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Environment, Urban & Climate Change



محکمہ ماحولیات، شہریت و آب و ہوا، حکومت پنجاب، اسلام آباد
محکمہ ماحولیات، شہریت و آب و ہوا، حکومت پنجاب، اسلام آباد

ENVIRONMENTAL IMPACT ASSESSMENT

(EIA) REPORT

Executing Agency



LAHORE DEVELOPMENT AUTHORITY

(LDA)

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DEVELOPMENT OF A CONTROLLED ACCESS CORRIDOR FACILITY FROM NIAZI
INTERCHANGE TO BABU SABU INTERCHANGE, LAHORE

**ENVIRONMENTAL IMPACT ASSESSMENT
(EIA)**

Project Proponent

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LIST OF ABBREVIATIONS

CTMP	Construction Traffic Management Plan
EA	Environmental Approval
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
EPC	Environmental Protection Council
GFPs	Grievance Focal Points
GoP	Government of Pakistan
HSE	Health Safety Environment
IEE	Initial Environmental Examination
LDA	Lahore Development Authority
M&E	Monitoring and Evaluation
MVEs	Motor Vehicle Examiners
NCS	National Conservation Strategy
NGOs	Non–Government Organizations
NOC	No Objection Certificate
O&M	Operation and Maintenance
OHS	Occupational Health and Safety
OHSAS	Occupational Health and Safety Assessment Series
OSHA	Occupational Safety and Health Administration
PEPA	Punjab Environmental Protection Act
PKR	Pak Rupees
PPE	Personal Protective Equipment
PSQCA	Pakistan Standards Quality Control Authority
PEQS	Punjab Environmental Quality Standards
RAR	Refined Activity Rate
SH & E	Safety Health & Environment
TEPA	Traffic Engineering & Transport Planning Agency
UNCED	United Nations Conference on the Environment and Development
WASA	Water and Sanitation Agency

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EXECUTIVE SUMMARY

TITLE & LOCATION OF PROJECT

Development of a Controlled Access Corridor Facility from Niazi Interchange to Babu Sabu Interchange, Lahore

A BRIEF OUTLINE OF THE PROPOSAL

The proposed project includes remodeling of existing Bund Road section from Niazi Interchange to Babu Sabu Interchange into a Controlled Access Facility. At present Bund Road has three segments from Niazi Interchange to Babu Sabu. The first two segments i.e., from Niazi Interchange to Saggian Interchange and Saggian to Gulshan-e-Ravi are part of Ring Road and carrying high traffic volume is observed daily. These aforesaid stretches have still sufficient traffic capacity but uncontrolled access, type of traffic, and frequent crossing of pedestrians result in frequent accidents. To improve the mobility of both vehicles and pedestrians this stretch is remodeled into a Controlled access facility. The third stretch Gulshan-e-Ravi to Babu Sabu is another Bottle Neck not only due to aforesaid issues but also the reduction in the of lanes as well results in gridlocks especially during peak hours in this stretch. To mitigate traffic congestion at the stretch including the intersection the Controlled access intervention including subways for cross movement of vehicles and pedestrians along with at-grade remodeling of service roads is proposed for direct relief.

The project includes the 4-lane dual carriageway with a Controlled Access Facility from Niazi Interchange to Babu Sabu Interchange with the provision of a crossing facility through subways. Remodeling of the service road is also included to improve the cross-mobility of traffic. This project will help in reducing traffic issues in the aforesaid segments

This project will help in reducing traffic issues at the aforesaid segments. This will result in a reduction in Vehicle Operating Costs (VOC), a significant reduction in accidents to convert the segment into a Control access facility, and at the same time alleviating noise and air pollution up to a certain extent.

The objectives of the project are to:

- (a) This project will help in reducing traffic jams/congestion at the aforementioned intersections.

- (b) This will result in a reduction in Vehicle Operating Costs (VOC) and at the same time alleviate noise and air pollution up to a certain extent.
- (c) This will also result in a significant reduction in accidents to convert the segment into a Control access facility
- (d) To reduce travel time.
- (e) Job Opportunities for local people would be created.

ENVIRONMENTAL BASELINE

The existing environmental conditions around the proposed project have been considered in physical, biological, and socio-economic aspects. The methodology used for the EIA preparation included the collection and review of relevant documents and firsthand data including policy and previous study documents, use of satellite imagery and Google Earth, onsite environmental, ecological, and social investigation, consultation with public and stakeholders, and undertaking the social impact assessment and analysis.

The topography of the project area is flat. The General height of the area is approximately 220 meters above the Mean Sea Level (MSL). The district of Lahore is divided into two parts. The low-lying alluvial soil is along the Ravi River and the upland in the east. Upland is a plain slope from northeast to southwest.

Alluvium is soil or sediments deposited by a river or other running water. The alluvium is typically made up of a variety of materials, including fine particles of silt and clay and larger particles of sand and gravel. A river is continually picking up and dropping solid particles of rock and soil from its bed throughout its length. Where the river flow is fast, more particles are picked up than dropped. Where the river flow is slow, more particles are dropped than picked up. Areas, where more particles are dropped, are called alluvial or floodplains, and the dropped particles are called alluvium. Seasonal climatic conditions must be considered for the design and execution of the Project. The climate including air, temperature, precipitation, humidity, and evaporation is an influencing factor, affecting the construction of the plant and other engineering structures. However, to determine the overall effect of the climatic stresses, daily and seasonal temperature changes, site altitude, direct solar radiation, and precipitation must be considered. The Project Area has an extreme climate: it has hot summers and cold winters. The summer starts in April and lasts till September. May, June, and July are the hottest months. The mean maximum and minimum temperature ranges from 40.4 °C and 27.3 °C respectively for these months

The Lahore division is a part of the Punjab Province of Pakistan. Geologically, this area is

a part of the lower Indus Basin. The name “Punjab” itself is indicative of the healthy presence and importance of rivers in this area. The word “Punjab” comes from 'Punj-aab' meaning five rivers. The five rivers of Punjab were Sutlej, Bias, Ravi, Jhelum, and Chenab Rivers. It is to be noted here that the Bias River has discontinued flowing in Pakistan, as discussed later. This blessing has resulted in cultivation on the most part of the land in Punjab as well as in the study area. Groundwater quality is fresh (defined as acceptable in terms of its salinity). Raw water abstracted from the deep tube wells is believed to be essentially bacteria-free. The status of the quality of groundwater both in the country and Punjab Province is shown in Fig. The water quality in the upper 50 meters zone of the subsoil is generally brackish. For the city's drinking purposes water is abstracted from the groundwater aquifer using tube wells located throughout the city. The quality of water is generally adequate for direct consumption. About 83% of the city population is consuming groundwater for drinking purposes. Groundwater is available at a depth ranging between 15 to 23m below the natural surface level

There are some schools, academies, mosques, and one church present along the project routes that may be affected by the project activities. But the impacts can be reduced by implementing mitigation measures. The baseline of air quality, water quality (both surface and groundwater), and noise levels were monitored and the parameters were found to be within the limits.

In general, various kinds of common trees and shrubs were found planted in the project area. Local bird species were observed flying in the area, on the trees, bushes, and electricity lines. The result analysis of a socio-economic survey of the proposed project area indicates that the majority of the people are living in a joint family system (63%) and in cemented houses (98.5%). The majority of the community members (98%) are Muslims.

The Consultant has employed a participatory bottom-up transparent and consultative approach in the preparation of the Environmental Impact Assessment (EIA) report. Various qualitative and quantitative data collection tools were used to develop an environmental baseline for the proposed area.

Different parameters are monitored at the project site as mentioned;

- ↓ Air quality
- ↓ Noise
- ↓ Water quality

The results of monitored parameters are provided in the *Annexure*

THE MAJOR IMPACTS AND THEIR MITIGATION MEASURES DURING THE CONSTRUCTION PHASE

Impacts

The main impact during the construction will be the clearing of ROW, cutting and filling of borrow pits including erosion of topsoil cover.

- ⬇ Soil erosion due to Construction activities, earthwork, cut and fill, stockpiles, etc.
- ⬇ Contamination of soil due to leakage/spillage of oil, bituminous and non-bituminous debris generated from demolition and road construction
- ⬇ Dust Generation due to construction activities and transport, storage, and handling of construction materials.
- ⬇ Noise from construction activities and operation of equipment and heavy machinery
- ⬇ Sourcing of water during Construction
- ⬇ Construction waste and debris may affect local people.
- ⬇ Safety of Workers and accident risk from construction activities
- ⬇ Approach/hindrance problems for the residents/business owners and movement of the people will be disturbed during construction activities.
- ⬇ Construction will pose a burden on the existing natural resources

Mitigation

- ⬇ Low embankments will be protected by planting vetiver grass that can flourish in relatively dry conditions.
- ⬇ Soil contamination by asphalt will be minimized by placing all containers in caissons
- ⬇ Construction vehicles and equipment will be maintained and refueled in such a fashion that oil/diesel spillage does not contaminate the soil.
- ⬇ Unloading of loose and fine materials through covered vehicles.
- ⬇ All equipment is to be timely serviced and properly maintained
- ⬇ Arrangements shall be made by the contractor that the water availability and supply to nearby communities remain unaffected
- ⬇ Dumping sites will be selected away from residential areas and water bodies
- ⬇ Dumping sites must be having an adequate capacity equal to the amount of debris generated.

- ↓ Safe work practices will be followed and applied by the contractor.
- ↓ At the construction site, fluorescent and retro reflective signage will be used
- ↓ Timely completion of the construction work and provision of alternate routes for the areas where the construction is being carried out
- ↓ One strategy for conserving aggregate resources and reducing the demand for virgin aggregate is to recycle and reuse materials in road construction

THE MAJOR IMPACTS AND THEIR MITIGATION MEASURES DURING THE OPERATIONAL PHASE

Impacts

- ↓ Accident risks associated with traffic movement
- ↓ Lack of maintenance during the operational phase can cause harm
- ↓ Noise generation

Mitigation

- ↓ All safety features provided in the main approach roads such as guide rails, and speed bumps, will be maintained and kept in good condition.
- ↓ Traffic control measures, including speed limits, will be enforced strictly
- ↓ Implementation of HSE Plans during the maintenance period.
- ↓ Ban on the use of pressure horns;
- ↓ Proper implementation of inspection and maintenance programs for vehicles

POSITIVE IMPACTS DURING THE OPERATIONAL PHASE

- ↓ The air quality will improve due to the smooth flow of traffic
- ↓ The noise level will decrease because of smooth traffic flow

PROPOSED MONITORING PLAN

The monitoring program is designed to assess the effective implementation of the Environmental Impact Assessment (EIA). A monitoring Program (MP) provides important information that allows for more effective planning and an adaptive response based on the assessment of the effectiveness of mitigation measures. The monitoring of various parameters will help to determine the extent to which project operation activities cause environmental disturbance.

ENVIRONMENTAL MONITORING PLAN

ENVIRONMENTAL MONITORING PLAN (EMP)					
WHAT (Is the parameter to be observed)?	WHERE (Is the parameter to be monitored)?	HOW (Is the parameter to be monitored)?	WHEN (Is the parameter to be observed)?	WHY (Is the parameter being monitored)?	WHO (Is responsible for monitoring)?
CONSTRUCTION PHASE					
Vegetation Clearance	Construction site	Visual inspection of loss of vegetation, soil erosion & instability, surface water pollution, and occupational health of workers and community	Weekly	To meet the PEQSAA (Punjab Environmental Quality Standards for Ambient Air)	Contractor, LDA through Approved Monitoring Agency
Excavation of earth	Construction site and camp site	Visual inspection for soil erosion & stability	Weekly	To meet the PEQSAA (Punjab Environmental Quality Standards for Ambient Air)	LDA through Approved Monitoring Agency
Dust Emissions	Construction site and camp site	Visual inspection during construction activities Transportation of materials	Weekly	To meet the PEQSAA (Punjab Environmental Quality Standards for Ambient Air)	LDA through Approved Monitoring Agency

ENVIRONMENTAL MONITORING PLAN (EMP)					
WHAT (Is the parameter to be observed)?	WHERE (Is the parameter to be monitored)?	HOW (Is the parameter to be monitored)?	WHEN (Is the parameter to be observed)?	WHY (Is the parameter being monitored)?	WHO (Is responsible for monitoring)?
Storage and handling of materials	Material storage facility and construction camp	Visual inspection of storage facilities	Monthly	To minimize any risk of accident	LDA through Approved Monitoring Agency
Traffic Safety	Construction site and camp site	Visual inspections	Monthly	To avoid the accidents	LDA through Approved Monitoring Agency
Ambient Air Monitoring	Construction site, campsite, batching plant	PM ₁₀ SO _x as SO ₂ , NO _x as NO ₂ , CO	Quarterly	To meet the PEQSAA (Punjab Environmental Quality Standards for Ambient Air)	LDA through Approved Monitoring Agency
	Material storage & active sites				
Noise Level	Construction Site	Using a noise level meter (minimum dB and maximum dB)	Quarterly	To meet the Noise Standards	LDA through Approved Monitoring Agency

ENVIRONMENTAL MONITORING PLAN (EMP)					
WHAT (Is the parameter to be observed?)	WHERE (Is the parameter to be monitored?)	HOW (Is the parameter to be monitored?)	WHEN (Is the parameter to be observed?)	WHY (Is the parameter being monitored?)	WHO (Is responsible for monitoring?)
Ground & Drinking Water Quality	Construction Site	By analyzing pH, TDS, Chloride, Fluoride, Colour, NO ₃ ⁻ , Selenium, Residual chlorine, Lead, Total hardness, Turbidity, Zinc, Manganese, Aluminum, Chromium, Cadmium, Boron, Barium, Antimony, Arsenic, Cyanide, Mercury, Nickel, Total Coliform, E.Coli, Total count.	Quarterly	To meet the PEQS Drinking Water Quality Guidelines	LDA through Approved Monitoring Agency
Solid Waste	Construction camps and construction sites	A visual inspection that solid waste will be disposed of at the designated site Waste generation rate, Waste composition,	Weekly	Minimize impacts on the Environment	LDA through Approved Monitoring Agency

Development of a Controlled Access Corridor Facility from Niazi Interchange To Babu Sabu Interchange, Lahore

ENVIRONMENTAL MONITORING PLAN (EMP)					
WHAT (Is the parameter to be observed)?	WHERE (Is the parameter to be monitored)?	HOW (Is the parameter to be monitored)?	WHEN (Is the parameter to be observed)?	WHY (Is the parameter being monitored)?	WHO (Is responsible for monitoring)?
		Recyclables and non-recyclables, Hazardous waste.			
Occupational health & safety	Construction Site	Proper provision of PPEs to workers	Daily	To avoid any risk to human health	HSE Officer
OPERATIONAL PHASE					
Ambient Air Monitoring	Road	PM ₁₀ SO _x as SO ₂ , NO _x as NO ₂ , CO	Quarterly (During operation)	To meet the PEQSAA (Punjab Environmental Standards for Ambient Air) & WHO (World Health Organization)	LDA through Approved Monitoring Agency
Noise Level	Road	Using a noise level meter (minimum dB and maximum dB)	Quarterly (During operation)	To meet the Noise Standards	LDA through Approved Monitoring Agency

Development of a Controlled Access Corridor Facility from Niaz Interchange To Babu Sabu Interchange, Lahore

ENVIRONMENTAL MONITORING PLAN (EMP)					
WHAT (Is the parameter to be observed)?	WHERE (Is the parameter to be monitored)?	HOW (Is the parameter to be monitored)?	WHEN (Is the parameter to be observed)?	WHY (Is the parameter being monitored)?	WHO (Is responsible for monitoring)?
Water Quality	Road	By analyzing pH, TDS, Chloride, Fluoride, Colour, NO ₃ -, Selenium, Residual chlorine, Lead, Total hardness, Turbidity, Zinc, Manganese, Aluminum, Chromium, Cadmium, Boron, Barium, Antimony, Arsenic, Cyanide, Mercury, Nickel, Total Coliform, E.Coli, Total count.	Quarterly (During operation) & End of summer before the onset of Monsoon every year.	To meet the PEQS Drinking Water Quality Guidelines	LDA through Approved Monitoring Agency

Consultation Outcomes

Overall, people expressed their wish for the construction of the road and their support for the proposed project. The proposed project construction was welcomed by the people as it will reduce traffic congestion and minimize other road hazards along the selected road section. Local communities demanded that they should be part of a continuous consultation process, together with other stakeholders, during different stages of the project including design, construction, and operation

Conclusion

After assessing the significance of potential impacts, it has been concluded that if the project activities are carried out as described in this report, and the suggested mitigation measures are implemented, the proposed project will not have a significant impact on the area's natural and socioeconomic environments. Hence, this EIA concludes upon implementation of the mitigation, the residual impacts of the proposed operation will be low, and careful implementation of the provided EMP will ensure that environmental impacts are managed and minimized and all statutory requirements are met by the project proponent.

1.0 INTRODUCTION

1.1 PURPOSE OF REPORT

This EIA report is being prepared to fulfill the legal requirements of the Punjab Environment Protection Act 1997 (PEPA Amended 2012) for obtaining the Environmental Approval (EA) for the project "Development of a Controlled Access Corridor Facility from Niazi Interchange to Babu Sabu Interchange, Lahore". The other relevant regulations and guidelines considered while preparing this EIA report include:

- (a) Policy and procedures for filing, review, and approval of environmental assessments.
- (b) Guidelines for the preparation and review of environmental reports
- (c) Guidelines for public participation.
- (d) Guidelines for sensitive and critical areas.
- (e) Detailed sectoral guidelines.

Different environmental aspects like physical, biological, and other related features of the project during regular occupancy are highlighted in this EIA report. The necessary measures to be adopted to mitigate negative environmental impacts on any segment of the environment in and around are also described. All the important project-related information is also provided as desired by the Guidelines for the Preparation of IEE / EIA reports-1997, based on which the present report has been prepared. This report will also help the decision makers to issue the desired Environmental Approval (EA) / No Objection Certificate (NOC).

1.2 IDENTIFICATION PROJECT & PROPONENT

Project Name: Development of a Controlled Access Corridor Facility from Niazi Interchange to Babu Sabu Interchange, Lahore

Sponsoring Agency: HUD&PHED

Project Proponent

Chief Engineer -I



Lahore Development Authority – LDA

467-D-II Ground Floor New Building, Johar Town, Lahore, Pakistan

1.3 DETAIL OF CONSULTANT

M/S *Integrated Environment Consultants* (IEC) has been entrusted with the preparation of an EIA report regarding the proposed project. The IEC's corresponding address is Suite # 11, 2nd Floor, Anwar Tower, 99-Shadman Chowk Lahore, Pakistan.

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1.4 PERSONS PERFORMING THE EIA STUDY (TEAM MEMBERS)

The EIA study of the proposed project has been conducted according to Environmental Assessment Procedures-1997, Review of IEE, and EIA Regulation-2022 as prescribed by the Federal Environmental Protection Agency (Pak-EPA), Government of Pakistan. The study team which completed the EIA Report consists of the following Experts

Table 1-1 Lists of Experts Performing EIA

Name	Qualification	Status In Project
Mr. Ahtasham Raza	M.Phil, Ph.D. Scholar, (Environmental Sciences)	Team In-charge
Mr. Adnan Sharif	Postgraduate (Environmental Law)	Project Manager
Mr. Mehmood Amjad	B.S (Environmental Sciences)	Monitoring In-charge
Ms. Iram Naz	M.Sc. Water Resource Management	Team Member
Dr. Gulnaz Malik	Ph.D. (Environmental Science)	Team Member

1.5 BRIEF DESCRIPTION OF THE NATURE, SIZE, AND LOCATION OF THE PROJECT

This Environmental Impact Assessment (EIA) Study is being carried out for the proposed project. The project includes remodeling of existing Bund Road section from Niazi Interchange to Babu Sabu Interchange into a Controlled Access Facility. The proposed project includes the 4-lane dual carriageway with a Controlled Access Facility from Niazi Interchange to Babu Sabu Interchange with the provision of a crossing facility through subways along with the development of a grade road facility.

At present Bund Road has three segments from Niazi Interchange to Babu Sabu. The first two segments i.e., from Niazi Interchange to Saggian Interchange and Saggian to Gulshan-e-Ravi are part of Ring Road and carrying high traffic volume is observed daily. These aforesaid stretches have still sufficient traffic capacity but uncontrolled access, type of traffic, and frequent crossing of pedestrians result in frequent accidents. To improve the mobility of both vehicles and pedestrians this stretch is remodeled into a Controlled access facility. The third stretch Gulshan-e-Ravi to Babu Sabu is another Bottle Neck not only due to aforesaid issues but also the reduction in the of lanes as well results in gridlocks especially during peak hours in this stretch. To mitigate traffic congestion at the stretch including the intersection the Controlled access intervention including subways for cross movement of vehicles and pedestrians along with at-grade remodeling of service roads is proposed for direct relief

Table 1-2: Project Brief

Major Component	Four-Lane Dual Carriageway
Approved Project Cost	PKR Million. 10,842.253/-
Approved Gestation	7 Months Till February 2024
Approval Forum	ECNEC

Scope of work details	Four Lane Dual Carriageway (Niazi Interchange to Babu Sabu Interchange) Carriageway Width (0.0-5.5Km) = 9.0 m Carriageway Width (5.5-7.3Km) = 9.0 m No of Lanes = 2 (each side) Subway Width = 25 m Clearance Height = 5.1 m Pavement Structure (Controlled Access) Asphaltic Wearing Course = 5 cm Asphaltic Base Course = 17 cm Water Bound Macadam = 30 cm Sub-base = 20 cm Subgrade CBR 8% Pavement Structure (At-grade) Asphaltic Wearing Course = 5 cm Asphaltic Base Course = 12 cm Water Bound Macadam = 25 cm Sub-base = 20 cm Subgrade CBR 8%
Environmental Impact	• Significant reduction in Carbon Emissions • Extensive tree plantation

2.0 SCREENING OF PROJECT

According to the review of the Initial Environmental Examination (IEE) / Environmental Impact Assessment (EIA) Regulation 2022, this project falls in *Schedule-II, Section-D "Transport", Sub-Section-2 "Highways, Motorways, Expressways or Major Ways "* for which Environmental Impact Assessment (EIA) Report is required.

Therefore, to fulfill the legal requirements of Section-12 of the Punjab Environment Protection Act-1997 (PEPA Amended 2012), the proponent is required to submit the EIA Report to the Environmental Protection Agency, Government of Punjab, to obtain the required Environmental Approval (EA).

3.0 SCOPING OF PROJECT

3.1 SPACIAL AND TEMPORAL BOUNDARIES OF ENVIRONMENTAL ASSESSMENT

Spatial boundaries for projects related to the environmental effects and cumulative effects for Valued Environmental Components. It depends on the Project Development Area and Local and Regional Assessment Area.

The proposed project includes the 4-lane dual carriageway with a Controlled Access Facility from Niazi Interchange to Babu Sabu Interchange with the provision of a crossing facility through subways along with the development of a grade road facility. Remodeling of the service road is also included to improve the cross-mobility of traffic

Temporal boundaries are based on the timings and duration of project activity that will happen during the construction and operational phase. The project will be completed in 6 months. Construction will be done in an environmentally friendly manner that will not harm any existing boundaries and surroundings of the project area. While during the operational phase, all the operational activities will be done to meet the PEQS.

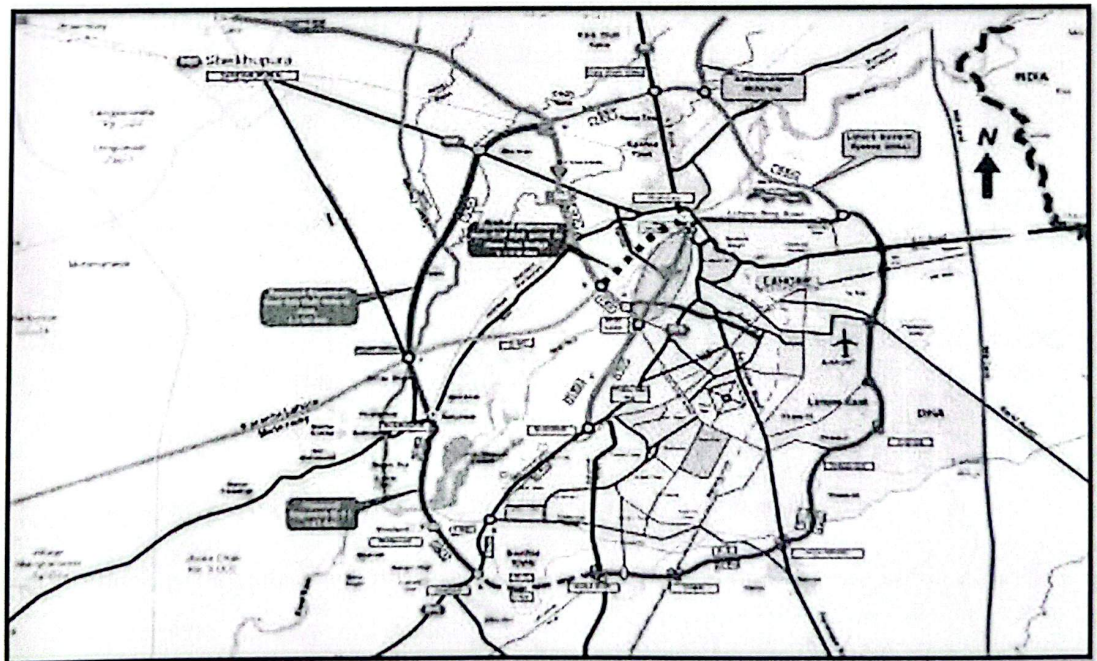


Figure 3-1: Locating Map of Project Area

3.2 IMPORTANT ISSUES AND CONCERNS RAISED DURING CONSULTATION

The regular survey and background studies were conducted to identify the stakeholders. People of surroundings were gathered who are likely to be affected, focus group meetings were conducted by the representatives. They were all briefed about the project's whereabouts in a non-technical and understandable way.

Table 3-1: Issues And Concerns Raised During Consultation

Sr. No	Issues/Concerns	
1.	Traffic	▪ Traffic congestion has been worsening day by day ▪ long traffic queries of the vehicles during peak hours causing increased traveling time ▪ Cause environmental degradation of the city. ▪ The public cannot go to their destination in the required time.
2.	Public Safety	▪ Secure site fencing to avoid any incidents ▪ Clear ingress and egress signage ▪ Clear working hours and notifications to the public regarding excessively noisy activities ▪ Provide secure alter routes to nearby residents ▪ Maintaining accessible routes for the disabled community
3.	Site Logistics	▪ Site ingress and egress ▪ Erosion and sediment control ▪ Cut-down on any utility during excavation
4.	Neighboring Properties	▪ Limiting noise, dust

3.3 SIGNIFICANT IMPACTS AND FACTORS TO BE DETERMINED

The following impacts are considered to be significant and proper mitigation and maintenance plans for these are made

- Air pollution
- Noise Pollution
- Top Soil Removal

- Health and safety of workers
- Accidents due to transportation of construction material
- Accidental spillages of oil to surface water during operation

4.0 CONSIDERATION OF ALTERNATIVES

No Project Option

The No-build alternative does not meet the purpose and need as the severity of the structural deficiencies precludes their being addressed satisfactorily by repair or maintenance work. Urban development is aimed to provide sustainable solutions for the socio-economic uplift of the commuters of the city and hence contributes to the economic development and liveability of the city.

The No Project Option is the least preferred from the socio-economic and partly environmental perspective since if the project is not done.

4.1 SITE ALTERNATIVES, THEIR SELECTION AND REJECTION CRITERIA

The proposed project is the construction of a controlled access corridor facility from Niazi interchange to Babu Sabu interchange, Lahore. The site is considered suitable both in terms of environment and physical constraints. As the land use on the project site is already on existing roads. This project will help in reducing traffic issues at the aforesaid segments. This will result in a reduction in Vehicle Operating Costs (VOC), a significant reduction in accidents to convert the segment into a Control access facility, and at the same time alleviating noise and air pollution up to a certain extent.

4.2 ENVIRONMENTAL ALTERNATIVES, THEIR SELECTION AND REJECTION CRITERIA

Without Project Scenario

At present Bund Road has three segments from Niazi Interchange to Babu Sabu. The first two segments i.e., from Niazi Interchange to Saggian Interchange and Saggian to Gulshan-e-Ravi are part of Ring Road and carrying high traffic volume is observed daily. These aforesaid stretches have still sufficient traffic capacity but uncontrolled access, type of traffic, and frequent crossing of pedestrians result in frequent accidents. To improve the mobility of both vehicles and pedestrians this stretch is remodeled into a Controlled access facility. The third stretch Gulshan-e-Ravi to Babu Sabu is another Bottle Neck not only due to aforesaid issues but also the reduction in the of lanes as well results in gridlocks especially during peak hours in this stretch. To mitigate traffic congestion at the stretch including the intersection the Controlled access intervention including subways for cross

movement of vehicles and pedestrians along with at-grade remodeling of service roads is proposed for direct relief.

The proposed project includes the 4-lane dual carriageway with a Controlled Access Facility from Niazi Interchange to Babu Sabu Interchange with the provision of a crossing facility through subways. Remodeling of the service road is also included to improve the cross-mobility of traffic. This project will help in reducing traffic issues in the aforesaid segments

The existing unsafe conditions and the adverse environmental consequences in terms of environmental quality would continue to worsen in the absence of the proposed improvements. Therefore, the no-action alternative is neither a reasonable nor a prudent course of action for the proposed project, as it would amount to a failure to initiate any further improvements and impede economic development.

With Project Scenario

The 'with project scenario' is found to have a positive impact in the long run on social, environmental, economic, and financial issues. This scenario includes the development of a 4-lane dual carriageway with a Controlled Access Facility from Niazi Interchange to Babu Sabu Interchange with the provision of a crossing facility through subways. Remodeling of the service road is also included to improve the cross-mobility of traffic. The scenario is economically viable and will improve the existing conditions of the project site. It, would thereby, contribute to the development and enhance the growth potential of the area. The project envisages the development within the existing ROW. Despite the various development benefits likely to accrue due to the project, as is the case of every road development project, the project would be accompanied by certain impacts on the natural, social, and environmental components.

Alternative access and utilities to existing facilities may need to be provided during construction or staged construction to allow access and maintain the utilities would be required. Sometimes, top-down construction rather than bottom-up construction can help to ameliorate the disruption and reduce its duration. Rigid excavation support systems and ground improvement techniques may be required to minimize potential settlements and lateral ground deformations, and their impact on adjacent structures. When excavation and dewatering are near the contaminated ground, special measures may be required to prevent the migration of the groundwater-contaminated plume into the excavation or adjacent

basements. Dust suppression and wheel washing facilities for vehicles leaving the construction site are often used, especially in urban areas. Excavation methods are available that can limit suspended solids in the water to acceptable levels. Existing fauna and flora and other ecological issues should be investigated to determine whether environmentally and ecologically adverse consequences are likely to ensue.

Excavation may encounter contaminated soils or ground water. Such soils may need to be processed or disposed of in a contained disposal facility, which may also have to be capped to meet environmental regulations. Provisions would need to address public health and safety and meet regulatory requirements. The potential impacts on the various environmental components can be avoided through good environmental practices. Wherever avoidance of negative impact has not been possible, appropriate mitigation and enhancement actions will be worked out to effectively offset the environmental damages inflicted due to the project.

Keeping in view the analysis of the alternative options, the construction of the 4-lane dual carriageway with a Controlled Access Facility along with the provision of a crossing facility through subways with the proposed design features appears to be the best option.

5.0 DESCRIPTION OF PROJECT

Describes type & category of project, its objectives location & layout, features of site related to vegetation, project schedule of implementation, and complete description of project related to its process and steps. The restoration plan and its rehabilitation are also mentioned in this chapter.

5.1 OBJECTIVES OF PROJECT

The objectives of the project are to:

- The proposed project will improve the mobility of both vehicles and pedestrians at two segments i.e., Niazi Interchange to Saggian Interchange and Saggian to Gulshan-e-Ravi.
- To mitigate traffic congestion at the Gulshan-e-Ravi to Babu Sabu interchange.
- This will also including the intersection of the Controlled access intervention including subways for cross movement of vehicles and pedestrians along with at-grade remodeling of service roads
- This will result in a reduction in Vehicle Operating Costs (VOC) and at the same time alleviate noise and air pollution up to a certain extent.
- This will also result in a significant reduction in accidents to convert the segment into a Control access facility
- To reduce travel time.
- Job Opportunities for local people would be created.

5.2 LOCATION AND SITE LAYOUT OF THE PROJECT

The project includes the 4-lane dual carriageway with a Controlled Access Facility from Niazi Interchange to Babu Sabu Interchange with the provision of a crossing facility through subways. Remodeling of the service road is also included to improve the cross-mobility of traffic.

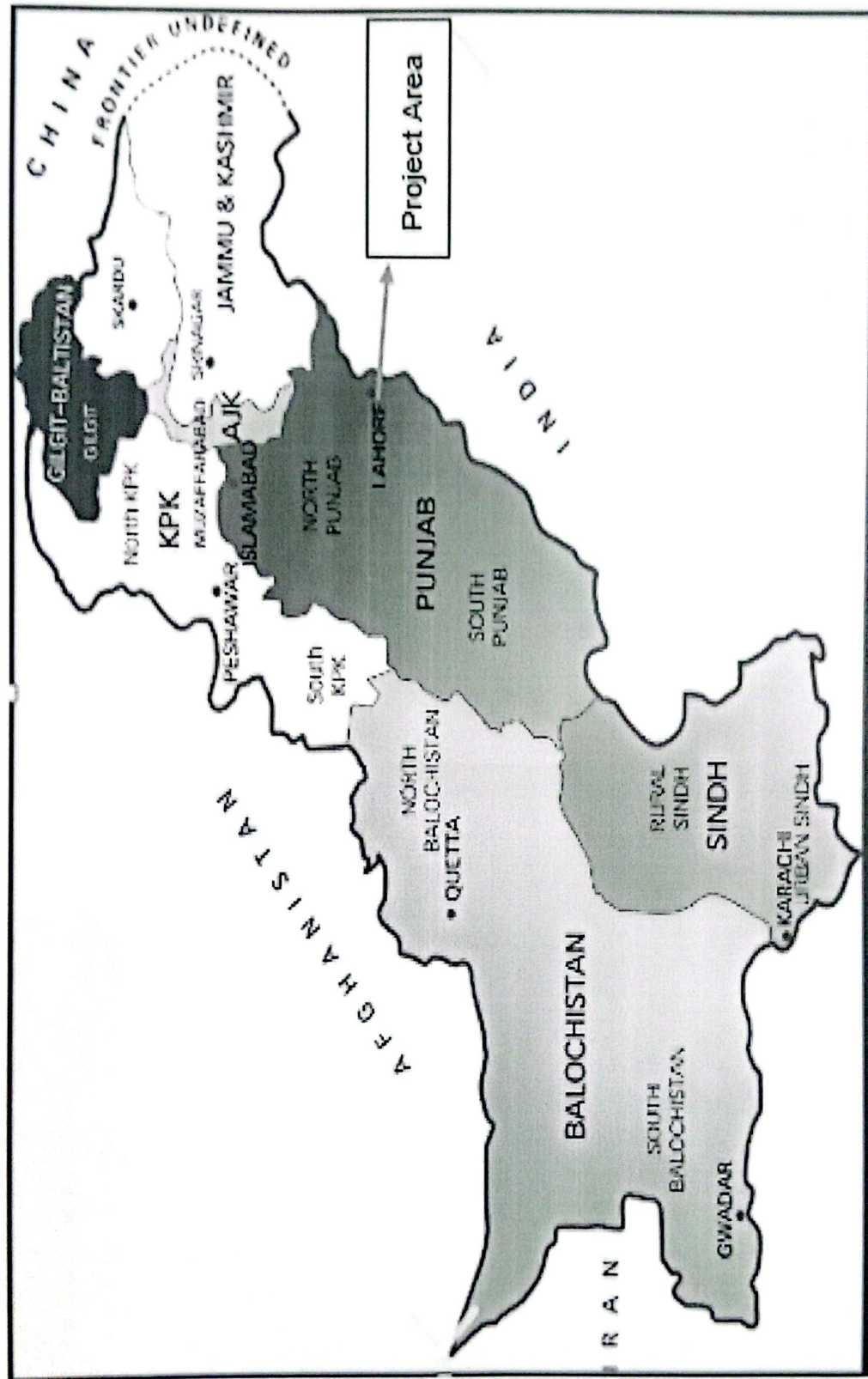
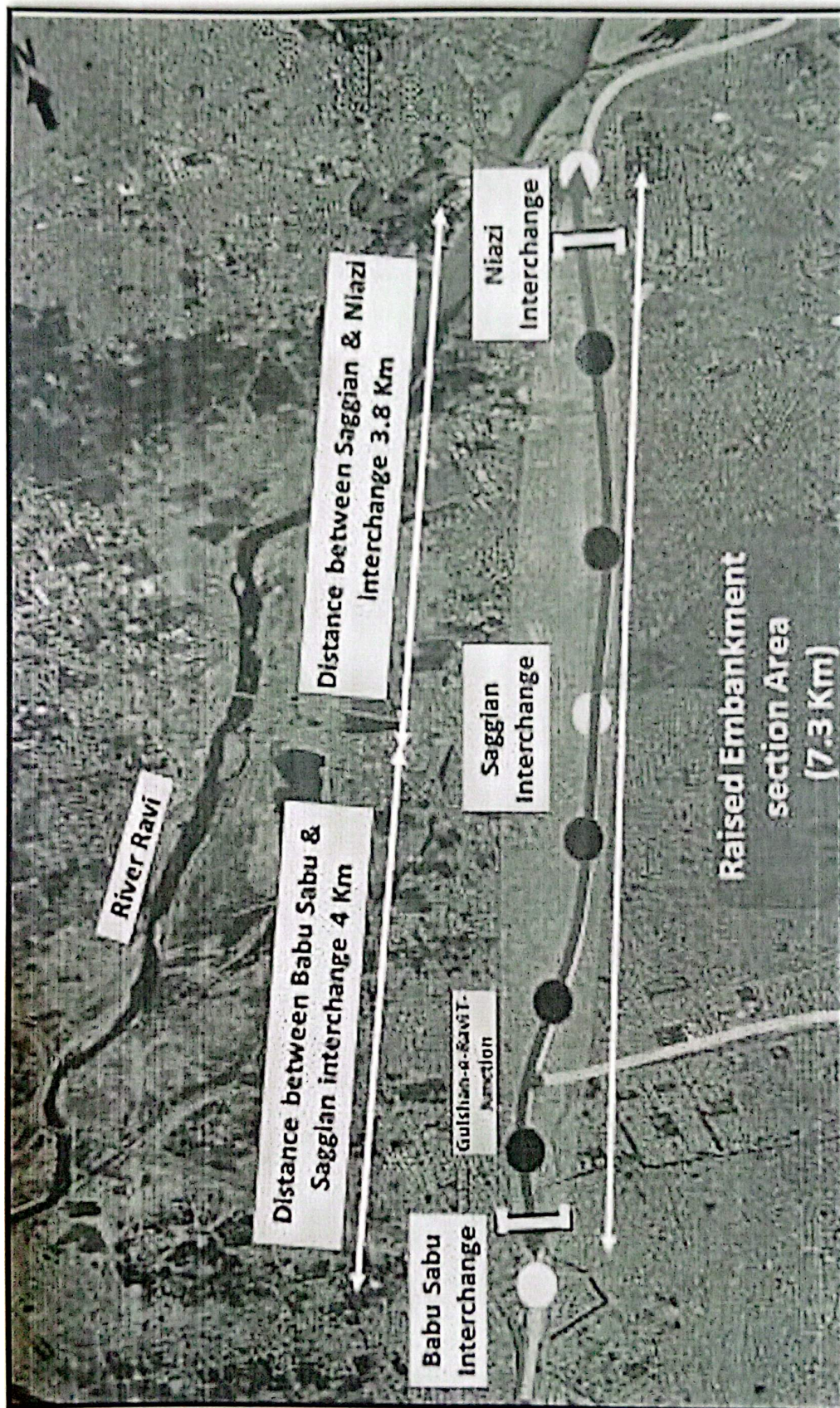


Figure 5-1: Map of Pakistan Locating Project Area



5.3 LAND USE ON THE SITE

A team of Consultant experts has visited the site to obtain basic information on the project area. The project would provide a significant reduction in the routine traffic jams on major roads of the city which will significantly improve environmental pollution with lesser vehicular emissions on the existing road network. The existing condition of the service road is poor as explained through photos of the site provided below



5.4 LAND ACQUISITION

The project includes the 4-lane dual carriageway with a Controlled Access Facility from Niazi Interchange to Babu Sabu Interchange with the provision of a crossing facility

through subways. Remodeling of the service road is also included to improve the cross-mobility of traffic. All these developments will take place on the existing road. Hence there will be no land acquired for the proposed project

5.5 ROAD ACCESS

The development of a proposed project will start from Niazi Interchange to Babu Sabu Interchange, Lahore.

5.6 VEGETATION FEATURES OF THE SITE

The proposed project aims to Remodel the service road and also includes the 4-lane dual carriageway with a Controlled Access Facility from Niazi Interchange to Babu Sabu Interchange with the provision of a crossing facility through subways. There will be no tree-cutting involved in the proposed project.

5.7 COST AND MAGNITUDE OF OPERATION

The project cost is Rs. 10,842,253,128 Million. The Project shall be funded by the Government of Punjab. The breakup of rough costs is given below;

Table 5-1: Project Cost Estimate Summary

Sr#	Description	Amount (Rs.)
1.	Earthwork and Allied Activities	291,923,413
2.	Subbase and Base	2,391,375,992
3.	Surface Courses & Pavement	630,225,214
4.	Structure (subways)	930,721,631
5.	Structures (Reinforced Earth Retaining Walls)	3,399,617,311
6.	Drainage & Erosion Works	1,264,685,509
7.	Ancillary Works	265,898,554
8.	General Items	-
9.	Electrical Works	145,166,667
10.	WASA(Nullah Cover Concrete Drain)	389,792,249
11.	Toll Plaza(P.S)	100,000,000
	Total Construction Cost =	9,809,406,540

12.	Contingencies @ 2% of Construction Cost	98,094,065
13.	Shifting of Services (LESCO, SNGPL & PTCL, etc/ Diversion of Traffic/ Energy Charges (P.S))	150,000,000
14.	Consultancy Charges for Design Services @ 1.0 % of Construction Cost	98,094,065
15.	Consultancy Charges for Construction Supervision Services @ 2% of Construction Cost (Man Month Basis)	196,188,131
16.	PST @ 5% of Construction Cost	490,470,327
17.	Total Project Cost =	10,842,253,128

5.8 SCHEDULE OF IMPLEMENTATION

The project will be completed in 6 months.

5.9 PROJECT DESCRIPTION

The primary concept of the Lahore Ring Road was to provide an intra-city High-speed access-controlled facility. At Bund Road/ Ring Road section from Niazi to Babu Sabu, high traffic volume is observed daily. To address the severance issue, U-turns along with Pedestrian Bridges were proposed due to locals' demand for cross accessibility. Non-usage of these pedestrian bridges results in trespassing of pedestrians ultimately leading to fatal accidents. The said section of Ring Road is uncontrolled access, therefore, could not serve the purpose of an urban expressway.

The remaining segment of Southern Loop is being taken up in parallel. Therefore, the facility under consideration is being designed to supplement the need for peripheral connectivity of the city for intra-city traffic.

The total length of this stretch is about 8km and is divided into three segments. The first two segments i.e., from Niazi Interchange to Saggian Interchange and Saggian to Gulshan-e-Ravi are part of Ring Road and carrying high traffic volume. These stretches have still sufficient traffic capacity but uncontrolled access, type of traffic, and frequent crossing of pedestrians result in frequent accidents. To improve the mobility of both vehicles and pedestrians this stretch shall be remodeled into a Controlled access facility. The third stretch, Gulshan-e-Ravi to Babu Sabu, is another Bottle Neck not only due to aforesaid issues but also the reduction in the lanes as well results in gridlocks especially during peak hours in this stretch. To improve the mobility of both vehicles and pedestrians

and mitigate traffic congestion at the last section and also delays at the Gulshan-e-Ravi Intersection this intervention is proposed.

5.9.1 Economic Justification

A major part of the economic benefits from the project implementation is expected to be in the form of VOC savings. The proposed project will help in reducing traffic jams/congestion. This will result in a reduction in Vehicle Operating Costs (VOC), Vehicle Travel Time (VTT) and at the same time alleviate noise and air pollution up to a certain extent. Annual vehicle operating costs have been worked out both without and with project conditions. A summary of VOC savings to the facility users is given below:

Table 5-2: VOC Savings (Million Rs.)

Years	Total VOC Savings
2024*	1480.41
2034	2129.79
2044	3004.77

The total Annual value of travel time (AVTT) is a function of VTT per km, ADT, and annual distance covered. Based on these parameters worked out earlier, annual AVTT has been estimated. The difference between AVTT without and with project conditions represents benefits on account of savings in travel time are summarized below:

Table 5-3: VTT Savings (Million Rs.)

Years	Total VTT Savings
2024*	233.63
2034	366.96
2044	577.31

Total project benefits are summarized as under

Table 5-4: Total Project Benefits (Million Rs.)

Years	Total Project Benefits
-------	------------------------

2024*	2117.24
2034	2994.33
2044	4173.82

Table 5-5: Results of the Analysis

Economic Indicators	At a 12% Discount Rate
Present Worth of Benefit (Million Rs)	18068.36
Present Worth of Costs (Million Rs)	9266.08
Net Present Value (Million Rs)	8802.29
B/C Ratio	1.95
EIRR (Percent)	24.44

The results given above indicate that the proposed road is economically viable as the calculated rate of return is well above 12 percent. The project should therefore be implemented as planned.

5.9.2 Sectoral Specific Information

The Geometric Design of the project is governed by prevalent standard codes for highway design. The Geometric design parameters are given below:

Four-Lane Dual Carriageway (Niazi Interchange to Babu Sabu Interchange)

Carriageway Width (0.0-5.5Km)	= 9.0 m
Carriageway Width (5.5-7.3Km)	= 9.0 m
No of Lanes	= 2(each side)

Subways

Width	= 25 m
Clearance Height	= 5.1 m

Pavement Structure

Asphaltic Wearing Course	= 5 cm
Asphaltic Base Course	= 09 cm
Water Bound Macadam	= 25 cm
Sub-base	= 20 cm
Subgrade CBR	8%

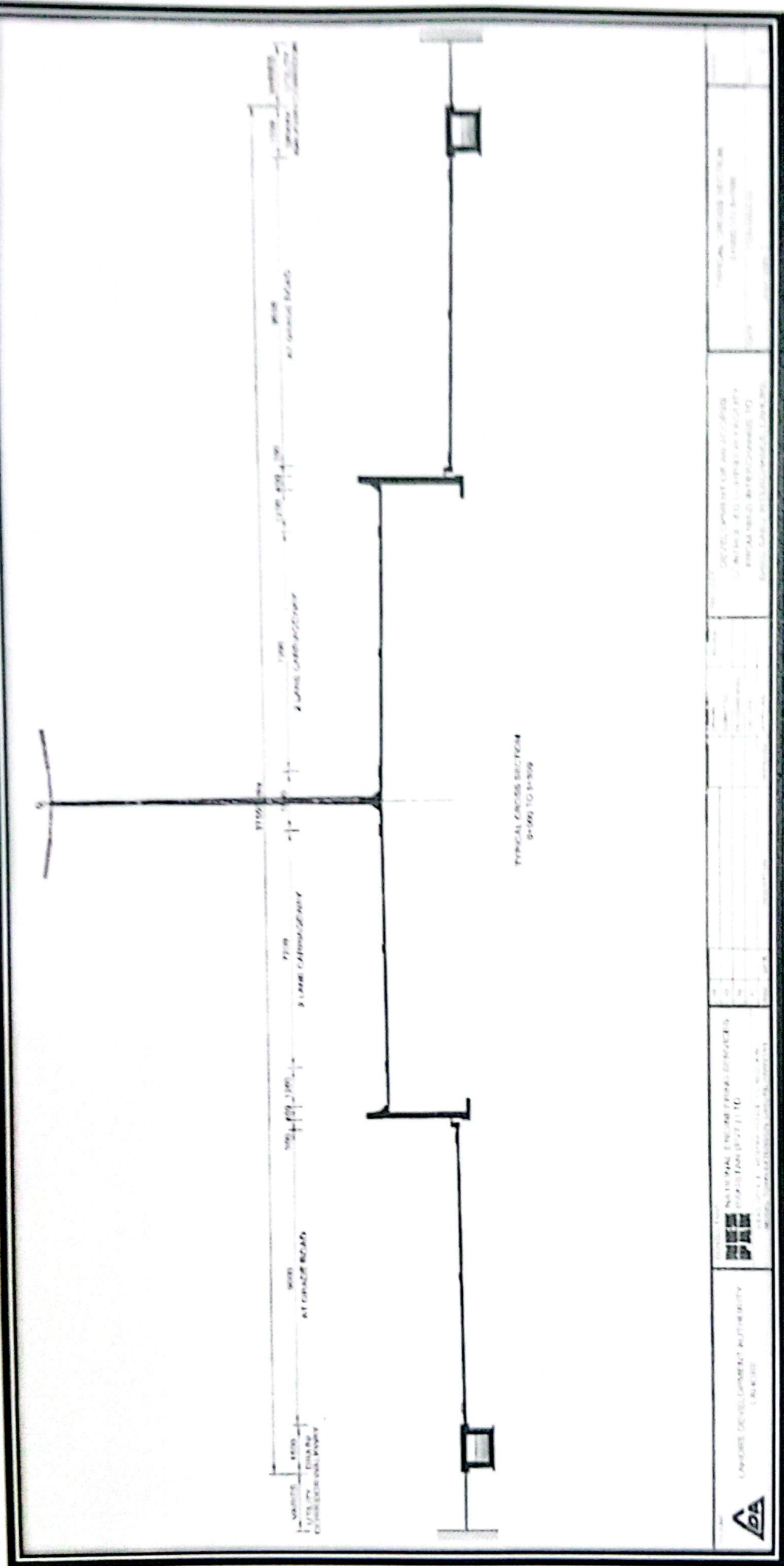
Pavement Structure (At-grade)

Asphaltic Wearing Course	= 5 cm
Water Asphaltic Base Course	= 12 cm
Bound Macadam	= 25 cm
Sub-base	= 20 cm
Subgrade CBR	8%

5.9.3 Typical Road Cross Section

The Cross Section of the proposed route is given below.

ment of a Controlled Access Corridor Facility from Niuu Interchange to Dunn Town Interchange



5.9.4 Construction Camp

Campsites will be selected keeping in view the availability of adequate areas for establishing campsites, asphalt, and batching plant site, including parking areas for machinery, stores, and workshops, access to local markets, and an appropriate distance from sensitive areas in the vicinity. The area requirement for construction camps will depend upon the deployed manpower and the type and quantity of machinery mobilized. Because of the area required, the contractors will have to acquire land on lease from private landowners, unless the appropriate area would not be possible to locate campsites within the ROW. Keeping in view the following criteria guidelines, the Contractor has to identify the construction camp sites before the start of the construction activities

- ❖ There should be no resettlement issue for the location of the camps;
- ❖ The campsite should be away from residential areas and sensitive receptors;
- ❖ Selection of sites for construction camps shall be near the project area having proper access to the nearby main link road;
- ❖ The camps must be located in a place where the drainage from and through the camps will not threaten any domestic or public water supply;
- ❖ Campsite must be adequate in size to prevent overcrowding of necessary structures;
- ❖ The campsite should consider avoiding any damage to property, vegetation, irrigation, and drinking water supply systems;
- ❖ The campsite must not be subject to periodic flooding; and
- ❖ There should not be any ecologically sensitive areas e.g. wildlife sanctuaries, game reserves, national parks, forest areas, etc. near the construction camp.
- ❖ Detail of the camp establishment and its management is attached in the annexure

5.9.5 Construction Equipment

The List of Machinery and Equipment required for the proposed project is provided in

Table 5-6.

Table 8-6: Machinery and Equipment Required for Project

Sr. No.	Machinery & Equipment
1.	Dump Truck
2.	Front End Loader
3.	Dozer
4.	Grader
5.	Vibratory Roller
6.	Water Tanker
7.	Aggregate Spreader
8.	Three Wheel Rollers
9.	Asphalt Plant
10.	Paver
11.	Asphalt Distributor
12.	Batching Plant
13.	Concrete Transit Truck
14.	Concrete Pump
15.	Excavator
16.	Water Pump
17.	Cranes
18.	Vibrator
19.	Generator
20.	Concrete Mixer

5.9.6 Management Structure and Manpower Requirements

Table 5-7: Management Structure for the Project

Job Description	No of
Manager Admin	1
Office engineer	1
Soil Engineers	6
Design Engineer	2
Civil Engineers	6
Electrical Engineer	1
Mechanical Engineer	1
Drainage Engineer	1
Horticulture Specialist	1
Contract Specialist	1
Surveyors	10
Skilled	200
Unskilled	300

5.9.7 Machinery Maintenance and Equipment Yards

Machinery and equipment yards will be sited near work camps. The yard will have enough storage and haulage space with ample moving and working space. The yard will be walled and will have a gate provided with ample security staff the work base machinery and equipment yard will be provided. The yard will have enough storage and haulage space with ample moving and working space. The yard will be walled and will have a gate provided with ample security staff.

5.9.8 Material Depots

Near work bases material depots will be required for storing construction materials. They will include temporary sheds for storing cement, steel, and asphalt and open space for storing stones, shingles, and bricks. The material depots will be walled and the gate will be provided with ample security. A storekeeper will keep account of incoming and outgoing material.

5.9.9 Machinery Repair Workshops

With a large number of vehicles and other similar machinery, a repair workshop is essential. The contractor may establish their workshop.

5.9.10 Approach to Work Bases

Since work bases will be established close to the road sections under can provide easy access to them. Public or private land (with the consent of the owner and/or locals) can be used for providing supplementary access roads and paths to work bases.

5.9.11 Camp Offices

Adjacent to labor camps and to work bases, the contractor will be allowed to set up a camp office to run his day-to-day field affairs. For that, the public or private land can be used by the contractor.

5.9.12 Security Arrangements

Given the prevailing field condition, security staff is necessary. Enough security will be required at the Work Base, Labor Camp, Material Store, Equipment Yards, and location of the work in progress on the work site. Coordination will be necessary with nearby law enforcement agencies.

5.9.13 Health Care

With a large number of laborers and employees working on the project of road construction, minor accidents are expected to take place on all construction sites. A dispensary will be set up by the contractor. For major cases, the patients will be shifted to the District Hospital under a pre-coordinated arrangement.

5.9.14 Labor Reporting Office

Along the road and in work bases special areas will be marked where the labor can gather at the time of pick and drop, emergency, or briefing. Those places will be marked and kept open and clean and as per requirement equipped with a public address system.

5.9.15 Labor Transport

Almost all of the unskilled labor will be employed from local sources. A contractor will provide vehicle(s), to pick up and drop local labor every day. This will also keep the camps less pressurized and more manageable

5.9.16 Work Uniform and Health Safety Equipment

Road construction is a special job and the labor working on such work requires special protective uniforms and special HSE measures. It will be ensured that the labor engaged in breaking stones, handling bricks, mixing concrete, or mixing and laying asphalt will have long boots, overall dresses, goggles, gloves, ear mufflers, Safety Jackets, safety hats, etc. As an overall HSE measure, all construction workers and anyone going into the construction area will use the necessary PPEs.

5.9.17 Signage

During construction suitable signboards and traffic signs will be displayed on the construction site in particular and on the entire road length in general. This will help in forestalling any possible accidents.

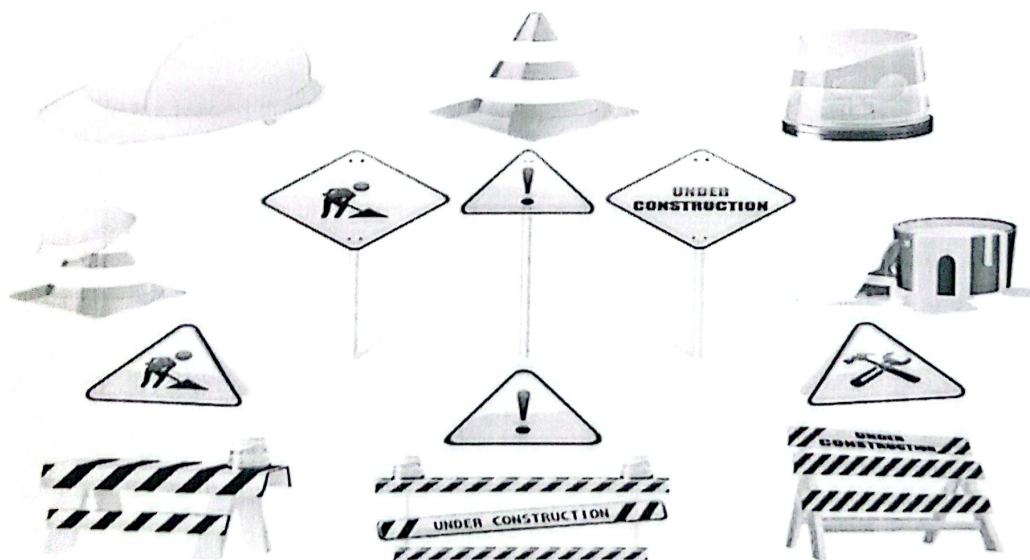


Figure – 8 1: Road Safety Signs

5.9.18 Lighting and Illumination

Suitable lighting arrangements will be made by the contractor over all work base, work sites, camp site, machinery yard, and material depots. This can help the contractor with extended working hours as well as security. If a local electric supply is not available, electricity generators will have to be arranged in all spots where lighting is required.

5.9.19 Environmental Training

Capacity building can be achieved through on-the-job training, short-courses, training workshops, lectures, educational visits, and seminars. Such interactions include leading team members of LDA, EPA, consultants, construction managers/supervisors, and other related agencies on road-related environmental issues.

5.9.20 Awareness Raising

Awareness about roads related current and potential environmental threats for the public at large and roadside dwellers, in particular, requires due attention; the aspect neglected in the past. Enhanced education in road-related environmental issues and awareness raising can be achieved through campaigns by; Visual graphics, Print media, Seminars & workshops.

5.10 TRAFFIC ANALYSIS

The main objective of Traffic Studies is to assess the volumes and composition of traffic load likely to use the proposed controlled access facility and to assess the benefit and travel time saving achieved due to the proposed improvement at the segment from Niazi to Babu Sabu. This intervention will not only facilitate the traffic but also resolve the pedestrian severance issue with the provision of subways without hampering the free flow of traffic. This will result in a significant reduction in accidents but also implement the true spirit of the Lahore Ring Road facility.

5.10.1 Scope of the project

The project aims is remodeling of existing Bund Road section from Niazi Interchange to Babu Sabu Interchange into a Controlled Access Facility. This will enhance the quality of the road and alleviate traffic issues.

5.10.2 Traffic Volume on Project Road

In order to assess the traffic volumes on the project road, a traffic counting survey was carried out on the existing road. Table 5.8 shows the daily classified Traffic and PCUs

at the Gulshan Ravi Main boulevard intersection at Band Road. Table 5.9 shows Peak Hour traffic and PCUs at the Gulshan Ravi Main Boulevard intersection at Band Road

5.10.3 Capacity Analysis

Passenger Car Units (PCUs)

The capacity of the road was analyzed using Highway Capacity Software (HCS) for present traffic volumes. Based on the traffic count, daily classified traffic volume and PCUs on the intersection observed are given in Table 5.4. Peak Hour traffic volume on the intersection is also given in table 5.5 The table also shows Peak hour PCUs.

Table 5-8: Daily classified Traffic and PCUs at Gulshan Ravi Main boulevard intersection at Band Road

From	To	M O T O R I Z E D												Total Vehicles	Total PCUs
		Motor Cycle / Scooter	Rickshaw / M. Cycle Rickshaw	Car/Taxi/ Suzuki Pickup	Hiace Wagon	Medium Bus/ Fyl. Coach	Bus Public Bus	Loader Pick-Up	Truck 2-Axle	Truck 3-Axle	Truck 4-Axle	Truck 5-Axle & Above	Tractor With Trolley		
Saggian Bridge	Gulshan Ravi	13,394	2,385	7,218	109	330	244	0	67	0	0	0	0	23,747	17,460
	Babu Sabu	21,918	12,110	23,987	584	184	655	0	3,072	453	180	183	41	63,367	59,388
Total From Saggian Bridge		35,312	14,495	31,205	693	514	899	0	3,139	453	180	183	41	87,114	76,848
Main Boulevard Gulshan Ravi	Babu Sabu	2,095	2,368	4,405	127	47	42	0	116	0	0	0	0	9,200	7,987
	Saggian Bridge	25,411	3,905	7,914	0	99	393	0	281	70	6	85	0	38,164	26,342
Total From Main Boulevard Gulshan Ravi		27,506	6,273	12,319	127	146	435	0	397	70	6	85	0	47,364	34,329
Babu Sabu	Saggian Bridge	17,781	5,218	16,242	294	329	400	0	1,867	153	139	173	50	42,646	38,803
	Gulshan Ravi	5,068	2,299	8,448	149	0	108	0	557	188	115	0	0	16,932	15,949
Total From Babu Sabu		22,849	7,517	24,690	443	329	508	0	2,424	341	254	173	50	59,578	54,752
Total Intersection Traffic		85,667	28,285	68,214	1,263	989	1,842	0	5,960	864	440	441	91	194,056	165,929

Table 5-9: Peak Hour traffic and PCUs at Gulshan Ravi Main Boulevard intersection at Band Road

From	To	MOTORIZED											Total Vehicles	Total PCUS
		Motor Cycle / Scooter	Rickshaw / M. Cycle	Car/Taxi / Suzuki Pickup	Hiaace Wagon	Medium Bus / Fyl. Coach	Bus Public	Loader Pick-Up	Truck 2-Axle	Truck 3-Axle	Truck 4-Axle	Truck 5-Axle & Above	Tractor With Trolley	
Saggian Bridge	Gulshan Ravi	480	159	382	7	6	10	8	26	5	3	3	1	1,088
	Babu Sabu	1,659	549	1,320	25	19	36	26	89	17	9	9	2	3,759
Total From Saggian Bridge		2,139	708	1,702	32	25	46	34	115	21	11	11	2	4,847
Main Boulevard Gulshan Ravi	Babu Sabu	182	60	145	3	2	4	3	10	2	1	1	0	412
	Saggian Bridge	712	236	567	11	8	15	11	38	7	4	4	1	1,614
Total From Main Boulevard Gulshan Ravi		894	296	711	13	10	19	14	48	9	5	5	1	2,026
Babu Sabu	Saggian Bridge	845	280	672	13	10	18	13	45	8	4	4	1	1,914
	Gulshan Ravi	335	111	267	5	4	7	5	18	3	2	2	0	760
Total From Babu Sabu		1,180	391	939	18	14	25	19	63	12	6	6	1	2,673
Total Intersection Traffic		4,212	1,395	3,353	63	49	91	67	226	42	22	22	5	9,546
														8,098

Development of a Controlled Access Corridor Facility from Niaz Interchange To Babu Sabu Interchange, Lahore

2031	0	0	0	49,280	1,036	605	1,245	6,226	764	402	449	115	60,122
2032	0	0	0	50,273	1,054	616	1,266	6,375	782	412	459	117	61,353
2033	0	0	0	51,263	1,071	626	1,287	6,525	801	421	470	120	62,584
2034	0	0	0	52,252	1,089	636	1,308	6,676	819	431	481	123	63,815
2035	0	0	0	53,238	1,106	646	1,329	6,829	838	441	492	126	65,045
2036	0	0	0	54,223	1,123	656	1,350	6,983	857	451	503	129	66,275
2037	0	0	0	55,207	1,141	667	1,371	7,138	876	461	514	132	67,505
2038	0	0	0	56,189	1,158	677	1,392	7,294	895	471	526	134	68,735
2039	0	0	0	57,169	1,175	687	1,412	7,452	914	481	537	137	69,965
2040	0	0	0	58,148	1,193	697	1,433	7,611	934	492	549	140	71,196
2041	0	0	0	59,125	1,210	707	1,454	7,771	953	502	560	143	72,426
2042	0	0	0	60,101	1,227	717	1,475	7,933	973	512	572	146	73,657
2043	0	0	0	61,094	1,245	727	1,496	8,098	994	523	584	149	74,909
2044	0	0	0	62,102	1,263	738	1,517	8,266	1,014	534	596	152	76,183
2045	0	0	0	63,128	1,281	748	1,539	8,438	1,035	545	608	155	77,478
2046	0	0	0	64,170	1,299	759	1,561	8,613	1,057	556	621	159	78,795
2047	0	0	0	65,229	1,318	770	1,584	8,792	1,079	568	634	162	80,136

Table 5-11: Capacity Analysis Results

Sr #	DESCRIPTION OF FACILITY	Level of Service
1	Controlled Access Facility	C
2	At Grade Facility	C

5.11 RESTORATION/REHABILITATION AT THE END OF PROJECT LIFE

There will be no matter of rehabilitation as the proposed project is already road. There will not be any let regarding safety factors as applicable from time to time for such projects on all accounts. However, at the end of the life of the road it will be duly dismantled with special precautions to avoid/minimize pollution and at the same time take all safety precautions to protect human life and property around the project site.

Debris or any other wastes resulting from demolishing will be disposed of in an environmentally sustainable fashion. The materials capable of recycling/reuse will be either sold in the market or to be reused for other suitable purposes.

After completion; all construction matrix, debris, and garbage will be removed immediately from the site within the minimum possible time under safe conditions. Any minor spillover of these materials will be cleared adequately. The land, if and where pitted will be adequately leveled. On the whole, the project site and the area in its near vicinity will be made neat and clean. This guideline discusses factors influencing successful site rehabilitation and restoration of disturbed areas.

5.11.1 Site Rehabilitation

Site rehabilitation should ensure that all disturbed areas caused by construction and maintenance activities are restored, leaving a stable environment that is conducive to the establishment of landscapes characteristic to the area.

5.11.2 Rehabilitation Hierarchy

In developing the rehabilitation objectives, indicators, and completion criteria for the borrow pits and access roads, the following hierarchy has been used to prevent or minimize environmental harm:

- ✚ Avoid disturbance that will require rehabilitation
- ✚ Reinstate land to pre-disturbance condition as closely as reasonable and feasible, to facilitate pre-disturbance land use, or otherwise as agreed with the landholder
- ✚ Propose lower-value land use as required and as agreed with the landholder.

5.11.3 Rehabilitation Objectives

The objectives of this rehabilitation strategy are to:

- ✚ Ensure a final landform is produced that is safe, stable, and non-polluting, as well as free draining and compatible with the post construction phase land use
- ✚ Ensure topsoil and subsoil are managed to conserve the seedbank, nutrients, and to encourage the establishment of proposed revegetation
- ✚ Ensure that disturbed areas are to be rehabilitated as close as reasonably practicable to their pre-disturbance condition or otherwise as agreed with the landholder
- ✚ Ensure that rehabilitation works comply with and are undertaken as per relevant regulatory requirements
- ✚ Establish a set of indicators and a rehabilitation monitoring program to ensure successful rehabilitation
- ✚ Establish agreed criteria where rehabilitation is deemed successful by relevant authorities and key stakeholders

5.11.4 Restoration

Restoration aims to get a seed mix that will provide an initial protective canopy cover using short-lived annual grasses backed up by grass species that are likely to be durable and persistent. It is an important component since vegetation acts to reduce dust and wind erosion, suppress weed infestations and provide protection to exposed surfaces from raindrop impacts and erosion processes.

5.11.5 Monitoring

To achieve continuous improvement and ensure the activities specified in contracts are being adhered to, regular monitoring should be undertaken with emphasis placed on the continuity between site characteristics and the adjacent landscapes.

5.11.6 Rehabilitation of Affected Areas

Rehabilitation should be done in accordance with the site's Environmental Management Plan (Construction and Maintenance). There are many areas affected by road construction

6.0 DESCRIPTION OF ENVIRONMENT

This chapter describes the baseline conditions, which cover the existing physical, ecological, and socio-economic environment of the Study Area. Information on these aspects has been derived from the desk study of available data, field visits to the project area as well as information obtained through visits to the Government departments and other agencies namely the Health Department, Irrigation Department, Meteorological Department, Forest offices, and prevailing environmental laws and environmental quality standards etc.

6.1 STUDY AREA

For an EIA study, it is imperative to delineate the area where the potentially significant impacts of the proposed Project are envisaged. The Study Area is the area within which the potentially significant adverse environmental and social impacts of the proposed intervention are envisaged. In light of this, potential impacts on the existing environment have to be considered in a larger geographical area than the proposed "Project Area" depending upon the extent of direct/indirect impacts.

In the criteria, critical parameters of physical (wind direction and speed, topography), ecological, and social (location of settlements, other receptors, and existing land use resources) domains of the environment for the proposed Project have been considered. Study Area includes the actual proposed Project boundary or the area which is considered to be acquired for the Project, as well as the area in the surroundings in which potential adverse impacts may be foreseen due to the implementation of the proposed Project like the location of construction camp, residential and nonresidential buildings, workshops, etc.

6.2 PHYSICAL RESOURCES

6.2.1 Topography

The topography of the project area is flat. The General height of the area is approximately 220 meters above the Mean Sea Level (MSL). The district of Lahore is divided into two parts. The low-lying alluvial soil is along the Ravi River and the upland in the east. Upland is a plain slope from northeast to southwest. The lowlands are generally inundated during the monsoon season by the Ravi River, flowing in the west of the district along its boundary with district Sheikhupura. Figure 6.1 represents the topography of the area.



Figure 6-1 Topographic Map of the Study Area

6.2.2 Soil

The soil is different and generally inclined to be dry. However, it is rich in potential plant nutrients. Rainfall is low and groundwater is saline and brackish at the shallow depth and irrigation is largely dependent on the canals. The chemical quality of groundwater in the district varies with depth. However, the sweet potable water is available in a belt five to twenty miles wide paralleling the Ravi River.

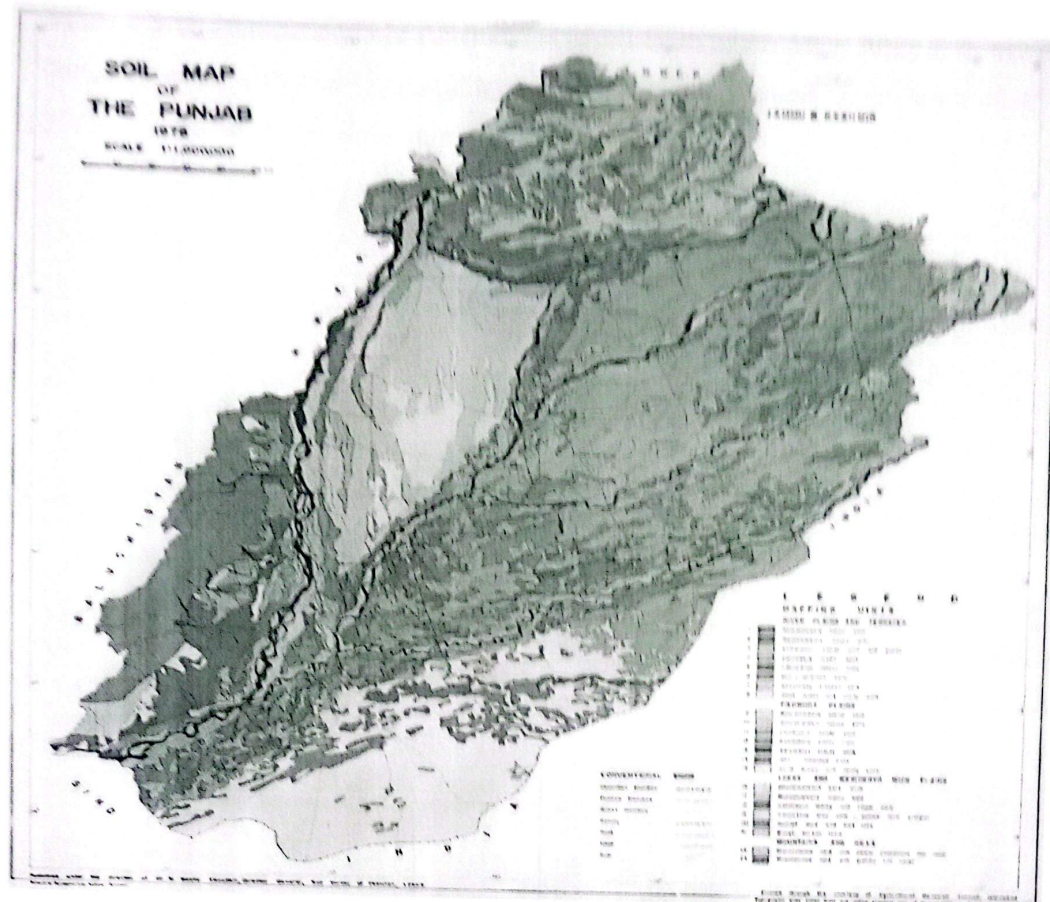


Figure 6-2: Soil Map of Punjab

Alluvium is soil or sediments deposited by a river or other running water. The alluvium is typically made up of a variety of materials, including fine particles of silt and clay and larger particles of sand and gravel. A river is continually picking up and dropping solid particles of rock and soil from its bed throughout its length. Where the river flow is fast, more particles are picked up than dropped. Where the river flow is slow, more particles are dropped than picked up. Areas, where more particles are dropped, are called alluvial or floodplains, and the dropped particles are called alluvium.

6.2.3 Climate and Meteorology

Seasonal climatic conditions must be considered for the design and execution of the Project. The climate including air, temperature, precipitation, humidity, and evaporation is an influencing factor, affecting the construction of the plant and other engineering structures. However, to determine the overall effect of the climatic stresses, daily and seasonal temperature changes, site altitude, direct solar radiation, and precipitation must be considered. The Project Area has an extreme climate: it has hot summers and cold

winters. The summer starts in April and lasts till September. May, June, and July are the hottest months. The mean maximum and minimum temperature ranges from 40.4 °C and 27.3 °C respectively for these months.

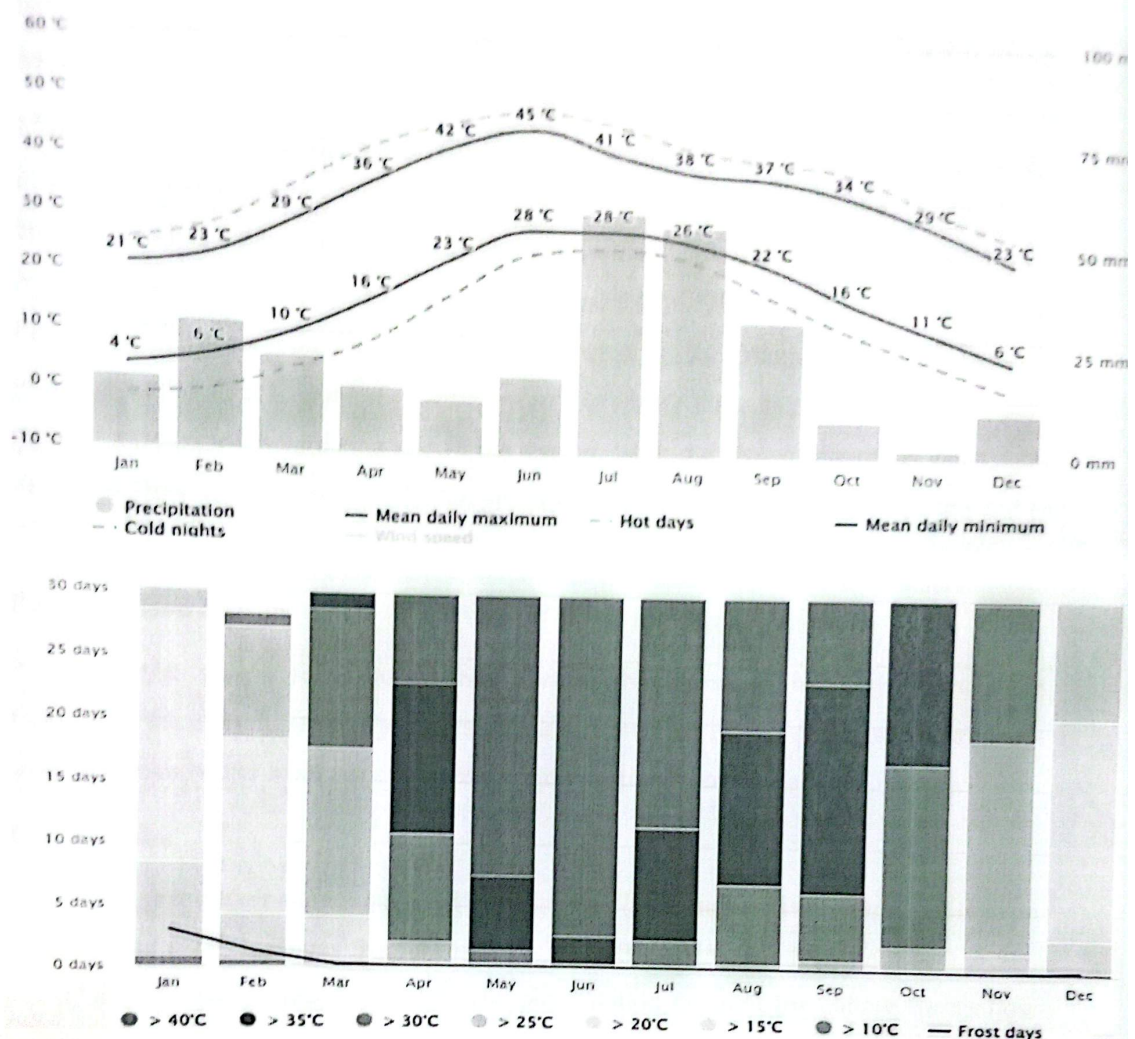


Figure 6-3 Temperature profile of Lahore¹

The winter season lasts from November to March. December, January, and February are the coldest months. The mean maximum and mean minimum temperature ranges from 19.8°C to 5.9°C in January. Temperatures in the Project Area vary from 5.9 °C to 40.4 °C.

6.2.3.1 Pre-Monsoon Season

¹ https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/lahore_pakistan_1172451

Pre-monsoon refers to the period from April to June before the setting in of the monsoon. This is the hottest and the driest season, with persistent dry and hot winds. The daytime temperature rises to 40° C. The flows in the river begin to rise simultaneously due to snow-melt water in the high mountains. The water table falls to the maximum depth

2.3.2 Monsoon Season

Monsoon is the main rainy period, which starts at the beginning of July, reaches its climax in August, and gradually, subsides in September. High-intensity Rainfall causes soil erosion which is a function of erosivity and erodibility. The cool monsoon winds followed by heavy showers lower the temperature to a great extent. The part of rain percolates into the soil and is conserved in the subsoil and the part adds to the groundwater. The conserved moisture in the soils is generally sufficient to rejuvenate the vegetation. All plants grow rapidly and mature towards the end of the season. With the start of the monsoon season, the rivers flow at their peak level. The groundwater level is improved toward the end of the season in September and October.

2.3.3 Post-Monsoon Season

Post-monsoon season refers to autumn (October-November). The temperature starts falling but the extreme aridity prevents plants to flower early and sets seed toward mid-season. Groundwater level rises as a result of infiltration from rainfall.

2.3.4 Precipitation

In Lahore, precipitation amounts to 630 millimeters (24.8 inches) per year: so, it is at an intermediate level. It ranges from 4 mm (0.2 in) in the driest month (November) to 200 mm (7.9 in) in the wettest one (July). The precipitation diagram for Lahore shows how many days per month, certain precipitation amounts are reached. In tropical and monsoon climates, the amounts may be underestimated

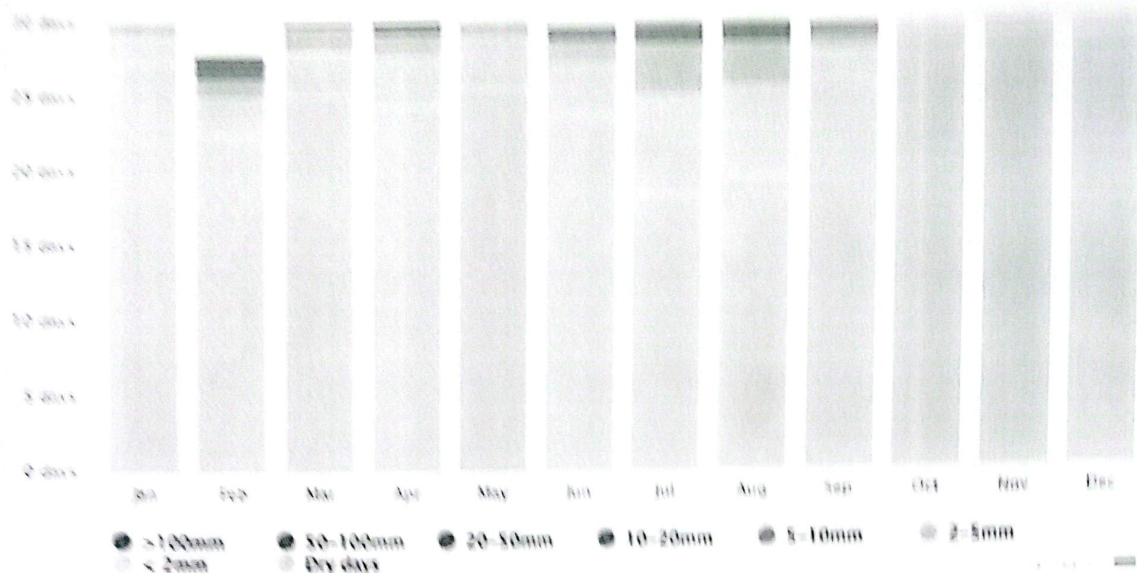


Figure 6-4 Precipitation Amount of Lahore

6.2.3.5 Winter Season

Winter refers to the period from December to January. The lowest temperatures ($< 20^{\circ}\text{C}$) and cold winds characterize this season. The plants become dormant and most of them dry out. Most of the trees shed their leaves and few remain green or partly green. Sometimes this season becomes severe due to cold Siberian winds. Groundwater level declines in this season due to low flows in the rivers and no or little rains which usually fall in light showers causing little soil erosion.

6.2.3.6 Spring Season

Spring refers to the period from February to March. Temperatures become pleasant. The mean maximum temperature is 27°C with the highest precipitation of 41.2 mm and relative humidity of 57.6 percent. Some light showers of rain may also fall without generating runoff. The vegetation sprouts again because of conserved moisture from winter and spring rains, if any. The water table starts falling

In winter (November-February) the predominant direction is West and North West, in summer (March-June) the predominant direction is South-East while in Monsoon/ summer season (July-October) the predominant direction is South East. A seasonal-wise wind rose indicating wind direction and speed is shown in the following Figures

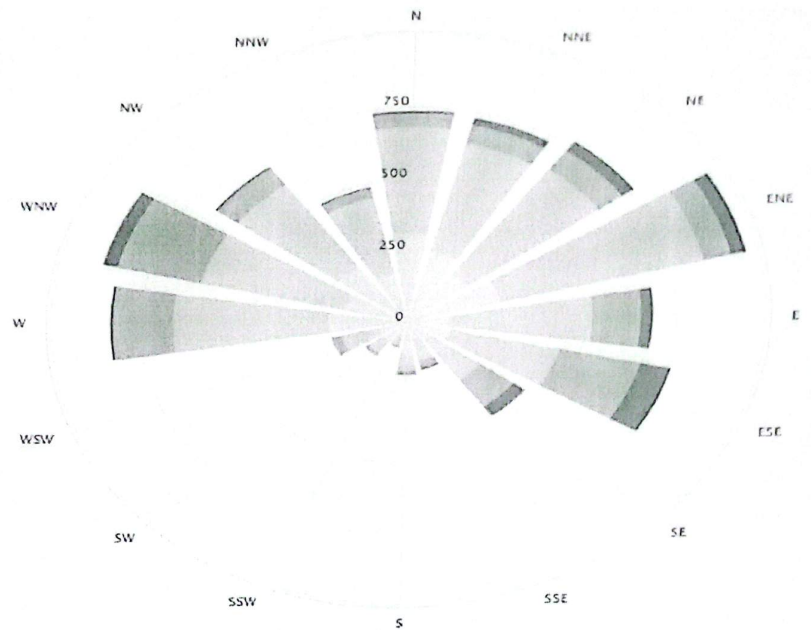


Figure 6-5 Average Wind Rose for Lahore²

6.2.3.7 Solar Elevation

Solar elevation over the year 2022, is shown in the figure. The black lines are lines of constant solar elevation (the angle of the sun above the horizon, in degrees). The background color fills indicate the azimuth (the compass bearing) of the sun. The lightly tinted areas at the boundaries of the cardinal compass points indicate the implied intermediate directions (northeast, southeast, southwest, and northwest).

² https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/lahore_pakistan_1172451

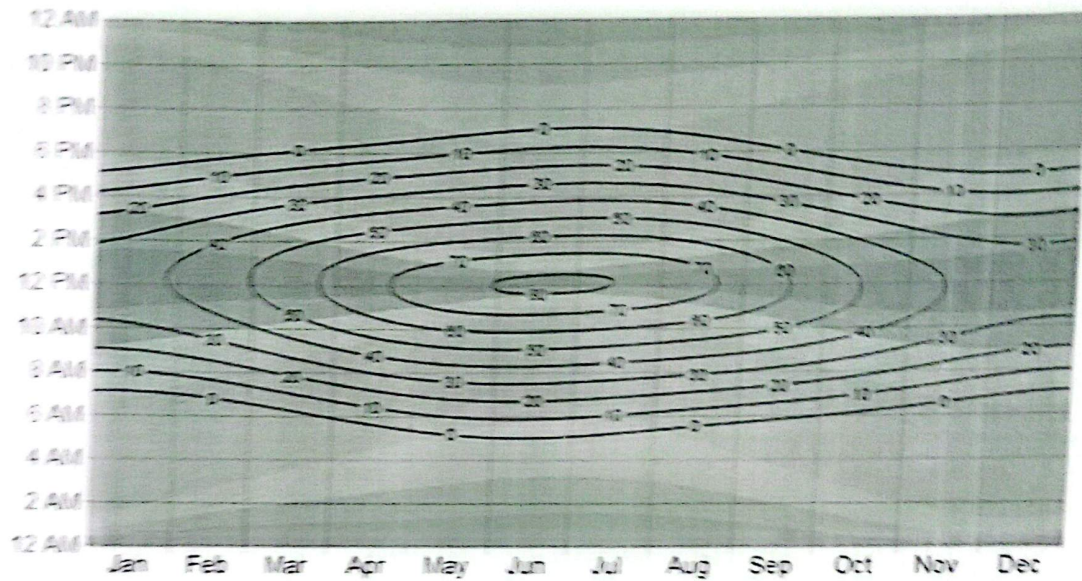


Figure 6-6 Solar Elevation Profile of Lahore

6.2.4 Surface Water & Ground Water

Hydrology

The Lahore division is a part of the Punjab Province of Pakistan. Geologically, this area is a part of the lower Indus Basin. The name "Punjab" itself is indicative of the healthy presence and importance of rivers in this area. The word "Punjab" comes from 'Punj-aab' meaning five rivers. The five rivers of Punjab were Sutlej, Bias, Ravi, Jhelum, and Chenab Rivers. It is to be noted here that the Bias River has discontinued flowing in Pakistan, as discussed later. This blessing has resulted in cultivation on the mast part of the land in Punjab.

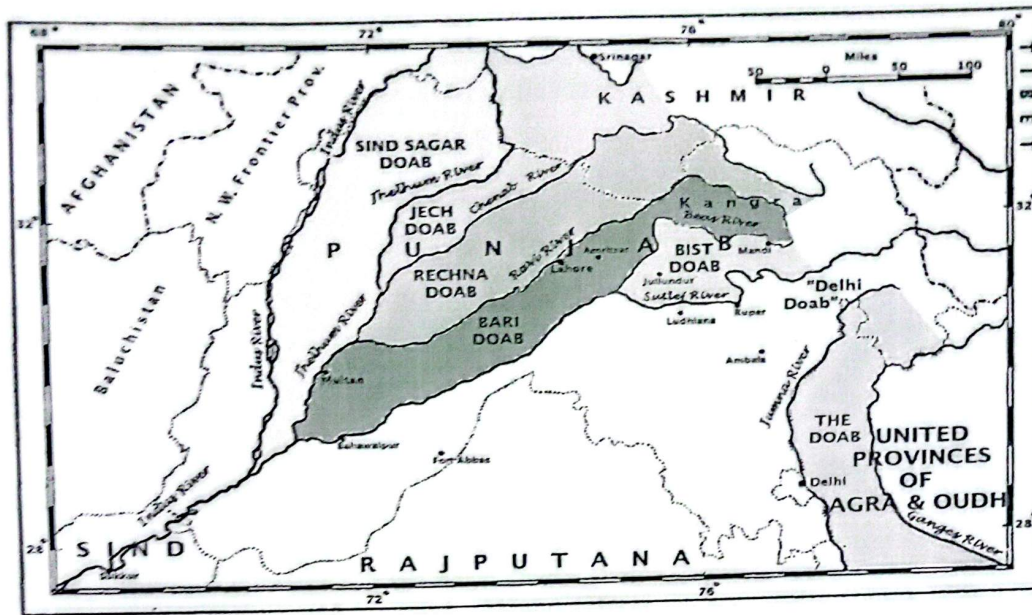


Figure 6-7 Watershed of Punjab

The only river that passes from Lahore is the Ravi River. The slope of the land in the planned area is to the southwest, which directs the rivers to flow in this path. The average slope of the area is 0.32m/km. Ravi has a major contribution to the glorious history of the study area. All the "historical assets" of Lahore, including but not limited to Lahore Fort, Badshahi Mosque, and Kamran ki Baradari, were built adjacent to the Ravi River.

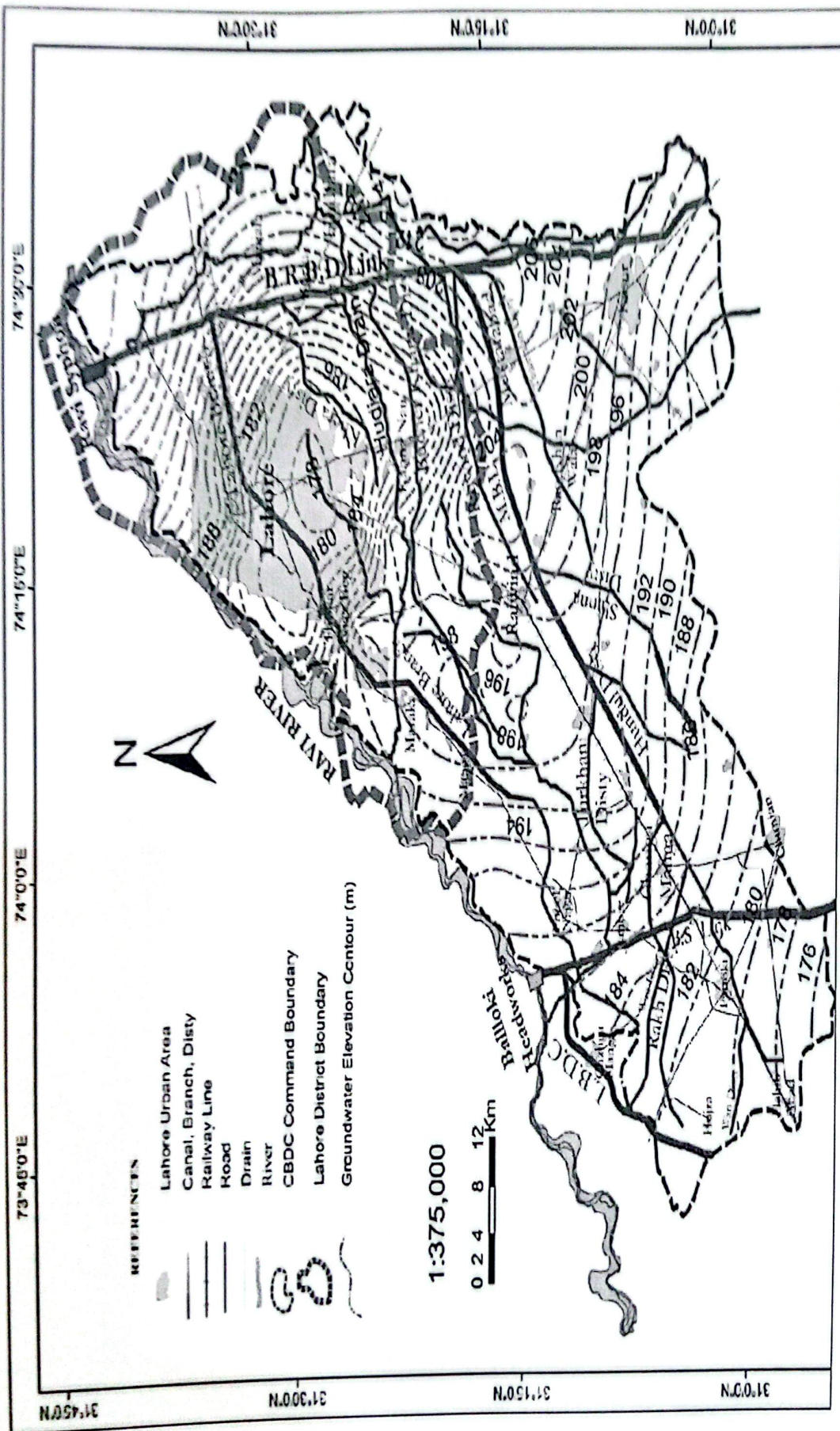
As per the Indus basin treaty of 1960, six major rivers were divided between Pakistan and India. As per the treaty, the rights of Eastern Rivers (Sutlej, Bias, and Ravi) were allocated to India, while the rights of Western Rivers (Chenab, Jehlum, and Indus) were reserved with Pakistan. Since the Indus Basin treaty, India has completed a series of structures to store and divert water from upstream and use it for the generation of electricity and irrigation. These interventions have put a stop to ecological and sustainable flows in these rivers, thereby depriving the downstream areas of Pakistan, including Lahore of naturally available water for irrigation. The Ravi allocated to India, still flows seasonally through the study area while the Bias River has discontinued flowing. Furthermore, the planned area has an abundance of water in the form of a groundwater aquifer. The aquifer of Lahore District is broadly viewed as a single contiguous, unconfined aquifer. The presence of alluvial soil, frequent flooding, and excessive rains in this region for hundreds of years have enriched this aquifer with an abundance of water.

Surface Water

No rivers exist in the vicinity; however, stormwater drains cross the route for disposal into the Ravi River. Water from River Ravi, flowing on the northwestern side of the city of Lahore, is being used for other purposes other than drinking purposes. River Ravi receives almost all the municipal/ industrial wastes from the city of Lahore. The potential value as a recreational water body and breeding place for fish is threatened by municipal and industrial pollution.

Groundwater

Groundwater quality is fresh (defined as acceptable in terms of its salinity). Raw water abstracted from the deep tube wells is believed to be essentially bacteria-free. The status of the quality of groundwater both in the country and Punjab Province is shown in the figure. The water quality in the upper 50 meters zone of the subsoil is generally brackish. For the city's drinking purposes water is abstracted from the groundwater aquifer using tube wells located throughout the city. The quality of water is generally adequate for direct consumption. About 83% of the city population is consuming groundwater for drinking purposes. Groundwater is available at a depth ranging between 15 to 23m below the natural surface level. According to Master Plan-2030 for the city of Lahore, the mean average decline in groundwater is about 2.03 feet per year. The water table contour map for the Year-2000 is exhibited in Figure 6.9. It is noted from the exhibit that groundwater is at a greater depth in the central part of the city where abstraction is more than the recharge and close to surface waters i.e. Ravi River and Canal, the situation is in the reverse order.



6.2.5 Geology

The geological history of Lahore along with that of the Punjab is linked with the uplift of the Himalayas in the Tertiary times, where a subsiding through a fore deep was formed adjoining the mountains. The alluvium mostly derived from the Himalayan ranges has been deposited in the Punjab geosynclines by the present and the ancestral tributaries of the Indus river system. The exposed Lahore alluvial complex of Pleistocene and recent age represents the latest phase of sedimentation and subsidence. Nearly all the deposits underlying the city of Lahore and the surrounding area are the products of events that evolved during the Pleistocene and recent geological times. The study of logs of boreholes and tube wells conducted in and around Lahore shows that the alluvium consists principally of fine to medium sand, silt, and clay. Associated with the fine-grained strata are concretionary zones of nodules of Kankar and silty clay, occasionally containing beds of reddish and ferruginous material. Drilling data obtained from several deep wells shows the absence of thick horizons of clay within the alluvium. Clay lenses occur only locally and have little horizontal continuity. In 1961 bedrock (mica schist) was struck at 1,274 feet depth near Niaz Beg (Table 1) after which the drilling was abandoned by Water and Power Development Authority (WAPDA). In subsequent years drilling operations in and around Lahore did not exceed 800 feet in depth. At present our knowledge of the deep geological formations underlying beneath the city of Lahore is incomplete.

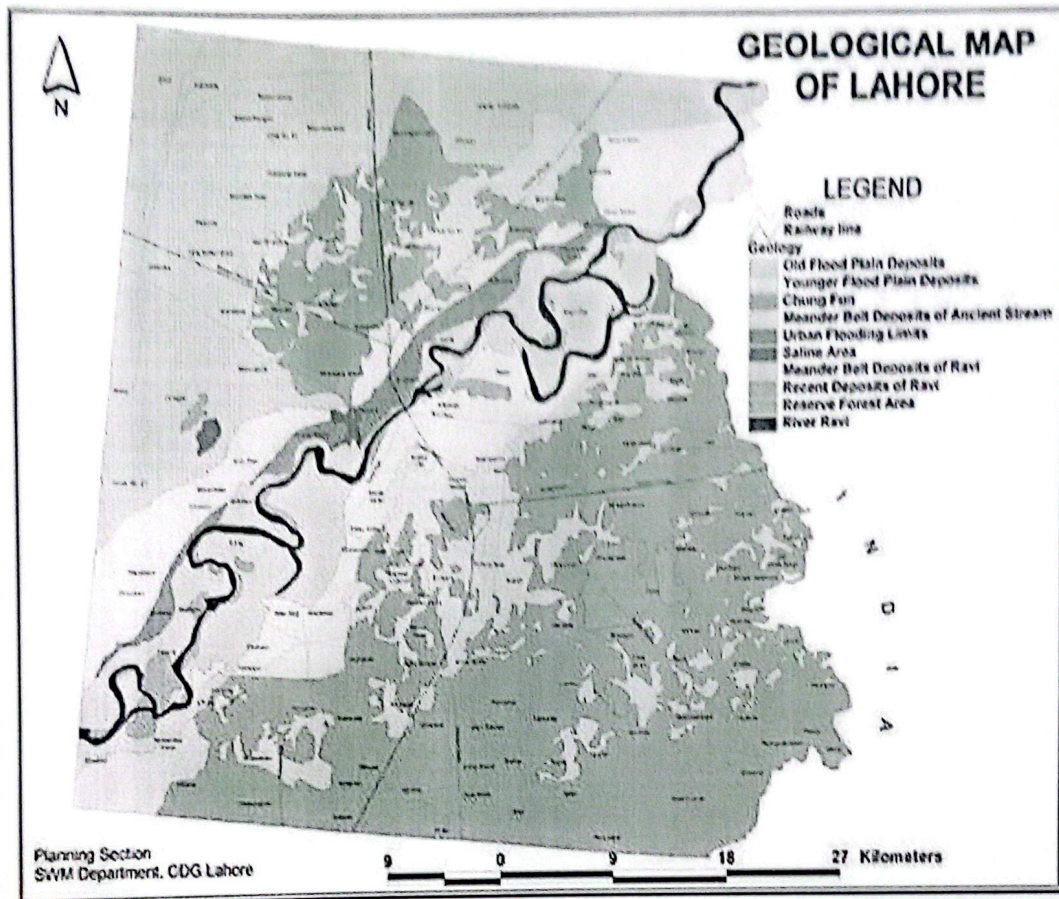


Figure 6-9 Geographical Map of Lahore

6.2.6 Seismology

Pakistan Building Code distributes the country into 4 zones, fig. The project site falls in Low Hazard Zone with seismic factor ground acceleration $g/10$ or less, as such structural design of buildings and others will follow the applicable criteria for the zone. Seismic details are a very important consideration for any planning activity. As it directly lays an impact on the construction of the site.

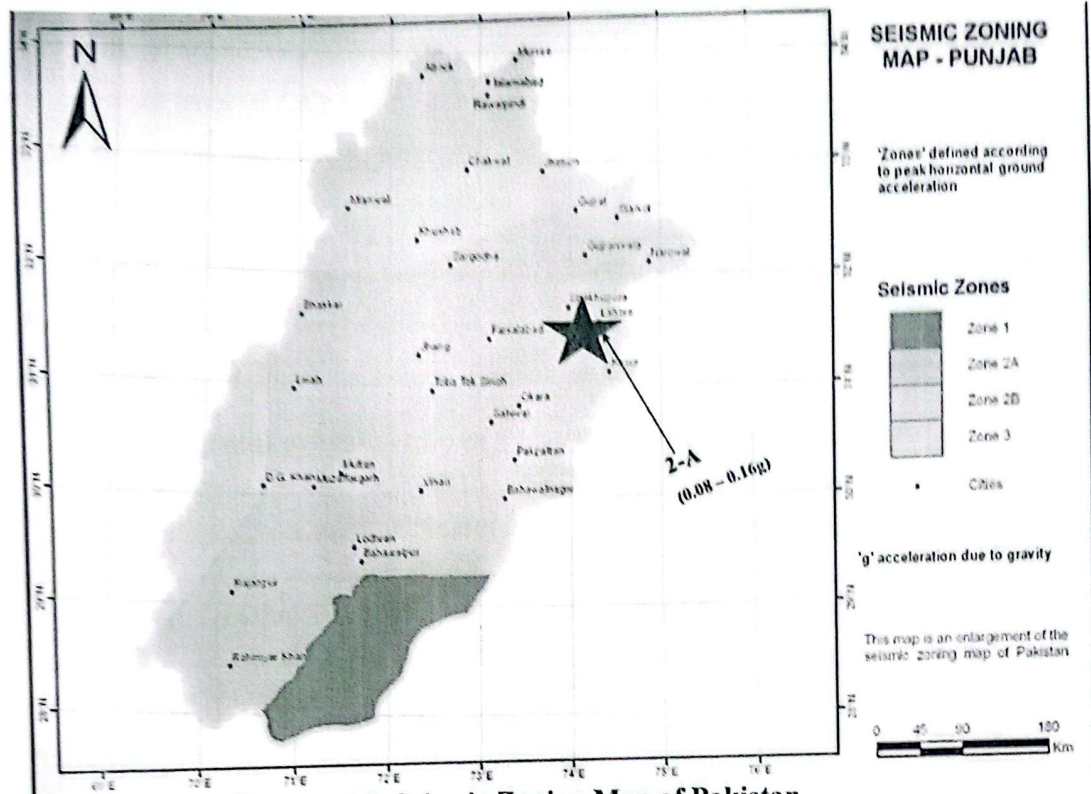


Figure 6-10: Seismic Zoning Map of Pakistan

6.2.7 Flooding

No surface drainage problems are foreseen as surface water can be disposed of in the existing primary and secondary drainage network including partly moving into the sewerage.

6.2.8 Water Logging and Salinity

There are no signs of waterlogging on the project site.

6.3 ECOLOGICAL RESOURCES

6.3.1 Flora

Lahore the city of gardens is the heart of Pakistan. The city has seen the heydays of the Mughals, Sikhs, and the British; all left their footprints on the history and cultural mosaic of the city. Resultantly Lahore is a treasure-trove of monuments, historical relics, and remains which these nations have left in this historical metropolis of Punjab.

Though an ancient city; over the years Lahore has considerably expanded. However, along these modern additions, the ancient monuments, old gardens, trees, graveyards, and

traditional bungalows having attached gardens, large expanses of lawn, and old roadside trees some of which can still be seen, are gradually disappearing. These green areas and old endemic trees of Lahore are home to many resident bird species as well as many summer, winter, and transit migrants. So, Lahore is also very important due to its ecological conditions.

Several types of floral species are present in Lahore, however, some of the principal trees, shrubs (plants), and herbs (ground-covering plants) are given below, which illustrates their nomenclature including local names, English names, and Botanical names.

Table 6-1 Inventory of Trees Present in Lahore District

Serial No.	Common Names	Botanical Names
1.	Arjun	<i>Terminalia arjuna</i>
2.	Dhak	<i>Butea frondosa</i>
3.	Mahwa	<i>Bassia latifolia</i>
4.	Bahara	<i>Terminalia bellerica</i>
5.	Amaltas	<i>Cassia fistula</i>
6.	Gul-e-nishtar	<i>Erythrina subrosa</i>
7.	Putajan	<i>Putranjiva roxburghii</i>
8.	Gab	<i>Diospyros embryopteris</i>
9.	Berna	<i>Crateva religiosa</i>
10.	Khark	<i>Celtis australis</i>
11.	Putajan	<i>Putranjiva roxburghii</i>
12.	Fiddle wood/Kashmir Lagotis	<i>Eithryllum ruberratum</i>

13.	Gul-e-mast	<i>Dalinia indica</i>
14.	Gul-e-mohr	<i>Poinciana regia</i>
15.	Alstonia	<i>Alstonia scholaris</i>
16.	Ashoke	<i>Saraca indica</i>
17.	Sheesham	<i>Dalbergia sisso</i>
18.	Alata	<i>Stercolia colorata</i>
19.	Kenair	<i>Nerium grandiflora</i>
20.	Weeping Willow	<i>Salix babylonica</i>
21.	Keekar	<i>Parkinsonia aculeata</i>
22.	Nilem	<i>Jacaranda mimosfolia</i>
23.	Kachnar	<i>Bauhinia purpurea</i>
24.	Molsary	<i>Mimosop elengi</i>
25.	Bel	<i>Aegle marmelos</i>
26.	Siris	<i>Albizia lebbek</i>
27.	Tun	<i>Cedrela toona</i>
28.	Jamin	<i>Eugenia jambolana</i>
29.	Moor pankh	<i>Thuja orientalis</i>
30.	Silkoak	<i>Grevillea robusta</i>
31.	Sufeda	<i>Eucalyptus citriodora</i>
32.	Peepal	<i>Ficus relegiosa</i>

33.	Simbal	<i>Hyacinthus orientalis</i>
34.	Berri	<i>Diospyros melanoxylon</i>
35.	Suk chain	<i>Pongamia glabra</i>
36.	Poplar	<i>Populus alba</i>
37.	Aam	<i>Mangifera indica</i>
38.	Shehtoot	<i>Morus alba</i>
39.	Peepal	<i>Ficus religiosa</i>

Source: PHA, Lahore

6.3.2 Fauna

Common birds found in the area are crows and sparrows. Chirping birds are having their nests in the well-grown trees that are providing a natural habitat for the birds. Some squirrels, parrots, rats, weavers, and sparrows are also found in the area.

Different species of reptiles and amphibians such as lizards and frogs are also found. Various bird species known to occur in the area include myna, bulbul, crow, and sparrow.

6.3.3 Endangered Species

The endangered plant in Pakistan is the Elm i.e., *Ulmus wallichiana* which is not found here. No endangered species exist in the project area.

6.4 SOCIOECONOMIC ENVIRONMENT

Lying between 31°31'08"41' N and 74°21'18"76' E, Lahore is bounded on the north and west by the Sheikhpura District, on the east by Wagah, and on the south by Kasur District. The Ravi River flows on the northern side of Lahore. Lahore city covers a total land area of 404 square kilometers (156 sq mi) and is still growing. With a rich history dating back over a millennium, Lahore is the main cultural center of Punjab and one of the most densely populated cities in the world. The city of Lahore remains an economic, political, transportation, entertainment, and educational hub. It is referred to as the "Mughal City of Gardens" due to the historic presence of gardens in and around the city dating back to the Mughal period.

6.4.1 Political and Administrative Setup

The project area falls in Lahore City of the Lahore District. District Coordination Officer is the highest-ranked administrator of the district. For the collection of revenue and administration, the districts are subdivided into Tehsils. Local governments also administer the area through Union Councils and Tehsils. The total area of the district Lahore is 2,300 square kilometers.

6.4.2 Economy and Industrial Activities

As of 2008, the city's gross domestic product (GDP) by purchasing power parity (PPP) was estimated at \$40 billion with a projected average growth rate of 5.6 percent. This is at par with Pakistan's economic hub, Karachi, with Lahore (having half the population) fostering an economy that is 51% of the size of Karachi's (\$78 billion in 2008).

The contribution of Lahore to the national economy is supposed to be around 13.2%. As a whole, Punjab has a \$115 billion economy making it the first and to date only Pakistani Subdivision of economy with more than \$100 billion at rank 144.

Lahore's GDP is projected to be 102 billion\$ by the year 2025, with a slightly higher growth rate of 5.6% per annum, as compared to Karachi's 5.5%. Central to Lahore's economy is the Lahore Stock Exchange (LSE), Pakistan's second-largest stock exchange.

Lahore has offices of several Pakistani government corporations including the Water and Power Development Authority (WAPDA) and Water and Sewage Authority (WASA). Food and restaurant businesses remain open all night. Lahore is the second largest financial hub of Pakistan and has industrial areas including Kot Lakhpat and the new Sundar Industrial Estate (near Raiwand). Lahore's economic base is broad and varied.

Major industries include the manufacture of automobiles and motorcycles, Heavy machinery, railway coaches, home appliances, steel, telecommunications, information technology, chemicals, pharmaceuticals, computers, engineering, and construction material. A major industrial agglomeration with about 9,000 industrial units, Lahore has shifted in recent decades from manufacturing to service industries. Some 42% of its workforce is employed in finance, banking, real estate, community, cultural, and social services. The city is Pakistan's largest software-producing Centre and hosts a growing computer-assembly industry. Arfa Software Technology Park in Lahore is the biggest and most advanced IT park in the country.

6.5 QUALITY OF LIFE

6.5.1 Demographic Characteristics of the Project Area

- The current metro area population of Lahore in 2023 is 13,979,000, a 3.23% increase from 2022.
- The metro area population of Lahore in 2022 was 13,542,000, a 3.41% increase from 2021.
- The metro area population of Lahore in 2021 was 13,095,000, a 3.58% increase from 2020.
- The metro area population of Lahore in 2020 was 12,642,000, a 3.72% increase from 2019.³

³ Lahore, Pakistan Metro Area Population 1950-2023 | MacroTrends

ADMIN-UNIT	POPULATION 2017										1998
	Area (sq. Km)	All Sexes	Male	Female	Transgender	Sex Ratio	Population Density per sq. Km	Urban Proportion	Average Household Size	Population 1998	2017 Average Annual Growth Rate
Lahore District	1,772	11,119,985	5,813,987	5,303,982	2,016	109.626275.39	6275.39	100.00	6.23	6,340,114	3.00
Rural	-	-	-	-	-	-	-	-	-	1,131,026	-100.00
Urban	-	11,119,985	5,813,987	5,303,982	2,016	109.626275.39	-	-	6.23	5,209,088	4.06
Lahore Cant Tehsil	466	1,632,702	857,133	775,333	236	110.55	3503.65	100.00	6.17	918,730	3.07
Tehsil	-	-	-	-	-	-	-	-	-	182,733	-100.00
Rural	-	-	-	-	-	-	-	-	-	735,997	4.27
Urban	-	1,632,702	857,133	775,333	236	110.55	-	-	6.17	-	-
Lahore City	214	3,653,616	1,905,921	1,746,900	795	109.10	17072.97	100.00	6.25	2,219,399	2.65
Tehsil	-	-	-	-	-	-	-	-	-	143,532	-100.00
Rural	-	-	-	-	-	-	-	-	-	-	-
Urban	-	3,653,616	1,905,921	1,746,900	795	109.10	-	-	6.25	2,075,867	3.01

⁴ <https://www.pbs.gov.pk/census-2017-district-wise/results/053>

Development of a Controlled Access Corridor Facility from Niazi Interchange To Babu Sabu Interchange, Lahore

ADMN-UNIT	POPULATION 2017										1998 2017 Average Annual Growth Rate
	Area (sq. Km)	All Sexes	Male	Female	Transgender	Sex Ratio	Population Density per sq. Km	Urban Proportion	Average Household Size	Population 1998	
Model Town Tehsil	353	2,703,569	1,421,291	1,218,762	516	110.89	7658.84	100.00	6.11	1,409,228	3.48
Rural	-	-	-	-	-	-	-	-	-	-	-
Urban	-	2,703,569	1,421,291	1,218,762	516	110.89	-	-	6.11	273,036	-100.00
Raiwind Tehsil	467	848,541	448,403	400,031	107	112.09	181 7.00	100.00	6.34	1,136,192	4.66
Rural	-	-	-	-	-	-	-	-	-	357,934	4.64
Urban	-	848,541	448,403	400,031	107	112.09	-	-	6.34	330,620	-100.00
Shalima r Tehsil	272	2,281,557	1,181,239	1,099,956	362	107.39	8388.08	100.00	6.35	27,314	19.78
Rural	-	-	-	-	-	-	-	-	-	1,434,823	2.47
Urban	-	2,281,557	1,181,239	1,099,956	362	107.39	-	-	6.35	201,105	-100.00
										1,233,718	3.28

6.5.2 Rural and Urban Distributions

The urban population was 5,209,088 or 82.4 percent of the total population of the Lahore district, which grew at an average rate of 3.3 percent during 1981-98. The growth decreased from 3.7 percent, which was observed during 1972-81. There are one Metropolitan Corporation, two Town Committees, and one Cantonment in the District.

There were 261 Mauzas (the smallest revenue unit) in 1998. Of these 61 had a population over 5 thousand, another 61 had 2 to 5 thousand, 64 had one to two thousand, and 74 had under one thousand persons while one was uninhabited.

6.5.3 Religion

The population of the district is predominantly Muslim i.e. 93.9 percent. The next higher percentage is of Christians with 5.8 points followed by Ahmadis with 0.2 percent. While other minorities like Hindus etc. are very small in number.

6.5.4 Ethnic Structure

The main castes and groups of the Lahore district are Arain, Jat, Rajput, Malik, Pathan, Mughal, Sheikh, Komboh, and Gujjar. Besides, there are also village artisans, which include Lohars (blacksmiths), Tarkhan (carpenters), Kumhars (potters), Mochis (cobblers), Machhis (water-carrier), barbers and weavers, etc.

6.5.5 Mother Tongue

The mother tongue refers to the language used for communication between parents and their children in any household. Punjabi is the predominant language being spoken by the majority (86.2 percent) of the population of the district followed by Urdu, Pushto, and Siraiki being spoken by 10.2, 1.9, and 0.4 percent. Sindhi is spoken by 0.1 percent.

6.5.6 Institutions

Lahore is a metropolitan city and a hub of various educational, academic, and flourishing government institutes. In the vicinity of the project, there are many educational institutions like Government College University, University of Veterinary and Animal Sciences, University of the Punjab, College for Women University, Forman Christian College, National College of Arts, King Edward Medical University, Kinnaird College for women, Shadbagh Girls College and many more renowned institutions.



Figure 6-11: Educational Institutes in Lahore

6.5.7 Transportation

The city of Lahore is one of the most accessible cities in the Punjab Province. In addition to the historic Grand Trunk Road (G.T. Road), a motorway (M- 2) was completed in 1997 from Lahore to Islamabad. The government has built underpasses to ease congestion and prevent traffic jams, and according to official figures, Lahore transportation services have improved to accommodate the growing number of visitors to the city. It is well connected by air to other countries as well as all major cities of Pakistan. Buses, trains, taxis, and rickshaws are the other means of transport available in Lahore.

6.5.8 Health Facilities

Ample medical and health facilities are available in the Lahore Metropolitan Corporation area and its suburbs. Shaukat Khanam Hospital is the latest addition to the medical care facilities in Lahore for the most dangerous disease in the country. i.e. Cancer. There are also other hospitals of voluntary organizations which provide health coverage to the general public. Among the prominent hospitals are General Hospital, Lady Willington Hospital, Mayo Hospital, Fatima Jinnah Hospital, The Children Hospital, Services Hospital, Ganga Ram Hospital, etc. Besides, several private medical practitioners, Hakims, and homeopathic doctors are also practicing in the city. Services Hospital is the nearest healthcare facility that is present in the vicinity of the project.

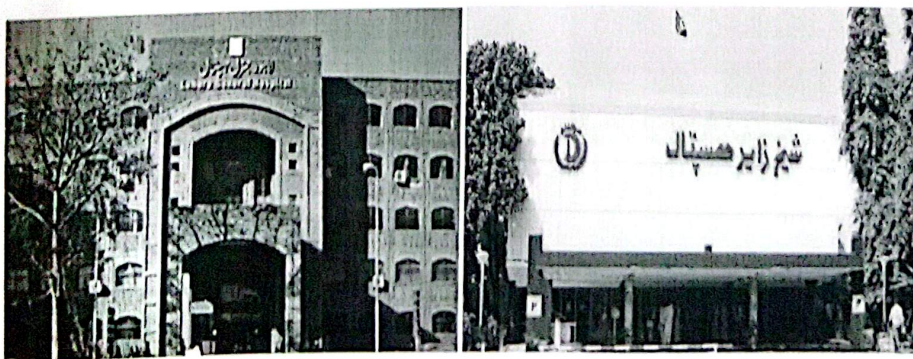


Figure 6-12: Hospitals in Lahore

6.5.9 Architecture Style

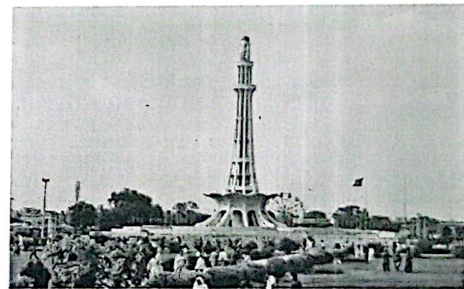
The most common places of interest in Lahore city are discussed as follows;

a) Royal Fort Lahore

Royal Fort Lahore/Shahi Qila is located at an eminence in the northwest corner of the Walled City. The Citadel is spread over an area of 50 acres. Many visitors from foreign and local tours of different educational institutions come to see this historical place every year. The front gate of the Fort is called the Alamgiri Gate of the Royal Fort.

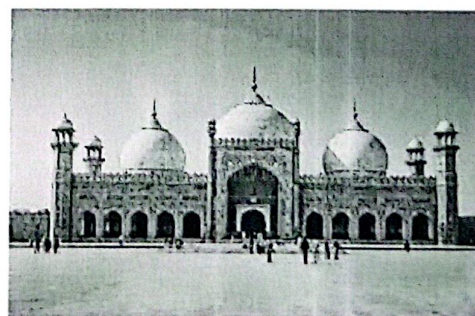
b) Minar-e-Pakistan

About 59.5 meters tall monument, called Minar-e-Pakistan is situated near the Royal Fort in the spacious Iqbal Park (previously known as Minto Park), where the historical resolution for the creation of Pakistan was adopted on the 23rd March 1940. Around the minar, there are spacious parks with beautiful Cyprus trees and flowers all over.



c) Badshahi Mosque

The Imperial or the Badshahi Mosque is across the courtyard from the Alamgiri Gate of the Royal Fort. It has a beautiful gateway and a courtyard that is said to be the largest mosque courtyard in the world for outdoor prayers.



d) Lahore Museum

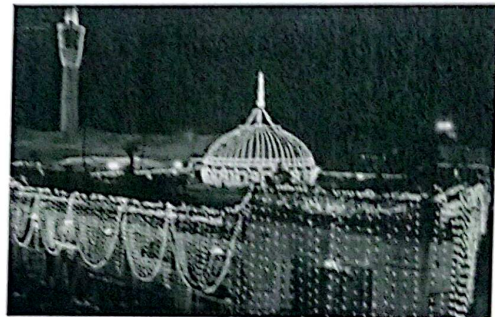
Opposite the old Punjab University Hall, a Mughal-style building on the Shahrah-e-Quaid-e-Azam houses the Lahore Museum. The Museum contains some fine specimens of Mughal and Sikh doorways and woodwork and has a big collection of paintings dating back to Indo-Pakistan, Mughal, Sikh, and British times



It also has a collection of musical instruments, ancient jewelry, textile, pottery, and armory. There are also relics from some Tibetan and Nepalese exhibits.

e) Shrine of Data Ganj Bakhsh

Close to the confluence of Lower Mall and the Circular Road is the shrine of Data Sahib. Data Sahib was a great Sufi saint, which is well-known work *Kashf-ul-Mahjub* has been translated from the original Persian version into Urdu and other several European languages and is considered a classic.



i) Shrine of Madhu Lal Hussain

This is the famous tomb in Lahore, where Mela Chiraghan is held on the last weekend of March and draws enormous crowds of devotees and others. The shrine is famous because of its antiquity and is revered by Muslims and Hindus alike.

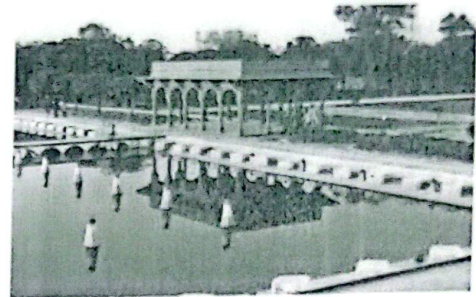


Recreational/Entertainment Places

i) Shalimar Garden

About 5 kilometers east of Lahore is the famous, Shalimar Garden laid out by the Mughal Emperor Shah-Jehan in 1642 A.D.

The Garden is spread out in typical Mughal Style and surrounded by high walls with watched towers at the four corners. It covers an area of about 42 acres. Many people from the entire city come to visit the park with their families at the weekend to spend their idle time.



j) Jallo Park

Jallo Park is 28 kilometers from Lahore and located on the Lahore Branch Canal. Covering an area of 450 acres, it has expanses of lawns, a forest research Centre, a children's park, a zoo, a small museum, and a gift shop inside.

6.5.10 Approach to The Project Area

The proposed project area is already developed and with suggested improvements, the functioning of the traffic facilities will be improved

6.5.11 Cultural & Religious Resources

There is not any documented or known site of archeological, or historical in the project site. However, quite a number mosques, schools, academies and one church is present within the area of influence.

7.0 ASSESSING IMPACTS

This chapter contains detailed environmental impact, and its identification based on timing, nature, duration, magnitude, and significance.

7.1 IMPACTS ASSESSMENT

Environmental Impact Assessment (EIA) is a systematic and integrative process for considering possible impacts before a decision is taken on whether or not a proposal should be approved to proceed.

Table 7.1 below shows the impact classification criteria based on its potential.

Table 7-1: Classifications of Impacts

IMPACT POTENTIAL	ABBREVIATION	IMPACT CRITERIA
Low Adverse	LA	Causing low environmental deterioration
Medium Adverse	MA	Causing ordinary environmental deterioration
High Adverse	HA	Causing extreme environmental deterioration
Not Applicable	NA	Not related to project activity
None or Insignificant	O	Causing no environmental deterioration
Low Beneficial	LB	Less positive environmental impacts
Medium Beneficial	MB	Ordinary positive environmental impacts
High Beneficial	HB	Extreme positive environmental impacts
Not Determinable	ND	Not present

Table 7-2: Anticipated Impacts and Their Magnitude of the Project

Environmental Components	Physical Environment											Biological Environment						Social Environment							
	Topography	Agricultural Lands	Soil (Erosion / Stability)	Cultural / Religious Properties	Infrastructure	Mineral Resources	Land pollution	Surface water quality	Groundwater quality	Air quality	Noise	Aquatic Ecosystem	Wetland Ecosystem	Terrestrial Ecosystem	Habitat change	Animal Movement	Wildlife	Disease Vectors	Public Health / Safety	Land Use	Communication System	Employment	Community Stability	Benefit to Community	Traffic Management
Components / Activities	O	O	LA	NA	LA	NA	LA	LA	LA	MA	M A	NA	NA	O	O	NA	NA	O	O	LA	LA	LB	O	LB	LB
	O	O	LA	NA	NA	NA	LA	NA	LA	LA	LA	NA	NA	O	O	O	NA	O	O	O	O	MB	LA	MB	LA
	O	NA	LA	NA	O	NA	LA	LA	LA	LA	LA	NA	NA	O	O	O	NA	NA	LA	LA	LA	LB	LA	LB	LA
Construction camps, workshops, etc.																									
Transportation of construction materials																									
Use of construction materials etc.																									

Environmental Components	Physical Environment										Biological Environment						Social Environment												
	Topography	Agricultural Lands	Soil (Erosion / Stability)	Cultural / Religious Properties	Infrastructure	Mineral Resources	Land pollution	Surface water quality	Groundwater quality	Air quality	Noise	Aquatic Ecosystem	Wetland Ecosystem	Terrestrial Ecosystem	Habitat change	Animal Movement	Wildlife	Disease Vectors	Public Health / Safety	Land Use	Communication System	Employment	Community Stability	Benefit to Community	Traffic Management				
Components / Activities	Material Storage	O	NA	LA	NA	O	NA	LA	O	LA	O	NA	NA	NA	NA	O	NA	O	O	LA	NA	LB	NA	O	O	O			
	Movement of Traffic	O	NA	O	NA	O	NA	LA	O	LA	LA	NA	NA	NA	NA	O	NA	O	O	LB	LB	MB	MB	HB	HB	HB			
	Road																												
	Maintenance Works	O	NA	LA	NA	O	NA	LA	LA	LA		NA	NA	NA	NA	O	NA	O	LA	LA	LA	MB	LA	LA	LA	LA			
	Air Quality	O	NA	NA	NA	O	NA	NA	O	LB	O	O	NA	NA	NA	NA	O	O	LB	LB	LB	O	O	LB	LB	O			
LA: Low Adverse		MA: Medium Adverse										HA: High Adverse						NA: Not Applicable						O: None or Insignificant					
LB: Low Beneficial		MB: Medium Beneficial										HB: High Beneficial						ND: Not Determinable											

LA: Low Adverse

LB: Low Beneficial

MA: Medium Adverse

MB: Medium Beneficial

HA: High Adverse

HB: High Beneficial

NA: Not Applicable

ND: Not Determinable

O: None or Insignificant

7.2 MITIGATION ASSESSMENT

Mitigation refers to minimizing or avoiding the described impacts. Overall, mitigation measures are a response to the findings of impact assessment; they need to cover all the areas identified. The key focus of mitigation actions should be on:

- ❖ Preventive measures that avoid the occurrence of impacts and thus avoid harm or even produce positive outcomes.
- ❖ Measures that focus on limiting the severity and the duration of the impacts.
- ❖ Compensation mechanisms for those impacts that are unavoidable and cannot be reduced further.

7.3 PURPOSE OF MITIGATION AND IMPACT ASSESSMENT

The purpose of conducting an EIA is to identify and understand (assess), and then prevent or minimize (mitigate) the adverse impacts of the planned project on the environment and people. Because the impacts of the project can change over time, the impacts need to be assessed and measured over the lifetime of the project – from its construction through to operations and after closing.

Impact assessment is indispensable to provide systematic and detailed descriptions of the probable impacts in comparison to the identified project alternatives. Mitigation measures are a critical part of the EIA process, as these actions aim to prevent adverse impacts from the planned project on the environment and people, ensuring that unavoidable impacts are maintained within acceptable levels

7.4 ENVIRONMENTAL MONITORING PLAN (EMP)

Environmental Monitoring is undertaken during project activities to ensure the effectiveness of the mitigation measures. To respond to the anticipated environmental concerns at an early stage and to determine the intensity of the impact, prediction is required. Specific monitoring programs are outlined below as well as responsibilities for the collection and analysis of data and the reporting requirements showing the environmental monitoring plan suggested for proposed project activity.

Table 7-3: Environmental Monitoring Plan

ENVIRONMENTAL MONITORING PLAN (EMP)					
WHAT (Is the parameter to be observed)?	WHERE (Is the parameter to be monitored)?	HOW (Is the parameter to be monitored)?	WHEN (Is the parameter to be observed)?	WHY (Is the parameter being monitored)?	WHO (Is responsible for monitoring)?
CONSTRUCTION PHASE					
Vegetation Clearance	Construction site	Visual inspection of loss of vegetation, soil erosion & instability, surface water pollution, and occupational health of workers and community	Weekly	To meet the PEQSAA (Punjab Environmental Quality Standards for Ambient Air)	Contractor, LDA through Approved Monitoring Agency
Excavation of earth	Construction site and camp site	Visual inspection for soil erosion & stability	Weekly	To meet the PEQSAA (Punjab Environmental Quality Standards for Ambient Air)	LDA through Approved Monitoring Agency

ENVIRONMENTAL MONITORING PLAN (EMP)					
WHAT (Is the parameter to be observed)?	WHERE (Is the parameter to be monitored)?	HOW (Is the parameter to be monitored)?	WHEN (Is the parameter to be observed)?	WHY (Is the parameter being monitored)?	WHO (Is responsible for monitoring)?
Dust Emissions	Construction site and camp site	Visual inspection during construction activities Transportation of materials	Weekly	To meet the PEQSAA (Punjab Environmental Quality Standards for Ambient Air)	LDA through Approved Monitoring Agency
Storage and handling of materials	Material storage facility and construction camp	Visual inspection of storage facilities	Monthly	To minimize any risk of accident	LDA through Approved Monitoring Agency
Traffic Safety	Construction site and camp site	Visual inspections	Monthly	To avoid the accidents	LDA through Approved Monitoring Agency
Ambient Air Monitoring	Construction site, campsite, batching plant	PM ₁₀ , SO _x as SO ₂ , NO _x as NO ₂ , CO	Quarterly	To meet the PEQSAA (Punjab Environmental	LDA through Approved Monitoring Agency

Development of a Controlled Access Corridor Facility from Niazi Interchange To Babu Sabu Interchange, Lahore

ENVIRONMENTAL MONITORING PLAN (EMP)					
WHAT (Is the parameter to be observed)?	WHERE (Is the parameter to be monitored)?	HOW (Is the parameter to be monitored)?	WHEN (Is the parameter to be observed)?	WHY (Is the parameter being monitored)?	WHO (Is responsible for monitoring)?
	Material storage & active sites			Quality Standards for Ambient Air)	
Noise Level	Construction Site	Using a noise level meter (minimum dB and maximum dB)	Quarterly	To meet the Noise Standards	LDA through Approved Monitoring Agency
Ground & Drinking Water Quality	Construction Site	By analyzing pH, TDS, Chloride, Fluoride, Color, NO ₃ -, Selenium, Residual chlorine, Lead, Total hardness, Turbidity, Zinc, Manganese, Aluminum, Chromium, Cadmium, Boron, Barium, Antimony, Arsenic, Cyanide, Mercury, Nickel, Total Coliform, E.coli, Total count.	Quarterly	To meet the PEQS Drinking Water Quality Guidelines	LDA through Approved Monitoring Agency
Solid Waste	Construction camps and construction	A visual inspection that solid waste will be disposed of at the designated site Waste generation rate, Waste composition,	Weekly	Minimize impacts on the Environment	LDA through Approved Monitoring Agency

ENVIRONMENTAL MONITORING PLAN (EMP)					
WHAT (Is the parameter to be observed)?	WHERE (Is the parameter to be monitored)?	HOW (Is the parameter to be monitored)?	WHEN (Is the parameter to be observed)?	WHY (Is the parameter being monitored)?	WHO (Is responsible for monitoring)?
	sites	Recyclables and non-recyclables, Hazardous waste.			
Occupational Health & Safety	Construction Site	Proper provision of PPEs to workers	Daily	To avoid any risk to human health	HSE Officer
OPERATIONAL PHASE					
Ambient Air Monitoring	Road	PM ₁₀ SO _x as SO ₂ , NO _x as NO ₂ , CO	Quarterly (During operation)	To meet the PEQSAA (Punjab Environmental Quality Standards for Ambient Air) & WHO (World Health Organization)	LDA through Approved Monitoring Agency

Development of a Controlled Access Corridor Facility from Niazi Interchange To Babu Sabu Interchange, Lahore

ENVIRONMENTAL MONITORING PLAN (EMP)					
WHAT (Is the parameter to be observed)?	WHERE (Is the parameter to be monitored)?	HOW (Is the parameter to be monitored)?	WHEN (Is the parameter to be observed)?	WHY (Is the parameter being monitored)?	WHO (Is responsible for monitoring)?
Noise Level	Road	Using a noise level meter (minimum dB and maximum dB)	Quarterly (During operation)	To meet the Noise Standards	LDA through Approved Monitoring Agency
Water Quality	Road	By analyzing pH, TDS, Chloride, Fluoride, Colour, NO ₃ ⁻ , Selenium, Residual chlorine, Lead, Total hardness, Turbidity, Zinc, Manganese, Aluminum, Chromium, Cadmium, Boron, Barium, Antimony, Arsenic, Cyanide, Mercury, Nickel, Total Coliform, E.Coli, Total count.	Quarterly (During operation) End of summer before the onset of Monsoon every year.	To meet the PEQS Drinking Water Quality Guidelines	LDA through Approved Monitoring Agency

8.0 SCREENING OF ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

8.1 GENERAL

The potential impacts of the proposed project on the area's geomorphology, surface, and groundwater resources, air quality, biological resources, and socio-cultural environment have been discussed in the following sections. Where appropriate, mitigation measures have also been included to reduce the unacceptable impacts. Likely impacts that trigger the Environmental Management Plan (EMP), and accompanied mitigation measures have been identified in this EIA. The organizational structure and responsibilities of various functionaries towards EMP also have been highlighted, indicating generic environmental control measures that need to be applied during the possible implementation of EMP if and when required. The primary objectives are to:

Facilitate the implementation of the mitigation measures required by EPA.

- ❖ Identify monitoring parameters to ensure the effectiveness of the mitigation measures.
- ❖ Provide a mechanism for taking timely action in the face of unanticipated environmental situations.
- ❖ Identify training requirements at various levels

Accordingly, mitigation measures have also been prepared to manage the environment and for sustainable development.

8.2 ENVIRONMENTAL PARAMETERS INCLUDING THE LOCATION OF THE PROJECT

Environmental problems related to the location of the project are mostly in the areas of the physical setting, socioeconomic setting, ecological setting, and special areas. The project involves the rehabilitation and widening of the existing roads for the smooth flow of traffic.

8.3 ENVIRONMENTAL PARAMETERS REGARDING DESIGN

The design of the project has sought to minimize any environmental potential impacts by ensuring that the project should be in according to the environmental standards. Local aesthetic value is another issue to be considered during project design.

8.4 IMPACT PHASES

This impact assessment and mitigating measures cover the entire cycle of the project activities, from pre-construction to construction, operation, and maintenance. The coverage of each of the project phases is defined as follows:

- ❖ Design Phase,
- ❖ Pre-construction Phase
- ❖ Construction Phase
- ❖ Operation Phase

8.5 TYPES OF IMPACTS

The types of impacts that may arise during Project work can be classified as follows:

Direct Impacts– i.e., those directly due to the Project itself such as the impacts on air quality resulting from construction activities, equipment, and vehicles. Direct impacts also include the impact of construction expenditures on the local economy.

Indirect Impacts– i.e., those resulting from activities prompted by the Project, but not directly attributable to it. The use of rock and other construction materials, for example, has an indirect impact on increasing the demand for these materials.

Cumulative Impacts– i.e., impacts in conjunction with other activities. A single road improvement may not exert a significant environmental impact, but if some roads are developed in the same area developing a road network the cumulative or additive effect could be more significant.

Impacts in all three categories may be either:

Short-term– i.e., impacts that occur during construction and affect land use, air quality, and other factors. Many of these impacts, however, will be short-term and without long-lasting effects. Even the effects of some relatively significant impacts such as borrow pits, for example, maybe eventually be erased if appropriate mitigation actions are taken.

Many potential short-term negative impacts can be avoided or otherwise mitigated through proper engineering designs and by requiring Contractors to apply environmentally appropriate construction methods.

Long-term – i.e., construction impacts that could, for example, affect regional community health and safety if poor design practices are used.

Both short-term and long-term impacts may be either beneficial or adverse. Short-term positive impacts will include, for example, the generation of employment opportunities during the construction period. Long-term benefits will include enhanced development opportunities, improved transport services, easier access to commercial and service facilities; faster communications and commodity transport; improved access to markets and growth centers, and increased services and commercial facilities.

8.6 POTENTIAL IMPACT SOURCES

Environment impacts are attributable to the project implementation and can broadly be classified into those taking place during construction and those occurring during the operational phase. Some of these impacts can be anticipated and avoided through appropriate adjustments in the project design. Some can be mitigated by careful implementation of the project while others can be mitigated by appropriately following the operational manual and an effective collaboration with local communities.

Construction related Impacts are heavily dependent on:

- ❖ The contractor's work practices, especially those related to the storage of construction mater
- ❖ Project management's enforcement of correct construction practices and standards;
- ❖ Effective collaboration with local communities in evolving a workable Social framework.
- ❖ The quality of Monitoring and Reporting of EMP implementation

Operational impacts of the proposed project are associated with the movement of vehicular traffic on it and allied activities. These include air and noise pollution, safety hazards, and other similar impacts.

For this Project, potential impacts are reviewed under construction and operational phases. The environment has been studied under the following subheads:

- ❖ Physical Environment
 - Land Resource
 - Water Resource
 - Air Quality
 - Noise Level
- ❖ Biological Environment

- Flora
- Fauna
- Fish
- Endangered Species
- Cultural and Historical Sites
- Socio-economic Environment

8.7 ENVIRONMENTAL IMPACTS AND THEIR MITIGATION MEASURES DURING THE CONSTRUCTION AND OPERATIONAL PHASE

Anticipated impacts during the construction and operational phase are given in Table 8-1 and Table – 8-2 similarly in detail with the discussion of suggested mitigation measures.

Table 8-1: Anticipated Impacts and Their Mitigation Measures during the Construction Phase

ENVIRONMENT COMPONENT	ACTIVITIES AND POTENTIAL IMPACTS	MITIGATION MEASURES
TOPOGRAPHY	The main impact during the construction will be the clearing of ROW, cutting and filling of borrow pits including erosion of topsoil cover.	❖ To minimize erosion and avoid creating hazards for people Ditches or borrow pits that cannot be fully rehabilitated will be landscaped ❖ Land for temporary facilities like construction camps, storage areas, etc. shall be brought back to its original land use. ❖ No waste dumping should take place in borrow areas ❖ Slope protection by providing frames, dry stone pitching, masonry retaining walls, and planting of grass and trees. ❖ Side slopes of all cut and fill areas will be graded and covered with stone pitching, grass, and shrub as per design specifications. ❖ Care should be taken that the slope gradient shall not be greater than 2:1. ❖ To avoid soil erosion the earth stockpiles will be provided with gentle slopes.
		This impact is temporary and Moderately adverse
SOIL	Soil erosion due to Construction activities, earthwork, cut and fill, stockpiles, etc.	❖ Low embankments will be protected by planting vetiver grass that can flourish in relatively dry conditions. ❖ Soil contamination by asphalt will be minimized by placing all containers in caissons.

Table 8-1: Anticipated Impacts and Their Mitigation Measures during the Construction Phase

ENVIRONMENT COMPONENT	ACTIVITIES AND POTENTIAL IMPACTS	MITIGATION MEASURES
TOPOGRAPHY	The main impact during the construction will be the clearing of ROW, cutting and filling of borrow pits including erosion of topsoil cover.	❖ To minimize erosion and avoid creating hazards for people Ditches or borrow pits that cannot be fully rehabilitated will be landscaped ❖ Land for temporary facilities like construction camps, storage areas, etc. shall be brought back to its original land use. ❖ No waste dumping should take place in borrow areas ❖ Slope protection by providing frames, dry stone pitching, masonry retaining walls, and planting of grass and trees. ❖ Side slopes of all cut and fill areas will be graded and covered with stone pitching, grass, and shrub as per design specifications. ❖ Care should be taken that the slope gradient shall not be greater than 2:1. ❖ To avoid soil erosion the earth stockpiles will be provided with gentle slopes.
		This impact is temporary and Moderately adverse
SOIL	Soil erosion due to Construction activities, earthwork, cut and fill, stockpiles, etc.	❖ Low embankments will be protected by planting vetiver grass that can flourish in relatively dry conditions. ❖ Soil contamination by asphalt will be minimized by placing all containers in caissons.

ENVIRONMENT COMPONENT	ACTIVITIES AND POTENTIAL IMPACTS	MITIGATION MEASURES
		❖ All spoils will be disposed of in a safe and sound manner and the original conditions before handling over. ❖ Store and treat the soil. This is required for the soil which is being disturbed during the construction of the road. The soil will be stored in a safe and sound manner and the original conditions before handling over. ❖ Reclamation of the disturbed area and the original conditions before handling over.
	Compaction of soil and impact on quarry haul roads due to the movement of vehicles and equipment.	❖ Construction vehicles, machinery, and equipment will be kept in a designated ROW or a safe and sound manner. ❖ Approach roads leading to the quarry will be kept in a safe and sound manner to reduce compaction. ❖ Transportation of quarry material to the quarry will be done through a safe and sound manner and the original conditions before handling over.
	Contamination of soil due to leakage/spillage of oil, bituminous and non-	❖ Construction vehicles and equipment will be maintained and repaired in a safe and sound manner to avoid leakage/spillage of oil, bituminous and non-bituminous. ❖ Fuel storage and refueling sites will be kept away from drainage channels.

ENVIRONMENT COMPONENT	ACTIVITIES AND POTENTIAL IMPACTS	MITIGATION MEASURES
	bituminous debris generated from demolition and road construction	❖ Unusable debris shall be dumped in ditches and low-lying areas. ❖ To avoid soil contamination Oil Interceptors shall be provided at wash-down and refueling areas. ❖ Waste oil and oil-soaked cotton/cloth shall be stored in containers labeled. ❖ Non-bituminous wastes are to be dumped in borrow pits with the concurrence of the landowner and covered with a layer of topsoil conserved from opening the pit. ❖ Bituminous wastes will be disposed of in an identified approved dumping site.
	This impact is temporary and moderately adverse.	
AIR QUALITY	Dust Generation due to construction activities and transport, storage, and handling of construction materials	❖ Unloading of loose and fine materials through covered vehicles. ❖ Paved approach roads. ❖ Storage areas are to be located downwind of the habitation area. ❖ Water spraying on earthworks, unpaved haulage roads, and other dust-prone areas. ❖ Provision of PPEs to workers. ❖ Storage of construction materials is to be carried out in accordance with the construction material storage and handling plan. ❖ Storage areas shall be at least 500m from communities.

ENVIRONMENT COMPONENT	ACTIVITIES AND POTENTIAL IMPACTS	MITIGATION MEASURES
		❖ Proper implementation of the dust management plan as given in Annexure C.
	Emission of air pollutants (PM10, PM2.5, HC, SO2, NOx, CO, etc.) from vehicles due to traffic congestion and use of equipment and machinery	❖ Regular maintenance of machinery and equipment. ❖ Batching, asphalt mixing plants, and crushers at downwind (1km) direction from the nearest settlement. ❖ Regular Ambient air quality monitoring will be conducted. ❖ A construction traffic management plan (CTMP) will be followed. (as given in Annexure-B.)
	The overall impact on the quality of air during the construction phase will, however, be limited to the project's construction phase only	
NOISE	Noise from construction activities and operation of equipment and heavy machinery i.e.	❖ All equipment is to be timely serviced and properly maintained ❖ Construction equipment and machinery are to be fitted with silencers and maintained properly. ❖ Confining noisy work to normal working hours in the day, wherever possible. ❖ Providing the construction workers with suitable hearing protection like ear caps, or earmuffs and training them in its use. ❖ Restricting construction vehicle movements during nighttime.
	❖ bulldozers, ❖ excavators, ❖ stabilizers, ❖ concrete mixing plant, ❖ pneumatic drills,	

ENVIRONMENT COMPONENT	ACTIVITIES AND POTENTIAL IMPACTS	MITIGATION MEASURES
	❖ stone crushers asphalt plants and ❖ other equipment's	❖ Contractors shall comply with the submitted work schedule, keeping noisy operations away from sensitive points; implement regular maintenance and repairs; and employ a strict implementation of operation procedures.
		This impact is temporary and minor adverse.
Flora & Fauna	❖ Direct impact on Fauna and Flora as a result of vegetation clearance. ❖ During the Construction Phase, the removal of natural vegetation.	❖ The project includes a rehabilitation plan through landscaping a large area which will improve vegetative cover. ❖ The cleared proposed site must be surveyed and demarcated before construction commences ensuring no unnecessary loss of natural vegetation outside the approved footprint. ❖ The contractor's staff must not harvest any natural vegetation. ❖ Vehicles and machinery should not encroach into areas outside/surrounding the planned project footprint. ❖ The project area must be monitored for any new growth of invasive plants until completion of construction. ❖ Short-term monitoring for 12 months after construction has been completed must be conducted.
		This impact is temporary and minor adverse.

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ENVIRONMENT COMPONENT	ACTIVITIES AND POTENTIAL IMPACTS	MITIGATION MEASURES
CONSTRUCTION CAMP	Due to the proposed campsites, loss of vegetation and dissatisfaction with rehabilitation measures during and after the completion of the construction phase may occur.	❖ The campsite is to be selected after careful reconnaissance to minimize the social and physical disruption to local communities and road users.
		❖ Setting up a complaint office for public complaints registration and advertisement of the grievance redress mechanism
		❖ The contractor shall provide a plan for removal & rehabilitation of the site upon completion.
		❖ Reinstate any temporary facilities to pre-existing conditions in ecologically sensitive areas.
		❖ Implement a landscaping plan for all facilities in areas where high landscape value and visual vulnerability to the proposed activities warrants site-specific landscape restoration measure.
This impact is temporary and moderately adverse.		
WATER	Sourcing of water during Construction	❖ Arrangements shall be made by the contractor so that the water availability and supply to nearby communities remain unaffected.
		❖ Water-intensive activities are not to be undertaken.
		❖ Provision of water harvesting structure to augment groundwater condition in the area.

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ENVIRONMENT COMPONENT	ACTIVITIES AND POTENTIAL IMPACTS	MITIGATION MEASURES
	Disposal of water during construction	❖ Provisions shall be made to connect roadside drains with existing nearby natural drains.
	Alteration in surface water hydrology	❖ The existing drainage system is to be maintained and further enhanced. ❖ Provision shall be made for adequate size and number of cross drainage structures particularly in the areas where land is sloping towards road alignment.
	Siltation in water bodies due to construction activities/earthwork	❖ Embankment slopes are to be modified suitably to restrict the soil debris entering water bodies. ❖ Provision of Silt fencing shall be made at water bodies. ❖ Silt/sediment will be collected and stockpiled for possible reuse as surfacing of slopes where they have to be vegetated. ❖ Earthworks and stonework to be prevented from impeding the natural flow of rivers, streams, and water canals or existing drainage systems.
	Deterioration in Surface water quality due to: ❖ leakage from vehicles ❖ leakage from equipment ❖ Waste from construction camps.	❖ No vehicles or equipment should be parked or refueled near water-bodies, to avoid contamination from fuel and lubricants. ❖ All chemicals and oil shall be stored away from water and concreted platform with a catchment pit for spill collection. ❖ All equipment operators, drivers, and warehouse personnel will be trained in immediate response for spill containment and eventual clean-up. Readily available, simple to understand, and preferably written in the local language

ENVIRONMENT COMPONENT	ACTIVITIES AND POTENTIAL IMPACTS	MITIGATION MEASURES
		emergency response procedure, including reporting, will be provided by the contractors. ❖ Construction camp to be sited away from water bodies. ❖ Wastes must be collected, stored, and taken to an approved disposal site only. ❖ Water quality shall be monitored.
		This impact is temporary and moderately adverse.
CONSTRUCTION WASTE & DEBRIS	Selection of Dumping Sites	❖ Dumping sites will be selected away from residential areas and water bodies ❖ Dumping sites must be having an adequate capacity equal to the amount of debris generated. ❖ Minimize the production of waste materials by the 3R (Reduce, Recycle, and Reuse) approach. ❖ Burning of solid waste will be prohibited. ❖ All personnel will Train and instruct in waste management practices and procedures as a component of the environmental induction process
	Reuse and disposal of construction and dismantled waste	❖ All excavated materials from roadway, shoulders, verges, drains, and cross drainage will be used for backfilling embankments, filling pits, and landscaping. ❖ Unusable and non-bituminous debris materials will be suitably disposed of at pre-designated disposal locations, with the approval of the concerned authority.

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ENVIRONMENT COMPONENT	ACTIVITIES AND POTENTIAL IMPACTS	MITIGATION MEASURES
		❖ The bituminous wastes shall be disposed of in secure landfill sites only in an environmentally accepted manner. ❖ Unusable and surplus materials, as determined by the Project Engineer, will be removed and disposed of off-site.
This impact is temporary and moderately adverse.		
HEALTH & SAFETY OF WORKERS	Safety of Workers and accident risk from construction activities	❖ Safe work practices will be followed and applied by the contractor. The health and Safety Management Plan will be strictly applied at the construction site which is given as Annexure-C ❖ At the construction site, fluorescent and retro-refractory signage will be used. ❖ Training workers on safety procedures and precautions. ❖ All regulations regarding safe scaffolding, ladders, working platforms, gangways, stairwells, excavations, trenches, and safe means of entry and egress shall be complied with. ❖ Provision of PPEs to workers. ❖ Provision of a readily available first aid unit including an adequate supply of dressing materials.
This impact is temporary and minor adverse		

ENVIRONMENT COMPONENT	ACTIVITIES AND POTENTIAL IMPACTS	MITIGATION MEASURES
SOCIAL ISSUES	Approach/hindrance problems for the residents/business owners and movement of the people will be disturbed during construction activities.	❖ Maintaining regular communication with local communities and other stakeholders to minimize tensions arising from Project activities. ❖ Maintaining a grievance procedure to facilitate stakeholders in expressing concerns. ❖ Timely completion of the construction work and provision of alternate routes for the areas where the construction is being carried out.
CONSERVATION OF RESOURCES AND ENVIRONMENTAL SUSTAINABILITY	Construction will pose a burden on the existing natural resources	This impact is temporary and minor adverse ❖ One strategy for conserving aggregate resources and reducing the demand for virgin aggregate is to recycle and reuse materials in road construction; ❖ Reuse of materials, such as concrete and asphalt, reduces the need for concrete and asphalt manufacturing, reduces greenhouse gas (GHG) emissions, and reduces waste disposal costs and emissions; ❖ Use solar panels and LED lights in the construction camps instead of using diesel-operated generators and normal bulbs. ❖ Waste minimization strategies will be developed and followed. ❖ To reduce the level of energy consumption, warm-mix asphalt (WMA) will be used to replace hot-mix asphalt (HMA). Besides the fact that WMA is produced at a lower temperature, it also induces great benefits such as an improvement of

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ENVIRONMENT COMPONENT	ACTIVITIES AND POTENTIAL IMPACTS	MITIGATION MEASURES
		working conditions (less exposure to heat and fumes) and asphalt compaction, reduction of paving cost, and longer hauling.
This will be a permanent negative impact.		
SITE RESTORATION AND REHABILITATION	Clean-up Operations, Restoration, and Rehabilitation	❖ The contractor will prepare site restoration plans, which will be approved by the 'Engineer'. ❖ The clean-up and restoration operations are to be implemented by the contractor before demobilization ❖ All construction zones including culverts, roadside areas, camps, hot mix plant sites, crushers, batching plant sites, and any other area used/affected by the project will be left clean and tidy, to the satisfaction of the Environmental officer. ❖ All the opened borrow areas will be rehabilitated and the 'Engineer' will certify.
		This will be a permanent negative impact.

Table – 8-2: Anticipated Impacts and Their Mitigation Measures during Operational Phase

ENVIRONMENT COMPONENT	ACTIVITIES AND POTENTIAL IMPACTS	MITIGATION MEASURES
AIR QUALITY	The air quality will improve due to the smooth flow of traffic	During the operational stage, the overall air quality will improve due to the smooth flow of Traffic, however, the following mitigation measures are recommended to be adopted for minimum deterioration of air quality: ❖ Vehicles with excessive smoke emissions shall not be allowed to enter the project area ❖ Permissible limits of air pollution (as specified in the guidelines) will be monitored regularly and any deviation shall be taken care of; ❖ Signs for sensitive zones to disallow the use of pressure horns. ❖ To improve air quality roadside tree plantation will be done.
This impact is permanent and minor adverse.		
NOISE	The noise level will decrease because of smooth traffic flow	To avoid any noise pollution following mitigation measures should be taken into account: ❖ Ban on the use of pressure horns; ❖ Proper implementation of inspection and maintenance programs for vehicles. ❖ Strict check on the use of proper silencers especially for motorcycles.

ENVIRONMENT COMPONENT	ACTIVITIES AND POTENTIAL IMPACTS	MITIGATION MEASURES
This impact is permanent and minor adverse.		
LAND AND SOIL	Soil erosion at embankment during heavy rainfall	❖ Periodic checking is to be carried out to assess the effectiveness of the stabilization measure ❖ Necessary measures are to be followed wherever there are failures.
	This impact is temporary and minor adverse.	
WATER	No major adverse impact on surface and groundwater, however, Water logging may be caused due to blockage of drains	❖ Regular visual checks and cleaning of drains shall be done along the alignment to ensure that the flow of water is maintained through cross drains and other channels. ❖ To avoid the exception of some occasional oil spills due to any road accident emergency plan will be followed.
This impact is temporary and minor adverse.		
MAINTENANCE OF RIGHT OF WAY & SAFETY	Accident risks associated with traffic movement	❖ All safety features provided in the main approach roads such as guide rails, and speed bumps, will be maintained and kept in good condition. ❖ Traffic control measures, including speed limits, will be forced strictly. ❖ Further encroachment of squatters within the ROW will be prevented. ❖ Monitor/ensure that all safety provisions included in the design and construction phase are properly maintained.

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ENVIRONMENT COMPONENT	ACTIVITIES AND POTENTIAL IMPACTS	MITIGATION MEASURES
This impact is temporary and minor adverse.		
ROAD MAINTENANCE WORK	Lack of maintenance during the operational phase can cause harm	❖ Implementation of HSE Plans during the maintenance period. ❖ Strict implementation of PPEs. ❖ Use of high-quality equipment and material by the contractor ❖ Continuous improvements in the emergency plans. ❖ Placement of sign boards for traffic diversions and proper implementation of traffic diversion plans. ❖ Selection of suitable sites for contractor camps and implementation of all the related important protocols for the management of camp activities to avoid environmental and HSE issues. ❖ Conservation practices that limit particulate matter emissions will be incorporated into long-term maintenance plans.
		This impact is temporary and minor adverse.

8.8 POTENTIAL ENVIRONMENTAL ENHANCEMENT MEASURES

As an additional measure, the following steps will further enhance roadways environments where its related dividends will be continued to be received for a very long time far beyond the project life. Following potential environmental enhancement measures will be taken to protect the environment of the project area, workers, and road users.

8.8.1 Construction Traffic Management Plan (CTMP)

An appropriate systematic traffic management Plan is essential for safety and smooth traffic flows on roads, making maximum usage of road facilities to enlarge the current road capacities.

- (a) To achieve smooth traffic flow
- (b) To reduce traffic accidents, and
- (c) To create pedestrian-friendly facilities

This CTMP addresses the following Key Issues:

- ❖ Safety and amenities of road users and the public;
- ❖ Site security, site access, and signage;
- ❖ Project identification, including advertising and site signage;
- ❖ Traffic and road user delay and inconvenience management;
- ❖ Speed limit signage;
- ❖ Traffic transfer (switch) arrangements and procedures;
- ❖ Maintenance during Construction;
- ❖ Traffic and Safety Management Responsibilities;
- ❖ Construction staging including detailing the intersection layout and capacities for each construction stage;
- ❖ Emergency and Incident Response Plans

Table 8-3 below shows the risks to be dealt with during the design and construction stage of the Project that may affect safety. A comprehensive Traffic Management Plan is developed and attached with the report as Annexure B to avoid any inconvenience or traffic accident during the construction of the project.

Table 8-3: Construction Traffic Management Plan

RISKS	POTENTIAL CONSEQUENCES	PROPOSED RISK TREATMENT
Construction methods may disrupt traffic	Traffic delays cause frustration for drivers	❖ Consider methods of construction at an early stage during the design to reflect community needs and reduce delay times, therefore, minimizing the impact on traffic
Traffic management— inadequate anticipation and communication of issues	Potential community issues causing dissatisfaction and frustration	❖ Determine traffic routes and engage with the community to refine details. ❖ Confirm pre-existing conditions. ❖ Consider the need for a night assessment. ❖ Identify any short-term corrective actions.
Severe delays to traffic are perceived by the community as a direct result of the construction activities.	Community dissatisfaction, claims for time delays.	❖ Establish good public relations from the outset. ❖ Erect Early Warning information signs through Variable Message Signs (VMS). ❖ Early engagement in ascertaining needs and potential effects of changed access.
Major Traffic Incident.	Local traffic was disrupted upsetting locals	❖ Regular checking of Traffic Management Plan implementation. ❖ Have procedures in place for rapid recovery, Keep locals informed.

RISKS	POTENTIAL CONSEQUENCES	PROPOSED RISK TREATMENT
Access to the site for deliveries	Traffic disruption or interference	❖ Development of this Plan in conjunction with Community Communication Strategy – access points will be high-risk locations and will need detailed consideration. ❖ Simplification of traffic staging will simplify access arrangements or minimize impacts ❖ Signage and pre-delivery notifications for delivery routes to be clear and simple as per the VMP
Traffic Speed	Works in multiple areas across the Project may result in intermittent speed changes that may frustrate road users	❖ Traffic is to generally be reduced to 80kph speeds within the construction zone. The construction zone to be the full length of the Project
Pedestrian access	Potential disruption to progress causing pedestrians to not comply with pedestrian provisions	❖ Liaise closely with the relevant bodies from an early stage to ensure pedestrian access provisions are adequately addressed, well established, and maintained

RISKS	POTENTIAL CONSEQUENCES	PROPOSED RISK TREATMENT
Lowering speeds, when it is perceived as unnecessary	Poor public opinion and safety for workers if motorists start ignoring limits	❖ Appropriate design of traffic protection measures, intersections, alignments, etc. to allow consistent speed limits, i.e., 80km/h where ever possible.
Too many changed configurations	Unfamiliarity causes potential confusion among road users that may cause traffic incidents	❖ Keep motorists on the existing alignment for as long as possible. Effective use of TMP for advanced notification and clear direction during any traffic flow adjustments
Inadequate provisions for break-downs during construction	Traffic delay	❖ Design temporary break-down bays. Consider temporary verges where possible during the design of traffic staging
Dangerous entry and exits to sites and properties	Traffic Incident	❖ Ensure that entries and exits are designed to cater to expected traffic volumes and for sight distances, acceleration, and deceleration provision, and clear advanced warning signage
Seasonal traffic variations are not allowed	High volumes during holidays and weekends	❖ Consider seasonal volumes in programming works. Keep TMP informed and up to date. Be aware of reporting and notification requirements

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RISKS	POTENTIAL CONSEQUENCES	PROPOSED RISK TREATMENT
Reduced allowable movements	Traffic delays and confusion for commuters may lead to an incident	❖ Implement effective community engagement strategies that will consider businesses, property owner's requirements
Damage to local roads due to heavy vehicle movements	Vehicle damage and potential incidents.	❖ Allow for heavy vehicle movements in traffic staging and planning ensuring existing, temporary alignment and pavements are suitable during the construction period.

9.0 ENVIRONMENT MANAGEMENT & MONITORING PLAN

9.1 ENVIRONMENTAL MANAGEMENT AND MONITORING PROGRAM

This section provides a brief description of environmental issues, mitigation measures to eliminate and/or reduce environmental and social impacts to an acceptable level, institutional arrangement for the implementation of the mitigation measures and also carrying out environmental monitoring for air quality, water quality, and noise pollution-related parameters.

9.2 ENVIRONMENTAL MANAGEMENT PLAN

This EMP describes the mitigation and management measures to address the environmental issues during construction, and its regular operation.

3 OBJECTIVES OF THE ENVIRONMENTAL MANAGEMENT PLAN

9.3.1 General Objectives

The objectives of the EMP are as follow:

- ❖ Identify and assess the environmental status and trends continuously;
- ❖ Act as an early warning system, by identifying any sudden environmental deterioration that needs to be countered.
- ❖ Afford effective environmental surveillance and provide reliable information upon which continued environmental management of the project can be updated and refined.
- ❖ To outline functions and responsibilities of responsible persons.
- ❖ To state standards and guidelines, which are required to be achieved in terms of environmental legislation.
- ❖ To outline mitigation measures and environmental specifications which are required to be implemented for all phases of the project to minimize the extent of environmental impacts and to manage the environmental impact associated with the proposed project.
- ❖ To prevent long-term or permanent environmental degradation
- ❖ To identify training requirements at various levels.

9.3.2 Objectives during Pre-Construction and Construction Stages

These are to:

- ❖ Monitor actual impacts on physical, biological, and socio-economic & human resources.
- ❖ Provide early warning to the project management whether the intensity of an impact is more severe than the one predicted.
- ❖ Suggest mitigation measures for the impacts which had not been anticipated in the EIA.
- ❖ Suggest mitigation measures for the impacts whose intensity is more severe than those predicted during the EIA.
- ❖ Furnish feedback for correction of any deficiencies / improper situations.
- ❖ Ensure compliance with the administrative and legal framework.
- ❖ Ensure fulfillment of the obligations required under Punjab Environmental Quality Standards (PEQS).
- ❖ Restore/rehabilitate construction camps and workshop sites.
- ❖ Ensure proper disposal of excavated soil and excess construction materials.
- ❖ Monitor rehabilitation of the borrow areas/pits.
- ❖ Ensure specified construction of project infrastructure.
- ❖ Monitor a-forestation along roads.

9.3.3 Objectives during the Operation and Maintenance (O&M) Stage

These are to:

- ❖ Monitor the effectiveness of mitigation measures.
- ❖ Evaluate the effectiveness of the EIA in the backdrop of projected levels of impact.
- ❖ Suggest modifications/improvements in construction procedures.
- ❖ Determine the survival rate of tree plantation along the roads.

INSTITUTIONAL CAPACITY

Project Proponent, (LDA) will be responsible for Monitoring and Evaluation, but the Environment consultant (of the proponent) will be responsible to monitor EMP implementation in the field and reporting to the Project Proponent. The Project Proponent will integrate monitoring reports in the main monthly reports of the project. The District Office of the EPA (Lahore) in the project area will monitor the overall activity at the site.

5 ORGANIZATIONAL STRUCTURE: ROLES & RESPONSIBILITIES

9.5.1 Primary Responsibilities

The project Manager of the proposed project will be responsible on the L.F.A's behalf to carry the primary responsibilities and local legislations for the overall duration of the project.

9.5.2 Operation Management & Control

Conducting the development activities in an environmentally sound manner will be the responsibility of the Project Manager.

9.6 PERFORMANCE INDICATORS

The following are the performance indicators:

- ❖ Decreased Vehicle Operating Costs.
- ❖ Control of air and noise pollution.
- ❖ Improved flow of traffic.
- ❖ Alleviation of poverty.

9.7 COMMUNITY AND WORKER HEALTH & SAFETY

The objective of environmental health and safety is to provide workers with safe and healthy working conditions and prevent accidents, injuries, and diseases. It also covers the establishment of preventive and emergency preparedness and response measures to avoid, and where avoidance is not possible, to minimize, adverse impacts and risks to the health and safety of local communities. It is therefore a combination of occupational health and safety of staff/workers at the subcomponent facilities and community health and safety of people living nearby or potentially affected by failures or poor operation of facilities.

Safety risks are mainly related to the construction phase. Residents, particularly children, are at risk during project construction. In linear construction activities such as road construction and pipe network construction which typically occur in areas frequented by the public, physical and educational measures to protect residents from risks are needed.

A comprehensive Occupational Health and Safety plan is developed and provided as Annexure-C. It is the responsibility of the contractor to implement the OHS Plan to avoid any fatal accident/injury.

Safety measures for construction staff and the public will include the following responsibilities of the Contractor:

- (i) Providing safe and convenient passages for the public;

- (ii) Providing construction workers with sufficient personal protection equipment as hard hats, earpiece, safety shoes, and others;
- (iii) providing seminars on safety issues to the local public, particularly school in
- (iv) Installing warning signs where potential dangers are present;

Ensuring construction staff are on duty on or near heavy movement of construction vehicles, or heavy construction vehicle traffic through the villages to ensure safety. Setting up traffic signs at and near construction sites. Health risks are primarily related to the increased transit population during construction (construction workers) and on (visitors) in the regions. The increased mobile population could potentially help spread infectious diseases in the Project area. Workers could spread diseases such as hepatitis to residents as well as among themselves. Measures for protecting human health include:

- (i) Providing disease prevention and control training to construction workers, particularly epidemic diseases such as hepatitis B before the start of construction. Leaflets and education seminars will be organized, in association with the government and communities, to increase awareness and knowledge;
- (ii) Providing posters in and around the construction sites for disease control, not only construction workers but also villagers and others in the areas;
- (iii) Providing periodical health checks to construction workers to ensure their health and well-being.

9.8 INSTITUTIONAL MONITORING ARRANGEMENTS

9.8.1 Establishment of Environmental Monitoring Cell

The monitoring and evaluation will be carried out during the construction and operation of the Project. There is thus a need of establishing a well-structured Environmental Monitoring Cell (EMC) for the Project. Keeping in mind the financial constraints, EMC personnel will be taken from the existing establishment.

9.8.2 Training of Monitoring Team

For capacity building of LDA staff, there is a dire necessity for environmental training where a general training vacuum has been felt at all levels. Without appropriate training there are apprehensions that EMP cannot be implemented in letter and spirit. The following

training activities have been proposed for wider dissemination of benefits to a larger number of stakeholders:

Following three different types of training workshops are proposed, each having its function, level of participants, and a particular segment of stakeholders, including their sensitization to environmental affairs of roads.

- (a) Advanced Environmental Training Workshops
- (b) Environmental Mitigation & Monitoring Workshops
- (c) Community Consultative Workshops.
- (d) One- day Training session on Health and Safety

9.9 ENVIRONMENTAL MANAGEMENT PLAN DURING THE CONSTRUCTION AND OPERATIONAL PHASE

Table 9-1 shows the planned Environmental Management Plan (EMP) for the project Development of a Controlled Access Corridor Facility From Niazi Interchange To Babu Sabu Interchange, Lahore during the construction and operational phase respectively. This EMP shows the goal of each effect that why we are moderating the undertaking and predicting impacts. The individual responsible to actualize and screen the EMP is also discussed in Table 9-1 and Table 9-2 below. Details of anticipated impact mitigation are discussed in Chapter No: 8 of this EIA Report titled Screening of Environmental Impacts & Mitigation Measures.

Table 9-1: Environmental Management Plan during Construction Phase

Impact	Objectives	Mitigation	Responsibility	
			Implementation	Monitoring
Topography	To ensure minimum changes in the topography of the project area.	❖ Project design should consider aesthetic concerns.	Construction Contractor	Project Manager Construction Contractor
Air Quality	Ensure that the pollution level does not exceed the limit	❖ Regular monitoring of vehicular emissions ❖ All vehicles, machinery, equipment, and generators used during construction activities shall be kept in good working condition and be properly tuned and maintained to minimize exhaust emissions; ❖ Open burning of solid waste from the Contractor's camps will be strictly banned. ❖ To avoid dust from construction activity Storage of construction materials is to be carried out in accordance with the construction material storage and handling plan and storage areas shall be no less than 500m from communities.	Construction Contractor	Project Manager Construction Contractor Approved Monitoring Authority

Impact	Objectives	Mitigation	Responsibility	
			Implementation	Monitoring
Noise		❖ Ensure implementation of the Dust management plan provided in Annexure- C		
	To minimize noise level	❖ Selection of up-to-date and well-maintained plant or equipment with reduced noise levels ensured by suitable inbuilt damping techniques or appropriate muffling devices. ❖ Confine excessively noisy work to normal working hours in the day, as far as possible. ❖ During construction, suitable hearing protection like ear caps or earmuffs will provide to workers. ❖ Preferably, restrict construction vehicles' movement during nighttime ❖ Contractors shall comply with the submitted work schedule, keeping noisy operations away from sensitive points; implement regular maintenance and repairs; and employ a strict implementation of operational procedures;	Construction Contractor Project Manager Construction Contractor Approved Monitoring Authority	

Impact	Objectives	Mitigation	Responsibility	
			Implementation	Monitoring
Flora & Fauna	To minimize impacts on the flora	❖ The project includes a rehabilitation plan through landscaping a large area which will improve vegetative cover.	Construction Contractor	Project Manager Construction Contractor
		❖ The tree plantation plan is planned and will be implemented according to the plan (See Annexure) ❖ The cleared proposed site must be surveyed and demarcated before construction commences ensuring no unnecessary loss of natural vegetation outside the approved footprint. ❖ The contractor's staff must not harvest any natural vegetation. ❖ Vehicles and machinery should not encroach into areas outside/surrounding the planned project footprint. ❖ The project area must be monitored for any new growth of invasive plants until completion of construction.		

Impact	Objectives	Mitigation	Responsibility	
			Implementation	Monitoring
Construction Camps	To minimize loss of assets and vegetation/trees due to construction of construction camps.	❖ The contractor shall provide a plan for removal & rehabilitation of the site upon completion; ❖ Reinstate any temporary facilities to pre-existing conditions in ecologically sensitive areas; ❖ Implement landscaping plan for all facilities in areas where high landscape value and visual vulnerability to the proposed activities warrants site-specific landscape restoration measures; ❖ Operate equipment in a manner sympathetic to the ambient noise environment. ❖ Do not leave equipment idling unnecessarily;	Construction Contractor	Project Manager Construction Contractor
		❖ Incorporate technical design measures to minimize the removal of trees, if possible such as a change in alignment. ❖ Disallow the introduction of exotic species with known environmental setbacks.		
Ecology	To avoid/minimize tree cutting.		Construction Contractor	Project Manager Construction Contractor

Impact	Objectives	Mitigation	Responsibility	
			Implementation	Monitoring
		❖ The vegetation which can be translocated, should be moved. The task may be assigned to the relevant department i.e. PHA for safe translocation. ❖ The contractor will provide gas cylinders at the camps for cooking purposes and cutting of trees/shrubs/bushes for fuel will not be allowed.		
Social Disturbance	To minimize the entry/exit problems of the locals in the Project Area.	❖ Inform residents of the area about the detail of work, likely disturbances, and their duration and to whom they should address their complaints. ❖ Establishing good community relationships so that any disruption can be resolved with due consideration of the community.	Construction Contractor	Project Manager Construction Contractor
Public Utilities	To avoid disturbance to the public.	❖ Incorporate technical design features to minimize the effect on public utilities.	Construction Contractor	Project Manager Construction Contractor

Impact	Objectives	Mitigation	Responsibility	
			Implementation	Monitoring
Water Resources	To avoid/minimize the contamination of surface and groundwater bodies.	❖ All public utilities will need to be relocated well before the commencement of construction work.		
		❖ Protection of groundwater reserves will be ensured from any source of contamination such as construction waste and spillage. ❖ The contractor will repair/replace/compensate for any damages caused by the Construction activities to the drinking water source/s. ❖ Use of spill prevention trays and impermeable sheets to avoid contamination of the groundwater/surface water ❖ Take immediate action by following the instruction mentioned (Emergency response plan, <i>Annexure-</i>) ❖ Furthermore, septic tanks will need to be constructed which will be cemented to prevent the groundwater contamination	Construction Contractor	Project Manager Construction Contractor Approved monitoring agency

Development of a Controlled Access Corridor Facility from Niaz Interchange To Babu Sabu Interchange, Lahore

Impact	Objectives	Mitigation	Responsibility	
			Implementation	Monitoring
Construction Waste & Debris	To avoid any illegal dumping and minimal impact on the environment	❖ Dumping sites will be selected away from residential areas and water bodies ❖ Dumping sites must be having an adequate capacity equal to the amount of debris generated. ❖ Minimize the production of waste materials by the 3R (Reduce, Recycle, and Reuse) approach. ❖ Burning of solid waste will be prohibited. ❖ All personnel will Train and instruct in waste management practices and procedures as a component of the environmental induction process ❖ All excavated materials from roadway, shoulders, verges, drains, and cross drainage will be used for backfilling embankments, filling pits, and landscaping. ❖ Unusable and non-bituminous debris materials will be suitably disposed of at pre-	Construction Contractor	Project Manager Construction Contractor

Impact	Objectives	Mitigation	Responsibility	
			Implementation	Monitoring
		designated disposal locations, with the approval of the concerned authority. ❖ The bituminous wastes shall be disposed of in secure landfill sites only in an environmentally accepted manner. ❖ Unusable and surplus materials, as determined by the Project Engineer, will be removed and disposed of site.		
Health and safety of workers	To minimize health risks	❖ Implementation of Health and Safety Plan as given in <i>Annexure</i> ❖ Provide basic medical training to specified work staff and basic medical services and supplies to workers; ❖ Work safety measures and good workmanship practices are to be followed by the contractor to ensure no health risks for laborers;	Construction Contractor HSE Officer	Project Manager Construction Contractor HSE Officer

Impact	Objectives	Mitigation	Responsibility	
			Implementation	Monitoring
		❖ Protection devices (ear muffs) shall be provided to the workers doing the job in high-noise areas. ❖ Provision of adequate sanitation, washing, cooking, and dormitory facilities; ❖ Proper maintenance of facilities for workers will be monitored; ❖ Provision of protective clothing i.e. helmet, adequate footwear for bituminous pavement works, protective goggles, gloves, etc. for laborers handling hazardous materials; ❖ Ensure strict use of wearing this protective clothing during work activities. ❖ Instruct foremen to strictly enforce the keeping out of non-working persons, off work sites; ❖ Adequate signage, lightning devices, barriers, yellow tape, and persons with flags during construction to manage traffic on Road.		

Impact	Objectives	Mitigation	Responsibility	
			Implementation	Monitoring
		❖ Protection devices (ear muffs) shall be provided to the workers doing the job in high-noise areas. ❖ Provision of adequate sanitation, washing, cooking, and dormitory facilities; ❖ Proper maintenance of facilities for workers will be monitored; ❖ Provision of protective clothing i.e. helmet, adequate footwear for bituminous pavement works, protective goggles, gloves, etc. for laborers handling hazardous materials; ❖ Ensure strict use of wearing this protective clothing during work activities. ❖ Instruct foremen to strictly enforce the keeping out of non-working persons, off work sites; ❖ Adequate signage, lightning devices, barriers, yellow tape, and persons with flags during construction to manage traffic on Road.		

Impact	Objectives	Mitigation	Responsibility	
			Implementation	Monitoring
Borrow Areas	To avoid land disputes and to minimize soil erosion	❖ No excavations are allowed within a distance of 500 m to RoW; ❖ In borrow pits, the depth of the pit will be regulated so that the sides of the excavation will have a slope not steeper than 1:4; ❖ Soil erosion along the borrow pit shall be regularly checked to prevent/mitigate impacts on adjacent lands; and ❖ In case borrow pits fill with water, measures have to be taken to prevent the creation of mosquito-breeding sites.	Construction Contractor	Project Manager Construction Contractor
		❖ Materials having the potential to produce dust shall not be loaded to a level higher than the side and tail boards and shall be covered with clean tarpaulin in good condition. ❖ Noise mufflers shall be installed and maintained in good condition on all motorized equipment under the control of the contractor	Construction Contractor	Project Manager Construction Contractor
Impacts of Heavy Vehicles	The working of heavy vehicles on the existing road network may result in air pollution			

Impact	Objectives	Mitigation	Responsibility	
			Implementation	Monitoring
Traffic Management	To minimize traffic problems in the Project Area.	❖ A proper traffic management plan as provided in Annexure B shall be implemented to avoid traffic jams / public inconvenience. ❖ Place substantial blocking under any chain-hoist suspended or jack-supported equipment under which people must work. ❖ All work areas shall be provided with proper ventilation. ❖ Secure unbolted heavy parts or engines if necessary to leave the work.	Construction Contractor	Project Manager Construction Contractor
Maintenance of Construction Equipment	Improper maintenance of construction equipment may lead to safety and environmental hazards	❖ A waste management plan shall be implemented including the provision of waste bins, defining collection frequencies, allocating personnel, and defining safe disposal options.	Construction Contractor	Project Manager Construction Contractor
Waste	To minimize odor, spreading of diseases, and clogging of canal and drain.	❖ One strategy for conserving aggregate resources and reducing the demand for virgin	Construction Contractor	Project Manager Construction Contractor
Conservation of Resources and	To minimize any burden on the natural resources			

Impact	Objectives	Mitigation	Responsibility	
			Implementation	Monitoring
Environmental Sustainability		aggregate is to recycle and reuse materials in road construction; ❖ Reuse of materials, such as concrete and asphalt, reduces the need for concrete and asphalt manufacturing, reduces greenhouse gas (GHG) emissions, and reduces waste disposal costs and emissions; ❖ Use solar panels and LED lights in the construction camps instead of using diesel-operated generators and normal bulbs. ❖ Waste minimization strategies will be developed and followed. ❖ To reduce the level of energy consumption, warm-mix asphalt (WMA) will be used to replace hot-mix asphalt (HMA). Besides the fact that WMA is produced at a lower temperature, it also induces great benefits such as an improvement of working conditions (less exposure to heat and fumes)		

Impact	Objectives	Mitigation	Responsibility	
			Implementation	Monitoring
		and asphalt compaction, reduction of paving cost, and longer hauling.		
Site Restoration and Rehabilitation	Proper implementation of the plan	❖ A contractor will prepare site restoration plans, which will be approved by the 'Engineer'.		
		❖ The clean-up and restoration operations are to be implemented by the contractor before demobilization		
		❖ All construction zones including culverts, roadside areas, camps, hot mix plant sites, crushers, batching plant sites, and any other area used/affected by the project will be left clean and tidy, to the satisfaction of the Environmental officer.		
		❖ All the opened borrow areas will be rehabilitated and the 'Engineer' will certify.		
			Construction Contractor	Project Manager Construction Contractor

Table – 9-2: Environmental Management Plan during Operational Phase

Impact	Objectives	Mitigation	Responsibility	
			Implementation	Monitoring
Air Quality	Ensure that the pollution level does not exceed the limit.	❖ Regular monitoring of vehicular emissions. ❖ Impose a fine on vehicles emitting gaseous emissions beyond the prescribed limit.	LDA Project Manager	Project Manager Approved Monitoring Authority
Noise	To minimize noise levels	❖ Ban the use of pressure horns ❖ Proper implementation of inspection and maintenance program for vehicle ❖ Strict check on the use of proper silencers especially for motorcycles	LDA Project Manager	Project Manager Approved Monitoring Authority
Land and Soil	To avoid soil erosion	❖ Periodic checking is to be carried out to assess the effectiveness of the stabilization measures viz. turfing, stone pitching, river training structures, etc. ❖ Necessary measures to be followed wherever there are failures	LDA Project Manager	Project Manager Approved Monitoring Authority
Water Quality	To minimize the water contamination	❖ Regular visual checks and cleaning of drains shall be done along the alignment to ensure	LDA Project Manager	Project Manager

Impact	Objectives	Mitigation	Responsibility	
			Implementation	Monitoring
	To avoid blockage of drains (waterlogging)	that the flow of water is maintained through cross drains and other channels. ❖ To avoid the exception of some occasional oil spills due to any road accident emergency plan will be followed. ❖ Monitoring of water-borne diseases due to stagnant water bodies		Approved Monitoring Authority
Maintenance of Right of Way & Safety	To avoid chances of accidents	❖ Safety measures shall provide in case of emergency ❖ Social awareness will be addressed among people on how to avoid any accidents with fast-moving vehicles. ❖ All safety features provided in the main approach roads such as guide rails, and speed bumps, will be maintained and kept in good condition. ❖ Traffic control measures, including speed limits, will be forced strictly.	LDA Project Manager	Project Manager Project HSE Officer

Impact	Objectives	Mitigation	Responsibility	
			Implementation	Monitoring
		❖ Further encroachment of squatters within the ROW will be prevented. ❖ Monitor/ensure that all safety provisions included in the design and construction phase are properly maintained.		
Road Maintenance work	To control HSE and environmental-related issues.	❖ Strict enforcement of speed limits, installation of speed guns, and channelization of traffic concerning categories (heavy vehicle traffic and light vehicle traffic) and enforcement of penalties for the violators. ❖ Implementation of HSE Plans during the maintenance period. ❖ Strict implementation of PPEs. ❖ Use of high-quality equipment and material by the contractor. ❖ Continuous improvements in the emergency plans.	LDA Project Manager	Project Manager Project HSE Officer

9.10 EQUIPMENT MAINTENANCE DETAIL

Equipment shall be inspected, tested, and maintained by qualified trained personnel. If any equipment is not in good operating condition, it should be repaired immediately. Authorized dealers will be responsible for the maintenance of equipment. Equipment procedures and maintenance guidelines shall be kept in a central location for quick reference when needed

9.11 ENVIRONMENT MANAGEMENT COST

The total cost for environmental management is estimated at 14 Million. Details are given below in Table 9-3:

Table 9-3: Environment Management Cost

Environmental Component	Quantity	Amount PKR
Contractor Environmental Specialist	3	3.0
Air and Water Quality & Noise Monitoring	5	4.0
Health and Safety Measures and Provision of PPEs	Lumpsum	3.5
Roadside Tree Plantations of Endemic / Local Species	Lumpsum	3.5
TOTAL		14 Million

10.0 INVOLVEMENT OF STAKEHOLDERS / PUBLIC CONSULTATION

10.1 GENERAL

Stakeholder consultation is a means of involving all primary and secondary stakeholders in the project's decision-making process to address their concerns, improve project design, and give the project legitimacy. Stakeholder consultation, if conducted in a participatory and objective manner, is a means of enhancing project sustainability. Community input (both knowledge and values) on socioeconomic and environmental issues can greatly enhance the quality of decision-making. Stakeholder consultation was therefore conducted in the project area not only to satisfy the legal requirements of the EIA process in Pakistan but also to improve and enhance the social and environmental design of the project.

The following chapter includes detailed information on the process and parties that depicts the involvement and consultation of the important stakeholders that is conducted by the Sustainable Environment Consultant. The consultation is carried out to resolve any kind of issues that are involved and can be potentially affected by the proposed project. The activity plays an important role in decision-making and keeps in view the concerns of stakeholders. The parties that are involved in the process are as follows:

- Local government
- Local community
- Affected community (directly and indirectly)
- General public
- Service providers
- Proponents

10.2 PROPONENT'S ENVIRONMENTAL MANAGEMENT TEAM

All possible impacts and mitigation measures related to the project were discussed with the proponent (LDA) and management. Proponent assured us to take all suggested mitigation measures to control any discrepancy that arose during the project construction and to make the protected environment friendly.

10.3 THE RESPONSIBILITY AUTHORITY

Lahore Development Authority shall be the responsible authority to take all measures before starting the project construction activity.

10.4 OTHER DEPARTMENTS AND AGENCIES

For the impact analysis detailed with the management, local community, educational institutes, and shopkeepers. All issues were discussed related to the implementation of the project. Scoping sessions, focused group discussions and wayside consultations were held with the relevant stakeholders in the area. The following Departments were also consulted;

- EPA
- TEPA
- WASA
- Civil defense
- Rescue 1122
- PHA

10.5 ENVIRONMENTAL PRACTITIONERS AND EXPERTS

During a visit to the project site, discussions with stakeholders and consulted with the local people of nearby areas to evaluate the project's socio-economic impacts. People of the area belong to different professions mostly belong to employment, own businesses, doctors, some abroad, teaching, etc. women were also consulted for their points of view regarding the betterment of the area through this project, some of them communicated but according to the social value of the area, they mostly hesitate to communicate comfortably and get pictured. People provide a massive information about the project and have positive remarks regarding the project development.

10.6 AFFECTED AND WIDER COMMUNITY

A large number of community and local businesses will be affected due to the construction of the proposed project. The team has consulted with the inhabitants of neighboring areas. The remarks of people are positive regarding the project and people foresee positive impacts like the smooth flow of traffic, business, development of the area, etc.

10.7 PUBLIC CONSULTATION:

During the fieldwork public consultations were carried out by the team members of the Integrated Environment Consultant (IEC) to brief the people of nearby areas about the Project. The participants included residents, workers, students, and others concerned. The majority of people are having positive comments/concerns regarding the Project.

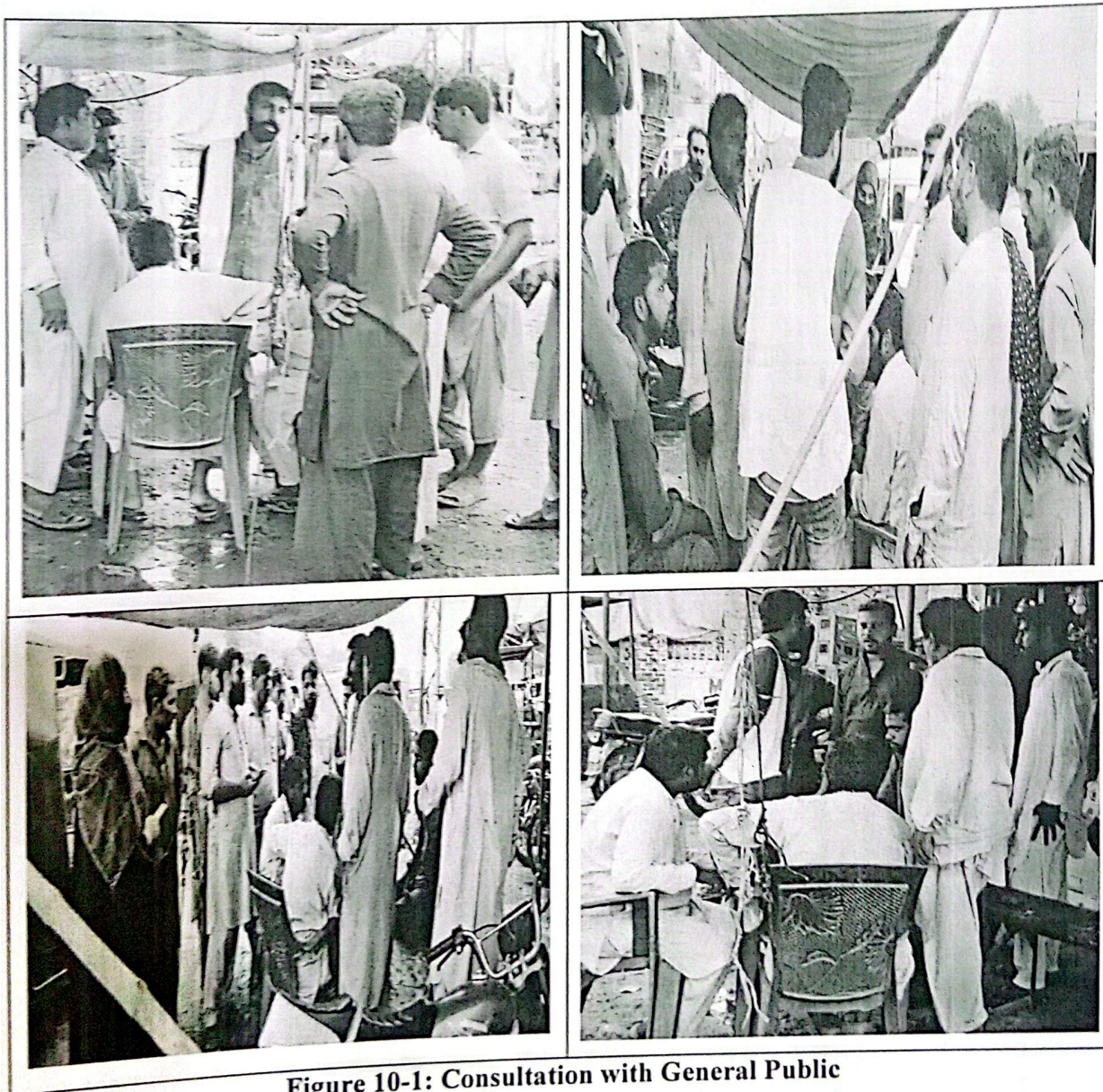


Figure 10-1: Consultation with General Public

Table 10-1 List Of Individuals Consulted Along With Their Written Feedback

Sr. No	Individuals Name	Designation	Address	Date	Feedback
1.	Iqrar Ahmad	Business	Babu Sabu	10-8-2023	This project will provide good job opportunities.
2.	Waqas	Worker	Babu Sabu	10-8-2023	As a result of this project, the probability of accidents will be reduced.
3.	Nouman Malik	Student	Babu Sabu	10-8-2023	The project will provide a smooth flow of traffic.
4.	Faisal Awan	Job	Babu Sabu	10-8-2023	It's a good initiative. The project will provide a smooth flow of traffic.
5.	Wajahat Naeem	Shopkeeper	Babu Sabu	10-8-2023	Local labor should be hired on a priority basis.
6.	Ahsen Waleed	Shopkeeper	Babu Sabu	10-8-2023	The proposed project is a step towards better facilities for residents.
7.	Shahbaz	Student	Babu Sabu	10-8-2023	It will facilitate residents.
8.	Waqar Ali	Student	Shaheenabad	10-8-2023	This project will provide smooth flow and will reduce traffic congestion
9.	Baber Ahmad	Medical Store	Shaheenabad	10-8-2023	Clear working hours and notifications to the public regarding excessively noisy activities

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10.	Idrees Ali	Food Stall	Shaheenabad	10-8-2023	During the project implementation traffic should remain uninterrupted
11.	Husnain	Autoshop	Shaheenabad	10-8-2023	It is a very good initiative taken by the authority but they should not destroy the environment and there should be a green belt around the project area
12.	Mubarak Ali	Fruit Stall	Shaheenabad	10-8-2023	It will facilitate residents and will minimize the chances of accidents.
13.	Ghulam Ahmad	Security Guard	Gulshan-e- Ravi	10-8-2023	The project will provide a smooth flow of traffic
14.	Mehmood Amjad	Private Business	Gulshan-e- Ravi	10-8-2023	This project will create jobs opportunity for the locals and the value of the nearby land will also increase
15.	Ali Hassan	Fruit Stall	Gulshan-e- Ravi	10-8-2023	During the project implementation traffic should remain uninterrupted
16.	Arshad Ahmad	Driver	Gulshan-e- Ravi	10-8-2023	As a result of this project, the probability of accidents will be reduced.
17.	Nadeem Bashir	Student	Gulshan-e- Ravi	10-8-2023	The project will provide a smooth flow of traffic
18.	Haider Waqar	Driver	Gulshan-e- Ravi	10-8-2023	This project will create jobs opportunity for the locals and the value of the nearby land will also increase

11.0 CONCLUSION AND RECOMMENDATIONS

Primary and secondary data were used to assess the environmental impacts of the project road, which were assessed comprehensively. This EIA Report provided a picture of all potential environmental impacts associated with the Project and makes suitable recommendations for mitigation measures.

The roadway mostly follows the existing alignments, being the best option from the environmental, legal, engineering, and socioeconomic points of view. Environmental impacts associated with the Project need to be properly mitigated through the existing institutional arrangements, which need to be augmented for optimum utilization of available resources.

The bulk of environmental impacts will take place during the construction phase. Implementation of mitigation measures during this period will be assigned to the contractors. However, traditionally contractors have little perception and understanding of environmental problems. Hence, the required environmental mitigation must be clearly described in the contract documents, and an environmental supervising consultant must monitor the implementation mechanism. This Report, including the EMP, should be used as a basis for an environmental compliance program.

The EIA Report has thoroughly assessed all the potential environmental impacts associated with the Project. The environmental impacts identified by the study are manageable and will be mitigated by LDA and contractors at various stages, as suggested in the Report. Based on the findings of the EIA, it is concluded that the project will pose some negative impacts that can be mitigated with the proper implementation of measures suggested in the Environmental Management Plan.

Therefore, it is recommended that the competent authority may please be issues Environmental Approval for the operation of this project.

REFERENCES

Listed below are some of the documents, reports, and other references consulted during the preparation of this Report:

- ❖ Information and data provided by project proponents;
- ❖ Project Pre-Feasibility Study Report;
- ❖ Technical Design Data related to the project.
- ❖ Information gathered through discussions with the project-related persons of the project proponent;
- ❖ Information collected from the Technical documents of various suppliers of machinery/equipment.
- ❖ The Punjab Environmental Protection Act 1997 (Amended 2012) covers aspects related to:
 - The protection, conservation, rehabilitation, and improvement of the environment and the prevention, control of pollution, and promotion of sustainable development;
 - Establishing complete regulatory and monitoring bodies, policies, rules, regulations, and Pakistan Environmental Quality Standards; and
 - To ensure enforcement, the act establishes regulating bodies i.e. Punjab Environmental Protection Council (PEPC), and responsible bodies i.e. Punjab Environmental Protection Agency (PEPA) at Provincial Level.
- ❖ Environment-related Laws in Pakistan;
- ❖ Government of Pakistan, Pakistan Environmental Protection Agency, Policy and Procedures for Filing, Review, and Approval of Environmental Assessment, 2000;
- ❖ Google earth, maps.
- ❖ Guidelines for Public Consultations – These guidelines cover:
 - Consultation, involvement, and participation of Stakeholders
 - Techniques for public consultation (principles, levels of involvement, tools, building trust)
 - Effective public consultation (planning, stages of EIA where consultation is appropriate)
 - Consensus building and dispute resolution.
- ❖ Work Place Safety and Health Act 2011
- ❖ Pakistan Penal Code, 1860

GLOSSARY

Air Quality	Measurement of the pollutants in the air; a description of the healthiness and safety of the atmosphere.
Consultation	Consultation refers to two-way transfer of information or joint discussion between project staff and the affected population. Systematic consultation implies a sustained and rigorous sharing of ideas. Bank experience shows that consultation often yields the best resettlement alternatives, fruitful procedures for continued participation, and independent information on actual conditions for implementation.
Contractor	A person or firm undertakes a contract to provide materials or labor to perform a service or do a job.
Disclosure	The action of making new or secret information known
Environmental Management	Attempt to control human impact on and interaction with the environment in order to preserve natural resources
Effluent	Wastewater – treated or untreated – that flows out of a treatment plant, sewer, or industrial outfall. Generally refers to wastes discharged into surface waters
Electrical conductivity	Electrical Conductivity is an indirect measure for finding the total dissolved solids in a water body
Evaluation	The making of a judgment about the amount, number, or value of something; assessment.
Geology	A science that studies rocks, layers of soil, etc., in order to learn about the history of the Earth and its life
Ground Water	Aquifers currently being used as a source of drinking water or those capable of supplying a public water system. They have a total dissolved solid content of 10,000 milligrams per liter or less, and are not "exempted aquifers."

Hazardous	Substance or material, which could adversely affect the safety of the public, handlers or carriers during transportation
Impact	Effect on someone or something
Jurisdiction	The extent of the power to make legal decisions and judgments.
Mitigation	The action of reducing the severity, seriousness, or painfulness of something
Monitoring	Supervising activities in progress to ensure they are on-course and on-schedule in meeting the objectives and performance targets
Occupational Health	Maintenance of the highest degree of physical, mental and social well-being of workers in all occupations by preventing departures from health, controlling risks and the adaptation of work to people, and people to their jobs
pH	pH is a measure of how acidic / basic water is.
Project Area	The area specified by the funding and / or implementing agency according to the Official Gazette Notification and includes the areas within the administrative limits of the Federal or a Provincial Government.
Project Manager	The person in overall charge of the planning and execution of a particular project.
Proponent	A person who advocates a theory, proposal, or course of action.
Rehabilitation	Include all compensatory measures to re-establish; at least lost incomes, livelihoods, living and social systems. It does not include the payment of compensation for required assets.
Resettlement	Means all measures taken to mitigate any and all adverse impacts, resulting due to execution of a project on the livelihood of the project affected persons, their property, and includes compensation, relocation and rehabilitation.

Road	A road is a thoroughfare, route, or way on land between two places that has been paved or otherwise improved to allow travel by foot or some form of conveyance, including a motor vehicle etc.
ROW	A right-of-way (ROW) is a right to make a way over a piece of land, usually to and from another piece of land.
Scope	The extent of the area or subject matter that something deals with or to which it is relevant
Social Environment	It includes the culture that the individual was educated or lives in, and the people and institutions with whom they interact.
Stakeholders	Include affected persons and communities, proponents, private and public businesses, NGOs, host communities and EPA.
Topography	Details of the surface features of land. It includes the mountains, hills, creeks, and other bumps and lumps on a particular hunk of earth.
Turbidity	Turbidity is the amount of particulate matter that is suspended in water.