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Green Star Environmental Consultancy
City business centre G.T road, near PSO okara
0333-6977622, 03116865251

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1 EXECUTIVE SUMMARY

This executive summary represents the finding of Environment impact assessment (EIA) of Extension of Green Planet Waste Management (Incineration Unit) at 36 Jhoray Pakpattan Road, Chak No 42/2-L District Okara. This will be a capacity enhancement for an existing incineration facility. The main objectives of this project will be ensuring safe disposal of hazardous waste in an environment friendly and scientific method in order to reduce pollution.

1.1 TITLE & LOCATION OF PROJECT

Extension of Green Planet Waste Management (Incineration Unit) at 36 Jhoray Pakpattan Road, Chak No 42/2-L District Okara.

1.2 NAME OF PROPONENT

Zain Hafeez S/O Hafeez Ur Rehman

R/O Zain House, Street No 3, Peoples Colony, Okara.

CNIC NO. 35302-4721106-7

1.3 NAME OF ORGANIZATION PREPARING THE REPORT

Extension of Green Planet Waste Management (Incineration Unit) has engaged Green Star Environmental Consultancy at City business centre G.T road, near PSO Okara.

Contact no: 0333-6977622, 03116865251

Table 1: Salient features of project

Salient features of project		
1.	Total Area	2 Kanal 1 Marla and 124 SFT
2.	Total covered area	10 Marla
3.	Cost of the project	Pkr/- 60 million approx.
4.	Existing Capacity of project	50 kg/hr
5.	Proposed Enhancement	500 Kg/hr
6.	Total Capacity after Enhancement	550 Kg/hr
7.	Storage capacity of project	20 tons/d
8.	Location of project	30°42'42.7"N 73°26'35.9"E
9.	Nature of area	Self-Developed Industrial area
10.	Present status of land Use	Open/vacant plot.land
11.	Land use in the surroundings of project site.	The surroundings are: North Open Plot

		South Road East Open Plot West Open Plot
12.	Waste material	Hazardous & Non-Hazardous Hospital, Industrial, Bio Waste, Organic Waste.
13.	Description of the project	The proposed project is a capacity enhancement for an incinerator unit of hazardous waste from industries and hospital.
14.	Nearby emergency services i.e. Hospital, police station, rescue, fire brigade etc.	At a distance of 2-3 Km
15.	Status of Project	Proposed
16.	Source of Power	LESCO

1.4 A BRIEF OUTLINE OF PROPOSAL (TYPE, PROCESS, TECHNOLOGY AND LAND REQUIREMENTS)

As per Punjab Environmental Protection Act 1997 (amended 2012) and Initial Environmental

Examination (IEE) & Environmental Impact Assessment (EIA) Regulations, 2022 proposed project falls under Category G (1) ***"Waste disposal and storage of hazardous or toxic wastes including landfill sites and incineration of hospital toxic waste"*** mentioned in Schedule-II.

The proposed project is about the Incineration of hospital and industrial waste. Site selected for the proposed project is under the undisputed rental agreement. The incinerator will work with natural gas burners with the option to operate on standby LPG fuel. Combustion gas will re-burn in the post-combustion (secondary) chamber at the temperature range of 1250°C during minimum 2-3 seconds. The incinerator will be designed as a packaged unit, having pre-wired electrical connection and fuel pipes in place, making installation easier at site. Waste will be introduced through a manual front-loading system, continuous interval into the incinerator. Incineration is an important method for the treatment and decontamination of biomedical and health-care waste. Incineration is a high-temperature (850°C to 1250°C) dry oxidation process that reduces organic and combustible waste to inorganic, incombustible matter and results in a very significant reduction of waste volume and weight the incineration/ pyrolysis should only be carried out in appropriate plants. The system will be designed to cope with the specific

characteristics of hazardous health-care waste. The estimated project cost is **PKR 60 million approx.,** and capacity of proposed project will be 550 kg/hr after enhancement, the project have 50kg/hr of existing capacity and an enhancement of 500kg/hr has been proposed. The project under consideration of this EIA is the industrial and hospital waste Incineration Unit at 36 Jhoray Pakpattan Road, Chak No 42/2-L District Okara. Beyond this scope no other development activities have been covered under this EIA study.

1.5 THE MAJOR IMPACTS & RECOMMENDATIONS FOR MITIGATION MEASURES

The potential impacts associated with the project operation activities

Included: increase in water consumption; surface water contamination, air pollution from vehicle; vehicle movement, noise and disturbance, soil contamination and waste generation.

Automated machineries have been installed to be laid on concrete fortifications. The machinery installation does not require water while only water use will be during washing and domestic activities. Water conservation practices will be utilized to reduce the overall water consumption during the project activities. The impermeable septic tank will prevent untreated sewage from polluting surface water.

The ambient air quality of the area can be affected by exhaust emissions, vehicles and combustion process in construction equipment. The emissions include sulphur dioxide, oxides of nitrogen, carbon monoxide, carbon dioxide, and particulates. The emission levels depend on the type and size of activity, the type and quality of fuel and the manner in which it is burned.

The sources of emissions during construction activities will not be significantly enough to alter the ambient air quality at regional level. All vehicles, equipment and machinery will be properly tuned and maintained to minimize emissions. Cleaner fuels if required (less 1% Sulphar content) will be preferred to procure. Monitoring of Ambient air parameters and emissions should be carried out on to ensure compliance with the PEQS.

Noise has the potential to cause an impact to nearby communities and working personnel. To avoid the impact of noise, it will be ensured that, vehicles and other potentially noisy equipment used are in good condition. The noise level monitoring results would be compared with Punjab Environmental Quality Standards (PEQS) for Noise to meet the permissible limits. All on-site personnel will use required personal protective equipment (PPE) in high noise areas that will be clearly marked.

Table 2: Impacts and mitigation measures

Environmental Aspect	Potential Impacts	Mitigation Measures
Water Resources	Depletion in groundwater, contamination of water resources by surface runoff, spillage of fuel	▪ Water extraction will be kept at minimum and water conservation measures will be practiced. ▪ Sewerage Wastewater from project site will be directed to settling tanks. ▪ Fuels and lubricants will be stored in covered and with bund walls, underlain with impervious lining. ▪ Spill prevention plan shall be followed to mitigate any kind of spill.
Air Quality	Dust, combustion emissions, vehicular emissions used for project- related activities.	▪ Water will be sprinkled daily on all exposed surfaces to suppress emission of dust. ▪ Regular maintenance of project vehicles and equipment to ensure that engines are in sound working condition to minimize air emissions. ▪ Use of cleaner fuels for combustion ▪ Ambient monitoring should be carried out to ensure compliance with the PEQS.
Noise	Disturbance to the site workers, Nuisance for surrounding communities and wildlife	▪ Proper maintenance of vehicles and potentially noisy equipment. ▪ Minimize/avoid unnecessary use of noisy machinery. ▪ Blowing of horn will be prohibited. ▪ Provision of Personal Protective Equipment (PPE) to the on-site personnel in high noise areas.
Solid Waste	Soil contamination, air pollution, odor, health hazards, aesthetic issues	▪ Proper testing and in compliance with standards before disposal. A scientifically approved pit will be prepared with the incinerator room and ash will be dumped there. ▪ Ash pits will be constructed to dispose off ash.
Environmental Aspect	Potential Impacts	Mitigation Measures
		▪ Records of all waste generated during the project activity period will be maintained. Quantities of waste disposed, recycled, or reused will be logged on a waste tracking register. ▪ Training will be provided to personnel for identification, segregation, and management of waste.

		▪ No waste will be dumped openly at any location.
Worker's Health and Safety	Health problems or immediate risk may take place, Occupational health of workers and community may be affected.	▪ Compliance to emergency response plan for emergencies and accidents will be ensured to avoid health safety risks. ▪ Work safety measures and good workmanship practices are to be followed by the contractor to ensure no health risks for laborers. ▪ Protection devices (earmuffs) will be provided to the workers operating in the vicinity of high noise generating machines. ▪ Proper maintenance of facilities for workers will be monitored. ▪ Provision of protective clothing for laborers e.g. helmet, adequate footwear, protective goggles, gloves ▪ Ensure strict use of wearing PPE during work activities. ▪ Provision of proper safety signage at sensitive/accident prone spots.

1.6 CONCLUSION

The study was carried out to assess the environmental issues of the installation of Incinerator plant. All the relevant environmental impacts of the study have been identified based on the field survey and accordingly their mitigation measures were proposed in the report. The EIA was carried out keeping in view the Punjab Environmental Protection Act 1997 (ammended-2022). In the light of the facts obtained from the project baseline study and control measures, it is envisaged that installation and operation of the said hospital & industrial waste incinerator will be useful for environment and has no adverse social and environmental impacts. The nearby residence communities have no issue with the installation of the project rather it is highly supported project because of present waste management condition, human health and disease risks in area.

2 INTRODUCTION

This chapter of the report provides a brief description of nature, size and location of the project. A defined scope of study, the magnitude of efforts and concise description of project proponent is also included in this chapter. The project objective is to provide proper incineration facility for hospital and industrial waste, keeping in view the business sustainability and to maintain workplace safety. Proposed Project proponent aims to deliver sustainable, industry leading financial performance and earn trust through enhancing quality of life and contributing to a healthier future.

The study has been carried out to estimate the potential environmental impacts, both positive and negative, on the environment as well as socio-economic fabric of the surrounding environment during construction as well as operational phase. This report intends to provide satisfactory mitigation measures to avoid/eliminate any chance of adverse environmental impact on the socio-cultural, economic and environmental components. This report also intends to fulfill the regulatory requirements set under Punjab Environmental Protection Act, 1997 (Amended 2012) and its consequent legislative framework for IEE/EIA Regulations 2022 and the guidelines drafted for IEE and EIA under numerous sectorial heads. The entire set of legislative framework requires any new development project to undergo an IEE or EIA based on the categorization of the project under Schedule I and/or Schedule II.

2.1 PURPOSE OF REPORT

As per Punjab Environmental Protection Act, 1997 (Amended 2012) and the IEE/EIA Regulations, 2022 it is mandatory for the proponent of any development project to obtain Environmental Approval before commencing construction from EPA Punjab by filing an IEE or EIA as the case may be before the Agency. This EIA Study presents the findings of this subject unit. For this purpose, the proponent has engaged environmental consultants, M/s Green Star Environmental Consultancy. The purpose of this study is to identify the environmental baseline i.e. physical, biological and socio- economic/cultural conditions and assess all possible impacts arising during the construction and operation phase of the project with the aim to find out appropriate measures for their mitigation, to either eliminate those impacts or to bring them to acceptable level and formulate Environmental Management and Monitoring Plan (EMMP) for implementation of the project in environment-friendly manner. This EIA Report provides relevant information, as required under the officially approved format, to facilitate the decision makers i.e. EPA Punjab for the issuance of Environmental Approval/NOC.

2.2 IDENTIFICATION OF PROJECT AND PROPONENT

2.2.1 IDENTIFICATION OF PROJECT

The EIA study was carried out by team of Green Star Environmental Consultancy comprising of environment scientists and engineers, sociologist, environmental chemist and environmental auditors with diversified experience on local and international assignments. The detail of the project team deputed on this assignment is attached to this report.

2.2.2 IDENTIFICATION OF PROJECT PROPONENT

Table 3: Identification of project proponent

Project proponent	Address	CNIC No.
Zain Hafeez	Zain House, Street No 3, Peoples Colony, Okara	35302-4721106-7

2.3 DETAILS OF CONSULTANT

The EIA study was carried out by team of Green Star Environmental Consultancy comprising of environment scientists and engineers, sociologist, environmental chemist and environmental auditors with diversified experience on local and international assignments. The detail of the project team deputed on this assignment is attached to this report.

2.4 BRIEF DESCRIPTION OF NATURE, SIZE AND LOCATION OF PROJECT

As per Punjab Environmental Protection Act 1997 (amended 2012) and Initial Environmental Examination (IEE) & Environmental Impact Assessment (EIA) Regulations, 2022 the project falls under Category G (2) “Waste Incinerators and autoclaves” mentioned in Schedule-II. The proposed project is an Incineration Unit of hospital and industrial waste. Site selected for the project is rented by the proponent. The incinerator works with natural gas burners with the option to operate on standby LPG fuel. Combustion gas will re-burn in the post-combustion (secondary) chamber at the temperature range of 1250°C during minimum 2-3 seconds. The incinerator will be designed as a packaged unit, having pre-wired electrical connection and fuel pipes in place, making installation easier at site. Waste will be introduced through a manual front-loading system, continuous interval into the incinerator. Incineration is an important method for the treatment and decontamination of biomedical and health-care waste. Incineration is a high-temperature (850°C to 1250°C) dry oxidation process that reduces organic and combustible waste to inorganic, incombustible matter and results in a very significant reduction of waste volume and weight the incineration/ pyrolysis should only be carried out in appropriate plants. The system will be designed to cope with the specific characteristics of hazardous health-care waste. The estimated project cost is PKR 60 million

approx., and capacity of project will be50 kg/hr. The project under consideration of this EIA is the industrial and hospital waste Incineration facility at is 36 Jhoray Pakpattan Road, Chak No 42/2-L District Okara. Beyond this scope no other development activities have been covered under this EIA study.

2.5 PROJECT NEED

The proposed project intends to incinerate infectious waste from industries and hospitals. Moreover, the project will eliminate infectious waste which will maintain hygiene and healthy surroundings of the area.

3 SCREENING

According to the Section 12 of Punjab Environmental Protection Act, 1997 (amended 2022) which states;

"No proponent of a project shall commence construction or operation unless he has filed with the Government Agency designated by Federal Environmental Protection agency or Provincial Environmental Protection Agencies, as the case may be or here the project is likely to cause an adverse environmental effect an Environmental Impact Assessment (IEE) and has obtained f the Government Agency approval in respect thereof."

According to Review of IEE and EIA Regulations, 2022; the project falls under Category G (2) ***"Waste Incinerators and autoclaves"*** mentioned in Schedule-II.

Thus, an EIA Report is being prepared for duly submission in EPA, Punjab.

3.1 EIA PROCESS

3.1.1 OVERVIEW OF EIA

EIA is a systematic process to identify, predict and evaluate the environmental impacts of proposed actions and projects. The process is applied prior to major decisions and commitments being made. Wherever appropriate, social, cultural and health effects are considered as an integral part of EIA. Particular attention is given to practical implementation of EIA to prevent and mitigate significant adverse effects of proposed undertakings.

3.1.2 OBJECTIVES OF EIA

The overall objective of the EIA is as follows:

- Description of the project, including an estimate of emissions, effluent and waste and consideration of the project alternatives;
- Identify and investigate all impacts of the project on the physical, biological, and socio-economic environment;
- Evaluation of the baseline environmental conditions in the impact zone to provide a basis for assessing the incremental impacts of the project, including existing pollution levels and nuisance conditions;
- Identification and assessment of the potential impacts on the environment during each of the project phases;
- To propose mitigation measures that would help the Project Proponent in conducting the operation in an environmentally sustainable manner; and
- To develop an Environmental Management Plan that would assist the Project Proponent in the effective implementation of the recommendations of the EIA.

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4 SCOPING & CONSIDERATION OF ALTERNATIVES

4.1 SPATIAL AND TEMPORAL BOUNDARIES OF ENVIRONMENTAL ASSESSMENT

Project land is rented by project proponent. Impacts have been assessed for the immediate and direct area of influence of the project defined as:

- Immediate Area of Influence: Within the project site boundary.
- Direct Area of Influence: Within 5 Km from the project site boundary.

Effects on socioeconomic receptors and resources have been assessed for the construction and operational phases of the project. The project activities are predicted to last for a period of 5-6 months within which the potential impacts have been assessed. The operational impacts have been assessed for the entire lifespan of the facility. The impacts related to the decommissioning of the project will be assessed at the time of decommissioning which will involve carrying out site assessment study at the project location.

4.2 SCOPE OF EIA

This consolidated EIA report covers the examination of physical, biological, environmental and socioeconomic impacts of the project

The spatial and temporal scope of the project is described below:

4.2.1 SPATIAL SCOPE

Impacts have been assessed for the immediate and direct area of influence of the project defined as:

- Immediate Area of Influence: Within the project site boundary.
- Direct Area of Influence: Within 5 Km from the project site boundary.

4.2.2 TEMPORAL SCOPE

Effects on socioeconomic receptors and resources have been assessed for the construction and operational phases of the project. The project activities are predicted to last for a period of 5-6 months within which the potential impacts have been assessed. The operational impacts have been assessed for the entire lifespan of the facility. The impacts related to the decommissioning of the project will be assessed at the time of decommissioning which will involve carrying out site assessment study at the project location.

4.2.3 EIA METHODOLOGY

The EIA project passes through series of stages prior to attaining approval from relevant environmental protection agency. The EIA process and the approach followed for the project is defined below:

4.2.4 SCOPING

Scoping is an early stage in the process and is designed to ensure that the environmental studies provide all the relevant information on:

- The impacts of the project, in particular focusing on the most important impacts;
- The alternatives to the project;
- Other environmental sensitivities to be addressed at early stage.

The EIA process started with the scoping study. The purpose of scoping was to identify:

- Important issues to be considered in an EIA;
- Appropriate time and space boundaries of the EIA study;
- Information necessary for decision-making;
- Significant effects and factors to be studied in detail.

The scoping was followed by data collection describes in subsequent section.

4.2.5 DATA COLLECTION

Following literature reviews and data collection was carried out for EIA:

- A generic description of the project and its related activities was collected from the proponent.
- Legislative review of the applicable laws, regulations, guidelines and standards from literature search.
- Baseline of the area's environmental and socio-economic settings was collected through literature search and field surveys.

4.2.6 Baseline

The environmental impact is measured through a change in the environment, resulting from a designated action or activity. In order to identify such a change, it is essential to have as complete as practicable understanding of the nature of the existing environment, prior to its interaction with the activity. This translates into the need to characterize the existing baseline environmental conditions, including establishing prevailing conditions for a range of environmental media, particularly air, water, soil and groundwater, flora and fauna and the human environment.

This was achieved through a detailed review of all secondary resources (i.e. existing documentation and literature); and the undertaking of project specific baseline studies and surveys to collect supplementary data in the following areas:

- Geology;
- Flora and fauna;
- Water quality characteristics;
- Traffic;
- Ambient air quality;

- Noise conditions;
- Socio-economic conditions;
- Archaeology.

Both the existing secondary sources and literature studies were conducted and integrated into one coherent description of baseline characteristics.

4.2.7 EVALUATION OF ALTERNATIVES

To establish an environmentally sound preferred option for achieving the objectives of the project, different alternatives including site selection and technology alternatives were studied in collaboration with the project proponent. Technology selection was made taking in to consideration environmentally, economically and socially suitable as well as technically feasible options.

4.2.8 STAKEHOLDER CONSULTATION

Stakeholder consultation was carried out for the project with primary and secondary stakeholders of the project. Following steps were involved to attain stakeholder consent:

- Providing information on the project activities;
- Identifying the stakeholders' concerns, expectations and apprehensions about the project;
- Summarizing the process outcome.

4.2.9 IMPACT ASSESSMENT AND MITIGATION

The information collected in the previous phases was used to assess the potential environmental impacts of the project activities. The impact assessment approach is provided in **Table 4.** Impacts of project activities on environment. The issues studied during impact assessment include potential impacts on:

- Physical environment of the area
- Biological environment of the area
- Socio-economic environment of the area

Table 4: Impact assessment approach

Impact Characteristics	Categories
Nature of the Impact	**Direct:** The environmental parameter is directly changed by the project. **Indirect:** the environmental parameter changes as a result of change in another parameter.
Duration of the impact	**Short term:** Lasting only till the duration of the project such as noise from the construction activities. **Medium term**: Lasting for a period of few months to a year after the project before naturally reverting to the original condition. **Long term:** Lasting for a period much greater than medium term impacts before naturally reverting to the original condition.

Geographical Location of the impact	**Local:** Within the area of project i.e. operation site and access road. Regional: Within the boundaries of the project area. **National:** Within the boundaries of the country. **Global:** Trans-boundary impacts
Timing	Construction Operation
Likelihood of the impact	**High:** High likelihood of occurrence during lifetime of operation, Regular/continuous part of operations. **Moderate:** Moderate possibility of occurrence during lifetime of operation, Periodic/occasional part of operations. **Low:** Unlikely to occur during lifetime of operation.

Impact Characteristics	Categories
Reversibility of the impact	**Reversible:** When a receptor resumes its pre-project condition. **Irreversible**: When a receptor does not or cannot resume its pre-project condition.
Significance of the impact	**Major, Moderate, Minor, Negligible and Beneficial** Based on the consequence, likelihood, reversibility, geographical extent, duration, level of public concern and conformance with legislative or statutory requirements.
Consequence severity of impact	**High:** ▪ Serious/catastrophic damage to environment ▪ Direct legislative requirement ▪ Corporate requirement ▪ Serious threat to corporate reputation/profitability/ability to do business. **Medium:** ▪ Measurable damage to the environment ▪ Subject to potential future legislation ▪ Potential to affect reputation/cost ▪ Implication/reduced efficiency **Low:** ▪ Negligible damage to the environment No risk to business

4.3 IMPORTANT ISSUES AND CONCERNS RAISED DURING CONSULTATION

During consultation it was observed that maximum of people was in favor of project and following issues and concerns were raised. Stakeholder Consultation it is mentioned in detail in

Chapter 10.

- During survey following concerns of the local community, Government Departments and Environmental Practitioners and experts were noted:
- Nuisance must be controlled.
- Latest/State of the art technology must be adopted.

- Locals should be preferred for the job opportunities.
- Solid waste should be managed effectively by adopting the standard practices of the area.
- Cleanliness of the area should be ensured.
- An effective EMMP should be designed and enforced with true spirit.
- Health of the workers should be ensured.

4.4 SIGNIFICANT IMPACTS AND FACTORS TO BE DETERMINED

Main impacts and factors to be determined are:

- Occupational Health and safety
- Site Security
- Traffic Management
- Hygiene management
- Job opportunities for locals
- Resource conservation
- Water consumption
- Proper site restoration after construction
- Tree plantation at designated green areas
- Emergency preparedness

4.5 SITE ALTERNATIVES (SELECTION AND REJECTION CRITERIA)

The land is already owned by the project proponent and considered suitable both in terms of environment and physical constraints. As sufficient area is available for installation that would also reduce the transportation cost for solid waste handling.

- Transportation infrastructure (road network) is available.
- Safe distance from sensitive receptors (residential area & protected area)
- The selected site is under the undisputed rental agreement of the proponent.
- No land use change is being foreseen due to implementation of proposed project.

4.6 PROJECT ALTERNATIVES

It is a common observation that hospitals generate large amounts of waste that falls into different categories in which about 85% is general, non- hazardous waste comparable to domestic waste. The remaining 15% is considered hazardous material that may be infectious, toxic or radioactive. Improper disposal of medical wastes, especially hazardous may lead to significant impacts on human health as well as on environment. This option is unacceptable when one considers the problems associated with the old or ongoing operations to treat hospital waste and its with associated health effects. The hospital hazardous and infectious waste without proper disposal measures will generate various diseases that will be a big threat to human health and the environment. Additionally, the current methods of medical waste management are not consistent with the hospital's waste management rules.

4.7 DESIGN/TECHNOLOGY ALTERNATIVES (SELECTION AND REJECTION CRITERIA)

The project technology will be up to date and will also environment and eco-friendly. So, no other technology will be taken under consideration.

4.8 ENVIRONMENTAL ALTERNATIVES (SELECTION AND REJECTION CRITERIA)

Environmental considerations are of utmost importance in selecting site. Being on a Self-Developed industrial zone there is no sensitivity in the area from environmental setting point of view. Thus, there is no ecologically sensitive or declared protected area such as territorial waters, forest, game reserve or biodiversity parks within a 4 km radius of the project site, requiring the proponent to look for site alternatives.

4.9 ECONOMIC ALTERNATIVES (SELECTION AND REJECTION CRITERIA)

The technology selected for the above stated project will be economical viable than alternatives present as compared to majority of the other available production technologies but it will be most efficient and convenient to use.

5 DESCRIPTION OF PROJECT

This chapter provides the description of "Extension of Green Planet Waste Management (Incineration Unit), type and category of project, location and layout, vegetation features of site, project schedule of implementation and complete description of the project related to its process and steps.

5.1 TYPE & CATEGORY OF PROJECT

According to Review of IEE and EIA Regulations, 2022; the project falls under Category G (2) ***"Waste Incinerators and autoclaves"*** mentioned in Schedule-II.

5.2 OBJECTIVES OF PROJECT

The objective of the project is minimizing the hospital and industrial waste by incineration in environmentally sound manner and minimizing the risk for personnel, general public health and environment Furthermore, recyclable & non-hazardous plastic & other recyclable, material will be recycled.

5.3 LOCATION AND SITE LAYOUT OF PROJECT

The proposed project site is located at 36 Jhoray Pakpattan Road, Chak No 42/2-L District Okara. Google Earth map of site is given in **Fig-1**. The nearby population to project is **1km** distant from project site.

Figure 1: Google earth map of project

5.4 LAND USE ON THE SITE

The site is owned by project proponent. Topography of the area is almost flat with no noticeable variation in the surface. There are no mountains or hills of any kind could be seen in the area.

5.5 ROAD ACCESS

The site is well connected to main road and it is well accessible via main Canal Road access map pf site is given in **Fig-2**

Figure 2: Road access map

5.6 VEGETATION FEATURES OF THE SITE

There is no vegetation, as the current project is located at Self-Developed industrial land and within the existing unit premises. However, proponent will make green belts, garden and plant ornamental plants.

5.7 COST AND MAGNITUDE OF OPERATION

Total cost of the project is estimated to be around **60 million PKR**. The capacity of unit will be 550 kg/hr after an enhancement of 500 kg/hr.

5.8 SCHEDULE OF IMPLEMENTATION

It is projected that the construction phase of entire project will be started after getting environmental approval from EPA Punjab and will be completed in the period of 5-6 months. Activities involved are:

- Assessment of environmental impacts and its mitigation measures
- EA approval, other local issues
- Implementation of recommended alteration in system, if required
- Commencement of operation

1st Stage: The stage–1 comprises the onsite contouring studies and soil investigations.

2nd Stage: The stage –2 comprises the following task:

- Laying of foundations excavation and commencement of erection work.
- Start of civil, electrical and mechanical work.
- Development of basic infrastructure.
- Fitting of instrumentation.

3rd Stage: The stage –3 comprises the following task:

- Equipment erection completion.
- Completion of the basic infrastructures water supply system, electricity supply etc.

4th Stage: The last stage will be Commencement of regular operation.

5.9 DESCRIPTION OF THE PROJECT (PROCESS FLOW CHART/STEPS, TECHNOLOGY, RAW MATERIAL AND PRODUCES, BY-PRODUCTS)

The project is Installation of Industrial & Hospital Waste Incinerator unit under the title of Extension of Green Planet Waste Managment(Incineration). Incineration is an important method for the treatment and decontamination of biomedical and health-care waste. Incineration is high-temperature (850°C to 1250 °C) dry oxidation process that reduces organic and combustible waste to inorganic, incombustible matter and results in a very significant reduction of waste volume and weight. The incineration/pyrolysis should only be carried out in appropriate plants. The system should be designed to cope with the specific characteristics of hazardous health-care. Only recyclable non-hazardous plastic will be converted in plastic granules and then will be sold.

5.10 HAZARDOUS & NON-HAZARDOUS WASTE

Table 5: Raw materials and storage details

Sr No.	Item	Quantity
Industrial waste		
i.	Mobil Oil	500 kg/day
ii.	Chemicals	500 kg/day
iii.	Fiber	1000 kg/day
iv.	Drums	1000 kg/day
v.	Sludge	500 kg/day
Hospital Waste		
i.	Glucose Bottles	500 kg/day
ii.	Syringes	500 kg day
iii.	Bandages	500 kg/day
iv.	Urine Bags	500 kg/day
v.	Other type of Hospital waste	1000 kg/day
Organic Waste		
i.	Organic waste	1000 kg/day

ii.	Foul Organic Waste	1000 kg/day
Total Raw material collection		**16-17 tons/day**
Yard Storage Capacity		**20 tons/day**

5.11 TIMING AND FREQUENCY OF COLLECTION OF WASTE

1. Timing: 08:00am to 06:00pm
2. Frequency: 2 times a day (max.)
3. Transportation mechanism: 8 trucks

5.12 TECHNICAL SPECIFICATIONS OF THE PROJECT

- The incinerator will have a capacity of 550 kg/hr.
- The incinerator shall work with natural gas burners with the option to operate on standby LPG fuel as well.
- Combustion gas will be re-burned in the post-combustion (secondary) chamber at the temperature of 1250°C.
- The control panel will be fitted with a functional synoptic view showing the operating situation of the whole incinerator and is controlled by P.L.C.
- The incinerator will be designed as a packaged unit, having pre-wired electrical connection and fuel pipes in place, making installation easier at site.
- Waste will be introduced through a manual front-loading system, continuous interval into the incinerator.

5.12.1 COMBUSTION CHAMBER OF WASTE

- The first phase of the incineration combustion will be without air (pyrolytic effect), comparable to gasification.
- The combustion chamber will have thick sheet of steel (5 to 8 mm), especially elaborated in rectangular shape.
- The insulation of the combustion chamber will be composed high content aluminum and insulates bricks in order to assure a minimum temperature on the outside metal sheet.

5.12.2 REFRACTORY

- Thickness: 110 mm
- Maximum temperature: 1650 °C Nature: 42% of Al203

5.12.3 INSULATOR

- Thickness: 80 mm
- Maximum temperature: 1250°C Nature: Calcium silicate

5.12.4 COMBUSTION BURNERS

- The combustion hearth has equipped with one combustion burners.
- Automatic burning and mono-bloc casting guiding flames have fitted with an electronic ignition device and permanent ventilation.

5.12.5 SECONDARY COMBUSTION CHAMBER

- The post-combustion of gases will take place at a temperature of minimum 1250°C for seconds. The cylindrical form of the secondary combustion chamber, combined with vortex effect in the secondary air injection enables to assure the achievement of very low hydrocarbon refuse.
- The post-combustion chamber will be fitted with inspection doors so that a periodical cleaning of dust can be achieved.
- The post-combustion will have a lined with high thermal insulating materials having a thickness of 250mm or more.
- The design of the post-combustion burner has similarity to the combustion burner.

5.12.6 SCRUBBER

The incinerator will be equipped with dry scrubber in order to control emissions.

5.12.7 ELECTRIC CONTROL AND REGULATION PANEL

- The panels will have the temperature regulators which have digital showings.
- One for regulating the temperature of combustion burners
- One for regulating the temperature of post-combustion
- The control panel commanded by the P.L.C (Programmable Logic Controller) System.
- The manual commanding is anticipated on each element.

5.12.8 CHIMNEY

- The incinerator will be equipped with a chimney
- The chimney will have a collection point/monitoring point for monitoring of emissions.
- The height of chimney will be 15 m

5.12.9 STANDBY LPG FUEL

An LPG Vaporizer with manifold system for reserve LPG cylinders having sufficient capacity to run the incinerator for at least 12 hours including shed.

5.13 PROCESS FLOW

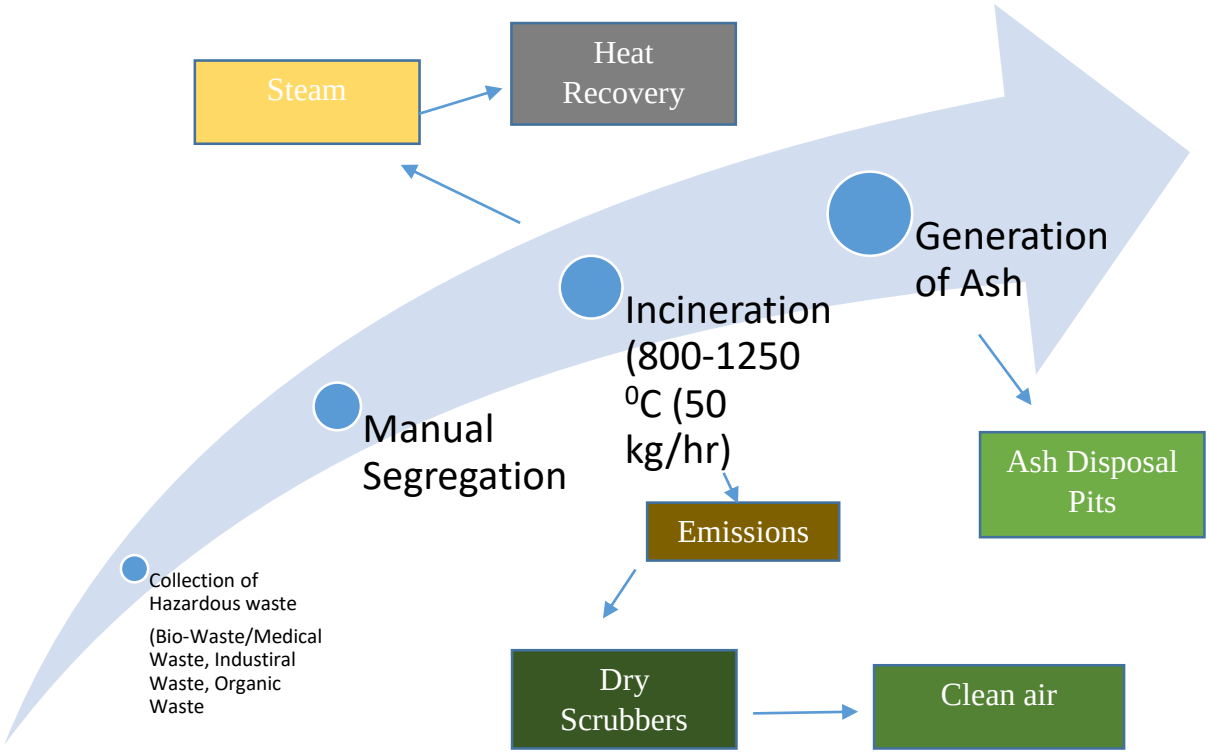

Figure 3: Schematic Flow Diagram of Incineration of Hazardous Waste

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Figure 4: Process Flow for Non-Hazardous Waste

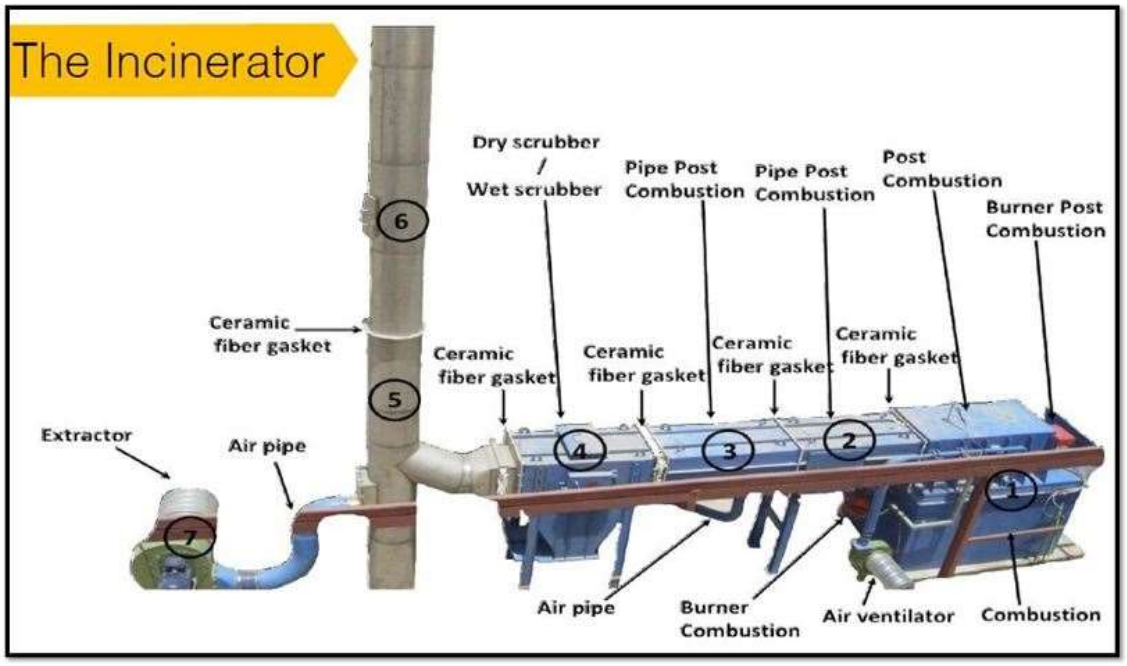

Figure 5: The Incinerator

Table 6: Technical Specifications

Type	Parameter	Recommendation
Capacity	Destruction rate, safety boxes capacity	50 kg/hr
Temperature	Primary chamber Secondary chamber	540 to 980 C 980 to 1200 C (EPA 1990 recommendations) >850/1100* C (S. African and EU standards) >1000/1100* C (Indian and Thai standards) * More than 1% chlorinated organic matter in waste
Residence Times	Gas (secondary chamber)	>1 s
Air Flows	Total combustion air Supply and distribution of air in the incinerator Mixing of combustion of gas and air in all zones Air emissions	140-200% excess Adequate Good Mixing Minimize by keeping moderate air velocity to avoid fluidization of the waste, especially if high >2%
Controls & Monitoring	Temperature and many other parameters	Continuous for some, periodic for others
Waste	Waste destruction efficiency	>97% by weight
Enclosure	Roof	A roof may be fitted to protect the operator from rain, but only minimum walls.

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Chimney	Height	At least 4 – 5 m high, needed for both adequate dispersion plus draft for proper air flow
Pollution Control	Installing air pollution control	Most frequently used controls include packed bed, venturi or other dry scrubbers, fabric filter typically used with a dry injection system, and infrequently electrostatic precipitator (ESP). Modern emission limits cannot be met without APCD.

5.14 RESTORATION AND REHABILITATION PLANS

At the end of the unit life, it will be duly dismantled with special precautions to avoid/minimize pollution and at the same time taking all safety precautions to protect human life and property around the project site. Debris or any other wastes resulting from demolishing will be disposed-off in environmentally sustainable fashion. The materials capable of recycling/reuse will be sold in the market. While dismantling, Government rules and regulations as applicable to such activities will be strictly adhered. Safety measures as desired under the code of demolition will be adopted to avoid any harm to humans, property around, or the environment in the project area. On the whole, the project site and the area in its near vicinity will be made neat and clean.

5.15 GOVERNMENT APPROVALS

The environmental approval according to the Section 12 of Punjab Environmental Protection Act is the mandatory requirement of the project.

6 DESCRIPTION OF ENVIRONMENT

6.1 GENERAL

This section of the report covers a comprehensive description of the baseline condition of the project and its related influential area with respect to the physical, biological and social aspects. In addition to the secondary data, the field survey was carried out and the environmental baseline conditions were established based on socioeconomic interviews, impact location profiles: environmental profile questionnaires and public consultations. A social survey was carried out through consultations with various communities. Interviews were conducted from the locals near the projects area. The main intention of these interviews were to acquire feedback associated with project as well as its impacts on their daily life on short term as well as long term basis.

6.2 PHYSICAL ENVIRONMENT

This section provides a clear description of the physical resources such as topography, soil, climatic condition, surface and groundwater resources and quality, ambient air quality and geology of the project site but also city as a whole. The description of physical environment of project site is presented in following subsections.

6.2.1 Topography

Okara is situated at a distance of about 127 km South- West of Lahore on National Highway (G.T Road) & on Lahore Karachi main railway line and 39 Km to the East of Sahiwal on the National Highway. Its approximate height above Sea level is 500ft. it's bearing longitude 31 North and Latitude 74 east.

6.2.2 Seismicity

Seismic Zoning Map of Pakistan showing proposed project site area is presented as **Figure – 3,** including zones according to the Building Code of Pakistan – 2007. The city of Okara. The project site falls in Seismic Zone 2A according to the Seismic Zoning Map of Pakistan.

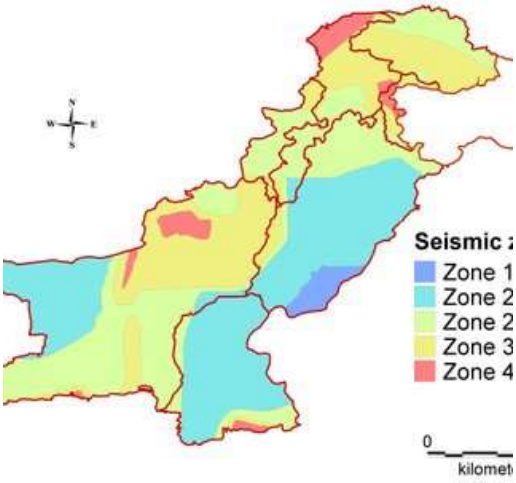

Figure 6 Seismic Zoning Map of Pakistan

6.2.3 Geography

Okara is situated at a distance of about 127 km South- West of Lahore on National Highway (G.T Road) & on Lahore Karachi main railway line and 39 Km to the East of Sahiwal on the National Highway. Its approximate height above Sea level is 500ft. it's bearing longitude 31 North and Latitude 74 east. There are number of different kinds of grasses and other plant of slow growth is considerable. But there are not more than half of a dozen species of trees of spontaneous growing plenty of water the sounding area of city might became very fairly wooded. Near the Rive there is a good quality of timber and along khanwah canal and in the villages adjoining it more especially to the south. There is a fine belt of trees, while the abandoned station of Gogera presents specimens of most trees found in the plains of upper India. The trees commonly met with are Ukkan, Kikar, Beri- Jand, and Karil. No special species of animal worth mention are to be found, only in the riverine track in the Depalpur Tehsil, stage deer is occasionally seen. Endemic, however, is the meaning wild boar in the river line belt of the Satluj and Ravi. They damage crops, and are shot down by farmers and occasionally are prey to concerted anti-wild boar campaigns, around the forest plantations, gray partridge is found, and there is duck and teal in the water- spots along the river bank of the Satluj and the Ravi during winter. With the ever-increasing number of licensed guns, these birds re getting smaller in numbers. Black partridge is the few that cling around the riverine track.

6.2.4 Temperature

The climate of Okara is hot is summer and comparatively cold in winter. May and June are the hottest months when temperature rises up to 44 degree centigrade. The Mon-soon starts at the end of June and remains by the middle of September but the average temperature is 36 degree centigrade. January is coldest month with average temperature of 6 degree centigrade. The annual rainfall is 490mm. water table in Okara city is 40 to 165 feet the water quality is good and fit for drinking.

Details description of the seasons is as under:

- Winter (October to February: Moderate to extreme and dry
- Spring (March & April): pleasant and moderately cold
- Summer (May to September): very hot to humid
- Monsoons (May to September): Wet. Although the temperatures are milder but due to appreciable humidity, the heat is oppressive; and
- Post –Monsoons Summer (September & October): Moderate and slightly humid

Given below are maximum and the minimum temperatures of Okara throughout the figure.

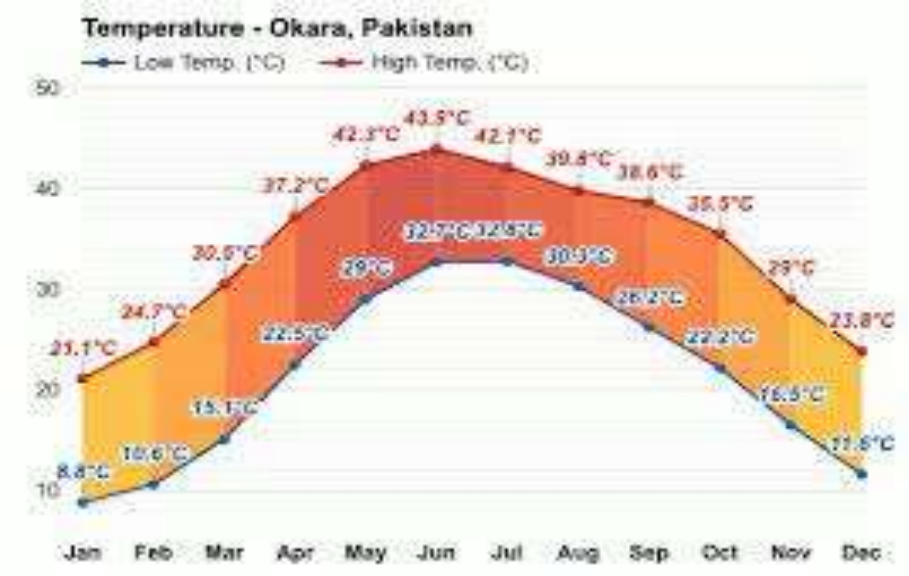

Figure 7 Average Temperature of Okara

6.2.5 Rainfall

The average yearly rainfall at about 490mm and is highly seasonal with approximately half of the yearly rainfall in the two months July and August.

6.2.6 Wind

The region experiences easterly and north westerly winds during the winter and spring seasons, known usually as the dry stable times of year and southerly and south easterly winds during summer and monsoons. Wind speeds are low during winter picking up during spring season and peaking during the summer months, the prevalent wind speed ranges from 10-25 km/h, however on some days, there appear storms of 60km/h

6.2.7 Noise Level

Noise is described as an unwanted sound emitted from un-avoidable sources of anthropogenic activates. Daily based natural induced sources of noise are rare to none but human induced noise sources are plenty and un-avoidable. Physically, there is no distinction between sound and noise. Sound is a sensory perception and the complex pattern of sound waves is labeled noise, music, speech, low altitude aero plane flying etc.

Environmental noise is a common cause of hearing loss of people indulged in industrial activities. Noise pollution in the city is on the rise with most residents complaining that the noise is becoming a public nuisance.

6.2.8 Ambient air Quality

The degradation of air quality in all the large cities is a major environmental concern these days. Air pollution levels in urban centers have either crossed safe limits given in the PEQS or heave reached the threshold values.

About 60 to 70 % of the deterioration in the air quality is due to the vehicular emissions. The parameters which have proved to be the major threat are particulate matter and concentration of oxides of nitrogen that are relatively higher in all the large cities of Punjab.

Atmospheric pollution particularly in urban area has a strong impact upon daily life. Okara is the main city of Pakistan. Its economic growth, industrial progression & transport have risen to grounds responsible for growing energy consumption leading ultimately to the consequences of increase in air pollution. The main sources of air pollution are exhaust from motor vehicles and industries. The main exhaust gases include SO_2, NO_2, CO_2 etc. Particulate Matter (MA) and noise which are inspected as the pollution indicators.

It was observed during the visit that Petrol and Diesel operated vehicles are emitting smoke and exhaust gasses in excessive quality worsening. In fact, exhaust emissions (including dangerous gases such as carbon monoxide, oxides of nitrogen, hydrocarbons and particulates) and Evaporative emissions (including vapors of fuel which is released into the atmosphere without being burnt) are the prime reasons of deterioration of air quality. It was however observed during the visit that environment of the project area is clean.

6.2.9 Climate

A short description is given here under to present the climate conditions of the area:

Humidity Monthly relative humidity for this area has been worked out as 55.0%. The maximum recorded humidity for the district is 91.0% while the minimum humidity is 35.0%

Precipitation

The average annual rainfall is 200 mm. most of the rain occurs during monsoon in summer which often result s in flooding of the nearby water drain and canal.

Water Resources

Ground Water

Ground water is the sources of potable water in the area. Water table in Okara city is 40 to 165 feet and up to this level the water quality is unfit for drinking purposes. Form above 165 feet the water quality is good and fit for drinking.

6.2.10 Water Supply:

The water supply network covers 60% of the town and serves 70% of the total population. 23 tube wells serve the town, of which 16 are operational and working 10-12 hours per day.1 No plan is being developed to address this issue. Tube wells installed at depth of 165 to 220 feet 16 Tube wells of TMA are installed near LBD Canal. While six tube wells installed near 5/4-L.

Minor and one tube well is at Bus Stop. Two tube wells under Public Works Department are installed near LBDC to supply system of the town; there are 23 tube wells out of which 10. Tube wells are operational and working 10-12 hours/day. No chlorination is done by TMA staff. Bleaching powder solution is used monthly and during the rainy days it is added after15 days basis.

6.3 BIOLOGICAL ENVIRONMENT

A detail of ecological account of the Project and Study Area is given below:

6.3.1 Flora

The area in which the project site is located was once covered was once covered with native vegetation, mostly consisting of tress like Ukkan, Kikar, Beri, Jand, Van, and Karil. With the onslaught of civilization and industrialization, this vegetation was cleared for agricultural, commercial or industrial land use purposes. The current biological details of the area in general and study area in particular are given below:

6.3.2 Trees

A field study related to the identification of tree species in the study area was also conducted. A vast majority of trees were observed in the localities visited as well as open fields. These are Tail/Sheeshum (Dalbergia sissoo), Kikar (Acacia nilotica), Neem (Azardirachta imdia), Peeloo (Salvadora persica), Bohar (Ficus religiosa) and Gas exotic species and mesquite has suppressed endemic species to a great extent. The endemic species of peeloo and Bohar are reported to be endangered, as the forest department is not propagating the same, and similarly the wild berry (Zizyphus numularia) has almost become extinct.

A tabular comparison is given hereunder to explicit frequency of each species in three zones of study area:

6.3.3 Vegetables

Vegetables in around and Project Site

No vegetables are grown in or around proposed project site.

Vegetables in Study Area

Some important of these Phool Gobhi/cauliflower (Brassica oleracea Ver. Botrytis), Band Gobi (Brassica oleracea Ver. Capitate), Onion (Allium Cepa), Potato (Solanum Tuberosum) and Turnip (Brassica rapa subsq. Rapa).

6.3.4 Fruits

Oranges, Lemon, Guava, Grape fruit and Mangoes, Mulberry and Jamun orchids are famous.

6.3.5 Agriculture

The soils of the area are quite suitable for all kinds of vegetation including fodder, orchards, vegetables and other seasonal crops. The pattern mainly consists of wheat-rice system, while other agriculture practices include the cultivation of sugarcane, Maize, etc.

6.3.6 Farm, Traction Power

Tractor is the sole source of farm traction power. No farmer was found using animal traction power. There was significant variation in tractor ownership across farm size groups. However, more than half of the farmers owned tractor while rest were hiring the services for land preparation.

6.3.7 Irrigation

The tube-wells and canal water are the main source of irrigation water for wheat, rice and other crops and fodder. Also, many farmers irrigate their fields with contaminated water of drain and also many studies have been conducted to assess the level of toxic heavy metals in the soil and vegetables irrigated by drain water and their ultimate impacts on human health. It has been highly recommended during these studies not to use the contaminated water of drains for agricultural practices. On the other hand, plenty of ground water is easily accessible for agriculture use.

6.3.8 Crops and Fodder

Crops usually seeded in the area include Wheat (Tritcum indicum), Potato, Maize, Rice, Sugarcane, and Tomato along with other fodder.

Cropping pattern

Rice and wheat are the major Kharif (summer) and rabi (winter) crops, respectively covering more than 64 percent of the cropped area in both seasons. Two third of the cropped area is under paddy, a cash crop of the area. Also, the rice- wheat is the dominant sequential cropping system, yet fodders and sugarcane are the other important crops of the area in Kharif and Rabi seasons.

Forests

No natural or artificial forest exists in the project influenced area.

6.3.9 Fauna

The area provides healthy environment for the growth and reproduction of a diverse nature of fauna. A short description is given in the following paragraphs.

6.3.10 Mammals

Mammals within project site

Common mammals reported from the project area wild-bore hyaena (Hyaena striata), red India foxes (Vulpes bengalensis), porcupies and jackals (Canis aureus). Until a few years ago the Wolf (Canis

palfies) was also found in riverain forests, but the species has almost become extinct due to loss of forests.

6.3.11 Reptiles

Reptiles within Project Site

No reptiles were identified within the project site

Reptiles in Study Area

Above reptiles were also seen in study area in localities and field. The most common reptiles include Snacks, Pakistani Cobra (Naja naja karachiensis), Lizards, Varanis (Goh/large lizard), Spiders and Scorpions, etc.

6.3.12 Amphibians

A number of Amphibians found in the tract include common Frog (Rana tigrina), Common Toad (Bufo bufo) and Tourists (Chitra indica).

6.3.13 Birds

Different types of birds' species were identified within the project site. The bird's species identified in these areas include House Sparrow (Passer domesticus), House Crow (Corvus splendens), Cheel, Bagle, Bulbul (Pycnon tus cager), Parrots (Psittacula Krameri), Haek (Buteo Jamaicensis), Kite (Milvus), Pigeons (Columbia livia), Ullu, etc. are also seen in the area. A large variety of waterfowls and migratory birds also visit the region because of the barrages and wetlands in the area.

Wildlife Sanctuaries and Game Reservoirs

No wild life sanctuary or game reservoir is located in the vicinity of the project area or in the project influenced area.

Rare or Endangered Species

There are no rare or endangered species in the study area.

6.4 SOCIOECONOMIC ASSESSMENT

Socioeconomic Assessment is represented by the human and economic development and quality of life values. For the study of socio-economic environment of the project area, field surveys were conducted interviews were held with general public and neighbors.

6.4.1 Demographic Profile

The Demographic Studies are the major source of any city's Socio-Economic profile.

Demographic Studies relate to population. Population studies are extremely important from Town Planning point of view. Until and unless we know about population in detail we cannot do successful

planning. All aspects of population, such as sex-age composition, trend of migration, social, cultural, political, economic and administrative works, values and facilities have to be related to planning considerations and decisions. Individuals are the raw material of society; therefore, society is directly affected by size, growth composition and distribution of its individuals. The term population refers to the number of individuals living within a geographical area at a given time.

Different community individuals in the vicinity of the project area have different family sizes depending upon their living setups. Average family size is however 5-7 individuals per family with 1-2 earning hands per family. Since the proposed project is located in an agriculture area, most of the individuals are associated with the agriculture area, most of the individuals are associated with the agricultural activities.

6.4.2 Health Facilities

As the project site is located in an agricultural area. Villages area present in the vicinity of the project site. Fever, malaria and chest congestion, Hepatitis-C were reported as the common diseases of the project area. THQ Hospital Renala Khurd and Rural Health Center Renala Khurd are the nearest hospitals for the projected site.

6.4.3 Educational Facilities

As the project site is not located in any residential area. However, the villages located around project site have few governments primary schools. Government Special Education Center Renala Khurd, Kahnur Education House, The Education Campus are nearest schools for the projected site.

6.5 SOCIO-ECONOMIC PROFILE OF PROJECT AREA

6.5.1 Demographic Characteristics of the Population

The field surveys (including interviews, focus group discussions, census, and area profile) was carried out to collect the socioeconomic data from the project affected people affected people as well as other general population to accomplish the baseline information, which will provide the basic for subsequent monitoring and evaluation studies.

The demographic features include the information on household's profile, gender composition, occupations, and literacy status of the population residing in the project area. The information relating to the demographic profile of the people in the project area is described below

Based on the field survey of local population, the average family size computed to be 7.5.

6.5.2 Age Groups

Ages of the consulted population were also recorded. The people interviewed for the socio-economic assessment belongs to different age groups i.e. 20-35 years, 46-55 years, and 56 years and above.

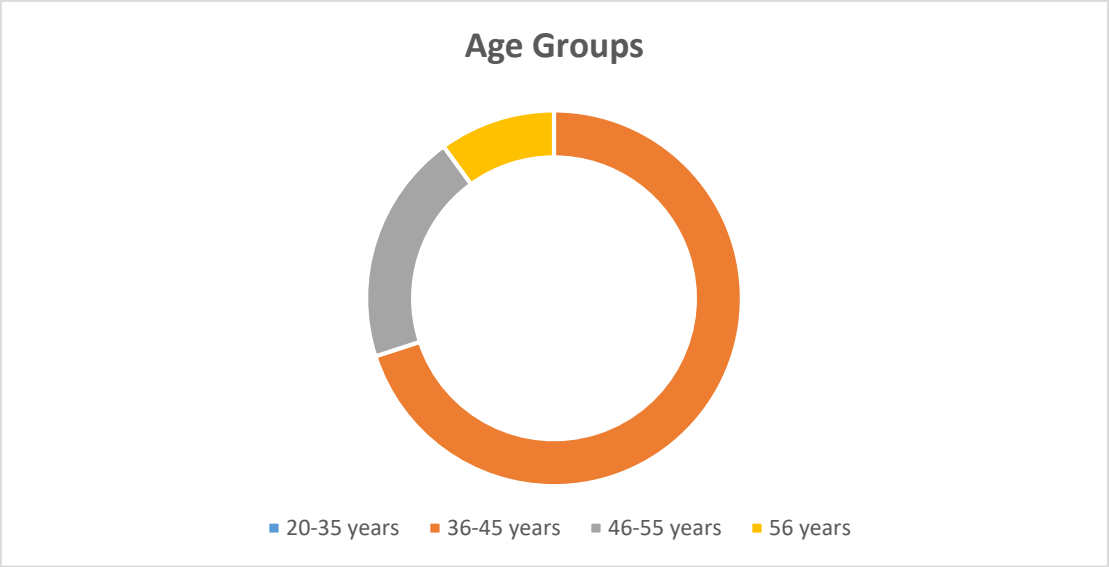

Figure 8 Consulted age groups in the area near project site

6.5.3 Occupation of Respondents

Majority of the respondents (55%) are attached with agriculture, 20% shopkeepers and remaining 25% are labors. During survey, efforts were made to interact with people representing all walks of life. The detailed graphic representation of occupational status is given below:

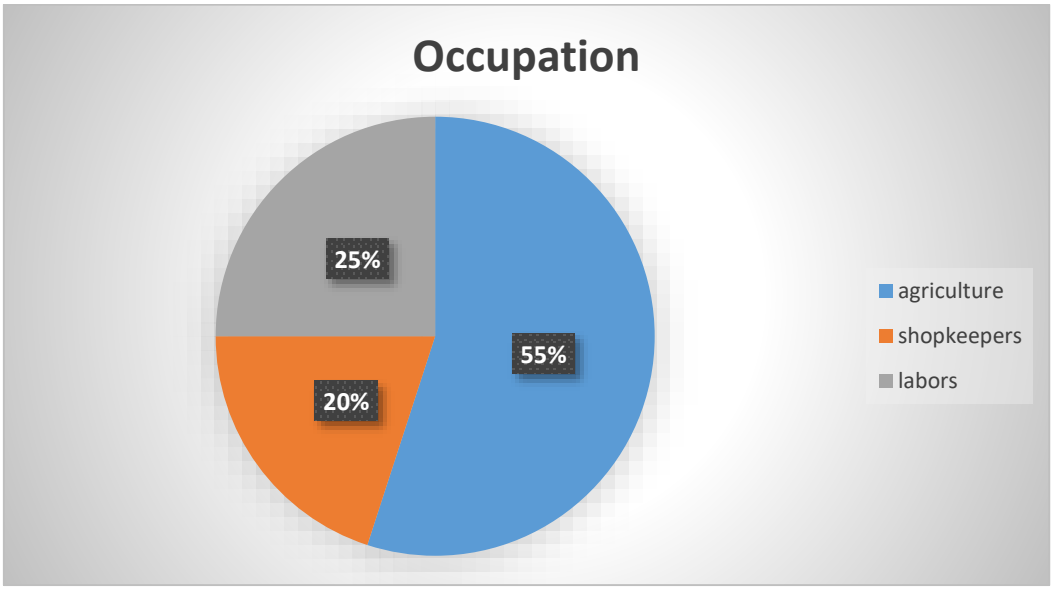

Figure 9 Occupation of Respondents

6.5.4 Literacy rate

From survey results, it was found that 75% of the studied population was illiterate, 15% was up to primary level, 10% studied up to middle level.

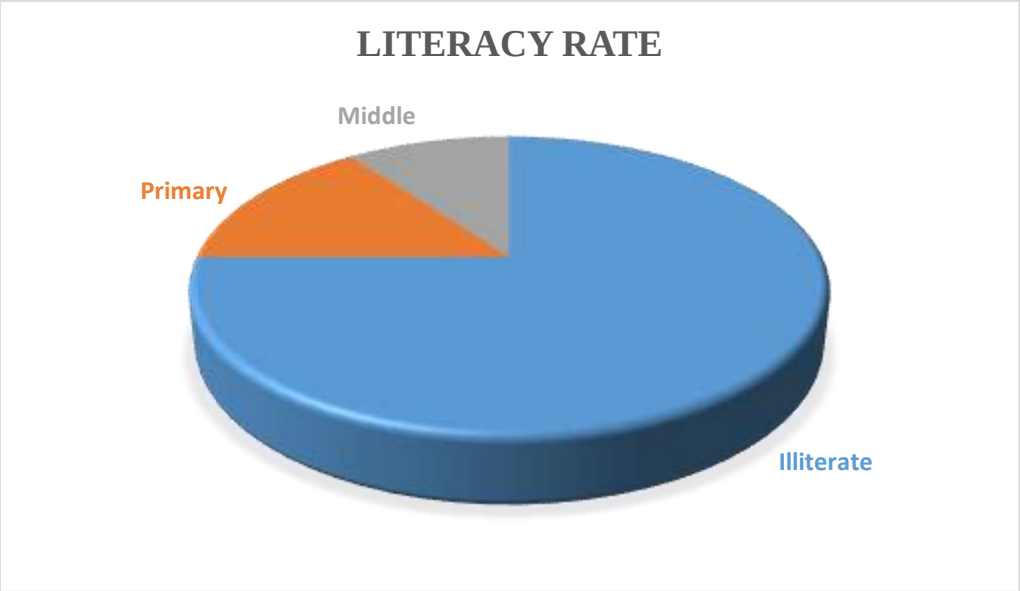

Figure 10 Literacy Rate

According to the survey the common disease recorded in the project area is Hepatitis.

6.5.5 Cultural, Religious & Other Structures

No cultural, religious and other structures are present in the close proximity of the project area that needs to be relocated. Villages present around the project site have mosques and imam bargah.

6.6 SOCIOECONOMIC SURVEY AND PUBLIC CONSULTATION

For ascertaining the perceptions of different stakeholders about the project, meetings were held with them. These meetings were held in an open atmosphere, in which participants expressed their views freely. Informal group discussions were also held as an additional tool for the assessment of the perceptions of the stakeholders.

6.6.1 Methods of Public Consultation

Public Consultation was carried out for a day. Socio-economic survey forms are attached as Annexure with IEE report. The following methods were used for public consultation with project stakeholders in order to ascertain their stakes regarding project implementation.

- Focused Group Discussion
- Scoping Sessions
- Formal Group Meetings
- Informal Group Meetings

6.6.2 Project Response

93% of the respondents were of the opinion that this project should be implemented. In their opinion, construction of the project will create labor opportunities for locals and it will help to improve economic conditions of area. The respondents also provided the mitigation measures like certified contractor must

be hired, proper plantation should be done, proper procedures should be followed etc. they said, if mitigation measures will be implemented they implemented they would have no objection.

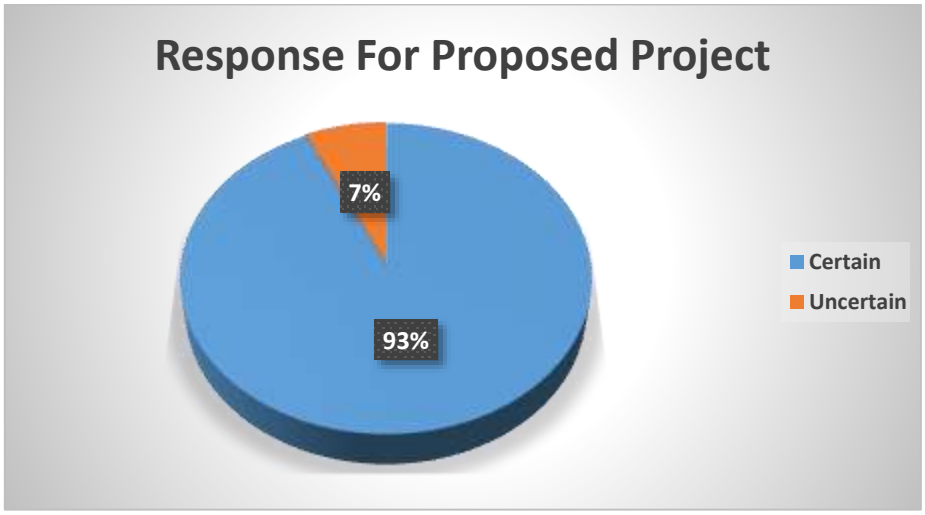

Figure 11 Percentage of People in favor or against the project

6.7 SUITABILITY OF THE SITE

The consultations demonstrated that goodwill towards the project proponents indeed exists; approval for project activities by the communities was evident. The consultations were considered a good gesture and appreciated. Proposed project will help in improving the health conditions of the area, so the respondents were positive about the proposed development. Proponent recognizes that benefits from the project should be distributed judiciously and equitably especially among primary stakeholders in the project area and will continue to ensure that this principle is followed in its projects and community development program.

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7 IMPACT ASSESSMENT

This section discusses the potential environmental impact of the project, methodologies for impact identifications and characteristics of impacts including nature, magnitude, extent and location, timing, duration, reversibility, risk the assessment carried out in this Section is based on potential impacts on overall environmental receptors within the project area.

7.1.1 METHODOLOGIES FOR IMPACT IDENTIFICATION

The potential impacts due to the incinerator are mostly beneficial. During construction phase, adverse environmental & social impacts are depending on the resources and receptors involved along with other parameters such as; geographical scope (magnitude and extent), temporal scope (duration) and reversibility. It is anticipated that this project will have maximum positive impacts as it is environmentally friendly project to reduce pollution load.

Moreover, the project is expected to result in negative impacts of short-term duration and transient in nature. Having identified and characterized the potential significant impacts during design, construction and operation phase of project an Environmental Impact Severity Matrix & checklist to summarize all the identified impacts as mentioned below in tables.

Table 7: Impact significance criteria

Impact	Criteria
No Impact	When the project activity will have no impact
Long Term	When the impact is of high intensity with high spread and high duration or of high intensity with medium spread and medium duration
Moderate Term	When the impact is of moderate intensity with high spread and high duration or of high intensity with low/ moderate spread and low duration
Short Term	When the impact is of low intensity but with moderate spread and moderate duration or of moderate intensity
Insignificant	When the impact is of low intensity, low spread and low duration
Adverse	When the impact is of large intensity, spread easily and long-term
Beneficial	When the impacts are positive and improve the environmental conditions

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Table 8: Impact assessment checklist for operational phase

Environmental Sensitivities	Intensity of Impact						Impact Nature		Impact Significance				
	Low Intensity	Moderate Intensity	High Intensity	Local	Moderate	Regional	Beneficial	Adverse	Insignificant	No Impact	Short Term	Moderate	Long Term
Physical Parameters													
Noise													
Water Quality													
Odor													
Biological Parameters													
Land Environment													
Flora													
Fauna													
Physical Parameters													
Local Economy													
Social Impacts													
Health & Safety													

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7.2 CHARACTERISTICS OF IMPACTS (NATURE, MAGNITUDE, EXTENT AND LOCATION, TIMING, DURATION, REVERSIBILITY AND RISK)

The impact characteristics are identified to screen out potentially insignificant environmental and social impacts from potentially significant adverse environmental and social impacts during planning & designing, construction and operational phases of the project. The objective of impact screening process is to assess the significance of issues related to the air, water, noise, soil, transportation, civil work, communication, the hazards and external constraints. The beneficial and adverse impacts of project during planning & designing, construction and operational phases are identified based on their duration, location, frequency, extent, significance and reversibility. The impact of each activity on various environmental parameters is given below:

Table 9: Impact assessment characteristics

Sr#	Environmental Component	Impact Characteristics												
		Duration		Location		Frequency		Extent		Significance			Reversibility	
		Long	Short	Direct	Indirect	Cont.	Intermittent	Wide	Local	Large	Moderate	Minor	Rev.	Irrev.
Beneficial Impacts														
1	Employment Opportunity	◙		◙		◙			◙		◙		◙	
2	Solid Waste Management	◙		◙		◙			◙		◙		◙	
3	Land Value	◙			◙	◙			◙			◙		◙
4	Tree Plantation	◙		◙		◙			◙		◙			◙
5	Wastewater		◙	◙		◙		◙			◙		◙	
Adverse Impacts														

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1	Solid Waste	•		•		•			•		•		•	
2	Health and Safety		•		•		•		•			•		•
3	Physical Hazards		•	•			•		•			•		•
4	**Security Risks**		•		•		•		•		•		•	

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8 SCREENING OF POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

This Chapter identifies the potential impacts (positive and adverse) on the physical, biological and socio-economic environment of project area due to the project. It also identifies measures that will help to mitigate the adverse environmental and social impacts (if any) and it will enhance positive impacts of the project. Impacts are assessed by analyzing their magnitude and sensitivity, which is a legal requirement.

8.1 IMPACTS ASSOCIATED WITH PROJECT ACTIVITIES

- Environmental Impact - Operation Activity
- Socioeconomic Impact - Operation Activity

8.2 PROJECT LOCATION

There will be no impacts due to project location as the land is rented by project proponent through proper channel. For the establishment the Incineration Unit an open plot in self-developed industrial area has been selected. In the project area or its vicinity no ecologically, important area is present. However, no human settlement or infra-structure will be dislocated due to the establishment of project. So, no adverse impact is being envisaged. Hence, there is no need to change the design of project is required.

8.2.1 COMPENSATION IN MONEY TERMS

There is no damage envisaged to fauna, flora or any other biological source due to the establishment proposed project. However, agricultural land is being converted to the built-up area. So, no compensation in monetary terms will be needed as the land is owned by the project proponent.

8.2.2 REPLACEMENT/RELOCATION/REHABILITATION

The proposed project is located in open land where there is no sensitive area, population or natural resource is present which could be impacted due to the establishment of project. No replacement, relocation and rehabilitation is required for the proposed project establishment. However, at the end of the life of the unit, it will be duly dismantled with special precautions to avoid/minimize pollution and at the same time taking all safety precautions to protect human life and property around the project site. Debris or any other wastes resulting from demolishing

will be disposed-off in environmentally sustainable fashion. The materials capable of recycling/reuse will be sold in the market.

8.3 PROJECT DESIGN

The proponent has planned to construct the unit on modern lines, meeting international standards, with incorporation of imported technology. The design, if maintained and operated in an environment-friendly manner, is expected to cast positive impact on the environment and will not pose any adverse impact or threat on any component of the environment.

The design of the proposed project will be sustainable and will follow the principles of energy conservation. The design of the main public buildings will follow the green building designs such as; maximum utilization of the sunlight, high roofs to keep the building cool, etc. Moreover, the building will be designed by keeping in consideration all the technical standards to avoid adverse impacts on the environment and society.

8.4 CONSTRUCTION PHASE

Following impacts could be impacts during constructional phase of project. The proposed project area is located in well-developed area and existing built-up area categorized as the Self-Developed industrial area (referring to the google earth view). The roads of the area are metaled. During the transportation of the raw-material such as cement, bricks, sand, gravels, etc. The dust clouds may be generated which could impact the local climatic conditions on temporary basis. This impact is considered in-significant because of the metaled road structure.

8.4.1 MITIGATION MEASURES

Impacts of raw materials transportation can be reduced significantly by adopting better management and monitoring practices. Following management and monitoring practices will be adopted to reduce the impacts:

- Proper tuning of vehicles should be done on the regular basis in order to control the air pollution generated by the burning of the fossil fuels in the vehicles
- Restrict excessive transportation of the vehicles as well as the speed of the haulage trucks that shall not exceed the speed limit of 40km/hour
- Careful site planning and managing the transportation routes for the vehicles carrying raw-materials
- Cover the vehicles with tarpaulin carrying sand and loose material

- The wind prone loose material should be covered and sprinkled with water on the regular basis.

8.4.2 IMPACTS ON VEGETATION

There are no vegetation present on site so no mitigation measures are required.

8.4.3 IMPACTS ON WATER SOURCES

During construction phase, water will be used for the preparation of the raw material, for watering under-construction buildings and consumption by the workers in various domestic activities. It will cause negative impact on underground water resource. The consumption of the water will be high causing minor negative impact on the water resource of the area. The groundwater may get polluted due to the presence/consumption of the chemicals and petroleum products on-site

8.4.4 MITIGATION MEASURES FOR WATER

Following mitigation measures will be required for water sources:

- Avoid un-necessary consumption of the water and close the tap when water isn't in use
- Special care will be required to protect the chemicals and petroleum products from spillage and contaminating the ground water sources
- Proper knowledge regarding the watering of the under-construction building should be given to the workers in order to conserve water
- Water efficient equipment and process will be used
- Awareness regarding the water conservation techniques should be carried out

8.4.5 IMPACTS ON AIR QUALITY

During construction phase, the machinery working on project site may cause air pollution due to release of the pollutants such as; carbon dioxide, methane, NOx and SO_x from the burning of the fossil fuels in the vehicles. Dust may be generated due to the excavation activity and filling activities. No other impact is envisaged that may deteriorate the ambient air quality of the area.

8.4.6 MITIGATION MEASURES FOR AMBIENT AIR QUALITY

Following mitigation measures will be adopted to reduce the impact on the air quality:

- Proper tuning of vehicles should be done on the regular basis in order to control the air pollution

- It should be ensured that the high-quality fuel is being used in the vehicles that are working on-site
- The material prone to wind should be covered with tarpaulin
- Avoid unnecessary movement of the trucks carrying raw-materials to avoid unnecessary air emissions
- Avoid excavation and filling activity on the windy days
- Impact can be minimized through a management program which ensure dust will be controlled by regular watering the dusty and wind areas
- Abandoned excess laterite and stone aggregate littered around stock pile areas after construction completed changes the soil structure
- Regular water sprinkling may be done to control the dust generation

8.4.7 IMPACTS DUE TO NOISE

During construction phase, heavy construction machinery will be use. The machines are noisy and can cause a certain degree of nuisance to the nearby residents. The noise levels of machines and vehicles vary widely depending on the type of noise generated and level of activity. Some common impacts of noise nuisance include annoyance, sleep disturbance and interference with communication. Acceptable levels of noise are regarded to be 40 dB(A) during the night and 50 dB(A) during the day. Since construction will take place during the day only the 50 dB(A) level is of importance. As the proposed project is not located in the residential zone so the noise related impacts will cause insignificant impact on the nearby community

8.4.8 MITIGATION FOR NOISE

Following mitigation measure will be adopted to reduce the noise;

- The noise related activities should be done during the day time to ensure minimum disturbance to the local community
- Proper tuning of the vehicles should be done on the regular basis, so that the noise level will be reduce up to the acceptable limits
- Noise related activities should be done speedily and completed as soon as practically possible
- Construction activity will be confined to the small reserved area

8.4.9 IMPACTS ON SOCIO-ECONOMIC ENVIRONMENT

During this phase, skilled and unskilled labor will be required. Employment opportunities for the un-skilled workers will therefore increase which will enhance the positive benefits for the local people who are in dire need of income for sustenance. Furthermore, indirect opportunities for employment will arise from the provision of services to the construction teams; sale of raw-material such as cement, bricks, sand etc., as well as food and beverages for the labor. After completion of construction phase serve as a permanent business opportunity.

8.4.10 MITIGATION MEASURES

No mitigation is required.

8.5 OPERATIONAL PHASE

The environmental and socio-economic impacts associated with the operation phase are had been studied in detail. Following is the detailed description:

8.5.1 WATER CONSUMPTION

For the project water usage will be the water required for domestic use of workers & for floor cleaning only.

8.5.2 MITIGATION MEASURES

Following mitigation measures will be adopted:

- Water conservation program will be initiated to prevent wastage of water
- The management will ensure maximum recycling of washing water, so that overall consumption could be reduced
- Reusing the water for sprinkling purpose after floor cleaning

8.5.3 WASTEWATER

The building operations will generate wastewater in the form of domestic wastewater. Domestic wastewater generated during building operation is estimated to be approximately 1.4m^3/day. Implementation of the proposed mitigation measures and regular monitoring is not likely to leave any significant impact of the wastewater from the facility.

8.5.4 MITIGATION MEASURES

Following mitigation measures will be adopted for effective management of wastewater:

- The grey water will be treated through settling tank which will be recycled to be re-used in gardening.
- Waste segregation measures would be employed to minimize entry of solid waste into the wastewater stream
- Water conservation strategies will be employed to avoid wastage of water
- Periodic sampling and monitoring of key parameters for wastewater effluent into the receiving body (drain or sewerage system) and for this purpose samples will be collected at the discharge point to ensure effective treatment

8.5.5 NOISE

No significant increase in noise level in the community is envisaged under normal operation. Moreover, implementation of the below-stated mitigation techniques will also keep the noise impacts at minimum to the workers as well as to the community.

8.5.6 MITIGATION MEASURES

Noise management and mitigation plan should follow the underlying strategy:

For people working in noisy installations, ear-protection aids like ear-plugs, ear-muffs, noise helmets, headphones etc. must be provided to reduce occupational exposure. This is possible if working methods are improved by:

- Proper designing and fabrication
- Proper lubrication and better maintenance of machines
- Covering noise-producing machine parts with sound-absorbing materials to check noise production
- Reducing the noise produced from a vibrating machine by vibration damping i.e. making a layer of damping material (rubber, neoprene, cork or plastic) beneath the machine
- Using silencers to control noise from automobiles, ducts, exhausts etc. and convey systems with ends opening into the atmosphere
- Using glass wool or mineral wool covered with a sheet of perforated metal for the purpose of mechanical protection

Noise can also be controlled with barriers by enclosing the source of the noise, by placing sound-reducing barriers between the worker and the source, or by increasing the distance between the worker and the source

- Tree plantation helps to block the propagation of sound. Proponent has planned tree plantation in and around the unit premises
- Sound-proof materials will also be used for construction
- During the project operation, it should be ensured that the noise level does not exceed prescribed limits as set by WHO or Pak-EPA; for which regular monitoring must be carried out.

8.5.7 WASTE MANAGEMENT

Improper disposal off the solid waste generated during the operational phase of the project can pose a health hazard; pollute soil, surface and ground water. Proper implementation of the mitigation measures will ensure that the residual impact from improper management and disposal of the waste is minimal. Monitoring and inspection will be undertaken to ensure compliance and minimize any residual impact.

Following mitigation measures will be adopted:

- Waste generation will be minimized by adopting waste management strategy of reduce, reuses and recycle
- A waste management plan will be prepared, implemented and monitored for the safe collection, storage and treatment/disposal of the building waste
- Quantities of waste disposed, recycled, or reused will be logged on a Waste Tracking Register
- Records of all waste generated will be maintained
- Training will be provided to personnel for identification, segregation, and management of waste
- Various waste containers for waste collection should be placed at appropriate locations in the building
- Waste management inspections will be undertaken on a regular basis of onsite waste management and of waste disposal contractors to ensure that the waste management procedures are being followed

Monitoring measures will include:

- Record of all waste generated
- Quantities of waste disposed, reused at site or sold should be logged on the waste tracking register
- Audit of waste management on annual basis
- The areas around the project boundary and access roads should be periodically inspected to verify that no project related waste is scattered in these areas

8.5.8 AIR EMISSIONS

The air emissions will release dust and particulate matter in the environment and some emissions are expected from the process activities. If these emissions are not handled may damage the health of workers, may be the cause of public nuisances and the wear& tear of the shelling machinery is fast.

8.5.9 MITIGATION MEASURES

Following mitigation measures will be adopted:

- PPEs such as; dust mask will be provided to the workers
- Installation of Dry Scrubber at incinerator.
- Pre-cleaning will be carried out to reduce the dust emission
- Water sprinkling will be carried out as and when required

8.5.10 EMERGENCY RESPONSE

Incidents and accidents may take place unexpectedly during project operations no matter how effective, strong and efficient the mitigation measures for all adverse impacts; especially the safety issues may be adopted. These may include; fire hazard which may poses a serious threat.

8.5.11 MITIGATION MEASURES

Following mitigation measures will be adopted:

- Fire extinguishers should be properly maintained and checked periodically
- Adequate fire hydrant system should be installed
- Flammable materials should be prohibited in the premises
- Fire alarm systems should be maintained for detection and warning of fire
- Adequate training of workers on use of fire-fighting system to deal with the situation.

- Administration of the unit will make a proper evacuation plans for emergency escape from all halls
- Emergency call service must be made available
- Fire-fighting team must remain ready at all times

8.5.12 OCCUPATIONAL HAZARDS

It includes occupational hazards like physical injuries arising from accidents such as being hit by falling weak structures, being overrun by heavy equipment. The major safety issues in operational phase are:

- Electrical Hazards
- Machine Guarding
- Eye, Head and Foot Protection
- Fire and Explosion Hazards
- House-Keeping Issues

8.5.13 MITIGATION MEASURES

Following mitigation measures will be suitable:

- Care will be taken to properly ground and insulate all equipment
- Proper machine guarding, which is critical for the prevention of injuries to workers by isolating them from moving machinery, will be provided
- Head, arms and foot PPE's will be provided
- Fire-fighting equipment will be available and their locations will be clearly marked
- Exits from work places will be well marked and visible in dim light
- Fire water will be located throughout the plant in well-marked piping
- Housekeeping will be frequent and thorough to prevent slips, trips, and falls
- Workers will be told and encouraged to use PPEs as may be standardized
- Workers' awareness and safety wall chart showing safety symbols will be displayed.
- First Aid Box will be kept in easy approach of all in case of any injury or mishap.
- Basic medical and health facilities will be provided to all employees
- Safety and warning devices such as reflectors, lights, etc. shall be installed at designated spots

- Visual monitoring of hazards and accidents will be done in order to control the potential hazard

8.6 POTENTIAL ENVIRONMENTAL ENHANCEMENT MEASURES

Tree plantation within and outside the premises is a potential environmental enhancement measure. A large area will be reserved for tree plantation and among plants native flora like Peepal, Kikar and Amaltas will be planted in the specified green zone which will have the maximum capacity to reduce noise pollution and tolerance index of these species are more than 10. Some floral species like roses and other ornamental evergreen plants will also be introduced in the lawn which will enhance aesthetic beauty. The proponent will also make arrangements for protection and maintenance of trees

8.7 BUILDING ENHANCEMENT

The introduction of an ecologically effective and efficient design of a commercial building is the environmental enhancement measures planned by the proponent to be incorporated into the design of the intended project.

8.7.1 SOCIAL ENHANCEMENT MEASURES

Following measures will be adopted to improve the socio-economic condition of the area:

8.7.2 EMPLOYMENT/POVERTY ALLEVIATION

The employment opportunities in the project area will be increased by the project in the area. Accounts and managers to run the administration office local community will be considered on the priority basis. In totality, the overall economic conditions of the area will be improved due to the operations project.

8.7.3 LOCAL ECONOMY

The employment opportunities and/or income sources generated by the project operation will be long term in nature. The local economy will experience a slight boom during operations.

9 ENVIRONMENTAL MANAGEMENT AND MONITORING PROGRAM

The potential environmental impacts are identified from the planning stage of the project through the Environmental Impact Assessment (EIA) process. The EIA has identified potential impacts that are likely to arise during the project. The EIA has examined in detail both negative and positive impacts at each stage of the project covering both construction and operations phase. To minimize the effects of adverse impacts the EIA has recommended mitigation measures. The proposed mitigation measures have been based on the understanding of the sensitivity and behavior of environmental receptors in the project area, the legislative controls that apply to the project and a review of good industrial practices while operating in similar environments.

For effective implementation and management of the mitigation measures an Environmental Management Plan (EMP) has been prepared. The EMP satisfies the requirement of the Punjab Environmental Protection Department Review of Initial Environmental Examination and Environmental Impact Assessment Regulations, 2022.

The EMP is a tool that serves as to manage environmental impacts and specifically focuses on implementation of mitigation measures in its true sense against likely environmental impacts.

9.1 PURPOSE AND OBJECTIVE OF THE EMP

The primary objectives of the EMP are to:

- Facilitate the implementation of the mitigation measures identified in the EIA.
- Define legislative requirements, guidelines and best practices that apply to the project.
- Define the responsibilities of the project proponent.
- Define a monitoring mechanism and identify monitoring parameters in order to:
    - Ensure the complete implementation of all mitigation measures.
    - Ensure the effectiveness of the mitigation measures.
- Define requirements for environmental monitoring and auditing.
- Provide a mechanism for taking timely action in the face of unanticipated environmental situations.
- Identify training requirements at various levels.

9.2 COMPONENTS OF THE EMP

The EMP consists of the following:

- Legislation and guidelines

- Organizational structure; roles and responsibilities
- Monitoring/Management plan
- Environmental monitoring
- Communication and documentation
- Change management Plan
- Training program/schedule

9.3 LEGISLATION AND GUIDELINES

The EIA has discussed national and international legislation and guidelines that are relevant to the project; proponent will ensure that the project is conducted in conformance to the project proponent corporate environmental policy, national legislation and relevant international conventions and that guidance is sought from national and international guidelines. Project proponent will also ensure that its key project management staff and all its assigned contractors are aware of these legislation and guidelines prior to the start of project activities

9.4 DESCRIPTION OF PROPOSED MITIGATION ACTIONS

It lists all the mitigation measures identified in the EIA and the associated environmental or social aspect in line during construction and operational phase with the administrative framework involving all the responsible implementing authorities who are required to take the planned actions/measures and monitor it accordingly. It enhances project benefits by reducing its impacts and making it environmentally friendly. The environmental management and monitoring plan is given below in table.

Table 10: Management and Monitoring Plan – Constructional

Sr. No.	Project Activity	Impacts	Mitigation Measures	Responsibility
1	Water Resources	▪ Depletion in groundwater aquifer ▪ Water contamination	▪ Water extraction will be kept at minimum and waste management plan will be developed. ▪ Wastewater from construction & installation site will be directed to settling tanks. ▪ Fuel and chemicals will be stored in covered and with bund walls, underlain with impervious lining. ▪ Spill prevention plan shall be followed to mitigate any kind of spill.	Proponent & Contractor
2	Air Quality	▪ Dust emissions during construction activities. ▪ Combustion products from vehicles used for project-related activities.	▪ Water will be sprinkled daily on all exposed surfaces to suppress emission of dust. ▪ All construction equipment used during the project will be properly tuned and maintained in good working condition. ▪ Regular maintenance of project vehicles to ensure that engines are in sound working condition and are not emitting smoke;	Proponent & Contractor
3	Noise	▪ Noise Pollution ▪ Disturbance to the site workers ▪ Nuisance for surrounding communities and wildlife	▪ Proper maintenance of vehicles and potentially noisy equipment. ▪ Minimize/avoid unnecessary use of noisy machinery. ▪ Blowing of horn will be prohibited. ▪ Provision of Personal Protective Equipment (PPE) to the on-site personnel in high noise areas.	Proponent & Contractor
4	Solid Waste	▪ Surface and groundwater pollution ▪ Soil contamination ▪ Air pollution, odor ▪ Health hazards ▪ Aesthetic issues	▪ Recyclable material will be separated at source and will be sold to waste contractor. Hazardous waste will be segregated and stored in closed containers in a fenced storage area with paved floor; ▪ On-site audits of the waste management will be undertaken on a regular basis during the period of project activity. ▪ Records of all waste generated during the project activity period will be maintained. Quantities of waste disposed, recycled, or reused will be logged on a waste tracking	Proponent & Contractor

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			register. ▪ Training will be provided to personnel for identification, segregation, and management of waste. ▪ No waste will be dumped at any location.	
5	Traffic Control	▪ Disturbance to local community	▪ Movement of vehicles (trucks) will remain confined to defined access and limited to a specific duration. ▪ Regular maintenance of vehicles to reduce exhaust emissions. ▪ Parking at NO PARKING areas shall not be allowed.	Proponent & Contractor
6	Worker's Health and Safety	▪ Health problems or immediate risk may take place. ▪ Occupational health of workers and community may be affected.	▪ Compliance to emergency response plan for emergencies and accidents will be ensured to avoid health safety risks. ▪ Work safety measures and good workmanship practices are to be followed by the contractor to ensure no health risks for laborers. ▪ Protection devices (earmuffs) will be provided to the workers operating in the vicinity of high noise generating machines. ▪ Proper maintenance of facilities for workers will be monitored. ▪ Provision of protective clothing for labors e.g. helmet, adequate footwear, protective goggles, gloves ▪ Ensure strict use of wearing PPE during work activities. ▪ Provision of proper safety signage at sensitive/accident prone spots.	Proponent & Contractor
7	Socio-Economic / Local community	▪ Community disturbance ▪ Community awareness ▪ Skilled and un-skilled jobs for local community	▪ All community grievances will be recorded and maintained in a Community Complaint's Register. ▪ Maximum number of unskilled and semi-skilled jobs will be reserved for the local communities. ▪ An increase in the income of locals may occur due to employment during project activities. ▪ Communities will be informed about the project activities and possible disturbance in advance.	Proponent & Contractor

Table 11: Management and Monitoring Plan – Operation

Sr. No.	Project Activity	Impacts	Mitigation Measures	Responsibility
1	Water Use / Wastewater	▪ Surface water contamination ▪ Pollution risk from accidental spillage	▪ Wastewater from the activities will be contained in settling tanks and will be reused. ▪ Compliance of effluent with PEQS will be ensured prior to discharge in water body. ▪ Water conservation practices will be followed to minimize the water usage. ▪ Water use will be monitored periodically to ensure that water is not wasted. ▪ In case of any accidental spillage, emergency plan should be implemented.	Proponent & Management of unit
2	Air Emissions	▪ Compliance with prescribed PEQS for ambient air	▪ Proper ventilation and exhaust system for air passages; ▪ Control of processing exhaust emissions by proper maintenance of production unit/equipment; ▪ Proper maintenance of machinery and scrubber is required to control emissions; ▪ Daily maintenance of transport vehicles is required to control air emissions.	Proponent & Management of unit
3	Noise	▪ Noise Pollution ▪ Disturbance to the personnel handling the installations	▪ The noise generating area at the operations will be lined with boundary wall to reduce impact on the workers. ▪ Operators of the developments will wear ear protections while operating or working nearby high noise emission sources. ▪ Tree plantation to reduce the effect of noise pollution.	Proponent & Management of unit

			▪ The project will be placed such that the cumulative noise levels at walkways and worker locations will not exceed PEQS for noise.	
4	Waste Management	If not managed properly; ▪ Surface and groundwater pollution ▪ Soil contamination ▪ Air pollution, odor ▪ Health hazards ▪ Aesthetic issues	Solid waste management plan will be implemented and following mitigation measures will be taken: ▪ Only municipal solid waste will be produced which will be segregated and disposed off using environment friendly techniques ▪ Area supervisor will mark the quantity/weight and nature of the material on the drums and logbook. ▪ Training will be provided to personnel for identification, segregation, and management of waste.	Proponent & Management of unit
5	Occupational Health and Safety	▪ Health problems or immediate risk may take place. ▪ Occupational health of workers and community may be affected.	▪ Providing basic medical training, safety training to work staff and basic medical service during operations. ▪ Firefighting equipment, safe storage of hazardous material, first aid, security, fencing, and contingency measures in case of accidents. ▪ Provision of adequate sanitation, washing, cooking and dormitory facilities including light up to satisfaction; ▪ Adequate signage, safety cones, lightning devices, barriers, yellow tape and persons with flags. ▪ Adequate signage, safety cones, lightning devices, barriers, yellow tape and persons with flags during operations.	Proponent & Management of unit

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9.5 SCHEDULE OF IMPLEMENTATION AND ENVIRONMENTAL BUDGET

9.5.1 SCHEDULE OF IMPLEMENTATION

The total cost of the project is **PKR 60 million approx**. Schedule is given below

9.5.2 ENVIRONMENTAL BUDGET

Environmental budget will be allocated for protection of environment. PKR 1.0 million will be allocated as environmental budget in both constructional and operational phase of project.

Table 12: Cost breakup of environmental budget

Constructional Phase		
Serial No.	Activity	Environmental Budget
1.	Air Quality Monitoring/Emission monitoring	Pkr/- 200,000
2.	Noise Monition	Pkr/- 50,000
3.	Waste Water Monitoring	Pkr/- 200,000
4.	Fire Safety	Pkr/- 200,000
5.	PPE's	Pkr/- 50,000
6.	Potential Environment Enhancement Measures	Pkr/- 200,000
Total		**Pkr/- 100,000,0**
Operational Phase		
Serial No.	Activity	Environmental Budget
1.	Air Quality Monitoring/Emission monitoring	Pkr/- 200,000
2.	Noise Monition	Pkr/- 50,000
3.	Waste Water Monitoring	Pkr/- 200,000
4.	Fire Safety	Pkr/- 200,000
5.	PPE's	Pkr/- 50,000
6.	Potential Environment Enhancement Measures	Pkr/- 200,000
Total		**Pkr/- 100,000,0**

9.6 ENVIRONMENTAL MANAGEMENT TEAM ALONG WITH THEIR ROLES AND RESPONSIBILITIES

Proponent shall hire environmental management team in operational phase of project. The roles and responsibilities of environmental management team are given below in table.

Table 13: Roles & responsibilities of environmental management team

Roles and Responsibilities		
Sr#	Concerned Persons	Duties
1	The Project Manager (Proponent)	Following will be the responsibilities of the Project Proponent: ▪ Ensure that the contractor is aware of all specifications, legal constraints, standards and procedures pertaining to the project specifically with regards to environment. ▪ Ensure that all stipulations within the EMMP are communicated and adhered to by contractor(s)

		▪ Monitor the implementation of the EMMP throughout the project by means of site inspections and meetings. This will be documented as part of the minutes of the site meeting documents ▪ Ensuring project execution within defined budget and timelines ▪ Conducting regular check of the project status and meetings with project team ▪ Provide support and guidance to project team as and when needed ▪ Project proponent is expected to continually monitor and improve the overall performance of their operation
4	HSE Manager	In addition to the health and safety responsibilities held by staff, managers and supervisors must do whatever is reasonably practical to ensure that both the workplace and the work itself are safe. This includes: ▪ Ensuring that staff are appropriately trained and supervised ▪ Identifying, assessing and managing health and safety risks ▪ Consulting with workers (including staff, affiliates and contractors ▪ Health and safety risk assessments ▪ Decisions are made about the measures to be taken to eliminate or control these risks ▪ Health and safety risk assessments ▪ Implementing health and safety risk management programs relevant to their operations, teaching, research and consulting functions and work environment ▪ Reporting investigating and responding to all hazards, accidents, incidents and taking action to control the risk ▪ Assisting with the development, implementation and maintenance of a return to work program for injured staff. ▪ Be fully conversant with the EIA and conditions of its approval ▪ Be fully conversant with the EMMP ▪ Be fully conversant with all relevant environmental legislation, policies and procedures, and ensure compliance ▪ Convey the contents of this document to the contractor site staff and discuss the contents in detail with the Project Manager and Contractor ▪ Undertake regular and comprehensive inspection of the site and surrounding areas in order to monitor compliance with the EMMP ▪ Take appropriate action if the specifications contained in the EMMP are not followed ▪ Monitor and verify that environmental impacts are kept to a minimum, as far as possible ▪ Review and approve construction methods, with input from the Site Manager, where necessary

		▪ Ensure that activities on site comply with all relevant environmental legislation ▪ Compile progress reports on regular basis, with input from the Site Manager, for submission to the Project Manager, including a final post excavation audit ▪ Liaise with the Site Manager regarding the monitoring of the site ▪ Report any non-compliance or remedial measures that need to be applied ▪ All environmental problems arising on the construction area will be reported to the Site Manager by the Environmental Manager. Reports on such problems will be submitted to the Project Manager by the Site Manager

9.7 PROPOSED MONITORING PROGRAM TO ASSESS PERFORMANCE OR OUTPUT OF EMP

For effective monitoring, management and documentation of the environmental performance during the construction and operational phase of the project, environmental matters will be discussed during meetings held on-site. Environmental concerns raised during the meetings will be mitigated after discussions between project proponent and the contractors. Any issues that require attention of project proponent higher management will communicate to them for action. Project proponent and its contractors will ensure that the communication and documentation requirements specified in the EMP arefulfilled during the project.

Environmental monitoring can be categorized into two types; 1) compliance monitoring and 2) effects monitoring. The environmental monitoring program is summarized in **Table 17** which identify the roles and responsibilities of project monitoring, further described in detail in following section

9.8 COMPLIANCE MONITORING

Compliance monitoring will be carried out to ensure compliance with the requirements of the EIA. The objectives of the EIA compliance monitoring will be to:

- Systematically observe the activities undertaken by the contractors or any other person associated with the project.
- Verify that the activities are undertaken in compliance with the EIA and other conditions identified by project proponent.
- Document and communicate the observations to the concerned person(s) of project proponent so that any corrective measures, if required, can be taken timely.
- Maintain a record of all incidents of environmental significance and related actions and corrective measures.

Compliance monitoring will be the responsibility of all teams involved in the project activities i.e. project proponent and the contractors. Project proponent staff and contractors will carry out the inspections on a set frequency.

9.9 EFFECTS MONITORING

To monitor actual impacts of the project on selected sensitive receptors so that impacts not anticipated in the EIA or impacts which exceed the levels anticipated in the EIA can be identified and appropriate mitigation measures can be adopted in time. This objective will be achieved through effects monitoring.

Considering the environmental conditions of the project area and the assessment of potential impacts of the project made in the EIA, the following environmental parameters will be monitored at identified locations.

Table 14: Environmental monitoring plan

Component	Parameters	Monitoring Frequency Operation	Responsibility Operation
Ambient Air Quality	SOx , NOx, CO, PM10, Smoke	As per EPA, Punjab Guidelines	Proponent
Ground Water Quality	pH, TDS, Chloride, Fluoride, Colour, $NO3^-$, Selenium, Residual chlorine, Lead, Total hardness, Turbidity, Zinc, Manganese, Aluminium, Chromium, Cadmium, Boron, Barium, Antimony, Aresenic, Cyanide, Mercury, Nickel, Total Coliform, E.Coli, Total count.	As per EPA, Punjab Guidelines	Proponent
Surface & Waste Water Quality	pH, DO, TSS, Alkalinity, BOD5, COD, Turbidity.	As per EPA, Punjab Guidelines	Proponent
Noise Level	Using noise level meter (minimum dB and maximum dB)	As per EPA, Punjab Guidelines	Proponent
Occupational Health & Safety	Proper provision of PPEs to workers	Daily	Proponent

9.10 PROPOSED EMP REPORTING AND REVIEWING PROCEDURES

The implementation of the EMP will be the prime responsibility of the project proponents who designate responsibilities and obligations to their selected contractors and staff. Monitoring, documentation and reporting the compliance components of the EMP will be the responsibility of proponent.

- Monitoring reports will be reviewed by EMP team and HSE department
- Photographic records will also be maintained
- Recorded data will be reviewed by supervisory contractor/proponent so that it can be further improved if required.

Specific responsibilities of key role players are illustrated hereunder:

A. Proponent

The proponent will be responsible for ensuring overall implementation of the EMP during operational stages of the project. The responsibilities of the proponent and the site team supervising the project activities include.

Project Manager (Proponent)

- Make sure that all activities are completed according to specifications.
- Certify that work being done by the contractor/s is in accordance to the EMP.
- Make sure that the specific system for environmental management is planned, documented, implemented and maintained through all stages of the project.
- Coordinate with regulatory agencies like TMA and EPA, etc.
- Communicate with local community in order to get time to time feedback of these stakeholders on various social and environmental concerns.
- Make sure liaison between the contractor/s and environmental consultant men to check environmental compliance with EPA requirements.

I. Supervisor

- Attend site induction and other training sessions.
- Make sure that procedures are followed.
- Advise site supervisor of any potential or actual breaches of plans.

II. Work Crew

- Attend site induction and other training sessions.

- Make sure that procedures are followed.
- Advise site supervisor of any potential or actual breaches of plans.

B. Consultant

The principal responsibilities of the Consultant include:

- Coordination with provincial and local officials, community groups, government departments etc. on environmental issues and obtaining the necessary clearances from the regulatory authorities.
- Monitoring of the environmental aspects of project during construction to ensure that the environmental requirements of the contract and the mitigation measures proposed in the EMP are implemented.
- Supervising Contractor preparing environmental input to the progress report
- Developing and conducting environmental training activities for Contractor and the Supervision Consultant staff
- Devise solutions to environmental issues as they arise particularly related to dust, noise levels and other impacts that are in some instances unavoidable. Good construction supervision requires that every effort be made to minimize these impacts.

C. EPA

- The role of EPA is on the apex and includes checking:
- Whether requirements of the conditional NOC awarded by the EPA against EIA report are met.
- The Implementation of mitigation recommendations as given in EIA.
- Approval for starting actual project operations is obtained from EIA.
- Review of audit/monitoring reports prepared internally or by a third-party monitoring
- Suggest or order any appropriate solutions if something goes against the given EMP.

9.11 TRAINING NEED

Environmental training will help to ensure that the requirements of the EIA and EMP are clearly understood and followed by all project personnel throughout the project period. Environmental training will form part of the environmental management system. The training will be directed towards all personnel for general environmental awareness

9.12 OBJECTIVES OF THE TRAINING PROGRAM

The key objective of training program is to ensure that the requirements of the EMP are clearly understood and followed throughout the project. The trainings to the staff will help in communicating environmental related controls specified in the EIA and EMP.

9.13 OBJECTIVES OF THE TRAINING PROGRAM

The key objective of training program is to ensure that the requirements of the EMP are clearly understood and followed throughout the project. The trainings to the staff will help in communicating environmental related controls specified in the EIA and EMP.

9.14 TRAINING SCHEDULE

The training modules will include air, noise and water pollution monitoring, social awareness, Environmental Laws, Environmental Quality Standards usage of personal protection equipment, and health and safety related issues on the construction site.

Training should consist of basic hazard awareness, site specific hazards, safe work practices, and emergency procedures for fire, evacuation. A generic scope of the training which covers the requirements of the EIA and the EMP is discussed below in **Table 15** while site contractor will prepare site specific training plan considering these training contents.

Table 15: Training needs

Target Audience	Contents	Schedule
Selected management staff	▪ Introduction to project EIA and EMP. Key findings of EIA ▪ Mitigation measures ▪ EMP ▪ Social and cultural values of the area.	During the project life
All site personnel (including locally hired staff)	▪ Environmental sensitivity of the project area ▪ Waste disposal ▪ Community issues/ Social and cultural ▪ values	During the project life
Drivers	▪ Safety provision ▪ Road access restrictions ▪ Dust reduction ▪ Waste disposal ▪ Emergency response preparedness	During the project life

Selected staff o	Safety provision Hazardous waste disposal Emergency response preparedness	During the project life

10 STAKEHOLDER'S CONSULTATION

Public consultation refers to the process by which the concerns of local affected persons and others who have plausible stake in impacts assessment of the project or activity are ascertained with a view to taking into account all the material concerns in the project or activity design as appropriate. According to the IEE and EIA Review Regulations, 2022 public consultation is mandatory for any socio-environmental study. For this purpose, assessment survey and public consultation sessions held with different stakeholder groups that may be impacted. The consultation process was carried out in accordance with the guidelines laid by EPA, Punjab. The objectives of this process were to:

- Share information with stakeholders on the project operations.
- To access the impacts on the physical, biological, and socio-economic environment.
- Understand stakeholder concerns regarding various aspects of the project.
- Understand the perceptions, assessment of social impacts and concerns of the communities of the project area.
- Find out the awareness level and situation of acceptability to identify any issues for the implementation of proposed project.
- To invite people to express their views about the positive/negative impacts on their life styles and environment.

This report includes all the comments, which were taken into account in preparing the definitive development concept for the subject facility.

10.1.1 CONSULTATION MECHANISM

Primary stakeholders were consulted during informal and formal meetings. The consultation process was carried out in the Urdu language. During these meetings a simple, non-technical, description of the project was given, with an overview of the project's likely human and environmental impact. This was followed by an open discussion allowing participants to voice their concerns and opinions. In addition to providing communities with information on the proposed project, their feedback was documented during the primary stakeholder consultation. The

issues and suggestions raised were recorded in field notes for analysis, and interpretation.

By reaching out to a wider segment of the population and using various communication tools such as participatory needs assessment, community consultation meetings, focus group discussions, in-depth interviews, and participatory rural appraisal EIA involved the community in active decision-making. This process will continue even after this EIA has been submitted, as well as during future EIA in which similar tools will be used to create consensus among stakeholders on specific environmental and social issues.

Secondary stakeholder consultations were more formal as they involved government representatives and local organizations, consulted during face-to-face meetings. They were briefed on the EIA process, the project design, and the potential negative and positive impact of the project on the area's environment and communities. It was important not to raise community expectations unnecessarily or unrealistically during the stakeholder consultation meetings in order to avoid undue conflict with community's leaders or local administrators. The issues recorded in the consultation process were examined, validated, and addressed in the EIA report. This section involves communication of possible impacts and concerns with

- Proponents Environmental Management Team
- The responsible authority
- Other departments and agencies
- Environmental Practitioners and experts
- Affected and wider community

10.2 PROPONENT'S ENVIRONMENTAL MANAGEMENT TEAM

Consultation regarding Extension of Green Planet Waste Managment(Incineration Unit) was done with stakeholders and anticipated impacts were discussed. Concerns of locals, Environmental Practitioners & experts and Government departments were discussed and asked to consider them while construction of proposed project. Locals will be preferred for employment after providing proper training. Mitigations measures mentioned in EMP will be truly implemented.

10.3 THE RESPONSIBLE AUTHORITY

Overall responsibility for implementation of EMP will be that of project proponent. He will appoint an HSE/Project Manager of relevant qualification. HSE/Project Manager will act as Environmental Manager and will manage the all HSE condition at the PEQS.

10.4 THE OTHER DEPARTMENTS AND AGENCIES

Different Government departments were consulted regarding the subject project. Government officer was consulted by the socio-environmental team of the consultants and concerned details about the project were noted down through personal interviews, group meetings, etc., in their offices.

10.5 ENVIRONMENTAL PRACTITIONERS AND EXERTS

Consultation with Environmental Practitioners and experts was done and following comments and suggestions were observed.

Table 16: Consultation with environmental practitioners and experts

Name	Qualification	Comments/suggestions
Ms. Rabiya Mahmood	Ph.D. (scholar) Environmental Sciences	Following comments are summarized: ▪ Latest technology must be preferred ▪ Regular monitoring should be conducted
Ms. Nusrat Ehsan	Ph.D. (scholar) Environmental Sciences	▪ She said that current project must be installed as : ▪ It will incinerate infectious waste from hospitals and industrial activities. ▪ good household practices must be practiced
Mr. Danial Zaib	BS Environmental Sciences	He said that: ▪ Locals should be preferred for employment. ▪ In case of outsider's residence must be provided ▪ Proper mitigation measures must be adopted while construction and operation of this project

10.6 AFFECTED AND WIDER COMMUNITY

Social survey was conducted to consult with local community. Their concerns were noticed and discussed with proponent and their team. Majority was in favor of project their details are attached along with the EIA as an Annexure (Appendices: 12.3).

11 CONCLUSION AND RECOMMENDATION

11.1 CONCLUSION AND RECOMMENDATIONS

Extension of Green Planet Waste Management (Incineration Unit) respects the environment, supports sustainable development and is committed to environmentally sound business practices. This study was carried out to assess the environmental and socioeconomic impacts of the project. The assessment was carried out in keeping with the legislation of Pakistan, as well as national and international guidelines.

Baseline environmental and socioeconomic information was collected from a variety of sources, including reports of previous studies, published literature, and field surveys. The information collected was used to compose profiles of the natural, socioeconomic, and cultural environment likely to be affected by the project.

The project activities were reviewed, and an assessment was made of the potential impacts of these activities on the area's natural and socioeconomic environments, using both qualitative and quantitative assessment methods. Where appropriate, mitigation measures were recommended to keep the environmental impacts within acceptable limits.

It was analyzed that most of the aspects related with the project have very minor impacts. It is therefore concluded that if the implementation of all mitigation measures is carried out as described in this report, the anticipated impact of the project on the area's natural and socioeconomic environment will be well within acceptable limits.

Proponent of subject project has expressed strong commitment to protection of the social and natural environment from any potential adverse impact of the project. A preventive maintenance philosophy supported by robust inspection plans and sound operational practices will be adopted to ensure sustainable and sound functioning of the project. Therefore, it is recommended that the competent authority may please be issues Environmental Approval for the operation of this project.

12 APPENDICES

12.1 GLOSSARY

Air Quality	Measurement of the pollutants in the air; a description of healthiness and safety of the atmosphere.
Consultation	Consultation refers to two-way transfer of information or joint discussion between project staff and the affected population. Systematic consultation implies a sustained and rigorous sharing of ideas. Bank experience shows that consultation often yields the best resettlement alternatives, fruitful procedures for continued participation, and independent information on actual conditions for implementation.
Closure	The action of making new or secret information known.
Env. Management	Attempt to control human impact on and interaction with the environment in order to preserve natural resources
Effluent	Wastewater - treated or untreated - that flows out of a treatment plant, sewer, or industrial outfall. Generally, refers to wastes discharged into surface waters.
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.
Household	People residing under one roof, using the same hearth and operating as a single economic unit.
Impact	Effect on someone or something
Jurisdiction	The extent of the power to make legal decisions and judgments.
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 Supervising activities in progress to ensure they are on-course and on schedule in meeting the objectives and performance targets.
Occupational Health	**Maintenance** of the highest degree of physical, mental and social wellbeing of workers in all occupations by preventing departures from health, controlling risks and the adaptation of work to people, and people to their jobs.
pH	pH is a measure of how acidic/basic water is.
Project Area	The area specified by the funding and/or implementing agency according to the Official Gazette Notification and includes the areas within the administrative limits of the Federal or a Provincial Government.
Proponent	A person who advocates a theory, proposal, or course of action.
Capacity	The volume of products or services that can be produced by an enterprise using current resources.
Quality Control	A system of maintaining standards in manufactured products by testing a sample of the output against the specification.
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.
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.

12.2 LIST OF ABBREVIATIONS

EIA	Environmental Impact Assessment
EMMP	Environment Mitigation and Monitoring Plan
EMP	Environmental Management Plan
EPA	Environmental Protection Agencies
PEPC	Pakistan Environmental Protection Council
IEE	Initial Environmental Examination
NGO's	Non–Government Organizations
NOC	No Objection Certificate
O&M	Operation and Maintenance
PEPA	Pakistan Environmental Protection Act 1997
PEQS	Punjab Environmental Quality Standards
CBD	Convention on Biological Diversity
DO	District Officer
PKR	Pak Rupees
hr	Hour
mg/l	Milligram per Litre
PPE	Personal Protective Equipment
QC	Quality Control
SEO	Site Environment Officer
BOD	Biochemical Oxygen Demand
COD	Chemical Oxygen Demand
SPM	Suspended Particulate Matter
NOX	Oxides of Nitrogen
SOX	Oxides of Sulphur
PM	Particulate Matter

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12.3 LIST OF INDIVIDUALS AND ORGANIZATIONS CONSULTED ALONG WITH THEIR WRITTEN FEEDBACK

Sr No.	Interviewer's Name	Contact
1.	Fahim Khan	0345-4166073
2.	Mudddasar Ahmd	0323-7141371
3.	Mudassar Pervaiz	0302-9383501
4.	Muhammad Zahid	0304-8141488
5.	Muhammad Aslam	0345-6032550
6.	Ghulam Niazi	0300-4577547
7.	Muhammad Danish	0308-4522737
8.	Sajjad AHmad	0300-4966961
9.	Adeel Ahmad	0306-4054157
10.	Abid Azeem	0333-4598420
11.	Azeem Sarwar	0304-0113595
12.	Mudassar Ali	0301-6065885
13.	Muhammd Jamil	0307-8750545
14.	Waseem Masroor	0311-7990673
15.	Sohail Ahmad	0307-4273364
16.	Muhammad Aslam	0300-8972941
17.	Hussain Ali	0304-8141488
18.	Muhammad Siddique	0300-4577547
19.	Amjad Ali	0304-6368671
20.	Sabir Mahmood	0300-7987863
21.	Shakeel Subhani	0343-2920843
22.	Kareem Niazi	0306-7869122
23.	Subhan Ali	0301-9356728
24.	Shahbaz Ahmad	0333-2029043
25.	Muhammad Shahid	0313-8398423

The survey in the study area following concerns of the local community were noted:

- Wastewater should be properly treated prior to final disposal in nearby drain.
- Solid waste should be managed effectively by adopting the standard practices of the area.
- Cleanliness of the area should be ensured.
- An effective EMMP should be designed and enforced with true spirit.
- Health of the workers should be ensured.
- Plantation should be carried out at extensive scale.
- Noisy activities should be confined.
- Workers should be hired from local community.
- PPE's must be provided to workers
- Indigenous trees around the facility should be planted to control air pollution.
- Removal of shrubs and bushes should be avoided to the extent possible.

12.4 SOURCES OF DATA AND FULL LIST OF ALL REFERENCE MATERIAL USED

1. Field surveys,
2. Government site
3. Stakeholder consultation
4. Proponent
5. Published articles
6. Culaba, A. 2020. A methodology for the life cycle and sustainability analysis of manufacturing processes. Ph.D. dissertation, University of Portsmouth, England.
7. Culaba, A. B. and M. R. I. Purvis. 2019. A methodology for the life cycle and sustainability analysis of manufacturing processes. Journal of Cleaner Production 7(6): 435–445.
8. ISO (International Organization for Standardization). 1997. ISO 14040: Environmental management—
9. Life cycle assessment—Principles and framework. Geneva: ISO.
10. Jensen, A., L. Hoffman, T. Moller, A. Schmidt, K. Christiansen, and J. Elkington. 2017. *Life cycle assessment: A guide to approaches, experiences and information sources.* Copenhagen: European Environment Agency.

12.5 TERMS OF REFERENCES

The consultants is required to carry out an environmental impact assessment study of the project under Section-12 of Pakistan Environmental Protection Act 1997/ Punjab Environmental Protection (Amendment) Act 2012.

The Study should be comprehensive and should cover all aspects which are envisaged under the relevant national and provincial laws & regulations including but not limited to:

- Identification and recommendation for suitable solution/treatment/mitigation measures for emissions and effluents such as wastewater 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.

12.6 LIST OF NAME, QUALIFICATION AND ROLES OF TEAM MEMBERS CARRYING OUT IN IEE/EIA STUDY

Name	Qualification	Position
Aqsa Nazir	M.Sc (environmental science) University of Punjab Lahore.	Environmentalist
Muhammad Irfan	L.L.B, Diploma in environmental law. University of Punjab Lahore.	Environmental
Iqra Khalid	University Of Engineering and Technology.	Environmental Engineer
Maryum Majid	University of Punjab Lahore.	Environmentalist