

CONSTRUCTION OF LPG STORAGE AND FILLING PLANT

M/S K2M ENERGY (PVT) LIMITED



ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

Prepared by



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EXECUTIVE SUMMARY

In Pakistan, LPG (Liquefied Petroleum Gas) plays a crucial role in the energy landscape as a versatile and efficient fuel source. With its growing demand in both domestic and industrial sectors, LPG provides a reliable alternative to traditional fuels such as natural gas and coal. Its use is particularly significant in regions with limited access to natural gas infrastructure, where LPG serves as a primary cooking and heating fuel. The adoption of LPG contributes to energy security by diversifying fuel options and reducing dependence on imported oil, which aligns with Pakistan's goals of sustainable energy development.

The project involves the construction of a Liquefied Petroleum Gas (LPG) storage and filling plant to enhance energy accessibility and distribution in Lahore, one of Pakistan's largest and most rapidly developing cities. As a major industrial and commercial hub, Lahore has a growing demand for clean and efficient energy sources. This facility will ensure the safe storage, handling, and filling of LPG while adhering to national environmental and safety regulations. By promoting the use of cleaner energy, the project aims to support the city's economic growth, create employment opportunities, and contribute to environmental sustainability. Additionally, strict safety protocols and environmental management measures will be implemented to minimize potential risks and ensure compliance with relevant standards.

The proposed project for the commissioning of its objective and construction requires fulfilling the legal requirements of the Punjab Environmental Protection Act (amended act 2012), Section 12, for which this Environmental Impact Assessment (EIA) report is being submitted.

i- TITLE AND LOCATION OF PROJECT:

Title: Construction Of LPG Storage and Filling Plant By M/S K2M Energy Private Limited.

Location: Khewat No. 566/314, 519/235, 519, Khatooni No. 666 & 588, Sultana Industrial Estate, Mouza Sadhoki and Sindhar Tehsil Model Town, District Lahore.

ii- PROJECT PROPONENT

Proponent: Muhammad Atif

Address: 24-A, Abid Majeed Road, Bridge Colony, Lahore Cantt.

iii- NAME OF ORGANIZATION PREPARING REPORT:

Organization: Climate Caretakers

Address: Flat 112, Subhan Center, Johar Town Lahore.

iv- BRIEF OUTLINE OF PROJECT

The proposed project aims the Construction of LPG Storage and Filling Plant by M/S K2M Energy Private Limited. A storage tank capable of collectively storing a total of 100 metric tons (2x50) of LPG are proposed to be constructed. The daily storage capacity for the tanks is proposed as 20-30 Metric tons. The total area of the project is 64220 SFT. The proposed location for its construction is Khewat No. 566/314, 519/235, 519, Khatooni No. 666 & 588, Sultana Industrial Estate, Mouza Sadhoki and Sindhar Tehsil Model Town, District Lahore.

v- ENERGY AND WATER AVAILABILITY

The electricity supply is the usual 500 kVA supply from electricity board that is IESCO. To meet the emergency as well as critical power requirements during electricity shut down the project also have a supportive facility for standby power generation. The water requirements of the facility will be fulfilled by the Municipal supply for all the construction and operational activities

vi- PROJECT IMPACTS AND RECOMMENDATIONS FOR THEIR MITIGATION

Impact assessment is crucial for project initiation as it enables the identification and comprehension of a project's potential positive and negative effects. Understanding these impacts aids in tailoring the project to maximize benefits and minimize risks. Impact assessment assists in recognizing environmental, social and economic challenges and risks and gives the directions to develop strategies that mitigate these risks and adjust the plan accordingly.

Table E-1 Possible Impacts and their Mitigation Measures

Possible Impact	Impact Magnitude	Proposed Mitigation Measures
CONSTRUCTION PHASE		
<p>Dust emissions likely to occur during the excavation of the top soil.</p> <p>Vehicular Emission from the heavy machinery used.</p>	<p>Minor/Short Term</p>	<ul style="list-style-type: none"> • Water Sprinkling on construction areas when necessary. • Cover all trucks hauling soil, sand and other loose materials or require all trucks to maintain at least two feet of freeboard. Pave, apply water when necessary, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas and staging areas at construction sites. • Cleaning of all paved access roads, parking areas and staging areas at construction sites. • Provision of PPEs to workers
<p>Water Quality Degradation.</p>	<p>Minor/Short Term</p>	<ul style="list-style-type: none"> • Use of impermeable sheets to avoid contamination of the groundwater/surface water • Proper disposal of waste material on dumping sites
<p>Construction waste will be produced from construction activities</p>	<p>Minor/Short Term</p>	<ul style="list-style-type: none"> • Conduct separate collection of construction and domestic waste to promote recycling and re-use.

Possible Impact	Impact Magnitude	Proposed Mitigation Measures
		<ul style="list-style-type: none"> • Proper disposal of waste to the authorized sites. The area to be leveled and contoured after disposing excess material. • No waste or debris will be thrown in the nearest canal water or other water bodies.
Noise pollution due to the moving machines (mixers, tippers, communicating workers) and incoming vehicles	Minor/Short Term	<ul style="list-style-type: none"> • Install portable barriers to shield compressors and other small stationary equipment where necessary. • Proper maintenance of vehicles and construction equipment. • Minimize/avoid unnecessary use of drills and other noisy machinery • The personal protective equipment (PPE) will be provided to the construction workers, and its usage will be made mandatory.
Workers Health & Safety	Minor/Long Term	<ul style="list-style-type: none"> • Provide training regarding proper handling and use of chemicals/paints • Install fire extinguishers at fire handling places • Continuous monitoring be carried out to ensure that contractor is

Possible Impact	Impact Magnitude	Proposed Mitigation Measures
		following safe working procedures and practices.
OPERATION PHASE		
<p>Air Impact</p> <p>Fugitive emissions such as volatile organic compounds (VOCs), and carbon monoxide (CO) can be released during transfer, storage, and handling operations.</p>	<p>Minor/Short Term</p>	<ul style="list-style-type: none"> • Frequent inspections, maintenance, and testing of storage tanks will be ensured to identify and leakage or faulty valves. • PEQs for air emissions will be strictly followed to avoid excess air pollution
<p>Impact on Noise</p> <p>LPG storage plants can generate noise from equipment such as compressors, pumps, and generators.</p> <p>The transportation of LPG can also generate noise.</p>	<p>Minor/Short Term</p>	<ul style="list-style-type: none"> • LPG storage plants will reduce noise pollution by installing mufflers on equipment and by building sound barriers around the plant.
<p>Fire and Workers Safety</p> <p>LPG is highly flammable and</p>	<p>Moderate/Long Term</p>	<ul style="list-style-type: none"> • Routine maintenance, inspections, and testing of equipment to ensure proper functioning and detect potential issues early on to prevent accidents.

Possible Impact	Impact Magnitude	Proposed Mitigation Measures
explosive. Leakages, improper handling, or accidental release of LPG can lead to fire or explosion hazards.		

vii- Environmental Monitoring Plan

The implementation of a monitoring plan within an EIA is crucial for several reasons. It serves as a fundamental tool to track and evaluate the actual environmental effects of a proposed project against the predicted impacts outlined in the EIA report. By establishing a monitoring plan, it becomes possible to assess the accuracy of the initial predictions, ensuring compliance with environmental regulations and standards. This ongoing assessment aids in identifying any unforeseen or adverse impacts, enabling timely corrective measures or adjustments to the project to mitigate or prevent environmental harm, fostering sustainable development and ensuring the project's alignment with environmental conservation objectives throughout its lifecycle.

Table E-2 Environmental Monitoring

Sr. No	Monitoring parameters	Monitoring location	Monitoring mechanism	Remarks
A. Construction phase				
1.	Noise	Construction vehicle/ machinery/ generators/welding work	Noise meter	Construction vehicles / machinery / generators will be checked regularly for noise level by the contractor during construction phase.

Sr. No	Monitoring parameters	Monitoring location	Monitoring mechanism	Remarks
2.	Air Emissions	Construction vehicle/ machinery/ generators	Ambient particulate matter monitoring.	Construction vehicles / machinery / generators will be checked regularly for smoke emissions by the contractor during construction phase.
B. Operation phase				
1.	Air Emissions	Filling of Storage Tanks	Gaseous Emissions	Will be carried out on quarterly basis
2.	Wastewater monitoring	Wastewater discharging points	Detection of residual hydrocarbons and Particulate Matter	Will be carried out on quarterly basis.
3.	LPG leakages	Storage tanks	Pressure tests	Will be carried out on monthly basis.

1 INTRODUCTION

Liquefied Petroleum Gas (LPG) is a crucial energy source widely used for domestic, industrial, and commercial applications. Its efficient storage and distribution play a significant role in ensuring energy security, reducing environmental impacts, and meeting the growing energy demands of various sectors. In a city where electricity supply can be inconsistent and natural gas infrastructure is limited, LPG offers a valuable alternative for cooking, heating, and powering various appliances. Its portability and ease of use make it an essential fuel source, particularly in areas where access to other energy forms is restricted or unreliable. The availability of LPG ensures that households can maintain their daily routines and businesses can operate smoothly, contributing to the overall quality of life in Lahore. Additionally, the use of LPG in Lahore supports economic development and environmental sustainability. By offering a cleaner-burning fuel compared to traditional options like wood or coal, LPG helps reduce air pollution and the negative health impacts associated with indoor smoke. This transition to a more efficient and environmentally friendly energy source not only enhances public health but also aligns with broader efforts to promote sustainable energy practices in the region. The ongoing availability and utilization of LPG are therefore integral to both the economic stability and environmental well-being of Lahore. Recognizing this necessity, M/S K2M Energy Private Limited has proposed the Construction of a LPG Storage and Filling Plant at Sultana Industrial Estate, Mouza Sadhoki and Sindhar, Tehsil Model Town, District Lahore. This project aims to enhance the availability of LPG in the region while ensuring compliance with environmental, health, and safety standards.

The proposed project for the Construction of LPG Storage and Filling Plant by M/S K2M Energy Pvt Ltd. is located at Khewat No. 566/314, 519/235, 519, Khatooni No. 666 & 588, Sultana Industrial Estate, Mouza Sadhoki and Sindhar Tehsil Model Town, District Lahore. The project's objective is to construct a storage tank capable of collectively storing a total of 100 metric tons (2x50) of LPG. The proposed project aims to fulfill its objectives through construction and operation necessitating compliance with the legal regulations specified in Punjab Environmental Protection Act 2012, Section 12. In accordance with these requirements, this Environmental Impact Assessment (EIA) is being submitted.

1.1 PURPOSE OF THE REPORT

As per the Punjab Environmental Protection Act (PEPA), Section 12, which covers Initial Environmental Examination and Environment Impact Assessment, no project proponent is allowed to initiate construction or operations without filing the necessary documentation with the designated Government Agency under the Provincial Environmental Agencies. If the project is anticipated to cause adverse environmental effects, it necessitates an environmental impact assessment. Subsequently, approval must be obtained from the Government Agency. This requirement set forth by the Government of Punjab mandates the preparation of this Environmental Impact Assessment (EIA) Report to secure Environmental Approval (EA) from the Environmental Protection and Climate Change Department (EPA), Government of Punjab (GoP), Lahore.

This report provides comprehensive information and data on the environmental, economic, and social impacts of the project, enabling its assessment and justification that the project will comply with the requirements of environmentally sustainable practices during both installation and operation stages, as required by the Punjab Environmental Protection Act, 2012, the Punjab Environment Quality Standards, and the rules and regulations thereof.

1.2 IDENTIFICATION OF PROJECT AND PROPONENT

The proposed project is the Construction of LPG Storage and Filling Plant by M/S K2M Energy Private Limited Located at Tehsil Model Town, District Lahore.

Proponent detail as following:

Proponent: Muhammad Atif

Address: 24-A, Abid Majeed Road, Bridge Colony, Lahore Cantt.

1.3 DETAILS OF CONSULTANTS

Organization: Climate Caretakers

Address: Flat 112, Subhan Center, Johar Town Lahore.

1.4 BRIEF DESCRIPTION OF NATURE SIZE AND LOCATION OF PROJECT:

The proposed project aims the construction of LPG Storage and Filling Plant by M/S K2M Energy Pvt. Ltd. A storage tank capable of storing a total of 100 metric tons (2x50) of LPG are proposed to be installed. The daily storage capacity for the tanks is proposed as 20-30 Metric tons. The total area of the project is 64220 SFT. The proposed location for its construction is at Khewat No. 566/314, 519/235, 519, Khatooni No. 666 & 588, Sultana Industrial Estate, Mouza Sadhoki and Sindhar Tehsil Model Town, District Lahore.

Figure 1-1 Proposed Location



2 SCREENING OF THE PROJECT

Based on the Punjab Environmental Protection Act 2012 and the Review of IEE & EIA Regulations, 2022 for filing, reviewing, and approving environmental assessments, the present project is classified under Schedule II class A (5). Following list shows the projects included in Class A.

A. Energy

1. Hydroelectric power generation over 50MW.
2. Transmission lines more than 132 kV and grid stations.
3. Nuclear power plant.
4. Petroleum refineries.
- 5. Oil and gas extraction projects including exploration, production, gathering systems, separation and storage.**
6. Renewable energy projects (including wind and solar) more than 100 MW.

LPG storage and filling facilities necessitate an EIA due to their significant scale, potential environmental risks, and complexity of operations. The EIA is required because of the considerable environmental impacts these plants may have, the extensive regulations, and the need for a comprehensive assessment involving public participation, considering potential risks, mitigation term measures, and consequences.

3 SCOPING OF THE PROJECT

The scoping process outlines the essential concerns and impacts requiring detailed investigation. It establishes the spatial and temporal limits, crucial concerns raised during consultations, and significant impacting factors impacting the project.

3.1 SPATIAL AND TEMPORAL BOUNDARIES OF ENVIRONMENTAL ASSESSMENT

Considering spatial and temporal boundaries in environmental assessments is vital to comprehensively evaluate the impact of a project. Spatial boundaries define the area affected, aiding in recognizing the extent of impact on ecosystems and nearby communities. Temporal boundaries assess short and long-term effects, enabling an understanding of how impacts evolve over time and helping in planning mitigation measures and long-term sustainability strategies. This approach ensures accurate, detailed assessments and effective addressing of potential environmental consequences related to the project. The proposed project is located at Khewat No. 566/314, 519/235, 519, Khatooni No. 666 & 588, Sultana Industrial Estate, Mouza Sadhoki and Sindhar Tehsil Model Town, District Lahore.

3.2 IMPORTANT ISSUES AND CONCERNS RAISED DURING CONSULTATION

The EIA for the proposed project incorporated a two-stage consultation process, primarily focused on one-on-one meetings. In the initial stage, the consultation was specifically directed towards engaging local government authorities, affected individuals, and local communities. The primary goal of this stage was to evaluate both the short-term and long-term impacts that might result from the new development proposed for the project in its early stages. The intent was to gather insights and perspectives from key stakeholders in the immediate vicinity to better understand potential environmental, social, and economic implications of the project.

The second stage of consultations, as indicated, will be conducted through a more extensive process of public participation if deemed necessary. This broader involvement will allow for a wider outreach to the public, enabling a more comprehensive engagement to gather additional feedback, concerns, and insights from a larger cross-section of the community. This will ensure a more inclusive approach, providing an opportunity for a wider range of stakeholders to contribute their perspectives, concerns, and suggestions, which can be valuable in shaping and refining the EIA for the proposed project.

3.3 SIGNIFICANT IMPACTS AND FACTORS TO BE DETERMINED

At an LPG storage and filling plant, the determination of significant impacts involves assessing environmental risks, safety and health concerns for workers, community impact, infrastructure and property damage, emergency response planning, regulatory compliance, and the adequacy of preventive measures. Understanding and addressing these factors are essential to ensure safe operations, mitigate risks, and protect the environment, workers, communities, and infrastructure from potential hazards associated with LPG handling.

3.4 DEVELOPMENT OF AN ENVIRONMENTAL MANAGEMENT PLAN

The EMP in an EIA is crucial as it outlines strategies to mitigate environmental impacts, ensures regulatory compliance, guides project operations, promotes sustainability, reduces risks, assures stakeholders, and allows for ongoing improvement and adaptation to address environmental concerns throughout the project's lifecycle.

These key parts of EMP include a clear description of the project, an outline of potential environmental impacts and risks, specific mitigation measures tailored to address these impacts, a comprehensive monitoring and reporting system to track environmental indicators, protocols for emergency response and contingency planning, details on stakeholder engagement and communication strategies, and a framework for ongoing review and updates to ensure the plan's adaptability and effectiveness over the course of the project. Together, these components form a comprehensive EMP designed to guide environmental practices, minimize adverse impacts, and maintain compliance with regulations and best practices in environmental management.

4 ALTERNATIVES OF THE PROJECT

The alternatives for the proposed project and their relative potential impacts on the environment were considered to evaluate the best project option. The following alternatives were considered for the project.

Project Alternatives

- No project option/worst scenario option.
- Site Alternative
- Technology Alternative

4.1 NO PROJECT OPTION / WORST SCENARIO OPTION

Analysis

❖ Strengths and Opportunities

If the project is not taken up at all then all the funds, efforts and inconvenience will be saved, and these will become available for diversion to other projects of the proponent. No more land will be required, and no disturbance will be caused to people through project construction process. Further the recurring cost of the maintenance of the project along with enhanced operational cost will be saved. No disturbance will be caused to any physical, biological and social part of the environment. The people benefiting out of a status quo will continue benefiting.

❖ Weaknesses and Threats

The absence of LPG distribution in a particular area poses several drawbacks. It limits the energy choices, potentially leading to reliance on traditional and less efficient fuel sources, which can result in increased expenses, environmental degradation, and health concerns due to indoor pollution on higher carbon emissions. Without the convenience and efficiency of LPG, residents may face challenges in food preparation and heating. Moreover, the lack of LPG distribution can impede economic growth by affecting local businesses and industries reliant on consistent and affordable energy sources. Safety concerns might arise if individuals resort to less safe or unregulated energy sources.

Conclusion

The “No project option” reveals that the absence of LPG distribution impacts affordability, convenience, health, the environment, and economic development in the area. Therefore, this option is not recommended.

4.2 LOCATION ALTERNATIVES

4.2.1 Construction on Government Land

The project proposal includes the option of building the LPG storage tank on Government-owned land. The feasibility study has indicated that the government land is available and suitable for the construction of the storage facility. The preliminary assessments and believes this location meet the technical requirement for the safe storage of LPG. However, it involves additional bureaucratic procedures for obtaining permits and approvals from the government. The additional costs associated with leasing or using government land including fees, and rent could impact project’s financial viability. Moreover, the Government regulations and polices might impose limitations on the scope of development or impose specific conditions on the usage of the land, which could restrict the project’s design or expansion plans.

4.2.2 Construction on Proponent’s Land

The proponent’s land has been carefully chosen due to its proximity to existing infrastructure and logistical convenience. The site has already undergone through assessments, and it is deemed suitable in terms of safety, environmental impact, and compliance with regulations. The proponent’s land is already owned, eliminating the need for additional land acquisition and streamlining the construction process. This option provides more control and flexibility to the proponent over the project’s development and operation. Additionally, it aligns with the proponent’s strategic goals and minimizes potential delays associated with the utilizing government land, making it the preferred choice for the project.

Conclusion

The construction of LPG on proponent’s land was preferred because it provides more control and flexibility to the proponent over the project’s development and operation.

4.3 TECHNOLOGY ALTERNATIVE

LPG Storage tank design as per ASME (American Society of Mechanical Engineers) and API (American Petroleum Institute) standards both provide robust frameworks for ensuring safety, reliability, and efficiency. However, specific distinctions exist between the two in terms of design criteria, and construction processes.

Design as per ASME Standards

ASME guidelines are comprehensive approach to pressure vessel design. They incorporate strict requirements for material selection, fabrication, inspection, and testing, ensuring a high standard of safety and quality. ASME standards also emphasize rigorous quality control, offering a more extensive and detailed framework for pressure vessel construction.

Design as per API Standards

API standards also offer well-defined regulations for the design and construction of LPG storage tanks. However, API standards might be more industry-specific, focusing on certain operational aspects and applications.

Conclusion

Conclusively, the design of LPG storage tanks under ASME guidelines is often considered superior due to its wider acceptance, global recognition, and stringent quality control measures. ASME Section VII Division 1 provides a more comprehensive and detailed approach, covering a broader spectrum of design and construction considerations. Its rigorous guidelines for material selection, fabrication, inspection, and testing contribute to a higher level of reliability and safety in LPG storage tank design compared to API standards. Therefore, ASME standards are generally regarded as a more preferred choice for ensuring the safety and quality of LPG storage tank designs.

5 DESCRIPTION OF THE PROJECT

5.1 OBJECTIVE OF THE PROJECT

The prime objective of the project is to construct LPG storage tank for ensuring a proper containment of the gas while facilitating its reliable distribution for various industrial, commercial and domestic purposes. These storage tanks serve as a critical infrastructure component, ensuring a continuous and stable supply chain for the efficient utilization of LPG, ultimately supporting economic activities and meeting energy across various sectors. The careful construction and maintenance of these storage facilities are essential to guarantee the safe storage and distribution of LPG, meeting energy demands while prioritizing safety and operational integrity.

5.2 LOCATION AND SITE LAYOUT OF THE PROJECT

The Location of the proposed project is Khewat No. 566/314, 519/235, 519, Khatooni No. 666 & 588, Sultana Industrial Estate, Mouza Sadhoki and Sindhar Tehsil Model Town, District Lahore.

5.3 LAND USE ON THE SITE

The selected land for the construction of the project is an expansive and currently undeveloped open space. The open land offers an opportunity for flexible and strategic planning, allowing for thoughtful consideration in designing and shaping the upcoming project.

5.4 ROAD ACCESS

The road access on the project site is shown in the Figure below. Rammy Road and Kahna Kacha Road are the nearest roads from the project site. All roads around the project site are paved and well connected.

Figure 5-1 Road Connectivity around Project Area



5.5 VEGETATION FEATURES OF THE SITE

The land earmarked for the project stands devoid of any significant vegetation, eliminating the need for cutting down or uprooting trees. It is an open land presents a unique advantage, sparing any ecological impact typically associated with land development. This absence of substantial vegetation not only streamlines the construction process for LPG but also mitigates the environmental footprint of the project. With no trees or major vegetation to clear, the project can progress without disturbing the natural ecosystem, allowing for a more environmentally friendly and efficient development process.

5.6 COST AND MAGNITUDE OF OPERATION

The total cost of the project is PKR 40,000,000 (Forty Million Rupees). The time for the completion of the project is proposed as 6 months.

5.7 SCHEDULE OF IMPLEMENTATION

The outlined project implementation schedule is intended to be followed, contingent upon smooth execution as per the plan and the absence of significant obstacles. The implementation stages of the project activity include:

1st Stage

The stage –1 comprises the onsite contouring studies and soil investigations and the finalization of storage plant designs.

2nd Stage

The stage –2 comprises the following task:

- Digging the ground to lay foundation and starting to build or put together the structure.
- Building support structures and foundation work.
- Beginning construction, electrical and mechanical tasks.
- Establishing essential infrastructure.
- Fitting of instrumentation

3rd Stage

The stage –3 comprises the following task

- Commercial building civil structure erection completion.
- Completion of the basic infrastructures water supply system, electricity supply etc.

4th Stage

The last stage will be the commencement of regular use of the LPG storage plant.

5.8 DESCRIPTION OF THE PROJECT

The proposed project aims the construction of LPG Storage and Filling Plant by M/S K2M Energy Pvt Ltd. A storage tank with a capacity of 100 (2x50) Metric ton is proposed to be constructed. The LPG storage tank is designed as per the standards of ASME (American Society of Mechanical Engineers) as shown in the figure below. The total area of the project is 64220 SFT. The proposed location for its construction is Khewat No. 566/314, 519/235, 519, Khatooni No. 666 & 588, Sultana Industrial Estate, Mouza Sadhoki and Sindhar Tehsil Model Town, District Lahore.

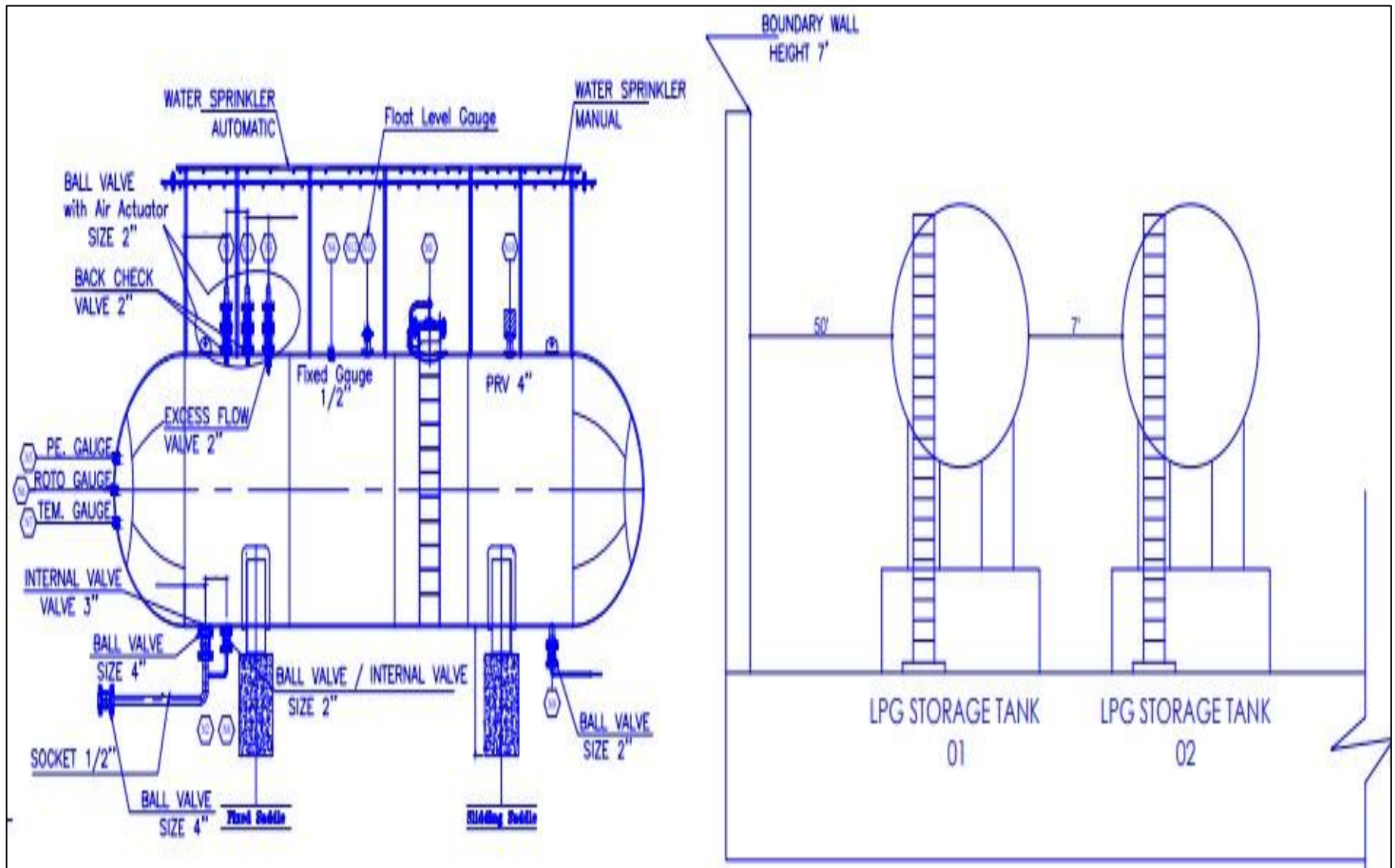


Figure 5-2 Storage tank Design

5.8.1 Area of the Land

The total area of the plot is 64220 SFT.

5.8.2 Tank Construction Details

The tank construction details are given below.

Table 5-1 Tank Construction Details

TANK CONSTRUCTION DETAIL			
Design Code	ASME Sec. VII Div. 1 ADD. 2021		
U Stamp	No	Vessel Size	ID= 3790
Equipment	LPG Storage Tank		T/T Length = 9500
Design Press @ Temp	1723.7 Kpa @ 66°C	NDE	YES
Oper. Press @ Temp	1034 Kpa @ 48°C		
Hydrostatic Press	2240 Kpa	Shell Thk. =25 mm	Head Thk. =14 mm
Specific Gravity	0.55	P.W.HT	No
Joint Efficiency (Shell, Head)	1	Wind Design	70 mph
Support	Saddle	Seismic Design	Yes
Impact Test	No	Vapor Space	10%
LPG Storage	100 MT(2X50)	MAWP@MDMT	1723.7 kpa @ -28°C
Water Capacity	101.83 Cu.M	Shell C.A	1 mm
Ladder & Platform	Yes		

5.8.3 Land Acquisition

Since the proponent owns the project site, there is no necessity for any land acquisition process to be initiated. The absence of land acquisition requirements minimizes the risks related to potential conflicts, delays, or disruptions arising from disputes over land ownership. This

scenario ensures a more seamless initiation and execution of the project, allowing resources and efforts to be focused on the project's core objectives and development activities.

5.9 RESTORATION AND REHABILITATION PLAN

To restore and rehabilitation the project site, a recommendation for tree plantation has been proposed. This strategic initiative aims to rejuvenate and enhance the site's ecological balance following the completion of the project. Tree plantation offers a means to restore the natural environment, promote biodiversity, mitigate potential environmental impacts, and contribute to the overall sustainability of the site. By introducing tree plantation, the project area can experience ecological restoration, afforestation, and the development of a more environmentally friendly landscape, aligning with the commitment to environmental stewardship and sustainability.

6 DESCRIPTION OF THE 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 Health Department, Irrigation Department, Meteorological Department, Forest offices and prevailing environmental laws and environmental quality standards etc.

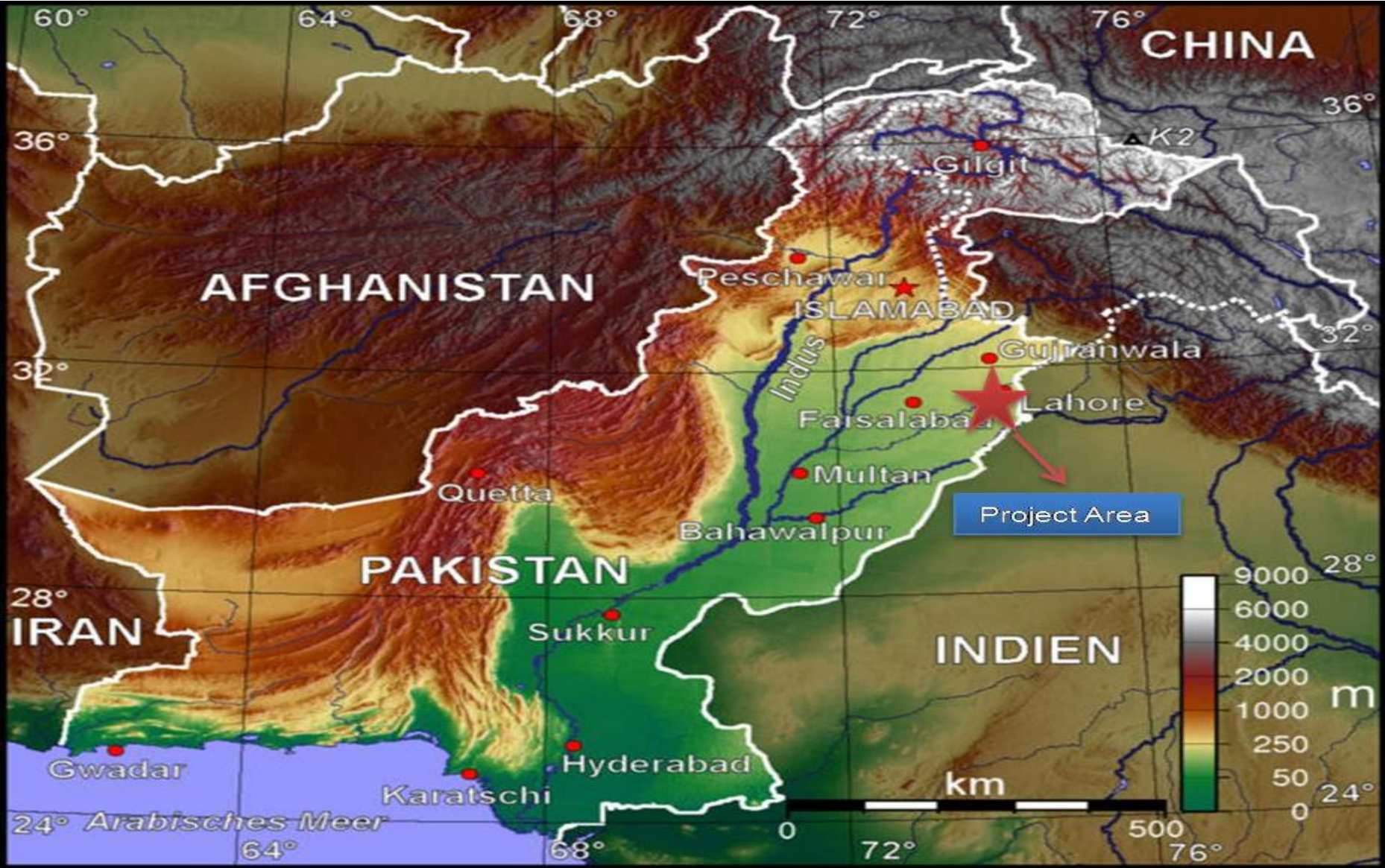
6.1 PHYSICAL RESOURCES

6.1.1 Topography

Lahore, the capital of Punjab and the second-largest city in Pakistan, is situated in the alluvial plains of the Indus River system. The city has a relatively flat topography with minor undulations, primarily influenced by river activity, natural drainage patterns, and extensive urban development. It lies at an average elevation of 213 meters (699 feet) above sea level. The landscape is mostly level, with a slight increase in elevation towards the east and southeast. One of the most significant geographical features of Lahore is the Ravi River, which flows along the northwestern boundary of the city. Historically, the river's floodplains played a crucial role in shaping the land, contributing to its fertility and supporting agriculture. However, urban expansion has led to encroachment on these floodplains, impacting natural drainage and increasing the risk of waterlogging and urban flooding.

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 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 north-east to south-west. The lowlands are generally inundated during the monsoon season by Ravi River, flowing in the west of district along its boundary with district Sheikhpura.

Figure 6-1: Tropical Details



6.1.2 Soil

The soil is different in character 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. Tube wells have also been sunk to the greater depths in the Project Area where fresh water is available. 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.

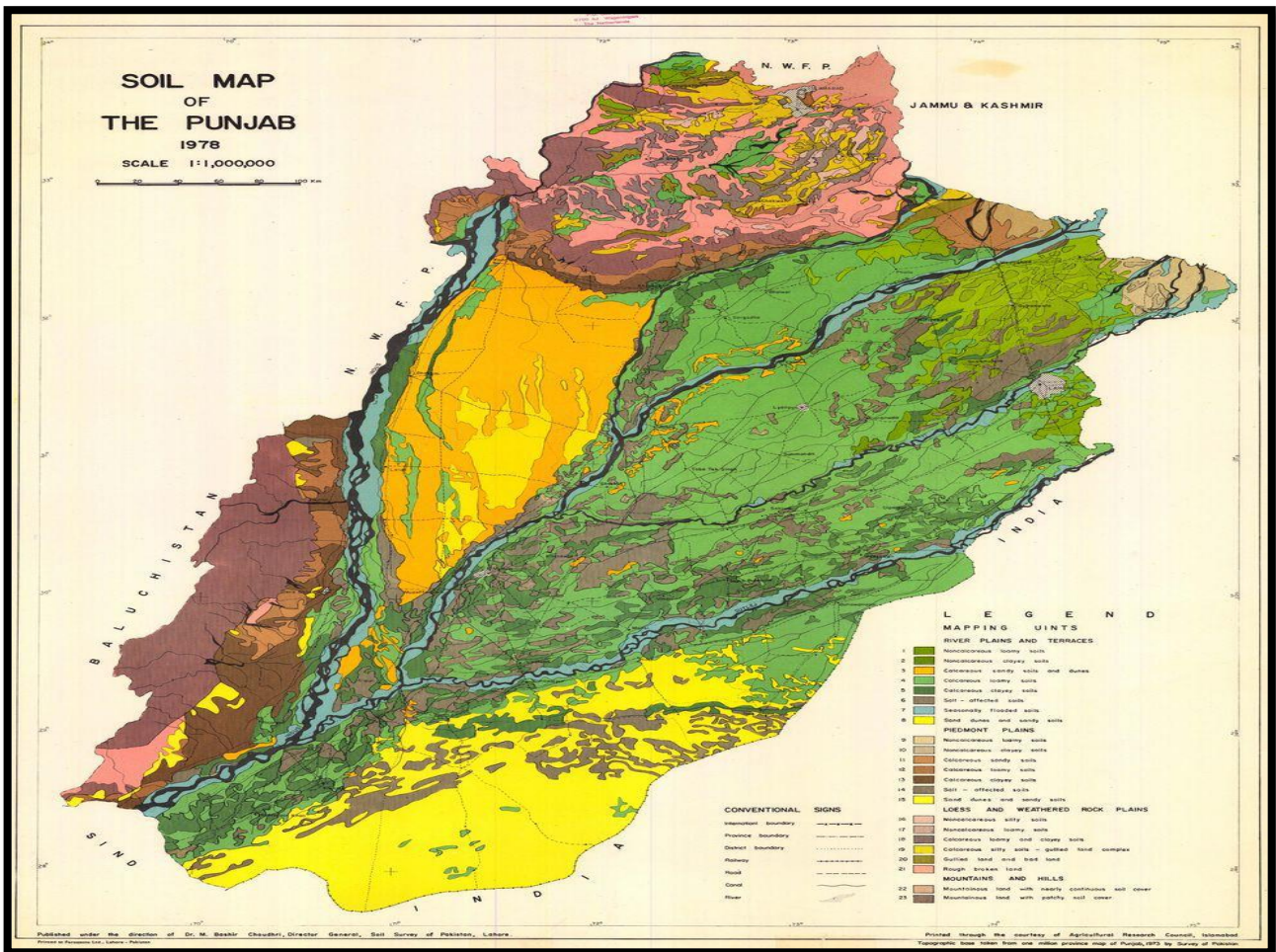


Figure 6-2 Soil map of Punjab

Alluvium is soil or sediments deposited by a river or other running water. 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 CLIMATE AND METEOROLOGY

Seasonal climatic conditions must be considered for the design and execution of 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 extreme climate: it has hot summer and cold winters. The summer starts from April and lasts till September. May, June, and July are the hottest months. The summer starts from 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.

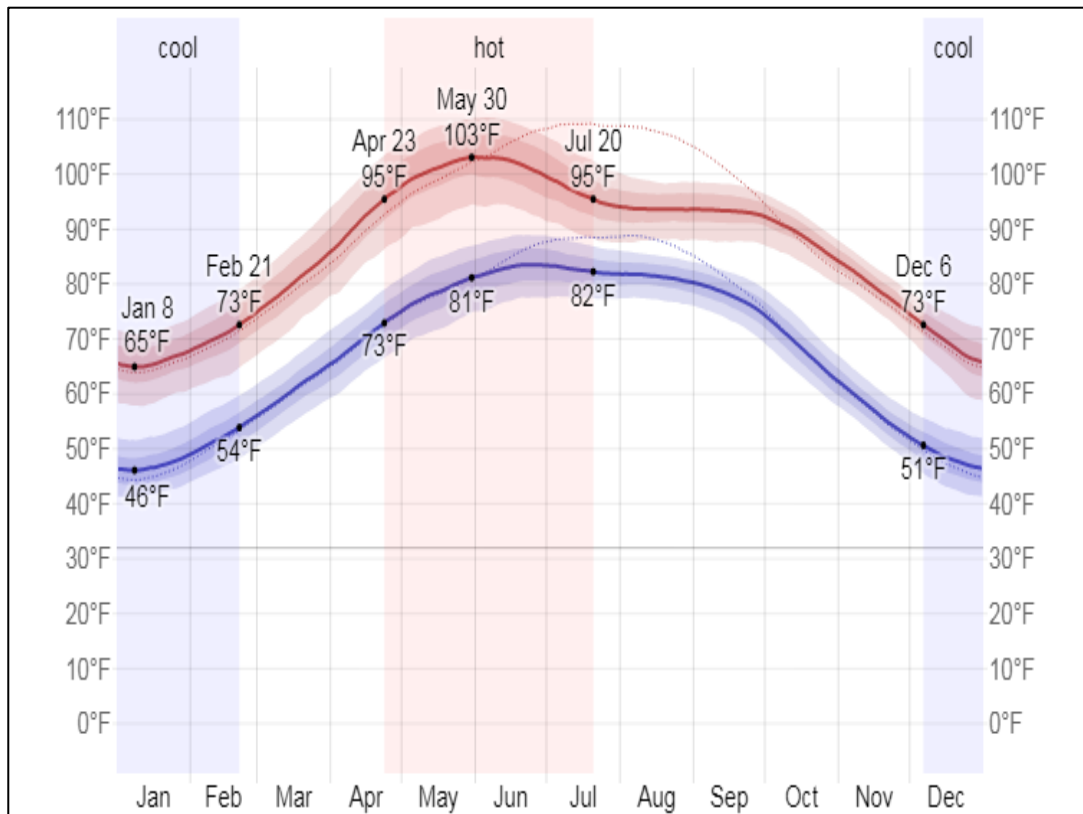


Figure 6-3 Temperature profile of Lahore

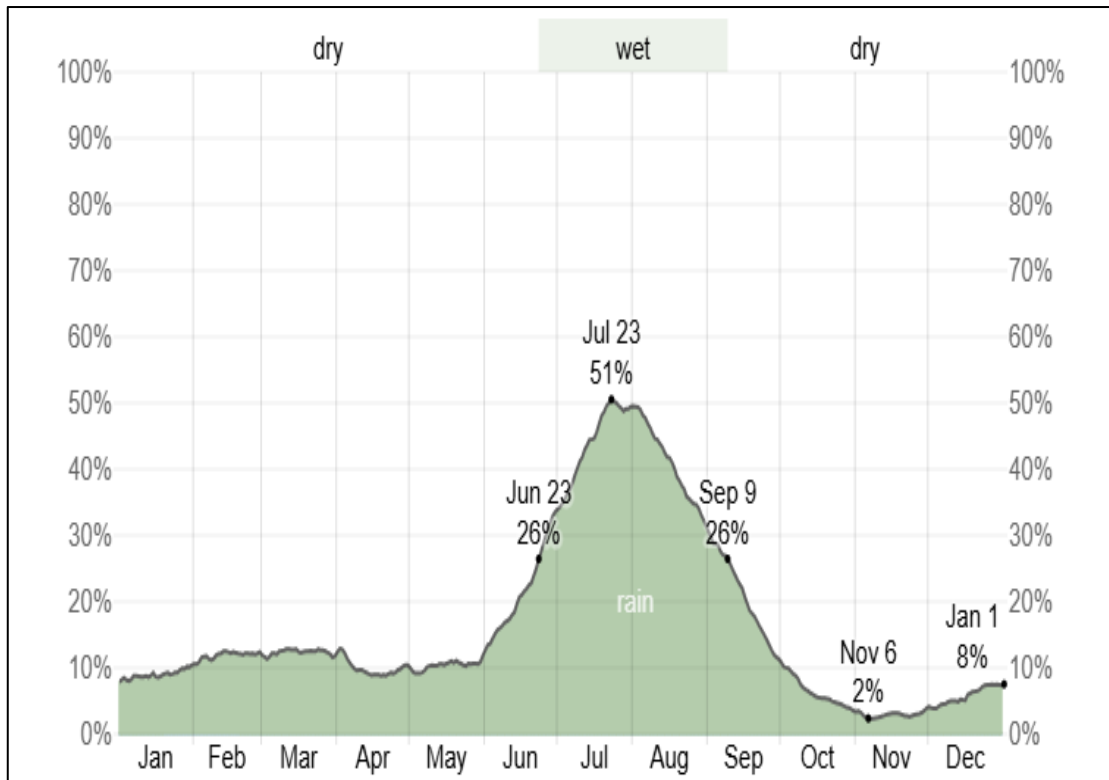


Figure 6.4: Precipitation Level in Lahore

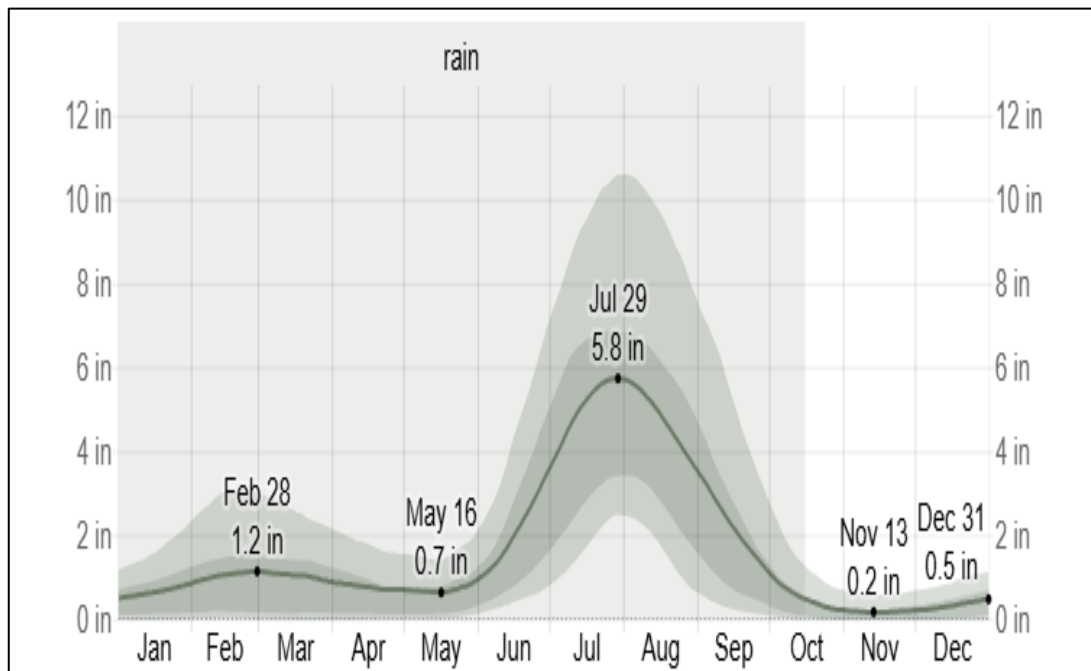


Figure 6.5: Average Rainfall in Lahore

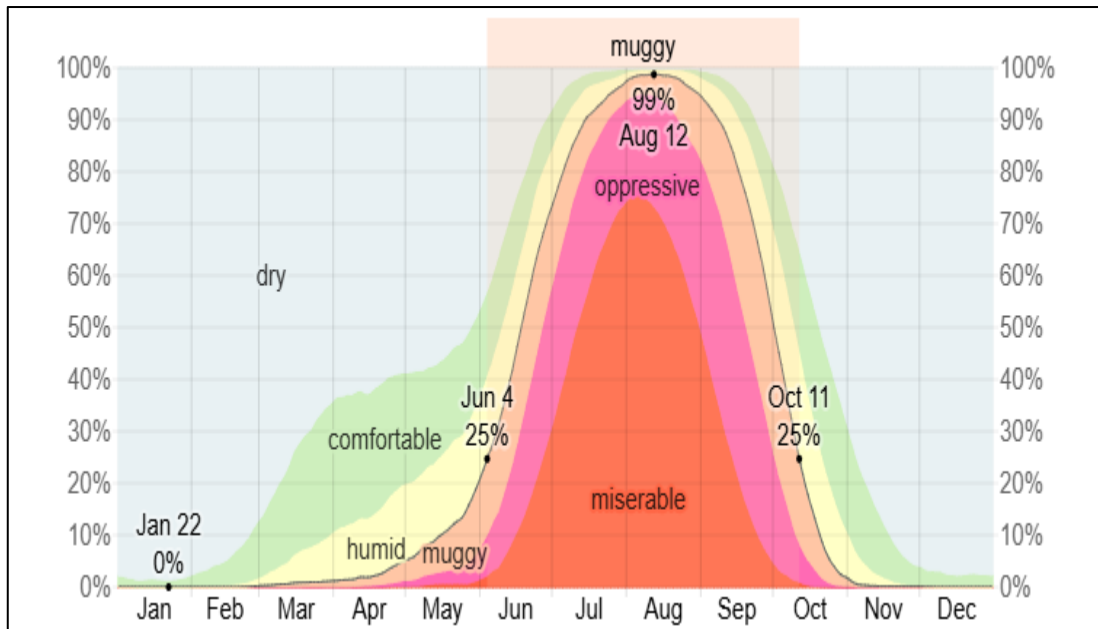


Figure 6.6: Average Humidity levels in Lahore

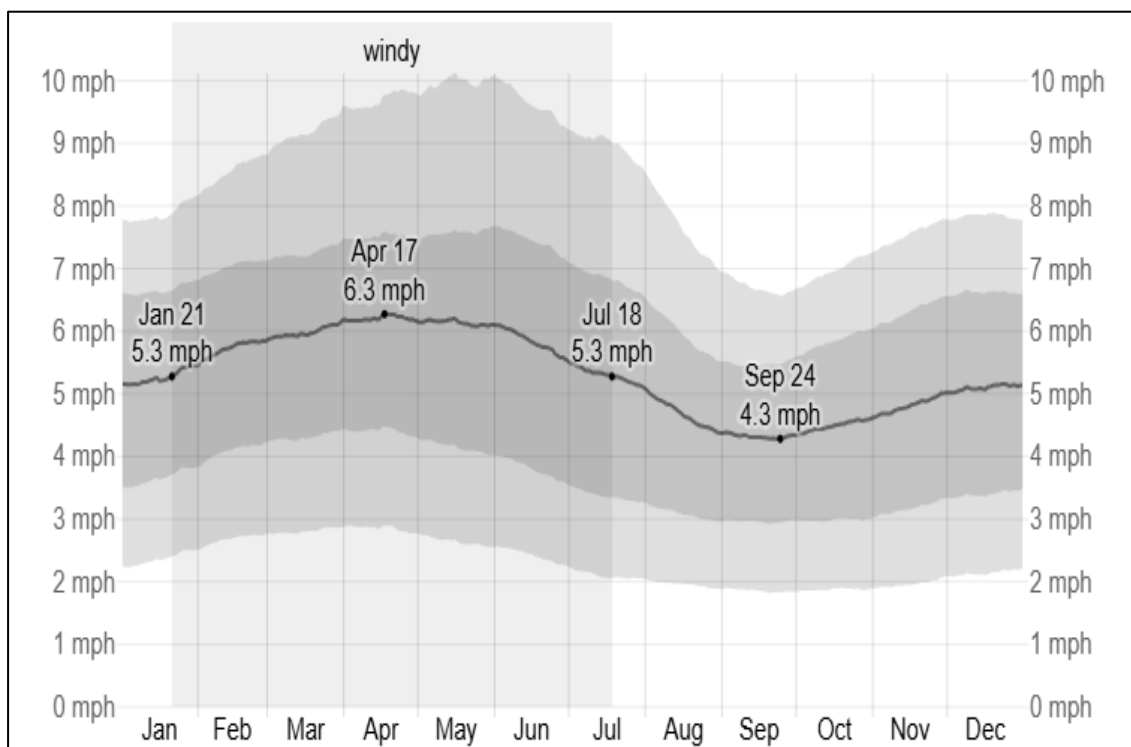


Figure 6.7: Average Wind Speed in Lahore

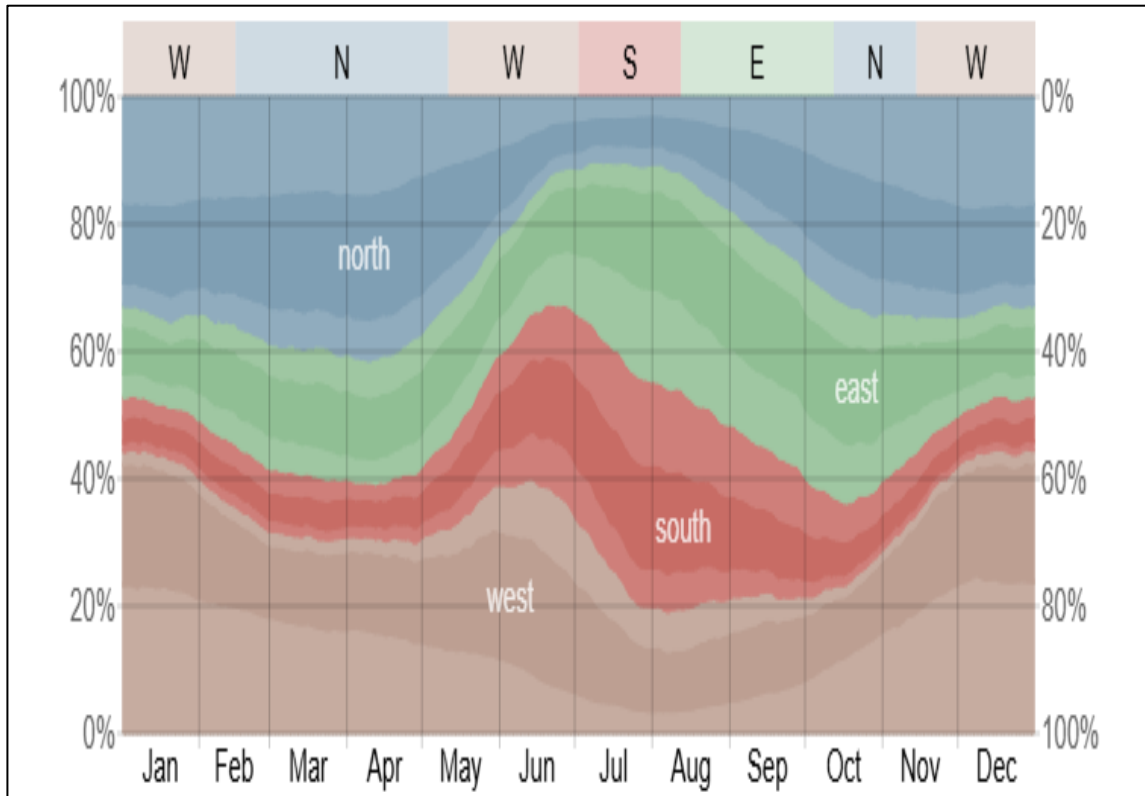


Figure 6.8: Average Wind Direction in Lahore

Wind patterns significantly influence Lahore's air quality. For instance, in November 2024, a combination of stagnant wind conditions and a lack of rainfall led to the accumulation of smog from agricultural fires in northern India and Pakistan. This resulted in Lahore experiencing its highest smog levels in five years.

Table 6.1 Meteorological and Climatic Features

Classification of Climate	Tropical (hot/humid)
Predominant Wind Direction	East/Northeast
Wind intensity	Weak to moderate
Average annual precipitation	>650 mm
Rainy season	July to September
Dry season	October to June
Average annual temperature	19-20 °C

Average summer temperature	36-38 °C
Average winter temperature	6.5-10.5 °C

Table 6.2 Average Monthly Temperature, Precipitation and Relative Humidity (2024)

Month	Mean Temperature		Precipitation (mm)	Average Relative Humidity (%)
	Maximum	Minimum		
January	18	8	100	72
February	24	11	31	60
March	28	15	39	54
April	37	22	62	40
May	39	26	50	37
June	37	26	176	54
July	36	27	200	68
August	35	27	184	69
September	35	25	50	63
October	34	22	0	56
November	24	13	19	72
December	22	9	31	63
Annual	30.8	17.8	666	78.34

6.2.1 Pre-Monsoon Season

Pre-monsoon refers to the period from April to June prior to the setting in of the monsoon. This is the hottest and the driest season, with persistent dry and hot winds. 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.

6.2.1.1 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 great extent. The part of rain percolates into the soil and is conserved in the subsoil and 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 monsoon season, the rivers flow at their peak level. The groundwater level is improved toward the end of the season in September and October.

6.2.1.2 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-seasons. Groundwater level rises because of infiltration from rainfall.

6.2.1.3 Winter Season

Winter refers to the period from December to January. The lowest temperatures (< 20C) 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.

6.2.1.4 Spring Season

Spring refers to the period from February to March. Temperatures become pleasant. The mean maximum temperature is 27oC 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

6.3 SOLAR ELEVATION

Solar elevation over the year 2022, 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).

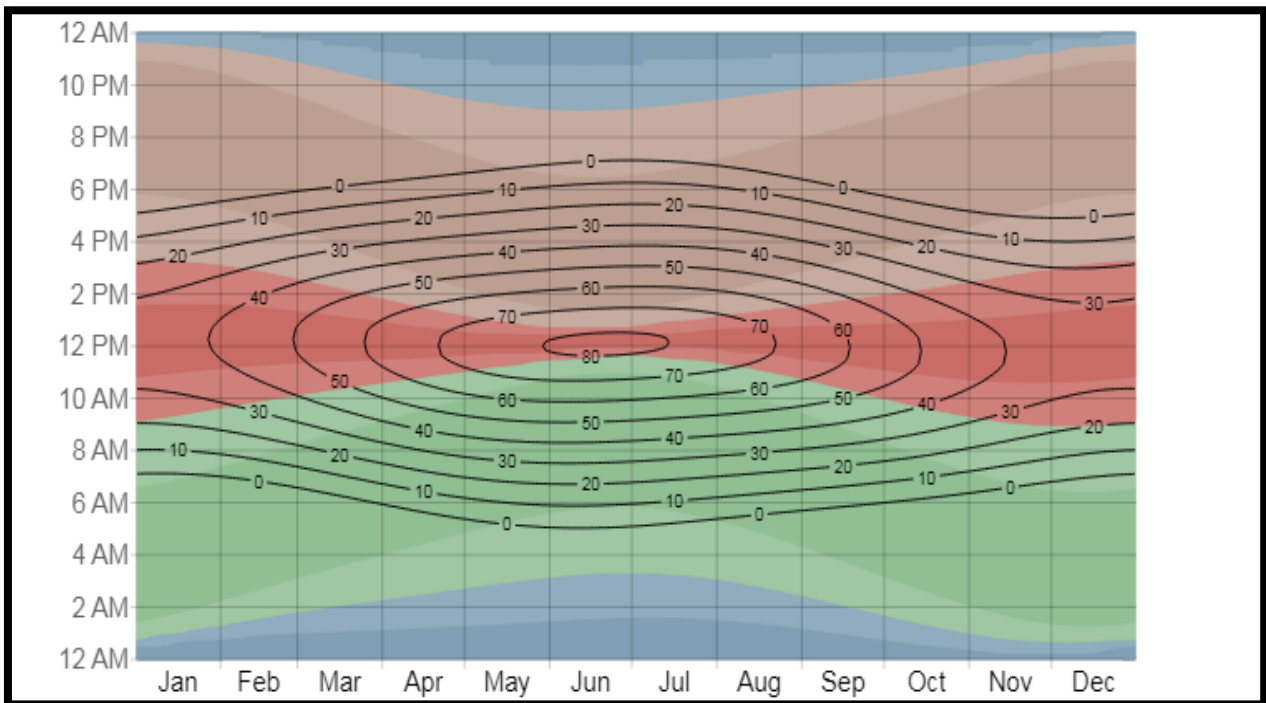


Figure 6-9 Solar Elevation Profile of Lahore

6.4 SURFACE WATER & GROUND WATER

6.4.1 Hydrology

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

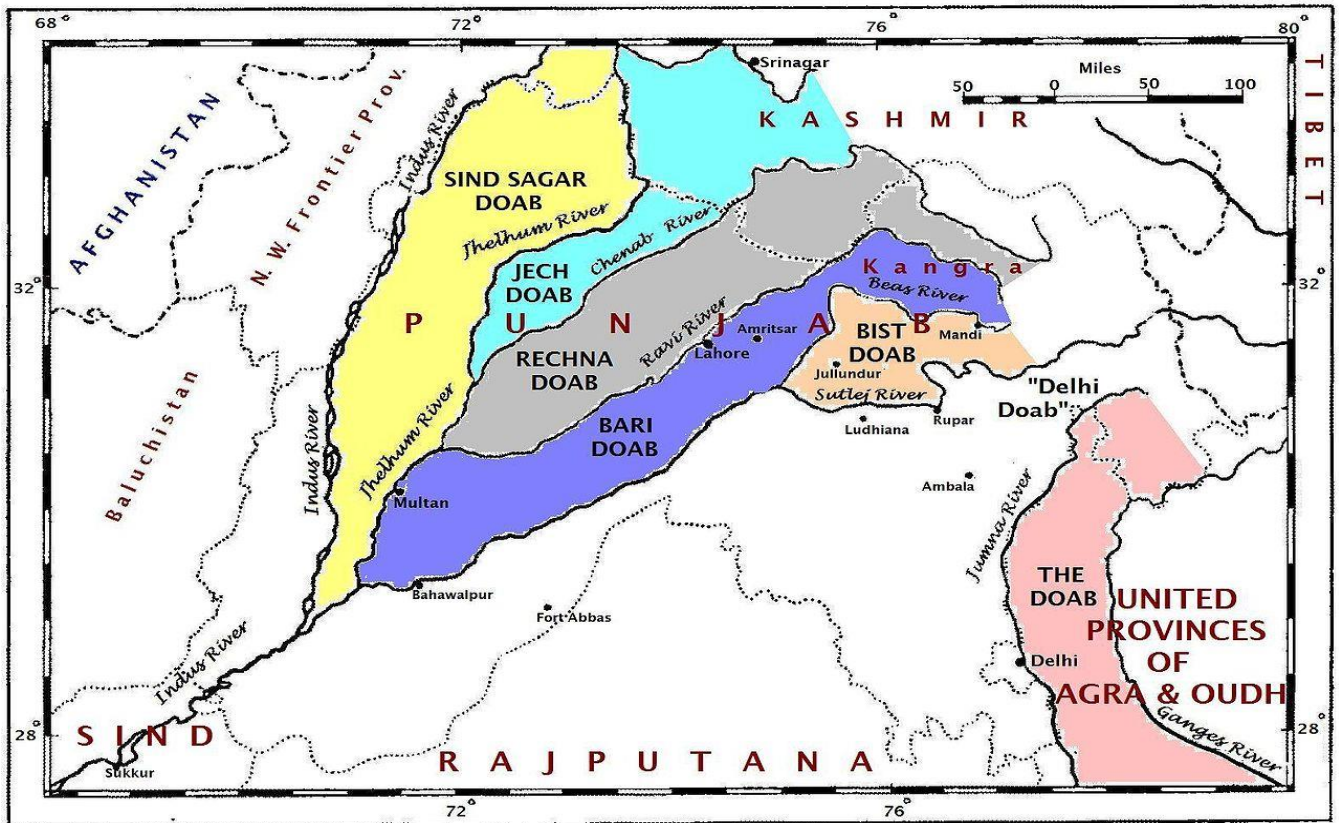


Figure 6-10 Watershed of Punjab

The only river passes from Lahore is Ravi River. The slope of the land in planned area is to the south-west, which directs the rivers to flow in this path. Average slope of the area is 0.32m/km.

The Ravi has a major contribution in 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 Ravi River.

As per the Indus basin treaty of 1960, six major rivers were divided among 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 series of structures to store and divert water from upstream and use it for 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 from naturally available water for irrigation. The Ravi allocated to India, still flows seasonally through the study area while Bias River have discontinued to flow.

Furthermore, the planned area has abundance of water in the form of 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 abundance of water.

6.4.2 Surface Water

No rivers exist in the vicinity; however, storm water 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 the municipal and industrial pollution.

6.4.3 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 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 city's drinking purposes water is abstracted from groundwater aquifer by means of 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. Water consumption varies significantly and its variation as of industrial units. Usual water consumption pattern for industrial units and data collected from the prospective industrialist will form the basis for total water demand.

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 Exhibit 4.14. 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 re-charge and close to surface waters i.e. Ravi River and Canal, the situation is in the reverse order.

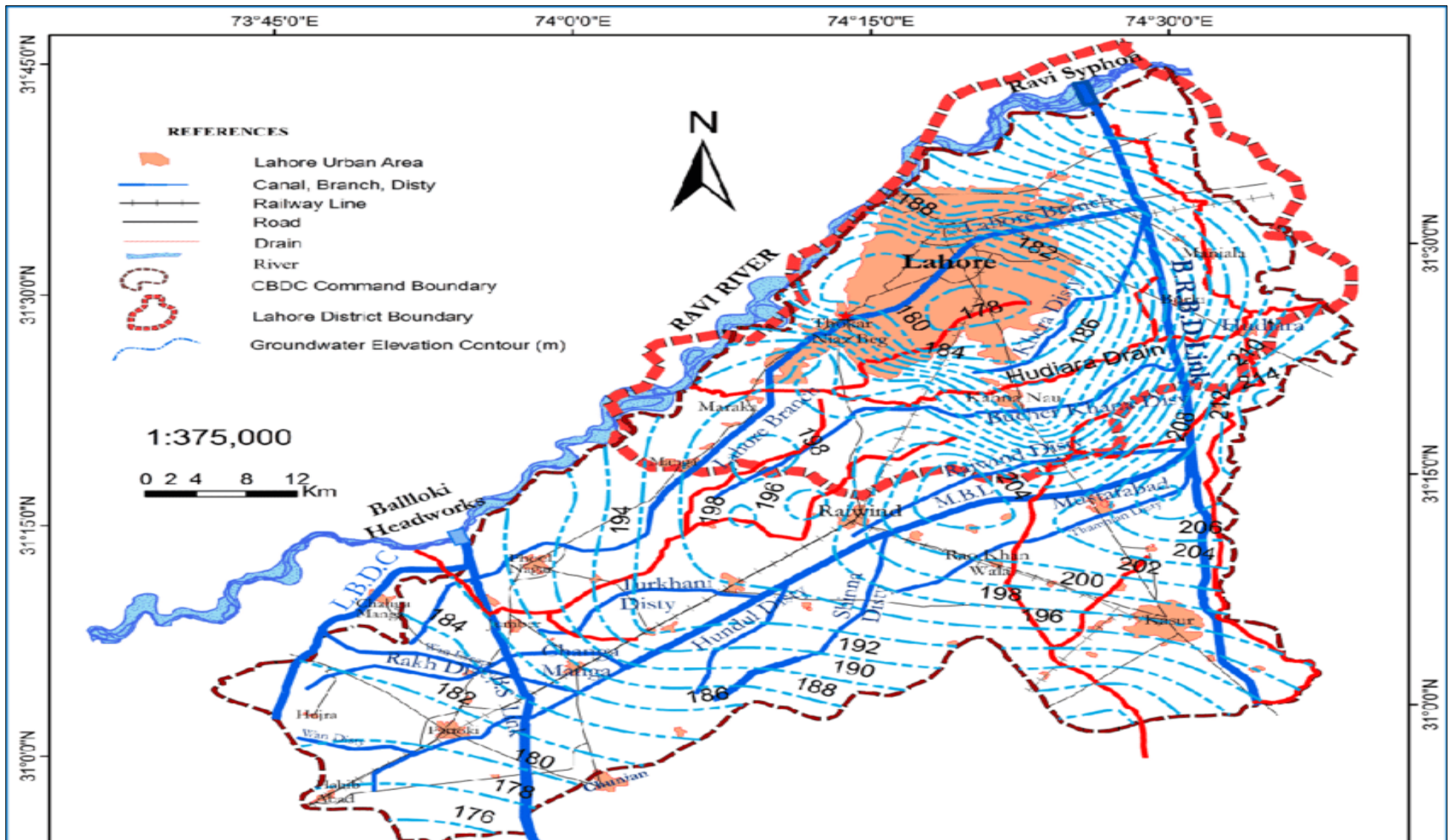
6.5 AMBIENT AIR QUALITY

To ascertain the state of environment baseline environmental monitoring was carried out through EPA certified laboratory. The monitoring points were chosen to represent data from

populated areas or selected sensitive receptors near Project Site. Ambient Air Quality Monitoring reports are attached as Annexure-D.

6.6 NOISE LEVELS

Noise measurement was carried out at five locations around the project site to assess current noise condition. Noise measurement Report is attached as Annexure-D.



6.7 GEOLOGY

Geological history of Lahore along with that of the Punjab is linked with the uplift of 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 Pleistocene and recent geological times. The study of logs of boreholes and tubewells conducted in and around Lahore show 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 bed rock (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 depth. At present our knowledge of the deep geological formations underlying beneath the city of Lahore is incomplete.

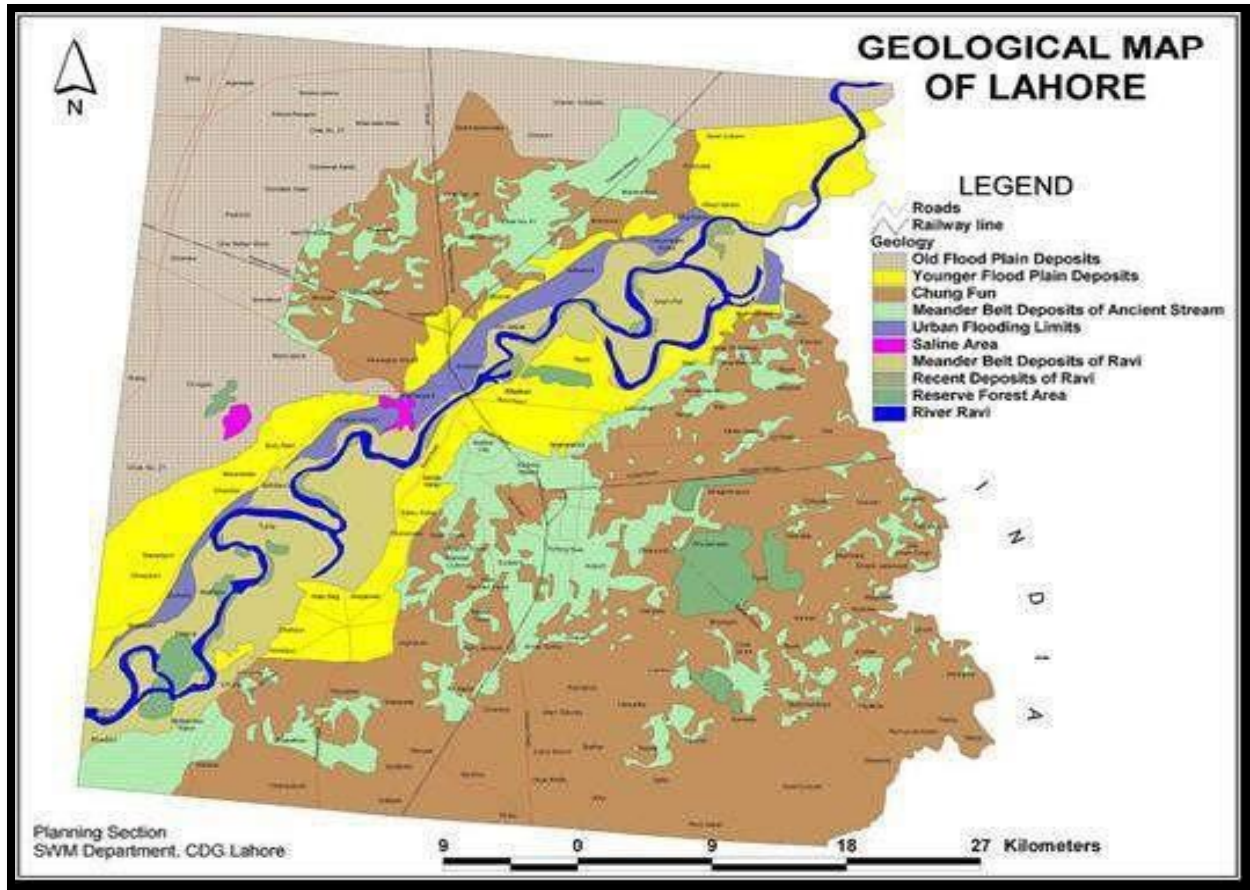


Figure 6-12 Geographical Map of Lahore

6.8 SEISMOLOGY

Pakistan Building Code distributes the country into 4-zones. 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 impact on the construction of the site.

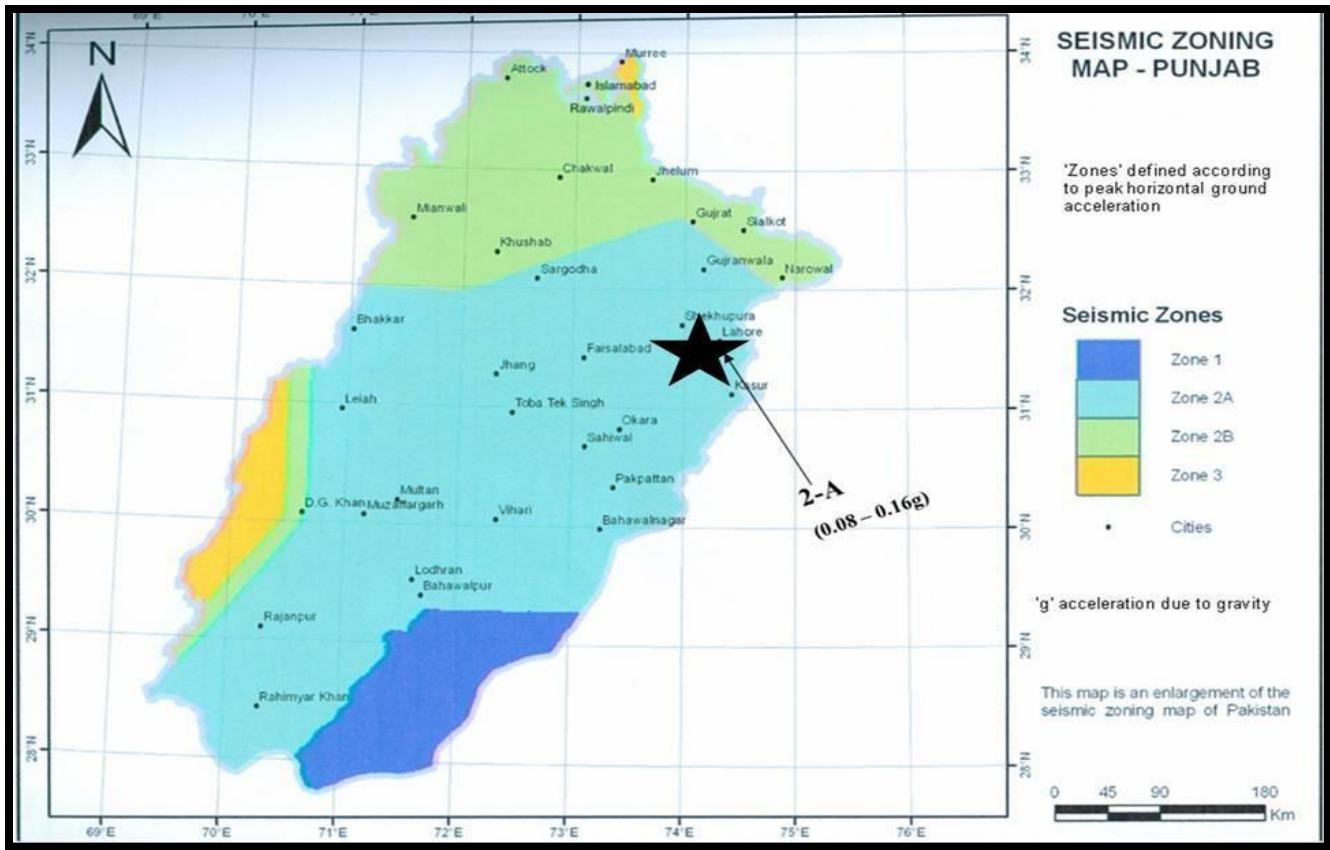


Figure 6-13 Seismic Zoning Map of Pakistan

6.8.1.1 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.

6.8.1.2 Water Logging and Salinity

There are no signs of water logging in the project site.

6.9 ECOLOGICAL RESOURCES

6.9.1 Marine and Aquatic Ecology

This is not applicable to the Project area.

6.9.2 Flora and Flora

Lahore the city of gardens is 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 them 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-nishter	<i>Erytrina subrosa</i>
7.	Putajan	<i>Putranjiva roxburgi</i>
8.	Gab	<i>Diospyores embryopteris</i>

9.	Berna	<i>Crateva religiosa</i>
10.	Khark	<i>Celtus australis</i>
11.	Putajan	<i>Putranjiva roxburgi</i>
12.	Fiddle wood/Kashmir Lagotis	<i>Eithrxyllum 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 religiosa</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

Some of the common trees found in Lahore include:

Shisham (*Dalbergia sissoo*): A fast-growing, nitrogen-fixing tree with dark brown wood used for furniture and construction.

Kikar (*Acacia nilotica*): A drought-resistant tree with yellow flowers and long thorns, used as a source of gum arabic.

Neem (*Azadirachta indica*): A multipurpose tree with medicinal properties, used in traditional medicine and as a pesticide.

Jamun (*Syzygium cumini*): A large evergreen tree with purple fruit, used for jams, jellies, and wine.



Figure 6.9: Flora of Project Area

The fauna of Lahore encompasses a diverse array of species adapted to the region's agricultural landscape and semi-arid climate. Common fauna in Lahore includes various bird species such as sparrows, doves, mynas, and parakeets, which thrive in both urban and rural habitats. The district's water bodies, including irrigation canals and ponds, support aquatic fauna like fish, frogs, and waterfowl.



Figure 6.10: Fauna of Project Site

Common birds found in the area are crows and sparrows. Chirping birds are having their nests at the well-grown trees that are providing a natural habitat for the birds. Some squirrels, parrot, rats, weaver, sparrows are also found in the area. Different species of reptile 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.

6.9.3 Endangered Species

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

6.10 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 a 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.

6.11 POLITICAL AND ADMINISTRATIVE SETUP

The project area falls in Lahore City of the Lahore District. District Co-ordination 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.

6.12 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 \$115 billion economy making it first and to date only Pakistani Subdivision of economy more than \$100 billion at the 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.

6.12.1 QUALITY OF LIFE

6.13 DEMOGRAPHIC CHARACTERISTICS OF THE PROJECT AREA

- The current metro area population of Lahore in 2022 is 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.
- The metro area population of Lahore in 2019 was 12,188,000, a 3.83% increase from 2018

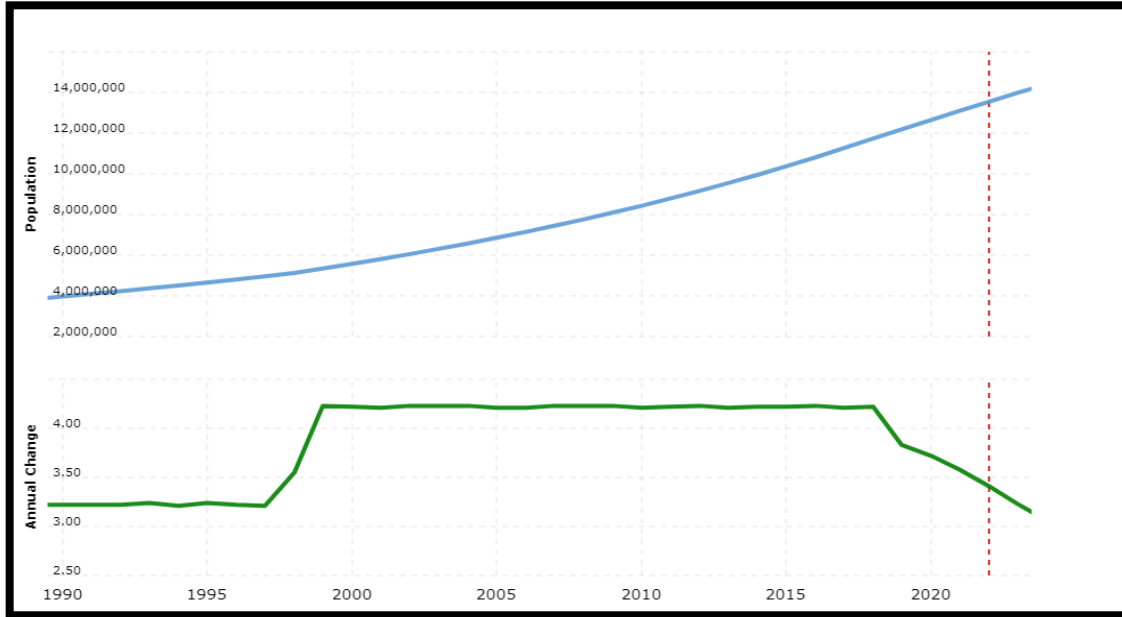


Figure 6-14 Graphical Representation of Intercensal Demographic Survey

Table 6-2 :Intercensal Demographic Survey

Year	Population	Annual Change
1990	3970000	3.22
1991	4098000	3.22
1992	4230000	3.22
1993	4367000	3.24
1994	4507000	3.21
1995	4653000	3.24
1996	4803000	3.22
1997	4957000	3.21
1998	5133000	3.55

1999	5350000	4.23
2000	5576000	4.22
2001	5811000	4.21
2002	6057000	4.23
2003	6313000	4.23
2004	6580000	4.23
2005	6857000	4.21
2006	7146000	4.21
2007	7448000	4.23
2008	7763000	4.23
2009	8091000	4.23
2010	8432000	4.21
2011	8788000	4.22
2012	9160000	4.23
2013	9546000	4.21
2014	9949000	4.22
2015	10369000	4.22
2016	10808000	4.23
2017	11263000	4.21
2018	11738000	4.22

2019	12188000	3.83
2020	12642000	3.72
2021	13095000	3.58
2022	13542000	3.41

6.13.1 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.

6.13.2 Religion

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

6.13.3 Ethnic Structure

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

6.13.4 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.

6.13.5 Institutions

Lahore is the metropolitan city and a hub of various educational, academic and flourishing government institutes. Near 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 Collage, National College of Arts, King Edward Medical University, Kinnaird College for women, Shadbagh Girls College and many more renowned institutions.



Figure 6-15 Educational Institutes in Lahore

6.13.6 Transportation

The city of Lahore is one of the most accessible cities of 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.

6.13.7 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 public. Among the prominent hospitals are General Hospital, Lady Willington Hospital, Mayo Hospital, Fatima Jinnah Hospital, The Children Hospital, Services Hospital, and Ganga Ram Hospital etc. Besides, a number of private medical practitioners, Hakims and homeopathic doctors are also practicing in the city. Services Hospital is the nearest health care facility that is present in the vicinity of the project.



Figure 6-16: Hospitals in Lahore

6.13.8 Architecture Style

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

6.13.9 Royal Fort Lahore

Royal Fort Lahore/Shahi Qila is located at an eminence in the north-west corner of the Walled City. The Citadel is spread over an area of 50 acres. Many visitors from the 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 Alamgir Gate of the Royal Fort.

6.13.10 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.



Figure 6-17: Minar E Pakistan

6.13.11 Badshahi Mosque

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



Figure 6-18: Badshahi Mosque

6.13.12 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 wood work 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.



Figure 6-19: Lahore Museum

6.13.13 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.



Figure 6-20: Shrine of Data Ganj Bakhsh

6.13.14 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.



Figure 6-21: Shrine Madhu Lal Hussain

6.14 RECREATIONAL/ENTERTAINMENT PLACES

6.14.1 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 times.



Figure 6-22 Shalimar Garden

6.14.2 Jallo Park

The 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, zoo, small museum and gift shop inside.

6.14.3 SITE SUITABILITY

Based on the biological, physical, and social data of the project area, it has been concluded that Tehsil Model Town & District Lahore is the most suitable place for the Construction of the LPG plant. The assessment indicates that the location meets all necessary environmental and safety criteria, with minimal impact on local ecosystems. The physical infrastructure, including road connectivity and proximity to key markets, supports efficient logistics and operations. Socially, the local community has shown support for the project, and the area's demographic and economic profile align well with the requirements for a successful LPG plant.

7 SCREENING OF POTENTIAL ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

7.1 GENERAL

The importance of impact assessment in EIA cannot be overstated, as it serves as a fundamental tool for evaluating and understanding the potential effects of a proposed project on the environment. Impact assessment systematically identifies, predicts, and evaluates the anticipated positive and negative consequences of a project, considering various environmental aspects such as air and water quality, biodiversity, soil health, and community well-being. This process is pivotal in informed decision-making, enabling stakeholders to assess the trade-offs and make choices that balance development with environmental conservation. The impact assessment phase provides a comprehensive understanding of the project's potential impacts, allowing for the development of effective mitigation measures and strategies to minimize or eliminate adverse effects. Additionally, it fosters transparency and accountability by providing a basis for public consultation and engagement, ensuring that the concerns and perspectives of affected communities are considered. Overall, impact assessment in EIA is essential for promoting sustainable development practices, preventing environmental degradation, and fostering responsible and informed decision-making in the planning and execution of projects.

7.2 PROJECT AREA OF INFLUENCE

Before commencing the environmental analysis of the project, it's essential to define the specific area of influence. While the primary construction activities will be contained within predetermined boundaries, there are certain aspects where construction-related tasks may extend beyond these confines. These include

- Establishment of construction camps and erection of material grinding plants on temporarily acquired land
- Borrowing soil material from temporarily acquired land
- Quarrying aggregate material; and Construction of haul tracks for transportation of construction material, etc.

Environmental impacts have been identified within the Project Area of Influence, which lies within 0.5 km boundary of the proposed plant building. Therefore, the identification of Project impacts and recommendations of mitigation measures will be limited within this area.

7.3 METHODOLOGY FOR IMPACT ASSESSMENT

In conducting the impact assessment for the project, a comprehensive methodology was adopted, encompassing both qualitative and quantitative assessments to provide a well-rounded understanding of potential effects. The qualitative assessment involved a systematic and in-depth analysis of the project's potential impacts on various environmental and social aspects. This included considering factors such as air and water quality, biodiversity, community health, and cultural heritage. Qualitative data, often derived from expert opinions, literature reviews, and consultations, were employed to evaluate the significance of these impacts. Simultaneously, a quantitative assessment was carried out to provide a numerical representation of specific parameters, allowing for a more precise measurement of the potential consequences. This involved data collection through field measurements, modeling, and statistical analyses to quantify environmental and social variables. The combination of qualitative and quantitative assessments ensured a holistic and rigorous evaluation, enabling a more nuanced understanding of the project's potential impacts and contributing to the formulation of effective mitigation strategies.

7.4 PROJECT DESIGN RELATED ENVIRONMENTAL PROBLEMS

The design of the storage plant has been meticulously crafted with a steadfast commitment to adhering to standard operating procedures (SOPs), thereby prioritizing safety, operational efficiency, and compliance with industry benchmarks. The emphasis on stringent SOPs ensures that the storage facility operates seamlessly and securely. Beyond functional considerations, a thoughtful tree plantation initiative has been seamlessly integrated into the project's framework, enhancing both the aesthetics and environmental sustainability of the site. This strategic incorporation goes beyond mere visual enhancement; it signifies a conscientious effort to align the project with ecological objectives. The introduction of trees not only contributes to the visual appeal of the surroundings but also plays a pivotal role in fostering environmental well-being, reflecting a holistic approach to the storage plant's development. This harmonious blend of

meticulous design, safety protocols, and environmental consciousness underscores the project's commitment to excellence and responsible stewardship.

7.5 IMPACTS DURING CONSTRUCTION PHASE

The detailed risk Matrix of Construction phase is shown in the table.

Table 7-1 Screening of Possible impacts during Construction Phase

Potential Impacts	Likelihood (Certain, Likely, Unlikely, Rare)	Consequences (Catastrophic, Major, Moderate, Minor)	Risk Level (Significant, Medium, Low)
Soil Erosion	Likely	Minor	Low
Land Contamination	Likely	Minor	Low
Soil Contamination	Likely	Minor	Low
Solid Waste	Likely	Minor	Low
Contractor Camp	Likely	Minor	Low
Ground Water	Likely	Minor	Low
Dust	Likely	Minor	Low
Noise	Likely	Minor	Low

7.5.1 Soil Erosion

Soil erosion may occur in the construction area due to improper runoff management from equipment washing yards and inadequate construction management practices. This impact is considered negative of minor magnitude.

Mitigation Measures

Soil erosion will be controlled by using good engineering practices especially both at construction site and peripheral area. Following measures should be taken to avoid soil erosion

due to runoff water:

- ☞ Ensuring that surface run-off controls are implemented and maintained to minimize erosion.
- ☞ Main drainage courses within the proposed project development site will be lined to avoid erosion.
- ☞ Plantation of indigenous grass which will flourish under project site conditions. This should be done for low road embankments.

7.5.2 Soil Contamination

Soil contamination during the construction phase can occur from waste generated from construction camps, such as garbage, putrescible waste, rubbish, and residues; discarded construction materials, such as wires, plastics, cut pieces of pipes, pieces of empty fuel and lubricant tins, and cardboard packing materials; and paint, varnishes, and other hazardous chemicals and toxic materials used in construction activities. This impact is considered negative of minor magnitude.

Mitigation Measures

- ☞ Oil, paint, and other chemical leakages will be controlled by storing these substances in special containers. Keep these containers away from unauthorized people and only allow authorized personnel to access them.
- ☞ Store other chemicals in adequate and appropriate places, depending on the type of material.
- ☞ Place safety equipment, such as fire extinguishers, near these storage areas, along with signs warning of danger and fire.
- ☞ Provide workers with Material Safety Data Sheets (MSDS) for each chemical and take care when handling and storing these chemicals.
- ☞ Develop and implement a proper solid waste management plan to avoid waste problems.
- ☞ Collect solid waste by placing solid waste collection containers at various locations. Provide separate arrangements for organic and inorganic waste and make workers aware of the solid waste management system in place at the site.

7.5.3 Land Contamination

The construction machinery, including cranes, trucks, loaders/dumpers, and batching plants, used during the construction period can release or spill lubricants, oil, chemicals, and toxic materials, contaminating the land. Paints used in the construction phase can also pose threats to both the environment and human health.

Mitigation Measures

Land contamination will be controlled by the following measures:

- ⌘ Vehicles and other equipment will be maintained only in designated areas with concrete slabs.
- ⌘ Prevent the release of contaminated effluent into the environment.
- ⌘ Direct machinery wash and other potentially contaminated effluents will be drain to a mud pit.
- ⌘ Proper Handling and storage of fuels, oils, and other hazardous substances according to standard safety practices, such as using secondary containment will be ensured.
- ⌘ Fuel tanks will be properly labeled and have impervious linings and dykes.
- ⌘ Leakages during fuel and oil transfer operations will be prevented.
- ⌘ Checking of fuel, oil, and chemical storage daily for leaks will be ensured.
- ⌘ Shovels, plastic bags, sandbags, and absorbent materials will be available near fuel and oil storage areas.
- ⌘ Vehicles will be properly maintained to avoid spills.
- ⌘ Maintain a leak/spill record for each vehicle.
- ⌘ Control of soil contaminated by moderate spills or leaks (up to 200 liters) using shovels, sand, and mud.

7.5.4 Impacts of Dust Emissions

Construction activities require machinery and equipment's such as transport vehicles, cranes, excavators, trucks for material excavation, dump/haul truck, etc. This machinery will generate air emissions that contain particulate matter (PM), smoke, dust, Carbon Monoxide (CO), and Oxides of Nitrogen (NO₂).

Mitigation Measures

- ☞ Vehicular emissions of NO_x, oxides of sulfur, PM, and CO will be controlled by tuning and maintaining vehicles in good working condition.
- ☞ Dust emissions will be controlled by regularly sprinkling water and covering trucks carrying earth, sand, aggregate, and other materials.
- ☞ Tuning of all equipment, generators, and vehicles used during the construction phase of the LPG storage plant.
- ☞ Ensuring that concrete mixers meet the requirements of zero emissions.
- ☞ Minimizing dust emissions due to vehicular traffic by reducing speed, minimizing traffic through good traffic management, and sprinkling water when required.
- ☞ Minimizing dust emissions at construction sites by implementing best management practices.

7.5.5 Impact of Noise

Construction activities may increase noise levels at active construction sites. Noise impact on construction workers/ laborers may be avoided in case of loud noise by provision of adequate Protective Equipment's (PPEs) like earmuffs, ear plugs, etc. This impact is considered negative of moderate magnitude.

Mitigation Measures

Following measures should be adopted to minimize the noise levels.

- ☞ Noise barriers (paneled fencing) will be installed where possible to keep the noise levels within permissible limits.

- ⌘ While replacing equipment, quieter alternatives will be purchased. New equipment may introduce a noise problem; therefore, a noise assessment will be carried out while installing new piece of equipment.
- ⌘ Contractor obligation will be to use appropriate and fit machinery.
- ⌘ Noise analysis will be done every month during construction phase.

7.5.6 Impact of Solid Waste and Sewerage Generation

The contractor camp is expected to generate waste. Improper disposal of this waste can lead to both land and water contamination. To address this, storage and collection system will be provided. This impact is considered minor but negative.

Mitigation Measures

- ⌘ Solid waste will be collected and segregated.
- ⌘ Material suitable for recycling will be stored separately and will be handed to vendor.
- ⌘ It will be ensured that the dumping area having construction waste will be leveled properly after disposal of waste material.

7.5.7 Impacts on Flora

The installation of LPG storage plant on open land is underway, yet a tree plantation plan is proposed. It aims to offset the environmental impact of construction by introducing trees, enhancing the ecological balance, and contributing to a greener environment. This initiative not only aligns with conservation efforts but also endeavors to mitigate the ecological footprint of the project, promoting sustainability and environmental responsibility in all over operational framework of the LPG storage plant.

7.6 IMPACTS DURING OPERATIONAL PHASE

The detailed risk Matrix of operational phase is shown in the table.

Table 7-2 Screening of possible impacts during operational phase

Potential Impacts	Likelihood (Certain, Likely, Unlikely, Rare)	Consequences (Catastrophic, Major, Moderate, Minor)	Risk Level (Significant, Medium, Low)
Air Quality	Likely	Minor	Low
Noise	Likely	Minor	Low
Water Quality	Likely	Minor	Low
Soil Quality	Likely	Minor	Low
Safety Hazard	Likely	Moderate	Medium

7.6.1 Air pollution

LPG storage plants can emit a variety of air pollutants into the atmosphere. Fugitive emissions such as volatile organic compounds (VOCs), and carbon monoxide (CO) can be released during transfer, storage, and handling operations. These emissions can also occur due to leaks, pressure relief, or equipment malfunctions. These pollutants can contribute to smog and ground-level ozone formation, which can cause respiratory problems and other health problems. The impact is considered as negative having a moderate effect.

Mitigation Measures

- ☞ Frequent inspections, maintenance, and testing of storage tanks will be ensured to identify and rectify any leakage or faulty valves helps prevent emissions from fugitive sources.
- ☞ PEQs for air emissions will be strictly followed to avoid excess air pollution.

7.6.2 Water pollution

Accidental leaks during transportation, handling, or storage of LPG can contaminate nearby water sources. When not properly contained, these leakages can seep into the ground and

potentially reach nearby water bodies, causing water pollution. LPG is a flammable liquid, and it can also dissolve in water and contaminate groundwater. Operational activities at an LPG storage plant may produce treatment or discharge of this wastewater into water bodies without adequate management can lead to water pollution.

Mitigation Measures

- ☞ LPG storage plants will reduce water pollution by preventing leaks.
- ☞ This will be done by installing leak detection systems and by using double-walled tanks.
- ☞ PEQs for wastewater discharges will be strictly followed to avoid water pollution.

7.6.3 Soil contamination

LPG leaks, and improper disposal of waste can also contaminate soil.

Mitigation Measures

- ☞ LPG storage plants will reduce soil contamination by preventing leaks.

7.6.4 Noise pollution

LPG storage plants can generate noise from equipment such as compressors, pumps, and generators. The transportation of LPG can also generate noise. This noise can be disruptive to nearby communities.

Mitigation Measures

- ☞ LPG storage plants will reduce noise pollution by installing mufflers on equipment and by building sound barriers around the plant.

7.6.5 Safety Hazard

LPG is highly flammable and explosive. Leakages, improper handling, or accidental release of LPG can lead to fire or explosion hazards, endangering workers and nearby population. LPG leakage can displace oxygen in the air, leading to an oxygen-deficient atmosphere. Workers

handling LPG are at a risk of exposure to hydrocarbons, which can cause skin irritation, respiratory issues, or more severe health problems upon prolonged or high-level exposure.

Malfunctioning equipment or over-pressurization of tanks can also pose risks of sudden release or ruptures, leading to physical injuries or exposure to hazardous material. Transportation of LPG to and from the storage point involves risks associated with vehicular accidents and spillage.

Mitigation Measures

- ☞ Comprehensive training to the employees on safe handling procedures, emergency response protocols, and the use of personal protective equipment (PPE) to minimize risks will be ensured.
- ☞ Routine maintenance, inspections, and testing of equipment to ensure proper functioning and detect potential issues early on to prevent accidents.
- ☞ Emergency response plan will be implemented to effectively manage and contain leaks or other potential accidents to minimize their impact on worker safety and nearby communities.
- ☞ Safety equipment such as gas detectors, flame arrestors, and personal protective gear to reduce exposure risks.

7.7 POTENTIAL ENVIRONMENTAL ENHANCEMENT PROCEDURES

To minimize these environmental impacts, LPG storage plants can implement a variety of enhancement measures, including:

- ☞ Water sprayers can be used to suppress LPG vapors in the event of a leak.
- ☞ Leak detection and repair programs can help to identify and repair LPG leaks early on, before they cause significant environmental damage.
- ☞ Double-walled tanks can provide a secondary layer of protection in the event of a leak from the primary tank.
- ☞ Storm water management plans can help to prevent LPG leakages from contaminating storm water runoff.

- ☞ Trees plantation can help to absorb pollutants from the air and water.
- ☞ Energy-efficient equipment can help to reduce greenhouse gas emissions.
- ☞ Electricity will be used from IESCO; however, available stand by generator will also be used whenever there is casual power shut down. In the first place the generator is to be housed in double built containment/ housing, therefore, its noise will be curtailed well within the limits of the Punjab Environmental Quality Standards (PEQS).
- ☞ Adequate firefighting system will be always maintained, and the required quantity of water will always be kept in storage.
- ☞ Rainwater disposal will be done through the adequate system.
- ☞ Sewage will be discharged to the main sewerage system; after its treatment through a septic tank and getting the permission from the competent authority.

8 ENVIRONMENTAL MANAGEMENT AND MONITORING PROGRAM

An Environmental Management and Monitoring Program (EMMP) is a crucial component of an EIA because it serves as a systematic framework to ensure the effective implementation of mitigation measures and compliance with environmental regulations. The EIA process identifies potential environmental impacts of a proposed project, and the EMMP is designed to address and manage these impacts throughout the project's lifecycle. By establishing a comprehensive monitoring program, authorities can track the environmental performance of the project in real-time, allowing for timely identification and response to any unforeseen adverse effects. Additionally, the EMMP provides a mechanism for ongoing evaluation and adjustment of mitigation measures, contributing to adaptive management strategies. This proactive approach enhances environmental sustainability, helps prevent or minimize negative impacts, and fosters continuous improvement in environmental performance, thereby promoting responsible and sustainable development practices.

8.1 OBJECTIVES OF ENVIRONMENTAL MANAGEMENT PLAN

The objectives of an Environmental Management Plan (EMP) generally revolve around the following key goals:

- ✓ The safeguard and conserve natural resources, habitat, and ecosystems. This involves preserving biodiversity, protecting endangered species, and maintaining the overall health of the environment.
- ✓ To minimize or eliminate pollution by managing emissions, waste, and other harmful byproducts generated by human activities. This involves adopting cleaner technologies, waste reduction, and recycling initiatives.
- ✓ To ensure the responsible and sustainable use of natural resources such as water, land, energy, and minerals. This involves strategies to conserve resources, reduce consumption, and promote renewable and alternative sources of energy.
- ✓ To adhere to environmental laws, regulations, and standards set by relevant authorities, ensuring that activities and operations are conducted in accordance with legal requirements.

- ✓ To identify potential environmental risks and develop strategies to mitigate these risks. This includes planning for emergencies and establishing protocols to respond to environmental incidents.
- ✓ To constantly assess and improve environmental performance through regular monitoring, evaluation, and adjustment of management strategies. This ensure that environmental goals are being met and that new challenges are addressed effectively.
- ✓ To involve and educate community, stakeholders, and employees in environmental initiative, fostering a culture of environmental responsibility and awareness.
- ✓ They manage environmental concerns in a manner that is cost-effective and integrate sustainability.

These objectives from the backbone of an Environmental Management Plan, guiding strategies and actions to ensure environmental sustainability and responsibility in all the phases of a project.

8.2 INSTITUTIONAL CAPACITY

In the proposed monitoring and evaluation framework, the Project Proponent assumes a central role in overseeing the environmental aspects of the project. The Project Proponent will be responsible for the overarching Monitoring and Evaluation (M&E) process. This includes integrating environmental considerations into the main monthly reports of the project, emphasizing a holistic approach to project reporting.

To ensure a detailed and on-the-ground assessment of EMP implementation, the Project Proponent designates the Environment Consultant, who is part of the proponent's team. This consultant will be actively involved in field monitoring, observing the day-to-day activities related to environmental management, and reporting findings to the Project Proponent. This approach ensures a real-time understanding of the project's environmental performance.

For a comprehensive evaluation at the conclusion of the project, an Environment Specialist from the Supervision Consultant will conduct a final assessment. This specialist will review the overall effectiveness of the EMP throughout the project's lifecycle, providing valuable insights into the long-term impact and sustainability of environmental management measures.

Recognizing the importance of external validation, the Project Proponent commits to engaging an independent agency for 3rd party validation of EMP implementation. This external entity, whether an NGO, an academic institute, or an individual consultant, will provide an unbiased and objective evaluation, adding credibility to the environmental performance assessment.

At the district level, the District Office of the Environmental Protection Agency (EPA) will play a crucial role in monitoring the overall activity at the project site. This involvement ensures that the project aligns with regional environmental regulations and standards. The district-level monitoring adds an extra layer of oversight, promoting accountability and adherence to local environmental guidelines.

In summary, the proposed framework establishes a multi-tiered approach to environmental monitoring and evaluation. It leverages internal expertise, engages external validation for impartial assessments, involves EPA offices for regulatory compliance, and integrates findings into regular project reporting. This comprehensive strategy aims to ensure the effective implementation of the EMP, fostering environmental sustainability throughout the project's lifecycle.

8.3 SCHEDULE FOR IMPLEMENTATION OF ENVIRONMENTAL MANAGEMENT PLAN

The implementation stages of the project activity include:

1st Stage

The stage –1 comprises the onsite contouring studies and soil investigations and the finalization of the project designs.

2nd Stage

The stage –2 comprises the following task:

- 1) Laying of foundations excavation and commencement of erection work.
- 2) Shoring and piling
- 3) Start of civil, electrical and mechanical work.
- 4) Development of basic infrastructure.

5) Fitting of instrumentation.

3rd Stage

The stage –3 comprises the following task:

- 1) Commercial building civil structure erection completion.
- 2) Completion of the basic infrastructures water supply system, electricity supply etc.

4th Stage

The last stage will be the commencement of regular use.

8.4 SCOPE OF ENVIRONMENTAL MANAGEMENT PLAN

The EMP provides mitigation and management measures for the following phases of the project:

8.4.1 Construction Phase

The EMP outlines crucial management principles tailored for the construction phase of the project. This section meticulously details environmental actions, procedures, and associated responsibilities vital during the construction phase. These specifications are not merely recommendations but are integral components of the contract documentation. Consequently, the contractor is bound to adhere to these specifications with precision. The compliance requirement is stipulated to ensure that environmental considerations are seamlessly integrated into the construction process. The satisfaction of both the Project Manager and the Environmental Control Officer is paramount, as their endorsement signifies the contractor's fulfillment of contractual obligations. The EMP serves as a comprehensive guide, fostering a proactive approach to environmental management within the construction framework. By embedding these specifications in the contract documentation, the project emphasizes its commitment to responsible and sustainable construction practices, aligning with regulatory standards and ensuring that environmental concerns are duly addressed throughout the construction phase. The coordination between the Project Manager and the Environmental Control Officer is pivotal, underscoring the importance of effective communication and collaboration in enforcing and overseeing the adherence to environmental specifications by the contractor.

8.4.2 Operation and Mitigation Phase

This section of the EMP outlines key principles for the project's operation and maintenance phase. It specifies environmental actions, procedures, and responsibilities required from the proponent during this phase. These specifications are contractual obligations, emphasizing the project's commitment to sustained environmental responsibility beyond construction. The EMP serves as a guide for seamlessly integrating environmental considerations into daily operations. Compliance ensures alignment with regulatory standards and promotes environmentally sound practices. Clear delineation of responsibilities fosters accountability, and regular communication among stakeholders ensures effective coordination. Overall, this section reflects the project's ongoing commitment to environmental stewardship throughout its lifecycle.

8.5 MITIGATION PLAN FOR CONSTRUCTION AND OPERATION PHASE

Table 8-1 Environmental Management Plan (EMP) for Constructional Phase

Sr. No.	Project Component/ Impact	Mitigation/ Preventive Action	Responsibility	
			Implementation	Monitoring
Constructional Phase				
1	<p>Air quality</p> <p>Dust and particulate matter resulting from construction activities.</p> <p>Use of heavy machinery will produce dust emissions</p>	<p>Water sprinkling on regular basis will be ensured to limit pollution from dust and particulate matter.</p> <p>Proper maintenance and management of all the construction machinery and vehicles.</p> <p>Tree plantation will be done to reduce air pollution.</p>	Contractor	Proponent and Contractor
2	<p>Water quality</p> <p>Run-off water from construction area.</p>	<p>Use of impermeable sheets to avoid contamination of the groundwater/surface water.</p> <p>Proper disposal of waste material on dumping</p>	Contractor	Proponent and Contractor

Sr. No.	Project Component/ Impact	Mitigation/ Preventive Action	Responsibility	
			Implementation	Monitoring
Constructional Phase				
	Inappropriate storage of constructional waste can cause leakages contaminating ground water.	sites.		
3	<p>Waste Generation</p> <p>Construction waste will be produced from construction activities</p> <p>Domestic waste from workers camp</p>	<p>Conduct separate collection of construction and domestic waste to promote recycling and re-use.</p> <p>Proper disposal of waste to the authorized sites.</p> <p>The area to be leveled and contoured after disposing excess material.</p> <p>No waste or debris will be thrown in the nearest canal water or other water bodies.</p>	Contractor	Proponent and Contractor

Sr. No.	Project Component/ Impact	Mitigation/ Preventive Action	Responsibility	
			Implementation	Monitoring
Constructional Phase				
4	Noise Noise caused by construction machinery and vehicles used for mobilization of construction equipment and workers.	The contractor will strictly follow the PEQS Proper maintenance of vehicles and construction equipment. Minimize/avoid unnecessary use of drills and other noisy machinery Unloading of constructional material will be done during daytime. The personal protective equipment (PPE) will be provided to the construction workers, and its usage will be made mandatory	Contractor	Proponent and Contractor
5	Soil Quality	Chemical leakages will be controlled by storing these substances in special containers. Proper waste management will be ensured.	Contractor	Proponent and Contractor

Sr. No.	Project Component/ Impact	Mitigation/ Preventive Action	Responsibility	
			Implementation	Monitoring
Constructional Phase				
6	Materials Management	<p>Stockpiles shall not exceed a particulate height.</p> <p>Stockpiles maybe exposed to windy conditions or heavy rain, so they will be properly covered with plastic sheets.</p> <p>Stockpiles may further be protected by the construction of low brick walls around their bases.</p>	Contractor	Proponent and Contractor
7	Workers Health & Safety	<p>Personal protective equipment will be provided to the workers.</p> <p>Provision of first aid box at work site to deal with emergency situation.</p> <p>Safety training to the workers.</p> <p>Adequate safety signs on site will be ensured.</p>	Contractor	Proponent

Sr. No.	Project Component/ Impact	Mitigation/ Preventive Action	Responsibility	
			Implementation	Monitoring
Constructional Phase				
		<p>Provide training regarding proper handling and use of chemicals/ paints</p> <p>Install fire extinguishers at fire handling places.</p> <p>Inspection that lifting devices, such as cranes, are appropriate for expected loads.</p> <p>Stagnant water at the project site will be prohibited to avoid the dengue larva production.</p> <p>Continuous monitoring will be carried out to ensure that contractor is following safe working procedures and practices.</p>		
8	Clearance of site from extra material and construction	<p>Regular removal of extra materials from the site to avoid congestion at workplace.</p> <p>Construction waste will be collected and</p>	Contractor	Proponent and Contractor

Sr. No.	Project Component/ Impact	Mitigation/ Preventive Action	Responsibility	
			Implementation	Monitoring
Constructional Phase				
	equipment	disposed of separately from other waste. Careful handling of waste will be ensured.		

Table 8-2 Environmental Management Plan (EMP) for Operational Phase

Sr. No.	Project Component/ Impact	Mitigation/ Preventive Action	Responsibility	
			Implementation	Monitoring
Operational Phase				
1	Air Impact Fugitive emissions such as volatile organic compounds (VOCs), and carbon monoxide (CO) can be released during transfer, storage, and handling operations.	Frequent inspections, maintenance, and testing of storage tanks will be ensured to identify and leakage or faulty valves. PEQs for air emissions will be strictly followed to avoid excess air pollution.	EHS Officer	Proponent/EHS Officer
2	Impact on Noise LPG storage plants can generate noise from equipment such as compressors, pumps, and	LPG storage plants will reduce noise pollution by installing mufflers on equipment and by building sound barriers around the plant.	EHS Officer	Proponent/EHS Officer

Sr. No.	Project Component/ Impact	Mitigation/ Preventive Action	Responsibility	
			Implementation	Monitoring
Operational Phase				
	generators. The transportation of LPG can also generate noise.			
3	Soil Contamination LPG leaks, and improper disposal of waste can also contaminate soil.	LPG storage plants will reduce soil contamination by preventing leaks.	EHS Officer	Proponent/ EHS Officer
4	Water Quality Accidental leaks during transportation, handling, or storage of LPG can contaminate nearby	LPG storage plants will reduce water pollution by preventing leaks. This will be done by installing leak detection systems and by using double-walled tanks. PEQs for wastewater discharges will be	EHS Officer	Proponent/ EHS Officer

Sr. No.	Project Component/ Impact	Mitigation/ Preventive Action	Responsibility	
			Implementation	Monitoring
Operational Phase				
	<p>water sources.</p> <p>LPG is a flammable liquid, and it can also dissolve in water and contaminate groundwater.</p>	<p>strictly followed to avoid water pollution.</p>		
5	<p>Fire and Workers Safety</p> <p>LPG is highly flammable and explosive. Leakages, improper handling, or accidental release of LPG can lead to fire or explosion hazards.</p>	<p>Comprehensive training to the employees on safe handling procedures, emergency response protocols, and the use of personal protective equipment (PPE) to minimize risks will be ensured.</p> <p>Routine maintenance, inspections, and testing of equipment to ensure proper functioning and detect potential issues early on to prevent accidents.</p>	EHS Officer	Proponent/ EHS Officer

Sr. No.	Project Component/ Impact	Mitigation/ Preventive Action	Responsibility	
			Implementation	Monitoring
Operational Phase				
	<p>LPG leakage can displace oxygen in the air, leading to an oxygen-deficient atmosphere.</p> <p>Workers handling LPG are at a risk of exposure to hydrocarbons, which can cause skin irritation, respiratory issues, or more severe health problems upon prolonged or high-level exposure.</p> <p>Malfunctioning equipment or over-</p>	<p>Emergency response plan will be implemented to effectively manage and contain leaks, or other potential accidents to minimize their impact on worker safety and nearby communities.</p> <p>Safety equipment such as gas detectors, flame arrestors, and personal protective gear to reduce exposure risks.</p>		

Sr. No.	Project Component/ Impact	Mitigation/ Preventive Action	Responsibility	
			Implementation	Monitoring
Operational Phase				
	<p>pressurization of tanks can also pose risks of sudden release or ruptures, leading to physical injuries or exposure to hazardous material.</p> <p>Transportation of LPG to and from the storage point involves risks associated with vehicular accidents and spillage.</p>			
6	Accidental Leakages	<p>Installation of Flame Detectors for rapid identification of open flames.</p> <p>Deployment of state-of-the-art Advanced Gas</p>	EHS Officer	Proponent/EHS Officer

Sr. No.	Project Component/ Impact	Mitigation/ Preventive Action	Responsibility	
			Implementation	Monitoring
Operational Phase				
		<p>Leak Detectors for prompt and accurate detection of potential gas leaks.</p> <p>Implementation of emergency shutdown systems to isolate processes in the event of detected flames or gas leaks.</p> <p>Installation of efficient ventilation systems to disperse released gases and maintain a safe working environment.</p> <p>Strategic placement of emergency exit points with clear signage for rapid and safe personnel evacuation.</p>		

8.6 ENVIRONMENTAL MANAGEMENT TEAM ALONG WITH THEIR ROLES AND RESPONSIBILITIES

The project proponent bears the responsibility for overseeing all the project activities. To cater to the varying requirements during operational phase, the proponent will hire personnel specifically dedicated to environmental management at the project site. This step is crucial to ensure the effective implementation and operations of the EMP.

Assigning the responsibilities to designated individuals is paramount to uphold accountability in the event of any oversight or mishap. Each appointed person will have specific duties outlined within the EMP. These responsibilities will be tailored to their roles, ensuring they are accountable for the successful execution of environmental protocols and procedures.

By delineating and assigning these responsibilities to individuals, the project proponent establishes a framework where each person understands their role and obligation within the broader context of environmental management. This structuring allows for a more efficient response to any environmental issue. This approach aims to create a clear chain of accountability, ensuring that the implementation of EMP is conducted diligently and that there are identifiable points of contact for any concerns or queries related to environmental management during the project's operational phase.

8.7 ENVIRONMENTAL MONITORING PROGRAM

An EMP is a structured system designed to consistently observe, assess, and record the environmental conditions and impacts associated with the construction of LPG storage plant. It involves systematic data collection related to air quality, water quality, soil conditions, and biodiversity. This collected data is analyzed to detect any deviations from the PPEQs.

It also involves impact assessments, communication of findings to stakeholder, and adaptive management –making necessary adjustments to mitigate environmental risks and issues. The program's goal is to ensure sustainable environmental practices, minimize adverse impacts, and maintain compliance with set standards, contributing to better environmental management and long-term sustainability.

The objectives of the Environmental Monitoring Plan are given below;

- ✓ Detecting environmental changes to prevent and minimize potential negative impacts on the environment.
- ✓ Ensuring compliance with environmental laws, permits, and regulations by regular monitoring and reporting environmental parameters. This helps in meeting legal requirements and avoiding penalties or sanction.
- ✓ Assessing and managing potential risks to the environment caused by human activities. This involves evaluating the impact of these risks and implementing strategies to mitigate or manage them effectively.
- ✓ Monitoring and managing the use of natural resources such as water, air, soil, and biodiversity. The goal is to conserve these resources and maintain ecological balance.
- ✓ Assessing the impact of specific actions, projects, or processes on the environment to understand their consequences and make informed decisions regarding future actions.
- ✓ Using collected data to improve environmental performance, refine strategies, and adapt measures to achieve better outcomes over time.
- ✓ Establishing protocols and responses for emergencies or unexpected environmental incidents, ensuring a rapid and effective reaction to minimize damage.

Table 8-3 Monitoring Parameters

Sr. No	Monitoring parameters	Monitoring location	Monitoring mechanism	Remarks
A. Construction phase				
1.	Noise	Construction vehicle/ machinery/ generators/welding work	Noise meter	Construction vehicles / machinery / generators will be checked regularly for noise level by the contractor during construction phase.
2.	Air Emissions	Construction vehicle/ machinery/	Ambient particulate matter	Construction vehicles / machinery / generators will be checked regularly for smoke

Sr. No	Monitoring parameters	Monitoring location	Monitoring mechanism	Remarks
		generators	monitoring.	emissions by the contractor during construction phase.
B. Operation phase				
1.	Air Emissions	Filling of Storage Tanks	Gaseous Emissions	Will be carried out on quarterly basis
2.	Wastewater monitoring	Wastewater discharging points	Detection of residual hydrocarbons and Particulate Matter	Will be carried out on quarterly basis.
3.	LPG leakages	Storage tanks	Pressure tests	Will be carried out on monthly basis.

8.8 ENVIRONMENTAL BUDGET

An environmental budget is a crucial aspect for the construction of LPG storage tank, as it delineates the financial allocation specifically designated for environmental management, sustainability, and mitigation potential ecological impacts. Before the commencement of the project, a detailed environmental budget was carefully formulated and allocated to ensure the responsible management of environmental aspects throughout the project's lifecycle.

The environmental budget outlined a comprehensive plan detailing financial resources for various environmentally significant aspects of the project. It encompassed expenses associated with the implementation of sustainability measures, compliance with environmental regulations,

and the execution of eco-friendly initiatives. Moreover, the budget accounted for costs related to environmental impact assessments, monitoring systems, and routine environmental audits to ensure adherence to established standards and regulations.

Table 8-4 Environmental Budget

Environmental Component	Amount PKR	Details	Remarks
A. Environmental Management Cost			
Fire and Health & Safety Measures	400,000	The workers are required to provide the PPEs for work site safety precaution and to avoid any safety hazard.	Amount to be included in the Project Budget.
B. Environmental Monitoring Cost			
(i) Air, Water and Noise Monitoring	200,000	Monitoring will be performed as per EPA Standards	Amount to be Included in Project Budget
C. Tree Plantation Tree Plantations of Endemic /Local Species	400,000	Landscaping around the project site.	Required for implementation of true spirit of EMP
Total Environmental Management and Monitoring Cost in PKR (A+B+C)	1,000,000	Summing up A,B, C	Amount to be included in the Project Budget.

9 TREE PLANTATION PLAN

The incorporation of a tree plantation plan within an EIA is of paramount importance for several compelling reasons. Trees play a pivotal role in environmental sustainability, acting as natural carbon sinks, enhancing biodiversity, and mitigating the impacts of climate change. A well-designed tree plantation plan contributes significantly to offsetting carbon emissions associated with a project, thereby fostering a more balanced and ecologically friendly footprint. Beyond their role in carbon sequestration, trees contribute to soil stabilization, preventing erosion and promoting water retention. They also provide habitat for diverse wildlife, supporting biodiversity conservation. Moreover, trees contribute to the improvement of air quality by filtering pollutants and releasing oxygen, thereby enhancing the overall health and well-being of surrounding communities. Integrating a tree plantation plan into the EIA showcases a commitment to ecological stewardship and reflects a proactive approach toward environmental sustainability, aligning the project with broader conservation goals and community well-being.

9.1 OBJECTIVES OF TREE PLANTATION

The following objectives of tree plantation helps to clarify its basic purpose.

- ✓ Trees in urban areas provide shade and heat reduce heat, mitigation the urban heat island heat.
- ✓ Trees store carbon in their biomass, helping and reduce the atmospheric carbon dioxide levels.
- ✓ Trees contribute to visual appeal of urban and rural landscapes, making areas more attractive.
- ✓ Trees yield valuable resource such as timber, fruits, nuts, and medicinal plants.
- ✓ Trees plantations create employment opportunities for the people living in the vicinity of the project area.
- ✓ Trees act as a natural air filters by trapping airborne pollutants and particulate matter.
- ✓ Trees release oxygen during photosynthesis, improving air quality.
- ✓ Trees help maintain healthy watersheds, reducing the risk of floods and ensuring a consistent water supply.
- ✓ Trees help prevent soil erosion by anchoring soil with roots.

- ✓ Trees planted strategically can safeguard against landslides and protect roads and buildings.
- ✓ Trees absorb carbon dioxide and release oxygen, helping reduce greenhouse gas level and circumvent climate change.
- ✓ Trees can efficiently serve as windbreaks.

9.2 BENEFITS OF TREE PLANTATION

A well-executed tree plantation plan offers numerous advantages, covering all the environmental, economic and soil aspects. Some of the key benefits of tree plantation are enlisted below;

- ☞ Plants absorb carbon dioxide (CO₂) from the atmosphere and store this carbon in the biomass helping to circumvent climate change by reducing greenhouse gas emissions.
- ☞ Roots of the trees help to stabilize soil and prevent soil erosion.
- ☞ Trees act as a natural air filter, by trapping particulate matter which leads to healthier living environments.
- ☞ Trees can provide habitat and food residues to birds contributing to local biodiversity.
- ☞ Trees act as a natural buffer that helps to control and purify water entering into the streams and rivers reducing the risks for the contamination of water.
- ☞ Well-maintained tree plantation enhances the visual appeal of the landscapes, making area more attractive.
- ☞ Tree roots can improve soil quality by increasing its organic matter content and nutrient availability.
- ☞ Tree plantation contribute to climate resilience by moderating temperature extremes, reducing the risk of heatwaves, and providing shelter from extreme weather events.
- ☞ Trees can help to enhance the mental and physical well-being of the people living around the project area.
- ☞ A well-designed tree plantation plan serves as a long-term investment in the environment and the future, as they continue to provide benefits for generations to come.

9.3 AREA ENHANCEMENT PLAN

Tree plantation plan of the area has been prepared keeping in view the project area and length. The plan is based on best possible estimations and can be modified accordingly at the execution stage.

9.4 TREES RECOMMENDED

Tree species are recommended for the plantation are the indigenous species of District Rawalpindi.

Table 9-1 Trees to be planted

Sr. No.	Local Name	Scientific Name
1.	Shisham	<i>Dalbergia sissoo</i>
2.	Keekar	<i>Acacia arabica</i>
3.	Siris	<i>Albizzia lebbeck</i>
4.	Ber	<i>Ziziphus jujuba</i>

9.5 COST OF TREE PLANTATION

The cost for the plantation and maintenance of trees at the project site is estimated as 3 Lakh PKR. The budget has been calculated for the procurement of manure, continued supply of water throughout the year. The proponent will make a proper record of the current number and conditions of the planted trees.

10 FIRE SAFETY PLAN

A fire safety plan is a structured and comprehensive document that details procedures, protocols, and strategies aimed at preventing, preparing for, and responding to fire emergencies at the project site. This essential plan outlines preventive measures, emergency procedures, evacuation protocols, fire detection and suppression systems, training requirements and communication strategies. It assigns specific roles and responsibilities to individuals and provides clear instructions for evacuations, ensuring occupants, or employees understand what to do in case of a fire. Regular reviews and updates to the plan maintain its relevance, ensuring compliance with fire safety regulations and fostering a safe and prepared environment in the event of a fire emergency.

10.1 OBJECTIVES OF A FIRE SAFETY PLAN

Following objectives collectively aim to create a safe and prepared environment in the face of a fire emergency, ensuring the protection of lives, property, and assets.

- The primary goal is to prevent fires from occurring by implementing measures that reduce fire hazards, ensuring that all the safety systems, equipment, and protocols are up to standard, and that fire risks are minimized.
- Protecting the lives and well-being of occupants and employees by ensuring a quick and safe evacuation during a fire emergency. This involves establishing and regularly practicing efficient evacuation routes and procedures.
- Minimizing damage to property and assets by having effective fire detection and suppression systems in place. This includes regular maintenance of fire safety equipment such as fire alarms, sprinkler systems, and fire extinguishers.
- Outlining procedures to respond effectively and efficiently in the event of a fire. This involves establishing clear roles and responsibilities for personnel during a fire emergency.
- Ensuring compliance with local fire safety regulations and standards.
- Conducting regular training sessions, and fire drills to educate occupants and employees about fire safety procedures, evacuation routes, and the use of fire equipment.

- Regularly reviewing and updating the fire safety plan to incorporate any necessary changes in equipment, procedures, or regulations. This ensures the plan remains current and effective.

10.2 FIRE SAFETY SYMBOLS

In a LPG storage and filling plant, hazard identification symbols play a crucial role in communicating potential hazards to employees, emergency responders, and the public. These symbols, often standardized, convey various hazards associated with the storage and handling of LPG. Some common symbols and their meanings in such a facility include:

10.2.1 Flammable Symbol

It indicates the flammability of LPG. It warns about the potential for fire explosion.



Figure 10-1 Symbol for Flammable Material

10.2.2 Gas Cylinder Symbol

It highlights the presence of compressed gas cylinder, signifying the potential pressure and hazards associated with gas containment.



Figure 10-2 Symbol for Gas Cylinder

10.2.3 Toxic Symbol

It warns about the toxicity of certain chemicals or gases, emphasizing the need for caution and proper handling to avoid health and hazard.



Figure 10-3 Symbol for Toxic Material

10.2.4 Explosive Symbol

It indicates the potential for an explosion due to certain conditions or elements present in the LPG plant.



Figure 10-4 Symbol for Explosive Material

10.2.5 Electrical Hazard Symbol

It warns about electrical hazards present in the facility, highlighting the risk of electrical shock or short circuits.



Figure 10-5 Symbol for Electrical Hazard

10.2.6 PPE (Personal Protective Equipment) Symbol

It emphasizes the necessity of wearing appropriate personal protective equipment while working in the facility.



Figure 10-6 Symbols of PPEs

10.2.7 Environmental Hazard Symbol

It signifies potential hazards to the environment, like contamination or pollution risks from LPG leaks.



Figure 10-7 Environmental Hazard Symbol

These symbols are commonly used in combination with written warnings, color codes, and other safety measures to ensure a comprehensive and easily understandable identification system for the hazards present in an LPG storage plant. It's crucial for all personnel to be familiar with these symbols and their meanings to ensure a safe working environment.

10.3 FIRE SAFETY MEASURES

Fire safety measures prevent fires and explosions, safeguard personnel, protect property and equipment, ensure compliance with regulations, maintain emergency preparedness, and mitigate environmental risks associated with potential fire incidents. Following safety measures are proposed at project site.

10.4 FIRE EXTINGUISHERS

Fire extinguishers are necessary in LPG storage areas due to high flammability of LPG. They provide a means to quickly suppress small fires, prevent their escalation, comply with safety regulations, and protect lives, and the environment. These extinguishers ensure emergency preparedness and the rapid containment of fires, offering immediate response and safety for individuals working in or around LPG storage areas.

10.4.1 Dry Chemical Powder Fire Extinguishers

Dry Chemical Powder (DCP) fire extinguishers are crucial in LPG storage and filling plants due to their versatility in combating different types of fires, including those involving flammable gases like LPG. These extinguishers work by interrupting the chemical reaction of the fire, making them effective for a wide range of fire classes, such as Class B (flammable liquids) and Class C (electrical fires). In LPG storage facilities, where various fire risks exist, DCP extinguishers serve as a reliable choice for their ability to quickly suppress fires, prevent their spread, and safeguard the environment, equipment, and personnel. Their adaptability, quick response, and effectiveness against various fire types make them an essential safety measure, ensuring preparedness for diverse fire emergencies in LPG-related settings.



Figure 10-8 DCP Fire Extinguisher

10.4.2 Fire Extinguishers Foam Type

Fire extinguishers of the foam type play a critical role in ensuring the safety of LPG storage plants. LPG, being a highly flammable and combustible substance, poses inherent risks, and a

potential fire can escalate rapidly. Foam-type fire extinguishers are specifically designed to combat flammable liquid fires, making them indispensable in LPG storage facilities. The foam forms a blanket over the liquid surface, suppressing the release of flammable vapors and preventing the fire from spreading. This targeted approach helps control the situation swiftly and effectively, minimizing the risk of catastrophic incidents. The use of foam extinguishers in LPG storage plants underscores a proactive safety measure, offering a reliable means of first response in the event of a fire emergency, and ensuring the protection of personnel, assets, and the surrounding environment. Regular maintenance, training in proper usage, and adherence to safety protocols will further enhance the efficacy of foam-type fire extinguishers in safeguarding LPG facilities.



Figure 10-9 Fire Extinguisher Foam Type

10.4.3 Fire Hydrants

Fire Hydrants at LPG storage plants provide immediate access to water for firefighting in emergencies, supporting fire suppression efforts, ensuring site safety by cooling structures, and complying with safety regulations. Although water might not directly extinguish LPG fires, hydrants serve as a crucial resource for firefighting equipment and overall emergency preparedness.



Figure 10-10 Fire Hydrant

10.4.4 Fire Alarm

Fire alarms are crucial in LPG storage plants for early fire detection, timely warnings, evacuation, facilitation, prevention of fire escalation, and compliance with safety regulations. They play a vital role in ensuring the safety of personnel and protecting the facility and its surroundings. Fire alarm is supposed to be installed at the storage plant.



Figure 10-11 Fire Alarm

10.4.5 Sand Buckets

Sand buckets hold significant importance in the safety measures at LPG storage plants. In the event of a small fire or a minor leak that may lead to a fire, sand buckets provide a crucial first line of defense. Sand is a non-combustible material, and when swiftly applied to a small flame, it can smother the fire by cutting off its oxygen supply. Moreover, in cases where liquid chemicals are involved, sand can be used to absorb and neutralize spills. The use of sand buckets is particularly essential in situations where traditional firefighting equipment, like water or foam, may not be suitable due to the flammable nature of LPG. These buckets are strategically placed throughout the facility, easily accessible for immediate use, and serve as an additional safety

measure to contain and control potential fire hazards effectively. Regular training and awareness regarding the proper use of sand buckets will further enhance their role in maintaining a secure environment at LPG storage plants. Fire Sand Bucket will be placed to cater any minor fire accident.



Figure 10-12 Sand Bucket

10.4.6 Fire Pump

A fire pump holds paramount importance in the safety infrastructure of an LPG storage plant. The high flammability of LPG necessitates rapid and effective responses to any fire incidents. A fire pump serves as a critical component of the plant's firefighting system by ensuring a pressurized and reliable water supply. In the event of a fire outbreak, the pump is activated to deliver water at high pressure to firefighting hoses and nozzles. This allows responders to quickly and efficiently extinguish or control the fire, preventing its escalation. The use of a fire pump is essential for overcoming challenges associated with water distribution, especially in large industrial settings like LPG storage plants. It enhances the plant's firefighting capabilities, providing a proactive and effective means to safeguard personnel, assets, and the surrounding environment from the potentially devastating consequences of a fire emergency. Regular maintenance and testing of the fire pump will be crucial to ensure its operational readiness when needed most.



Figure 10-13 Fire Pump

10.4.7 Jockey Pump

The jockey pump plays a crucial role in maintaining the operational efficiency and safety of an LPG storage plant's fire protection system. This small but vital pump ensures that the fire suppression system's main piping remains pressurized within an optimal range. By doing so, the jockey pump helps prevent unnecessary cycling of the main fire pump and ensures that it only activates when there's an actual fire emergency. This not only conserves energy but also extends the lifespan of the main pump, reducing wear and tear. The jockey pump contributes to the plant's readiness to respond swiftly and effectively to fire incidents by maintaining the required pressure in the fire protection system, guaranteeing that water or fire suppression agents can be delivered promptly when needed. Regular monitoring and maintenance of the jockey pump will be essential to ensure its reliability, making it an integral component of the overall fire safety strategy at an LPG storage plant.



Figure 10-14 Jockey Pump

10.4.8 Standby Pump

The standby pump is a critical component in ensuring the reliability and continuous functionality of the fire protection system at an LPG storage plant. In the event that the primary fire pump faces mechanical failure or requires maintenance, the standby pump serves as a backup, ready to seamlessly take over the crucial task of maintaining water pressure for fire suppression. This redundancy is vital for preventing any downtime in the plant's ability to respond promptly to fire emergencies. The standby pump ensures that there is no compromise in the fire protection system's effectiveness, providing a constant and reliable water supply even during unexpected failures. This redundancy not only enhances the overall safety of the LPG storage facility but also contributes to the resilience of the plant's fire safety infrastructure, ensuring uninterrupted protection against potential fire hazards. Regular testing and maintenance of the standby pump will be imperative to guarantee its operational readiness when called upon.

11 OCCUPATIONAL HEALTH AND SAFETY PLAN

The Occupational Health and Safety (OHS) plan holds paramount importance within the framework of an EIA. This plan is a comprehensive document that outlines strategies and protocols to safeguard the well-being of workers involved in the project. Beyond the ethical imperative of ensuring a safe working environment, the OHS plan is integral to regulatory compliance and risk management. It identifies potential occupational hazards associated with the project, establishes preventive measures, and details emergency response procedures. By incorporating an OHS plan into the EIA, not only is the health and safety of the workforce prioritized, but it also contributes to the overall success and sustainability of the project. A well-executed OHS plan minimizes the likelihood of accidents, injuries, and occupational health issues, fostering a workplace culture that values the welfare of its personnel. In essence, the OHS plan, as part of the EIA process, aligns with responsible and ethical project management, ensuring that occupational health and safety considerations are seamlessly integrated into the project's design, implementation, and ongoing operations.

11.1 OBJECTIVES OF OCCUPATIONAL HEALTH AND SAFETY

The objectives of Health and Safety plan at LPG storage are given below

- ✓ Protect the health and safety of employees, contractors, visitors, and the surrounding community. This includes preventing injuries, illnesses, and fatalities caused by LPG releases, explosions, fires, and other hazards.
- ✓ Minimize the environmental impact of LPG storage and handling. This includes preventing releases of LPG to the air, water, and soil.
- ✓ Comply with all applicable health, safety, and environmental regulations.

11.2 SCOPE OF OCCUPATIONAL HEALTH AND SAFETY PLAN

Following scope of occupational health and safety will be followed;

- Assessment and identification of potential hazards specific to the LPG storage and filling operations, including risks associated with handling, storage, transportation, and potential exposure to LPG will be ensured.

- Detailed guidelines on the use, maintenance, and adequacy of personal protective equipment required for various tasks, such as flame-resistant clothing, safety goggles, gloves, respirators, and other specialized gear will be provided.
- Comprehensive training programs for workers, ensuring they are well-informed about the risks involved in working with LPG, handling emergency situations, and the correct usage of safety equipment will be ensured.
- Detailed protocols and procedures for handling emergencies such as gas leaks, fires, and other incidents, including evacuation plans, communication strategies, and coordination with emergency services.
- Compliance with relevant occupational health and safety regulations and conducting regular audits to review and update safety protocols based on changing circumstances or regulations.
- Implementation of the regular maintenance schedules and inspections of equipment, machinery, and facilities to ensure safe working conditions and prevent potential hazards.
- Involving workers in safety decisions, creating a culture of safety awareness, and encouraging reporting of safety concerns or incidents will be implemented.

11.3 PERSONAL PROTECTIVE EQUIPMENT

The use of Personal Protective Equipment in a paper manufacturing plant is vital for safeguarding workers, ensuring regulatory compliance, mitigating risks, and promoting a culture of safety that is conducive to both employee well-being and operational excellence. The importance of Personal Protective Equipment (PPE) at a paper manufacturing plant cannot be overstated. Here are several key reasons highlighting the significance of PPE in this industrial setting:

- PPE provides a crucial line of defense against various occupational hazards prevalent in a paper manufacturing environment. It includes items such as safety helmets, gloves, safety glasses, and respiratory protection, which shield workers from potential injuries, chemical exposures, and airborne particles.

- Utilizing PPE is often a legal requirement and is mandated by occupational health and safety regulations. Adhering to these regulations not only ensures the safety of workers but also prevents regulatory penalties and legal issues for the manufacturing unit.
- Paper manufacturing involves machinery, chemicals, and processes that pose inherent risks. PPE serves as a risk mitigation strategy by minimizing the likelihood and severity of injuries or illnesses, contributing to a safer working environment.
- In the paper manufacturing process, workers may come into contact with various chemicals used in pulping, bleaching, and other stages. PPE, such as chemical-resistant gloves and protective clothing, safeguards workers from direct skin contact and potential harm.
- Dust and other airborne particles are common in paper mills. Respiratory protection, such as masks or respirators, is vital in preventing inhalation of harmful substances, promoting respiratory health, and minimizing the risk of respiratory-related illnesses.
- PPE not only prioritizes safety but also contributes to the overall comfort of workers. Comfortable and well-fitted PPE encourages adherence to safety protocols, fostering a positive work culture and enhancing overall productivity.
- In the event of unexpected incidents or emergencies, PPE can be crucial for protecting workers and mitigating the impact of accidents. Items like hard hats and steel-toed boots provide added protection during emergencies.
- Providing PPE demonstrates the employer's commitment to the health and safety of its workforce, instilling confidence and trust among employees. This, in turn, contributes to a positive work environment and employee morale.

11.4 PPE REQUIRED FOR CONSTRUCTION PHASE

During the construction of a project, including a paper manufacturing unit, a comprehensive set of Personal Protective Equipment (PPE) is necessary to safeguard the health and safety of workers involved in various tasks. The specific PPE requirements may vary based on the nature

of construction activities, potential hazards, and regulatory standards. Here is a general list of PPE commonly required during construction:

Head Protection: Hard hats to protect against falling objects, impact, or head injuries.

Eye and Face Protection: Safety glasses or goggles to shield the eyes from dust, debris, or other airborne particles. Face shields for additional protection during tasks with a higher risk of facial exposure.

Hearing Protection: Earplugs or earmuffs to reduce exposure to loud noises, especially in areas with heavy machinery or construction equipment.

Respiratory Protection: Dust masks or respirators to protect against inhalation of dust, particulates, or hazardous substances.

Hand Protection: Safety gloves appropriate for the specific tasks, such as cut-resistant gloves, leather gloves, or chemical-resistant gloves.

Body Protection: High-visibility vests or clothing to enhance visibility, especially in areas with moving equipment. Reflective clothing for nighttime or low-visibility construction activities. Protective clothing, such as coveralls, for tasks involving exposure to hazardous substances.

Foot Protection: Steel-toed safety boots or shoes to protect against crushing injuries, falling objects, or punctures.

Fall Protection: Safety harnesses, lanyards, and other fall protection systems for workers operating at heights or in elevated areas.

Hand and Arm Protection: Elbow and knee pads for tasks that involve kneeling or crawling. Wrist support or braces for tasks with repetitive motions.

Weather Protection: Weather-appropriate clothing, such as rain gear, insulated clothing, or sunscreen, depending on the climate and weather conditions.

First Aid Kit: Access to a well-equipped first aid kit to provide immediate care for minor injuries.

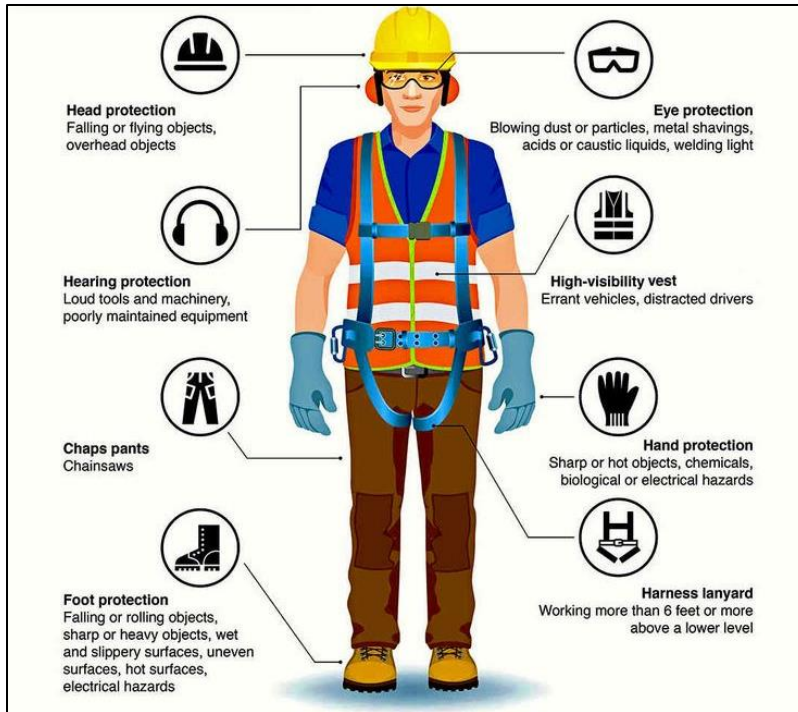


Figure 11-1 PPEs for Construction Phase

It is essential for the construction project management to conduct a thorough hazard assessment to identify the specific risks associated with each construction activity and determine the appropriate PPE for the workers involved. Regular training, monitoring, and enforcement of PPE usage contribute to a safer construction environment.

11.5 SAFETY SIGNS DURING CONSTRUCTION PHASE

Safety signs serve as critical elements in maintaining a secure and hazard-free environment at construction sites. Their importance lies in their ability to effectively communicate potential risks and hazards to workers, visitors, and contractors. By providing clear information about safety procedures, required personal protective equipment, and safe work practices, these signs play a pivotal role in preventing accidents and injuries. Moreover, safety signs contribute to regulatory compliance, ensuring adherence to local regulations and occupational health and safety standards. They also serve as essential tools for emergency response by indicating the location of emergency exits, first aid stations, fire extinguishers, and other emergency equipment. In addition to their role in risk reduction, safety signs assist in site navigation, guiding individuals to specific areas and enhancing overall organization. Beyond practical

benefits, safety signs contribute to fostering a culture of safety awareness among the workforce. They communicate important safety policies, promote compliance with site-specific regulations, and reduce the project's liability by showcasing a commitment to responsible construction practices. Ultimately, safety signs are integral components in creating a safe, compliant, and organized construction site conducive to the well-being of all involved parties.



Figure 11-2 Safety signs for Constructional Phase

11.6 PERSONAL PROTECTIVE EQUIPMENT DURING OPERATIONLAL PHASE

Personal protective equipment (PPE) is an important part of any health and safety plan at an LPG storage plant. PPE can help to protect employees from a variety of hazards, including:

- PPE can help to protect employees from exposure to LPG vapors, which can be harmful to the respiratory system and can cause burns.
- PPE can help to protect employees from flying debris and from the heat and flames associated with an explosion.
- PPE can help to protect employees from burns and from exposure to smoke and toxic gases.

- PPE can also help to protect employees from other hazards, such as slips, trips, and falls.

11.6.1 PPE Required for LPG Storage and Filling Plant

PPE is crucial in LPG storage and filling plants to ensure the safety of workers and minimize the risk of accidents. The necessary PPE for such environments typically includes:

1. **Safety Goggles/Face Shields:** Protect the eyes and face from potential splashes or contact with LPG, chemicals, or other hazardous materials during filling or maintenance operations.
2. **Chemical-Resistant Gloves:** Shield hands from direct contact with LPG, chemicals, or corrosive substances used in the process to prevent skin irritation or burns.
3. **Flame-Resistant Clothing:** Clothing made of fire-resistant materials is essential to protect against potential fire hazards. This includes flame-retardant coveralls or other specialized clothing designed to resist ignition.
4. **Safety Shoes/Boots:** Non-slip, closed-toe footwear is important to protect the feet from spills, slips, or potential impact hazards.
5. **Respiratory Protection:** In some cases, respiratory masks or respirators may be required to safeguard against inhalation of fumes, vapors, or airborne contaminants in the LPG storage or filling environment.
6. **Hard Hats:** Essential for protecting the head from falling objects, particularly during maintenance or handling tasks where there is a risk of items falling from above.
7. **Ear Protection:** If the operations involve loud machinery or equipment, ear protection in the form of earplugs or earmuffs can prevent damage to hearing.
8. **Safety Harnesses:** In instances where workers are operating at elevated heights or working in confined spaces, safety harnesses can prevent falls and ensure worker safety.

The specific PPE required in an LPG storage and filling plant might vary based on the site's procedures, potential hazards, and regulatory requirements. Employees working in these

areas should be trained in the correct usage of PPE and adhere to safety protocols to mitigate risks associated with handling LPG and ensure a safe working environment.



Figure 11-3 PPES for Operational Phase

12 STAKEHOLDER CONSULTATION

Stakeholder consultation is of paramount importance in the EIA process as it facilitates inclusive decision-making, fosters transparency, and enhances the overall quality of the assessment. Involving stakeholders, including local communities, governmental bodies, non-governmental organizations, and affected parties, ensures that diverse perspectives, concerns, and local knowledge are taken into account. This inclusive approach contributes to the identification of potential environmental and social impacts that might not be evident from a solely technical or regulatory standpoint. Stakeholder consultation is a way to involve both the primary and secondary stakeholders in making decisions about the project. Stakeholder engagement builds trust, allows for the exchange of valuable information, and empowers communities by giving them a voice in the decision-making process. Moreover, it helps to align the project with the needs and expectations of the local population, minimizing conflicts and fostering a sense of shared responsibility for environmental stewardship. In essence, stakeholder consultation transforms the EIA into a more robust and credible tool, enhancing the sustainability and social acceptance of proposed projects.

12.1 OBJECTIVES OF STAKEHOLDER CONSULTATION

In 1992, the United Nations Conference on the Environment and Development (UNCED) supported the idea of involving the public in decision-making, and this was outlined in one of the key documents of the conference called Agenda 21.

Agenda 21 is a comprehensive plan for global actions focused on sustainable development and deals with how people interact with the environment. It highlights the importance of including the public in making decisions about the environment to achieve sustainable development.

The objectives of stakeholder consultation in the context of EIA are multi-faceted, aiming to foster meaningful engagement, inclusivity, and informed decision-making. Some key objectives include:

- ✓ Ensure the inclusion of diverse stakeholder perspectives in the decision-making process, promoting a more comprehensive understanding of potential environmental and social impacts.

- ✓ Provide a platform for stakeholders to express their concerns, values, and local knowledge related to the project, contributing to a more nuanced understanding of potential impacts and benefits.
- ✓ Gather valuable insights and feedback that can be integrated into the project design, helping to address and mitigate potential adverse impacts and enhance positive contributions.
- ✓ Establish trust among stakeholders by being transparent, responsive, and open to dialogue. Building trust is essential for the successful implementation of the project and its long-term acceptance by the community.
- ✓ Fulfill regulatory requirements by actively engaging with stakeholders, demonstrating a commitment to compliance with environmental and social standards, and addressing concerns raised during the consultation process.
- ✓ Facilitate an open and inclusive dialogue to build understanding and acceptance of the project within the affected communities, minimizing potential conflicts and fostering a sense of shared responsibility.
- ✓ Integrate local knowledge and community input to enhance the overall sustainability of the project, aligning it with the needs and aspirations of the affected stakeholders.
- ✓ Disseminate accurate and accessible information about the project, its potential impacts, and proposed mitigation measures to ensure that stakeholders are well-informed and can actively participate in the decision-making process.
- ✓ Consider the needs and interests of all affected parties, including vulnerable or marginalized groups, to ensure that the benefits and burdens of the project are distributed equitably.
- ✓ Create a platform for addressing conflicts and disputes, allowing for the resolution of issues through open communication and negotiation.



Figure 12-1 Stakeholder Management

By achieving these objectives, stakeholder consultation contributes to the overall success and sustainability of the project, enhancing its social, environmental, and economic outcomes while fostering positive relationships with the communities it impacts.

12.2 PROPONENT ENVIRONMENT MANAGEMENT TEAM

A comprehensive discussion on all conceivable impacts and corresponding mitigation measures related to the project was conducted with both the proponent and project management. In this collaborative dialogue, a thorough examination of potential environmental, social, and economic implications of the project took place. The proponent and management, demonstrating a proactive commitment to responsible practices, assured the incorporation of all suggested mitigation measures to effectively control and address any discrepancies that may arise during the project's implementation. Their pledge to embrace these measures underscores a dedication to environmental stewardship and sustainable practices. By actively engaging in this discourse, the proponent and management not only exhibit a commitment to regulatory compliance but also

demonstrate a broader responsibility to the well-being of the community and the preservation of the surrounding environment. This collaborative approach ensures that the project aligns with best practices, fostering a positive impact on the environment and minimizing any potential adverse effects.

12.3 THE RESPONSIBLE AUTHORITY

The Proponent assumes the crucial role of the responsible authority, pledging to undertake all necessary measures both prior to the commencement of the project and throughout its operational phases. This commitment encompasses a comprehensive approach to project management, ensuring that all regulatory requirements, environmental standards, and best practices are diligently adhered to. Before project initiation, the Proponent commits to conducting thorough assessments and implementing necessary preparatory measures to mitigate potential impacts. This includes adopting robust environmental management strategies, obtaining required permits, and addressing any concerns raised during stakeholder consultations. Throughout the operational phase, the Proponent maintains an ongoing commitment to environmental sustainability and regulatory compliance. This involves continuous monitoring, prompt response to emerging issues, and the implementation of adaptive management practices. By assuming the mantle of responsibility, the Proponent not only safeguards the project's integrity but also prioritizes the well-being of the environment, local communities, and all stakeholders involved. This proactive stance ensures that the project operates within the parameters of environmental and ethical standards, reflecting a dedication to responsible and sustainable project execution.

Table 12-1 Stakeholders and Their Roles and Responsibilities

Stakeholders	Roles
Proponent/Responsible Authority	The discussion with the proponent proposed the mitigation measures and alternatives to control any disparity in the project.
Environmental Expert	The consultants from the Climate Caretakers survey the project site to gather relevant information and to record

Stakeholders	Roles
	the local community stance and behaviors regarding the project. And also the evaluation of socio-economic impacts of the project has been done.
Government Departments	The consulted government department includes Environmental protection agency, wildlife, planning, and development. The departments overviewed the proposed projects and its socio-economic impacts.
Local affected communities	The surveys determined the extent of community that could be affected and their verdict about the proposed project.

12.3.1 Other departments and agencies

A comprehensive impact analysis was conducted in collaboration with key stakeholders, including project management, the local community, educational institutes, health institutions, hospitals, and non-governmental organizations (NGOs). This inclusive approach sought to gather diverse perspectives and insights related to the implementation of the project. The engagement process involved scoping sessions, focused group discussions, and wayside consultations, providing a multifaceted platform for dialogue and information exchange. Through these forums, all pertinent issues associated with the project were thoroughly examined, including potential environmental, social, and economic impacts. The proactive involvement of stakeholders, representing various sectors of the community, ensured that a holistic understanding of the project's implications was achieved. This collaborative effort not only fostered transparency but also allowed for the incorporation of valuable local knowledge and concerns into the impact analysis. By actively engaging with stakeholders through diverse communication channels, the project management demonstrated a commitment to responsible and inclusive decision-making, setting the stage for a well-informed and socially accepted project implementation process.

12.4 ENVIRONMENTAL PRACTITIONERS AND EXPERTS

Our dedicated team undertook a comprehensive site visit, engaging in extensive discussions with a broad spectrum of project stakeholders. This inclusive approach involved reaching out to residents from nearby villages and beyond, ensuring a diverse representation of perspectives to assess the socio-economic impacts of the project. The community demographic was richly diverse, encompassing individuals from various professions, such as those employed in different fields, business owners, doctors, expatriates, military personnel, and educators. In a conscious effort to ensure gender inclusivity, consultations with women were prioritized to gather their unique perspectives on how the project could contribute to the improvement of the area. While some women openly shared their thoughts, it was evident that social norms in the area made many feel hesitant, creating discomfort with speaking or being photographed. This nuanced understanding allowed our team to respect and navigate the cultural sensitivities of the community. The local community, nonetheless, proved to be a wellspring of information, offering valuable insights into the project and expressing predominantly positive views regarding its potential for development. This holistic approach to stakeholder engagement not only highlights the diverse fabric of the community but also underscores the importance of cultural sensitivity in ensuring meaningful and respectful interactions during the assessment of socio-economic impacts.

12.5 DISCUSED POINTS

The points that have been kept in view while consulting stakeholders are as follows:

- ❖ Activities of the project and their consequences.
- ❖ Requirements of the people likely to be affected.
- ❖ Mitigation measures or compensation strategies.
- ❖ Role of the affected people in the implementation and development of the project.

12.6 AFFECTED AND WIDER COMMUNITY

In the vicinity of the proposed project, there is no identified affected community; however, the proactive engagement of the proponent with inhabitants from various villages has been instrumental in understanding and addressing local perspectives. The absence of a distinct affected community does not diminish the importance of comprehensive consultations. The

proponent has undertaken conscientious efforts to reach out to residents across different villages, fostering a dialogue to assess the community's sentiments towards the project. Remarkably, the feedback from these consultations has been overwhelmingly positive, with residents expressing favorable views regarding the proposed endeavor. This positive reception is indicative of the proactive communication and collaborative approach adopted by the proponent, establishing a foundation of mutual understanding and support within the broader community. While the absence of an affected community streamlines certain aspects of the engagement process, the commitment to inclusive consultations with diverse stakeholders remains integral to building a harmonious relationship with the local population.



Figure 12-2 Pictorial View of Consultation

13 GRIEVANCE REDRESS MECHANISM

A Grievance Redress Mechanism is a structured system established to address and resolve complaints, concerns, or issues raised by individuals or entities regarding their experiences or interactions. This mechanism typically involves clear channels for lodging complaints, whether through written communication, online platforms, or dedicated grievance officers. Once a grievance is registered, the mechanism ensures a systematic and fair investigation of the matter, taking into account all relevant information and perspectives. Timely resolution and effective communication with the aggrieved party are essential components, helping to restore trust and rectify any perceived injustices. An efficient Grievance Redress Mechanism not only safeguards the rights and interests of individuals but also contributes to organizational transparency, accountability, and continuous improvement in service delivery.

13.1 OBJECTIVES OF GRIEVANCE REDRESS MECHANISM

The objectives of a GRM are designed to provide an effective and transparent process for addressing and resolving complaints or grievances raised by individuals or entities affected by a project or organization. The key objectives of a Grievance Redress Mechanism include:

- Ensure that the grievance redress process is easily accessible to all stakeholders, providing a straightforward means for individuals or communities to voice their concerns.
- Promote a fair and impartial mechanism that treats all grievances with equal consideration, regardless of the stakeholder's background, status, or affiliation.
- Establish a system that addresses grievances in a timely manner, minimizing delays and providing prompt resolution to concerns to prevent prolonged dissatisfaction.
- Foster transparency in the grievance redress process, ensuring that stakeholders are informed about the status of their complaints and the steps taken to address them.
- Hold the organization or project accountable for addressing and resolving grievances in accordance with established policies and procedures.
- Utilize the grievance redress process as an opportunity for organizational learning, collecting feedback to identify areas for improvement in project implementation or organizational practices.

- Empower affected individuals or communities by giving them a voice in the decision-making process and acknowledging the importance of their concerns.
- Serve as a mechanism for resolving conflicts and disputes in a constructive manner, minimizing the potential for escalation and promoting harmonious relationships.
- Use insights gained from the grievance redress process to enhance project design, implementation strategies, and overall organizational practices for continuous improvement.
- Ensure that the grievance redress mechanism aligns with legal requirements, industry standards, and the principles of social responsibility.
- Strengthen community engagement by demonstrating a commitment to addressing concerns and maintaining open communication channels.

By achieving these objectives, a Grievance Redress Mechanism contributes to building trust, fostering positive relationships with stakeholders, and enhancing the overall social and environmental sustainability of a project or organization.

13.2 COMPONENTS OF GRM

GRM typically involves several basic steps to address and resolve complaints or grievances effectively. While specific procedures may vary depending on the organization or context, the following are common steps in a basic GRM:

- Individuals submit their grievances through designated channels, which may include online platforms, written communication, or direct contact with a grievance officer.
- The received grievance is formally registered in the system, assigning a unique identifier. This step ensures proper tracking and documentation of each complaint.
- A preliminary assessment is conducted to determine the nature and severity of the grievance. This step helps in categorizing grievances and prioritizing them based on urgency.
- A thorough investigation is carried out to gather relevant information and facts related to the grievance. This may involve interviews, document reviews, or other means of inquiry.

- Clear and timely communication is maintained with the aggrieved party throughout the process. Regular updates and feedback are provided to keep them informed about the progress of the investigation.
- Once the investigation is complete, appropriate measures are taken to address the grievance. This may involve corrective actions, policy changes, compensation, or other forms of redress, depending on the nature of the complaint.
- The resolution is communicated to the aggrieved party, and feedback is sought to ensure their satisfaction. Follow-up may be conducted to confirm that the resolution has been implemented and to monitor any lingering concerns.
- The entire process, from grievance registration to resolution, is documented for record-keeping and reporting purposes. This documentation aids in analyzing trends, identifying systemic issues, and improving the overall grievance-handling process.

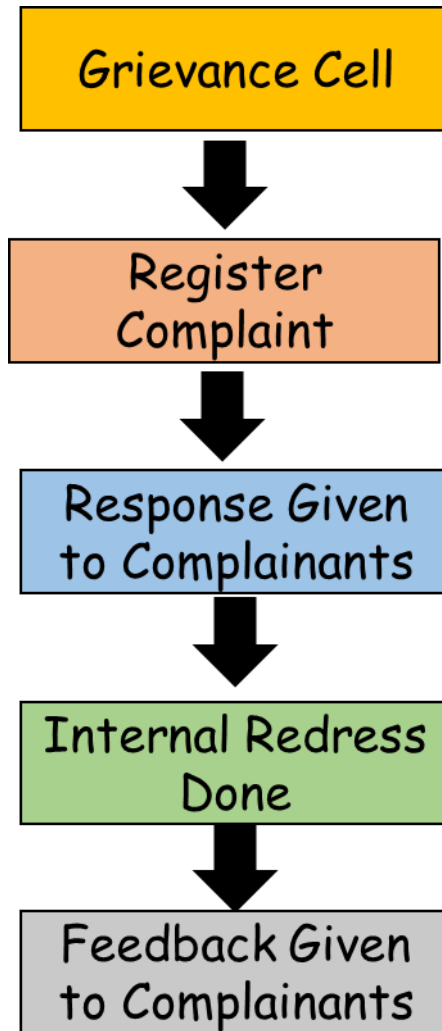


Figure 13-1 Grievance Redress Mechanism

CONCLUSION AND RECOMMENDATION

Based on the study conducted for EIA of the project, the following recommendations are made:

- ☞ Plantation as far as permissible and within the scope of the project to be carried out.
- ☞ Sustainable development approach through conservation of natural environment is followed.
- ☞ Environmental aspects of the project should be well taken care through implementation of the Environmental Management Plan as recommended in this report.
- ☞ The project management may adopt “cleaner and greener environment” as its motto and this will make the project more environment friendly.

On the basis of the findings of the EIA, it is concluded that the project will not pose any adverse impact on the local population and the environment. Therefore, it is recommended that the competent authority may please be issues Environmental Approval for the construction and operation of this project.

Glossary

Air quality	Measurement of the pollutants in the air; a description of healthiness and safety of the atmosphere.
Area	Area is the quantity that expresses the extent of a two-dimensional figure or shape, or planar lamina, in the plane.
Compensation	Includes cash payment, deferred payment, a bond, an insurance policy, stipend, payment in kind, rendition of services, grant of privileges and disturbance money, entitlement to special treatment by government and semi government entities, grant of alternative land, grant of import licenses and business, trade and commercial facilities in addition to the rehabilitation and resettlement of an affected person.
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.
Coordinates contaminate	Each of a group of numbers used to indicate the position of a point, line, or plane to make impure, pollute
Disclosure	The action of making new or secret information known
Disruption	Disturbance or problems which interrupt an event, activity, or process.
Environmental Management	Attempt to control human impact on and interaction with the environment in order to preserve natural resources
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
Land acquisition	The process whereby a person is compelled by a public agency to cede all or part of the land a person owns or possesses, to the ownership and possession of that agency, for public purpose in return for compensation.
Mitigation	The action of reducing the severity, seriousness, or painfulness of something
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
Parking	A parking garage is a building, or an area under a building, where cars can be parked.
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.
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.
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.

LIST OF ABBREVIATION

API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
CO	Carbon Monoxide
CO₂	Carbon Dioxide
DCP	Dry Chemical Powder
EA	Environmental Approval
EC	Electrical Conductivity
EIA	Environmental Impact Assessment
EMMP	Environmental Management and Monitoring Plan
EMP	Environmental Management Plan
EPA	Environmental Protection and Climate Change Department
Gop	Government of Punjab
IEE	Initial Environmental Examination
IESCO	Islamabad Electric Supply Company
LPG	Liquefied Petroleum Gas
MAWP	Maximum Allowable Working Pressure
MDMT	Minimum Design Metal Temperature
NGO	Non-Governmental Organizations
P.W.H.T	Post Weld Heat Treatment
PEPA	Punjab Environmental Protection Act
PEQs	Punjab Environmental Quality Standards
PPE	Personal Protective Equipment
TDS	Total Dissolved Solid
UC	Union Council
UNCED	United Nations Conference on the Environment and Development

VOCs Volatile Organic Compounds

WAPDA Water and Power Development Authority

REFERENCES

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

1. Information and data provided by project proponents;
 2. Project Pre-Feasibility Study Report;
 3. Technical Design Data related to the project.
 4. Information gathered through discussions with the project related persons of the project proponent;
 5. Information collected from the Technical documents of various suppliers of machinery/equipment.
 6. Punjab Environment Quality Standards for Ambient Air August 2016;
 7. Punjab Environment Quality Standards Noise Levels August 2016;
 8. Punjab Environment Quality Standards for Drinking Water August 2016;
 9. Pakistan Environmental Protection Act, 1997;
 10. The Punjab Environmental Protection (Amendment) Act 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 national 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 (Punjab EPA) at Provincial level.
- i. Environment related Laws in Pakistan and the Province of Punjab;
 - ii. Government of Pakistan, Pakistan Environmental Protection Agency, Policy and Procedures for Filing, Review and Approval of Environmental Assessment, 2022;
 - iii. Google earth, maps.
 - iv. Guidelines for Public Consultations - These guidelines cover:

- Consultation, involvement and participation of Stakeholders
 - Techniques for public consultation (principles, levels of involvements, tools, building trust)
 - Effective public consultation (planning, stages of EIA
 - where consultation is appropriate)
 - Consensus building and dispute resolution.
1. workplace safety and health act 2011
 2. Land Acquisition Act (LAA) of 1894
 3. The forest Act 1927
 4. Pakistan Penal Code, 1860
 5. Provincial Wildlife Act, 1974
 6. Drugs Act 1976

TERM OF REFERENCES

1. The Consultant is required to carry out an Environment Assessment Study of the Project as required under section 12 of Pakistan Environmental Protection Act 1997/ Punjab Environmental Protection Act 2012.
2. The Study should be comprehensive and should cover all aspects which are envisaged under the relevant national and provincial's laws & regulations including but not limited to:
 - Identification and recommendation for suitable solution/treatment/mitigation measures of emissions and effluents such as waste water and sludge etc. in accordance with Punjab Environmental Quality Standards (PEQS).
 - Identification and recommendation for suitable solution/treatment/mitigation measures of solvents, oils (tar), hazardous waste, organic compounds, steam, flue gases, particulate matter and chemical compounds harmful for the environment and other substances leading to air, noise, water and soil pollution in accordance with PEQS.

The Study should be acceptable to the relevant national and/or provincial authorities (relevant authorities) in Punjab