ENVIRONMENTAL IMPACT ASSESSMENT REPORT

ESTABLISHMENT OF MUNICIPAL AND INDUSTRIAL WASTES MANAGEMENT FACILITY, NEAR KATAR BUND ROAD LAHORE

Project proponent: **Habib Ur Reahman**

Environment Consultant: **Friends of Environment and Economic Development (FEED), Garden Tower Plaza, Barkat Market, Lahore**

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LIST OF ABBREVIATIONS

CO_2	Carbon Dioxide
°C	Degree Celsius
dB(A)	Decibel (Unit of Noise)
IEE	Initial Environmental Examination
EMMP	Environmental Mitigation and Monitoring Plan
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
EP&CC	Environmental Protection and Climate Change Department
HSE	Health, Safety & Environment
m^3/h	Cubic meter per hour
NOC	No Objection Certificate
Nox	Oxides of Nitrogen
PM	Particulate Matter
PPEs	Personal Protective Equipment
PEPA 1997	Punjab Environmental Protection Act 1997
SOPs	Standard Operating Procedures
Sox	Oxides of Sulfur

EXECUTIVE SUMMARY

The name of project is **"Establishment of Municipal and Industrial Wastes Management Facility''.** The project site is a vacant area and management of the project has planned construction of Halls / Sheds and installation of machinery after obtaining environmental approval from EPA under section 12 of PEPA 1997. The salient features of the project are as under:

Sr. No	Salient Features of Project	
i.	Title of Project	Establishment of Municipal and Industrial Wastes Management Facility
ii.	Description of Project	Collection of Municipal & Industrial Wastes and their segregation and shredding at the project site, and recycling / incineration of Wastes at EPA approved Facilities/ Incinerators
iii.	Location of Project	Near Katar Bund Road Lahore
iv.	Coordinates	Latitude: 31.48523° Longitude: 74.227451°
v.	Name of Project Proponent	Mr. Habib Ur Rahman
vi.	Name of Organization/ Environment Consultant	Friends of Environment and Economic Development (FEED), Garden Tower Plaza, Barkat Market, Lahore
vii	Area of project	4 Kanal
viii	Arrangements for Wastewater Treatment and final disposal	No any process/ operation of project consumes water for its completion and hence no generation of waste water.
ix	Arrangements for the mitigation and control of	The applicant plans to establish Waste Collection, Segregation and Recycling Facility for Municipal and Industrial Wastes. The Waste

	gaseous emissions	Management Facility does not involve any such process/ operation which may generate gaseous emissions. Further, there is no requirement of installation of Boiler.
x	Environmental Impacts anticipated during Construction Phase of Project	The anticipated environmental impacts during construction phase may include dust, noise, vehicle emissions, workers' safety and employment issues. The EIA Report describes all possible environmental impacts and mitigation measures.
xi	Environmental Impacts anticipated during Operation Phase of the Project	The project is not likely to generate adverse environmental impacts during its operational phase.
xii	Mitigation Measures for construction and operational phase of Project	Environmental impacts during the construction phase may include noise, dust and workers' safety. Mitigation measures have been included in the EIA report. Construction-related noise will be mitigated by regular servicing and tuning of the machinery and vehicles. Dust (the only significant air emission) will be controlled by water sprinkling and covering the construction material. The use of adequate PPEs will ensure the safety of the workers. The contractor will hire local labor for construction work to avoid employment conflicts. The operational phase of Project is not likely to generate adverse environmental impacts except weak aesthetic looks of the premises of Project. The boundary wall of the project site will work as a Barrier and hence no one of the surrounding area will get affected by the weak looks of the internal area of the project. There is no likelihood of generation of waste water and gaseous emissions during operational phase of project as no process/ operation of project involves use of water and requires support of boiler.

xii	Proposed Environmental Monitoring Plan	The Environmental Monitoring Plan has been prepared and made part of EIA Report.

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CHAPTER .1

INTRODUCTION

Chapter 1: INTRODUCTION

The Project Proponent has planned a Project **"Establishment of Municipal and Industrial Wastes Management Facility"** and this document is the Environmental Impact Assessment Report (EIA) of said Project. The main objective of the study is to keep the project in compliance with prevailing Environmental Laws, Rules, and Regulations. The report indicates potential environmental impacts of the project and suggests mitigation measures to enhance the environmental performance of the proposed project. The report is comprehensive and presents the Environmental Impacts of the project during its construction and operational phase along with a monitoring framework to keep the project in compliance with Environmental Laws and Punjab Environmental Quality Standard (PEQS).

1. Objectives of EIA

The main purpose of this report is to meet legal requirements prescribed in Punjab Environmental Protection Act, 1997. Section 12 of Punjab Environmental Protection Act, 1997 states as under:

"No proponent of a project shall commence construction or operation unless he has filed with the Provincial Agency an Initial Environmental Examination (IEE) and, where the project is likely to cause an adverse environmental effect, an Environmental Impact Assessment (EIA), and has obtained approval from the Provincial Agency in respect thereof"

The Punjab Environmental Protection Agency (Review of IEE and EIA Regulations, 2000) provides the details regarding categories of Projects. The project of **Establishment of Municipal and Industrial Wastes Management Facility** falls in schedule II of IEE/EIA Regulations 2022; hence this EIA report has been prepared.

The following are the main objectives of EIA Report: -

i. To determine and document the state of the environment of the project area to establish an environment baseline for assessing the suitability of the Project site.
ii. To identify construction and operational activities of project and assess their impacts on the environment.

iii. To assist the proponent in planning, designing, and implementing the project in a way that eliminates or minimizes the negative impacts on the biophysical and socio- economic environment and maximizes the benefits for all parties/stakeholders.

iv. To present an Environmental Mitigation and Monitoring Plan to smoothly implement the mitigation measures and supervise their efficiency and effectiveness.

v. To present a Mitigation and Monitoring Plan to smoothly implement the suggested mitigation measures and supervise their efficiency and effectiveness.

vi. To provide an opportunity for the public to understand the project and its impacts on the community and their environment in the context of sustainable development.

1.2 Brief Introduction to Environment Consultant

The project proponent has hired the services of Environmental Consultant i.e. ***Friends of Environment and Economic Development (FEED).*** A team consisting of professionals having qualifications in the field of Environmental Sciences has worked for the collection of requisite data/ information and preparation of Environmental Impact Assessment (EIA).

The Environment Consultant; ***Friends of Environment and Economic Development (FEED)*** consists of well-trained professionals who provide the following services as per Guidelines, Rules and Regulations notified by EPA Punjab:

i. Initial Environmental Examination

ii. Environmental Impacts Assessment

iii. Socio-Environmental Impacts Assessment

iv. EPA NOC for the Construction Phase of existing industrial units and new industrial units

v. EPA NOC for the Operational Phase of industrial units

vi. Renewal of EPA NOC after every 3-years

1.3 Contact Details of Focal Person of Environment Consultant

The contact details of Environment Consultant are in the following Table 1.

Table 1.1 Contact Details of Focal Person of Environment Consultant		
i.	**Contact Person**	Ms. Aqsa Tabbasam, Assistant Manager (Environment) (03237843076)
ii.	**Environment Consulting Firm**	***Friends of Environment and Economic Development (FEED)***
iii.	**Address**	Garden Tower Plaza, Barkat Market, Lahore

1.4 Details of Project Team of Environment Consultant

The following Team of qualified professionals has conducted environmental assessment and contributed for preparation of the IEE / EIA report.

Table 1.2 Details of Project Team of Environment Consultant

Sr.#	Name	Qualification	Roles
i.	**Mr. Muhammad Tahir**	MSc. Environmental Sciences MSc. Agricultural Engineering	• Team Head
ii	**Ms. Aqsa Tabbasam**	BS Environmental Sciences MS Textile Engineering	• Data Collection • Report Writing
iii	**Mr. Mehroz Khan**	BS Environmental Sciences MS Environmental Sciences	• Data Collection • Report Writing
iv	**Ms. Amina Ramzan**	BS Environmental Sciences	• Social Survey • Report Writing

1.5 Screening and Scoping

In an Environmental Impact Assessment (EIA) screening is the initial step to determine if a project is likely to have significant environmental impacts, thus requiring a full EIA, while scoping is the subsequent process that identifies and defines the key environmental issues, alternatives, and the baseline data needed for that EIA. Screening uses criteria or project lists to decide if an EIA is mandatory, leading to outcomes ranging from no further assessment to a full EIA. Scoping then sets the boundaries and terms of reference for the EIA, involving public consultation and stakeholder input to focus the assessment on relevant concerns and ensuring an efficient and comprehensive evaluation.

1.6 Environmental Impacts of Project

The Team determined the potential environmental impacts of the proposed project during the study. Subsequently, the potential environmental impacts have been characterized to determine their significance. Mitigation measures have been identified to minimize the significant environmental effects. A management framework has also been developed in the form of an EMP for the implementation of the mitigation measures identified during the study.

1.7 Structure of Report

This EIA reviews information on existing environmental attributes of the project Area. All-important ecological features, air quality, noise, water quality, social and economic aspects are included. The report predicts the probable impacts on the environment due to the said project. This Environmental Impact Assessment Report (EIA) also proposes various environmental management measures. Details of all background environmental quality, environmental impacts/pollutant generating activities, pollution sources, predicted environmental quality and related aspects have been provided in this report.

The structure of this assessment report is as follows:

i. Introduction
ii. Legislative Framework
iii. Screening and Scoping
iv. Description of the Project
v. Description of Environment
vi. Screening of Potential Environmental Impacts and Mitigation Measures
vii. Stakeholders Consultations

viii. Environmental Mitigation and Monitoring Plan (EMMP)

ix. Conclusion and Recommendations

CHAPTER NO.2

LEGISLATIVE

FRAME WORK

Chapter 2: LEGISLATIVE FRAMEWORK

Pakistan is a signatory to Multilateral Environmental Agreements and different International Treaties. Pakistan has a comprehensive set of environmental legislation covering multiple environmental issues facing Pakistan like pollution of freshwater bodies, gaseous emissions from Industrial Units degradation of ambient air quality, deforestation, loss of biodiversity, lack of proper waste management, and adverse impacts of climate change. The basic policy and legislative framework along with detailed rules, regulations, and guidelines required for implementing the policies and enforcement of legislation for the protection of the environment and biodiversity are in place, in Pakistan.

In Punjab, prime and the most important legal instruments to deal with the environmental matters and challenges, are Punjab Environment Protection Act 1997 and Punjab Environment Quality Standards PEQS. The above stated enactment is a very comprehensive law and covers all the important aspects as explained below. Similarly, Punjab Environmental Quality Standards are also added in this chapter for ready reference.

2.1 Punjab Environmental Protection Act 1997

After the 18th Amendment in the Constitution of Pakistan, the Federal Ministry of Environment has been dissolved and the subject of Environment and Ecology was devolved to provinces of Pakistan. The province of Punjab has made its own Environment Act titled Punjab Environmental Protection Act, 1997. The Punjab Environmental Protection Act (PEPA), 1997 covers the following important topics /subjects.

i. Establishment of the Punjab Environmental Protection Council.
ii. Functions and Powers of the Council.
iii. Establishment of the Provincial Environmental Protection Agency.
iv. Functions of the Provincial Agency.
v. Powers of the Provincial Agency.
vi. Establishment of the Provincial Sustainable Development Fund.
vii. Management of the Provincial Sustainable Development Fund.
viii. Prohibition of certain discharges or emissions.
ix. Initial environmental examination and environmental impact assessment
x. Prohibition of import of hazardous waste.
xi. Handling of hazardous substances.

xii. Regulation of motor vehicles.

xiii. Environmental Protection Order.

xiv. Penalties.

xv. Offences by bodies corporate.

xvi. Offences by Government Agencies, local authorities or local councils.

xvii. Environmental Tribunals.

xviii. Jurisdiction and powers of Environmental Tribunals.

xix. Appeals to the Environmental Tribunal.

xx. Appeals from orders of the Environmental Tribunal.

xxi. Jurisdiction of Environmental Magistrates.

xxii. Appeals from orders of Environmental Magistrates.

2.2 Review of IEE/EIA Regulations 2022

Review of IEE/EIA Regulations provide clear mechanism for processing the NOC applications. The said regulation provides the list of projects requiring IEE through schedule I and the list of projects requiring IEE through schedule II. The said regulations further provide details regarding review fee in its schedule III. The procedure for conducting preliminary scrutiny of project documents and public hearing/ public participation have been stated in detail. In addition to above, the Regulations describes validity period of approval, mechanism regarding entry and inspection, monitoring and cancellation of approval. The Regulations further provides composition of Environmental Assessment Advisory Committee and its mandate.

Apart from the above mentioned two important Legal Instruments (i) Punjab Environmental Protection Act, 1997 (PEPA 1997) and (ii) Review of IEE/EIA Regulations 2022, there are others legal instruments on the subject of Environment and they all are applicable in the Province of Punjab. Some of them are mentioned below: -

i. Punjab Clean Air Policy and Action Plan

ii. Policy on Controlling Smog 2017

iii. Production and Consumption of single use Plastic Products Regulations 2023

iv. Smog Prevention and Control Rules 2023

v. Delegation of Powers for Environmental Approvals Rules 2017

vi. Punjab Hospital Waste Management Rules 2014

2.3 Punjab Environmental Quality Standards (PEQS)

The Govt. of Punjab has notified Punjab Environmental Quality Standards for different kinds of pollutants, as described in the following tables: -

Table 2.1 Punjab Environmental Quality Standards for Ambient Air

Sr. No	Pollutant	Time-Weighted Average	Concentration in Ambient Air	Method of Measurement
1.	Sulfur Dioxide (SO2)	Annual Average	80 µg/m3	Ultraviolet Fluorescence Method
		24 hours	120 µg/m3	
2.	Oxides of Nitrogen as (NO)	Annual Average	40 µg/m3	Gas phase chemiluminescence
		24 hours	40 µg/m3	
3.	Oxides of Nitrogen as (NO)	Annual Average	40 µg/m3	Gas phase chemiluminescence
		24 hours	80 µg/m3	
4.	Ozone (o3)	1 hour	130 µg/m3	Non-Dispersive UV Absorption Method
5.	Suspended particulate matter (SPM)	Annual Average	360 µg/m3	High volume sampling (average flow rate not less than 1.1 m3/min)
		24 hours	500 µg/m3	
6.	Respirable Particulate Matter PM10	Annual Average	120 µg/m3	Preferably β-Ray absorption method
		24 hours	150 µg/m3	
7.	Respirable Particulate Matter PM2.5	Annual Average	15 µg/m3	Preferably β-Ray absorption method
		24 hours	35 µg/m3	

	Pollutant	Time-weighted	Concentration	Method Of Measurement

		Average	in Ambient AIR	
		1 hour	15 µg/m3	
8.	Lead (Pb)	Annual Average	1 µg/m3	Ass method after sampling using EPM2000 or equivalent Filter paper
		24 hours	1.5 µg/m3	
9.	Carbon Monoxide (CO)	8 hours	5 µg/m3	Non-Dispersive Infra-Red (NDIR) method
		1 hours	10 µg/m3	

2.2 Punjab Environmental Quality Standards for Drinking Water

Sr. No.	Properties /Parameters	Standard Values	WHO Standards	Remarks
1.	All water intended for drinking (E. Coil or Thermo-tolerant Coliform bacteria)	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	Most Asian countries also follow WHO standards.
2.	Treated water entering the distribution system (E. Coil or thermo-tolerant coliform and total coliform bacteria)	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	Most Asian countries also follow WHO standards.
3.	Treated water in the distribution system (E. Coil or thermo-tolerant coliform and total coliform bacteria)	Must not be detectable in any 100 ml sample In the case of large supplies, where sufficient samples are examined, must not be present in 95 % of the sample taken throughout any 12-month period.	Must not be detectable in any 100 ml sample In the case of large supplies, where sufficient samples are examined, must not be present in 95 % o f the s ample taken throughout any	Most Asian countries also follow WHO standards

			12- month period.	
4.	Color	≤15 TCU	≤15 TCU	
5.	Taste	Non objectionable/ acceptable	Non objectionable/ acceptable	
6.	Odour	Non objectionable/ acceptable	Non objectionable/ acceptable	
7.	Turbidity	<5 NTU	<5 NTU	
8.	Total hardness as CaCO3	< 500 mg/l	_	
9.	TDS	< 1000	< 1000	

10.	Ph	6.5 – 8.5	6.5 – 8.5	
11.	Essential Inorganic	mg/Liter	mg/Liter	
12.	Aluminum (AI) mg/l	≤0.2	0.2	
13.	Antimony (Sb)	≤0.005 (P)	0.02	
14.	Barium (Ba)	0.7	0.7	
15.	Arsenic	≤0.05 (P)	0.01	Standard for Pakistan similar to most Asian developing countries
16.	Boron (B)	0.3	0.3	
17.	Cadmium (Cd)	0.01	0.003	Standard for Pakistan similar to most Asian developing countries
18.	Chloride (Cl)	<250	250	
19.	Chromium (Cr)	≤0.05	0.05	
20.	Copper (Cu)	2	2	
21.	Toxic Inorganic	mg/l	mg/l	
22.	Cyanide (CN)	≤0.05	0.07	Standard for Pakistan similar to most Asian developing countries

23.	Fluoride (F)*	≤1.5	1.5	
24.	Lead (Pb)	≤0.05	0.01	Standard for Pakistan similar to most Asian developing countries
25.	Manganese (Mn)	≤0.5	0.5	
26.	Mercury (Hg)	≤0.001	0.001	
27.	Nickel (Ni)	≤0.02	0.02	
28.	Nitrate (NO3)	≤50	50	
29.	Nitrite (NO3)	≤3 (P)	3	
30.	Selenium (Se)	0.01 (P)	0.01	
31.	Residual chlorine	0.2-0.5 at consumer end 0.5-1.5 at source		
32.	Zinc (Zn)	5.0	3	The standard for Pakistan similar to most Asian developing countries

33.	Organic			
34.	Pesticides mg/l			PSQCA No. 4639 – 2004, page No. 4 Table No. 3 Serial No. 20 – 58 may be consulted
35.	Phenolic compound (as Phenols) mg/l			
36.	Poly-nuclear aromatic hydrocarbons (as PAHs) g/l		0.01 (By GC/MS method)	
37.	Alpha Emitters bq/L	0.1	0.1	
38.	Beta emitters	1	1	

*Indicates priority health-related inorganic constituents, which need regular monitoring.

*PSQCA: Pakistan Standards Quality Control Authority.

2.3 Punjab Environmental Quality Standards for Municipal and Liquid Industrial Effluents (mg/l, unless otherwise defined)			
Sr. No	**Parameters**	**Into Inland Waters**	**Into Sewage Treatment**
1	Temperature or Temperature Increase	≤3°C	≤3°C
2	pH value (H)	6-9	6-9
3	Biochemical Oxygen Demand (BOD) at 20 °C	80	250
4	Chemical Oxygen Demand (COD)"	150	250
5	Total suspended solids (TSS)	200	400
6	Total dissolved solids (TDS)	3500	3500
7	Grease and Oil	10	10
8	Phenolic compounds (as phenol)	0.1	0.3
9	Chloride (as CI").	1000	1000
10	Cyanide (as CN)	1.0	1.0
11	An-ionic detergents (as MBAs) (2	20	20
12	Sulfate (SO4)	600	1000
13	Fluoride (as F)	10	10
14	Sulfide (S^{-2})	1.0	1.0
15	Ammonia (NH_3)	40	40
16	Pesticides(3)	0.15	0.15
17	Cadmium (Cd)(4)	0.1	0.1
18	Chromium (trivalent and hexavalent)	1.0	1.0

19	Copper (Cu)(4)	1.0	1.0
20	Lead (Pb)(4)	0.5	0.5
21	Mercury (Hg)(4)	0.01	0.01
22	Selenium (Se)(4)	05	0.5
23	Nickel(Ni)(4)	1.0	1.0
24	Silver(Ag)(4)	1.0	1.0
25	Total Toxic metals	2.0	2.0
26	Zinc (Zn)	5.0	5.0
27	Arsenic (As)(4)	1.0	10
28	Barium (Ba)(4)	1.5	15
29	Iron (Fe)	8.0	8.0
30	Manganese (Mn)	1.5	1.5
31	Boron (Ba)(4)	6.0	6.0
32	Chlorine (Cl_2)	1.0	1:0

Explanation:

1. Assuming minimum dilution 1:10 on discharge, lower ratio would attract progressively stringent standards to be determined by the Provincial Environmental Protection Agency. By 1:50 dilution means, for example that for each one cubic meter of treated effluent, the recipient water body should have 10 cubic meter of water for dilution of this effluent.
2. Methylene Blue Active Substances; assuming surfactant as biodegradable.
3. Pesticides include herbicides, fungicides and insecticides.
4. Subject to total toxic metals, discharge should not exceed level given al S.N. 25.
5. Applicable only when and where sewage treatment is operational and BOD5-80 mg/l is achieved by the sewage treatment system.
6. The effluent should not result in temperature increase of more than 30°C at the edge of the zone where initial mixing and dilution take place in the receiving body. In case zone is not defined, use 100 meters from the point of discharge.

Note:

1. Dilution of liquid effluents to meet to the PEQS limiting value is not permissible through fresh water mixing with the effluent before discharging into the environment

2. The concentration of pollutants in water being used will be subtracted from the effluent for calculating the PEQS limits.

Table 2.4 Punjab Environmental Quality Standards for Industrial Gaseous Emissions (Mg/Nm3)

Sr. No.	Parameter	Source of Emissions	Stander
1	Smoke	Smoke opacity not exceed	40% or 2 Ringelmann Scale or equivalent Smoke number
2	Particulate matter	Boilers and furnaces	
		Oil fired	300
		Coal-fired	500
		Cement Kilns	300
		Grinding, crushing, clinkers coolers and related processes, metallurgical processes, converters, blast furnaces and cupolas	500
3	Hydrogen chloride (HCL)	Any	400
4	Chlorine	Any	150
5	Hydrogen fluoride	Any	150
6	Hydrogen Sulphide	Any	10
7	Sulphur Oxides	Sulfuric acid/Sulfonic acid plants	5000
		Other plants expect power plant operating on oil and coal	1700
8	Carbon Monoxide Parameter	Any Source of Emission	800 Stander
9	Lead (PB)	Any	50
10	Mercury (Hg)	Any	10
11	Cadmium (Cd)	Any	20
12	Arsenic (Ar)	Any	20
131	Copper (Cu)	Any	50
14	Antinomy (Sb)	Any	20

15	Zinc (Zn)	Any	200
16	Oxides of Nitrogen	Nitric acid manufacturing unit	3000
		Other plants expect power operating on oil or coal	
		Gas Fired	400

Table 2.5 Punjab Environmental Quality Standards for Noise

Sr. No	Category of Area Zone	Effective from 1" July, 2010		Effective from I" July, 2013	
		Limits in Db(A) Leq			
		Day Time	Night Time	Day Time	Night Time
1	Residential Area (A)	65	50	55	45
2	Commercial Area (B)	70	60	65	55
3	Industrial Area (C)	80	70	75	6545
4	Silence Zone (D)	55	45	50	

Note:1. Day time hours; 6:00am to 10:00pm.

2. Night Time hours; 10:00 pm to 6:00 am.

3. Silence Zone: Zones which are declared as such by the competent authority. An area comprising not less than 100 meters around hospital, educational institutions and courts

4. Mixed categories of areas may be declared as one of the four above mentioned categories by the competent authority

dB(A) Leq: Time weighted average of the level of sound in decibel on scale A which is relatable to human hearing.

CHAPTER NO.3
SCREENING
AND SCOPING

Chapter 3: SCREENING AND SCOPING

In an Environmental Impact Assessment (EIA), screening is the initial step to determine if a project is likely to have significant environmental impacts, thus requiring a full EIA, while scoping is the subsequent process that identifies and defines the key environmental issues, alternatives, and the baseline data needed for that EIA. Screening uses criteria or project lists to decide if an EIA is mandatory, leading to outcomes ranging from no further assessment to a full EIA. Scoping then sets the boundaries and terms of reference for the EIA, involving public consultation and stakeholder input to focus the assessment on relevant concerns and ensuring an efficient and comprehensive evaluation.

3.1 Screening

Purpose: To determine if a proposed project or plan requires an Environmental Impact Assessment (EIA).

How it Works: It involves evaluating the potential magnitude and significance of a project's environmental and social impacts.

Methods: This can include using predefined lists of projects, applying specific criteria related to potential impacts, or conducting a preliminary environmental examination.

Outcome: The result of screening is a decision on whether a full EIA is necessary, or if alternative, less intensive assessments are sufficient.

3.2 Scoping

Purpose: To identify the most significant environmental issues that need to be addressed in the EIA and to define the boundaries of the assessment.

How it Works: It's a collaborative process involving the project proponent, regulatory bodies, and the public to define the scope and detail required for the Environmental Statement.

Activities: Key activities include identifying potential alternatives, establishing the environmental baseline, setting the terms of reference for the assessment, and defining the range of issues to be studied.

Output: The outcome is a scoping opinion or a similar document that guides the developer on the information that must be included in the EIA.

This section of the study focuses on the details of project screening, scoping, and the selection of alternatives. According to Section 12 of Punjab Environment Protection Act, 1997. "No proponent of a project shall commence construction or operation unless he has filed with the Provisional Agency an initial environmental examination or where the project is likely to cause an adverse environmental effect, an environmental impact assessment (EIA) and has obtained from the Provisional Agency approval in respect thereof.

The IEE/EIA Regulation 2022, classifies the projects under two schedules called Schedule-I and Schedule-Il. The Regulations read that a proponent of a project falling in any category specified in Schedule II shall file an EIA with the Provincial Agency and the provisions of section 12 shall apply to such project. According to the said regulations, the proposed project falls under Schedule II

The scoping exercise helps identify key environmental issues that should be highlighted and further investigated in the EIA. Effective scoping is essential in terms of the following: -

i. Defining the spatial and temporal boundaries.
ii. Consulting with stakeholders to identify a full range of concerns.
iii. Focusing on key issues that have been characteristic of the existing environment in the baseline study.
iv. Reviewing the types of alternatives to be considered.
v. Making logical decisions that have been more significant and need to be prioritized in the EIA

3.3 Alternatives

3.3.1 Environmental alternatives

The surrounding environmental conditions are congenial for the project. Both the construction as well as operation phases will not adversely affect the environment. All of the aspects will be kept strictly within the limits defined under Punjab Environmental Quality Standards (PEQS) and the project shall comply with requirements prescribed in Punjab Environmental Protection Act 1997.

3.3.2 Site alternative

The site selected for the project is highly suitable as it is located in relatively away from human settlements. Other sites have also been considered near the city of Lahore and Kasur but finally the selected site has been found more appropriate for the proposed project.

CHAPTER .4

PROJECT

DESCRIPTION

Chapter 4: PROJECT DESCRIPTION

This section of the study concentrates on details of the project and its salient features, such as location, Site layout, objectives, selection of alternatives, and magnitude of the operations. Inputs and discharges relevant to different phases of the project, such as electricity, vehicles & materials, etc. have been examined to ascertain the potential environmental impacts and to suggest necessary corrective measures required during the construction and operational phase of project to safeguard the environment.

4.1 Project Objectives

The objective of this project is Establishment of Municipal and Industrial Wastes Management Facility.

4.3 Location of the Project

The Project site is located near Katar Bund Road Lahore. Other sites have also been considered near the city of Lahore and Kasur but finally the selected site has been found more appropriate for the proposed project. A Google map showing the location of the project is attached:

Table 4.1 Geographical Configuration

1.	***Current Position of Land on 4 Sides* of Project Site**	
2.	North	Vacant Plot / No Residence/ No any other activity
3.	South	-do-
4.	East	-do-
5.	West	-do-

4.4 Road Access

Katar Bund Road has very good access roads. All the roads accessing the project site are metaled. The map showing the road network of area is annexed.

4.5 Vegetation Features of the Site

Land is clear and no any plant / tree or vegetation of ecological importance is present at the site. The Project Proponent will develop greenery at the project site after construction work and this greenery will serve as a useful buffer zone to lessen the effects of pollution from other different sources like factories and vehicles. The project will not cause any harm to vegetation and environment of the area.

4.6 Salient Features of Project

The salient features of Project are as under in Table 4.2.

Table 4.2 Salient Features of Project

Sr. No	***Saliant Features* of Project**	
1.	Project Title	"Establishment of Municipal and Industrial Wastes Management Facility"
2.	Total Area	4 Kanal
3	Project Cost	Rs.15.00 million
4	Purpose of Project	The main objective of the project is establishment of Municipal and Industrial Wastes Management Facility". In other words, project is a Resource Recovery Unit (RRU). A Resource Recovery Unit (RRU) is a facility which recovers usable materials and energy from waste before it is sent for final disposal. The main objective of RRU is to minimize the quantity of waste going to landfills and maximize resource conservation through segregation, recycling, reuse, and composting. RRUs are often set up at municipal transfer stations, industrial estates, or

		community-level waste management centers as part of an integrated waste management system.

The following Table describes how a Waste Management Facility / Resource Recovery Unit performs its different functions.

Sr. No	Function	Description
i.	**Segregation and Sorting**	RRUs receive mixed solid waste and separate it into recyclable, compostable, and non-recyclable fractions using manual and mechanical methods. Sorting lines, conveyor belts, and screens may be used for efficiency.
ii.	**Material Recovery**	RRU recover valuable materials such as metals, plastics, paper, glass, rubber, and textiles that can be sold to recycling industries.
iii.	**Composting and Organic Waste Processing**	Organic and biodegradable waste (mainly food and green waste) is converted into compost or biogas, reducing the waste load on disposal sites.
iv.	**Recycling Operations**	Facilitate the recycling process by compacting, baling, and temporarily storing recyclable materials before they are transported to recycling industries.
v.	**Energy Recovery**	Non-recyclable but combustible materials may be used for Refuse-Derived Fuel (RDF) or waste-to-energy operations.
vi.	**Waste Minimization and Reuse Promotion**	Encourage communities and industries to adopt waste reduction, reuse, and recycling (3Rs) practices to minimize waste generation at source.
vii.	**Data Collection and Record Keeping**	Maintain quantitative and qualitative records of waste received, processed, recovered, and disposed of, helping municipal authorities in waste management planning.
viii.	**Environmental Protection**	Ensure that waste processing is done in an environmentally sound manner, preventing leachate, odor, and air pollution through proper housekeeping and treatment measures.

ix.	**Awareness and Capacity Building**	Conduct community outreach and awareness programs on segregation at source and responsible waste disposal.
x.	**Support for Circular Economy**	By returning recovered materials to industries, RRUs play a crucial role in promoting a circular economy where materials are continuously reused instead of being discarded.

4.8 Types of Waste Collected by Waste Management Facility / Resource Recovery Units

RRUs handle a variety of municipal, commercial, and industrial solid wastes, except hazardous and biomedical waste (which are managed separately).

Sr. No	Category	Examples of Waste Materials	Recovery/Reuse Option
	Recyclable Waste	Paper, cardboard, plastics (PET, HDPE, LDPE), metals (aluminum cans, steel scraps), glass bottles	Sold to recycling industries for remanufacture
	Organic/Biodegradable Waste	Food scraps, vegetable/fruit waste, garden trimmings, leaves, livestock manure	Converted into compost or biogas
	Construction and Demolition Waste	Bricks, concrete, rubble, metal rods, tiles	Crushed and reused in road base or building works
	E-Waste (limited handling)	Small electronic components, wires, metal casings	Segregated and sent to authorized e-waste recyclers
	Textile Waste	Fabric cuttings, old clothes	Reused or recycled into rags, padding, or insulation
	Rubber and Leather Waste	Used tires, rubber scraps, leather trimmings	Recycled into flooring materials, fuel, or reprocessed rubber
	Agricultural Residues	Crop residues, husks, shells	Used for composting or biomass energy

	Mixed Non-Recyclable Waste	Polystyrene, multilayer plastics, contaminated packaging	Converted into RDF (Refuse Derived Fuel) or disposed of safely

4.9 Operational Flow of a Typical Resource Recovery Unit

Step 1: Waste collection and transportation from households or transfer stations

Step 2: Weighing and recording at RRU gate

Step 3: Manual/mechanical segregation (dry vs. wet waste)

Step 4: Sorting of recyclables (paper, metals, plastics, etc.)

Step 5: Composting of biodegradable waste

Step 6: Baling, compacting, and temporary storage of recyclables

Step 7: Dispatch of recovered materials to recyclers or industries

Step 8: Safe disposal of inert residues to sanitary landfill

4.10 Environmental and Economic Benefits

i. Reduction in waste volumes sent to landfill sites
ii. Conservation of natural resources through material recovery
iii. Employment generation for local communities (especially informal waste pickers)
iv. Reduction in greenhouse gas emissions due to reduced waste decomposition in open dumps
v. Contribution to cleaner cities and sustainable waste management

4.11 Compliance and Regulatory Aspects

i. In Punjab (Pakistan) and other regions, RRUs should operate in line with:
ii. Pakistan Environmental Protection Act, 1997
iii. Punjab Environmental Quality Standards (PEQS)
iv. Punjab Solid Waste Management Regulations
v. Municipal Solid Waste Management Rules (where applicable)

4.12 Schedule of Implementation

The project construction work will take almost 6 months, because this type pf projects do not involve much civil work or installation of machinery. The schedule of Construction/ Installation of machinery/

Project implementations is as under in Table 4.3

Table 4.3 Schedule of Implementation

Sr. No	Activities	First 2 Months	Second 2Months	Third 2 Months
1.	Construction of Hall/ Shed			
2.	Installation of Machinery			
3.	Trial operation			

4.13 Water and Wastewater Details

i. Sources of water

Water requirement will be met from groundwater through installation of pumps during construction phase as well as during operation phase. There is very little requirement of water during construction as well as operational phase of the project. There is no such process during the operational phase of project which consumes water , hence no generation of waste water.

iii. Restoration and Rehabilitation Plan

After completion of the construction work, all the disturbed sites will be changed into conditions as they were prior to the commencement of the project or even far better than the previous one. For improving the environmental and aesthetic value or visual quality of the site, the proponent will carry out tree planting.

CHAPTER .5

DESCRIPTION OF ENVIRONMENT

Chapter 5: DESCRIPTION OF ENVIRONMENT

This chapter describes the baseline conditions, which cover the existing physical, ecological, and socio-economic environment of the Project 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 relevant agencies.

5.1 Data Collection

The primary data was collected by surveying the project area and its nearby vicinity. The secondary data regarding physical parameters (topography, geology, seismology, hydrology, and climatology) was obtained by visiting relevant departments and their official websites. The biological parameters (flora and fauna) were also studied in the project area. The vegetation of the project area was studied by preparing a floristic list based on visual observation. The species were recorded in terms of their historical existence in the project area.

Information on wildlife/fauna species (mammals, amphibians, reptiles, birds, etc.) in the assessment area is based on opportunistic observation, gathering the existing information, and consultation with local experts, community members, government, and Non-Government Organizations (NGOs).

5.2 Physical Environment

This part examines the physical resources such as topography, soil, climate, surface and ground water resources and quality, ambient air quality and geology of not only the Project site but also the city as a whole to assess whether the project under assessment can or does have any impacts on any of these parameters. The description of physical environment of District Lahore and the project site is presented in the following sub sections.

5.3 Geography and Geology

The project area is located in Lahore district and lies on the alluvial plains of the Ravi River. The district is characterized by fertile soils, primarily formed by river deposits, making it ideal for agriculture. Geologically, it is part of the Indo-Gangetic Plain, with a flat terrain and minimal elevation changes, and it experiences a subtropical climate.

5.4 Topography

Lahore District lies between the river Ravi, which flows along its boundary with Sheikhupura District. The district has two main types of land: a low-lying area near the river and canals that often floods during the monsoon season, and a higher, flat area farther from the water. The soil in the low-lying parts is sandy, while the upland areas gently slope from north to south. The elevation in Lahore generally ranges from 200 to 250 meters above sea level.

4.5 Hydrology

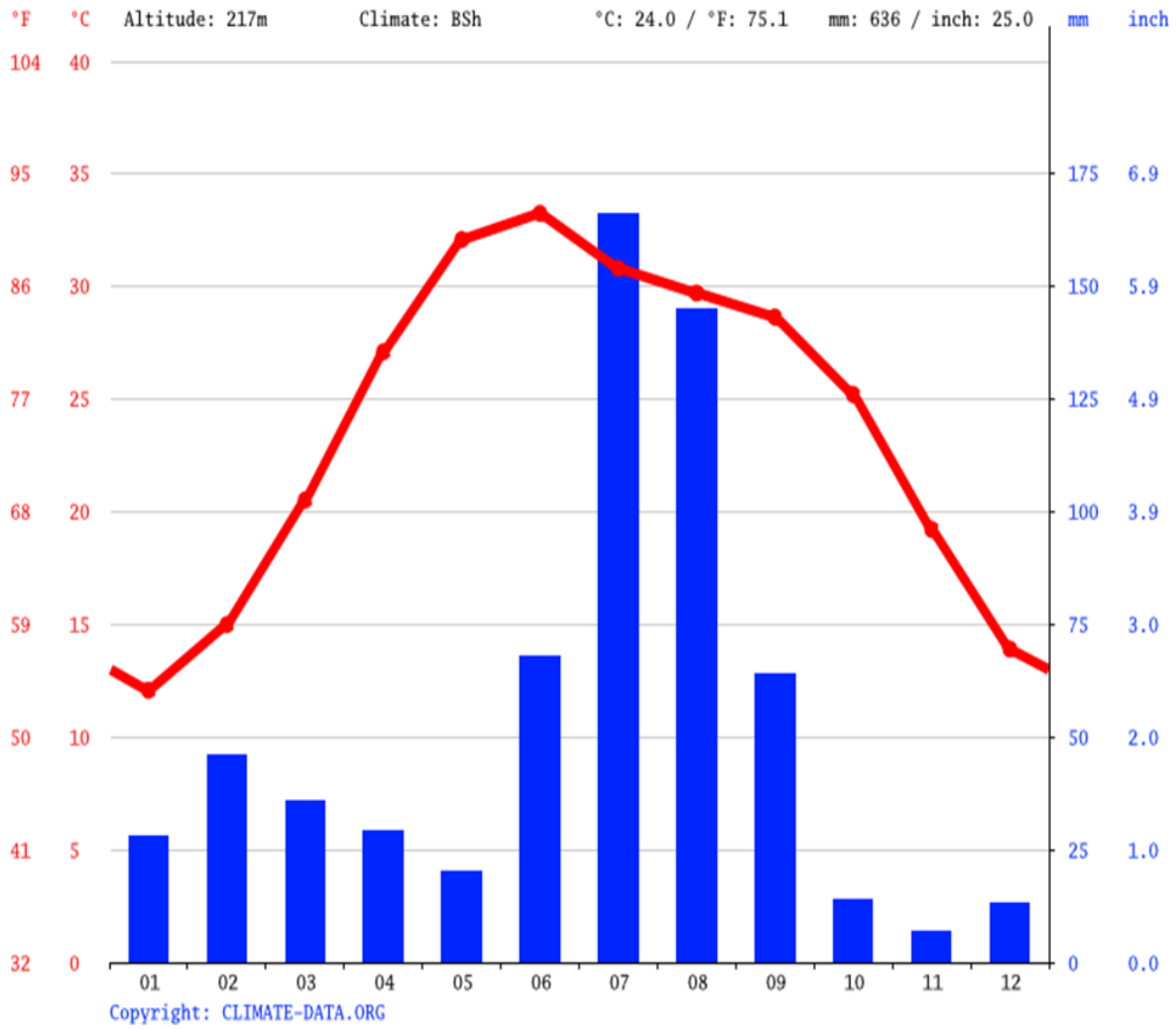
Groundwater from depth of 200-250 ft can be used for drinking and other purposes. Groundwater is the major source of water in the study area, which is extracted with the help of pumps and motors. The groundwater extracted is used to fulfill various domestic, irrigation and industrial needs. Ground water quality report of area is annexed with this Report.

5.6 Climate

The District Lahore has extreme climate conditions and summer season starts from April and continues till October. During the summer season, temperature ranges from 30 °C to 48 °C.

The winter season starts from November and continues till March. December and January are the coldest months with a mean minimum temperature of about 7-8 °C. The dust storms occur occasionally during the hot season, June, July and August. Climate of District Lahore is very hot and dry in summer and cool in winter.

At an average temperature of 33.5 °C | 92.4 °F, June is the hottest month of the year. The lowest average temperatures in the year occur in January, which it is around 12.3 °C | 54.1°F. Average temperature in Lahore over the year. Average weather in Lahore, Pakistan Climatological information about changes of temperature over the years in Lahore.



(Blue bars represent the *monthly average rainfall (mm)*, and red line represents the *monthly average temperature (°C)*)

Figure 5.2 Average Annual Temperature and Precipitation of District Lahore

The month of June is the hottest month, reaching around 47°C, while January is the coldest month with temperatures around 7-8°C. This results in a temperature difference of 15°C between the hottest and coldest months. Additionally, there is a significant variation in rainfall, with August having the highest precipitation and November experiencing the least, resulting in a difference of 114 mm.

5.7 Biological Environment

5.7.1 Flora

Several types of floral species are present in district Lahore. However, some of the principal species are in the following pics.

Figure 5.3 Species of Flora

5.7.2 Fauna in the Area

Common mammals found in the area are dogs, cats, house rats, and bats. Snakes such as cobra, kraits, etc. were once common in the tract, but now cases of snake bites are very rare, as these reptiles have been either killed by expanding urbanization or they have moved away. Lizards such as Spiny-tailed lizard (Uromastix hardwickii) and fringed-toed lizard (Acanthodactylus cantoris) are also reported by the residents of the area.

Amphibians frequently seen in and around the project area, especially during the rainy season, include the common Frog (Rana tigrina) and Indus Valley toad. House sparrow (Passer domestics), House crow (Corvus splendens), and Mynah (Acridotheres tristis) are the most common sights in the area. There are no endangered species of flora and fauna in the Study Area.

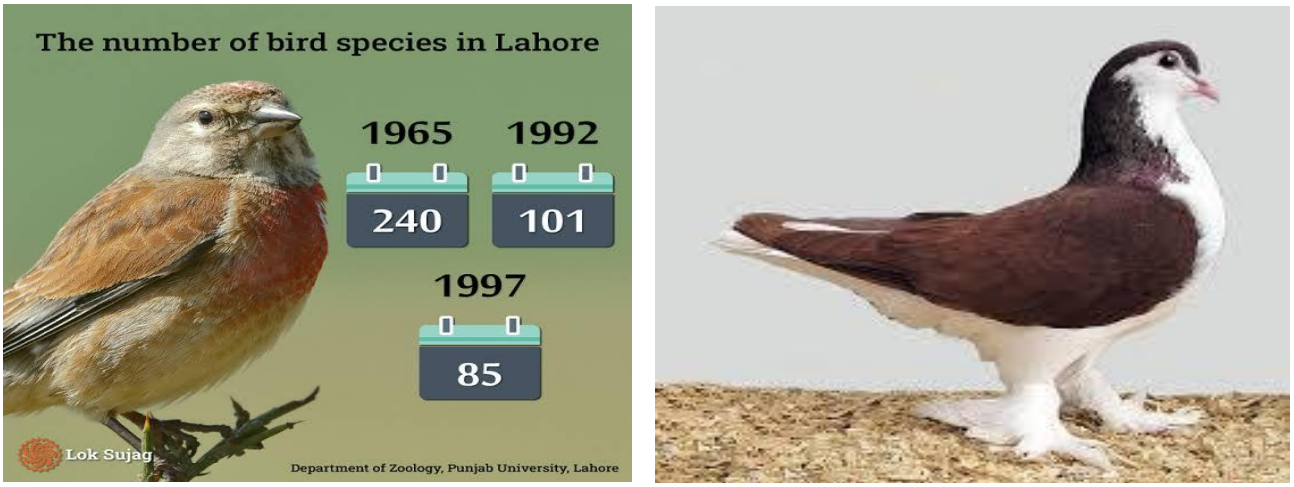


Figure 5.4 Species of Fauna

5.8 Socio-Economic Resources

Socio-economic resources refer to the social and economic factors that impact and are influenced by a project. These include:

i. Human Resources: The availability of a skilled and unskilled workforce for construction, operation, and maintenance.
ii. Economic Resources: Local businesses, industries, and markets that may benefit from the project's economic activity.
iii. Community Infrastructure: Access to roads, healthcare, education, and other services that can be impacted or enhanced by the project.
iv. Livelihoods: Employment generation, income opportunities, and economic upliftment for the local population.
v. Social Well-being: The project's influence on public safety, community health, and overall quality of life.

The project area is rich in term of human resources, economic resources, community infrastructure, livelihoods, and social well-being.

5.9 Demography

The population of Lahore is 12,978,661 (13 million) as of 2024. The principal tribes residing here include the Jats, Arains, Dogars, Ansari, Sheikh, Pashtuns etc. Among them, there are also a concentration of Kashmiris who had migrated earlier, during partition. There are also Moreens or artisans; they include Christians, blacksmiths (Lohar), carpenters (Tarkhan), ceramicists (Kumhar), barbers, weavers etc.+

5.10 Literacy Rate

As of the 2023 census, Lahore District has a literacy rate of 79.62%, with male literacy at 81.41% and female literacy at 77.59%. This reflects a significant improvement from earlier years; for instance, the 2006-07 Pakistan Social & Living Measurement survey reported an overall literacy rate of 64.7% in Lahore District. This upward trend highlights the district's ongoing efforts to enhance educational attainment among its residents.

5.11 Industries

The Lahore district hosts a mix of industries, including textile mills, steel mills, foundries food processing units, and small-scale manufacturing facilities. The area may also feature brick kilns and agricultural product processing industries due to its proximity to farming lands. Additionally, logistic and warehousing facilities are common, supporting transportation and trade along the bypass.

5.12 Amenities

The project area is in the of Lahore city and Lahore city offers extensive facilities, including advanced healthcare services with public and private hospitals, a well- established educational network comprising schools, colleges, and universities, and robust transportation infrastructure like roads, railways, and the Metro Bus. It has recreational facilities such as parks, museums, and shopping malls, along with modern utilities like electricity, water supply, and communication networks to support urban living.

5.13 Major Educational Institutions

Lahore is often referred to as the educational capital of Pakistan, home to some of the country's most prestigious institutions. These include:

i. **University of the Punjab (PU):**

Established in 1882, it is Pakistan's oldest public university and a leading center for higher education and research.

ii. **Lahore University of Management Sciences (LUMS):**

A top-ranked private university offering degrees in business, economics, law, and sciences.

iii. **University of Engineering and Technology (UET), Lahore:**

Renowned for engineering disciplines and technological research.

iv. **King Edward Medical University (KEMU):**

One of the oldest medical institutions in South Asia, known for producing highly qualified medical professionals.

v. **Government College University (GCU), Lahore:**

Offers a wide range of undergraduate and graduate programs and is known for its strong academic heritage.

These institutions attract students from across the country and internationally, contributing significantly to Lahore's cultural and intellectual landscape.

5.14 Major Hospitals

Lahore has a well-developed healthcare infrastructure, offering both public and private health services. Notable hospitals include:

i. **Mayo Hospital**:

One of the oldest and largest government hospitals, affiliated with KEMU, offering a wide range of medical services.

ii. **Shaukat Khanum Memorial Cancer Hospital & Research Centre**:

A state-of-the-art facility specializing in cancer treatment, research, and diagnostics.

iii. **Services Hospital**:

A major public hospital providing general and specialized medical care.

iv. **Jinnah Hospital**:

Another key government hospital, known for its emergency and surgical services.

v. **Hameed Latif Hospital & Doctors Hospital**:

Leading private hospital providing high-quality tertiary care and specialized treatment.

These hospitals serve not only the residents of Lahore but also patients from across Punjab and neighboring regions.

5.15 Major Parks

Despite urbanization, Lahore retains several well-maintained green spaces and recreational parks:

i. **Bagh-e-Jinnah (Lawrence Gardens):**

A historic park with botanical gardens, jogging tracks, and a library; popular for leisure and sports.

ii. **Racecourse Park (Jilani Park**):

Famous for its flower shows, walking tracks, and horse racing track.

iii. **Gulshan-e-Iqbal Park**:

A large urban park with a lake, amusement rides, and walking paths.

iv. **Greater Iqbal Park**:

Located near the Minar-e-Pakistan monument; includes a museum and water fountains.

v. **Model Town Park**: Popular among families and fitness enthusiasts for jogging and morning walks.

These parks play a vital role in providing green relief in a rapidly urbanizing city.

5.16 Major Shopping Malls

Lahore is also a commercial hub with modern shopping facilities catering to diverse consumer needs:

i. **Emporium Mall**:

One of the largest shopping malls in Pakistan, featuring hundreds of retail outlets, food courts, cinemas, and children's entertainment.

ii. **Packages Mall:**

A high-end mall with international and local brands, restaurants, and a hypermarket.

iii. **Fortress Square Mall**:

Located in the Fortress Stadium area, it combines shopping with dining and entertainment.

iv. **Mall of Lahore**:

Situated in the upscale Cantt area, known for luxury shopping and dining.

v. **Amanah Mall:** A family-friendly mall located in Model Town, offering a mix of fashion, grocery, and entertainment options.

CHAPTER .6

POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Chapter 6: POTENTIAL ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

Assessment of impacts depends on the nature and magnitude of the project/ activity being undertaken, as well as the type of environmental control measures that are envisaged as part of the project proposal. The potential impacts of the project have been identified and assessed based on the type and scale of the various activities associated with this project. This section discusses the project's potential environmental impacts on the area's geomorphology, soil, water resources, air, biological resources, and socioeconomic conditions and, where applicable, identifies mitigation measures that will reduce, the adverse impacts.

6.1 Identification of Potential Environmental Impacts

In the first step, potential environmental impacts of the project are identified by desktop work using checklists, professional judgment, and published literature on environmental impacts of similar projects, and standard environmental guidelines. Potential impacts are also identified through discussion with project proponent, and consultation with stakeholders and community to identify their concerns. The main aspects associated with potential environmental impacts are as follows: -

i. Ambient Air Quality
ii. Waste water and Solid waste
iii. Noise pollution
iv. Ecology of the area, including flora and fauna
v. Soil Contamination and Erosion
vi. Gaseous Emissions from Boilers and Generators

6.2 Scoping Criteria for Impacts

The potential impacts of the Project/ (Establishment of Municipal and Industrial Wastes Management Facility**"**) are evaluated based on the following criteria:

The current baseline conditions and the anticipated changes in environmental parameters are likely to be affected by Project. Whether any impact will violate applicable Punjab Environmental Quality Standards (PEQS).

6.3 Methodology for Impact Assessment

The impact assessment methodology defines three levels of consequences (or severity) and likelihood (chance of occurrence) i.e. Low, Moderate/Medium, or High. The significance of an impact is determined based on the level of consequence and likelihood of the impacts.

Table 6.1 Methodology for Impacts Assessment

Sr. No	Level	Severity of Impact (Results)	Likelihood
1.	High	Significant or catastrophic harm to the local and regional environment. A serious threat to the company's reputation, profitability, and overall ability to operate.	Measurable harm to the environment. Potential impact on reputation and costs. Decreased operational efficiency
2.	Moderate	Measurable damage to the environment Potential to affect reputation/cost Reduced efficiency	Moderate likelihood of occurrence throughout the operational lifetime. Periodic or occasional aspects of the operations.
3.	Low	Negligible damage to the environment No risk to business	Unlikely to occur during lifetime of operation.

6.4 Impacts Assessment

The impacts are classified based on their spatial distribution, i.e. local when impacting an area of approximately 1 km radius from the project area, moderate spread, when impacting an area of 1 to 2 km radius, and regional beyond 2 km.

The impacts are classified as short-term, moderate-term, and long-term in terms of their existence on a temporal scale. Impacts with less than 1 year of existence as short-term term, while those with 1 to 3 years as moderate term and more than 3 years as long term.

The negative impacts are termed as adverse impacts while positive impacts as beneficial. The significance of the environmental impacts of various involved activities has been evaluated based on the following criteria.

Table 6.2: Impacts Significance Area

Sr. No	Impacts Significance	Criteria
1.	Long Term	When the impact is of high intensity with high spread and high duration.
2.	Moderate Term	When the impact is of moderate intensity with high moderate spread and high-moderate duration.
3.	Short Term	When the impact is of low intensity but with moderate spread and moderate duration.
4.	Insignificant	When the impact is of low intensity, low spread, and low duration.
5.	Beneficial	When the Impacts are Positive.

6.5 Environmental Mitigation Measures

Highly effective environmental management practices will be done to keep the project's surrounding environment within safe limits in terms of air and water quality. Environmental monitoring will be conducted as per requirements of environmental law and EPA directions.

6.6 Compensation in Money Terms

There is no damage to flora, fauna, or any other resource, hence compensation in money terms is not needed.

6.7 Replacement/ Relocation/ Rehabilitation

The said project is planned in a vacant area and there is no sensitive area, population, or natural resource. So, replacement, relocation, and rehabilitation are not required.

6.8 Potential Environmental Impacts associated with Project Location

i. The proponent has selected a site for his project which exists in the vacant area.
ii. There is no community or human settlement within the safe radius of the site.
iii. There is no flora & fauna (particularly belonging to an endangered species) within a 2 km radius of the site.
iv. There is a good road network in the area of the project.
v. There is no ecologically sensitive or declared protected area (PA) like forest, fish hatcheries, Territorial Waters, wildlife or game reserves, or any structure of socio-cultural significance (historical or archaeological site or religious structures.

It can be safely concluded that the selected site is best suited for the project, and will not pose any adverse environmental impacts.

6.9 Methodology for Impact Assessment

The environmental aspects of the project during all stages namely construction and operation have been selected from a master list of environmental items which is widely used world over for this purpose. The extent of qualitative and quantitative impacts has been described and mitigation measures have been proposed to keep them within permissible limit.

6.10 Impacts associated with Construction Phase and Mitigation Measures

The Environmental and Socio-Economic Impacts associated with the construction phase of project, are the following:

i. Air Pollution
ii. Waste water and Solid waste
iii. Noise pollution
iv. Ecology of the area, including flora and fauna

6.11 Impacts of Air Pollution

Dust emissions from land clearing, construction activities, and movement of machinery and vehicles may degrade local air quality.

Mitigation Measures:

- Water sprinkling on unpaved roads and active construction sites.
- Covering of construction material during transport and storage.
- Regular maintenance of vehicles and machinery to minimize exhaust emissions.

6.12 Impacts of Noise Pollution

Increased noise levels from construction machinery and equipment may disturb nearby residents and workers.

Mitigation Measures:

- Use of noise-suppressing equipment and proper mufflers.
- Limiting construction activities to daytime hours.
- Provision of personal protective equipment (PPE) like earplugs to workers

6.13 Impacts of Occupational Health and Safety

Workers are exposed to dust, noise, and mechanical hazards, posing health and safety risks. A comprehensive occupational health and safety plan is as under.

Mitigation Measures

i. Adequate shuttering should be established and used for all kinds of construction activities
ii. Comprehensive occupational health and safety plan.
iii. Regular training programs for workers.
iv. Provision of PPE (masks, gloves, goggles, etc.).
v. Emergency response and first aid arrangements on-site.
vi. Work at height should be performed only after permit to work by HSE staff who shall issue such permit to work at height after taking all appropriate measures.
vii. Safety signage should be adequately displayed,
viii. Clean drinking water availability should be ensured for use by all construction staff.
ix. Emergence response plan should be made, communicated to all and maintained during all construction activities.
x. First aid facility should be readily available for workers at the site.
xi. Good house-keeping should be practiced to prevent the events of slips.

xii. Personal protective equipment like helmets, masks gloves and helmets should be strictly used by the labor according to their assignments at the work site.

xiii. Fire and any other emergency shall be managed with the help of emergency services.

xiv. Proper fire safety arrangements will be provided at site. A part form installation of fire hydrant, smoke detectors, fire alarm, safety sign, emergency exits, trained staff from rescue 1122.

xv. During hot season, outdoor work timing may be changed. Only indoor construction activities may be performed during sunny part of the day. In case of inevitable circumstances, workers should be given adequate breaks.

xvi. Workers should be given proper fluids during hot season to balance electrolytes in their body.

xvii. Painting activity should be performed with all occupational health and safety precautions.

6.14 Environmental Enhancement Measures

The following steps shall be taken for environmental enhancement:

i. Daily sweeping and dusting/cleaning shall be ensured.

ii. Vacuum cleaning shall be done daily where required.

iii. The perimeter and lawns of the plot shall be vegetated with flowering plants and fruit trees for environmental enhancement

iv. Adequate firefighting system will be established and maintained at all times according to the requirements of respective Regulatory Authority.

v. Visual impacts of the unit and its surroundings shall be given due consideration. Visiual impacts shall be improved through landscaping and tree plantation.

The potential environmental impacts of the project and respective mitigation measures are summarized below:

6.3 Environmental Impact & Mitigation Measures	
CONSTRUCTION PHASE	
Potential Impact	**Mitigation Measures**
Solid Waste	
• Solid waste shall be generated in the form of excavation waste, broken bricks, waste concrete material, steel trimmings, etc.	• All types of waste shall be kept segregated. The waste shall be managed regularly. • The construction waste shall be disposed of through construction waste contractors. The

	recyclable part of the waste shall be sold to the recyclers.
Air Pollution	
• Particulate matter may arise due to excavation and movement of off- road and on-road vehicles during transport of construction materials such as sand, aggregate, etc. • Cutting, grinding and welding may cause noise pollution. • Off-road or on-road vehicles may also cause exhaust pollution.	• Construction contractor shall be directed to ensure using well-conditioned and well-tuned vehicles and equipment. • Contractor will ensure Sprinkling of water on the exposed surfaces. • Contractor will Cover all trucks loaded with sand and other such lose construction materials. • Regular sweeping of roads and parking areas shall be ensured to avoid deposition of dirt /dust. • Contractor will ensure use of appropriate masks by workers to prevent entry of dust in their breathing system.
Noise Pollution	
• Operation of construction machinery and equipment may be a source of noise pollution. • Cutter's grinders and welding activities may also cause noise. • Movement of off-road or on-road vehicles may generate noise	• The Project proponent and contractor will ensure that all vehicles are well maintained. • Contractor will ensure use of ear plugs by workers to prevent entry of noise in their ears.
Occupational Health & Safety	
• Cutting, grinding, welding operations may operate metal dust	Contractor will ensure use of personal protective equipment by respective workers.
Socioeconomic	
• Disturbance of local population • Jobs for locals	• The construction labor shall be advised to respect the local culture and moral values. • Locals shall be preferred for job as far as possible

	according to their competence/ education/ skills.

Operational Phase	
Solid Waste	
• Non-recyclable or residual waste from sorting and recovery	Segregation at source, storage in designated area, disposal through EPA-approved landfill or incinerator
Hazardous Waste	
• Contaminated rags, sludge, spent solvents, or filters	• Proper labeling, storage in impervious containers, disposal through licensed vendors
Wastewater / Leachate	
• Disturbance to local population • Jobs for the locals	• The construction labor shall be advised to respect the local culture and moral values. • Locals shall be preferred for job as far as possible according to their competence/ education/ skills.
Noise	
• Equipment, conveyor belts, compactors	• Noise enclosures, ear protection, equipment maintenance
Energy and Resource Use	
• High energy and water consumption	• Implement energy efficiency measures, install water recycling systems, periodic audits
Occupational Health & Safety	
• Worker exposure to dust, sharp objects, or chemicals	• Provide PPEs, safety signage, fire extinguishers, regular training, health checkups

CHAPTER .7

STAKEHOLDERS CONSULTATION

CHAPTER NO 7: STAKEHOLDERS CONSULTATION

Stakeholders' consultation refers to the process by which the concerns of relevant persons/ departments who have a plausible stake in the environmental impacts of the project or activity are ascertained to consider all the material concerns in the project or activity design as appropriate. Impact assessment surveys and stakeholders' consultation sessions are held with different stakeholder's groups to take their comments/views proposals.

7.1 Objectives of Consultation

Stakeholders' consultation plays a vital role in ascertaining the impacts of the said project on stakeholders in the successful implementation and execution of the project. It provides an opportunity to exchange knowledge with the beneficiaries and affected parties. The involvement of stakeholders is essential, as it leads to better and more acceptable decision-making. The overall objective of the consultation with the stakeholders is to help verify the environmental and social issues, besides technical ones, that have been presumed to arise and to identify those that are not known or are specific to the project. Discourse from many who have thoroughly observed the site conditions in the pre-development phase goes a long way in updating knowledge and understanding.

i. Share information with Stakeholders on said project installation and operation
ii. Share the impacts on the physical, biological, and socioeconomic environment
iii. Understand stakeholders concerns regarding various aspects of the project
iv. Collect valuable suggestions from the stakeholders to improve the said project design
v. Understand the perceptions, assess social impacts, and concern of the people/communities of the project area
vi. Raise the awareness level and identify any issues for the implementation of the said project
vii. Invite people to express their views about the positive/negative impacts on their lifestyles and environment
viii. Disclose information of contact offices/officers for any complaints/queries

7.2 Advantages of Stakeholder Consultation

Stakeholder consultation during an Environmental Impact Assessment (EIA) study is a critical component of the process. It ensures that the project is not only environmentally sustainable but also socially acceptable and legally compliant.

Here are the key advantages of stakeholder consultation during an EIA study:

(A) Improved Project Design and Planning

- Stakeholders such as local communities, NGOs, and technical experts can provide valuable local knowledge and insights about the project area.
- Their input helps in identifying potential environmental and social impacts early, allowing the project design to be modified or optimized accordingly.

(B) Enhanced Identification of Environmental and Social Issues

- Consultation helps uncover site-specific environmental risks (e.g., flood-prone areas, biodiversity concerns) that might not be evident from technical data alone.
- It ensures a more comprehensive assessment of environmental, social, and economic impacts.

(C)Strengthened Public Trust and Social Acceptance

- Involving affected communities and other stakeholders builds transparency and credibility of the EIA process.
- It promotes public confidence and cooperation, reducing chances of local opposition or protests later.

(D)Compliance with Legal and Institutional Requirements

a. Many national environmental laws (including Pakistan Environmental Protection Act 1997) and international funding agencies (like World Bank, ADB, IFC) require stakeholder engagement as a mandatory step.
b. Proper consultation ensures legal compliance and smoother approval of the Environmental Approval/NOC.

(E) Conflict Prevention and Risk Reduction

c. Early dialogue helps to identify and resolve conflicts before they escalate.
d. It minimizes the risk of delays, litigation, or reputational damage during project implementation.

(F) Promotion of Sustainable Development

a. Stakeholder input ensures that social, economic, and environmental factors are balanced.
b. This contributes to long-term sustainability and responsible resource management.

(G) Strengthened Decision-Making

a. Consultations provide multiple perspectives and data sources for decision-makers.
b. It leads to more informed, transparent, and defensible decisions about project approval or modification.

(H) Empowerment of Local Communities

a. The process gives a voice to people directly or indirectly affected by the project.
b. It promotes community ownership, social inclusion, and local empowerment.
c. The summary of all above mentioned benefits is that stakeholder consultation during an EIA ensures better environmental protection, social harmony, and project success by integrating local knowledge, ensuring transparency, and building trust among all involved parties.

7.3 Identification of Stakeholders

All the people who are directly or indirectly affected or concerned with the project are the stakeholders. Besides the living population of the surrounding areas, some other stakeholders were identified and contacted. They are the key players including; shops, public and government offices, schools, hospitals, hotels, and NGOs. Not only published material and other literature was obtained but also the views and concerns of stakeholders

were noted.

7.3.1 Direct Stakeholders

No disturbance in the local community is being foreseen due to the installation of the said project as the project is located in open land area. No property loss is being envisaged due to the construction of Asphalt Plant.

7.3.2 Indirect Stakeholders

The indirect impact will occur on those who are living or doing business within a Project Area of Influence (AOI). In the case of the said project, the residents around the project area will get an opportunity to be employed. So, in the early development stages and during the operational phase, people of surrounding communities will be benefited. Indirect respondents include;

i. Government agencies responsible for dealing with the project-related activities.
ii. Government Agencies directly or indirectly involved in the execution and monitoring of the said project.
iii. Government departments such as TMA and the Planning & Development Department, working on other development activities are considered indirect stakeholders.

7.4 Consultation Process

Information disclosure, public consultation, and discussion regarding the various aspects of the project with the people of the area are necessary. This process is intensified during the EIA Studies. Surveys were carried out to investigate physical, biological, and socioeconomic resources falling within the immediate AOI of the project. Primary data collection included:

i. Data collection regarding the socio-economic conditions of the study area.
ii. Collection of information on the biological environment from the locals.

7.5 Objectives of Meetings with the Stakeholders

i. Share information with stakeholders on the said project and expected impacts on the community in the vicinity of the project.
ii. Understand stakeholders' concerns regarding various aspects of the project, including existing conditions, and the likely impacts of construction and operation activities.

iii. Provide an opportunity to the public to influence the project design positively.
iv. Obtain local and traditional knowledge, before decision making.
v. Increase public confidence in the proponent, reviewers, and decision-makers.
vi. Reduce conflict through the early identification of controversial issues, and work through them to find acceptable solutions.
vii. Dissemination of information through discussions, education, and liaison with stakeholders.
viii. Documentation of information narrated by the stakeholders and mitigation measures proposed by the stakeholders.
ix. Incorporation of public concerns and their solutions in the EIA; and eliciting their comments and feedback.
x. Create a sense of ownership of the project proposal in the minds of the stakeholders.

7.6 Consultation with Local Community

The response of various stakeholders in the population of the study area was ascertained by conducting a sample survey, through specially formatted questionnaires. Questions posed to the public were related to the creation of possible impacts, adverse impacts, and beneficial impacts, including; employment opportunities, income generation activities, change in living standards, and provision of the amenity. The various rounds of public meetings and consultations were arranged in the project and study area.

7.7 Summary of Views, Concerns, and Suggestions

The summary of socioeconomic concerns and problems highlighted by different persons have been mentioned here:

i. No any tree located inside the project area or in the surrounding area should be removed.
ii. The project will become a source of income for locals to earn their livelihood easily and honorably.
iii. Employment opportunities should be provided to the locals.
iv. Water sprinkling should be done regularly during the construction phase to avoid dust emissions.
v. Good relations with the local communities should be promoted by encouraging the Contractor to provide opportunities to the locals against skilled and unskilled positions.

vi. The contractor should prefer hiring local labor from adjacent nearby villages.

vii. Indigenous trees around the facility should be planted to control air pollution and improve the aesthetic conditions of the area.

CHAPTER. 8

ENVIRONMENT MANAGEMENT & MONITORING PLAN

CHAPTER 8: ENVIRONMENT MANAGEMENT & MONITORING PLAN

This chapter provides the Environmental Management and Monitoring Plan (EMMP) of the project for its construction and operation phases to keep its environment benign and to ensure compliance of Punjab Environmental Quality Standard (PEQS). This section an underline the monitoring framework for both construction and operational phases to check compliance of Monitoring Plan and to take timely actions for correction.

8.1 Introduction

The Environmental Management and Monitoring Plan (EMMP) for the Resource Recovery Unit (RRU) aims to ensure that the project's operations are environmentally sustainable, safe, and compliant with all applicable Punjab Environmental Quality Standards (PEQS). The EMMP identifies potential environmental impacts associated with the construction and operation phases and prescribes mitigation, monitoring, and reporting measures to prevent environmental degradation and enhance resource efficiency.

8.2 Objectives of the EMMP

- Implement mitigation measures identified in the Environmental Impact Assessment (EIA).
- Ensure compliance with NEQS and other regulatory requirements.
- Establish a systematic monitoring framework for key environmental parameters.
- Promote waste minimization, reuse, and recycling practices.
- Protect human health, safety, and the environment through proactive management.
- Support continual improvement and environmental performance reporting.

8.3 Components of Environmental Management and Monitoring Plan

The EMMP consists of the following:

i. Environmental Management Plan

ii. Environmental Monitoring Plan

iii. Communication and Documentation

iv. Institutional Capacity

v. Environmental Training

8.4 Environmental Management Plan (EMP)

Table 8.1 Construction Phase					
Sr. No	**Environmental Aspect**	**Potential Impact**	**Mitigation Measures**	**Responsibility**	**Monitoring Frequency**
i.	**Air Quality**	Dust and particulate matter from excavation, construction machinery, and vehicle movement	Regular water sprinkling, covering of trucks transporting material, proper maintenance of machinery	Contractor/ Proponent	Bimonthly
ii.	**Noise**	Increased noise from machinery and vehicles	Limit working hours, use noise-suppressing equipment, ear protection for workers	Contractor	-do-
iii.	**Solid Waste**	Generation of construction debris, packaging waste	Reuse of debris, segregation at source, disposal at approved landfill	Contractor	-do-
iv.	**Soil Contamination**	Fuel/oil spills from machinery	Store fuel in impervious areas with spill kits, immediate cleanup	Contractor	-do-
v.	**Water Quality**	Wastewater from labor camp and washing	Provide septic tank for domestic wastewater, avoid discharge to open drains	Contractor	-do-
vi.	**Occupational Health &**	Accidents, injuries, unsafe working conditions	Use of PPE, safety induction training,	HSE Officer	-do-

	Safety		first aid and emergency response plan		

Table 8.2 Operational Phase					
Sr. No	**Environmental Aspect**	**Potential Impact**	**Mitigation /Measures**	**Responsibility**	**Monitoring Frequency**
i.	**Solid Waste**	Non-recyclable or residual waste from sorting and recovery	Segregation at source, storage in designated area, disposal through EPA-approved landfill or incinerator	Plant Manager	Quarterly
ii.	**Hazardous Wast**	Contaminated rags, sludge, spent solvents, or filters	Proper labeling, storage in impervious containers, disposal through licensed vendors	-do-	-do
iii.	**Wastewater / Leachate**	Possible contamination from washing or waste handling areas	Collection through drains, treatment in ETP, regular quality checks before discharge	-do-	-do
iv.	**Noise**	Equipment, conveyor belts, compactors	Noise enclosures, ear protection, equipment maintenance	-do-	-do
v.	**Energy and Resource Use**	High energy and water consumption	Implement energy efficiency measures, install water recycling systems, periodic audits	-do-	-do
vi.	**Occupational Health & Safety**	Worker exposure to dust, sharp objects, or chemicals	Provide PPEs, safety signage, fire extinguishers, regular training, health	-do-	-do

			checkups		

-8.5 Environmental Monitoring Plan

Environmental Monitoring is a vital component of Environmental Management Plan. It is the mechanism through which the effectiveness of the environmental management Plan in protecting the environment is measured. The feedback provided by the environmental monitoring is instrumental in identifying any problem or lapse in the system under implementation and planning corrective actions.

Table 8.3 Environmental Monitoring Plan

Environmental Component	Standards	Monitoring Frequency	Responsibility
CONSTRUCTION PHASE			
Ambient Air Quality	PEQS	Quarterly	Facility Manager
Noise Level	PEQS	-do-	-do-
Health and Safety	OSHA	-do-	-do-
OPERATIONAL PHASE			
Ambient Air Quality	PEQS	Quarterly	Facility Manager
Noise Level	PEQS	-do-	-do-
Health and Safety	OSHA	-do-	-do-

Table 8.4 Environmental Monitoring Plan along with Location of Monitoring Points

Sr. No	Parameter	Location	Frequency	Method / Standard	Responsibility
i.	**Ambient Air Quality**	At site boundary and work zone	Quarterly	PEQS	Facility Manager
ii.	**Noise Level (dB)**	At equipment and boundary points	Quarterly	PEQS	-do-
iii.					

iv.	**Leachate Quality**	Waste storage area	Quarterly	PEQS	-do-
v.	**Drinking Water Quality**	Staff kitchen / canteen	Quarterly	PEQS	-do-
vi.	**Solid Waste Quantity and Type**	Collection and storage areas	Quarterly	Internal SOPs	-do-
vii.	**Occupational Health & Safety**	Work environment	Quarterly	ISO 45001 / Factory	-do-

8.6 Supervision & Monitoring

The Facility Manager will be responsible for all environmental issues and the implementation of EMMP.

8.7 Communications & Documentation

An effective mechanism will be developed to store and communicate environmental information to the responsible persons.

8.8 Environmental Training

Environmental Training will help to ensure that the requirements of the EIA and EMMP are clearly understood and followed by all project personnel in the course of construction and operational phase of project.

Table 8.5 Training Schedule

Target Personal	Topic	Schedule
Selected Staff	HSE Management	Quarterly
All personnel of Project	Fire Fighting	-do-

Table 8.6 Annual Environmental Budget		
Sr. No	**Components**	**Estimated Cost**
1	Environmental Monitoring	Rs. **5**,00,000/-
2	Training of staff	Rs. 200,000/-
3	Tree Plantation	Rs. 300,000/-
Total Rs.10,00,000/-		

CHAPTER.9

CONCLUSION

AND RECOMMENDATION

Chapter 9: CONCLUSION & RECOMMENDATIONS

9.1 Conclusion:

The EIA findings showed that the project design is the most suitable based on the current best practices and the available technology. The project is feasible and desirable from the perspective of environmental and social-economic evaluation undertaken in this study. The overall benefits of the proposed development are far higher than the potential cost of the marginal negative environmental changes which are likely to occur. The proposed project is desirable because it will improve the socio-economic status of the people in the area. It will create employment and deliver a wide range of other socioeconomic benefits.

The baseline environmental assessment of the proposed project site indicate that the site selected for the project does not contain any sensitive area. The EIA establishes that the proposed project design is far more suitable than the No project option.

The project proponent shall shoulder the responsibility of environmental protection and safety of workers. It will also fulfill the requirements of Regulatory Authority i.e. E P A . Employment opportunities shall be provided to skilled, unskilled, and high qualified persons.

Based on an overall assessment of the environmental impacts of the project, it is concluded that the project is not likely to cause any significant adverse impacts on the social, physical, and biological environment of the area.

9.2 Recommendations

Following are recommendations to make this project more environment friendly.

i. Implementation of EMP must be given priority.

ii. Proper PPEs including gloves should be provided to workers during Construction and Operational phase of project.

iii. Installation of fire extinguishers in the premises and their regular maintenance must be ensured.

iv. Equipment maintenance and efficiency must be checked regularly.

v. No compromise on public health and the environment should be allowed during Construction and Operational phase of project.

vi. A proper tree plantation plan should be developed to support the environment and air quality of the area.

GLOSSARY

i. **Biodiversity:** The variety of all life forms on earth – different plants, animals, microorganisms, their genes, and the ecosystems they form.

ii. **Carbon Footprint:** The total amount of greenhouse gases emitted directly or indirectly by human activities, usually measured in carbon dioxide equivalents (CO_2e).

iii. **Climate Change:** A long-term change in the average weather patterns of the Earth, primarily caused by increased levels of greenhouse gases.

iv. **Conservation:** The sustainable use and management of natural resources to prevent exploitation, degradation, and destruction.

v. **Deforestation:** The clearing or thinning of forests by humans, often for agriculture, logging, or development.

vi. **Ecosystem:** A community of living organisms interacting with their physical environment (e.g., forest, desert, coral reef).

vii. **Emissions:** Substances released into the air, especially harmful gases such as CO_2, methane, and nitrogen oxides from industrial and vehicular sources.

viii. **Endangered Species:** Species that are at risk of extinction due to loss of habitat, environmental changes, or human activities.

ix. **Environmental Impact Assessment (EIA):** A process to evaluate the environmental effects of a proposed project or development.

x. **Fossil Fuels:** Natural resources like coal, oil, and natural gas formed from ancient organic matter, which release greenhouse gases when burned.

xi. **Global Warming:** An increase in Earth's average surface temperature due to the buildup of greenhouse gases in the atmosphere.

xii. **Green Energy / Renewable Energy:** Energy sources that are naturally replenished, like solar, wind, hydro, and geothermal power.

xiii. **Greenhouse Gases (GHGs):** Gases that trap heat in the atmosphere, including carbon dioxide, methane, nitrous oxide, and fluorinated gases.

xiv. **Habitat Loss:** Destruction or alteration of the natural environment where wildlife lives, often due to human activity.

xv. **Pollution:** Contamination of air, water, or soil by harmful substances or waste.

xvi. **Recycling:** The process of converting waste materials into new products to reduce resource consumption and pollution.

xvii. **Renewable Resources:** Resources that can be replenished naturally over time, such as sunlight, wind, and biomass.

xviii. **Sustainability:** Meeting the needs of the present without compromising the ability of future generations to meet their own needs.

xix. **Urbanization:** The process of increasing population in cities and towns, often leading to environmental stress and loss of natural spaces.

xx. **Zero Waste:** A philosophy that encourages the redesign of resource life cycles so that all products are reused, and no trash is sent to landfills or incinerators.

xxi. Environmental Protection & Industrial Pollution Control

xxii. **Afforestation / Reforestation:** Planting trees to create forests (afforestation) or restore degraded forest lands (reforestation), used as a pollution mitigation measure and carbon sink.

xxiii. **Air Pollution Control Devices:** Equipment used to reduce or remove pollutants from industrial exhaust gases. Examples include electrostatic precipitators, baghouse filters, and scrubbers.

xxiv. **Ambient Air Quality Standards (AAQS):** Limits set for the concentration of pollutants in outdoor air to protect human health and the environment. Enforced by national or regional regulatory bodies.

xxv. **Best Available Techniques (BAT):** The most effective and advanced stage in industrial technology and methods used to limit emissions and impacts on the environment.

xxvi. **Bio-remediation:** The use of microorganisms or plants to detoxify and restore polluted industrial sites (soil and water).

xxvii. **Continuous Emission Monitoring System (CEMS):** An automated system that provides real-time data on the pollutants released from an industrial source, helping ensure regulatory compliance.

xxviii. **Effluent:** Liquid waste or sewage discharged from an industrial facility into the environment, often treated before disposal.

xxix. **Effluent Treatment Plant (ETP):** A facility to treat industrial wastewater and remove harmful contaminants before it's discharged into water bodies or reused.

xxx. **Environmental Compliance:** The act of adhering to environmental laws, regulations, standards, and permits applicable to an industrial operation.

xxxi. **Environmental Management System (EMS):** A framework that helps an organization achieve its environmental goals through consistent control of its operations, often ISO 14001 certified.

xxxii. **Hazardous Waste:** Waste materials from industrial processes that are dangerous to health or the environment and require special handling and disposal.

xxxiii. **Noise Pollution:** Unwanted or harmful industrial sound that disrupts the surrounding environment or human well-being, controlled through barriers, enclosures, or silencers.

xxxiv. **Particulate Matter (PM):** Fine dust or tiny particles released from industries that can cause respiratory and cardiovascular problems; controlled using filters and scrubbers.

xxxv. **Pollution Control Board (PCB):** Statutory authorities (like State Pollution Control Boards or CPCB in India) responsible for monitoring and enforcing environmental regulations in industries.

xxxvi. **Resource Recovery:** The process of reclaiming usable substances or energy from industrial waste streams, such as waste-to-energy or metal recovery from slag.

xxxvii. **Scrubber:** A device used in industries to remove particulates and/or gases (e.g., SO_2) from industrial exhaust using water or chemical solutions.

xxxviii. **Solid Waste Management:** Systematic control of the collection, treatment, and disposal of industrial solid waste, including recycling and landfilling.

xxxix. **Stack Emissions:** Pollutants released into the atmosphere through chimneys or stacks of industrial plants; subject to regular monitoring and standards.

xl. **Sustainable Industrial Practices:** Approaches that reduce environmental impact by using energy-efficient processes, clean technology, waste reduction, and closed-loop systems.

xli. **Water Pollution Control:** Measures taken to prevent or reduce contamination of water bodies from industrial discharges, including effluent treatment and zero liquid discharge (ZLD) systems.

xlii. **Zero Liquid Discharge (ZLD):** A wastewater treatment approach in which all industrial wastewater is purified and reused, eliminating any discharge into the Environment.