F-59(EIA)-23

Mining of Coal Over an Area of 611.46 Acres

Near Maghal, District Chakwal

ENVIRONMENTAL IMPACT ASSESSMENT

(EIA) REPORT

MARCH 2023

ENVIRONMENTAL PROFESSIONAL & ASSOCIATES

Head office: Suit 27-Shumali Market, Commercial Area, Phase-I, Hayatabad Peshawar
Lahore Office: 231-G, Johar Town, Lahore
E-mail: eprofessional07@gmail.com

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BRIEF OF PROJECT

Name of Project	Mining of Coal
Address of Project	Near Maghal, District Chakwal
Name of Proponent	M/S Malik Hameed Raza
The total area of the project	611.46 Acres
Location of Project	

Points	East	North
A.	3497000	1041500
B.	3499000	1041350
C.	3499000	1040300
D.	3498290	1040300
E.	3498290	1039750
F.	3497000	1039750
Total area 611.46 acres		

Present status of land use	Topographically, the area is comprised of plain terrain making a wide net. All the rock units are widely extended in the North-South direction. Minerals, such as Coal, Gypsum, Limestone, and many others are being mined as well as near the exploration area.
Lease Period	Five Years
Project Cost	26.5 million PKR
Type of Waste	Solid Waste, generated from eating items on the project camp site.
Energy Requirement	Not required during operation time on the project site.
Description of the proposed project	Mr. Malik Hameed Raza holds a mining lease License no ML-CKL-I-COAL(215)/1818, of coal near Maghal in District Chakwal, Punjab, Pakistan. The coal lease area is over 611.46 acres and was granted by Mines and Minerals Department, Government of the Punjab.

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EXECUTIVE SUMMARY

Coal provided the main source of primary energy for industry and transportation in industrial areas from the 18th century to the 1950s. Coal remains an important energy source. Coal is also mined today on a large scale by open pit methods wherever the coal strata strike the surface or are relatively shallow. Coal is the most abundant source of electricity worldwide, currently providing more than 36% of global electricity. Pakistan is a coal-rich country, but, unfortunately, coal has not been developed for power generation for more than three decades due to a lack of infrastructure, insufficient financing, and the absence of modern coal mining technical expertise. Pakistan holds 3,377 million tons (MMst) of proven coal reserves as of 2016, ranking 20th in the world and accounting for about 0% of the world's total coal reserves of 1,139,471 million tons (MMst).

Pakistan has proven reserves equivalent to 331.1 times its annual consumption. This means it has about 331 years of coal left (at current consumption levels and excluding unproven reserves). Pakistan consumes 10,199,674 Tons of Coal per year as of the year 2016. Pakistan ranks 38th in the world for Coal consumption, accounting for about 0.9% of the world's total consumption of 1,139,471,430 tons. Pakistan consumes 50,089 cubic feet of Coal per capita every year (based on the 2016 population of 203,631,353 people), or 137 cubic feet per capita per day. Whereas, Pakistan produces 4,506,243.28 tons of Coal per year (as of 2016) ranking 34th in the world. The Government has now determined to facilitate private investors to promote investment in coal development and coal power generation. Coal also serves many industrial uses. Among the most significant are steel production, which uses metallurgical/coking coal, and cement manufacture. Coal and coal by-products are also used to manufacture a variety of goods, including activated carbon used in filters for water and air purification systems; carbon fiber in the construction of airplanes and automobiles; silicon metal for lubricants and even chemical processes to extract rare earth elements, just to name a few examples. Thus to meet the present demand for Coal M/S Malik Hameed Raza intends to conduct the mining of coal over an area of 611.46 acres of land situated near Maghal District Chakwal

Title and Location of Proposal

Project Title: Coal mining over an area of 611.46 acres by M/S Malik Hameed Raza

Location: Near Maghal, District Chakwal

Name of the Proponent

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Malik Hameed Raza

Name of the Organization Preparing Report

Environmental Professional Associates

Head Office: Suit 27-S Shumali Market Commercial Area Phase -1, Hyatabad Peshawar

Lahore Office 231-G Johar Town Lahore

Email: eprofessional07@gmail.com

Purpose & Scope of the EIA Study

The project envisages the mining of coal as one of the raw materials for power and industrial fuel works. Following the Pakistan, Environmental Protection Agency Review of Initial Environmental Examination and Environmental Impact Assessment Regulations, 2022, the project for coal mining falls in **Schedule-II,** Part-C "Mining, and processing of coal, gold, copper, sulphur and precious stones". Thus, an Environmental Impact Assessment of the project will be conducted.

This EIA shall also satisfy the regulatory requirements of the Mining and Mineral Department, Government of Punjab. This report has been prepared according to the category defined in Schedule –II of "Punjab Environmental Protection Agency (review of IEE and EIA) Regulation 2022". the elements of this EIA report address the followings:

i. Executive or non-technical summary (title and location of the project, name of the proponent, name of the organization preparing the environment report, brief outline of the report, major impacts, recommendations for mitigation and compensation, and proposed monitoring).

ii. Description of the objectives of the proposal.

iii. Description of the proposal and its alternatives (status of the proposal in the project cycle, description of planning, design and implementation stages, requirements for raw materials, water, energy, and equipment).

iv. Discussion of the proposal and current land use and policies (current land use controls in the context of the Government policies).

Brief Description Of Project

Table- A Description of the Project

Project Name	Coal mining over an area of 611.46 Acres
Project Location	Near Maghal, District Chakwal

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Lease Period	Five Years
Lease Area	611.46 Acres
License # ML-CKL-I-COAL(215)/1818	

The project area lies over 611.46 acres and involves mining coal by underground methodology. The project is located near Maghal in District Chakwal, of Punjab. The huge coal resources of Pakistan can play a significant role in meeting its energy demand for a long time. In this connection, it will be necessary to make all-out concerted efforts towards:

- Expanding the coal resources base through intensive exploratory efforts in all known fields as well as in new prospective areas;
- Introducing semi-mechanization in coal mining to keep up production as well as its cost at competitive levels; Environmental Professional And Associates conduct Environmental Impact Assessment for Mr. Malik Hameed Raza's Mining Lease for Coal Over an Area of 611.46 acres of land situated near Maghal, District Chakwal ML-CKL-I-COAL(215)/1818.
- Developing indigenous R&D capabilities for adopting various advanced coal technologies to suit local conditions. Coal briquette needs special attention to cope with the energy requirements of villages and remote areas. In these areas, due to fuel shortage, deforestation has reached an alarming stage.

The mining industry is capital-intensive and has the longest gestation period where success stories are about 40-50%. The minimum time required to reach the coal seam in Punjab is 18-24 months for developing a mine to raise an average production of 25 tons/day with an investment portfolio of 15-20 million Rupees. The investment portfolio and minerality enhancement are appended in the following pDharialagraphs. Again success is the function of all the favorable factors mentioned above. The mineral managers either intentionally ignore or are not well-versed in the intricacy of the mining system. The decision-making in a production mine goes side by side with the development as well because the coal seam once in position may fade away or change in thickness or quality. This phenomenon adversely affects the inability and marketability.

Major Impacts During Development Phase

The impacts in relation to development of mine includes the impacts resulting from;

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construction of pavements, establishment of workers camps at safe sites and distances,land clearing and leveling, drilling, and surveying etc. The impacts resulting from these activities mainly include:.

Dust Generation

Dust may be generated during the extraction of coal from the coal face either manually or through continuous mining. It may also be generated during the haulage of coal to the surface.

Higher Noise Levels

Higher noise levels and vibrations due to the operation and movement of carts or continuous miners underground and drilling are being carried out in case of hard rocks.

Solid Waste and Wastewater

No solid waste and wastewater will be generated underground due to the mining method. The solid waste generated at the mine site underground is partially dumped underground in the extracted coal chambers which may act as packing material and support system for wall stability. The shales associated with coal are generally dumped outside close to the mine mouth. These shales have impregnation of alum. This impregnation mixed with water is a supporting mixture for vegetation growth. Hence, this impact is negligible.

Loss of Vegetation

As the coal mining method is underground. Therefore, there will be no loss of vegetation due to this neither at the surface nor underground. This impact is negligible in this case scenario.

Solid Waste and Wastewater Generation

Solid waste and wastewater may be generated from camps and offices. It will be disposed of as per the standards of TMA.

Community Amenity

Disturbance to the nearby community may be occurred due to dust and noise generation. Noise is associated with project operations. Excessive dust impacts may be harmful to some people, for example, with some experiencing respiratory conditions. The paving of the road in the mountainous region is done through a backhoe machine and not through drilling and blasting. The labor huts are placed in a contagious block close to the mines keeping in view the safety, and vigilance of the workers encamped. The mining leases/ license are granted by Mines and Minerals Department while access to the lease to the surface is left to the lessee and surface land owner for settlement. These local people, blackmail the lessees to the last extent and are the biggest stumbling block

Preventive Measures

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- Controlled water sprinkling will be ensured to reduce PM10.
- Maintain appropriate buffers between the site and receptors.
- Use of PPEs (face masks etc.) will be ensured by the mine operators and staff
- Use of PPEs (noise suppression equipment-ear mufflers etc.) will be ensured by the workers where noise levels are higher than 85 (dBA).
- Development activities will be ensured during the daytime when background noise levels are high.
- The vehicle speed limit will be maintained to avoid excessive vibrations.
- Regular maintenance of machinery will be ensured.
- Cutting down vegetation and trees will be avoided as far as possible.
- Afforestation will be carried out as maximum as possible.
- Solid waste will be managed efficiently. Solid waste at the site will be stored in containers covered with lids.
- Wastewater will be disposed of as per the standards of TMA.

Major Impacts During Operational Phase

The potential effects of the proposed development during operation can be divided as follows:

- Impacts associated with noise, from the trucks engaged in the mining, loading, and transportation of the coal
- Removal of the overburden (the material that overlies the coal).
- The workers in the mine have a high risk of occupational diseases.
- Coal mining affects communities at multiple levels. During mine's opening – Displacement, Loss of livelihood During mine's operation - Pollution impact (air, water, noise, vibration), Health Impact
- Impacts of transport, traffic flow

Mitigation Measures

- The contractor will control the dangers of oil spills during operation by maintaining the machinery in specific areas designed for this purpose hence will not be a serious impact as a result of the operational phase activities.
- Limit pickup trucks and other small equipment, observe a common sense approach to vehicle use and encourage workers to shut off vehicle engines whenever possible.
- Scraped topsoil should be used immediately for plantation/agriculture, If it is not possible to use the topsoil immediately, then it should be stacked at a designated area, Storage must be done in a pyramidal form, with garland drains all around.

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- Water quality monitoring should be carried out at the site. Parameters to be monitored at all locations should include the same as prescribed by the PEQS.
- Watering all active development areas when necessary.
- Safe transportation of development equipment from the site.

Proposed Monitoring

The monitoring program is designed to ensure that the requirements of the environmental approval awarded by the EPA are met. A monitoring Program (MP) provides important information that allows for more effective planning and an adaptive response based on the assessment of the effectiveness of mitigation measures. The monitoring of various parameters will help to determine the extent to which project operation activities will cause an environmental disturbance.

Table B Environmental Monitoring Plan

Sr. No.	Monitoring Parameters	Monitoring mechanism	Frequency	Responsibility
1.	**Water quality**	Discrete grab sampling and laboratory testing of ground and surface water samples.	As described by smart	Lease Holder
2.	**Dust emissions**	Ambient particulate matter monitoring system.	Will be carried out on quarterly basis.	Lease Holder
3.	**Noise levels**	Noise meter (at Project site)	On quarterly basis by a third party	Lease Holder
4.	**Emissions**	Emissions monitoring system. Monitoring of ambient air quality at project site	Will be carried out on quarterly basis.	Lease Holder
5.	**Security**	Security arrangements will be made	Daily	Lease Holder
6	**HSE**	Provision of health safety PPEs	Daily	Lease Holder

Conclusion

It is concluded that the project will run in an environmentally sustainable order and full compliance with the Punjab Environmental Protection Act (PEPA) 1997 (amended 2012), rules, regulations, and the Punjab Environment Quality Standards (PEQS). The project, therefore, provides the necessary safeguards for the protection of all the

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elements/segments of the environment including in particular human and environmental health.

No sensitive habitat with any particular ecological value was identified in the project area. There are no forests or fish farming activities in the vicinity of the project area.

In conclusion, the EIA of the project shows that by adopting environmental management and mitigation measures, the project will not have any adverse impact on the environment and the surrounding community.

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1 INTRODUCTION

This chapter of the Environmental Impact Assessment (EIA) Study Report for Coal Mining presents the information relevant to the EIA carried out by Environmental Professional Associates . Details of the project title and project proponent and EIA consultants are discussed below.

1.1 Purpose Of Report

This report has been prepared to conform to the requirements of the Punjab Environmental Protection (Amendment) Act 2012 (PEPA), which states that: "*No proponent of a project shall commence construction or operation unless he has filed with the provincial agency an initial environmental examination or where the project is likely to cause an adverse environmental effect, an environmental impact assessment, and has obtained from the provincial agency approval in respect thereof.*"

It is of utter importance to examine the environmental impacts, both beneficial and adverse, of the proposed project, and to recommend and propose mitigating measures to prevent, minimize or mitigate such impacts. The EIA study of the proposed project is necessary to assess the environmental consequences of the extraction at the proposed sites and to suggest appropriate, practical, and site-specific mitigation as well as enhancement measures. Furthermore, The Environmental Impact Assessment (EIA) of mining concession has been made mandatory and has also been demanded by the Mines and Minerals Department, Government of Punjab, Pakistan.

The objectives of EIA study are to:

- Assess the environmental settings, including the identification of environmentally sensitive areas and social baseline conditions of the project area.
- Assess the coal mining activities and their potential environmental impacts.
- Identify the environmental impacts in terms of both quality and quantity.
- To develop an appropriate Environmental Management Plan (EMP), including mitigation and monitoring measures for adverse environmental impacts to enhance capacity building.
- To propose a rehabilitation development plan for the project site

1.2 Identification Of Project And Proponent

1.2.1 Detail Of The Project

Mr. Malik Hameed Raza holds a mining lease of coal located near Maghal in District Chakwal, Punjab, Pakistan. The coal lease area is over 611.46 acres(license # ML-

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CKL-I-COAL(215)/1818) and was granted by the Mines and Minerals Department, Government of Punjab.

1.2.2 Detail Of The Proponent

Malik Hameed Raza is a proponent of the project "Mining of coal over an area of 611.46 acres " near the Maghal, District Chakwal.

Table 1-1 Details of Proponent

Name of the proponent	Malik Hameed Raza
Address	P.O Noorpur Sethi, Tehsil Kallar Kahar, District Chakwal

1.2.3 Details Of Consultants

The proponent has assigned the task of preparing the EIA report to M/S Environment Professional And Associates, Office # 231-G Johar Town, Lahore. The EIA study of the proposed project has been conducted according to Punjab Environmental Protection (Amendment) Act 2012 and its interpretation as per the Review of IEE & EIA Regulations, 2022.

1.3 Brief Description Of The Project

The area is leased by the project proponent vide Mines and Mineral Department License no ML-CKL-I-COAL(215)/1818.

The project area lies over 611.46 acres and involves mining coal by underground methodology. The project is located near Maghal in District Chakwal of Punjab.

The huge coal resources of Pakistan can play a significant role in meeting its energy demand for a long time. In this connection, it will be necessary to make all-out concerted efforts towards:

- Expanding the coal resources base through intensive exploratory efforts in all known fields as well as in new prospective areas;
- Introducing semi-mechanization in coal mining to keep up production as well as its cost at competitive levels;
- Developing indigenous R&D capabilities for adopting various advanced coal technologies to suit local conditions. Coal briquette needs special attention to cope with the energy requirements of villages and remote areas. In these areas, due to fuel shortage, deforestation has reached an alarming stage.

The mining industry is capital-intensive and has the longest gestation period where success stories are about 40-50%. The minimum time required to reach the coal seam

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in Punjab is 18-24 months for developing a mine to raise an average production of 25 tons/day with an investment portfolio of 15-20 Million Rupees. The mineral managers either intentionally ignore or are not well-versed in the intricacy of the mining system. The decision-making in a production mine goes side by side with the development as well because the coal seam once in position may fade away or change in thickness or quality. This phenomenon adversely affects the inability and marketability.

This EIA report has been prepared according to the category defined in "Punjab Environmental Protection Agency (review of IEE and EIA) Regulation 2022".

This report provides detailed basic specific information and facts; including environmental, economic, social, etc., enabling its assessment and justification that the project will meet the requirements of environmentally sustainable practices; during the regular mining stage; as desired under the Punjab Environmental Protection Act, 1997 (amended 2012), the Punjab Environment Quality Standards and the rules and the regulations thereof.

1.4 Objective Of The Report

1.4.1 Objectives

The main objective of the current study was to identify the potential impacts of the project and to recommend mitigation measures to be followed. The ultimate aim is to establish if the proposed project will be environmentally sound.

1.4.2 Methodology

The following methods were used in undertaking this study:

Literature review

A literature review of reports, documents, and other relevant information about the project was conducted. The review also included other literature & data found important.

Site visit

Site visits were made to get a general understanding of the target area and assess the environmental impacts of the project.

Consultations

Consultations were made with stakeholders, district officials, local leaders, and other key informants who will be affected by the project.

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2 SCREENING OF PROJECT

Section 12 of the Punjab Environmental Protection Act (PEPA), 1997 (Amended 2012) 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, where the project is likely to cause an adverse environmental effect an Environmental Impact Assessment (EIA), and has obtained from the Government Agency approval in respect thereof." As per the Review of Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA) Regulations, 2022 made under Section 12 of the Punjab Environmental Protection Act, 1997 (Amended 2012), the current project (coal mining) falls under Schedule II (List of projects requiring EIA), Category C-I (Mining and processing of coal, gold, copper, Sulphur and precious stones).

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3 SCOPING OF PROJECT

3.1 Spatial And Temporal Boundaries Of Environmental Assessment

The project site is open land. After its development with time nature of the area will change from open land to a project site. Currently, there is no significant population center present in the lease area. The current project site is near Maghal, district Chakwal, and all the parameters are within PEQS. No environmentally sensitive area is present that could be impacted due to the current project.

Location: The proposed project is situated near Maghal, District Chakwal

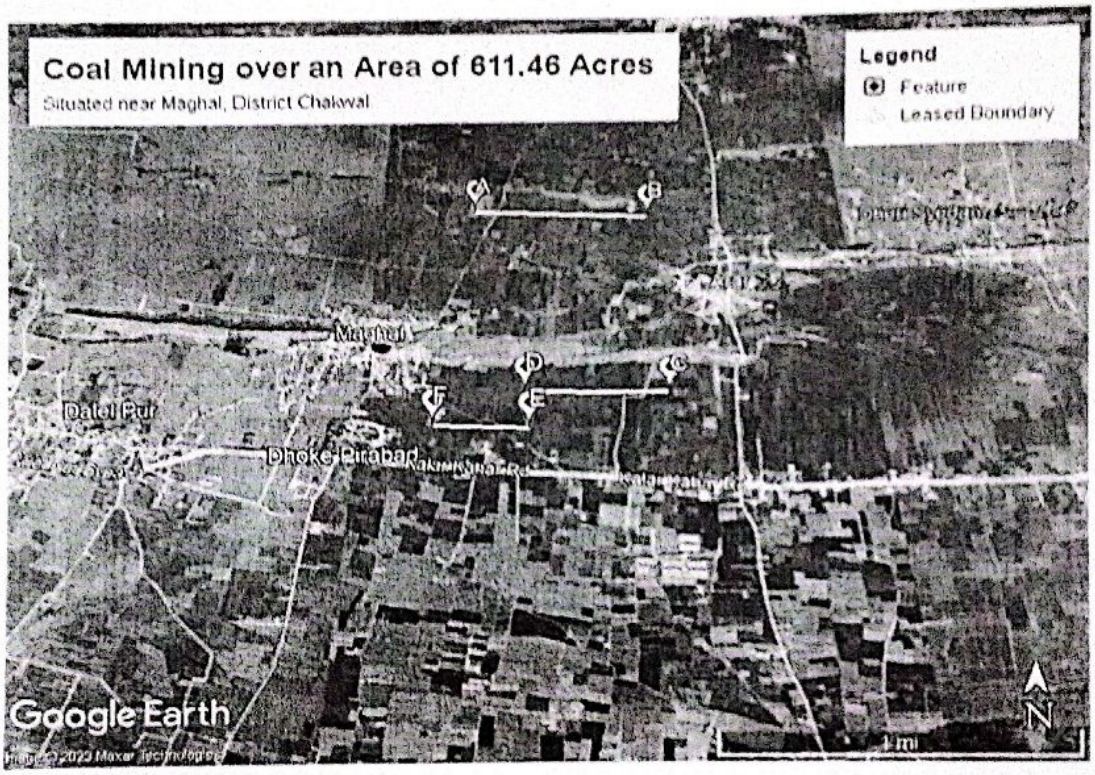

Figure 3-1 Location of the Project Site

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3.2 Important Issues And Concerns Raised During Consultation

The regular survey and background studies were conducted to identify the stakeholders. People surroundings were gathered who are likely to be affected, and focus group meetings were conducted by the representatives. They were all briefed about the project's whereabouts in a non-technical and understandable way. Certain issues and suggestion about the project that is included and raised by the locals were filed and recorded.

During the consultation, it was observed that a maximum of people were in favor of the project, and the following issues and concerns were raised which have also been discussed in length in the chapter Stakeholder Consultation:

- Air pollution should be controlled effectively.
- Locals should be preferred for job opportunities.
- Wastewater should be treated before final disposal.
- 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.
- The health of the workers should be ensured.
- Workers should be hired from the local community.
- Indigenous trees around the facility should be planted to control air pollution.

3.3 Significant Impacts And Factors To Be Determined

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

- Occupational Health and safety
- Site Security
- Traffic Management
- Community impacts
- Control Air emissions
- Job opportunities for locals
- Confined noisy activities
- Resource Conservation
- Avoid excessive water consumption
- Energy-efficient techniques must be adopted

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- Proper site restoration after project completion
- Tree plantation at designated green areas
- Emergency Preparedness

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4 CONSIDERATION OF ALTERNATIVES FOR THE PROJECT

4.1 Site Alternatives, Their Selection And Rejection Criteria

The land is already acquired by the project leaseholder and considered suitable both in terms of environment and physical constraints.

Site Alternatives, their Selection and Rejection Criteria

Unlike industrial establishments, coal mining projects are pegged with favorable geology in the given/ granted area. There are proven coal reserves in the area. Coal existence is subject to geological variations. The projects involving the mining of minerals are located in areas that geologically favor the presence of coal or other minerals. The site selection needs very careful, well-thought-out, and wise decisions. The most important factors for such a site selection include the availability of raw material and land, seismic stability of the site, existence of basic infrastructure including roads, water, manpower, proximity to the electric transmission system, project economic viability concerning the specific site, land use policies, further expansion possibilities, etc. From the standpoint of environmental sustainability, the site selection is based on numerous factors including proximity from residential areas, protected areas, surface water bodies, wildlife reserves, etc. No site alternative was considered because the site was already selected by the proponent and it lies within the coal-bearing formation. The site was not rejected because the geological formations support the existence of coal subject to exploration. The project site is located in an area where geology favors coal mining activities as enough reserves of coal are available. Coal mining operations cannot be carried out at a site where reserves are not enough. Hence, there is no alternative location available in this case.

Following are some of the additional parameters that favor coal mining in the respective region:

- Favorable geology with the coal-bearing area.
- Easy extraction of the coal by available methodology.
- The project operation doesn't involve human settlements displacement or relocation.
- Mining of the coal in the respective zone has provided job opportunities to local people and improved their socio-economic status.
- Coal production has contributed positively to the income stream of the national exchequer as well as the contribution to GDP.
- The coal transportation from the mine to the market road is easily available.
- The project has a sustainable lifespan.

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- The mining operations are undertaken up to the coal-bearing strata with a geological depth of around 250-400 feet.
- Moreover, there is no railway line, reservoir, canal, or public building within a 2 km distance of the mining area.
- No important religious, archaeological, recreational site, ecologically sensitive, declared protected area or human settlement exists within close vicinity of the selected site i.e., within 100 m which is considered to be a safe distance.
- There is no alternative to fixed geology at the site. The grant of lease is specific to the lessee and coal discoveries in the leased area. The sequence of rocks is the same in the salt range with small variations of thickness due to the depositional environment.

Because of these facts, it can be concluded that the chosen site per force is fixed. Considering the facts the mine site is at a safe distance from sensitive receptors and has the advantage of not only being environmentally friendly but also potentially sound to enhance sustainable development in the region. Therefore, the given site is the most suitable.

4.2 Design/Technology Alternatives, Their Selection And Rejection Criteria

The coal can be mined out majorly by two methodologies namely: i. Underground Mining ii. Surface Mining. Under the present conditions and due to geological along with techno-economic parameters, only underground methodology.

4.3 Environmental Alternatives, Their Selection And Rejection Criteria

The project simply involves the mining of coal from the Patala Formation and transporting it to the required sites. The extraction of coal often involves the extraction of other insignificant minerals such as limestone and shale. The lessee is committed to utilizing limestone extracted for the foundation of infrastructure to be built while the shales will be leveled off and covered with an additional layer of soil leading to plantation activities.

4.4 Economic Alternatives, Their Selection, And Rejection Criteria

The currently selected mythology, designing, and mining technique is economically efficient and provides extensive job creation avenues. It refers to the shift of materials used in the proposed project towards environmentally friendly and sustainable materials. In the present case, the material that is being mined is coal and there is no alternative mineral present. All machinery, equipment, and materials procured for the said project will be environmentally friendly and sustainable. Hence, there is no material alternative considered in this case as coal is being mined

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5 DESCRIPTION OF PROJECT

5.1 Objectives Of The Project

The objectives of the project are:

a) To meet coal-based energy demands through environmentally friendly coal mining at the national level.

b) Expand business through added exploration and exploitation by new entries based on techno-economical parameters.

c) Accelerate the pace of development in the existing mines.

d) Enhance production, and productivity coupled with safety by improvising with the adaptable technology mechanization.

e) Add matching infrastructure, machinery, and equipment along with other inputs needed as a factor of production to keep pace with the envisaged programs.

f) Undertake aggressive marketing to maximize domestic share.

g) Expand community development programs and social fabrics

h) Consider feasible options to utilize mine effluents if possible as a raw material for compatible industrial use and minimize the adverse impact of mining on the environment (Use of shale in cement plants) i) Supporting the government's economic agenda by creating job avenues.

5.2 Location And Site Layout Of The Project

To define the boundaries of the EIA study, a location and site layout map is prepared. The lease of coal is located near Maghal in District Chakwal of Punjab. The proposed plant site boundary primarily falls within mainly inhabited and presently unused areas. The coordinates of the coal lease area are given in Table No. 5-1.

Table 5-1: Coordinates Of Coal Lease Area

Points	East	North
A.	3497000	1041500
B.	3499000	1041350
C.	3499000	1040300
D.	3498290	1040300
E.	3498290	1039750

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F.	3497000	1039750

Total area 611.46 acres

5.3 Land Use On The Site

The areas where the mining will be done are of no use. Most of the proposed coal mining sites are abandoned. So, there won't be any loss or degradation of productive land. Moreover, the coal is being extracted underground making no change to surface

5.4 Road Access

The project site is located near the Maghal, District Chakwal which is easily accessible from Choa Saidan Shah-Kallar Kahar Road.

5.5 Vegetation Features Of The Site

In the proposed mining areas, the land has no vegetation cover. The area is devoid of any vast tree cover

5.6 Cost And Magnitude Of Operation

The mining of coal can be done over an area of 611.46 acres subject to favorable reserves and coal quality. The total cost of the project is

5.7 Schedule Of Implementation

The mining operations are conducted with due care and vigilance not to pollute the environment or inflict any kind of danger/threat to environments downstream. The impact of mining is analyzed in the subsequent chapters. In case of any adverse impact, the mitigating measures will be suggested for implementation The implementation stages of the project activity include:

1st Stage

Stage–1 comprises the onsite survey.

2nd Stage

Stage –2 comprises the following task:

i- Making site camp for labor rest and equipment

ii- Replenishment Rate

iii- Geological Determination

iv- Extraction Volume Determination

3rd Stage

Stage –3comprises of the Commissioning and regular operation.

v- Mining of coal by Pits

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vi- Loading of coal and transportation.

5.8 Description Of Project Process

The mining activities will be carried out by considering all the environmental parameters. No mining activity will pose any threat or danger to the environment. The mining operations will be carried out with due care and vigilance. All the impacts will be assessed in detail in every environmental setting. The corresponding mitigation measures will be suggested for every impact resulting from the project activities. The method of mining is a function of mineral deposition, its environment, geological surrounding, seam thickness, its dip, and the nature of coal whether gassy or non-gassy or fire prom or not. The Punjab coal seams are thin less than 2 feet which is a world record for coal extraction for such a thin coal seam. Access to the coal seam either through adits or shafts is made as the permanent access roadways to the coal seam. These openings are used for the passage of miners, machinery, and the passage of mined coal. There are three choices for making access roadways to the mineral deposit for underground mining i.e. shafts, tunnels, and adits. The shaft opts where the strata are nearly horizontal in bedded deposit. The tunnels have opted for an almost vertical or nearly vertical stratum in a bedded deposit. The adits are an artesian way of making access to the mineral deposit and are in practice since the time of the memorial. Worldwide the fastest means of mineral transportation from underground to the surface are shafts and tunnels. The adits are compromises in-between. Shafts are sunk by using conventional drilling and blasting by the artesian method which is not cost-effective and takes 12-15 months with a shaft diameter of 2.5 meters and an average depth of 150 meters. The existing mine which has gone deeper and has expanded laterally is confronted with a ventilation problem. Bore-raising from the last workstation to the surface will improve the ventilation. In nutshell, the shaft sinking and bore-raising technology must be adopted with imported machines with government support. Except for Makarwal, tunneling has been rarely adopted in the private sector. There are a few locations like in Dandot, Kamlial where an effort has been made for tunneling. The rest of Punjab's coal mining is on adit. The coal extraction is done generally on the room and pillar method. Makarwal area claims to have adopted longwall advancing and retreating. In most of the mines, a combination of advancing is improvised by Surakhi System. There are different underground Coal mining methods which are as follows: 1. Room and Pillar Mining 2. Longwall Mining 3. Short wall Mining

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5.9 Equipment/Machinery

As the activities were for initial exploration purposes only and there was no permission to use explosives for digging the inclines. The mode of coal extraction is manual. Hence, simple Equipment such as pans and bates, rockers, sluices, Long Toms, and dry washers were used. Besides this, some machinery, such as generators, Hand Drilling machines, and Conveying tools for stones and dust were also used.

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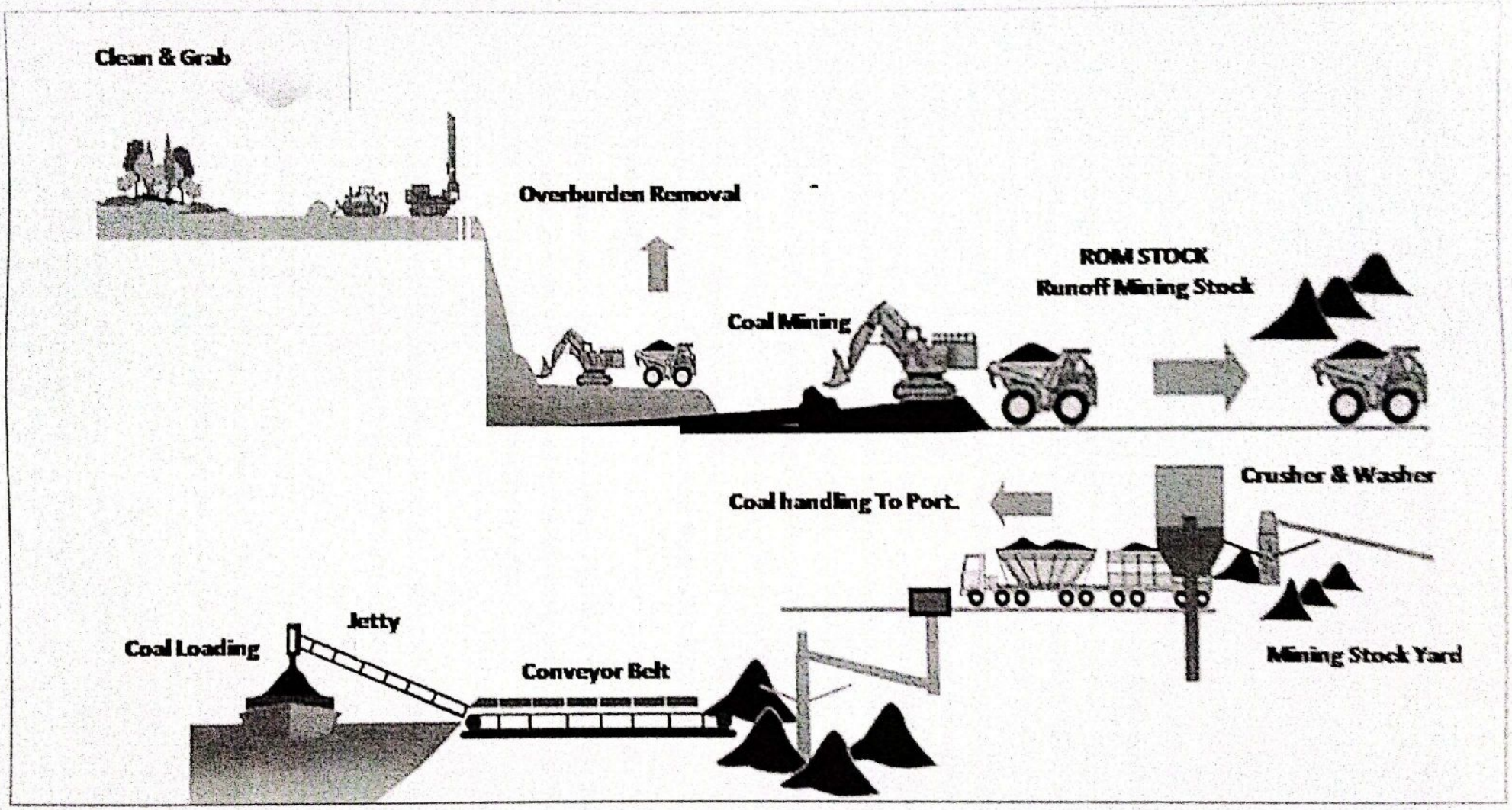

Figure 5-1 Process Flow of Coal Mining

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5.10 Coal Haulage, Storage, Loading, Transportation & Unloading

The details of coal haulage, storage, loading, transportation & unloading are given below

5.10.1 Coal haulage

The development incline or shaft is generally track mining. In this case, the rail track is used to facilitate the mining cars which are hauled up through haulage installed at the top. Rarely, the trackless system is adopted for underground mining in mining due to the low volume and high grade as well as the absence of electricity from the national grid. The loading and unloading are done through an improvised method of mechanical levers. In certain cases, for low production or low volume, it opted for manual operation. Underground transportation is generally through hand-tramming of mining cars carrying about one ton of coal. Most of the mines being worked on a conventional system using donkeys do not need hand tramming underground. The cutting of coal and stone at the face is done by hand pick where the output per man per shift at the face is 0.75 tons and on an overall basis 0.33 tons. Coal haulage is the transport of mined coal from working faces to the surface, and is a major factor in underground mine efficiency. In the present case, the coal will be loaded into tubs/ carts using shovels and picks and then hauled from working faces to the surface

5.10.2 Coal Storage

Coal will not be stored at the site in the form of coal piles after extraction from the coal face and haulage at the surface. Coal will be loaded onto trucks for transportation to marketplaces/ consumer end after haulage at the surface.

5.10.3 Loading

After haulage at the surface, coal will be loaded onto trucks from carts to be supplied to the consumer end. Coal will be loaded from carts into trucks either using hand spades or shovels.

5.10.4 Transportation

Coal will be transported to the consumer end/ market places using trucks. Coal extracted from this area is transported to various cities in Punjab province.

5.10.5 Unloading

The unloading of coal is done by the consumer or truck/ tractor trolley owner/ agency in the consumer area which is a concern of the consumer

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5.11 Manpower

The coal mining industry is labor intensive and hence carries the potential for employment generation in remote locations. Exploration calls for safe, efficient, and economical operation which can only be achieved by the supervision of the trained mining staff. The site manager (Mining Engineer) will be in charge of the operation holding all the administrative and technical powers as stipulated under the Mines Act. 1923. Geologists and trained mining and drilling crew shall be supervising all exploration and drilling operations. All the operations are to be looked after by qualified technical staff as per the requirement of Punjab Mining Concession Rules, 2002, and Mines Act 1923. Besides these, local personnel was also hired during the exploration activities as laborers, Guards, Cooks, Lay Men. As the company aims to expedite the exploration activities more speedily, hence, around 15 local personnel will be hired for spade works in exploration and mining activities.

The workers are being given the following facilities:

- Transport facilities to the sites and back.
- Uniforms, helmets, safety shoes, etc. for workers.
- Messing facilities at the exploration sites.
- First Aid and Medical facilities
- Safety Helmet, goggles, shoes, dust masks, hand gloves, and more for all the site staff.
- Raincoats and jerseys are to be provided
- Cold drinking water facilities.
- Wash room's facilities.
- Mosque at the working site.

5.12 Blasting Details

The hard rocks maybe during development or associated with rocks are fragmented by the use of appropriate explosive with different drilling and blasting pattern which is purely need-based. The coal is manually cut and excavated while the hard stone in the development galleries or chopper is excavated by adopting conventional drilling and blasting using high explosives coupled with a safety fuse and detonator. The amount of explosive to be used is procured on daily basis and utilized as per the Rules and Regulations of Mines Act 1923.

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5.12.1 Blasting Frequency

The blasting frequency is almost once a day at each workstation requiring the support for use of an explosive to the extent of its licensed limits i.e. 5 kg/day. Whenever there are hard rocks exposed in development galleries or choppers, drilling and blasting have to be carried out.

5.12.2 Method Used for Blasting

The conventional blasting method will be used with high explosives coupled with a safety fuse and detonator.

5.12.3 Location Designated for the Storage of Explosives

The Explosive is stored on the surface in an approved manner as per the provision of the Mines Act 1923. The amount of explosive to be used is procured on daily basis and utilized as per the Rules and Regulations of Mines Act 1923.

5.12.4 Mitigation Measures to Control Environmental Impacts during Blasting

Following are the preventive measures adopted for environmentally friendly and safe blasting operation:

- All blasting operations will be carried out in compliance with conditions as specified in Coal Mines Regulations, 1926.
- The area where blasting is being carried out will be fenced properly.
- To avoid noise problems and disturbance to the community, blasting will be carried out on specified days and between specified times.
- To prevent air quality, blasting may not be carried out in extreme weather conditions, if practical/ possible.
- Proper monitoring of blasting operations will be carried out by the manager or concerned persons

5.13 Health, Safety & Hygiene

Health, Safety & Hygiene includes the following:

5.13.1 First Aid Facility

At the workplace workers and employers have enough information, knowledge, and training regarding first aid treatment in case of an emergency. The Inspectorate of Mines in collaboration with Halal e Ahmed and local medical staff arrange refresher courses for First Aid. The employees of the company take due advantage of such opportunities along with other companies.

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5.13.2 Safety Training

Workers and all the staff is provided with proper training about work and safety practices. Regular training courses are being organized by the training wing of the Inspectorate of Mines Punjab and Pakistan Mine Owners Association. The lessee sends its trainees for such courses subject to available seats.

5.13.3 Use of Drugs and Narcotics

Drugs and narcotics are strictly prohibited. Smoking will be only allowed in rest timings at properly isolated places.

5.14 Personal Protective Equipment

To control any health and safety risk and to reduce the magnitude of any adverse impact, the workers are required by law to have PPE such as safety helmets, safety goggles, rubber gloves, long shoes, safety lamps/ torches, etc. The company will provide the requisite PPEs to its employees where required.

5.15 Water Requirements

The main water supply requirement is for drinking water and nothing in the mining process. The workers are being provided 2-3 liters of water per capita per day. For a 50-worker camp, the quantity of water required is about 100-150 liters per day.

5.16 SOLID WASTE

The coal seam is not very thick. The solid rocks associated with the coal seams are required perforce to be extracted for making the size of galleries within the prescribed limits of comfort. Generally speaking, the size is kept 6x6 feet in the gallery. The cavity created by the coal extraction provides enough space for hosting the solid rock dumping underground up to 40%. The surplus stones are hauled up and dumped on the surface of the hill slope in a way that the natural drainage pattern is not blocked if required.

5.17 Process Flow Chart

The mining activities are carried out in a very coordinated way. From the selection of the site till the mining and conclusion of a project, the mining supervisors and laborers are trained to develop an understanding of the complexity and sensitivity of the operations

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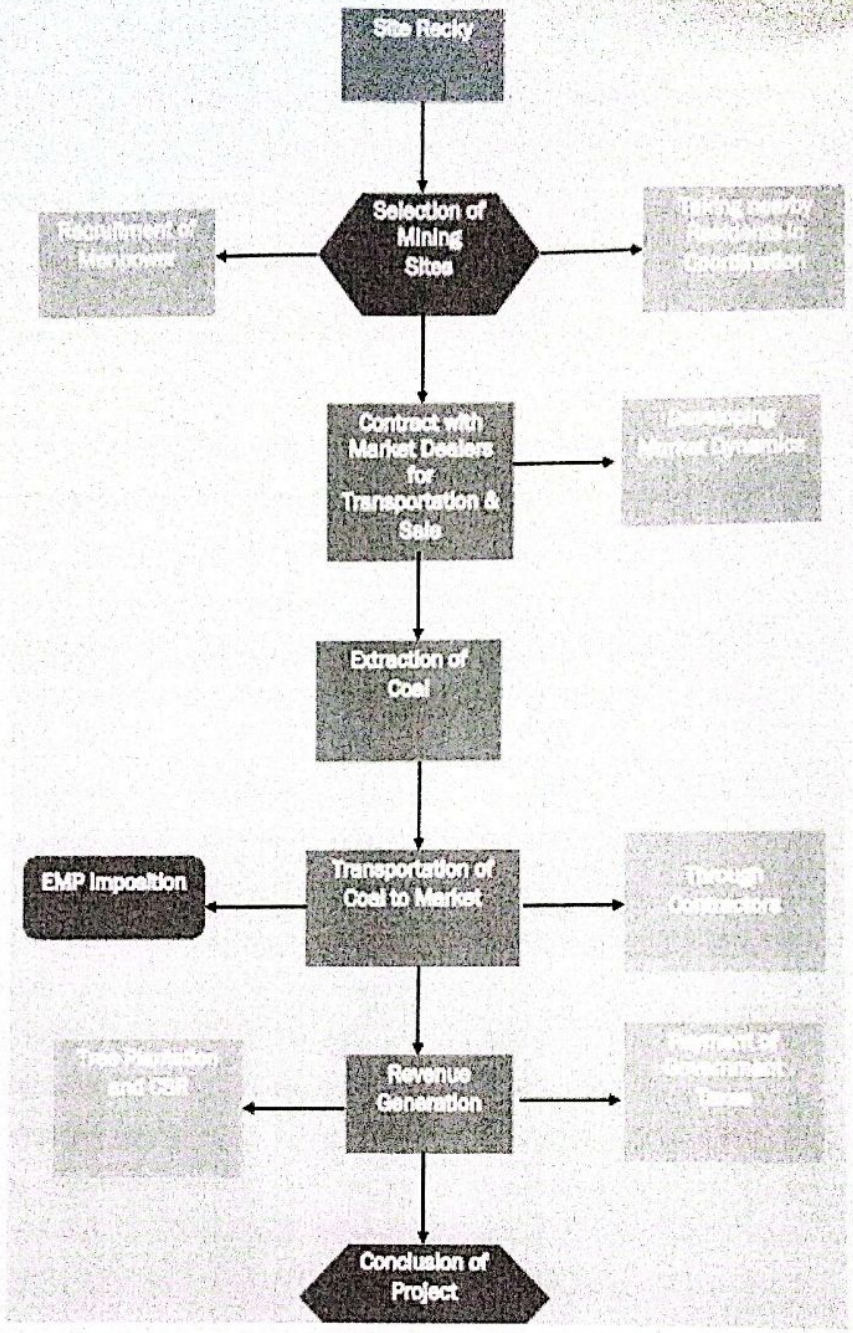

Figure 5-2 Process Flow Chart of Coal Mining

5.18 Mode Of Excavation

The mode of excavation is manual. The mining will be carried out either by hand spades or by hand picks. No machinery is used for the extraction of coal from the coal face. The coal mining is done at depth of about 400 to 500 feet. The coal deposits are generally present at such depths in the Salt Range.

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5.19 Market Of The Coal

After loading into the trucks, coal will be transported to the marketplaces based on demand. Trucks will be used for the transportation of coal to the marketplaces. Coal may be marketed to Chakwal and nearby areas

5.20 Restoration/Rehabilitation At The End Of Project Life

The following measures can be adopted hypothetically to restore and rehabilitate the site:

- There exists no human settlement within a safe radius of the selected project site to be displaced owing to the mining operations. No structure of any significance stands at the site to be relocated or dismantled. Mine is already awarded to the proponent, hence, no relocation and rehabilitation are required
- The process of mining employed will be a surface mining process in which the least disturbance to the vegetation features and the infrastructure at the project site will occur.
- The importance of the site is due to economic activity, otherwise. It is a replica of barren land. The question of rehabilitation, therefore, doesn't arise except for recoursing the land formed by the cavities of the mined-out area
- The isolated site can be used for geo-tours to the visitors for generating alternate economic activity once the reserves are exhausted.
- Trees will be planted in the project area by using the dry afforestation technique and the overall ecology of the area will be improved significantly.
- The site can be used for re-stocking the livestock Reclamation practice varies widely, depending on the type of mine, its location, and the applicable legal requirements. The proponent will strictly follow the provisions of the Environmental Protection Act, 1997, and the Punjab Mining Concession Rules, 2002.

Considering its importance proponent will operate to the highest environmental standards of environmental management within the context of sustainable development. Each mine requires a particular solution depending on the region where it is situated, the type of mine, and the mining methods applied.

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6 DESCRIPTION OF THE ENVIRONMENT

6.1 General

This section describes the baseline conditions, which show the clear-cut picture of existing environmental resources; the physical, ecological, and socio-economic environment of the Project Area. Information on these aspects has been derived from field visits to the project area as well as information obtained through visits to the Government departments and other relevant agencies. The primary data was collected by surveying the project area and its nearby vicinity. The secondary data regarding physical parameters (topography, geology, seismology, hydrology, and climatology) was obtained by visiting relevant departments and their official websites. The biological parameters (flora and fauna) were also studied in the project area. The vegetation of The project area was studied by preparing a floristic list based on visual observation. The species were recorded concerning their historical existence in the project area. Information on wildlife fauna species (mammals, amphibians, reptiles, birds, etc.) in the assessment area was compiled based on opportunistic observation, gathering the existing information, and consultation with local experts, community members, and government departments. The socio-economic aspects were studied and analyzed by conducting detailed socio-economic surveys.

6.2 Baseline Physical Environment

Chakwal District is in the Potohar Plateau of Punjab, Pakistan. It is located in the north of the Punjab province, Chakwal district is bordered by Khushab to its south, Rawalpindi to its northeast, Jhelum to its east, Mianwali to its west, and Attock to its north-west. The district was created out of parts of Jhelum and Attock in 1985. Its population is 1,495,982 according to the 2017 census.

During British rule, Chakwal was a tehsil of the Jhelum district. It contained the towns of Chakwal and Bhaun and 248 villages. The predominantly Muslim population supported Muslim League and Pakistan Movement.

Chakwal city is the district headquarter of Chakwal. It is also the administrative center of Chakwal tehsil (a subdivision of the district). The Chakwal district is divided into five tehsils, namely, Kalarkahar, Chohsaidan Shah, Talagang, Lawa, and Chakwal. The city of Chakwal itself is divided into five Union Councils: and Chakwal district is divided into 68 union councils.

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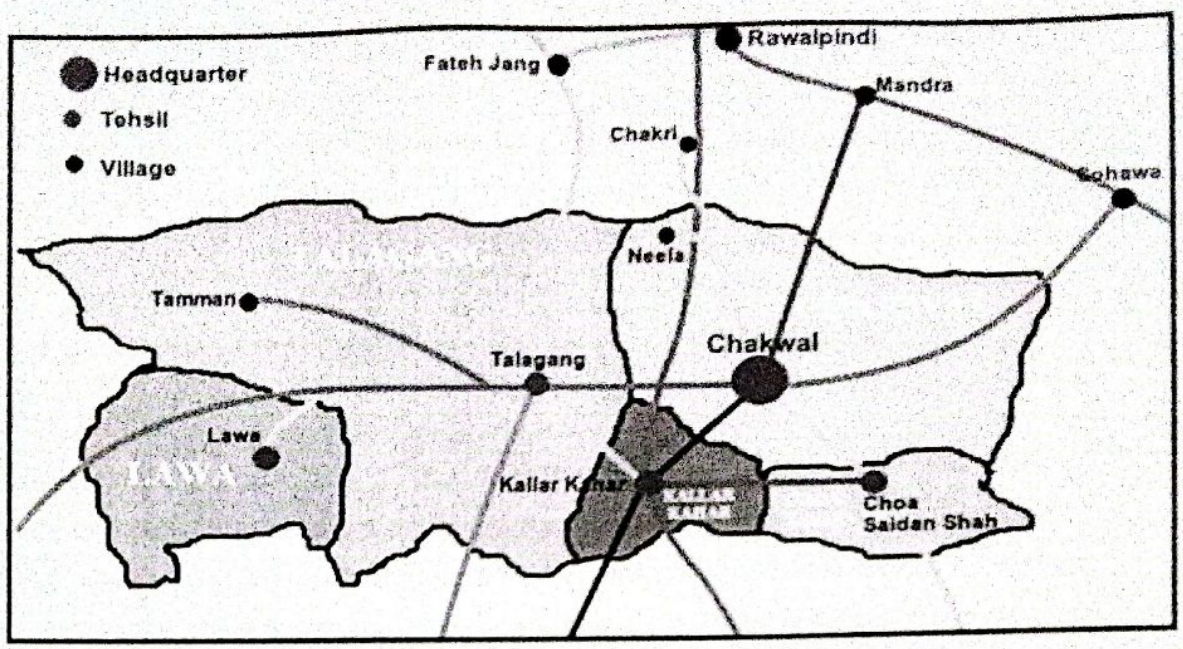

Figure 6-1: Map of District Chakwal

6.2.1 Topography and geology

The land comprises mainly hills, plateaus, plains, and deserts with the river Jhelum flowing on its East. Chakwal district borders the districts of Rawalpindi and Attock in the north, Jhelum in the east, Khushab in the south, and Mianwali in the west. The southern portion runs up into the Salt Range and includes the Chail peak, 3,701 feet (1,128 m) above the sea and the highest point in the District. Between this and the Sohan river, which follows more or less the northern boundary, the country consists of what was once a fairly level plain, sloping down from 2,000 feet (610 m) at the foot of the hills to 1,400 feet (430 m) in the neighborhood of the Sohan; but the surface is now much cut up by ravines and is very difficult to travel over.

6.2.2 Geology

Lying at the beginning of the Potohar plateau and the Salt Range, Chakwal is a district and the terrain is mainly hilly, covered with scrub forest in the southwest, and leveled plains interspaced with dry rocky patches in the north and northeast. The Salt Range is interpreted as the surface expression of the leading edge of the decollement thrusts over northward offsets of the crystalline basement of the still-active fold and thrust belt of the Himalayas. The Salt Range Thrust juxtaposes Late Precambrian to Mesozoic rocks on top of Early Tertiary rocks. The overall stratigraphy sequence can be subdivided into three major units that are seismo-stratigraphically distinguishable:

- Salt Range Formation, representing evaporite deposition of Precambrian age;

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- Cambrian rocks from the Jhelum group to Lower Eocene rocks of the Chharat group, representing stable platform conditions;
- Post Lower Eocene rocks, representing deposition in an active tectonic setting.
- The Salt Range is an east-northeast trending complex salt anticlinorium with a series of salt anticlines. The range's southern boundary is an escarpment, rising 800–900m above the plains, which marks the southernmost extent of significant deformation along the Himalayan Fold and Thrust Belt in Pakistan.

6.2.3 Soil

Soils form a major part of the environment. Their fertility and other special characteristics have a great relationship with the environment. Climate has a great influence on the formation of soils; therefore, the study of these factors is of great importance. Soil is a dynamic layer in which many complex physical, chemical, and biological activities are taking place. Therefore, the soil is a dynamically changing body. Soils are made up of solids, liquids, and gases. The solid part of the soil is made up of both inorganic and organic. While weathering of rocks makes inorganic particles, the organic solids consist of living and decayed plants. To classify the entire soil in Pakistan, the Soil Survey of Pakistan has divided the entire country into nine ecological zones.

6.2.4 Climate

Like in other major parts of the province of Punjab, the site observes four seasons summer, winter, spring, and autumn during twelve months of the year. The climate in Chakwal is considered to be a local steppe climate. During the year there is little rainfall. This climate is considered to be BSh according to the Köppen-Geiger climate classification. The temperature here averages 22.3 °C. About 519 mm of precipitation falls annually. The driest month is November, with 7 mm of rain. Most of the precipitation here falls in August, averaging 133 mm.

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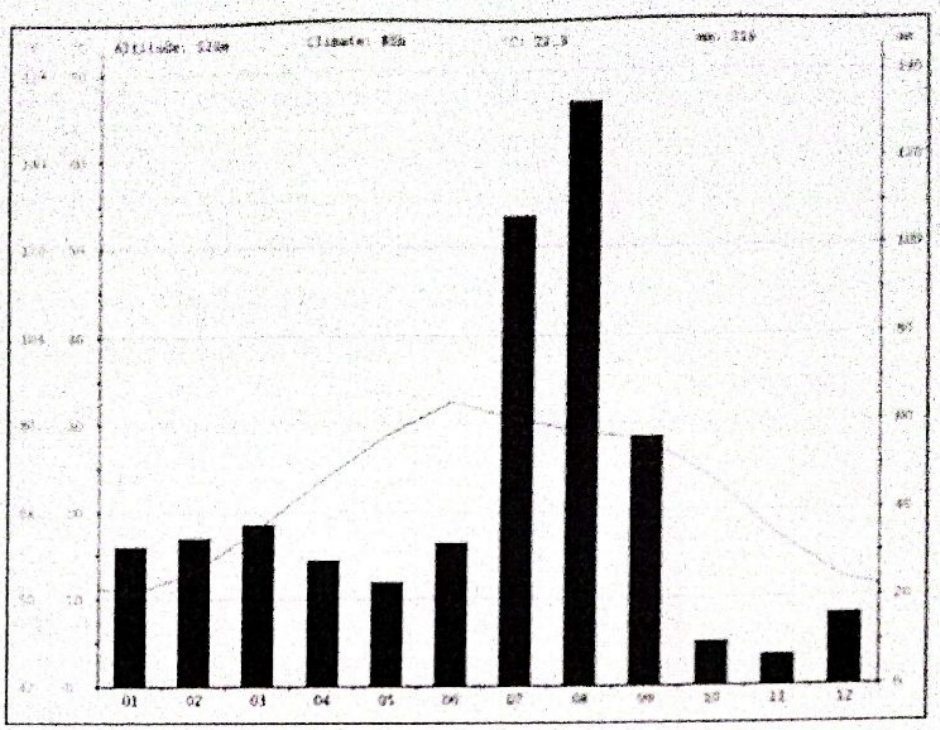

Figure 6-2: Climate of Chakwal

6.2.4.1 Temperature

The project area is semi-arid and characterized by large seasonal variations in temperature. June is the warmest month of the year. The temperature in June averages 32.5 °C. January is the coldest month, with temperatures averaging 10.5 °C. There is a difference of 126 mm of precipitation between the driest and wettest months. Throughout the year, temperatures vary by 22.0 °C.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Nov	Oct	Dec	Year
Record high °C (°F)													
Average high °C (°F)	21.9 (71.42)	24.57 (76.23)	30.27 (86.49)	37.25 (99.05)	42.82 (109.08)	45.03 (113.05)	42.93 (109.27)	40.40 (104.72)	40.09 (104.16)	37.41 (99.34)	29.79 (85.62)	24.41 (75.94)	34.74 (94.53)
Daily mean °C (°F)	16.64 (62.91)	19.8 (67.64)	25.55 (77.99)	33.06 (91.51)	39.25 (102.65)	41.83 (107.47)	40.17 (104.31)	37.76 (99.97)	36.32 (97.38)	32.7 (90.86)	25.04 (77.07)	19.35 (66.83)	30.64 (87.15)
Average low °C (°F)	10.07 (50.13)	11.74 (53.13)	16.16 (61.09)	23.59 (74.46)	30.15 (86.27)	34.01 (93.22)	33.88 (92.98)	31.49 (88.68)	28.47 (83.25)	24.56 (76.21)	18.05 (64.49)	13.09 (55.56)	22.54 (72.57)
Record low °C (°F)	3.95 (39.11)	4.64 (40.35)	8.89 (48.0)	14.82 (58.68)	21.74 (71.13)	24.7 (76.46)	25.69 (78.24)	24.7 (76.46)	22.75 (72.95)	17.79 (64.02)	10.87 (51.57)	5.97 (42.75)	3.95 (39.11)
Average precipitation mm (inches)	13.02 (0.43)	25.71 (1.01)	31.11 (1.22)	25.96 (1.02)	20.17 (0.79)	18.63 (0.73)	36.57 (1.44)	42.52 (1.67)	31.84 (1.25)	2.44 (0.1)	3.68 (0.14)	2.39 (0.09)	253.45 (9.98)
Average precipitation days (≥ 1.0 mm)	1.93	3.86	5.21	6.23	4.22	4.5	7.19	7.64	3.86	0.39	0.71	0.44	46.18
Average relative humidity (%)	43.39	46.0	43.66	27.8	18.86	21.77	33.19	40.58	36.76	26.57	27.91	29.61	33.01
Mean monthly sunshine hours	8.3	9.28	11.13	12.72	13.45	13.89	13.67	13.01	11.88	9.55	9.49	8.89	11.54

Figure 6-3: Temperature in Chakwal

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6.2.4.2 Rainfall

Chakwal lies within the monsoon range, and apart from occasional rainfall, there are two rainy seasons: the first, caused by the monsoon winds originating from the Bay of Bengal, begins from the 15th of July and continues upto around the 15th of September; the second, caused by Mediterranean winds lies in the last two weeks of December and the first two weeks of January. The average rainfall is 22 to 25 inches. Choa Saiden Shah subdivision has the maximum rainfall in the district.

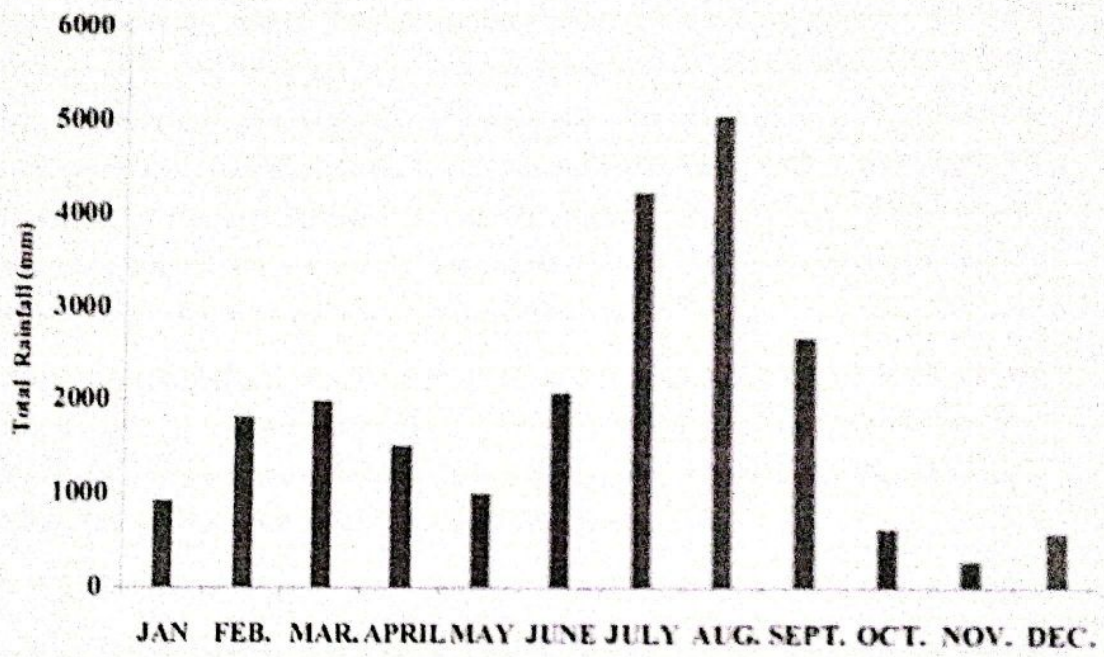

Figure 6-4: Rainfall Pattern Of Chakwal District

6.2.4.3 Humidity

July, August, and September are the most humid months in the area, whereas May and June are the least humid months. Average monthly relative humidity values at various locations in the project area are 64%.

6.2.4.4 Geography

The district is located between 33°40'38"N and 72°51'21"E. Chakwal district borders the districts of Rawalpindi and Attock in the north, Jhelum in the east, Khushab in the south, and Mianwali in the west. The total area of Chakwal district is 6,609 square kilometers, which is equivalent to 1,652,443 acres (6,687.20 km2). The southern portion runs up into the Salt Range and includes the Chail peak, 3,701 feet (1,128 m) above the sea, and the highest point in the district. Between this and the Sohan river, which follows more or less the northern boundary, the country consists of what was once a fairly level plain, sloping down from 2,000 feet (610 m) at the foot of the hills to

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1,400 feet (430 m) in the neighborhood of the Sohan; the surface is now much cut up by ravines and is very difficult to travel over.

6.2.5 Surface Water

Chakwal is a water deficit area and transmission of water from outside the city is very costly. Hence it is difficult to meet the criteria of maximum day demand due to the high cost of pumping against gravity.

The quantity of water in the city is low and the sub-soil level is too deep. The water supply scheme started with the construction of the DhokTalian and Khokhar Zer small dams in 1972. The rainwater is collected in these cement reservoirs 27 kilometers away from Chakwal, pumped to village Waryamal where it is treated and then supplied in the city. But people still prefer to buy sweet well water for drinking at the rate of two rupees per 18-liter can. People have installed motor pumps in their homes to suck water to fill their containers when the supply is opened at different times. Hawaiians still are living under strict water discipline permanently.

A small number of small dams have been constructed in the district, which irrigates a small acreage of cultivated land through water channels are the Khokhar zerdam, Surrlah dam, Dhurnal dam, Ghurab dam, Wallana dam, Nikka dam, Bughtal dam, Dhoke Qutb Din dam, Kot Raja dam, Pira Fathial dam.

6.2.6 Ground Water

The groundwater table in Chakwal lies in the range of 40 to 60m. Groundwater use in district Chakwal is of fundamental importance to meet the rapidly expanding drinking and agricultural water requirements. The main factors contributing to groundwater recharge in Chakwal are rainfall, evapotranspiration, and geology. Due to the semi-arid climatic conditions of the area, resources are almost the only key to economic development.

There are several dug wells in the area where water is getting stored during the rainy season. Sources and processes of recharge in humid areas are different compared with semi-arid areas. Due to the main source of available water in the area, the potential groundwater recharge estimation could be a good exercise to visualize the amount of rainwater entering the ground. The average potential recharge estimated is 60% of the rainfall of 148 mm. Potential recharge value was higher for an area having grassland-type vegetation and low for an area covering shrubs and thick vegetation

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6.2.7 Seismicity

According to the seismic zoning of Pakistan, the project area lies in seismic zone 2B and represents minor damage. An earthquake with high intensity for a fundamental period of more than 1 second may cause damage to infrastructure. The seismic zoning map of Pakistan is given in Figures 6-7.

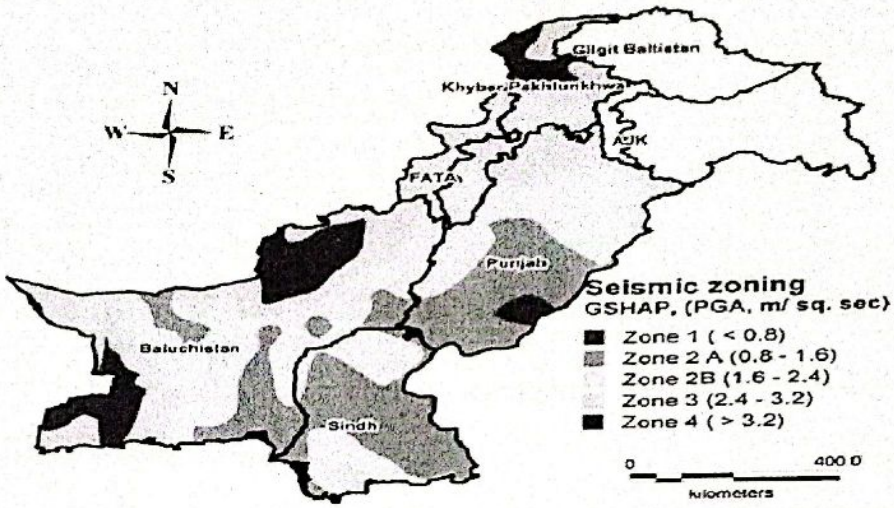

Figure 6-5: Seismic Map of Pakistan

There are three main faults in the Salt Range:

- Kalabagh Fault (North-South)
- Jhelum Fault (North-South)
- Salt range thrust fault (East-West)

In the Region of Salt Range over all earthquake occurrence frequency trend is the same and the area represents moderate seismicity.

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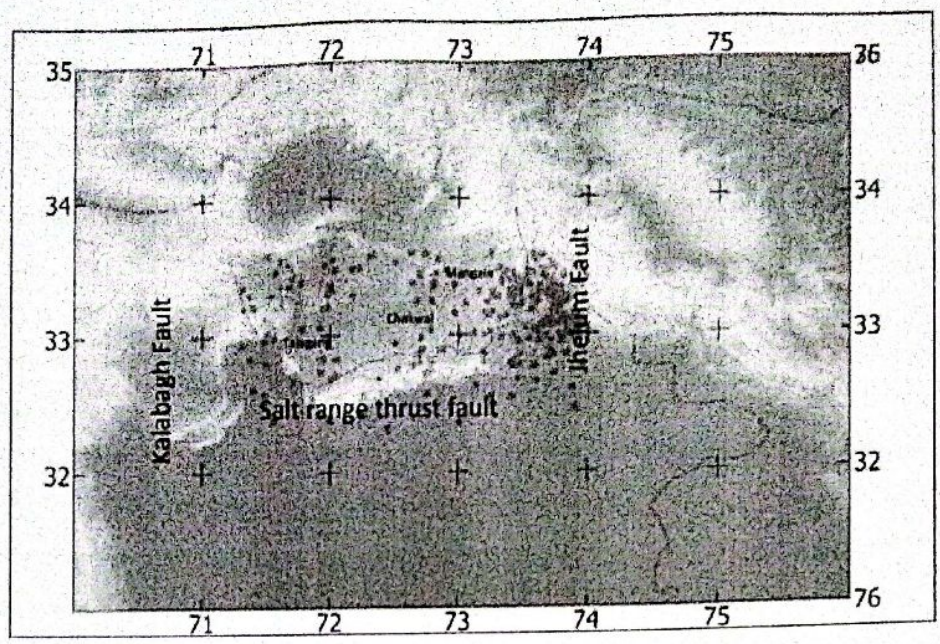

Figure 6-6: Earthquake Occurance Frequency

6.3 ECOLOGICAL ENVIRONMENT

The project area falls in the Northern Punjab Province of Pakistan and comprises mostly land that is not agricultural. These areas are rich in biodiversity due to the presence of multiple habitats including scrub forests, seasonal & permanent streams having various types of vegetation, and seasonal wetlands/ponds.

6.3.1 Habitat

Chakwal is quite rich in bird species, including Black partridges, and Grey partridges. In addition, some of the areas are also known as a habitat for raptors /birds of prey, particularly during the winter season, when migratory birds also occupy these areas. Like other areas of Punjab, the breeding season of this region is the month of March-April while the shooting season during winter is from November till the start of February.

6.3.2 Wasteland and Gorges with Scrub Vegetation

These areas are found in the vicinity of cities and human settlements. Most of them are used as pastures, and the others also have ethnobotanical importance in terms of fuelwood and medicinal uses. The dominant species are Acacia modesta, Saccharum benghalensis, Saccharum spontaneum, Ziziphus nummularia, and Acacia nilotica.

The wildlife of these areas includes Black partridge and Grey partridge. Among mammals, the presence of Black-naped hare, Indian crested porcupine, Asiatic jackal, and Indian wild boar was recorded. The rare predator, the Indian wolf, was present in less disturbed locations but no strong evidence of its presence could be recorded from

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project sites. A thin population of foxes was reported while rodents are quite common and causing damage to agriculture and forest lands.

6.3.3 Seasonal/Permanent Stream Beds/Wetlands

The other important habitats are recorded in the form of seasonal as well as permanent streams, mostly dry stream beds which take the rainwater from watersheds to low lying plains of the project area. The water accumulation sites were having grasses and sedges including *Acacia modesta, Ziziphus nummularia, Saccharum spontaneum, Typha latifolia, Phragmites karka, Schoenoplectuslittoralisetc. Typha latifolia* was also found in and along the water ponds. Scattered trees of Acaianiloticaand bushes of different plant species were also observed along these streams. In some pockets, small ponds/wetlands are also present which are though small but very critical as a major source of drinking water for wildlife during dry and hot seasons.

6.3.4 Agricultural Lands and Human Settlements

Another important, major, and established component of the study area is occupied by fields and human settlements. Although, the land holdings are small in the province, however, in the districts of Chakwal and Jhelum, the big land holding was also observed by some of the landlords. The old buildings, houses, and agricultural fields are planted with fruit and ornamental trees. In most of the areas, agriculture is rain-fed (barani), and some small patches are irrigated from tube wells. In cultivated crops, Wheat, Oilseed crops, and fodders were observed.

The agricultural fields and human settlements are not very rich in avifauna. Mostly those species recorded that have adopted human inhabitation and depend upon agricultural produce or domestic waste. The crop patterns and harvesting seasons also influence the distribution of birds. The birds noted in agriculture areas are a Grey partridge, Common Myna, House crow, House sparrow, Collared dove, Little brown dove, Red-ventedBulbul, Indian roller, Indian tree pie, Red-wattledLapwing, and Cattle egret. The trees planted on the margins of agricultural fields provide shelter and roosting places to the birds including raptors which were recorded during field visits.

6.3.5 Forest

The forests which exist naturally, since Chakwal lies in the subtropical, semiarid zone, are dry deciduous scrub, consisting of the plant varieties which are typical of these kinds of forests- keeker, Kau, Phulai, Sanatha, Wild Beri, Gurgura, and Potaki. The underbush mainly consists Of Saryala, Khawi, Mesquite, and Karir. In the plantations that have been carried out by the Forest Department and private farmers, apart from

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the naturally occurring species of trees, the Sheesham, Sufaida and to some extent the poplar trees have alsobeen planted. At present, a total of 92382 acres of the district are under reserve forest and 57868 acres are under unclassed forest. The main reserve and unclassed forests in the district are at Diljabbah, Surullah, Drangan, Gandala, Khokhar Bala, Makhiala, Dandot, Chinji, Kot Kala, Simbli, Nurpur, Bagga, Sammarqand and Thirchak. Forests in Chakwal district are taken care of by the Chakwal Forest Division, headed by the Divisional Forest Officer who is assisted by four Sub-divisional Forest Officers. The Chakwal Forest Division is spread over an area of 150250 acres which includes 375 km roadside and 40 km rail side plantations.

6.3.6 Flora

Chakwal is rich in Flora. Table 6.1 provides a detailed list of floral species with their local names, family names, and life form. Poaceae family was found dominant with 16 vegetation species followed by Asteraceae 7, Moraceae 6, Solanaceae 5, Amaranthaceae, Mimosaceae, Euphorbiaceae, and Verbenaceae each having 4 species. The table given below shows the number of floral species with dominant families and life form status of all the 104 species

Table 6-1: Floral Species of the Chakwal District

Sr. No.	Family Name	No. of Species	Life Form	No. of Species
1.	Poaceae	17	Herbs	30
2.	Asteraceae	7	Shrubs	13
3.	Moraceae	6	Grasses	17
4.	Solanaceae	5	Trees	32
5.	Verbenaceae	4	Sedges	03
6.	Mimosaceae	4	Climbers	04
7.	Euphorbiaceae	4	Creepers	02

6.3.6.1 Dominant Species

In the study area, vegetation is dominated by Acacia modesta, Ziziphus nummularia, and Acacia nilotica, with small patches of Calotropis procera and Saccharum spontaneum. Plantations of Eucalyptus globulus and Tamarixaphylla were also found. Desmostachyabipinnata, Heteropogoncontortus, and Cymbopogon jwarancusa are observed along the margins of agricultural fields. In the agricultural fields around the proposed project sites, wheat and fodder crops were cultivated.

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6.3.6.2 Plants of Economic or Medicinal Value

Several plant species having medicinal value were observed in the project area. Most of these are naturally grown and are used by local people for the treatment of various ailments. Withaniacoagulans, Tinosporacordifoliaand Calotropis procera is commonly used by the locals.

6.3.6.3 Rare or Endemic Species

No endemic or rare plant species were recorded during the field visit. All species have a wide range of distribution in other ecological zones of the country, especially at other locations of Punjab province in general and in similar habitats of target districts in particular.

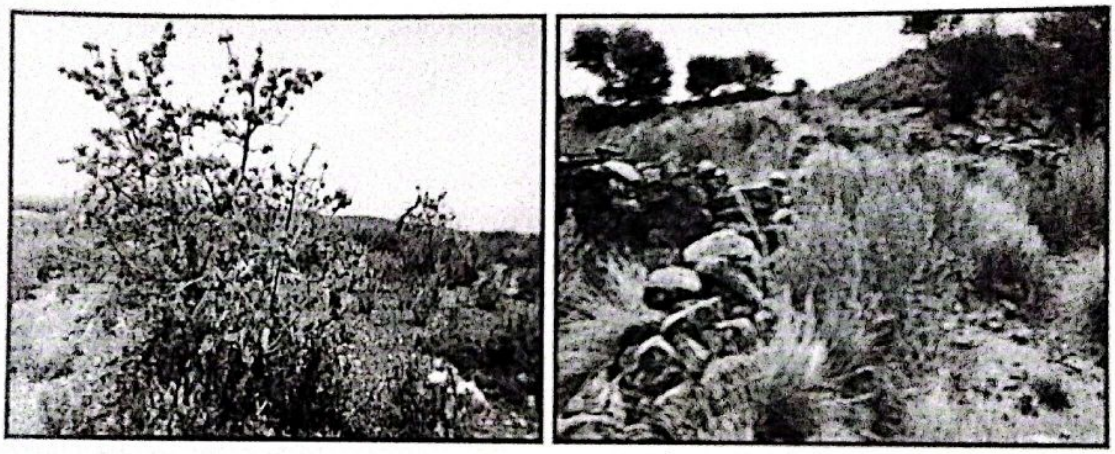

Figure 6-7: Flora in Chakwal

6.3.7 Fauna

The species which exist in various areas of Chakwal district are Grey partridge which is found all over the district, especially in sparsely populated areas, Black partridge found along the seasonal channels and water holes in the Bellas throughout the district, Chakore mostly found in dry rocky areas in the district, especially in the ChoaSaidan Shah area, See partridge are found at a number places in the district in the dry rocky area, especially in the Kallar Kahar mountain belt leading into subdivision Talagang.

6.3.7.1 Birds

There are a total of 121 avian species have been recorded from project areas during all field visits. Out of the total recorded species, 89 are residents of Punjab and 32 are migratory species. As far as, their abundance is concerned, 69 species are common, 34 are abundant, 12 are less common and six are rare species.

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Out of the total 121 recorded avian species, 19 species are protected under the Punjab Wildlife (Protection, Preservation, Conservation, and Management) Act, 1974 (Amended 1991), three are on the IUCN Red list, four are covered by CMS, whereas 17 are listed on CITES appendices.

6.3.7.2 Mammals

There are 24 mammalian species have been recorded from project areas. Out of these 7 are protected under the Punjab Wildlife (Protection, Preservation, Conservation, and Management) Act, 1974 (Amended 1991), two species are on IUCN Red Listand seven are listed on CITES appendices due to demand for international trade.

6.3.7.3 Reptiles

There are a total of 20 reptiles in the project area/Chakwal. So out of these 20 species, 10 belong to lizards and the same number of snake species. Out of the total recorded species, 9 are protected under the Punjab Wildlife (Protection, Preservation, Conservation, and Management) Act, 1974 (Amended 1991), while 6 are listed in CITES appendices.

6.3.7.4 Species of Concern/Species of Interest

From the observations of current project sites, none of the wildlife species including birds, mammals, and reptiles may be categorized as species of concern. However, among the recorded species, raptors/ birds of prey are of ecological importance being on top of the food chain. The game birds like Black partridge, and Grey partridge, may be considered species of interest for shooting during the winter season.

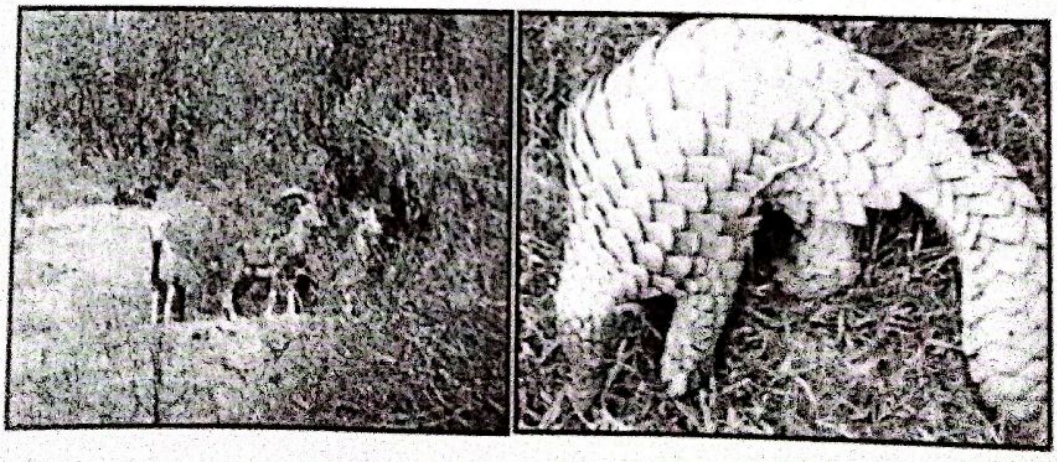

Figure 6-8: Fauna in Chakwal

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6.4 Socio-Cultural Environment

This section provides a detailed discussion of the socio-economic and socio-cultural environment of the local community in the project.

6.4.1 Population and Communities

6.4.1.1 Demographic Data

District Chakwal is consisting of 5 Tehsils and 72 union councils. There are 8 urban and 64 rural union councils in the district.

Table 6-2: Administrative Division of Chakwal District

Name of Tehsil	No. of Union Councils	No. of Villages	No. of Public Schools	No. of Police Stations	No. of Post Offices
Chakwal	30	207	523	5	48
Kallar Kahar	8	72	148	1	15
ChoaSaidan Shah	7	47	96	1	14
Talagang	17	76	318	3	30
Lawa	6	18	119	1	11
Total	68	420	1204	11	118

6.4.1.2 Population

The population of Chakwal district is estimated at 1,351,000 in 2013 which gives a population density of 205 persons per square kilometer. The total population of the district was 1,083,725 in 1998 with a density of 166 persons per square kilometer. According to the 1998 census, the urban population was 12.2% of the total population and 87.8% population was the rural population. In the year 2013, it is estimated that the urban population is 14% and the rural population is 86%. As per the 1998 census, the male population of the district was 52% and the female population was 48% of the total population. 44% population is estimated below the age of 15 years.

Punjabi (Potohari) is the predominate language being spoken in the district representing 97.7% of the population followed by Pushto spoken by 1.2%, Urdu by 0.9%, and Siraiki 0.2% while other speaks Sindhi, Balochi, Bravi, Dari, etc. 80% of the population living in Chakwal District is ethnically Punjabis of Aryan origin. The remaining 20 % are Jatts, Khokhars, JattBhuttas, Awans, Mair Minhas, Kahuts, Janjuas, Mughal Kassars, Gujjars, Syeds, Gondals, Sheikhs, and Awans.

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Table 6-3: Detail of Population according to Provisional Census

District	Household	Population 2017					Sex Ratio	1998-2017 Average Annual Growth Rate
		Male	Female	Transgender	Population 2017	Population 1998		
Chakwal	266,109	724,205	771,744	33	1,495,982	1,083,725	93.84	1.71
Rural	217,585	582,201	629,836	5	1,212,042	909,935	92.44	1.52
Urban	48,524	142,004	141,908	28	283,940	173,790	00.07	2.61

6.4.2 Economy& Industries

Agriculture is the main activity of the district Chakwal. Farming and farm-related activities are the main occupations of the district. Livestock is kept on a large scale. Chakwal is the most recruiting area of the armed forces there is a huge number of people serving in the armed forces from Chakwal.

There are considerable deposits of minerals in the district Chakwal especially coal reserves in the area of Chao Saidan Shah. There are about 246 coal mines exist in Chakwal. There are also reserves of limestones and marble in Chakwal. There are 4 cement factories are established in the district Chakwal. People are also employed in the mining and cement industries.

The various minerals which exist in different places are Argillaceous Clay, Antimony, Copper, Gold, Gemstone, Lime Stone, Dolomite, Bentonite, Fireclay, Marble, Rock Salt, Coal, Crude Oil, and Natural Gas, Brine, Silica Sand.

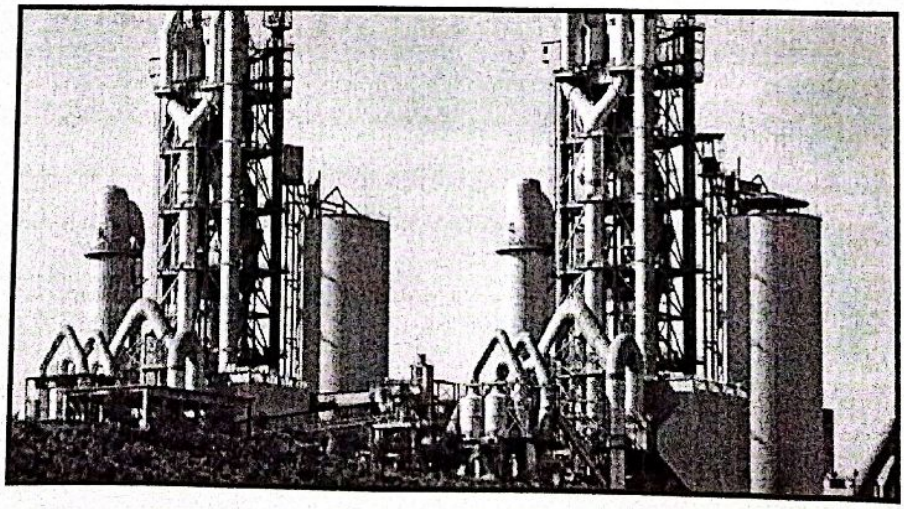

Figure 6-9: Bestway Cement Industry in Chakwal

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6.4.3 Education

Chakwal has a total of 1,199 government schools out of which 52 percent (627 schools) are for female students. The district has an enrolment of 181,574 in public sector schools. The literacy rate of the district is 67%.

6.4.3.1 Important Educational Institutions

- UET Taxila (Sub Campus Chakwal)
- Government Post Graduate College (Chakwal)
- Government College for Women (Chakwal)
- Cadet College Kallar Kahar
- Cadet College ChoaSaiden Shah
- Misali Pre-Cadet College
- Government College of Technology Chakwal

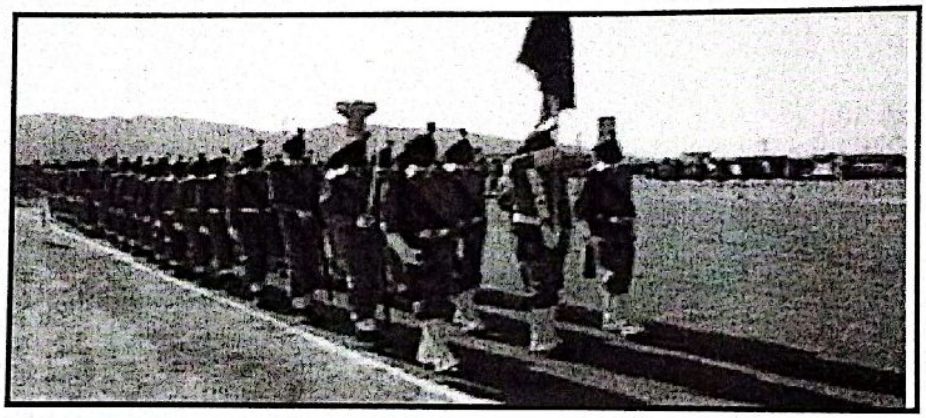

Figure 6-10:Cadet College in Chakwal

6.4.4 Employment

The unemployment rate is approximately 25 - 30% in the workforce between 18-55 years. About 12% of the family members work outside the village. They are engaged in education, health, the army, police, and other government departments as well as working in the private sector. Child and student labor is common, especially in the mining sector. The agriculture, livestock, poultry, and mining industry is providing skilled and unskilled jobs. An emerging sector is concrete block manufacturing. Due to the availability of cheap raw materials of stone crush and dust, several factories and units are being established in the area. About 5.4% of the population receives remittance from outside of the town within Pakistan while 6.5% of the people receive foreign remittance.

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6.4.5 Housing

About 77% of the population has pacca houses with finished pacca walls. 95% of the population has houses and 46% of the total population has landed and 54% of the population has the ownership of livestock. The average household size is 6.0 persons per household. There is about 3.0 person per room occupancy. The houses are constructed on uncultivated land.

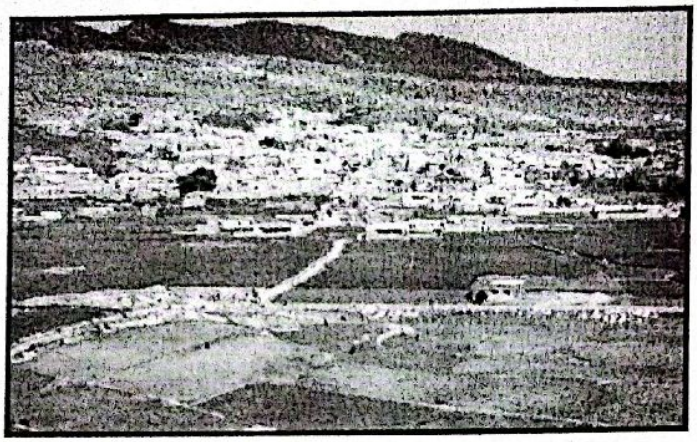

Figure 6-11: Housing in Chakwal

6.4.6 Mining Industry

Chakwal District is rich in the endowment of mine and Mineral resources. It is one of the major sectors contributing to the economy of the area. A significant segment of the population is directly or indirectly engaged in employment with mining activities. Out of the total workforce, a predominant majority of the labor force comprises skilled labor from KPK Provincial and other Districts, who work in this area. This specialized labor plays important role in this industry. The mining activities are not only contributing to the local economy but also providing jobs to the labor force from other provinces. The labor force emigrated from other cities and provinces have settled in Tehsil ChohaSaiden Shah and Chakwal. The town of the ChohaSaiden Shah has witnessed demographic changes due to the settlement of the mining labor force. The local and immigrant population is almost equal population size in ChohaSaiden Shah. The Mining Training Institute at ChohaSaiden Shah is catering to the need for technical staff for the mining industry, not for this area but other parts of the country also. There are five cement factories presently working in ChohaSaiden Shah and Kallar Khar, tehsil besides the ICI factory in Khewara. These factories are providing jobs to the local population and contribute to the economy of the area.

The names of these factories are as under:

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- Best Way Cement Factory at Katas Raj
- D.G. Cement Factory at Khairpur
- Pak Cem Factory at Kallar Kahar
- Gharibwal Cement Factory at Gharibwal
- Dondat Cement Factory at Dondot

6.4.6.1 Type of Mining Industry

The district has a deposition of Coal, Rock Salt, Gypsum, Limestone, Iron Ore and Laterite, Dolomite, and Silica Sand. However, the major mining deposits comprise coal and Rock Salt.

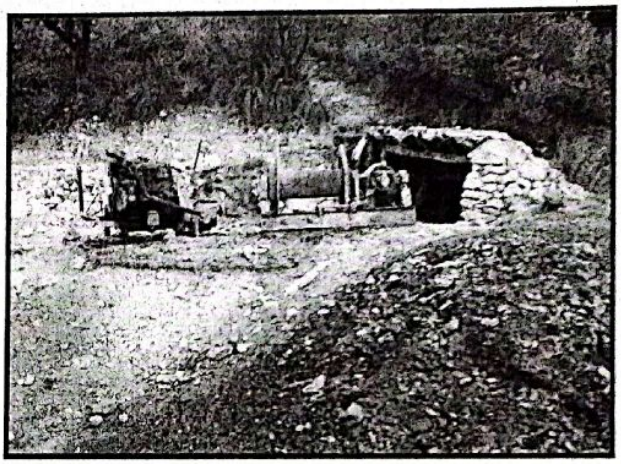

Figure 6-12: Mining in Chakwal

6.4.7 Cultural and Aesthetic Values

Because of limited income, most of the common people live marginalized statuses of life. Agriculture and work in industries are the main livelihood-earning sources with limited land holdings. Old traditional and simple life typical of the Punjab villages is the prevailing cultural and aesthetic characteristic of the lifestyle of the majority of the people. Despite all the modernized way of style even now virtually elders are responsible to make decisions and the decision is valued by the family members. Elderly people command respect and are the deciding factor in most decisions.

Print and electronic media are influencing almost all walks of life of people of all categories. There is a lot of awareness about the value of education. Rich or poor, all families are trying hard to get their children educated. Mostly joint family system prevails and people reap the fruits of this system. Most of the families are quite coherent. There is a rising trend in society to change their old traditional socioeconomic pattern of life. Print and electronic media are playing a great role in bringing tangible change to the old pattern of life.

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6.4.8 Infrastructure

The area is supplied electricity from the National Grid by Islamabad Electric Supply Company. All bigger villages are connected through roads and ultimately to National Highway and Motorway. A variety of private road transport in the form of buses and wagons are available to a reasonable extent. Other services like Sui Northern Gas, Telephone, etc., are also available in the area.

6.5 Site Suitability

The site suitability analysis of the study area was done by different techniques and it was recommended that the project area has great value in the case of the coal resources and this could be considered a good step towards a better spatial understanding of the coal resources in the study area. However, taking advantage of these available resources no conflicts implies with other land use interests. There are no ecological important species found at the site. Thus the site is not prohibited by any means and a lease from the concerned mines and mineral department has already been obtained.

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7 IMPACT ASSESSMENT AND MITIGATION

7.1 Methodology

To clarify the purpose and limitations of the impact assessment methodology, it is necessary to address the issue of subjectivity in the assessment of the significance of environmental impacts. Even though Digby Wells and the majority of environmental impact assessment practitioners propose a numerical methodology for impact assessment, one has to accept that the process of environmental significance determination is inherently subjective. The weight assigned to each factor of a potential impact, and also the design of the rating process itself, is based on the values and perception of risk of members of the assessment team, as well as that of the I&APs and authorities who provide input into the process. Whereas the determination of the spatial scale and the duration of impacts are to some extent amenable to scientific inquiry, the severity value assigned to impacts is highly dependent on the perceptions and values of all involved.

It is for this reason that all EIA's must refer to the environmental and socio-economic context of the proposed activity to reach an acceptable rating of the significance of impacts. Similarly, the perception of the probability of an impact occurring is dependent on perceptions, a version of risk, and the availability of information.

7.2 Impact Identification

Impact identification is performed by use of an Input-Output model which serves to guide the assessor in assessing all the potential instances of ecological and socio-economic change, pollution, and resource consumption that may be associated with the activities required during the planning, operational, closure, and post-closure phases of the project. These activities were listed below:

Phase	Sr No.	Activity
Development	1	Site Clearing: Removal of topsoil &vegetation
	2	Construction of any surface infrastructure e.g. haul roads, pipes, stormwater diversion berms (including transportation of materials & stockpiling)
Operational	3	Operation and maintenance of Infrastructure
	4	Removal of overburden and backfilling when possible (including drilling/blasting hard overburden & stockpiling)

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Decommissioning	5	**Use and maintenance of haul roads (incl. transportation of coal to washing plant)**
	6	**Concurrent replacement of overburden, topsoil, and revegetation**
	7	**Demolition & Removal of all infrastructure (incl. transportation off-site)**
	8	**Rehabilitation (spreading of soil, re-vegetation & profiling/contouring)**
	9	**Installation of post-closure water management infrastructure**

Outputs may generally be described as any changes to the biophysical and socio-economic environments, both positive and negative, and also include the product and waste produced by the activity. Negative impacts could include gases, effluents, dust, noise, vibration, other pollution, and changes to the bio-physical environment such as damage to habitats or reduction in surface water quantity. Positive impacts may include the removal of invasive vegetation, construction of infrastructure, skills transfer, or benefits to the socio-economic environment. During the determination of outputs, the effect of outputs on the various components of the environment (e.g. topography, water quality, etc.) is considered.

During the consultation with I&APs, perceived impacts were identified. These perceived impacts will become part of the impact assessment and significance rating to differentiate between probable impacts and perceived impacts.

7.3 Impact Rating

The impact rating process is designed to provide a numerical rating of the various environmental impacts identified by the use of the Input-Output model. As discussed above, it has to be stressed that the purpose of the EIA process is not to provide an incontrovertible rating of the significance of various aspects, but rather to provide a structured, traceable, and defendable methodology of rating of the relative significance of impacts in a specific context. This gives the project proponent a greater understanding of the impacts of his project and the issues which need to be addressed by mitigation and also gives the regulators information on which to base their decisions.

The significance rating process for impacts follows the established impact/risk assessment formula:

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Significance = Consequence x Probability

Where

Consequence = Severity + Spatial Scale + Duration

And

Probability=Likelihood of an impact Occurring

The matrix calculates the rating out of 147, whereby Severity, Spatial Scale, duration, and probability are each rated out of seven as indicated in Table 7-1. The weight is assigned to the various parameters for positive and negative impacts in the formula.

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Table 7-1: Impact assessment parameter ratings

Rating	Severity	Spatial scale	Duration	Probability
7	Very significant impact on the environment. Irreparable damage to highly valued species, habitats, or ecosystems. Persistent severe damage.	International The effect will occur across international borders	Permanent: No Mitigation No mitigation measures of the natural process will reduce the impact after implementation.	Certain/ Definite. The impact will occur regardless of the implementation of any preventative or corrective actions.
6	Significant impact on highly valued species, habitat, or ecosystem.	National Will affect the entire country	Permanent: Mitigation Mitigation measures of natural processes will reduce the impact.	Almost certain/Highly probable It is most likely that the impact will occur.
5	Very serious, long-term environmental impairment of ecosystem function that may take several years to rehabilitate	Province/ Region Will affect the entire province or region	Project Life The impact will cease after the operational lifespan of the project.	Likely The impact may occur.

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4	Serious medium-term environmental effects. Environmental damage can be reversed in less than a year	Municipal Area Will affect the whole municipal area	Long term 6-15 years	Probable Has occurred here or elsewhere and could therefore occur.
3	Moderate, short-term effects but not affecting ecosystem functions. Rehabilitation requires the intervention of external specialists and can be done in less than a month.	Local Local extending only as far as the development site area	Medium-term 1-5 years	Unlikely Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur.
2	Minor effects on the biological or physical environment. Environmental damage can be rehabilitated internally with/ without the help of external	Limited Limited to the site and its immediate surroundings	Short term Less than 1 year	Rare/ improbable Conceivable, but only in extreme circumstances and/ or has not happened during the lifetime of the project but has happened elsewhere. The possibility of the impact

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	consultants.			materializing is very low as a result of design, historic experience or implementation of adequate mitigation measures
1	Limited damage to the minimal area of low significance, (egadhoc spills within plant area). Will have no impact on the environment.	Very limited Limited to specific isolated parts of the site.	Immediate Lessthan1month	Highly unlikely/None Expected never to happen.

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7.4 Summary Of Environmental Impact Ratings

The following are the most potentially significant negative impacts (higher than the significance of 75) that have been determined by the above methodology for each phase.

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Activity, Phase, and Impact				Pre-mitigation						Post-mitigation					
Wetlands	C	1	Site Clearing	5	4	5	14	7	98				0		0
	C	2	Construction surface infrastructure	5	4	5	14	7	98				0		0
	O	3	Operation and maintenance of infrastructure	5	4	3	12	7	84				0		0
	O	4	Removal of overburden and backfilling when possible	5	4	3	12	7	84				0		0
Visual /topography	C	1	Site Clearing	5	3	4	12	7	84	5	3	3	11	5	55
	O	3	Operation and maintenance of infrastructure	5	4	5	14	7	98	5	4	4	13	7	91
	O	4	Removal of overburden and backfilling when possible	5	4	5	14	6	84	5	4	4	13	6	78
Air Quality	O	4	Removal of overburden and backfilling when possible	5	3	3	11	7	77				0		
	O	5	Use and maintenance of haul roads	5	3	3	11	7	77				0		0
	O	6	Concurrent replacement of overburden, topsoil land revegetation	5	3	3	11	7	77				0		0

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8 SCREENING OF ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

8.1 General

Any human activity in any environment produces impact, modifying it to a status that is considered adverse or beneficial according to the damage or improvement it brings about in the physical, chemical, and biological status of air, water, land including biota and in socio-cultural lifestyles and economy of the populace it affects. Depending on the nature of activities and existing status, the impacts are assessed for their importance. Based on the impact analysis, the mitigating action and future monitoring requirements are focused on the Environmental Management Plan for counting or minimizing adverse impacts.

8.2 Project Location

The project site is situated near the Maghal, District Chakwal. Minerals, such as Coal, Gypsum, Limestone, Shale, Iron ore, and many others are being mined as well as near the exploration area.

8.3 Identification Of Potential Environmental Issues

The environmental issues identified during the site visits and discussion are enumerated in Table 8-1.

Table 8-1 Environmental Impacts And Their Discussion

Environment components	Environmental Issues	Description
Water resources	Channel Water Quality	Since the Coal does not flow into the channels, the quality of water is not affected. Hence, this impact is nil.
	Channel Water Discharge	The mining operation will not interrupt the flow of water into water channels. Hence, the flow of water in the channels will remain unchanged. On account of this finding, this will cause no impact on the channel water flow.
	Groundwater Quality and Level	The coal mining operations will not affect the quantity/ level of GW. Pumping is

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		sometimes needed in the rainy season. The quality of GW will remain unchanged as there is no introduction of any contaminant into the GW during coal mining.
	River Degradation	The question of river degradation arises case if any river is present within the close vicinity of the mine. No river is present within a safe distance from the project area. Hence, no river degradation will take place.
	Surface Run-Off	Because of the coal mining operations underground, the surface topography is not being disturbed, and hence no obstruction to the surface run-off. Thus, this impact will be insignificant
	Drainage	The mining area lies on the naturally developed crisscross drainage pattern and doesn't disturb its ecology, pattern, and flow. Thus, this impact will be nil.
Land Resources	Soil salinity	The coal mining operations will not add any saline materials into the soil. Thus, there will be no effect on the soil salinity.
	Soil erosion	The coal mining operations will be carried out underground. The type of coal mining is underground coal mining. As all the mining activities will be operated underground, hence, no impact on soil erosion is observed.
	Land use change	The areas where the mining will be done are of no use. Most of the proposed coal mining sites are abandoned. So, there

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		won't be any loss or degradation of productive land. Moreover, the coal is being extracted underground making no change on the surface. Hence, there will be no impact on the land use of the site.
	Land utility/productivity	The mineral is being worked underground and after the extraction of the mineable reserves, the area will be available for the use of geo tours. Hence, this impact will be positive.
Climate	Microclimate changes	After mining the coal, the plantation will help in improving local climatic conditions to some extent. This impact will be positive.
Atmosphere	Dust and air emissions	Coal mining operations will be carried out underground. The small quantity of dust will be generated only at underground locations. Dust will not be generated during the loading of coal in trucks for its transportation to the markets as coal is in lumpy form. Hence, this impact will be negligible. Some additional measures will be taken to reduce dust emissions.
	Noise and vibration	The sources of noise generation are generators, vehicular movement, and drilling & blasting activities. All these operations will be carried out under a controlled environment and do not exceed the threshold limit of 80 dBA. Hence, this impact is nil.
Waste Generation	Wastewater	The mining operations incidentally are carried out through such rock structures which do not provide access to water

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		ingress in the mines. The question of effluents, therefore, doesn't arise. This impact is nil.
	Solid waste	The solid waste generated at the mine site is partially dumped underground in the extracted coal chambers which may act as packing the support system for wall stability. Hence, this impact will be negative.
Flora	Forest/ trees	The project area is devoid of any forest cover. Scant wild species are found. There are no trees except some small size bushes on the project site not worth mentioning. Therefore, there is no question of tree cutting during the operation of the project as well. The forest reserves are at a safer distance from the lease area. Hence, no impact is envisaged.
	Other terrestrial vegetation	Insignificant vegetation is growing in the area. Hence, there will be no impact on this parameter.
Fauna	Mammalscommunities /habitats	Only wild mammalian species are found. On extraction of coal underground, these species will rarely migrate to nearby areas. Hence, this impact will be temporary and insignificant.
	Reptiles communities /habitats	Reptile species will not be migrated and affected due to underground coal mining operations. Hence, these species will remain un-effected. The impact on these species will be negligible

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Social	Population	The population is likely to increase at a national growth rate. Hence, a positive impact is envisaged.
	Land ownership	On completion of mining, the lease area land will available for geo-tours. The impact will be positive.
	Land lease	As the mineral resources belong to Provincial Government which will enable mineral exploitation and add government revenue. The overall impact is positive.
	Social cohesion/attitude	The project has added interwoven knitwear awareness. The group of people working from the local area will have more social inter-woven cohesion and interdependence for economic survival. The impact is positive.
	Food/Nutrition	There will be a positive impact since more resources will be available for the purchase of foodstuff.
	Health	The health of residents of nearby villages and workers will not be affected due to mining operations and activities. This impact is not significant.
	Education	On improvement of income level, people will send their children to educational institutions. Hence, this impact will be positive.
Economic	Income level	The project has a positive impact on the income levels of the locals. The people of other parts of the country will also benefit from this project.

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	Employment	The mining operations employ locals from nearby villages. Hence, the job avenues will increase for the locals. This impact is positive.
	Land value	During the tenure of the mining project life, the land value will escalate and may stabilize during the post-mining operation. Hence this impact is positive
Institutional	Institutional Activities / Effectiveness	Various governmental and non-governmental offices will become more active due to this activity. There will be a positive impact
Human use	Cultivation and Livestock	As the area is non-agriculture, hence the livestock will not have greasing ground. This impact is nil
	Afforestation	Different plant species will be planted within the vicinity of the project area to enhance the environmental conditions of the project area. Hence, this impact will be positive
	Domestic water supply	The project is located well away from the nearby towns/ villages. The project will not affect the quality and quantity of water supply to communities in the surrounding areas. This impact is nil.
	Community development	The proponent is already on the supportive grid of the community welfare programs. Hence, this impact will be positive.

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Resettlement and relocation	Dislocation of population	The project does not involve any dislocation of the local people. So, there will be no impact.
	Loss of property and infrastructure	No movable or immovable property of public and private sectors will be lost during mining operations. Hence, this impact will be nil
	Resettlement of affected communities	There is no requirement for resettling even a single individual of the community as there will be no loss of property or relocation. Therefore, this impact will be nil.

8.4 Anticipated Environmental Impacts Related To Project Design

The impacts related to design incorporate the impacts resulting from the underground short wall mining method. The overall impacts resulting from underground coal mining operations are discussed below.

- **Dust Generation**

  Dust may be generated during the extraction of coal from the coal face either manually or through continuous mining. It may also be generated during the haulage of coal to the surface.

- **Higher Noise Levels**

  Higher noise levels and vibrations due to the operation and movement of carts or continuous miners underground and drilling is being carried out in case of hard rocks.

- **Solid Waste and Wastewater**

  No solid waste and wastewater will be generated underground due to the mining method. The solid waste generated at the mine site underground is partially dumped underground in the extracted coal chambers which may act as packing material and support system for wall stability. The shales associated with coal are generally dumped outside close to the mine mouth. These shales have impregnation of alum. This impregnation mixed with water is a supporting mixture for vegetation growth. Hence, this impact is negligible.

- **Loss of Vegetation**

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As the coal mining method is underground. Therefore, there will be no loss of vegetation due to this neither at the surface nor underground. This impact is negligible in this case scenario.

Preventive Measures

- Use of PPEs (face masks etc.) will be ensured by the mine operators and staff working at the coal face.
- Use of PPEs (noise suppression equipment-ear mufflers etc.) will be ensured by the workers where noise levels are higher than 85 (dBA).
- Underground working carts/miners' speed limit will be maintained to avoid excessive vibrations.
- Regular maintenance of underground equipment will be ensured.

8.5 Environmental Problems Associated With The Development Stage

The impacts of the development of the mine include the impacts resulting from; the construction of pavements, the establishment of workers' camps at safe sites and distances, land clearing and leveling, drilling, surveying, etc. The impacts resulting from these activities mainly include:

8.5.1 Dust Generation

Dust may be generated due to the movement of machinery and vehicles at the site for mining purposes. Dust may be generated during access road development, land clearing, leveling, etc. The mines are located in far-flung areas away from the population. Mining concedes with mountainous region void of population. Any access to the mineral deposit is done through a jeep-able road which is improved by placing the shingle on top to avoid the muddy and slippery situation. The movement of the truck on these "Katcha Roads" provides a phenomenal dust fanning which is rarely visible or seen. Hence the impact is almost nil.

8.5.2 Higher Noise Levels

Higher noise levels and vibrations may be caused due to the operation and movement of heavy machinery and vehicles at the site and drilling is being carried out in case of hard rocks.

8.5.3 Loss of Vegetation

Vegetation may be lost due to land clearing and leveling if comes in the direct way of mining activities.

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8.5.4 Solid Waste and Wastewater Generation

Solid waste and wastewater may be generated from labor camps and offices. It will be disposed of as per the standards of TMA.

8.5.5 Community Amenity

Disturbance to the nearby community may be occurred due to dust and noise generation. Noise is associated with project operations. Excessive dust impacts may be harmful to some people, for example, with some experiencing respiratory conditions. The paving of the road in the mountainous region is done through backhoe machines and not through drilling and blasting. The labor huts are placed in a contagious block close to the mines keeping in view the safety, and vigilance of the workers encamped. The mining leases/ license are granted by Mines and Minerals Department while access to the lease to the surface is left to the lessee and surface land owner for settlement. These local people, blackmail the lessees to the last extent and are the biggest stumbling block.

Preventive Measures

- Controlled water sprinkling will be ensured to reduce PM10.
- Maintain appropriate buffers between the site and receptors.
- Use of PPEs (face masks etc.) will be ensured by the mine operators and staff
- Use of PPEs (noise suppression equipment-ear mufflers etc.) will be ensured by the workers where noise levels are higher than 85 (dBA).
- Development activities will be ensured during the daytime when background noise levels are high.
- The vehicle speed limit will be maintained to avoid excessive vibrations.
- Regular maintenance of machinery will be ensured.
- Cutting down vegetation and trees will be avoided as far as possible.
- Afforestation will be carried out as maximum as possible.
- Solid waste will be managed efficiently. Solid waste at the site will be stored in containers covered with a lid.
- Waste water will be disposed of as per the standards of TMA

8.6 Environmental Problems Associated With The Operational Stage

The potential environmental impacts resulting during the operational phase of the project and their possible mitigation measures are given below

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8.6.1 Noise Pollution

Increased noise levels due to the use of heavy machinery such as tractors for the transportation of extracted coal.

- Disturbance to workers and residents.
- Drilling and Blasting

Mitigations

For Drilling and Blasting

- All blasting operations will be carried out in compliance with conditions as specified in Coal Mines Regulations, 1926. The area where blasting is being carried out will be fenced properly.
- To avoid noise problems and disturbance to the community, blasting will be carried out on specified days and between specified times.
- Proper monitoring of blasting operations will be carried out by the manager or concerned persons.

For Noise

- Use of PPEs (noise suppression equipment-ear mufflers etc.) will be ensured by the workers where noise levels are higher than 85 (dBA).
- Mining activities will be ensured during the daytime when background noise levels are high.
- The vehicle's speed limit will be maintained to avoid excessive vibrations.
- Regular maintenance of machinery will be ensured.

8.6.2 Air Quality

- Dust generation due to the movement of trucks and vehicles
- Drilling and Blasting

Mitigation Measures

- Maintenance of buffers between the site and receptors.
- Controlled water sprinkling will b ensured to reduce PM10.
- Use of PPEs (face masks etc.) will be ensured by the mine operator and staff.
- To prevent air quality, blasting may not be carried out in extreme weather conditions, if practical/possible.

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8.6.3 Wastewater

- The mining operations incidentally are carried out through such rock structures which do not provide access to water ingress in the mines. The question of effluents, therefore, doesn't arise.
- The domestic wastewater will be generated from camp offices and labor activities.

Mitigation Measures

The domestic wastewater generated from the camp office should be disposed of as per the standards of TMA if applicable.

8.6.4 Solid Waste

- The solid waste generated at the mine site is partially dumped underground in the extracted coal chambers as well as packing the support system for wall stability while the remaining rock waste is dumped on the hill slope without disturbing the natural drainage pattern.
- Solid waste from campsites will be produced by labor activities.

Mitigation Measures

- A proper waste management plan will be developed. The vegetation of the coal waste dumps happens to be a mitigation measure for the coal waste dumps already developed
- Littering will be prohibited at the site.
- Containers will be emptied before they reach their carrying capacity.
- Waste will be stored at the site in covered containers.

8.6.5 Acid Mine Drainage

- Damage to aquatic life
- Risks to human health
- Soil contamination
- Surface and groundwater quality contamination

Mitigation Measures

- The water peculating in the mines is through limestone beds which are nonacidic.
- The metalliferous mines having sulfide ores can have the chance of acidity. In such cases, the pumps used are especially galvanized for rotors, or screw-type pumps are used having impregnation of rubber. In the case of muddy mines pulsatory pumps are used which are non-rotating and take care of the acidity factor if

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available. Once the pumping is done, the water stored on the surface tank is mixed with a fine dust of calcium carbonate powder to mitigate its acidic factor.

8.6.6 Flora

The project area is devoid of any forest cover. There are no trees except some small size bushes on the project site not worth mentioning. Therefore, there is no question of tree cutting during the operation of the project as well.

Mitigation Measures

Nill

8.6.7 Fauna

Temporary migration of mammals and birds from the area.

Mitigation Measures

This impact is temporary and no significant mitigation measures are required.

8.6.8 Endangered Species

There are no endangered species found in the project area, hence this impact will be negligible.

Mitigation Measures

Nill

8.6.9 Community Amenity

- Dust and visual amenities
- Excessive dust impacts may be harmful to some people, for example, with some experiencing respiratory conditions.
- Noise associated with coal mining activities and traffic

Mitigation Measures

- Adopt and maintain good management practices.
- Maintain appropriate buffers between the site and receptors.
- If these buffers include vegetative screens, they have the added benefit of providing improvements in visual amenities

8.6.10 Mine Workers Health and Safety.

- Health and safety risks to workers due to explosion underground, formation of sinkholes, etc.
- Damage to workers' health can cause fatal injuries as well.

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Mitigation Measures

- Provision of first aid facility.
- Provision of safety training to mine workers and staff.
- Prohibition for use of drugs and narcotics at coal face underground.
- Provision of Personal Protective Equipment to workers and staff working underground near the coal face.

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8.7 Mine Workers' Health And Safety

Coal mining deep underground involves a higher safety risk than coal mined in opencast pits due to problems associated with mine ventilation and the potential for mine collapse. However, there are safety risks associated with all forms of coal mining. Mining explosions are a safety risk in underground mining. Methane released from the coal seam and surrounding rock strata during the process of mining can present a high risk of explosion at concentrations in air of 5-15%. The proponent has not been deemed to have methane gas.

8.7.1 Preventive Measures

The employment of a worker is regulated through Labor Laws. Safety and health are regulated through the enactments of the Mines Act 1923 and its subordinate laws. The mines are under the control of qualified mining engineers who conducted the mining operations as per legal requirements and SOPs. The super-inspection is carried out by the Regulatory Staff appointed under the Chief Inspectorate of Mines. The medical staff appointed under the Chief Inspectorate monitors sanitation, hygiene conditions as well as health protection of mine workers at mines.

8.7.2 Provision of First Aid Facility

At the workplace workers and employers have enough information, knowledge, and training regarding first aid treatment in case of an emergency. The Inspectorate of Mines in collaboration with Halal e Ahmed and local medical staff arrange refresher courses for First Aid. The employees of the company take due advantage of such opportunities along with other companies.

8.7.3 Safety Training

Workers and all the staff is provided with proper training about work and safety practices. Regular training courses are being organized by the training wing of the Inspectorate of Mines Punjab and the Pakistan Mine Owners Association. The lessee sends its trainees for such courses subject to available seats.

8.7.4 Use of Drugs and Narcotics

Drugs and narcotics are strictly prohibited. Smoking will be only allowed in rest timings at properly isolated places.

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8.7.5 Provision of Personal Protective Equipment

To control any health and safety risk and to reduce the magnitude of any adverse impact, the workers are required by law to have the PPEs such as safety helmets, safety goggles, rubber gloves, long shoes, safety lamps/torches, etc.

The company will provide the required PPE to its employees where required.

8.8 Emergency Response Plan (Erp) For Accidents/Collapses

ERP is prepared for underground coal mines to act in emergencies. Following are some of the objectives of ERP:

- To provide an effective response to emergencies.
- To develop responsibility levels and support coordination.
- To minimize the effect of emergencies on personnel, the surrounding communities, and on the public.
- To minimize injury; damage to the environment; property damage; damage to equipment; and losses to process that result from emergencies.
- To ensure timely communication and cooperation with the government and outside agencies.
- To provide suitable information to be conveyed to the public.
- Define the Emergency Response Team as the combination of site personnel in the area of the emergency, personnel from other areas, Mine Rescue Team, and other off-site emergency personnel as needed.

The Chief Inspectorate of Mines (CIM) is responsible for mine safety. Rescue stations are established by CIM in the mining areas. Emergencies are responded to through these rescue stations. Mines Labour Hospitals are also established in mining areas. All health and safety measures are made in compliance with the Mines Act, of 1923.

8.9 Potential Environmental Enhancement Measures

To enhance the environment the following measures will be adopted:

All vehicles used in coal mining will be regularly inspected and maintained.

- Extracted coal will be transported to the marketplaces according to proper management practices.
- Vegetative buffers will be maintained regularly to keep them in good condition.
- The labor force will be trained to use personal protective equipment to avoid any accident/ near miss at the site.

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- The vehicles used for the transportation of coal will be properly designed, covered, and cleaned to avoid any risk while departing to and from the project site.
- Extensive plantation will be done in and around the project site to enhance the environmental quality.
- Environmental Management and Monitoring Plan (EMMP) will be strictly operational throughout the project life. All monitored data will be reported to the EPA Punjab, Lahore for scrutiny at their end.

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9 ENVIRONMENTAL MANAGEMENT & MONITORING PLAN

9.1 Introduction

This section presents the environmental management plan (EMP) for the proposed project. The EMP specifies the mitigation and management measures that the Proponent will undertake and shows how the Project will mobilize organizational capacity and resources to implement these measures. The EMP covers information on the management and mitigation measures that will be taken into consideration to address impacts in respect of the operational phase of the project.

9.2 Objective

The objective of the Environmental Management and Monitoring Plan (EMMP) is to address all the major environmental issues and provide a framework for the implementation of the proposed mitigation measures during the operational phase of the project. The proper implementation of the EMP will ensure that all the adverse environmental impacts identified in the EIA report are adequately mitigated, either prevented or minimized to an acceptable level, and that required actions to achieve those objectives are successfully adopted by the concerned institutions or regulatory agencies. The EMMP provides a delivery mechanism to address potential impacts of the project activities, enhance project benefits and introduce standards of good practice to be adopted for all project works. The EMMP has been prepared with the objectives:

- Defining the roles and responsibilities of the project Proponent for the implementation of EMMP and identifying areas where these roles and responsibilities can be shared with other parties involved in the execution and monitoring of the project.
- Outlining mitigation measures required for avoiding or minimizing potential impacts assessed in the EIA report.
- Developing a monitoring mechanism and identifying requisite monitoring parameters to confirm the effectiveness of the mitigation measures recommended in the EIA report.
- Defining the requirements for communication, documentation, training, monitoring, management, and implementation of the mitigation measures

9.3 Implementation Of EMMP

The implementation of EMMP should be carefully coordinated with the design and operational program of the project. This will ensure the implementation of relevant

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mitigation measures at the appropriate project stages. It will also ensure that adequate resources are properly allocated to achieve the desired results. This EMMP has been prepared to satisfy the requirement of "IEE and EIA Regulations, 2022"

9.4 Environment Management Team

The following functionaries will be involved in the implementation of EMMP:

- The project Proponent is the owner of the EMMP.
- Project contractor(s) as executors of the EMMP during the installation and operational phase of the project.
- Operational & Maintenance (O&M) and the Health, Safety, and Environment team of the project as an executor of the EMMP during the installation and operational phase of the project.

Table 9-1: List of Individuals and their Responsibilities

Designation	Responsibilities
Manager	↓ Direct operations at the site. ↓ He will act as a team lead. ↓ Interact with other executives, mine staff, and community residents. ↓ Effectively motivate staff to follow protocols and to work productively. ↓ Look after the Health and Safety Related issues. ↓ Responsible for scheduling staff and ensuring that supplies are stocked. ↓ He will play a direct role in developing business goals for the mine they run, and he will help to produce a business plan to ensure that those goals are met.
Accountant	↓ Proper management of the funds for the CSR. ↓ Development of fund proposal for environment-related expenses. ↓ Ensuring the smooth transaction of funds for environmental-related projects/activities. ↓ He will prepare the yearly budget. ↓ Taking minutes in meetings and other administrative duties. ↓ During his shift timings, he will be responsible to look into the smooth functioning of the process in an environmentally sustainable way. ↓ He will be responsible to rectify any problem regarding the environmental matter in collaboration with concerned authorities. ↓ Prepare reports on different events and incidents.

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- He will report all matters regarding E.M. to the manager.

9.5 Responsibilities Of Management Of Project

Management of the project will be responsible for environmental management and supervisory affairs during the project activities. Environmental personnel designated by the management of the project will look after the environmental-related issues during the project activities. The responsibilities of environmental personnel are as follows:

- Monitoring the progress of the project as per the planned schedule of activities.
- Exercising oversight over the implementation of environmental mitigation measures by the contractor.
- Documenting the experience in the implementation of the environmental process.
- Preparing training materials and implementing programs.
- Maintaining interfaces with the other lined departments/ stakeholders and
- Reporting to the management of the project on the status of EMMP implementation

9.6 Proposed Environmental Management And Monitoring Plan (EMMP)

The Environmental Management and Monitoring Plan (EMMP) will be used as a management and monitoring tool for the implementation of the mitigation measures identified in the EIA report. The EMMP matrix lists down:

- The required mitigation measures are recommended in the EIA report.
- The person/organization is directly responsible for adhering to or executing the required mitigation measures and monitoring adherence to the mitigation measures.
- The parameters will be monitored to ensure compliance with the mitigation measures.
- The timing at which the mitigation or monitoring has to be carried out.
- The budget allocated for management practices (cost of EMMP).
- Project Proponent will hold primary and overall responsibility for ensuring the full implementation of the EMMP.

9.7 Environmental Management Plan

The Environmental Management and Monitoring Plan have been provided for both the installation and operational phases of the project below:

9.7.1 EMMP for Installation Phase

Phase The EMMP for the installation phase of the project includes the following:

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- Air quality management & monitoring plan
- Noise management & monitoring plan
- Solid Waste Management & monitoring plan
- Health and safety management & monitoring plan

Table 9-2: Air Quality Management & Monitoring Plan for Development Phase

	Management Plan		Monitoring Plan		
SR#	Potential impacts	Management & Monitoring Measures	Timeframe	Responsible Party	
		Reduce Dust Emissions			
1.	Dust Emissions	Monitor speed limits of vehicles operating at the project site.	Throughout installation period	Proponent	
		Avoid installation activities in extremely dry weather.	Throughout installation period	Proponent	
		Sprinkle water at the site when necessary, to reduce dust spread.	Throughout installation period	Proponent & Contractor	
		Ensure the use of Personal Protective equipment by workers and staff.	Throughout installation period	Proponent & Contractor	
		Reduce Exhaust Emissions			
2.	Exhaust Emissions	Ensure minimization of Vehicle idling time.	Throughout installation period	Proponent & Contractor	
		Alternatively, fueled equipment shall be used where feasible equipment shall be properly tuned and maintained.	Throughout installation period	Proponent & Contractor	
		Give awareness to vehicle drivers and operators to avoid unnecessary racing of vehicle engines at loading/unloading points. Ensure that vehicles engines must be switched off at these points	Throughout installation period	Proponent & Contractor	

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Table 9-3: Noise Management & Monitoring Plan for Development Phase

Management Plan			Monitoring Plan	
SR#	Potential impacts	Management & Monitoring Measures	Timeframe	Responsible Party
		Minimization of Noise and Vibrations		
1.	Noise and Vibrations	Aware vehicle and machinery operators to switch off the engines of vehicles or machinery not being used to avoid excessive noise and vibrations	During installation period	Proponent & Contractor
		Sensitize drivers to avoid gunning of vehicle engines or unnecessary hooting, especially when passing through sensitive areas such as churches, mosques, residential areas, and schools.	Throughout installation period	Proponent & Contractor
		Ensure that machinery is kept in good condition to reduce noise generation.	Throughout installation period	Proponent & Contractor
		The noisy installation works will entirely be planned during day time when most of the neighbors will be at work	Throughout installation period	Proponent & Contractor

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Table 9-4:Solid Waste Management & Monitoring Plan for Development Phase

Management Plan			Monitoring Plan		
SR#	Potential impacts	Management & Monitoring Measures	Timeframe		Responsible Party
Minimization of solid waste generation and ensuring efficient solid waste management					
1.	Increased solid waste generation	Donate recyclable/reusable or residual materials to local community groups, and institutions.	During installation period		Proponent
		A proper waste management plan must be developed.	During installation period		Proponent
		Waste must be stored at the site in covered containers.	During installation period		Proponent
		Containers must be emptied before they reach their carrying capacity	During installation period		Proponent
		Littering must be prohibited at the site.	During installation period		Proponent
		Awareness will be given to the staff and workers about handling of solid waste at the site.	During installation period		Proponent
		Use of an integrated solid waste management system i.e. through a hierarchy of options: • Source reduction • Reuse • Recycling	Throughout installation period		Proponent & Contractor

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Use of durable, long-lasting materials that will not need to be replaced as often, thereby reducing the amount of waste generated over time.	Throughout installation period	Proponent & Contractor

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Table 9-5:Health and Safety Management & Monitoring Plan for Development Phase

Management Plan			Monitoring Plan	
SR#	Potential impacts	Management & Monitoring Measures	Timeframe	Responsible Party
		Minimization of occupational health and safety risks		
1.	Health and Safety Impacts	Implement all necessary measures to ensure the health and safety of workers and the general public during the installation of the project	Continuous	Proponent
		Suitable overalls, safety footwear, dust masks, gas masks, respirators, gloves, ear protection equipment, etc. should be made available and personnel must be trained to use the equipment.	Once off	Proponent & Contractor
		Ensure general safety and security at all times by providing day and night security guards and adequate lighting within and around the premises.	Continuous	Proponent
2	First Aid	Provision of well-stocked first aid boxes must be ensured within the premises of the project area.	One-off/as required	Proponent
		Provision must be made for persons to be trained in first aid	One-off	Proponent

9.7.2 EMMP For Operational Phase

The EMMP for the operational phase includes the following:

- Air quality management & monitoring plan
- Noise management & monitoring plan
- Solid Waste Management & monitoring plan
- Health and safety management & monitoring plan

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Table 9-6: Air Quality Management & Monitoring Plan for Operational Phase

	Management Plan		Monitoring Plan		
SR#	Potential impacts	Management & Monitoring Measures	Timeframe	Responsible Party	
		Reduce Dust Emissions			
1.	Dust Emissions	Monitor speed limits of vehicles operating at the project site.	Throughout operational period	Proponent	
		Avoid operational activities in extremely dry weather.	Throughout operational period	Proponent	
		Sprinkle water at the site when necessary, to reduce dust spread.	Throughout operational period	Proponent & Contractor	
		Ensure the use of Personal Protective equipment by workers and staff.	Throughout operational period	Proponent & Contractor	
		Reduce Exhaust Emissions			
2.	Exhaust Emissions	Ensure minimization of Vehicle idling time.	Throughout operational period	Proponent & Contractor	
		Alternatively, fueled equipment shall be used where feasible equipment shall be properly tuned and maintained.	Throughout operational period	Proponent & Contractor	
		Give awareness to vehicle drivers and operators to avoid unnecessary racing of vehicle engines at loading/unloading points. Ensure that vehicles engines must be switched off at these points	Throughout operational period	Proponent & Contractor	

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Table 9-7: Noise Management & Monitoring Plan for Operational Phase

Management Plan			Monitoring Plan	
SR#	Potential impacts	Management & Monitoring Measures	Timeframe	Responsible Party
		Minimization of Noise and Vibrations		
1.	Noise and Vibrations	Aware vehicle and machinery operators to switch off the engines of vehicles or machinery not being used to avoid excessive noise and vibrations	During operational period	Proponent & Contractor
		Sensitize drivers to avoid gunning of vehicle engines or unnecessary hooting, especially when passing through sensitive areas such as churches, mosques, residential areas, and schools.	Throughout operational period	Proponent & Contractor
		Ensure that machinery is kept in good condition to reduce noise generation.	Throughout operational period	Proponent & Contractor
		The noisy installation works will entirely be planned during day time when most of the neighbors will be at work	Throughout operational period	Proponent & Contractor

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Table 9-8:Solid Waste Management & Monitoring Plan for Operational Phase

	Management Plan		Monitoring Plan	
SR #	Potential impacts	Management & Monitoring Measures	Timeframe	Responsible Party
Minimization of solid waste generation and ensuring efficient solid waste management				
		Donate recyclable/reusable or residual materials to local community groups, and institutions.	During operational period	Proponent
		A proper waste management plan must be developed.	During operational period	Proponent
		Waste must be stored at the site in covered containers.	During operational period	Proponent
		Containers must be emptied before they reach their carrying capacity	During operational period	Proponent
1	Increased solid waste generation	Littering must be prohibited at the site.	During operational period	Proponent
		Awareness will be given to the staff and workers about handling of solid waste at the site.	During operational period	Proponent
		Use of an integrated solid waste management system i.e. through a hierarchy of options: • Source reduction • Reuse • Recycling	Throughout operational period	Proponent & Contractor

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Use of durable, long-lasting materials that will not need to be replaced as often, thereby reducing the amount of waste generated over time.	Throughout operational period	Proponent & Contractor

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Table 9-9:Health and Safety Management & Monitoring Plan for Operational Phase

Management Plan			Monitoring Plan	
SR#	Potential impacts	Management & Monitoring Measures	Timeframe	Responsible Party
		Minimization of occupational health and safety risks		
1.	Health and Safety Impacts	Implement all necessary measures to ensure the health and safety of workers and the general public during the installation of the project	Continuous	Proponent
		Suitable overalls, safety footwear, dust masks, gas masks, respirators, gloves, ear protection equipment, etc. should be made available and personnel must be trained to use the equipment.	Once off	Proponent & Contractor
		Ensure general safety and security at all times by providing day and night security guards and adequate lighting within and around the premises.	Continuous	Proponent
2	First Aid	Provision of well-stocked first aid boxes must be ensured within the premises of the project area.	One-off/as required	Proponent
		Provision must be made for persons to be trained in first aid	One-off	Proponent

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9.7.3 Social Management Plan

In the table below are the Mitigation measures that have been recommended during the EIA.

		Activity	MitigationMeasures
Development phase	Positive aspects	Job creation	Maximize& monitor local recruitment Prevent nepotism/ corruption in local recruitment structures Promote the employment of youth Use of labor-
		Multiplier effects on the local economy	As for maximizing employment benefits.
		Increased markets for local entrepreneurs	As for enhancing multiplier effects on the local economy
	Negative aspects	Physical and economic displacement	Determine the party responsible for relocation favorable outcome on a case-by-case basis
		Conflict/competition between newcomers and the incumbent population	Communicate local recruitment policy Use of community structures to identify local labor pool
		Increased pressure on local services/resources	As for maximizing local employment and discouraging the influx - Also, consultation with the municipality well in advance
		Increased social pathologies	Extensive HIV/ AIDS awareness campaign Clear identification of workers; prevention of loitering Liaison with police Do not recruit laborers on-site
		Growth of informal settlements	-As for conflict/ competition between newcomers and the incumbent population
		Safety impacts	Access control to all project elements, including fencing PPE for mines workers Storage of hazardous materials to adhere to prescribed regulations

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			Traffic control to prevent speeding Road maintenance Community Education
		Decreased quality of life	Impacts on visual environment, noise, vibration, air quality, and groundwater are discussed in separate specialist studies: as per relevant specialist reports For the sense of place: rehabilitation For health and well-being: as for displacement
		Loss of farm labor to the mine	- No deliberate recruitment of workers from farms
Operational phase	Positive aspects	Job creation	- As for job creation during operational phase.
		Community development and addressing community needs	Liaison with beneficiaries to ensure needs are met Collaboration during implementation Implement CSR initiatives
	Negative aspects	Economic dependency on the project	Transparency regarding employment practices and CSR initiatives Keep communities updated Presentation of EIA findings in a clear and understandable manner
		Opposition because of perceived negative impacts	Transparency regarding employment practices Presentation of EIA findings in a clear and understandable manner

9.8 Restoration And Rehabilitation Plan

9.8.1 Leased Area Rehabilitation Plan

Coal mining is an interim land use. Once the coal is extracted from a pit the site is rehabilitated into productive wildlife habitats, wetlands, golf courses, recreational parks, urban uses, conservation lands, forestry, or agricultural lands.

9.8.2 Overview Of Operations

M/S Malik Hameed Raza has proposed to mine coal deposit material from the Project Site, which will generally involve the following:

Removal and stockpiling of vegetation;

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Stripping of topsoil;

Ripping and removal of the material by adits/bates and truck to the stockpile area.

9.8.3 Rehabilitation Objectives

The objectives of this rehabilitation plan are to:

- Ensure that site drainage and sedimentation structures remain stable and functional;
- Ensure that vegetative matter and topsoil are made available for the site rehabilitation as required;
- Undertake rehabilitation in a manner consistent with that of the existing adjacent pit;
- Guarantee that the resource is extracted and the site rehabilitated in a manner that will ensure the quality of surface runoff at all times;
- Produce a final "walk away" landform that is geotechnical stable that blends aesthetically into the surrounding landforms, yet as far as possible does not limit possible future land uses.

9.8.4 Rehabilitation And Re-Vegetation

It is proposed to re-establish a similar cover to the majority of the post-excavation landform (excluding the void). Native vegetation will largely be established Rehabilitation of the site will be undertaken once extraction is complete.

The re-vegetation program will re-establish native tree/shrub/ground cover and will stabilize reshaped and benched areas. Benches will be deep ripped to actively promote infiltration of water which will enhance soil moisture requirements for direct tree seeding and minimize surface runoff to underlying benches and the pit floor dirty water control system. Re-vegetation will also visually screen disturbed areas and will re-establish habitat for native fauna.

On completion of Pit operations, the pit floor will be re-shaped and re-vegetated with native plant species to form an aesthetic environment. For the rehabilitation of vegetation following native tree species will be planted.

- *Acciamodesta* (kikar),
- *Acacia modesta* (Phulai),
- *Dalbergiasissoo*(Sheesham)

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9.8.5 Roles and Responsibilities

The Manager (or their nominated representative) is responsible for overseeing the implementation of this leased area Rehabilitation Plan, including:

- Delegating tasks associated with this Pit Rehabilitation plan where necessary;
- Providing adequate resources to implement this Pit Rehabilitation Plan
- Providing adequate training to employees and contractors regarding their requirements under this Pit Rehabilitation Plan

9.9 Environmental Monitoring And Evaluation

9.9.1 Aim

In the context of coal mining, monitoring, and evaluation are carried out to achieve the following objectives:

- To access whether the project site is being managed sustainably as planned or whether certain bottlenecks are experienced both qualitatively and quantitatively.
- To ensure compliance of environmental parameters (i.e. ambient air and noise) with PEQS.
- To ensure the implementation of mitigation measures for the overall conservation of the environment at the project site.
- To undertake effective environmental surveillance of the site.
- To assess the effectiveness of mitigation measures and potential environmentally enhanced measures.
- To ensure compliance with national environmental obligations.
- To monitor the rehabilitation of recovered land including afforestation.

9.9.2 Environment, Health & Safety Policies

9.9.2.1 Environment Policy

The environment policy right from the initiation of project installation to its proper operations will be based on:

- Compliance with applicable regulatory requirements;
- Conservation of natural resources;
- Assurance of sustainable development;
- Maintaining a safe working environment;
- Providing high environmental expertise and know-how; and
- Regular training and refresher courses to achieve continuous improvement of the environment.

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9.9.2.2 Health & Safety Policy

The proponent identifies the safety and health of the personnel as integral parts of every work aspect at every level. In addition to compliance with the statutory rules and regulations as the minimum acceptable, the proponent will set nationally acceptable standards for practice and will intend to achieve the above by the following:

- Provide adequate and continuous training to all personnel;
- Prepare an overall safety & health manual giving general requirements of leadership, planned inspections, job analysis & procedures, emergency preparedness, organizational rules, necessity and use of protective equipment, health control, etc.;
- Systematic evaluation & measurement of system performance at all operational levels and continuously update the overall safety & health manual;
- Carrying out regular publicity campaigns for effective personnel safety and health consciousness; and
- To employ a person in in-charge of planning, training & safety and make him responsible for the implementation of safety and health policy.

9.10 EQUIPMENT MAINTENANCE DETAILS

9.10.1 Objectives

The maintenance of equipment and machinery used during project activities is carried out to achieve the following objectives:

- To avoid environmental pollution including dust issues, exhaust emissions, excessive noise, vibrations, etc.
- To avoid any risk to the health and safety of the workers including injuries.
- To avoid any hindrance and to ensure the smooth operation of project activities.

9.10.2 Measures for Equipment Maintenance

Measures for the maintenance of equipment involve:

- All the machinery and vehicles will be inspected and monitored.
- Always keep a suitable fire extinguisher ready for emergencies.
- Always keep a first aid box within the premises of the project site.
- Secure unbolted heavy parts or engines if necessary to leave the work.
- Monthly tuning, servicing, and cleaning of machinery and vehicles.

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9.11 Training Needs

There is a requirement for training of the members of the Monitoring and Evaluation department on multifarious environmental aspects of coal production. Training may be arranged at a suitable institution.

9.11.1 Training Schedules

• Environmental Technical Assistance and Training Plan

To raise the level of professional and managerial staff, there is a need to upgrade their knowledge in the related areas. The proponent will play a key role in this respect and arrange the training. An environmental and social training and Technical Assistance (TA) program is to be carried out before the implementation of the project.

The contractor's environmental awareness and appropriate knowledge of environmental protection is critical to the successful implementation of the EMMP because, without appropriate environmental awareness, knowledge, and skills required for the implementation of the mitigation measures, it would be difficult for the Contractor(s) workforce to implement effective environmental protection measures.

Proponent will manage the environmental training program. This will organize training courses for contractor staff to train them in specialized areas such as air and noise pollution monitoring; develop environment operation manuals in consultation with the EPA, Punjab. The training will take place in three phases:

Table 9-10: Training Schedule

Phases	Description
Phase-1	↓ The workers and labor force will be given basic training on project activities. They will be explained different possible environmental impacts resulting from the project activities. ↓ The environmental management and monitoring staff will be given basic knowledge of the possible environmental impacts, how to mitigate them, and methods of personnel protection. This will take place during the design phase.
Phase-2	↓ The second phase of training will take place at the start of the operational phase. ↓ It will involve hands-on experience in carrying out the different activities during the operational phase, responsibilities of each

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	individual, implementation of mitigation measures, use of personnel protective equipment, and an emergency handling and exit drill
Phase-3	All the staff will be briefed about the implementation of EMMP.
Phase-4	The staff and workers will be provided with suitable and required PPEs

9.12 PROJECT BENEFITS

9.12.1 Physical Infrastructure

Once the proposed project is commissioned the socio-economic status of the local people will improve and thereby infrastructure facilities like communication systems and others will improve.

9.12.2 Social Infrastructure

With the implementation of the proposed project, the socio-economic status of the local people will improve substantially. The land rates in the area will improve in the nearby areas due to the proposed plant. This will help in the upliftment of the social status of the people in the area. Educational institutions will also come up and will lead to improvement of the educational status of the people in the area. Medical facilities will certainly improve due to the proposed project.

9.12.3 Employment Potential

9.12.3.1 Direct Employment

During the operational phase, about 21 people will be employed directly. Considering that some of the skilled personnel to be employed for the project will be from outside the area and unskilled/ semiskilled personnel will be from within the study area, the project will add to the well-being of the area. In addition to the workforce, indirect employment will also be generated for local persons. It will help in bringing prosperity to the area

9.12.3.2 Indirect Employment

The project will also provide some indirect employment to the people of the nearby area of the mine site. Some people will get engaged in pet shops like tea shops, vehicle repair centers, etc. It will also provide some need-based opportunities to the local public. The project will provide the following indirect employment to the local people:-

- Transportation and warehousing in the region required to transfer the mineral will eventually be needed and therefore trucks and jobs in logistical activities will come up.

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- There will be the development of externalities for the worker's petty shops (tea, repair stations for trucks, etc.) as supporting services.
- This would create Indigenous Technologies for sustainable development.

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10 INVOLVEMENT OF STAKEHOLDERS/PUBLIC CONSULTATION

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

10.1 Proponent's Environment Management Team

All possible impacts and mitigation measures related to the project were discussed with the proponent and management. They assured to take all suggested mitigation measures to control any discrepancy that arose by the project and to make the project environmentally friendly.

Exploration calls for safe, efficient, and economical operation which can only be achieved by the supervision of the trained mining staff. The site manager (Mining Engineer) will be in charge of the operation holding all the administrative and technical powers as stipulated under the Mines Act. 1923. Geologists and trained mining and drilling crew shall be supervising all exploration and drilling operations. All the operations are to be looked after by qualified technical staff as per the requirement of Punjab Mining Concession Rules, 2002, and Mines Act 1923. In addition to the above, skilled staff of various categories shall be appointed. The list of technical staff is given below:

Table 10-1 Proponent Operation Management Staff

Sr No.	Designation	Responsibilities
1	Project Director	Project Planning and Supervision
2	Project Manager	Management at the workplace and reporting
3	Mining Engineer	Safe exploration and mining practices according to the characteristics of the site
6	Surveyor	Mines Survey & Mapping.
7	EHS Officer	Environmentally Safe practices execution

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Besides these, around 08 local personnel were hired during the exploration activities as laborers, Guards, Cooks, Lay Men. As the company aims to expedite the exploration activities more speedily in the renewal phase, hence, around 15 local personnel will be hired for spade works in exploration and mining activities.

The workers are being given the following facilities:

- Transport facilities to the sites and back.
- Uniforms, helmets, safety shoes, etc. for workers.
- Messing facilities at the exploration sites.
- First Aid and Medical facilities
- Safety Helmet, goggles, shoes, dust masks, hand gloves, and more for all the site staff.
- Raincoats and jerseys are to be provided
- Cold drinking water facilities.
- Wash room's facilities.
- Mosque at the working site.
- The company shall fulfill corporate social responsibilities (CSR) for the benefit of workers and local communities as per the law of the country.

10.2 The Responsible Authority

The proponent Malik Hameed Raza will be the responsible authority to take all measures before the start of the project and during operation.

10.3 Other Departments And Agencies

The impact analysis is detailed with the management, local community, educational institutes, health institutes, hospitals, and NGOs. All issues were discussed related to the implementation of the project. Scoping sessions, focused group discussions, and wayside consultations were held with the relevant stakeholders in the area.

10.4 Environmental Practitioners And Experts

A team of Environmental Professional Associates visited the project site, had a discussion with stakeholders, and consulted with the local people of nearby and other villages to evaluate the project's socio-economic impacts. People of the area belong to different professions mostly belong to employment, own businesses, doctors, some abroad, in Army, teaching, agriculture, etc. women were also consulted for their point

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of view regarding the betterment of the area by this project, some of them communicated but according to the social value of the area, they mostly hesitate to communicate comfortably and get pictured. People provide a massive information about the project and have positive remarks regarding the project development.

10.5 Affected And Wider Community

There is no affected community present in the area of the proposed project. The consultant's team has consulted with the inhabitants of different villages. The remarks of people are positive regarding the project and people foresee positive impacts like employment opportunities, business, development of the area, etc.

10.6 Important Issues And Concerns Raised During Consultation

The summary of the stakes of consulted stakeholders is given below.

- The activities of the project must be studied in detail to assess all the impacts resulting from the project.
- All the environmental parameters i.e. ambient air quality, noise levels, and water quality must be kept within permissible limits of PEQS.
- Project-specific mitigation measures must be implemented during the project's lifecycle.
- A proper Environmental Management and Monitoring Plan should be prepared to reduce adverse environmental impacts.
- Waste management must be taken into consideration (if generated during project activities).
- Management practices suggested in EMMP for solid waste should be implemented during the operation of the project.
- The findings of the EIA report must be incorporated into the design and planning phase of the project.
- The EIA report should be compiled appropriately according to reporting style as suggested in Guidelines/Checklist.
- The project holds good economic circulation. The advantages of the project seem more than their disadvantages. Therefore, the project should be operational as soon as possible

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11 CONCLUSION AND RECOMMENDATIONS

11.1 Conclusion

At the end of this EIA study, the following conclusions are drawn and recommendations have been given accordingly.

- Coal extraction is very crucial for meeting increased energy demands on national as well as international levels.
- All the positive and negative impacts resulting from coal mining operations have been studied in due detail in environmental settings. All the negative impacts have been given magnitude based on the defined criteria and scoring.
- Mitigation measures have been suggested for each negative impact resulting from coal mining activities. Based on the findings of the EIA, it is concluded that the project will not pose any adverse impact on the local population and the environment. Therefore, it is recommended that the competent authority may please be issues Environmental Approval for the development and operation of this project
- No wastewater will be generated during project activities. The water, if exposed during underground coal mining will be used for drinking purposes.
- The type of solid waste produced at the surface will be food waste only. The solid waste produced underground will consist of material excavated for mine space widening.
- The food waste at the surface will be disposed of in covered containers to avoid any waste littering. The solid waste underground will be used to fill up the cavities formed due to coal extraction. This will save the transportation cost of solid waste to dispose of at the surface. It will also provide additional support to the mine against subsidence.
- Proper mitigations may be adopted in the preliminary design including safe and environmentally friendly disposal of solid waste.
- Physical impacts like soil contamination, water contamination, air pollution, high noise level, etc. are temporary. However, during the operational stage by adopting abatement technologies and the development of buffer zones and green areas intensity of negative impacts can be minimized.
- All the baseline environmental parameters including ambient air and noise are well within the permissible limits of PEQS.

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- There are no human settlements present within the vicinity of the project site. The settlements are away from the coal mines at safer distances. All the sensitive receptors are at a safer distance from the project area.
- No forest area or wildlife sanctuary exists within the vicinity of the Project Area, which may be affected by the Project. Few reptiles like lizards and snakes will be disturbed by the Project activities and may have to move into nearby areas. This will be a temporary insignificant impact. Anyhow the outskirts blank area is to be covered with green trees so the project site will not give barren look.
- The other social issues like the safety of the public and workers, security problems, community accessibility issues, women's accessibility to fields for their daily routine life, etc. will be temporary.
- The mining activities will provide additional job opportunities to the community of the area. The project will raise the income levels of the population of the area. Social cohesion is optimal.
- The environmental cost is negligible.
- The proponent is committed to ensuring an eco-friendly, sustainable, safe, and sound environment.

11.2 Recommendations

- All measures as suggested in EMP should be adopted to minimize adverse impacts.
- All appropriate environmental management & monitoring measures detailed in this report, together with any other environment management commitments should be implemented throughout the entire life of the project.
- Environmental Management and Monitoring Plan proposed will be implemented in the true spirit throughout the lifespan of the project.
- Regular monitoring and auditing will be taken by the management to ensure compliance with all the mitigation measures.
- Environmental monitoring will be carried out by the company as suggested and communicated by EPA, Punjab.
- The mining site and the road links should adopt such measures and select such machinery and their operations to minimize the dust spread.
- Dust suppression machines should be available on each site for wetting of all the materials to avoid the effects of dust such as respiratory diseases.
- Water contamination, air pollution, and high noise levels will be controlled with the use of good engineering practices.

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- Proper measures will be taken to control air emission or high noise levels. Vehicles and equipment must be properly maintained and tuned well.
- The extensive plantation must be carried out throughout the tenure of the lease as an environmental enhancement measure
- Periodic monitoring of occupational health and safety must be conducted to avoid workplace hazards.
- Proponent will take due care of the local community and its sensitivity toward local customs and traditions.
- Safety signs or boards will be placed wherever needed within the premises of the Project site.
- Personal Protective Equipment (PPEs) will be provided and ensured that they are used by the workers during working hours. The workers working near the noise-generating machines will be strictly required to use ear muffs/ plugs.
- Fire extinguishers or firefighting equipment will be provided at well-notified points to cope with fire events.
- Good housekeeping will be ensured by the management.
- First aid medical facility will be provided at the project site

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REFERENCES

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

i. Information and data provided by project proponents;

ii. Project Pre-feasibility Study Report;

iii. Technical Design Data related to the project.

iv. Information gathered through discussions with the project-related persons of the project proponent;

v. Discussion with concerned government officials;

vi. Punjab Environment Quality Standards for Municipal and Liquid Industrial Effluents, The Ministry of Environment, Government of Pnjab vide its Notification, Islamabad, the 5th August 2016 under SO(G)/EPD/7-26/2013 established standards for Drinking Water Quality

vii. Punjab Environment Quality Standards for Ambient Air, August 2016;

viii. Punjab Environment Quality Standards Noise Levels August 2016;

ix. Punjab Environment Quality Standards for Drinking Water August 2016;

x. Pakistan Environmental Protection Act, 1997;

xi. The Punjab Environmental Protection (Amendment) Act 2011 covers aspects related to:

   a. the protection, conservation, rehabilitation, and improvement of the environment and the prevention, control of pollution, and promotion of sustainable development;

   b. establishing complete regulatory and monitoring bodies, policies, rules, regulations, and national environmental quality standards; and

   c. to ensure enforcement, the act establishes regulating bodies i.e. Punjab Environmental Protection Council (PEPC), and responsible bodies i.e. Punjab Environmental Protection Agency (Punjab EPA) at the Provincial level.

xii. Land Use Policies and Environmental Legal Framework including;

xiii. Environment-related Laws in Pakistan and the Province of Punjab;

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xiv. The Pakistan National Conservation Strategy, Environment and Urban Affairs' Division (presently- Ministry of Environment, Urban Affairs, and Wild Life), Government of Pakistan, Islamabad;

xv. Government of Pakistan, Pakistan Environmental Protection Agency, Policy and Procedures for Filing, Review, and Approval of Environmental Assessment, 2000;

xvi. Environmental Assessment Requirements and Environmental Review Procedures of the Asian Development Bank, 1993;

xvii. GOOGLE EARTH, maps.

xviii. Guidelines for Public Consultations - These guidelines cover:

- Consultation, involvement, and participation of Stakeholders
- Techniques for public consultation (principles, levels of involvement, tools, building trust)
- Effective public consultation (planning, stages of EIA where consultation is appropriate)
- Consensus building and dispute resolution.

xix. Applicable International Environmental and Occupational Safety and Health Laws and Regulations;

xx. Applicable International Environmental and Occupational Safety and Health Laws and Regulations;

xxi. National Resettlement Policy (Draft), Government of Pakistan, March 2002.

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LIST OF ABBREVATIONS

EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPA	Environmental Protection Agency – Punjab
NGOs	Non–Government Organizations
NOC	No Objection Certificate
O&M	Operation and Maintenance
OHS	Occupational Health and Safety
PC	Primary Clarifier
PEQS	Punjab Environment Quality Standards
PEPA	Punjab Environment Protection Agency
PKR	Pak Rupees
MSL	Mean Sea Level

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TERM OF REFERENCES

1. The Consultant is required to carry out an Environment Assessment Study of the Project as required under section 12 of the Pakistan Environmental Protection Act 1997/ Punjab Environmental Protection Act 2012.
2. The Study should be comprehensive and should cover all aspects which are envisaged under the relevant national and provincials laws & regulations including but not limited to the:
   - Identification and recommendation for suitable solution/treatment/mitigation measures of 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 to the environment and other substances leading to air, noise, water, and soil pollution in accordance with PEQS.
3. The Study should be acceptable to the relevant national and/or provincial authorities (relevant authorities) in Punjab.

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GLOSSARY

Air quality	Measurement of the pollutants in the air, a description of healthiness and safety of the atmosphere.
Coal Mining	Coal mining is the process of extracting coal from the ground. Coal is valued for its energy content and since the 1880s has been widely used to generate electricity. Steel and cement industries use coal as a fuel for extraction of iron from iron ore and for cement production.
Consultation	Consultation refers to two-way transfer of information or joint discussion between project staff and the affected population. Systematic consultation implies a sustained and rigorous sharing of ideas. Bank experience shows that consultation often yields the best resettlement alternatives, fruitful procedures for continued participation, and independent information on actual conditions for implementation.
Coordinates	Each of a group of numbers used to indicate the position of a point, line, or plane to make impure, pollute
Disruption	Disturbance or problems which interrupt an event, activity, or process.
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
Hazardous	Substance or material, which could adversely affect the safety of the public, handlers or carriers during transportation
Impact	Effect on someone or something
Land acquisition	The process whereby a person is compelled by a public agency to cede all or part of the land a person owns or possesses, to the ownership and possession of that agency, for public purpose in return for compensation.
Wildlife	Wildlife traditionally refers to undomesticated animal species, but has come to include all organisms that grow or live wild in an area without being introduced by humans. ... Deserts, forests, rainforests, plains, grasslands, and other areas, including the most developed urban areas, all have distinct forms of wildlife.
Shrubs	A woody plant which is smaller than a tree and has several main stems arising at or near the ground.
Scope	The extent of the area or subject matter that something deals with or to which it is relevant

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