Access to the bridge for the residents of Naluchi may be provided.	Employment opportunity for the people of area will be increased. The land value will increase.
2	Oriental College	25 Feb. 2007	23	Proper bus stops and parking areas should be constructed. Pedestrian crossing bridges may be given near central place of the road side settlement. Contractor will be required to ensure that construction works do not hinder local people's access to the road and their ability to cross it safely. Temporary construction ramps and diversion routes will facilitate pedestrians and livestock when crossing the road	Transport facility will be improved. Business opportunities will be created at maximum possible level. There will be easy access to city area.
3	Gojra	26 Feb. 2007	19	Pedestrian crossings should be provided. Under pass should be constructed. Waiting room with proper facility of water and lavatory should be constructed at bus stands.	Better transport facilities will be expected. Employment opportunities will occur during the construction. Travel time will be reduced.
4	Chowk Sardaran	26 Feb. 2007	13	Dust pollution will be expected during the construction. Labour should be hired from local.	Better transport facilities will be expected. It will generate employment opportunities during the construction period. Travel time will be reduced.
5	WAPDA colony	27th Feb 2007	9	Accidents chances will be increased. Service road should be constructed. Construction activities will be limited to daylight hours to minimize the impact of noise generated by construction machineries. Landowners will be compensated according to the terms of lease agreements negotiated with the landowners and contractor to hire the land for ditch and pit purpose. Disturbance due to traffic noise & vibrations is expected.	Unemployment will be decreased. Patients would easily go to the big cities for treatment.

S. No.	Village Name/ Venue	Date	No of Participants	Main Concerns	Expectations
6	Bela Noor Shah	27 Feb. 2007	11	Contractor will be required to maintain close liaison with local communities to ensure that conflicts, if any, related to the utilization of water for project purposes or any other issues are resolved quickly. Service road should be provided. Sign board should be provided along the settlement and school.	We will enjoy better transport facilities. Business facilities will be generated. Better transport facilities will be available.
7	Bela Noor Shah	06 Mar. 2007	11	Landowners will be compensated according to the terms of lease agreements negotiated with the landowners and contractor to hire the land for ditch and pit purpose.	People will be able to reach big cities easily. Trend for migration from village to big cities will be reduced.
8	Al Dawa	07 Mar. 2007	13	The small land of the people may be avoided to acquire. The compensation may give at the current market value. Contractor workforces will be trained in the storage and handlings of materials and chemicals that can potentially cause soil contamination and, in case of contamination, it shall be handled accordingly.	Economy of the area will be boosted and people will get jobs locally.
9	Chela Bandil	08 Mar. 2007	21	Land should be acquired on both side of the road to avoid the settlement. Improved travel facility leads to increased probability of accidents. Overhead bridge may be given near school to make the easy access to education institution for the student of the area.	Different kind of conveyances will be available. Different kind of industries will be installed.
10	Chela Bandi	08 Mar. 2007	16	Compensation will be given as per with the market value. Fast speeding should be prohibited near the villages. Proper signboards should be installed along the road. Overhead bridge may be given near bus stops to cross the road. The general mobility of local residents, as well as the operators of roadside businesses and their clientele in and around the construction area is likely to be hindered.	Business facilities will be generated. Better transport facilities will be available. The extent of accidents will be minimized.

Source: Field Survey Team, February-March 2007

SECTION 4: ALTERNATIVES

4.1 General

After the earthquake on 8 October 2005, JICA conducted the Master Plan Study in order to formulate appropriate projects for rehabilitating and reconstructing the city. The Master Plan selected the Project as an urgent and the highest priority project among nine proposed projects.

Prior to the implementation of various projects including satellite town construction recommended in the Master Plan Study, the Project should urgently be implemented to provide sufficient traffic flow capacity in Muzaffarabad City. This because Neelum Valley Road, one of the major roads in the city, does not have enough traffic flow capacity to accommodate the future traffic induced by rehabilitation and reconstruction activities.

As described in "SECTION 2 DESCRIPTION OF THE PROJECT", the Project intends to provide additional traffic capacity to enhance rehabilitation and reconstruction activities especially reconstructing urgently needed social infrastructures. This is because Neelum Valley Road, the main existing road in Muzaffarabad city, has already reached its full capacity and it is expected that the traffic volume will increase when the rehabilitation and reconstruction works are in full scale.

4.2 Alternatives

The following section briefly describes and evaluates different alternatives to arrive at the best possible option to achieve the goal of the Project.

4.2.1 Alternative 1: No Project

It is estimated that traffic will increase considerably in the coming years and more people will be using roads. According to the previous study, total daily traffic is increasing at a rate of 5% per year. It is estimated that in 2019, there will be counted approximately 20,000 annual average daily traffic (ADDT) at the intersection in front of the Supreme Court on Kohala Muzaffarabad Road.

Without the Project, the existing road will continue to be the main transportation corridor in the area. The traffic volume on the existing road is expected to increase with the travel time. The existing road is a dual carriageway without median, due to which many accidents may cause on this road, especially between Bela Noor Shah and Chela Bandi. Traffic congestion is expected to increase in the future and also the road conditions are expected to deteriorate due to increasing traffic volume.

Therefore the alternative 1, "No Project", will result in disturbing the rehabilitation and reconstruction activities for the city, and in worsening of the present environmental conditions

and in increasing disturbance to residents of the area and the road users.

4.2.2 Alternative 2: Alternate Transport Modes

This alternative proposes other transport modes include railways, trams, boat transportation using the Neelum River.

Regarding railways and trams, in view of current congestions in the area there is no room from topographic aspects for laying line of railway and tram tracks. Regarding boat transportation, the Neelum River is a rapid river and this option is not realistic.

4.2.3 Alternative 3: Improvement of Neelum Valley Road

The Neelum River Road goes through Muzaffarabad City and is dual carriageway. This alternative describes the improvement of the road to 2-lane dual carriageway.

The road goes through populated area and there are many houses, shops and hotels along the road. This alternative, therefore, causes extensive impacts to the social environment of the residents in the city, a large scale resettlement. It also needs a long project time which does not meet the demand of the rehabilitation and reconstruction activities. This is not cost wise realistic either.

4.2.4 Alternative 4: Construction of a new bypass road on the eastern side of the Valley

The Alternative 4 proposes to construct a new bypass road with two (2) lanes on the eastern side of the Neelum Valley. The bypass traverses the eastern river terrace of the valley, on which the city is located.

From topographic and geographic aspects, this alternative is not technically and financially feasible. It also gives extensive social impacts to the residents of the city like “Alternative 3” because the bypass goes through the populated area.

4.2.5 Alternative 5: Construction of a bypass road on the western side of the Valley

It proposes a bypass road which traverses the western river terrace of the valley, which is a dual carriage way.

This alternative is feasible in the view of topographical and geographical features of the western river terrace. It gives less social impacts to the residents of the area because a new road section is located in less populated area and the rest of the bypass runs the existing road with improvement.

The concern is a bridge over the Neelum River and connecting viaduct which is about 600 m long. The construction of these structures needs high level of technical skills and requires high cost.

The evaluation of these alternatives is summarised in **Table 4.1**, and the Alternative 5 is selected.

Table 4.1 Summary of the Evaluation of the Alternatives

	A1 No Project	A2 Alternate Transport Modes	A3 Improvement of the Neelum Valley Road	A4 A new bypass road on the eastern side	A5 A bypass road on the western side
Topographical and geographical point	-	Not feasible	Feasible	Not feasible	Feasible
Cost	-	High	High	High	Medium
Project Period	-	Long	Long	Long	Short
Social Impacts	-	High	High	High	Medium
Project Purpose	It does not meet the purpose at all.	Medium	High	High	High
Final Selection	Rejected	Rejected	Rejected	Rejected	SELECTED

4.3 Alternative routes for the Western Bypass

4.3.1 Preparation of the evaluation

In order to consider the best possible alternative route for the Western Bypass, the Project road is subdivided into the following three sections.

Section 1

Section 1 is defined as a section from location A after crossing the Naluchi Bridge to location B, the junction of the project road and the Naluchi road. Since the elevation difference between locations A and B has been about 30 m, alternative S-1-1 is provided to divert route by U turn road, while alternative S-1-2 is planned to connect locations A and B directly utilizing a viaduct.

Section 2

Section 2 is defined as a section from location B, the junction of the project road and the Naluchi road, to location C, the junction of the project road and the Chela Bandi Bridge-Alama Iqbal Bridge road. This road section consists of an improvement of the existing road and newly construction without any alternatives for this Section 2.

Section 3

Section 3 is defined as the section from location C, the junction of the project road and the Chela Bandi Bridge-Alama Iqbal Bridge road, to location D, the junction on the west bank of the Chele Bandi Bridge along the Neelum Valley Road. This road section has two alternatives. The first alternative, S-3-1, is raising the grade of the exiting the Chela Bandi Bridge-Alama Iqbal Bridge road considering flood level, while the second alternative, S-3-2, is a new route on the river terrace.

The alternative routes are shown in **Figure 4.1**.

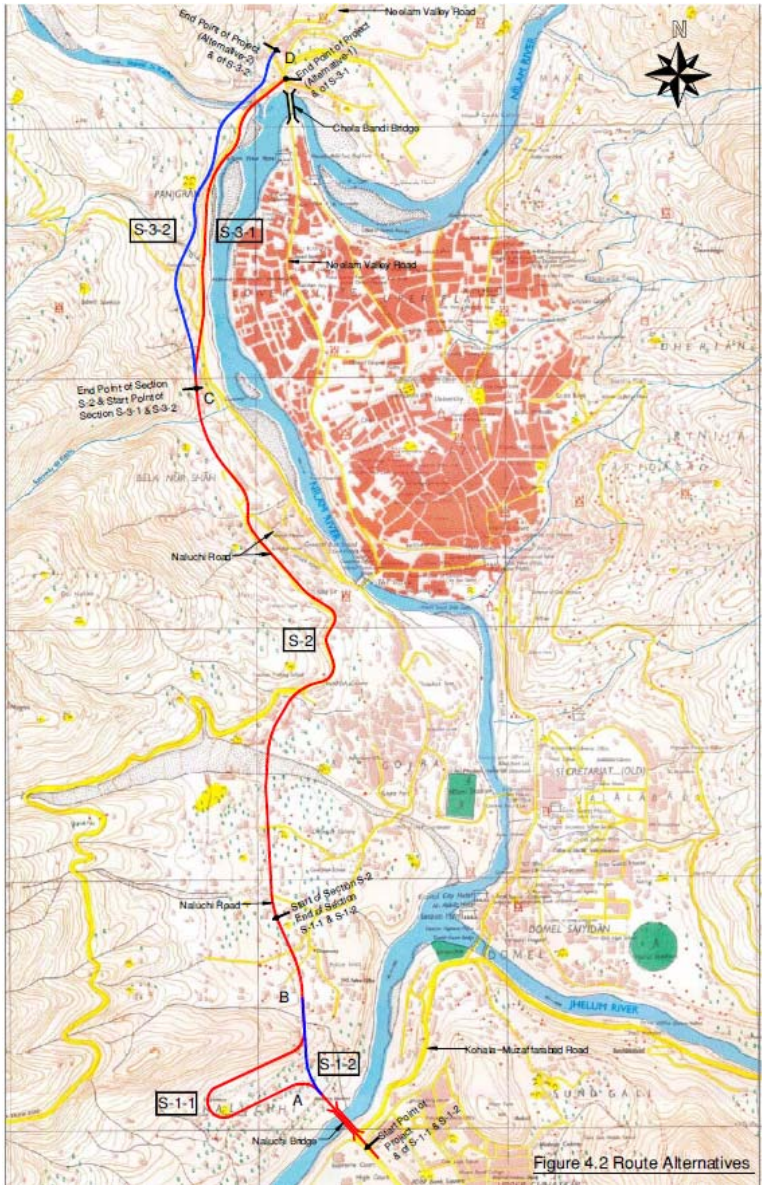

Figure 4.1 Route Alternatives

4.3.2 Evaluation of Alternative Sections

Each alternative section is evaluated from viewpoints of cost, technical aspect and environmental aspect as shown in **Table 4.2**.

Table 4.2 Evaluation of Alternative Sections

Items		Section -1		Section -2	Section -3	
		S-1-1	S-1-2		S-3-1	S-3-2
Technical Data	Characteristic	U-Turn Route	Direct Connection	Improvement of Existing	River side	Mountain side
	Section Length (m)	1,820	1,125	2,510	1,290	1,480
	Availability of Existing Road	No	No	Yes	Yes	No
	Road Structure	Earth Work	Bridge	Earth Work	Earth Work	Earth Work
	Traffic Volume (cpu/day)	19,500	19,500	19,500~12,000	12,000	12,000
	No. of lanes	2	2	2	2	2
	Road Width	10~14 m	12.5 m	10~14 m	10~14 m	10~14 m
	Min. Radius	R=75	R=250	R=75	R=100	R=150
	Max. Grade	I=3.75	I=8	I=7	I=3.1	i=6.7
	Major Intersection	4 legs at grade	4 legs at grade	3 legs at grade	5 legs at grade	3 legs at grade
Evaluation	Cost	Inexpensive	Expensive	-	Inexpensive	Expensive
	Technical Aspect	Longer travel distance	Steep grade	-	Adverse affect to at grade intersection and risk of flood	Local community development
	Socio Economic Environment	Large area of land acquisition required	Minor adverse effects	-	Less influence	Large area of land acquisition required
	Natural Environment	Spreading of noise	Minor adverse effects	-	Risk of flooded road	Possibility of Land slides

4.3.3 Selection of Optimal Route

An optimal route, which is S-1-2 + S-2 + S-3-1, is selected mainly on the basis of its lowest degree of negative socio-economic environmental aspects as well as its cost aspect. **Table 4.3** summaries the evaluation of these options.

Table 4.3 Evaluation of Alternative Routes

Items	Alt-1	Alt-2	Alt-3	Alt-4
Combination of Section	S-1-1 + S-2 + S-3-1	S-1-1 + S-2 + S-3-2	S-1-2 + S-2 + S-3-1	S-1-2 + S-2 + S-3-2
Total Road Length in m	5,620	5,880	4,925	5,115
-Earth Work Section	5,380	5,640	4,485	4,675
-Bridge Section	240	240	440	440
Alignment				
-Horizontal	R min=75 m	R min=75 m	R min=75 m	R min=75 m
-Vertical	i max=7 %	i max=7 %	i max=8 %	i max=8 %
Construction Cost Ratio	1.00	1.15	1.10	1.25
Approx. No. of Houses Affected	100	110	80	90
Final Selection	Discarded	Discarded	SELECTED	Discarded

4.4 Alternative designs for the Intersection No. 4

4.4.1 Proposed design in the Basic Design Phase

The following design for the Intersection No. 4 (**Figure 4.2**) was proposed in order to meet the criteria of the road requirements e.g. the traffic demand in 2019. The Intersection No.4 is four-leg, and one lane is added on each leg for either left or right turn. A signal system is not required for the estimated traffic volume. There are many pedestrians observed on the roadside because the intersection is in commercial area. Therefore, adequate space on sidewalk and pedestrian crossings are ensured in the design.

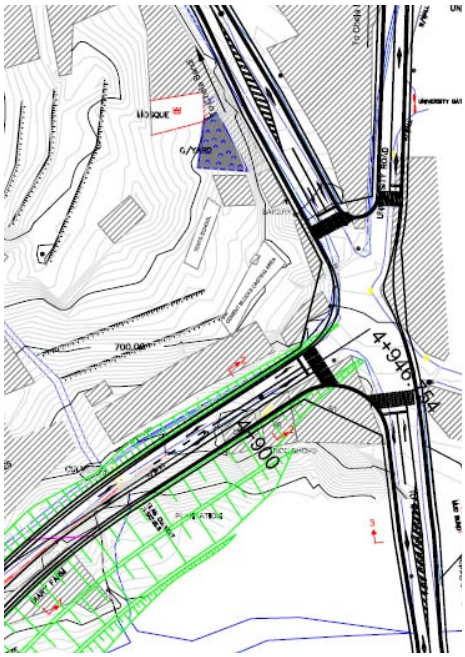

Figure 4.2 Design of the Intersection No.4 in the Basic Design Phase

4.4.2 Alternative study in the Detailed Design Phase

In the beginning of the Detailed Design Phase, ERRA requested to conduct an alternative study on the Intersection No. 4. in order examine whether it is feasible to have more traffic capacity than the original design.

Five alternatives were studied; three intersection designs with flyover structures and two at-grade designs. Three designs with flyover structures were discarded because of their high costs (benefit/cost ratios vary from 0.12 to 0.16). Two at-grade designs were studied in details. Figure 4.3 shows the two at-grade designs.

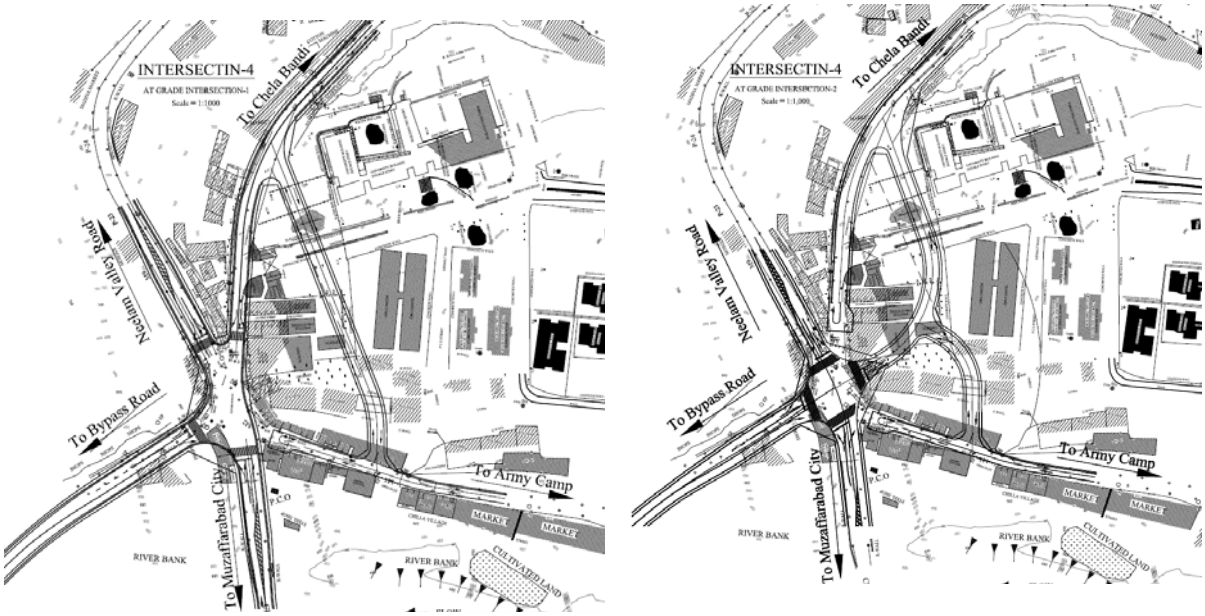

Figure 4.3 Alternative A (left) and Alternative B (right) for the Intersection No.4

The result of the study of the two at-grade designs is shown in **Table 4.4.**

Table 4.4 Evaluation of Alternative Designs for the Intersection No. 4

Layout	Alternative A		Alternative B	
Safety Level	D	- The crossing distance is relatively long, so the crossing traffic flows are more complicated, and guiding the traffic is difficult. This may induce higher traffic accident ratio compared with Alt-B. - It is difficult for drivers to judge instantly which signal to follow because two signals facing the same direction could show different signs. - The intersecting angle of 35 degree creates blind area, which threatens traffic safety.	A	- The crossing distance is the minimum, which provides a safe intersection. - The traffic flow is simple. It provides easy discernment to drivers.
Service Level	C	- Cycle time: 70 s - Average time of delay: 23.5 s/vehicle	B	- Cycle time: 60 s - Average time of delay: 15.8 s/vehicle with higher serviceability
Traffic Capacity	A	Demand Rate in 2019 (demand/capacity): 41.7%	A	Demand Rate in 2019 (demand/capacity): 33.4% It has better tolerance for future traffic demand
Traffic Safety and Convenience as effects on social environment	F	- It creates inconvenience for users of closed road. They have to travel more than 200 m to reach the intersection.	A	- The level of traffic safety is significantly improved by minimizing crossing distance, ensuring enough sight clearance and simplifying traffic flows,

Layout	Alternative A		Alternative B	
		- The long crossing distance, poor sight clearance and complicated traffic flows of this design can be causes for traffic accident.		and the number of traffic accidents is expected to be reduced. - Inconvenience for users of closed roads is less than Alternative A.
Affected Commercial Area	C	Less than B (Approx. 484 m^2)	D	More than A (Approx. 766 m^2)
Additional Cost	A	PKR 1.9 million	B	PKR 2.6 million
Evaluation	18 points: Discarded		26 points: Selected	

Legend: A: Excellent (5 points), B: Good (4 points), C: Fair (3 points), D: Poor (2 points), F: Bad (0 points)

Although Alternative B will affect more commercial area, it is selected by ERRA. This is because it is safer and has more traffic capacity than Alternative A.

SECTION 5: ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

5.1 General

This section identifies the overall impacts of the Project during preconstruction, construction and operation stages on the physical, biological and socio-economic environments of the Project Area. This assessment also includes the impact of traffic volume due to improved road conditions. In addition, it also narrates the measures that will mitigate the Project's adverse environmental effects. Following is a description of the perceived environmental impacts (positive/negative) of the Project with their proposed mitigation measures.

5.2 Project Corridor

The Project corridor is delineated according to two criterions: ROW; which PWD is legally entitled to, and COI, i.e. the width of the corridor that will be impacted, directly or indirectly, by the Project during the construction and operation stages.

a) Right of Way (ROW)

The Project Corridor has a well defined ROW that will be 11.3 metres. Major construction works will generally remain confined within the ROW. All the infrastructure and commercial activities within the proposed ROW need to be relocated and have direct impacts of the Project.

b) Corridor of Impact (COI)

The COI is delineated as the extent, which has direct or indirect impacts of the Project. Direct impacts of the Project, caused by relocation, are visioned within the ROW and indirect impacts, caused by noise, dust emissions, camp sites and borrow sites could be beyond the ROW. After the site visits, indirect COI was defined as area covered within 200 metres (100 metres on both sides of the road section from its centre).

5.3 Conceivable Impacts

Main environmental items[11] and the conceivable impacts in both preconstruction/construction and operation stages of the Project are listed in **Table 5.1**.

The list is based on the preliminary screening and scoping in the Master Plan Study, the results of IEE, field observations and interviews to the stakeholders in the area along the proposed road.

[11] These environmental items to be checked were prepared by JICA in 1992.

Table 5.1 Conceivable Impacts at Each Stage of the Project

	Environmental items	Preconstruction/ Construction Stage	Operation Stage	Description of Impacts
Social Environment				
1	Involuntary resettlement	Yes	-	Land acquisition is required for widening of the existing road, constructing new road, widening of the existing intersections. Land acquisition may be needed for land & waste dumping. Land tenancy is also required for construction yards during the construction stage. They will cause involuntary resettlements along the proposed road.
2	Local economy such as employment and livelihood, etc.	Yes	Yes	➢ Shops/restaurants will be relocated by road widening (land acquisition) during the construction stage. Some of the local residents expect rise of the employment rate by the Project. This expectation should be well considered by contractor, otherwise unnecessary conflict may occur with the contractor. ➢ After the completion of the Bypass, the residential population and visitors of the area are expected to increase. Negative impacts such as social instability because of rapid expansion of economy are expected.
3	Land use and utilisation of local resources	-	Yes	According to the Master Plan Study[12], the area along the proposed road is classified as "residential area" in the future. The population of the area is expected to increase, which may lead new development of the area.
4	Social institutions such as social infrastructure and local decision-making institutions	Yes	-	At the 1st intersection (starting point), it is necessary to allocate some part of the site of the Supreme Court, AJK, for a diversion road during the construction stage.
5	Existing social infrastructures and services	Yes	-	There are schools, hospitals, mobile communication towers and an electric booster station along the proposed road. At the 1st intersection, traffic flow to and from Chhattar town is disturbed during the construction stage.
6	The poor, indigenous and ethnic people	Yes	Yes	There are still many tent dwelling people in the Project Area. Some of them are expected to be affected because of resettlement. There are no "indigenous" people in the Project Area.
7	Gender	Yes	Yes	Some of them are expected to be affected because of resettlement.
8	Children's right	Yes	-	There is an apprehension that children may be forced to work during the construction stage.
9	Misdistribution of benefit and damage	Yes	-	In the construction stage, employment for the Project is expected. This kind of benefit should be equally offered to the local people.

[12] PACET Corp., and Nippon Koei Co., Ltd. (2007). *The Urgent Development Study on Rehabilitation and Reconstruction in Muzaffarabad City, AJK. The Islamic Republic of Pakistan*. JICA, Tokyo, Japan.

	Environmental items	Preconstruction/ Construction Stage	Operation Stage	Description of Impacts
10	Cultural heritage	Yes	-	There are graveyards along the proposed road. There is no historical / archaeological place in and near the vicinity of the Project Area.
11	Local conflict of interests	Yes	Yes	There may be some disturbance in the communities because of resettlement.
12	Water Usage or Water Rights and Rights of Common	-	-	It is expected that water usage by the local residents is not disturbed by the Project. There is not a place as "the commons" in the area.
13	Sanitation	Yes	Yes	➢ Volume of wastes will increase from construction camp sites. ➢ After the completion of the Bypass, waste water and solid waste from each household are expected to increase because of population increase.
14	Hazards (Risk) Infectious diseases such as HIV/AIDS	Yes	Yes	➢ Infectious diseases may be spread by construction workers during the construction stage. ➢ After the completion of the Bypass, because of population increase, infectious diseases such as hepatitis may be spread.
15	Accidents	Yes	Yes	➢ During the construction stage, traffic accidents may increase at diversion roads and intersections. Heavy traffic congestions will also be expected especially at 1st and 4th intersections, and in Muzaffarabad City. ➢ Traffic accidents may increase by over speed vehicles in the operation stage.
Natural Environment				
16	Topography and Geographical features	Yes	-	Some areas are cut for the road construction.
17	Soil Erosion	Yes	-	During the construction stage, soil erosion may occur.
18	Groundwater	-	-	It is expected that there will be no impact related to this issue. The new road construction part does not cut any streams and expects not to affect any aquifer sources.
19	Hydrological Situation	-	Yes	The Project route is passing on the hilly area which has its uphill on the left side of the road. From this topographical condition, the surface water from hillside should be collected and discharged to natural streams.
20	Coastal Zone	-	-	Coast zone will not be affected.
21	Flora, Fauna and Biodiversity	-	-	There is neither protected area nor important ecosystem in the area, and it is expected that there will be no significant impact related to this issue.
22	Meteorology	-	-	It is expected that there will be no impact related to this issue.
23	Landscape	Yes	Yes	➢ Some areas are cut for the road construction and their original landscapes will be changed. ➢ Naluchi bridge will change the landscape.
24	Global Warming	-	Yes	Traffic volume will increase, which may adversely contribute the global warming.
25	Air Pollution	Yes	Yes	➢ Dust may increase during the construction stage.

	Environmental items	Preconstruction/ Construction Stage	Operation Stage	Description of Impacts
				➢ Air pollution during the operation stage may increase with expected traffic volume.
26	Water Pollution	Yes	Yes	➢ Risk of water pollution during the construction stage is expected. ➢ After the completion of the Bypass, waste water from each household are expected to increase because of population increase.
27	Soil Contamination	Yes	-	There is a risk that leakage of oil and other chemicals occur at construction yards.
28	Waste	Yes	Yes	➢ Construction and demolition waste from the existing road, bridges and buildings will be expected. Wastes from construction yards will be expected. ➢ After the completion of the Bypass, solid waste from each household are expected to increase because of population increase.
29	Noise and Vibration	Yes	Yes	➢ Noise and vibration during the construction stage will be expected. ➢ Noise and vibration during the operation stage may increase with future traffic volume.
30	Ground Subsidence	-	-	It is expected that there will be no impact related to this issue.
31	Offensive odour	-	-	It is expected that there will be no impact related to this issue.
32	Bottom sediment	-	-	It is expected that there will be no impact related to this issue.

** "Yes" indicates that impact (s) is expected. "-" indicates that impact is not expected.*

5.4 Incorporation the Findings into the Basic Design Phase

During the EIA Study, the findings should simultaneously be incorporated into the Basic Design. The following four (4) main aspects have been considered in the Basic Design Stage to avoid and/or minimise the impacts. In case of impacts not being avoided, appropriate mitigation measures are proposed.

5.4.1 High risk areas of natural disaster

The Master Plan Study in 2006 identified the land slide areas and the Jhelum Fault which have high risk of natural disaster in future. These high risk areas are avoided as much an extent as possible.

5.4.2 Width of the ROW

The width of the ROW especially in the residential area is set up at the minimum required one which satisfies the design criteria, which gives minimum impacts to the surrounding environment especially the social one. In the residential area, the existing road is utilised and expanded. In the newly constructed area, the width of ROW will be designed as minimum as possible to avoid and/or minimise the resettlement.

5.4.3 Control Points

In order to avoid and/or minimise impacts to social infrastructures, education institutions, cultural heritages, the control points in **Table 5.2** were identified at the beginning of the Preliminary Design Study and the alignment is proposed accordingly. It is also referred to "4.3.3 Selection of Optimal Route".

Grave yards in particular are the important control points. The importance of them has been suggested in the stakeholders meetings, and the Study Team decides the alignment to avoid all the grave yards.

Some of the social infrastructures cannot be avoided and appropriate mitigation measures will be implemented to minimise the impacts.

In addition to these control points, the main residential and commercial area around the General Bus Stand in Gojira is bypassed because the construction of new road leads significant social impacts.

Table 5.2 Control Points along the Bypass and Mitigation Measures

No.	Closest St. No.	Side of the road	Category	Description and mitigation measures
1	0+000	Left side	Cultural heritage	Grave yard: It is avoided.
2	0+600	Inside the road	Social infrastructure	Water tank: It cannot be avoided. Impacts will be assessed and appropriate mitigation measures will be recommended.
3	0+600	Right side	Social infrastructure	Mobile communication tower (2 towers): They are avoided.
4	0+800	Left side	Education institution	Schools: They are avoided.
5	1+000	Left side	Education institution	School: Part of its site or building may be affected.
6	1+100	Left side	Cultural heritage	Mosque: It is avoided.
7	1+100	Left side	Cultural heritage	Grave (one grave): It is avoided.
8	1+600	Left side	Cultural heritage	Grave yard: It is avoided.
9	1+900	Left side	Education institution	School: Part of its site or building may be affected.
10	1+900	Right side	Education institution	School: Part of its site or building may be affected.
11	2+300	Left side	Education institution	School: Its site and building may be affected.
12	2+400	Right side	Social infrastructure	Mobile communication tower (1 tower): It is avoided.
13	2+500	Left side	Cultural heritage	Grave yard: It is avoided.
14	2+500	Left side	Cultural heritage	Grave yard: It is avoided.
15	2+800	Right side	Cultural heritage	Grave yard: It is avoided.
16	3+000	Left side	Cultural heritage	Grave yard: It is avoided.
17	3+100	Right side	Cultural heritage	Grave yard: It is avoided.
18	3+200	Left side	Social infrastructure	Electric transformer substation and its major power transmitting pylon (one pylon): They are avoided.
19	3+300	Left side	Cultural heritage	Grave yard: It is avoided.
20	3+300	Left side	Education institution	School: It is avoided.
21	3+300	Right side	Cultural heritage	Grave yard: It is avoided.

No.	Closest St. No.	Side of the road	Category	Description and mitigation measures
22	3+300	Right side	Cultural heritage	IMAMBARA (praying site): It is avoided.
23	3+400	Inside the road	Social infrastructure	Power transmitting pylon: It cannot be avoided because the alignment avoids two grave yards (No. 18 and 20). Impacts will be assessed and it will be relocated.
24	3+400	Right side	Social infrastructure	Hospital: It is avoided.
25	4+700	Left side	Social infrastructure	Hospital: It is avoided.

5.5 Pre-Construction/Design Stage

The scale of impact is defined as the following:

Minor Negative: Impacts are reversible and/or can be mitigated within the project boundary,

Moderate Negative: Impacts are reversible and/or can be mitigated outside the project boundary, and

Major Negative: Impacts give irreversible losses and they are permanent.

From this section, details of the main impacts are described. First, here are descriptions of impacts envisaged during Pre-construction/ Design stage.

5.5.1 Land Acquisition and Resettlement

The Project-impact related activities will be land acquisition and clearing of the ROW that will result in causing disturbance to the affected residents of the Project Area. Land acquisition is mainly required for construction of road. A total 6.8 ha of residential and commercial lands will have to be purchased for construction of the bypass. Clearing is required for areas already under PWD jurisdiction where temporary squatters may have their businesses. These exercises will lead resettlement of the residents.

This impact will be permanent and major negative in nature. One of the mitigation measures has already taken to minimise the impact with careful alignment and route selection.

Regarding this issue, a Land Acquisition and Resettlement Plan (LARP) is prepared. A detailed quantification of affected assets including land and structures is made while preparing the LARP for the Project. The impact assessment survey has been undertaken to document the losses for compensation associated with the land acquisition and displacement of people from their houses and businesses due to the construction of the Bypass. The number of the affected households is 180 and the number of the affected persons (APs) is 993 based on the survey in August 2007. The compensation package and the resettlement measures are designed to ensure that the APs will have better standard of living or at least the same as the one before the Project intervention.

A series of stakeholder meetings were held with related governmental authorities such as ERRA, SERRA (State Earthquake Reconstruction and Rehabilitation Authority), AJK EPA, MCM (Municipal Corporation Muzaffarabad) and MDA (Muzaffarabad Development Authority), and with the local residents in the Project Area.

5.5.2 Changes in Nearby Land Value

The Project is expected to increase the land values, especially in areas which will be connected to city through the proposed bridge. Landowners will have an opportunity to sell their land on increased prices and start a new business. This impact will be a major positive in nature, but on the other hand it may lead social conflicts in the local communities. This issue should be carefully addressed to the local people.

5.5.3 Poverty Alleviation

Economic activities will be increased in the Project Area by involvement of the local people in the Project related activities. Local labour will be hired, which will provide them an opportunity to develop their skills and capacities. After serving in this Project, the local can utilize their skills in future endeavours.

As a result of the Project, prices of nearby lands will increase that will be a positive thing for the local people. After the construction of bridge at Naluchi, local people will get easy access to main city and new business will develop in the area. This will provide them more earning opportunities, which will enhance economic profile of the area. This would be a moderate positive impact.

However, it also is two-folded the same as “5.5.2 Changes in Nearby Land Value”. This issue should be carefully addressed to the local people.

5.5.4 Public Utilities

Removal of public utilities temporary or permanently may create disruption of public services and inconvenience. This impact would be temporary and may be considered as moderately negative in nature. The mitigation measures have already considered in the Basic Design which includes:

- Design and budget for the relocation of the existing utility infrastructures are provided wherever required and necessary; and
- All the public utilities (e.g. water supply lines, electric poles, cables) likely to be affected by the carriageway widening need to be relocated well ahead of time before the actual commencement of road widening works.

5.5.5 Topography / landscape

The topography in the Project Area will change to some extent because of construction of related structures such as embankments and culverts. Visual changes to the topography would be of permanent and moderate negative in nature.

The Project design has considered aesthetic concerns, and the length and volume of the cut section is designed as minimum as possible.

The Naluchi Bridge and viaduct will be the permanent change of the landscape, and it will be the landmark of the entrance of AJK and Muzaffarabad City. The design of the bridge and the viaduct is selected from aesthetic view point.

5.5.6 Soil

In order to reduce soil erosion at all stages of the Project, the necessary measures are considered in the Preliminary Design and the Basic Design. Land slide prone areas are avoided during the route selection. All embankments and cuttings have appropriately been designed with adequate and effective slope protection measures for preventing soil erosion and slope collapse in the operation stage. The impact would be of permanent and minor negative.

5.5.7 Hydrological Issue

The Project route is passing through the hilly area which is ascending on the left hand side of the road. From this topographical condition, the surface water from hillside should be collected by the side drain and discharged to natural streams. Adequate drainage design has been considered to avoid and minimum impacts to the surrounding environment. The impact would be of permanent and minor negative.

The drainage design has the following policies:

- Both left and right side drains are provided in residential and commercial areas;
- Minimization of the land acquisition is considered;
- At the intersections, side drains are provided at all sides; and
- Impacts to the downstream of the drainage system is appropriately avoided and mitigated.

5.5.8 Flora (vegetation)

Due to the Project, about some trees will be cut for the widening of the existing road and for the newly constructed section. These trees include Apple *Malus pumila*, Mango *Mangifera indica*, Shisham *Dalbergia sissoo*, Eucalypts *Eucalyptus camaldulensis* and Mulberry *Morus alba*.

Cutting of these trees may affect the ecological habitat of the area. This impact would be permanent and moderate negative in nature.

The proposed mitigation measures include the following:

- In order to minimise removal of roadside plantation, contractor will pay careful attention to removal of the trees;
- It is planned that compensatory and compulsory plantation for each felled tree, 4 plants of similar floral function/type; and
- It is not disallowed to introduce exotic species or species with known environmental setbacks (e.g. *Eucalyptus* spp.).

5.6 Construction Stage

This section describes impacts envisaged during Construction stage.

5.6.1 Resettlement and social issues

The resettlement and land acquisition must be completed before starting of the Project. The details are described in the LARP.

Social activities (daily activities) may be disturbed by the Project. This impact would be temporary (during the construction period) and minor negative in nature. The mitigation measures will include:

It is recommended that timely completion of the construction works and provision of alternate routes during the construction; and

It is also recommended that safe diversion routes for pedestrians at appropriate places, especially near schools so that children can cross the road safely. This will also smoothen the traffic flow.

5.6.2 Traffic Management

Due to the construction activities, it needs adequate traffic management in the Project Area. Without traffic management, it may result in heavy traffic congestions and cause inconvenience to the people passing through the Project Area due to movement of vehicles carrying construction materials. The traffic load will also increase on the existing road, which leads deteriorating the existing condition of the road. These impacts will also be expected for the all access roads to the Project Area.

This impact would be temporary (during the construction period) and minor negative in nature. The mitigation measures include:

- Contractor should prepare an overall traffic management plan for the Project Area which

include Muzaffarabad City;

- Providing proper alternate traffic management plan during rehabilitation of existing road;
- Existing road should be upgraded in stages and during construction of new road, parallel road should be used for the traffic; and
- Proper traffic control with marking should be done on the existing road.

5.6.3 Migrant workers and the local community

Migrant construction workers inevitably cause social unease and active disputes with the local community due to cultural differences. The impact would be temporary (during the construction period) and moderate negative in nature. In addition, the involvement of migrant workers in the Project activity may reduce the employment opportunity for the locals.

Mitigation measures include the followings:

- Migrant worker camp sites will preferably be located away from local settlements and sensitivity towards local customs and traditions will be encouraged; and
- Good relations with the local communities will be promoted by employing skilled and un-skilled residents.

Regarding child labour, it is not practiced in the area but the contractor will be strictly instructed not to employ children for the construction works.

5.6.4 Risk of Infectious Diseases/Safety

Infectious diseases may be spread by construction workers. The impact would be of permanent and minor negative. The mitigation measures include:

The contractor should be provided with instruction regarding these risks such as HIV/AIDS and hepatitis. The instruction also needs to address safety measures to prevent accident to the workers and the residents.

Workers should be trained in construction safety procedures and all workers should be equipped with hard boots, helmets, gloves and protective masks.

5.6.5 Topography/landscape

As a result of construction, topography/landscape of the Project Area will be changed. One of the important activities during construction will be dismantling of pavements and borrow areas that have an environmental impact.

This impact would be permanent and moderate negative in nature. Mitigation measure for this impact is the proper landscaping including replanting of trees after the completion of the Bypass.

5.6.6 Borrow/ Open Pits

The utilization of land for procuring borrow material will induce temporary as well as permanent changes in the existing land use patterns and slope stability issues, as well as in soil resource quality. If land has acquired on lease or temporarily, it must be restored when finished extracting material. These are described below:-

- The loss of the fertile plough layer top soil/rangeland at campsites and asphalt plants, and a drop in the elevation of borrow areas will decrease land productivity;
- Potential conflicts may emerge with landowners regarding the restoration of borrow areas;
- Borrow pits and other landscape depressions if left open, may prove hazardous to human beings, livestock and wildlife as well as health issues (e.g. mosquito breeding); and
- In the long term, high embankments become increasingly prone to soil erosion, causing an increase in dust emissions, reduce land productivity, impacting economic activities, safety hazards associated with localized settlements and possible silting of nearby water bodies.

This impact would be permanent and moderately adverse in nature. Mitigation measures will include:

- Necessary permits must be obtained for any borrow pits from the competent authorities, and restoration plan should be well informed to the landowner;
- No excavations should be allowed within a distance of 100 metres of the ROW;
- In borrow pits, the depth of the pits should be regulated so that the sides of the excavation will have a slope not steeper than 1: 4;
- Soil erosion along the borrow pit should be regularly checked to prevent/mitigate impacts on adjacent lands;
- In case borrow pits are filled with water, measures have to be taken to prevent the creation of mosquito-breeding sites; and
- Borrow pits can be restored using for waste landfill, but during the excavation, top 50 cm soil cover should be preserved for vegetation after the filling of the pits. However, attention should be paid to hazardous waste, which should be treated adequately.

5.6.7 Air Quality

The major sources of air pollution would be construction machineries, asphalt plants, vehicular traffic, dust emissions due to wind blowing and uncontrolled burning of construction wastes. Impacts of air pollution may be carried over long distances depending upon the wind speed, direction, the temperature of the surrounding air and atmospheric stability.

Emissions from crushers and quarry sites can cause health impacts, i.e. coughing, flu, difficulty in inhaling, irritation in eyes and reduction in visibility. This impact is temporary (during the construction period) and minor negative in nature.

The mitigation measures will include:

- Dust control should be conducted by equipping asphalt, hot mix and batching plants with fabric filters or wet scrubbers to reduce the level of dust emissions;
- Proper dust collection system should be ensured at crushers and continuous sprinkling of water;
- Water should be sprinkled regularly across diversion tracks;
- It should be ensured that that haul trucks carrying aggregate fill materials are kept covered with canvass sheet to help contain construction material being transported between sites;
- The NEQS and US EPA standards are applied to gaseous emissions generated by construction vehicles, equipment and machineries; and
- Dust masks will be provided to the workers.

5.6.8 Construction Waste Disposal (Wastewater, Oil, Solid Waste)

Due to construction activities, these wastes will be generated at construction and contractors camp sites. The construction wastes will include wastewater, oil spillage from machineries and solid wastes. Without treating them appropriately, this will result in unhygienic conditions, health risk to work forces and the residents.

The followings are the types and sources of construction waste.

- Oil, grease etc. from construction machineries;
- Solid waste from extra construction material and food;
- Wastewater from washing and sprinkling; and
- Sanitary waste from staff toilets.

This impact would be temporary and moderate negative in nature but some impacts (e.g. disposal of solid wastes at waste disposal sites) are permanent. The mitigation measures will include:

- Wastewater effluent from contractor’s workshops and equipment washing yards would be passed through gravel/ sand beds to remove oil/ grease contaminants before discharging it into natural streams;
- Working force should be trained in the storage and handling of materials and chemicals

that can potentially cause soil contamination;

- Solid Waste generated during construction will be safely disposed in demarcated waste disposal sites and the contractor will provide a proper waste management plan;
- Sanitary wastes generating from staff and labour camps must be disposed off in environment friendly manner, i.e. provision of septic tank for toilet wastes;
- Aggregate waste material of existing road will be reused in up-gradation of road; and
- The used lubricant oil can be sent back to supplier to reuse.

5.6.9 Soil

Due to construction activities, soil erosion and contamination may occur. Soil erosion may occur around roadside, contractor's camps and at embankment works as a result of unmanaged run-off from equipment washing yards, excavation of earth, cutting operation, embanking and clearing of vegetation whereas contamination of soil by oil and chemicals at asphalt plant sites, workshop areas and equipment washing yards may limit future use of lands for agricultural purposes.

This impact would be temporary (during the construction period) and moderate negative in nature. The mitigation measures will include:

- Low embankments will be protected by planting vetiver grass that can survive in relatively dry conditions;
- The plant site/ workshop areas will be restored to the original condition. The contaminated soil will be removed and disposed at appropriate site; and
- Soil contamination by asphalt will be minimized by placing all containers in caissons.

5.6.10 Noise

Noise is one of the most pervasive environmental problems in the urban areas especially on the road side. Noise pollution will be due to increase in mobility and construction activities. This impact would be temporary (during the construction period) but moderate negative in nature. All mitigation measures mentioned below should be taken in order to minimize the impacts of noise in the Project Area. These measures include, but are not limited to the following:

- The latest equipment and plant will be utilized with reduced noise levels ensured by suitable in-built damping techniques and appropriate muffling devices;
- Noisy works using heavy machineries like percussion hammers and pneumatic drills should be confined to normal working hours in the daytime,;

- The construction workers should be provided with suitable personnel protection equipment (PPE) such as dust mask and ear muffs; and
- Rock crushing, concrete mixing and material shipment yards should be located away from residential areas, particularly schools, hospitals and nursing homes.

Table 5.3 Maximum Limits of Noise Levels

Noise Level dB (A)	Situation
194	Lung damage
180	Ear drum rupture
150	Absolute limit with ears protected
150	Maximum of instantaneous noise
135	Absolute maximum with ears unprotected
100	Prolonged noise causing permanent damage
90	Factory work for an 8-hour day, 5 days a week
*85	Ear protection should be worn
80	Noise on building or construction sites
70	Normal road traffic near residential areas

Source: "Environmental Degradation" by Engr. Col. Mumtaz Hussain
** Above 85 dB (A) ear protection devices should be worn.*

Table 5.4 General Noise Levels of Machinery and Equipment

S. No.	Equipment	Noise-Level in dB (A)
1	Earth Moving Machinery	75-85
2	Material Handling Equipment	75
3	Stationary Equipment	75
4	Tools, Hammers and Drivers	80-95

Source: The General Services Administration, Construction Noise Specification, USEPA 1972

Table 5.5 Construction Equipment Noise Levels

S. No.	Equipment	Observation Point to the Source (meters)	Noise dB(A)
1	Wheeled loading	5	90
2	Grader	5	90
3	Vibration pavement roller	5	86
4	2-wheel vibration pavement roller	5	81
5	3-wheel pavement roller	5	81
6	Tire pavement roller	5	76
7	Bulldozer	5	86
8	Wheeled pneumatic dredger	5	84
9	Sprayer	5	87
10	Power generator	5	98
11	Impact drill	5	87
12	Impact pile driver	5	112
13	Truck	5	92
14	Concrete mixer	5	91
15	Concrete pump	5	85
16	Mobile lift	5	96
17	Pneumatic hammer and rock crusher	5	98
18	Breaker	5	84
19	Pneumatic spanner	5	95

Source: Guangzhou City Centre Inner Ring Road Project, Environmental Assessment Report (1997)

5.6.11 Surface and Groundwater

The surface water bodies might get contaminated due to the disposal of construction waste generated by the Project activities; this contamination will not only endanger the aquatic life but will also result in jeopardizing the health of the residents that use the water for meeting domestic requirement. In addition to that, construction waste, if left unattended will result in forming leachate which will percolate through the soil strata and will reach underground water table and hence, will end up contaminating it.

This impact would be temporary (during the construction period) and minor negative in nature. Following are the proposed mitigation measures:

- The surface and groundwater reserves must be adequately protected from any source of contamination such as the construction and oily waste that will degrade its potable quality;
- The solid waste will be disposed off in designated landfill sites to sustain the water quality for domestic requirements;
- Water quality monitoring should regularly be conducted according to determined sampling schedule;
- The contractor should ensure that construction debris do not find its way into the drains or canals which may get clogged;
- Prohibit washing of machineries and vehicles in surface waters, provide sealed washing basins and collect wastewater in sedimentation/retention pond;
- Construction works close to the streams or other water bodies will be avoided, especially during monsoon period; and
- Wastes must be collected, stored and taken to approve disposal site.

5.6.12 Flora (vegetation)

Some of the plants and shrubs at yards of houses need to be cut.

Contractor will compensate all these plants and shrubs cut in the residents' properties; and

Contractor must be bound to establish the staff and labour camps, and workshop at barren (non vegetative) land.

5.7 Operation stage

From this section, details of the main impacts are described. First, here are descriptions of impacts envisaged during the Operation stage.

5.7.1 Social issues

According to the Master Plan Study[13], the area along the proposed road is classified as "residential area" in the future. Although the land use pattern is the same as it is at the moment, the population of the area may increase, which may lead new development of the area.

The development will lead social issues to the residents such as needs for more social infrastructures. The population increase leads increase of solid waste and waste water from each household, which require proper waste management and sewage treatment system. The impact would be temporary and moderate negative.

The Master Plan proposes sewage treatment system and solid waste management based on the predicted population in 2016. The sewage treatment system would be centralised in each populated area and the waste management would be setting up a new solid damping area. These infrastructures are expected to be planned and built by PWD and/or the Municipal Corporation Muzaffarabad. The details of the proposal are described in Chapter 8, Volume III, of the final report of the Master Plan Study. The governments of AJK and Muzaffarabad City should pay careful attention to these facts and are requested to implement the Master Plan smoothly.

These issues include risk of infectious diseases. Infectious diseases such as hepatitis may be spread when the area is developed and its population grows. The mitigation measures include:

- The authority concerned should provide the residents with health information how to prevent such risks.

5.7.2 Noise

Due to lack of sufficient data, it is difficult to estimate the future level of noise induced by the traffic. However, because of increase in traffic volume, noise is expected to increase. This impact would be permanent and minor negative. The mitigation measures include:

- Monitoring system of the noise level should be established in the Project Area in accordance to the NEQS and other international standards. If negative impact is detected in future, PWD should take an appropriate action to mitigate the impact.
- Adequate noise barriers should be provided such as hedges and indigenous tree species will reduce the noise; and
- Further improvement can be made with the help of PWD and Traffic police (TP) by enforcing the relevant laws (for example, enforcing the design speed of 50 km/h to every

[13] PACET Corp., and Nippon Koei Co., Ltd. (2007). *The Urgent Development Study on Rehabilitation and Reconstruction in Muzaffarabad City, AJK. The Islamic Republic of Pakistan*. JICA, Tokyo, Japan.

vehicle).

5.7.3 Air Quality

This impact would be permanent and two-folded. It is expected that the improvement in road condition helps reduce traffic related emissions in the short term by allowing a smoother traffic flow (positive).

Due to lack of sufficient data, it is difficult to estimate the future volume of these emissions. However, it is expected that, in a long run, increased traffic levels may lead to higher values of emissions (permanent and moderate negative).

The mitigation measures will include:

- Monitoring system of the air quality should be established in the Project Area in accordance to the NEQS and other international standards.
- Monitoring emissions of vehicles as per NEQS should be conducted; and
- The governments should help the owners and occupants of the affected premises to identify and implement special measures such as hedges and vegetation to reduce air pollution.

The emission of global greenhouse gas would decrease in a short term because of decrease of travel time, but it will increase in a long term.

5.7.4 Time Saving

Due to increase in speed and undisturbed flow of traffic, travelling time would be saved to reach at destinations. This impact will be permanent and major positive in nature.

5.7.5 Safety Concerns

This impact would be permanent and two-folded. Improved dual carriageway will improve safety conditions and will reduce accidents and loss of lives due to better traffic movements. This impact would be permanent and major positive in nature.

However, high speed vehicles may increase traffic accidents and pedestrian accidents, which would be permanent and moderate negative. Safety measures have already integrated into the Basic Design such as traffic signals, sidewalks and pedestrian crossings.

- Traffic signals: They will be installed at the 1st and 4th intersection.
- Sidewalks: With close consultation with PWD, the Study Team has identified the areas along the Bypass where pedestrians are expected to use the sidewalks. Sidewalks will be added to the bridge and the viaduct at Naluchi, all intersections and the residential areas.
- Pedestrian crossing: They will be installed at the all intersections.

- Sign boards: Sign boards will be installed.

5.7.6 Prevention of Deteriorating Vehicles

Improved road condition will result in less wear and tear to vehicles. It will also result in less fuel consumption. This impact would be moderate positive in nature. The road needs to be maintained properly otherwise the impact could be temporary.

SECTION 6: ECONOMIC ASSESSMENT

6.1 General

This section includes the overall economic benefits in relation to environmental costs as a consequence of implementation of the Project.

6.2 Economic Benefits and costs

The economic benefits resulting due to the implementation of the Project will include:

1. Decreasing the vehicle operation cost and travel time costs due to better/ improved road facility, reduced traffic congestion, uninterrupted and smooth traffic flows;
2. Increase in value of land along the Project resulting due to gentrification effect; and
3. It will improve the commercial activity in the Project Area resulting in economic uplift of the people of the Project Area.

The benefits listed are direct ones and come under the category of tangible benefits. These benefits have been quantified and undertaking economic analysis.

Other benefits and costs are of the nature of environmental/social benefits which are very important, however it is very difficult to quantify them and they are not included in the Economic Evaluation.

6.3 Economic Evaluation

The economic evaluation is carried out so as to ascertain the economic viability of the Project in terms of the national economy of Pakistan. The major benefits from the construction of the bypass are vehicle operation cost and travel time cost saving as mentioned above, which will lead the improvement of urban traffic condition in Muzaffarabad City.

In the project evaluation, it is considered that the opening year of the bypass is set in 2010 and evaluation period is set for 25 years after the opening, considering the nature of road in urban area. Opportunity cost of capital or discount rate is set at 12% per annum.

The Project is evaluated by three indicators such as EIRR, Net Present Value (NPV), Benefit Cost Ratio (B/C) and the evaluation results are shown in the following table.

Table 6.1 Economic Evaluation of the Project

Parameter Case	EIRR	NPV	B/C
Whole section	0.1406	314.5	1.21
Section -1	0.1457	327.6	1.27
Section -2	0.1249	11.3	1.05

- Section -1 means that the road section from the beginning of the bypass to the 2nd intersection with the road from Balakot.
- Section -2 means that the road section from the 2nd intersection to the end point of the bypass.
- NPV in million Rs.

It could be concluded that the Project is economically viable for the all the cases of evaluation.

Sensitivity analysis for the whole section is also conducted in the combined 5 x 5 cases of cost and benefits fluctuation as the followings.

Cost: 20% up, 10% up, original, 10% down and 20% down

Benefit: 20% up, 10% up, original, 10% down and 20% down

The results shown in the following table suggest the Project is viable in such combined case as 20% increase in project cost as far as the benefit from the project remains at the original level.

Table 6.2 Sensitivity Analysis for the Project

Benefit Cost	-20%	-10%	Original	+10%	+20%
-20%	0.1406	0.1542	0.1671	0.1795	0.1913
-10%	0.1278	0.1406	0.1528	0.1643	0.1754
Original	0.1169	0.1291	0.1406	0.1516	0.1621
+10%	0.1075	0.1192	0.1302	0.1406	0.1506
+20%	0.0992	0.1105	0.1211	0.1311	0.1406

Shaded cases indicate that the Project is not viable.

SECTION 7: ENVIRONMENTAL MONITORING AND MANAGEMENT PLAN

7.1 Introduction

7.1.1 General

This section provides an approach for managing and monitoring environment related issues and describes the institutional framework for environmental management and resource allocations to be carried out by PWD for mitigating the negative impacts of the Project.

7.1.2 Objectives of Environmental Monitoring and Management Plan (EMMP)

The EMMP will help PWD address the foreseen adverse environmental impacts of the Project, enhance the Project's overall benefits and introduce standards of good environmental practices. The primary objectives of the EMMP are to:

- Define the responsibilities of Project proponents in accordance with the three Project stages (design, construction and operation);
- Facilitate the implementation of the mitigation measures by providing the technical details of each Project impact, and proposing an implementation schedule of the proposed mitigation measures;
- Define a monitoring mechanism and identify monitoring parameters to ensure that all proposed mitigation measures are completely and effectively implemented;
- Identify training requirements at various levels and provide a plan for the implementation of training sessions;
- Identify the resources required to implement the EMMP and outline corresponding financing arrangements; and
- Provide a cost estimate for all proposed EMMP actions.

7.1.3 Key Environmental Components

The key environmental issues associated with the Project are as follows:

- Resettling the residents, commercial structures presently operating within the proposed construction limit of the project corridor;
- Appropriately locating temporary construction camps, asphalt plants, and waste disposal sites, and the environmental impacts of operating these facilities;
- Regulating the procurement of borrow material and topsoil erosion during the construction;

- Avoiding the obstruction of road drainage system during the construction and operation;
- Enhancing and maintaining avenue tree plantation along the newly constructed portion;
- Minimizing the impact on cultural sites or structures and community-owned assets during the construction and operation; and
- Ensuring pedestrian and traffic safety during the construction and operation.

7.1.4 Role of Functionaries for Implementation of EMMP

This sub-section describes the methodology required for the implementation of the EMMP and LARP by PWD. The Chief Engineer (CE PWD) will be the overall in charge of the environmental matters related to the Project. The CE (PWD) will delegate the supervisory responsibilities of the environmental matters the Director (Environment, Social and Land/ Resettlement) who will have Environment Specialist and Social/ Resettlement Specialist supported by a team of consultants including Environmental /Monitoring Consultant.

EPA AJK will act as the overall regulatory body. The specific roles of key functionaries are described hereafter. An organizational setup of the environmental matters is shown in **Figure 7.1**.

1) Public Works Department (PWD)

   a. Director (Environment, Social and Land/Resettlement)

      The Director (Environment, Social and Land/Resettlement) will be overall in charge of handling PWD's obligations with respect to the environmental matters. The Director (Environment, Social and Land/Resettlement) will depute an Environment Specialist, who will be responsible for ensuring that the provisions of the EMMP are implemented. In addition, the Environment Specialist will also coordinate with the EPA AJK, NGOs/ CBOs and other public/ private sector organisations.

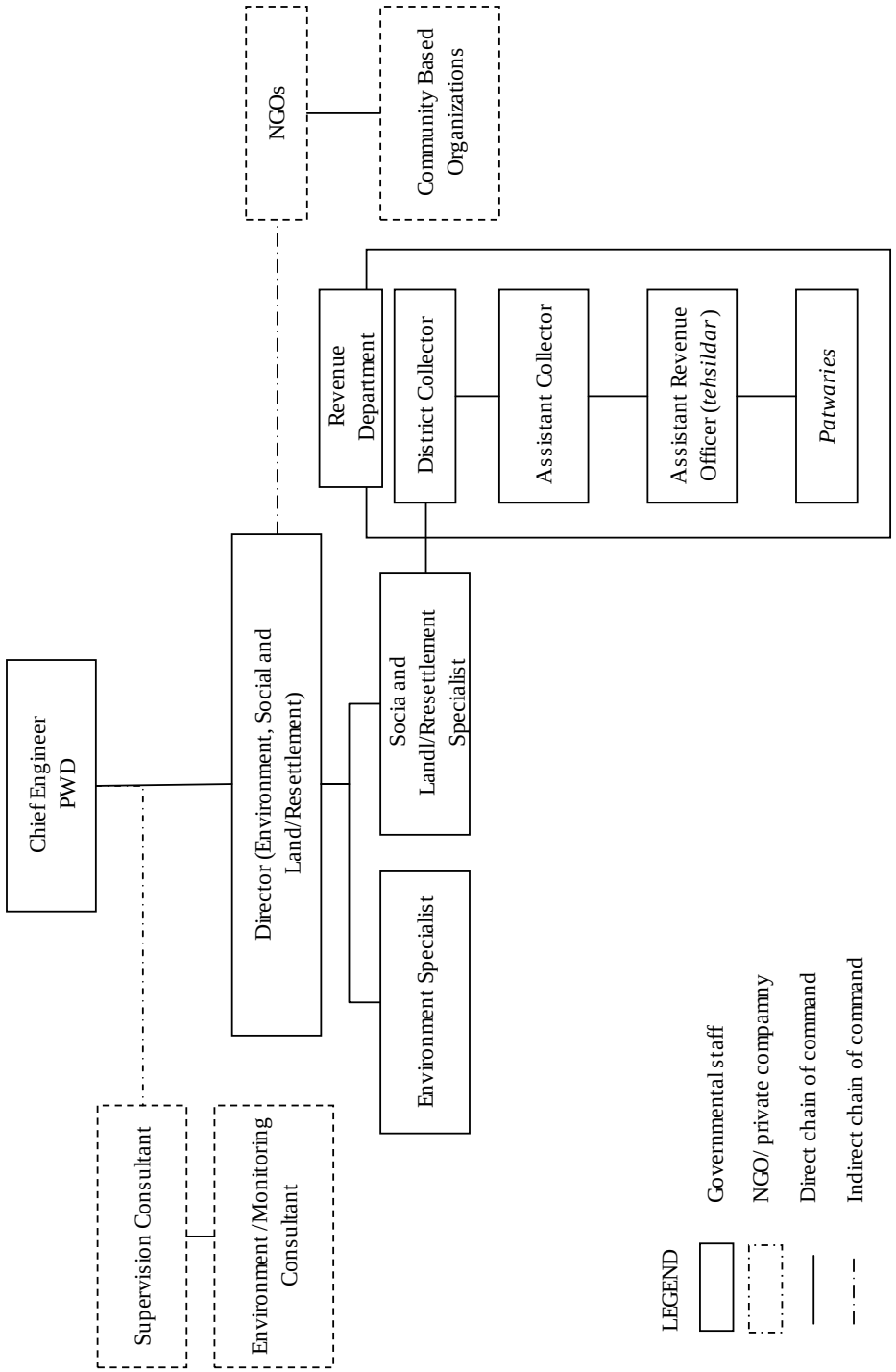

Figure 7.1 Organisation Chart for Environmental Matters Related to the Project

The Social and Land/Resettlement Specialist will be responsible for the land acquisition and resettlement related issues.

In the Revenue Department, the District Collector will be assisted by Assistant Collector, Assistant Revenue Officer and *Patwaries* in assessing the award price for land acquisition to the APs.

2) EIA Consultant

EIA Consultant will prepare an EIA including EMMP and LARP of the Project in compliance to Pakistan and AJK EPA and JICA Guidelines.

3) Design Consultant

Design Consultant will ensure that all the mitigation measures proposed for the design stage are incorporated in the design and included in the contract documents.

4) Supervision Consultant

Supervision Consultant (SC) will supervise the Project contractors to ensure quality of work and fulfilment of contractual obligations. SC will provide one Environment/ Monitoring Consultant (MC) who will:

- Ensure that all the environmental parameters/provisions comply with the applicable standards;
- Ensure that day-to-day construction activities are carried out in an environmentally sound and sustainable manner;
- Organise periodic environmental training programmes and workshops for the Contractors' staff and PWD site staff in consultation with PWD; and
- Develop "good practices" construction guidelines to assist the Contractors and PWD staff in implementing the EMMP.

5) Construction Contractor

The EMMP will be incorporated in the contract agreement and the contractor will ensure that all Project activities are in compliance with the EMMP and NEQS.

7.2 Specific Implementation Responsibilities in the Project Stages

This section describes the implementation and supervision responsibilities for the different stages of the Project.

7.2.1 Design Stage/ Pre-Construction Stage

The Director (Environment, Social and Land/Resettlement), PWD, and his staff with the assistance of the EIA Consultant will be responsible for ensuring that the Project design and specifications adequately reflect the EMMP and the LARP. He will ensure the Project's compliance with environmental regulations and donor requirements, and ensure stakeholder participation in the Project design.

The responsibilities of Director (Environment, Social and Land/Resettlement) may be briefly described as follows:

- Coordinating with regulatory agencies including EPA, EIA Consultant, local NGOs, that could assist PWD in independent reviews of environmental compliance;
- Supervising environmental assessment reports, and provide substantial inputs and guidance to the EIA Consultant;
- Obtaining approval of EIA from EPA AJK; and
- Ensuring that the Design Consultant have incorporated all the mitigation measures proposed in the design and included in the contract documents.

Specifically, before the start of the Project, the Social and Land/Resettlement Specialist will ensure that the following activities are carried out in a transparent manner and according to the acceptable standards:

- Identifying and verifying the APs on the basis of specified documents;
- Identifying which public facilities and utilities need to be relocated;
- Identifying alternative resettlement sites for APs outside the ROW;
- Carrying out a consultation and dissemination campaign with regard to compensation procedures, entitlement packages, and proposed alternative resettlement sites;
- Preparing individual entitlement files;
- Preparing and approving compensation budgets;
- Ensuring that an adequate notice period is given to APs before shifting; and
- Providing shifting assistance to displaced squatters and to assist squatter-owners to salvage their facilities.

7.2.2 Construction Stage

SC along with the Environment Specialist will oversee the implementation activities of the contractor to ensure compliance with the EMMP. The SC will conduct the following activities:

- Liaising with the Project staff to monitor environmental compliance during construction;
- Supervising construction and provide technical support to help ensure compliance with the EMMP;
- Assessing the environmental impacts of the road construction;
- Monitoring the progress of work and adherence of the contractor to the EMMP and LARP; and
- Directing the contractor to work in such a manner that all the Project activities are in compliance with the EMMP and NEQS.

7.2.3 Operation stage

The Environment Specialist will be responsible for the following activities:

- Coordinating with the operation staff to monitor environmental compliance during road operation;
- Advising on, and monitoring tree plantations along the roads;
- Reporting on the progress of environmental compliance to the federal and EPA AJK;
- Assessing the long-term environmental impacts of the road operation;
- Sustaining a working partnership among PWD, EPA AJK, Agriculture, Forest and Wildlife Departments of AJK, NGOs and other related public private sector organizations; and
- Reporting to Director (Environment, Social and Land Resettlement) about progress of the work.

7.3 Environmental Monitoring

This section provides a monitoring plan that identifies the roles and responsibilities of the Project staff involved in environmental monitoring, and lists the parameters that will be used in the monitoring process.

7.3.1 Objectives

The objectives of the pre-construction and the construction stage monitoring plans will be:

- Monitoring the actual impact of the works on physical, biological and socio-economic receptors within the Project corridor for indicating the adequacy of the EIA;
- Recommending mitigation measures for any unexpected impacts or where the impact level exceeds that anticipated in EIA;
- Ensuring compliance with legal and community obligations including safety on construction sites;

- Monitoring rehabilitation of borrow areas and restoration of construction camp sites as described in the EMMP; and
- Ensuring the safe disposal of excess construction materials.

The objectives of monitoring during the operation stage will be:

- Appraising the adequacy of the EIA with respect to the Project's predicted long-term impact on the corridor's physical, biological and socio-economic environment; and
- Evaluating the effectiveness of the mitigation measures proposed in the EMMP and recommend improvements, if and when necessary; and

7.3.2 Monitoring Roles, Responsibilities and Schedules

The monitoring exercises will be described in the following sections.

1) Internal Monitoring

The Project staff engaged in social and environmental monitoring is listed below, followed by descriptions of the monitoring responsibilities specific to each post:

- Environment Specialist
- Supervision Consultant

Overall monitoring plan is shown in **Table 7.1** (page 79).

2) Environment Specialist

The Environment Specialist will have overall responsibility for Environmental Monitoring. This includes the following:

- Ensuring the availability of human and material resources required for environmental monitoring;
- Generating periodic monitoring reports and disseminating these among the management and appropriate staff members;
- Ensuring that the required environmental training is provided to the staff concerned; and
- Contracting out external monitoring to independent firms and ensuring that periodic environmental audits are carried out.

The Environment Specialist will also be responsible for:

- Visits to the construction sites to review the environmental performance of the contractors; and

- The status of the Project's consultation strategy.

3) Supervision Consultant (SC)

SC will appoint MC and a Resident Engineer. The Resident Engineer will overlook the performance of the contractors to make sure that the contractors are carrying out the works in accordance with EMMP. The MC on the other hand will carry out the environmental monitoring and report to the Environment Specialist for adequacy of the monitoring programme as specified in the EMMP. The MC will also conduct a Technical Training Consultant to educate the Contractor's and PWD's staff.

7.3.3 Monitoring Parameters

The monitoring parameters will be described in this section.

1) Environmental Monitoring Parameters

The following environmental parameters will be monitored at locations identified during the construction stage (e.g. location of asphalt plants, construction camps. etc.).

- Air quality (NO_2, SO_2, CO and PM_{10})
- Asphalt Plant Emissions (smoke, dust, etc.)
- Ambient Noise Levels; and
- Water Quality

2) Social Monitoring Parameters

Social monitoring will be carried out based on the following indicators. Regarding the resettlement issues, the LARP will separately handle all the monitoring items in details.

- Number of the APs to be resettled/relocated/provided livelihood assistance where required;
- Availability and adequacy of alternative resettlement sites for the APs (by number and type);
- Inventory and valuation of the APs' affected assets;
- Pre- and post-resettlement incomes of the APs;
- Notice period given to the APs before shifting them from their original locations within the ROW;
- Number of vulnerable APs compensated under the LARP;
- Verification of shifting assistance provided to displaced squatters and to squatter-owners allowed to salvage their facilities;

- Number and nature of consultations carried out, as well as targeted stakeholders;
- APs' perspectives on compensation procedures, entitlement packages, and proposed alternative resettlement sites;
- Number of grievances recorded and redressed;
- Record of any problems due to restricted access to the road during construction and whether ramps/ diversions have been provided where required; and
- Number of public facilities and utilities to be relocated.

7.3.4 Reporting Structure and Outcomes

Progress reporting will be the overall responsibility of the Director (Environment, Social and Land/ Resettlement) who will provide inputs to the SC for submission to the CE (PWD). The SC will be responsible for submitting a monthly environmental/ social report to the CE (PWD). In addition, the Environment Specialist will prepare a quarterly report encompassing environmental concerns, and after review by the Director (Environment, Social and Land/Resettlement), he will submit the report to the EPA AJK.

7.4 Environmental Management Plan

The Environmental Management Plan based on the mitigation measures (indicated in Section 5 of this Report) is presented in **Tables 7.2(a), 7.2(b)** and **7.2(c)** below.

Table 7.1 Environmental Monitoring Plan

Project Stage	Parameters	Details of Location	*Standards/ Guidelines	No. of Samples	Frequency	Responsibility	Duration	Cost (Rs. in million)
Pre-Construction/ Design								
	Air Quality, water quality and noise level	The baseline survey was conducted in the EIA Study. The results are presented in "Section 3".						
Construction (34months)								
	Air Quality PM_{10}	35 metres from the hot mix plant in downwind direction	150 µg/m^3	1	Once every 3 months during the construction stage. Rs. 20,000 @ location.	Monitoring Consultants (MC)	Continuous 24 hours or over one full working day.	0.22
	Air Quality SO_2 NO_2 PM_{10}	5 m from edge of the pavement downwind	 0.14 ppm 0.01-0.02 ppm 150 µg/m^3	3	Once every 3 months during the construction stage. Rs. 20,000 @ location.	MC	Continuous 24 hours or over one full working day.	0.66
	E-Coli	Community groundwater sources near the labour camp sites, and areas where contamination is expected.	It must be absent in samples. (WHO drinking water quality guidelines)	6	Once every 3 months during the construction stage. Rs.2,000 @ sample.	MC	-	0.132
	Noise Levels on dB(A) scale	5 m from edge of the pavement at three selected locations on existing/proposed road	WHO Noise Guidelines. Table 3.3 (b) will be used for references.	3	Once every 3 months during the construction stage. Rs. 1,000 @ location.	MC	24 hours, readings taken at 15 sec intervals, over 15 min, every hour, and then averaged.	0.033
	Oil and Grease	Five selected locations in contractor's equipment yards, as identified by the supervision consultant.	10 mg/L (NEQS)	6	It will be conducted along with water quality monitoring. Once every 3 months during the construction stage.	MC	-	
	Smoke and noise	Every machinery		Vehicle Pollution and Noise Inspector will be mobilised 10 days per month.		Rs. 2,784.71 / day		0.89
	The cost for equipment mobilization and transportation charges will occur at every monitoring survey.					Rs. 25,000 @ one survey		0.275

Project Stage	Parameters	Details of Location	*Standards/ Guidelines	No. of Samples	Frequency	Responsibility	Duration	Cost (Rs. in million)
Operation (3 years)								
	Air Quality SO_2 NO_2 CO PM10	5 m from the edge of the pavement downwind background concentration near a residential area at a sensitive location e.g. hospital or school, taken at 3 selected locations on the road.	 0.14 ppm 0.01-0.02 ppm 35 ppm 150 µg/m^3	3	Once every 6 months for three years. Rs. 20,000 @ location.	MC	Continuous 24 hours (Assuming three years past Project monitoring).	0.36
	Water Quality E-Coli	Community ground water sources near ROW – two selected locations.	It must be absent in samples. (WHO drinking water quality guidelines)	6	Once every 6 months for three years. 2,000 Rs. @ sample.	MC	-	0.072
	Noise Levels on dB(A) scale	Three locations: 5 metres from the edge of pavement, at sensitive location and residential/commercial areas.	WHO Noise Guidelines. Table 3.3 (b) will be used for references.	3	Once every 6 months for three years. Rs. 1,000 @ location.	MC	24 hours, readings taken at 15 sec, 15 min, every hour and then averaged.	0.002
	The cost for equipment mobilization and transportation charges will occur at every monitoring survey.					Rs. 25,000 @ one survey		0.15
	Tree plantation survival rate of trees and revelation	On each visit the number of surviving trees to be compared with the number of samplings planted	The survival rate should be at least 70%, below which replantation shall be done.		Every year for three years or more depending upon the survival rate.	MC & PWD		
							Total Monitoring Cost	2.794

SO_2 (24-hour average), CO (one hour average), PM_{10} (24-hour average) values are compared with USEPA (NAAQS). The USEPA standard for NO_2 is Annual Arithmetic Mean (0.053 ppm) which cannot be applied in Pakistan. It is therefore that the baseline data colle

Table 7.2(a) Environmental Management Plan (Design/ Pre-Construction Stage)

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility
1	Land acquisition and clearing: major negative	Land acquisition and resettlement	The road alignment is designed to avoid and minimize acquisition of residential and commercial land.	DC
2	Resettlement issues: major negative	Relocation of households, commercial and public buildings	The road is designed in such a manner that resettlement should be minimum.	DC
			Land Acquisition and Resettlement Plan is prepared.	PWD
3	Economic activities: moderate negative	Exit/entry problems for the residents and loss of commercial activities.	The road is designed in such a manner to reduce these disturbances at minimum level.	DC
4	Safety concerns:moderate negative	Traffic hazard in the construction and operation stages	Traffic management during the construction stage is considered and specified in the Tender Document. Safety measures are integrated into the design.	DC
5	Topography: moderate negative	ROW Clearing Visual changes to the landscape Soil erosion	Adequate design is conducted to avoid and minimize degradation of topographical features and soil erosion of the area.	DC
6	Hydrological issue/flood hazards: minor negative	Flood damages to the local community and road due to poor drain design	Effective and adequate drain design is conducted.	DC
7	Flora (vegetation): moderate negative	Cutting of trees falling within the corridor	Design alignment in such a manner that minimum trees are cut is applied. Re-plantation is planed.	DC

Table 7.2(b) Environmental Management Plan (Construction Stage)

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility
1	Land acquisition and resettlement: major negative	Social unease caused by delay of the land acquisition and resettlement	Timely completion of the LARP is strictly required.	PWD's land/social staff and CC
2	Traffic management: moderate negative	Disturbance to routine traffic plying in the Project Area	Alternate traffic management plan to be prepared with the cooperation of PWD and TP.	PWD and TP
3	Migrant workers: moderate negative	Social unease and active disputes with the local community by inflow of migrant construction workers. Conflict over labour opportunity caused by migrant workers. Child labour	Migrant worker camp sites will preferably be located away from local settlements and sensitivity towards local customs and traditions will be encouraged. Good relations with the local communities will be promoted by employing skilled and un-skilled residents as mcuh extent as possible. Regarding child labour issue, the contractor will strictly be instructed not to employ children for the construction activities.	PWD, CC and SC in coordination with Union Councils and local NGO's
4	Social issues: minor negative	Exit/entry problems for the residents may occur, and their daily movement may be disturbed.	Timely completion of the construction works and provision of alternate routes are required.	CC and SC
5	Utilities: moderate negative	Relocation of various utilities such as electrical poles, transmission and telephone lines within the RoW	Close coordination with the concerned departments to curtail inconvenience to the residents of the Project area.	PWD staff and local concerned departments.
6	Risk of infectious diseases/health and safety hazards: minor negative	Spread of infectious diseases by construction workers Accidents to workers at the construction site	The contractor should be well informed about the risk of infectious diseases such as HIV/AIDS and hepatitis. Workers should be trained in construction safety procedures and all workers should be equipped with hard boots, helmets, gloves and protective masks.	Training assistant hired by PWD. SC and CC
7	Topography /landscape: moderate negative	Cutting and dismantling of pavements and borrow area	Landscaping and construction of stone pitching/ riprap across the embankments are applied. Land management to take care of the drop in the elevation of the borrow areas is applied.	CC and SC
8	Borrow/ open pits: moderate negative	Loss of fertile top soil Conflict with landowners over restoration of the sites Hazardous to human beings, livestock and wildlife Potential sources of mosquito breeding site	Where deep ditching is to be carried out, the top one meter layer of ditching area will be stripped and stockpiled. The ditch will initially be filled with scrap material from construction and then levelled with the stockpiled top soil. Restoration plan should be well informed to landowners.	CC and SC
9	Air quality: minor negative	Fugitive dust emissions from construction machinery, asphalt plants and vehicular traffic (Emission may be carried over long distances depending upon the wind speed, direction, the temperature of the surrounding air.)	Dust control should be conducted by equipping asphalt, hot mix and batching plants with fabric filters or wet scrubbers to reduce the level of dust emissions. Water should be sprinkled across diversion tracks. It should be ensured that haul trucks carrying asphalt concrete mix and/ or aggregate fill materials are kept covered with tarpaulin to help contain construction material being transported between sites. The NEQS and US EPA standards should be enforced where applicable to gaseous emissions generated by construction vehicles, equipment and machinery. Construction workers should be properly equipped with dust masks.	CC, SC and PWD's Staff

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility
10	Construction waste disposal (wastewater, oil and solid waste etc.): moderae negative	Contamination of soil and waters Unhygienic conditions Solid wastes	Wastewater effluent from contractor's workshop and equipment washing yards would be passed through gravel/ sand beds to remove oil/ grease contaminants before discharging it into natural streams. Training of the work force in the storage and handling of materials and chemicals that can potentially cause soil contamination. Solid waste generated during construction and in camp sites will be properly treated and safely disposed off in demarcated waste disposal sites. Debris generated by dismantling of existing pavement structures will be recycled subject to the suitability of the material.	CC and SC
11	Soil: moderate negative	Soil erosion around construction sites and contractors' camps	Low embankments will be protected by planting grass. High embankments will be protected by constructing stone pitching or riprap across embankments. This practice will also be applied across cross drainage structures where embankments are more susceptible to erosion by water run-off. Appropriate measures for slope protection like vegetation cover will be taken. Soil contamination by asphalt will be minimized by placing all containers in caissons.	CC, SC and PWD staff for land affairs
12	Noise: moderare negative	Noise pollution due to increased vehicular mobility and construction activities	Latest equipment and plant are utilized, with reduced noise level ensured by suitable in-built damping techniques and appropriate muffling devices. Noisy works should be confined to normal working hours in the daytime. The construction workers should be equipped with suitable hearing protection like ear muffs. Rock crushing, concrete mixing and materials shipment yards should be located away from residential areas, particularly schools, hospitals and nursing homes.	CC, SC and PWD staff
13	Surface and groundwater: minor negative	Contaminated by the disposal of construction waste	The surface and groundwater reserves will be adequately protected from any source of contamination such as the construction and oily waste that will degrade its potable quality. The solid waste will be disposed off in designated landfill sites to sustain the water quality for domestic requirements.	CC, SC and PWD staff
14	Flora (vegetation): moderate negative	Cutting of trees due to Project related construction activities	Re-plantation of indigenous species, and four trees are planted for each tree cut.	PWD staff

Table 7.2(c) Environmental Management Plan (Operation Stage)

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility
1	Social issues: moderate negative	Social unrest and other negative impacts induced by rapid development of the area such as increase of water pollution and solid wastes	The residents should be well informed by the authorities concerned about the consequences by the Project. The government of Muzaffarabad City should pay careful attention to these adverse effects and are recommended to implement the Master Plan (2007) effectively.	PWD
2	Noise: minor negative	Noise increase due to increase in traffic volume	Setting up of a system to monitor noise level in the Project Area in accordance with NEQS or acceptable international standards.Provision of adequate noise barriers such as hedges and indigenous tree species. The height of boundary walls of sensitive receptors such as basic health units, schools and colleges can be raised along the Project corridor.	PWD
3	Air quality: moderate negative	Air pollution caused by increased traffic levels	Setting up of a system to monitor air quality in the Project Area in accordance with NEQS or acceptable international standards. Helping the owners and occupants of the affected premises to identify and implement special measures such as hedges and vegetation to reduce air pollution	PWD

Note: DC (Design Consultant), CC (Construction Contractor), SC (Supervision Consultant), PWD (Public Works Department), TP (Traffic Police)

7.5 Environmental Mitigation Cost

To minimise the negative impacts arising due to increased vehicular activities on the road, the mitigation measures could be:

- Tree plantation (number of trees planted will be 4 times the number of trees cut) for reducing the air pollution along with the excessive noise;
- Plantation of trees along the Project Section; and
- Installation of street lights in the areas having excessive population on both sides of the Section.

Table 7.3 gives the mitigation costs for the above mentioned mitigation measure.

Table 7.3 Cost for Mitigation Measures

Proposed Mitigation	Details	Cost (Rs.)	Cost (Million Rs.)
Trees Plantation for replacing cut trees	198 trees will be cut in the ROW. Therefore 800 trees will be planted.	40/plant	0.032
Sub Total			0.032
Environmental Monitoring Cost			2.794
Resettlement Costs including Monitoring and Evaluation Costs (as per LARP)			323.272
Sub Total			326.066
Overall Mitigation Cost in million Rs.			326.098

7.6 Environmental Technical Assistance and Training Plan

An environmental training and Technical Assistance programme will be carried out to build PWD's capacity to effectively implement the EMMP, as well as to facilitate the improved environmental management of future road projects by increasing the environmental awareness of PWD staff in general. PWD with the collaboration of MC will arrange the environmental training sessions for their staff.

The objectives of these sessions will be to help establish appropriate systems, and to train senior PWD staff responsible for managing environment, operations, and planning, who can then impart training at a broader level within and outside PWD (i.e., the training of trainers). The Consultant could organize training courses for PWD staff, in specialized areas such as air and noise pollution monitoring; develop environment operation manuals in consultation with PWD's Environmental wing. The details of this training programme are presented in **Table 7.4**.

Table 7.4 Personnel Training Programme/ Technical Assistance Services

Provided by	Contents	Trainees/ Events	Duration
Monitoring consultants/ organizations specializing in environmental management and monitoring	Short seminars and courses on: Environmental laws and regulations daily monitoring and supervision	Three seminars for PWD Project staff	2 days
Monitoring consultants/ organizations specializing in social management and monitoring	Short seminars and courses on: Social awareness	Three seminars for Project staff dealing in Social/lands matters	2 days
Monitoring consultants/ organizations specializing in Occupational, health and safety issues	Short lectures relating to Occupational Safety and Health	Two seminars for contractor's staff	2 days

7.7 Sufficient Funds for Environmental Activities

For an effective implementation of environmental mitigation measures, it is very important to provide sufficient funds for implementation of environmental mitigation measures, monitoring and training.

SECTION 8: PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

8.1 General

This section deals with the information disclosure to the public and consultation sessions held with the different stakeholder groups that are likely to be affected by the implementation of the Project. The consultation process was carried out as per the guidelines of JICA and AJK EPA.

This consultation process had the following objectives:

- Sharing information with stakeholders on the Project and expected impacts on the physical, biological and socio-economic environments of the Project corridor;
- Understanding stakeholders' concerns regarding various aspects of the Project, including the existing condition of the road, upgrading requirements, and the likely impacts of activities in construction / operation stages;
- Providing an opportunity to the public to influence Project design in a positive manner;
- Obtaining local and traditional knowledge, before decision making;
- Increasing public confidence about the proponent, reviewers and decision makers;
- Reducing conflict through the early identification of controversial issues, and working through them to find acceptable solutions; and
- Create a sense of ownership of the proposal in the mind of the stakeholders.

8.2 Identification of main Stakeholders

During the field surveys and other occasions, significant efforts were made to identify the possible stakeholders and their stakes. They were local residents, government officials, shop owners, hotel owners, vendors, and general public.

8.3 Consultation Meetings

A series of focussed group discussions were carried out with local communities and local government representatives. The meetings were held at various locations.

Generally, people were found to be aware of the need to upgrade the road, and indicated their support for the present PWD Project. The proposed improvement of the existing carriageway met with particular support since it reduces traffic congestion and other road hazards near settlements along the Project corridor. Local communities demanded that they should be part of a continuous consultation process with other stakeholders at different stages of the Project including the design, construction, and operation.

8.4 Stakeholders' Concerns

The most commonly raised concerns during the meetings are listed hereunder:

8.4.1 Road Design

- Improving general standards of construction;
- Abating dust emissions by providing paved road shoulders;
- Constructing median in the centre of road for the safety of moving traffic.
- Providing U-turns where required, and provide pedestrian crossing bridges near schools;
- Providing drain outlets to help drain away run-off from the road, particularly in water channels areas and in areas where road level is higher than that of the surrounding settlements;
- Providing sidewalks and lanes for slow-moving traffic, particularly cyclists;
- Providing parking areas and waiting facilities along the road; and
- Planting trees along the bridge that could be entrusted to the local communities.

8.4.2 Road Construction

- Avoiding undue delays in road construction and ensure that Project works are carried out quickly;
- Avoiding dumping construction materials along the road and median;
- Adopting measures to minimise dust, smoke, and noise pollution, and to control spillages from construction machineries;
- Implementing a proper solid waste management plan;
- Inducting local labour into the construction workforce as far as possible to avoid social conflict between the migrant labour and local communities; and
- Providing proper traffic diversion during construction to avoid traffic congestion, related hazards, and dust emissions.

8.4.3 Road Operation

- Erecting cautionary and informative signs;
- Controlling over-speeding, overloading, the use of pressure horns near schools, traffic disorders and violations of traffic regulations;
- Specifying speed limits where required;
- Prohibiting commercial vendors and squatters from encroaching the ROW;

- Ensuring that cross-drainage pipes and culverts are regularly cleaned; and
- Regularly removing accumulated piles of rubbish from the ROW.

Categories of different stakeholders are presented in **Table 8.1**.

Table 8.1 Categories of Different Stakeholders and their Stakes

Stakeholders	Concerns/ Aspirations Raised	Mitigation Measures	Proposed in EMMP
Residents	i. Noise and air pollution should be controlled; ii. There should be less exit/entry problems for the residents; iii. Proper relocation of utilities; and iv. Waste material should be disposed off in a proper way.	i. Discussed in Section 5, under construction and operation stages	Discussed under Section 7 in Table 7.2 (a), (b) & (c)
Office Workers	i. Noise and air pollution should be controlled; and ii. Proper relocation of utilities.	i. Discussed in Section 5, under construction and operation stages; and ii. Steps will be taken to minimize the negative impacts on business activities.	Discussed in Table 7.2 (a), (b) & (c)
Shops owners	i. Dust and air pollution should be controlled; ii. Proper relocation of utilities; and iii. Business will decrease during construction.	i. Discussed under Section 5, during construction and operation stage; and ii. Steps should be taken to minimize the negative impacts on business activities.	Discussed in Table 7.2 (a), (b) & (c)
Hotel Owners	i. Dust and air pollution should be controlled; ii. Proper relocation of utilities; and iii. Reduction in the business activities during construction.	i. Discussed under Section 5, during construction and operation stage; and ii. Steps will be taken to minimize the negative impacts on business activities.	Discussed in Table 7.2 (a), (b) & (c)
Vendors	i. Possible loss of livelihood; and ii. Displacement from the location.	i. Assistance in shifting and compensation will be provided during the transition period.	Discussed in Table 7.2 (a), (b) & (c)
General Public N.G.O (Non governmental organization)	i. Noise and air pollution should be controlled; ii. Proper alternate routes should be provided; iii. Proper relocation of the affected people; and iv. Proper relocation of utilities.	i. Discussed under Section 5, during construction and operation stages	Discussed in Table 7.2 (a), (b) & (c)

8.5 Proposed Measures for Incorporating the Stakeholders' Concerns

Stakeholders' concerns will appropriately be incorporated into the design as much as possible.

8.5.1 Road Design

The following environmental and safety provisions will be incorporated into the Project Design:

- Road safety audits and improved road markings/signage and demarcation of accident-prone areas in order to improve the horizontal and vertical geometry, and reduce conflicting movement during operation, particularly along inhabited stretches of the road;
- Traffic control devices, including information and cautionary signs, signals, traffic diversion and road markings, to ensure pedestrian safety during construction and operation;
- A tree plantation programme to compensate for the anticipated loss of vegetation during the construction activities, and to help abate pollution caused by emissions, dust, and noise during road operation; and
- Outfalls for side drains to divert surface run-off from the carriageway, and protect ribbon development areas and settlements.

8.5.2 Road Construction

The following measures will be carried out in order to protect surrounding communities from the expected impact of construction:

- The construction activities will be regularly supervised and proceed based on the activity plan without delay.
- The Project facilities will be located at a minimum distance from the existing settlements and built-up areas. In order to avoid restricting the mobility of local people, construction vehicles will remain confined within their designated areas of movement.
- Sensitivity towards local customs and traditions will be encouraged to minimise social friction. Good relations with local communities will be maintained by encouraging contractors to provide opportunities for skilled and unskilled employment to locals, as well as on job training in construction for young people.
- PWD is bound to comply with the prevailing national/provincial regulations concerning pollution and waste disposal.
- Solid waste generated during construction and at camp sites will be properly treated and safely disposed off only in demarcated waste disposal sites approved by the SC; and

- All necessary measures will be taken to ensure the safety of traffic during construction, including barricades (including signs, pavement markings, flags, and lights) erected as required by PWD/ TP. All such barricades will be set up as per local regulations.

8.5.3 Road Operation

The following measures will be carried out in order to protect surrounding communities from the expected impact in the operation stage:

- PWD will work closely with TP to ensure that drivers as well as pedestrians observe traffic rules and that the safety of pedestrians is not compromised;
- PWD and TP will maintain the traffic signs and signals and make sure that in case of some emergency, the affected persons are provided emergency services without any delay; and
- Traffic management plans will be prepared and implemented in conjunction with the TP and roadside commuters to reduce congestion and traffic hazards.

8.6 Future Information Disclosure Plan

After suggesting the possible solutions of the stakeholders' concerns, the EIA Report will be disclosed before the stake holders and general public. The EIA report will be accessible to interested parties on request and the version of final report will be available in the nearest library and its summary will be available in Urdu.

SECTION 9: CONCLUSIONS

9.1 General

This section presents conclusions of the entire EIA Report. The Project has been conceived to provide easy and safe access to the traffic using the Western Bypass that joins the western part and Muzaffarabad City.

The conclusions are based on the findings of detailed environmental assessment, which has been carried out as a requirement of the AJK and Pakistan Environment Protection Act, 1997.

9.2 Feasibility/Practical Utility of the Project

In order to check the feasibility of the Project, the EIA Study was carried out. After carrying out detailed field surveys, it is concluded that this Project will prove to meet the requirements of the rehabilitation and reconstruction activities in a full scale, and to be beneficial in overcoming the problems being faced due to the existing single 2-lane carriageway.

9.3 Various Options considered for the Project

Five alternatives of the Project were considered those included “No project”, “Alternate transport modes”, “Improvement of the existing carriageway in the city”, “Eastern Bypass” and “Western Bypass”. These have been discussed in detail in Section 4 of the EIA Report. The last option was selected because it fulfils the Project requirements in the best way.

In “Western Bypass” alternative, several options were evaluated, and the final decision was based on the conditions of technical standards, cost efficiency and environmental impacts.

9.4 Workforce and Machinery Requirements

Workforce and machinery requirements for the execution of the Project have been discussed in Section 2 of this Report. 312 labourers will be required during construction of the road, and 26 kinds of equipment with the quantity of 75 will be required.

9.5 Identification of the Main Issues and Concerns

During the field surveys, significant efforts were made to identify the main social, cultural and environmental issues related to the execution of this Project. The government departments and agencies were also consulted for obtaining salient information as the stakeholders. The following is the list of main issues and concerns:

- Resettlement of the structures, i.e. houses, shops, electric poles, cables etc. that fall within the design Right of Way (ROW);
- Cutting of trees falling within the proposed corridor;

- Due to change in the hydrologic regime, flood water can cause damage to the local community and road;
- Disturbance to the public movement during construction;
- Reduction in the business activities during construction;
- Noise and air pollution due to the operating of construction machineries during the construction stage of the Project;
- Solid waste generation during construction; and
- Oil spillages from construction machinery, resulting in soil and groundwater contamination.

In order to overcome the social, cultural and environmental issues discussed above, following mitigation measures have been proposed (details available in Section 7):

- All the affected persons should be compensated for their properties, falling in the ROW, through judicious compensation packages. For this purpose all such structures have been measured and evaluated for their costs estimation.
- Trees that are within the corridor and have to be cut down should be compensated by planting new trees in a ratio 4:1 to the cut trees.
- Provision of culverts can be made to control flood damages and ensuring safety of embankments against floods. Drains should be designed to take the design flows.
- In order to minimise the disturbance to the public during construction, informative signs and warning boards should be displayed. Pedestrian crossings and U turns provided at appropriate places will help people safely cross the road even after the construction.
- Compensation should be made to the affected persons for loss in business/ commercial activities.
- Air and dust pollution can be controlled by equipping asphalt, hot mix and batching plants with fabric filters or wet scrubbers to reduce the level of dust emissions. Haul trucks carrying asphalt concrete mix and/ or aggregate fill materials should be kept covered with tarpaulin to help contain construction material being transported between sites.
- Noise pollution due to working machinery and equipment must be taken seriously. All the workers must be provided with suitable hearing protection like dust mask, ear muffs etc. Machines and equipment noise should be controlled by providing appropriate muffing devices to the construction workers.
- Solid waste generated during construction and in camp sites should be properly treated

and safely disposed off in demarcated waste disposal sites. Aggregate waste material of existing road can be reused in up-gradation of road. Sanitary wastes generating from staff and labour camps must be disposed off in environment friendly manner, i.e. provision of septic tank etc. for toilet wastes.

9.6 Findings and Recommendations

Table 9.1 summarises the overall findings and recommendations of the present EIA Study in matrix form.

Table 9.1 Findings and Recommendations of the EIA Study

S. No.	Main Findings	Recommendations
1	The Project will cause resettlement of the houses, shops, electric poles etc. that fall within the design Right of Way (ROW).	A detailed Land Acquisition and Resettlement Plan is prepared. Social and cultural/religious infrastructures such as telecommunication tower, school, mosque and graveyards are already avoided in the designing study. A few infrastructure which can be relocated and compensated are in the ROW, and will be appropriately treated.
2	Due to the change in hydrologic regime, floods can damage road and local community.	Based on Basic Design Study, an appropriate design has already been incorporated.
3	During the construction stage, public movement will be disturbed.	Informative signs and warning boards should be displayed. Pedestrian crossings and U turns should be provided at appropriate places.
4	Execution of the construction works will reduce the business activities of the area.	Proper compensation should be provided to the affected persons for their business losses.
5	The Project activities (operating of construction machineries during the construction stage of the Project) will increase noise and air pollution of the Project Area.	Air and dust pollution can be controlled by equipping asphalt, hot mix and batching plants with fabric filters or wet scrubbers to reduce the level of dust emissions. Haul trucks carrying asphalt concrete mix and/ or aggregate fill materials should be kept covered with tarpaulin to help contain construction material being transported between sites. For minimising the effects of heavy noise emissions from working machinery and equipment, all the workers must be provided with suitable hearing protection equipment like ear cap, ear muffs etc. Machines and equipment noise should be controlled by providing appropriate muffling devices.
6	Social unrest and other negative impacts may be caused by rapid development of the area.	The residents should be well informed by the authorities concerned about the consequences by the Project. The government of Muzaffarabad City should pay careful attention to these adverse effects and are recommended to implement the Master Plan effectively.
7	Solid waste will be generated during construction stage of the Project.	Solid waste generated during construction and in camp sites will be properly treated and safely disposed off in demarcated waste disposal sites. Aggregate waste material of existing road could be reused in up-gradation of the road. Sanitary wastes generating from staff and labour

S. No.	Main Findings	Recommendations
		camps must be disposed off in environment friendly manner, i.e. provision of septic tank etc. for toilet wastes
8	Noise increase due to increase in traffic volume	Provision of adequate noise barriers such as hedges and indigenous tree species will be planned and implemented. The height of boundary walls of sensitive receptors such as basic health units, schools and colleges can be raised along the Project corridor.
9	Air pollution caused by increased traffic levels	Setting up of a system is necessary to monitor air quality in the Project Area in accordance with acceptable international standards. It is necessary to help the owners and occupants of the affected premises to identify and implement special measures such as hedges and vegetation to reduce air pollution
10	Trees will have to be cut for widening the existing road and in the newly constructed part.	New trees must be planted in a ratio 4:1 to the cut trees.

9.7 Benefits of the Project

After the execution of the Project, people living in the Project Area and travellers of project will get the following benefits:

- Overall safety of passengers will be increased.
- Less time will be required for travelling and reaching the destination.
- During the construction stage, local labour will be accommodated in the construction activities.
- Economic condition of the area is expected to be uplifted due to better approach to the nearby markets; and
- Inter-city trading will get a boost due to better communication passage.

9.8 Environmental Monitoring and Management Plan (EMMP)

The EMMP has been provided in Section 7 of the EIA Report. The EMMP will facilitate PWD in taking mitigation measures for potential environmental impacts of the Project. It will also enable PWD to enhance the Project's overall benefits and introduce standards of good environmental practices. Roles and responsibilities of functionaries have also been defined in the EMMP for effective management of the Project components.

9.9 Surveillance and Maintenance of the Road after Construction

PWD and TP will take care of the road after upgrading/ widening. PWD will look after its surface condition and make sure that there are no encroachments within the Right of Way

(ROW).

PWD and TP will be responsible for ensuring smooth traffic flow on the road. TP will advise PWD to provide the required facilities for reducing the road accidents and hazards.

9.10 Proposed Measures for Incorporating the Stakeholders' Concerns

During the field surveys and other visits, the EIA team identified various stakeholders of the Project and discussed the Project with them in order to get feedback about their concerns and further suggestions. Section 8 of the EIA Report discusses public consultation and information disclosure in detail. It also describes the measures suggested for mitigating these concerns.

ANNEXES

REGISTERED No. M-302
L. 7646

ANNEX 1: National Environmental Quality Standards

The Gazette  *of Pakistan*

EXTRAORDINARY
PUBLISHED BY AUTHORITY

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ISLAMABD, SUNDAY, AUGUST 29, 1993
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PART-II

Statutory Notification (S.R.O)

GOVERNMENT OF PAKISTAN

MINISTRY OF ENVIRONMENT, LOCAL GOVERNMENT AND RURAL DEVELOPMENT

NOTIFICATION

Islamabad, the 24th August 1993

S.R.O. 742 (I)/93. – In pursuance of the powers conferred by clause (d) of section 6 of the Pakistan Environmental Protection Ordinance, 1983 **(XXXVII of 1983),** the Pakistan Environmental Protection Agency, with the prior approval of the Pakistan Environmental Protection Council, hereby establishes the National Environmental Quality Standards as contained in the Annexes to this notification.

2. These National Environmental Quality Standards relating to municipal and liquid industrial effluents (Annex I), industrial gaseous emissions (Annex II) and motor vehicle exhaust and noise (Annex III), shall come into force with immediate effect, except in the case of industrial units to which the following schedule shall apply:

Existing industrial units i.e. those units already in production	01 July, 1996
New industrial units i.e. those units that will come into production or after 30th June, 1994	01 July, 1994

Annex I

[PART II] THE GAZETTE OF PAKISTAN, EXTRA, OCT, 19, 1995 2213

NATIONAL ENVIRONMENTAL QUALITY STANDARDS FOR MUNICIPAL AND LIQUID INDUSTRIAL EFFLUENTS (mg/L, UNLESS OTHERWISEDEFINED)

S.No.	Parameters	Standards
1	Temperature	40^{o}C
2	pH value (acidity / basicity)	6-10 pH
3	5-day Biochemical Oxygen Demand (BOD) at 20 ^{o}C	80
4	Chemical Oxygen Demand (COD)	150
5	Total Suspended Solids	150
6	Total Dissolved Solids	3500
7	Oil and Grease	10
8	Phenolic compounds (as phenol)	0.1
9	Chloride (as Cl^-)	1000
10	Fluoride (F^-)	20
11	Cyanide (CN^-)	2
12	An-ionic detergents (1) (as MBAS (2))	20
13	Sulphate (SO_4^{2-})	600
14	Sulphide (S^{2-})	1.0
15	Ammonia (NH_3)	40
16	Pesticides, herbicides, fungicides and insecticides	0.15
17	Cadmium (3)	0.1
18	Chromium (3) (trivalent and hexavalent)	1.0
19	Copper (3)	1.0
20	Lead (3)	0.5
21	Mercury (3)	0.01
22	Selenium (3)	0.5
23	Nickel (3)	1.0
24	Silver (3)	1.0
25	Total toxic metals	2.0
26	Zinc	5.0
27	Arsenic	1.0
28	Barium	1.5
29	Iron	2.0
30	Manganese	1.5
31	Boron	6.0
32	Chlorine	1.0

Explanations:

(1) Assuming surfactant as biodegradable.
(2) MBAS means Methylene Blue Active Substances.
(3) Subject to total toxic metals discharge as at S. No. 25.

Annex II

[PART II] THE GAZETTE OF PAKISTAN, EXTRA, OCT, 19, 1995 2213

NATIONAL ENVIRONMENTAL QUALITY STANDARDS FOR INDUSTRIAL GASEOUS EMISSIONS (mg/Nm^3, UNLESS OTHERWISE DEFINED)

S. NO.	Parameter	Source of emission	Standards
1	2	3	4
1.	Smoke	Smoke opacity not to exceed :-	40% or 2 (Ringlemann Scale)
2.	Particulate matter.(1)	Boilers and furnaces:	
		(i) Using Oil.	300
		(ii) Using Coal.	500
		(iii) Cement Kilns.	200
		Grinding, crushing, clinker coolers and related processes, metallurgical processes, converters, blast furnaces, and cupolas.	500
3.	Hydrogen Chloride	Any.	400
4.	Chlorine	Any.	150
5.	Hydrogen Fluoride	Any.	150
6.	Hydrogen Sulphide	Any.	10
7.	Sulphur Oxides	Sulfuric Acid plants.	400
		Others.	400
8.	Carbon Monoxide	Any.	800
9.	Lead	Any.	50
10.	Mercury	Any.	10
11.	Cadmium	Any.	20
12.	Arsenic.	Any.	20
13.	Copper	Any.	50
14.	Antimony	Any.	20
15.	Zinc	Any.	200
16.	Oxides of Nitrogen (NO_x).	(i) Any Nitric Acid manufacturing unit	400
		(ii) other sources.	400

Explanations:

(1) Based on the assumption that the size of the particles is 10 microns or more.

Annex III

[PART II] THE GAZETTE OF PAKISTAN, EXTRA, OCT, 19, 1995 2213

NATIONAL ENVIRONMENTAL QUALITY STANDARDS FOR MOTOR VEHICLE EXHAUST AND NOISE

S. No.	Parameters	Standards (max: permissible limit)		Measuring Method
1	Smoke	40% or 2 on the Ringleman Scale during engine acceleration.		
2	Carbon Monoxide	Emission		
		New Vehicle	Used Vehicle	
		4.5 %	6 %	Under idling conditions, non-dispersive infrared detection through gas analyzer.
3	Noise	85 db (A)		Sound meter at 7.5 m from the source.

F. No. 2(21)/93-E-II
Mohammad Aslam Malik
Section Officer

2212 THE GAZETTE OF PAKISTAN, EXTRA, OCT 19, 1995 [PART-II]

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ENVIRONMENT AND URBAN AFFAIRS DIVISION

Islamabad, the 16th October, 1995

S.R.O. 1023 (I)/95.-In exercise of the powers conferred under clause (e) of section 6 of the Pakistan Environmental Protection Ordinance, 1983 **(XXXVII of 1983),** the Pakistan Environmental Protection Agency, with the approval of the Pakistan Environmental Protection Council, is pleased to make the following amendments in its Notification No. S.R.O. 742 (1)/93, dated the 24th August, 1993, namely:-

In the aforesaid Notification :-(i) In Annex II, in column 1:-

(a) In S.No. 7, in column 3, after the word "Others", the comma and words " , expect for power plants operating on oil land coal" shall be added;
(b) In S.No. 16, in column 3, in clause (ii), after the words "other sources", the comma and words ", except for power plants operating on oil and coal" shall be added; and
(c) After the Explanations, the following shall be added, namely:-
"In respect of emissions of Sulphur Dioxide and Nitrogen Oxides, the power plants operating on oil or coal as fuel shall, in addition to National Environmental Quality Standards (NEQS) specified above, comply with the following standards:-

A. Sulphur Dioxide

Sulphur Dioxide Back-ground levels Micro-gram			**Standards per cubic meter (µg/m³).**	
			Criterion I	Criterion I
Background Air Quality (SO_2 Basis).	Annual Average	Max. 24-hours Interval	Max. SO_2 Emission (Tons per Day per plant)	Max. allowable ground level increment to ambient (µg/m³) (One Year Average).
Unpolluted	<50	<200	500	50
Moderately Polluted*				
Low	50	200	500	50
High	100	400	100	10
	>100	<400	100	100

*For intermediate values between 50 and 100 ug m^3 linear interpolations should be used.
**No projects with Sulphur dioxide emissions will be recommended.

[PART II] THE GAZETTE OF PAKISTAN, EXTRA, OCT, 19, 1995 2213

B. Nitrogen Oxides

Ambient air concentrations of nitrogen oxides, expressed as NO_2, should not exceed the following:-

Annual Arithmetic Mean	100 µg/m^3.
	((0.05 ppm.)

Emission levels for stationary source discharges, before mixing with the atmosphere, should be maintained as follows:-

For fuel fired steam generators, as Nanogram (10-9 gram) per joule of heat input:

Liquid fossil fuel	130
Solid fossil fuel	300
Lignite fossil fuel	260

[File No. 2 (21)/92-E-II.]

MUHAMMAD ASLAM MALIK
Section Officer.

ANNEX 2: Socio-economic Baseline Survey of the Project Area

JICA STUDY TEAM
Urgent Rehabilitation Project: West Bank Bypass Design

Socio-economic Baseline Survey of the Project Area

Name of Interviewer: _____ Date: _____

a) Settlement: _____

b) Tehsil: _____

1. Name of Respondent _____

2. What is your father's Name? _____

3. What is your age:

Age Years	15 – 25	_____
	25 – 35	_____
	35 – 45	_____
	Above 45	_____

4. Marital Status:

1. Married 2. Unmarried

5. Water is your caste/ethnic group? _____

6. What is your language? _____

7. What is your educational qualification?

1. Illiterate
2. Primary
3. Matric/Intermediate
4. Graduation/Post Graduation

8. What is your profession? _____

9. What is your average monthly income?

Income Rs.	Less than 5,000	_____
	5,000 – 10,000	_____
	10,000 – 15,000	_____
	15,000 – 20,000	_____
	Above 20,000	_____

10. What is the type of your family system?

1. Joint 2. Nuclear

11. Do you marry outside your tribe?

1. Yes (Exogamy) 2. No (Endogamy)

12. What is the employment status of your family members?
    1. Government Employee
    2. Private Employee
    3. Self-Employed
    4. Unemployed
    5. Household

13. What are your major sources of income?
    1. Agriculture
    2. Cattle (meat, hides & wool)
    3. Trade/Business
    4. Poultry
    5. General Labor
    6. Milk/Ghee Selling
    7. Service
    8. Any other

14. How much is your average monthly expenditure?

Expenditure Rs.	
	Less than 5,000 _____
	5,000 – 10,000 _____
	10,000 – 15,000 _____
	Above 15,000 _____

15. What is the type of ownership of your house?
    1. Self-Owned
    2. Rented
    3. Free on Landlord property
    4. Relative House (Free)

16. What is the nature of construction of your house?
    1. Kacha
    2. Pacca
    3. Semi-pacca

17. Which of the following facilities are available in your house?
    1. Electricity
    2. Water Supply
    3. Gas
    4. Telephone
    5. Sewerage

18. What are the sources of water for your domestic use?
    1. Public Water Supply
    2. Hand Pumps
    3. Channel
    4. Any other

19. What are the sources of water for your agriculture use?
    1. Canals
    2. Public Water Supply
    3. Channels
    4. Rain
    5. Any other

20. What is your landholding?
    1. Cultivated Land
    2. Cultivated Waste
    3. Uncultivated Land
    4. Orchards

21. What is the status of ownership of your land?
    1. Owner
    2. Owner-cum-tenant
    3. Tenant

22. What do you grow mostly in you agriculture land?
    1. Wheat
    2. Cotton
    3. Sugarcane
    4. Fodder
    5. Vegetable
    6. Maize
    7. Fruits Orchards
    8. Any Other

23. In your opinion, should this Project be implemented here?
    1. Yes 2. No

If yes, then reasons	If no, then reasons

24. In your opinion, what will be possible impacts of this road?

During Construction

After Construction

25. What protective measures do you suggest to safeguard your interest?

ANNEX 3: Household Census Survey

JICA STUDY TEAM
Urgent Rehabilitation Project: West Bank Bypass Design

Household Census Survey

Sr. No. Date: / /
Respondent's Name Name of Family Head

Postal Address

Type of Family System
1. Nuclear 2. Extended

1. Family Profile

Sr. No.	Name	Relationship with H/H	Sex	Age	Caste	Religion	Education	Occupation	Annual income (Rs.)	
									Land	Other source

2. What is your landholding?
Total landholding _____ Kanals

3. What livestock do you have?

S. No	Type	Number	Value (Rs.)
1	Bull		
2	Cow		
3	Buffalo		
4	Calve		
5	Horse		
6	Donkey		
7	Camel		
8	Sheep		
9	Goat		
10	Poultry birds		
11	other		

4. Which kind of agriculture equipment do you have?

S. No.	Equipment	Number
1	Tractor	
2	Trolley	
3	Plough	
4	other (please specify)	
5	other (please specify)	
6	other (please specify)	

5. Which of the following items do you have?

S.No.	Item	Number	S.No.	Item	Number
1	Refrigerator		15	Rickshaw	
2	Deep freezer		16	Cord	
3	Television		17	Van /pick up	
4	Washing machine		18	Rehra /tonga	
5	Greyer		19	VCR	
6	Electric fan		20	Dish antenna	
7	Electric iron		21	Telephone	
8	Sewing machine		22	Air conditioner	
9	Tape recorder /radio		23	Power generator	
10	Bicycle		24	Electric water pump	
11	Motorcycle		25	other	
12	Computer		26	other	
13	Bed		27	other	
14	Safe		28	other	

6. Food expenses during the last month

Amount_____Rs.

7. Household (non-food) expenses during the last month

Amount_____Rs.

8. Other expenses

（1） Educational expenses (last one year average)_____Rs.

（2） Health expenses (last one year average) _____Rs.

(3) Utility charges such as electricity
(last one year average) _____Rs.
(4) Other private expenses (last one year average) _____Rs.

9. During last one year, did you borrow money?
1. Yes 2. No

If yes,
(1) How much did you borrow? _____Rs.
(2) For what purpose did you borrow money?

10. How much of it have been paid back?
1. one fourth 2. one half 3. three fourth 4. all

(1) Source of borrowing
1. bank 2. money lender 3. private

(2) Interest rate of the loan

11. If your house is acquired for road improvement, what effects of it do you visualise?
(1) On your family
(2) On your livelihood
(3) Any other

12. How shifting by the Project will have impact on household and income? (positive or negative as perceived)

13. Do you have any other place to move?
1. Yes 2. No

14. If yes,
(1) How far from your present house? ____km
(2) Name of the place
(3) Comments

15. In case of relocation, what is your preference of relocation?

A. 1. nearest government's land 2. nearest small town
3. in cash
B. Any other

16. Tree inventory

Type of tree	No.	App. stem height (m)	Total height (m)	App. diameter (inches)

ANNEX 4: Census of Commercial Structures

JICA STUDY TEAM
Urgent Rehabilitation Project: West Bank Bypass Design

Census of Commercial Structures

Commercial Structure: Locality Ward District

Sr. No.	Business Identity/Nature of Business	Name of owner/owners	Status os Ownership	Business Established since	Type of Construction	Total Area (sq.ft.)	Covered Area (sq.ft.)	Total number of Employees		Average Number of Customers	Annual Expenditures (Rs.)	Annual Income (Rs.)		Estimated Value of Shop (Rs.)
								Monthly	Daily Wages			Business	Other Sources	

ANNEX 5: Gender Component Survey

JICA STUDY TEAM
Urgent Rehabilitation Project: West Bank Bypass Design

Gender Component Survey

Sr. No.

Interviewer: _____

D/o or W/o Union Council _____

District _____

1. What is your age?

2. What is your education?

3. Are you married?
   1. Yes 2. No

   If yes, what is the profession of your husband?_____

4. Are you married within or outside the family?
   1. within family _____ 2. outside family

5. If married what was your age at the time of marriage? Years

6. How many children do you have?
   5. Male _____
   6. Female _____
   7. Total _____

7. Do your daughters/sisters go to school?
   1. Yes

   If no, do they work? 1. Yes _____

   If yes, then what kind of work they do

   Nature of work _____ Monthly earning _____ Rs.

8. Do you think women should get education?

   1. Yes _____ 2. No _____

9. Do you marry outside your tribe?

   1. House Wife _____ 2. Working Women _____

   If working women then,

1. Self-employed at home _____
2. Government employee _____
3. Any private organization _____

If self-employed how do you get raw material _____,
then how do you market your products _____

10. How much do you earn per month?
    Rs _____

11. In case of working woman what's nature of work?
    1. Office work _____ 2. Field _____ 3. Both _____

12. Do you have full power to spend you money the way you like?
    1. Yes 2. No

13. In addition to household work, do you do any other work for earning?
    1. Yes 2. No
    If yes, in which way _____

14. How many hours per day do you work?
    _____ Hours

15. Do you also work in the agriculture fields?
    1. Yes 2. No
    If yes, how many hours/day?

16. Do the male members of your family like your job?
    1. Yes _____

17. Do you think that women should do a job?
    1. Yes 2. No

18. Do you think that women should learn some skills for earning income?
    1. Yes _____ 2. No _____
    If yes, what skills _____

19. Are you satisfied with the present education facilities in you village?
    1. Yes _____ 2. No _____

20. Are you satisfied with the present health facilities in you village?
    1. Yes _____ 2. No _____

21. In case of health problem, whom do you consult for treatment?
    1. Govt. Health Center 2. Private Doctor 3. Hakeems
    4. Self-medication 5. Homeopathic 6. Quack
    7. Lady health visitor

22. What are some of the pressing needs for the women of your village?
    a. _____
    b. _____
    c. _____
    d. _____

23. Do you know that the existing road is being upgraded?
    1. Yes 2. No

24. What effects do you visualize of the road?

    _____

    _____

    _____

    _____

    _____

25. In what form, would you like the compensation for your losses?
    1. In cash _____ 2. In kind _____
    3. Any other specify _____

    _____

    _____