ASIAN PRECIOUS MINERALS LIMITED

CEMENT PROJECT
Near Choa Saidan Shah,
District Chakwal, Punjab, Pakistan

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) MAIN REPORT

SUBMITTED BY

AFTEC (PVT.) LIMITED
20, Gulberg-5, Lahore

INTEGRATED ENVIRONMENT CONSULTANT
Office # 7, 2nd Floor, Anwar Tower, 99-Shadman, Lahore.
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EXECUTIVE SUMMARY

1. Project Title & Proponents
The proposed project to which this EIA relates is “Asian Precious Minerals Limited – Cement Project” (APML), to be located near Choa Saidan Shah, District Chakwal.

Proponent of proposed project is Asian Precious Minerals Ltd (“APML”). APML was formed as a holding company seeking to obtain and manage assets as a mining investment and exploration company. It is a business company incorporated in the British Virgin Islands on 2 June, 2004 as African Precious Minerals Ltd, which successfully realised a return on investment for its shareholders through a number of gold exploration projects in South Africa. It subsequently changed its name to Asian Precious Minerals Ltd on 17 May, 2012, to focus on its limestone and potash projects in Pakistan.

2. Title and location of the proposal:
   - Project title: Asian Precious Minerals Limited (APML)
   - Location: Near Choa Saidan Shah, District Chakwal, Punjab
   - Head Office (of the project):
     House No. 03, Street No. 11, Sector F-8/3
     Islamabad, Pakistan.
     Phone: +92-51-2853333, Fax: +92-51-2854444
3. The Project

The proposed project will be designed to produce 7,200 tonnes per day of clinker which is approximately equivalent to a production of 2,641,206 tonnes of cement per annum.

The proposed Project will be located in the “Salt Range”. Location of proposed APML project is shown in Figure – E.1. Its location is 1.5 km north of Kallar Kahar – Choa Saidan Road.

There are three other cement producers (DG Khan, Bestway, and Lafarge, (now PakCem) in the immediate vicinity, and Dandot Cement close to Khewra. Apart from abundant availability of limestone raw material another factor making the location attractive is the proximity to both Afghanistan and Northern India. The Chinese plans to revitalise the old ‘Silk Route’ will bring access to new markets.

Figure – E.1

APML has obtained leasing right for Limestone & Clay mining which are in the vicinity of the plant. [Figure – E.2].
Prior to granting of limestone lease, the Director General of Mines addressed all the related environmental issues. In order to demonstrate its seriousness and long term commitment to safeguard the interests of local community and environments, APML agreed on the advice of the Directorate General of Mines and Minerals, Punjab and local community to reduce the applied for area from 6460.53 acres to 2381.07 acres. This reduction was meant to address concerns raised by the communities having a cement factory and limestone mine close to educational institutions and archeological sites and impacts on water resources of nearby villages. This was done by creating a sufficient buffer between the proposed Cement Plant with the following establishments:

i. Katas Cadet College,
ii. Katas Raj Temples Complex,
iii. Punjab School of Mines (PSM); Katas
iv. Population centers comprising the town of Choa Saidan Shah and nearby villages of Khajula, Katas, Dulmial, Dhoke Rupper and Tatral.
Figure – E.3 presents location of APML plant and lease area; various villages, Katas Raj Temple; Bestway Cement lease area; and Choa Saidan Shah.

Figure – E.3

4. **EIA Consultants**
This Environmental Impact Assessment Study has been carried out by Aftec (Pvt.) Limited, 20, Gulberg-5 Lahore, in association with Integrated Environment Consultants located at 2nd Floor, Office # 7, Anwar Tower, 99-Shadman, Lahore, Pakistan.

5. **Existing Cement Market**
Cement manufacturing in Pakistan has been a growing Industry. Most analysts believe that the sector looks even stronger in the fiscal year 2015 - 16, as domestic demand has grown at 16% during year 2014 - 15 from previous year. It is probably the only sector that has enjoyed all the support of domestic as well as global trends for over years which has resulted in continuous increase in the sector’s profitability.
One of the biggest factors upon which industry officials and analysts are banking on is the better allocation of funds for the public sector development programmes (PSDP) that is expected to increase local cement consumption. Improvements in the market scenario improved the fundamentals of not only big, but also mid-size cement producers. Pakistan has a regular export market for cement.

In addition, China is assisting Pakistan in the establishment of China – Pakistan Economic Corridor (CPEC) which will include development of energy sector, roads, railway and Special Economic Zones.

Discussions are currently underway between APML and the Pakistani Railway authorities to bring a rail line directly to the area. This would provide a significant advantage to the local area and proposed Project. The rail line installed will provide passenger services to the area population as well as transport of inflow & outflow materials from the project. As yet, this option has not been considered in the project cost, it will be evaluated as soon as reasonable costs estimates become available from the Pakistan Railways. The Company is giving this factor serious consideration.

6. **Purpose & Scope of the EIA Study**

   This EIA report has been prepared according to the category defined in Schedule – II of “Pakistan Environmental Protection Agency (review of IEE and EIA) Regulation 2000”.

   As desired under the “Guidelines for the Preparation and Review of Environmental Reports October 1997/2000”, 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).

v- Description of existing and expected conditions (boundaries adopted to study various aspects of the study).

vi- Evaluation of the impacts and their mitigation (assessment of any impact on the local population, relevant environmental data, gaps in knowledge, compliance with relevant environmental standards, assessed significance of the impacts, possible measures for avoiding or mitigation the impacts).

7. Salient Features of the Project

The feasibility study for the Project is under completion. The Islamabad Electric Supply Company has agreed to meet Project's electricity requirement from its 132 KV transmission line. It shall ensure environmental soundness of the project in accordance with the requirements of the NEQS Pakistan and the rules and regulations made under the Punjab Environmental Protection Act (PEPA) 2012.

Deliberations on plant designing and detailed engineering studies are in progress. After the completion of these studies, selection of EPC contractors, and final over all detailed engineering is going to be undertaken.

The proposed plant will produce cement from solid raw materials extracted from the adjacent mine. The raw materials are heated to a very high temperature causing the thermal reactions which produce cement clinker. This clinker is then crushed to produce the cement for sale.

The cement production process involves the following activities:

- Mining of limestone and other raw materials & raw materials preparation
- Clinker production
- Cement grinding, packaging & Distribution
7.1 Raw Materials

Annual raw materials requirements are summarized in the table below.

<table>
<thead>
<tr>
<th>Description</th>
<th>Tonnes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limestone</td>
<td>3,834,345</td>
</tr>
<tr>
<td>Clay (silica/alumina)</td>
<td>6,516</td>
</tr>
<tr>
<td>Iron</td>
<td>8,958</td>
</tr>
<tr>
<td>Gypsum</td>
<td>163,429</td>
</tr>
</tbody>
</table>

Limestone & Clay will be extracted from the quarries near the plant. Gypsum & iron (laterite) will be obtained from sources outside the plant area.

7.2 Fuel – Coal

240,000 tonnes of imported coal per year. Coal will be brought to the cement plant by road from Karachi, most probably imported from the Kumba Grootegeluk coal mines near Ellisras in the Limpopo Province or from the Kumba Leeupan coal mine near to Delmas, both in South Africa. The Project will require 240,000 tonnes of coal per annum at 85% capacity utilization.

7.3 Water Supply

Hydrological study of the Project area is being carried out. At present surface water or sub-surface water source is not available within the plant site. According to local sources ground water is available near the area at a depth of 45 to 60 meters. This needs to be confirmed. If the borehole water is not potable a suitable purification plant will be installed for domestic and industrial use.

It is envisaged that the plant will be designed for dry process, water consumption will therefore be for plant cooling evaporative losses and for domestic use only. The plant will be designed to use minimum water. Water requirement is estimated at 3,800 to 4,000 tonnes/day, including the requirement for a housing colony and other domestic use.

7.4 Site Location & Plant Layout

The proposed plant site boundary primarily falls within mainly inhabited and presently unused area, except Village “Rupper” located extreme north-east corner
of proposed plant area. This is a small dhoke/village comprising of 32 houses with a population of 175 people. The population of this village will be relocated/resettled.

Figure – E.4 presents overall plant area, tentative plant layout and showing the “Rupper” village.

The area of the plant site selected is comprised of approximately of 963.58 hectares (2381 acres). This area does not include the housing colony, which will be located in different area on purchased land. The Elevation at the plant layout varies from 709 to 735 meters. The average elevation is at 720 meters above sea level.
Figure – E.5 shows the location of limestone and silica/clay mine in relation to the Cement Plant.

![Figure – E.5](image-url)

Because the “overburden” consists of low grade limestone and clay, it will be used in the production process. Stripping of 1 - 3 meters of topsoil at surface will be required and this material will be stored in a designated area for future re-vegetation purposes. Wherever possible the skyline to the south of the mining pit will not be broken. This means that the mine pit should mostly be hidden from general view.

The access to the mine will be at the 790 meter level. All water on levels above this will be drained naturally via the pit access. Levels below 79 meters will require a sump to be developed in the pit from where the water can be pumped out. A water storage area below the access point will be created. This will ensure that no water is fed directly to natural streams. This water will then be used to control dust in the mine. All trees & larger bushes will be cut and supplied to the local community as firewood.

The access road from the Cement Plant to the limestone area will follow a route which passes to the West of the plant and then crosses the valley to ascend the
limestone ridge at a gradient of <1:10 to an elevation of 780 meters above sea level. The access road will be constructed to a width of 22 meters and will be constructed to the standard required to transport laden 80 tonne capacity haul trucks.

The crushed limestone (crusher installed at the mine) will be transported from the crusher to the blending beds at the cement plant, by means of an overland conveyor.

In order to prevent dust emissions during the transport of extracted materials: The overland conveyor will be covered; a simple, linear layout will be applied to minimize the number of transfer points; cleaning of return belts in the conveyor belt systems; storage of crushed and pre-blended raw materials in covered or closed bays. The crusher will be fitted with dust suppression systems. All haul roads will be treated with “Dustex” or similar dust suppression materials. Roads will be watered regularly using a water-bowser truck.

There will not be any waste or reject material produced by the mining operation. Topsoil overlying the limestone will be stripped and stored in a designated area to be used for re-vegetation of disturbed areas.

It is envisaged that the preheater will be a twin stream five stage preheater so as to provide sufficient heat for drying of the raw mill feed. The waste gas from the preheater will be fed to a boiler for waste heat recovery and the generation of steam for the waste heat recovery steam turbine for power generation.

Excess hot gas from the clinker cooler, after extraction of secondary and tertiary air has been extracted will be fed to a boiler, as per the preheater gas, for the recovery of heat for the waste heat generation of steam for the waste heat recovery steam turbine for power generation.

Preheater and cooler de-dusting will be via ESP and or bag filters and the dust emissions will comply with Pak-EPA National Environmental Quality Standards for Ambient Air..
At 80% capacity utilization cement will be bagged in about 54 million bags of 50 kg each.

Coal received by road will be stored in a longitudinal stockpile. The coal stockpile like all the raw materials will be unloaded and stored in a fully enclosed stockpile storage area. The coal stockpile will be provided with a sprinkler system.

### 7.5 Pollution Control

Air pollutants generated during the operation of the Project consist primarily of particulates from mining, raw, and finished materials as well as fuel combustion by-products. Electrostatic Precipitators (ESP), Bag Filters and bag houses will be employed as de-dusting equipment to control major emissions in the Kiln, Raw Mill, Grate Cooler, Coal Mill and the Cement Mill. For other emissions, a sufficient number of standardized bag filters will be installed at all transfer points at hopper, bins or silos as well as dust producing machinery (crushers, loading equipment, conveyors etc.) for de-dusting purposes.

Modern technology burners, dosing systems for fuel and kiln feed, and kiln control systems are used for the plant processes to control emissions (NOx, SO2, CO). Cyclones will also be installed to capture materials entrained in airflows, which are routed through principal process units (e.g. milling and pyro-processing stages.)

All wastewater will be routed to the wastewater treatment plant prior to reuse within the industrial system. The treated effluent will comply with NEQS & International Standard for sewage effluent. Cement tanker and mobile equipment washing and floor washing water will be collected and conveyed by open drains. The process wastewater will be channelled into a solids 'gravity' separator then to the wastewater treatment plant prior to collection and reuse within the industrial system. The solid material will be collected and reused as part of the raw material input.

Most cement projects generate significant, intermittent noise levels during blasting of the limestone within the mine. The principal noise emission sources will be associated with mine drilling operation, motors, fans, blowers, crushers, air compressor, and mills. In-plant shielding of noise emissions will be adopted to
ensure that noise levels at the boundaries are within the regulatory limits which demonstrates that the cement plant will be fully compliant with both IFC and Pakistan National Standards for noise emissions. All equipment to be employed for the plant will be designed to operate with low noise levels, and will not exceed the maximum allowable noise level for the surrounding receiving land use.

7.6 Housing Colony

Land will be made available for laying down and staff accommodation during the construction phase. Since the site is in an undeveloped area, there is adequate room for construction material & machinery laydown. There will be three general areas:

- Container-based housing for the management. These will be removed after completion of construction phase.
- Cement block / concrete housing for lower management and supervisors. These buildings will be designed as permanent buildings and will be used for the outage workers after the plant is in operation.
- Hall style housing for the workers. These will be removed at the completion of construction.

It is planned to construct a permanent housing colony, for more than 200 persons on purchased land of 20-25 acres situated at about one kilometer away from the Plant. The residential colony will comprise of bachelors hotel, support complex, library, 20 apartments in shape of 5 blocks for deputy managers, managers and general managers, a guest house, TV lounge and officers mess, mosque, kids play ground, fair price shop, security rooms, internal telephone exchange, vehicles parking, lawns, drivers and cooks compound, etc.

8. Environmental

The proposal takes into account all necessary aspects of environmental management not only in accordance with the Punjab Environmental Protection Act 2012 and rules and regulations made thereunder including also environmental compliance with the NEQS and IFC & other international standards.
It has taken into consideration likely environmental impacts on the environmental settings around the project site and systematically provides solutions/safeguards against any pollution to accrue from the project activity. The most recent and efficient equipment for abatement and prevention of all sorts of pollution be it gaseous emission, PM, effluents, noise or solid wastes will be adequately taken care of.

This proposal takes stock of the likely potential environmental impacts from the project activity and describes necessary mitigation measures to be adopted to minimize their adverse impacts. In order to achieve the goals of environmentally sustainable operations of the project, the report especially recommends a comprehensive Environmental Management Plan (EMP), Environmental Monitoring Plan (EMnP) and last but not the least the proposal recommends training of the staff to implement effectively the recommended EMP.

Biodiversity, water, forestry, crops, vegetation, scientific, cultural, historical buildings, soil, water and heritage which constitute an important segment of environment have also been considered from environmental management point of view. The proposal also takes into account the inbuilt stringent mechanism incorporated in the designing of the plant in order to run the plant in an environmentally safe fashion.

In short, all environmental aspects in relation to the project have been duly considered and mechanism recommended to ensure environmentally safe practices during plant operation.

9. **Hours of Operation**

In general, the Plant will operate around the clock, in three shifts, throughout the year. The mine will operate for between 10 and 12 hours per day for 6 days per week.
10. Manpower Requirement
The Project will require about 350 personnel for its Plant and mining operation. Expected maximum manpower during construction will be about 1,500 persons. Construction will start with about 500 persons and then increase to maximum, and then decrease again to about 300 persons.

11. Transportation
At full capacity operation the project will involve following vehicular transport.

- Off Highway, within plant & mine, 175 loads per day of 75 tonnes capacity each.
- Highway, in/out, 482 x 2 = 964 loads per day of 25 tonnes capacity each.

The project will provide a trucks lay area at entrance to the Plant.

In addition, about 20 vehicles will be plying in/out of the plant carrying plant personnel.

12. Applicable Policies and Legislation
Pollution control will be a main priority as it is the duty of APML to be the steward of environmental protection at the cement plant and limestone mine. As such, pollution control measures and safeguards were selected with respect to the applicable national, provincial and international policies and legislation requirements:

- National Conservation Strategy (NCS) - Pakistan
- Pakistan Penal Code (1860)
- Pakistan Environmental Protection Act, 1997
- Policy and Procedures for the Filing, Review and Approval of Environmental Assessments
- Guidelines for the Preparation and Review of Environmental Reports
- (November 1997/2000)
- Guidelines for Public Consultations
- The Punjab Environmental Protection Act 1997, Amended 2012
- National Environmental Quality Standards (NEQS)-1993, Amended August 2000
- National Environmental Quality Standards for Ambient Air- November- 2010
- National Standards for Drinking Water Quality - November, 2010
- National Environmental Quality Standards for Noise - November, 2010
- Sectorial Guidelines for Environmental Reports
- Guidelines for Sensitive and Critical Areas
- National Resettlement Policy and Ordinance
- The National Forest Policy 2001 of Pakistan
- Forest Act, 1927
- Industrial Relation Ordinance, 2002
- Punjab Environment Policy, 2015
- Punjab Industrial Relations Bill 2010
- Industrial Relations Ordinance 2011 Promulgation
- Pakistan Explosive Act, 1884, [updated December 6, 2014]
- Provincial Local Government Ordinances, 2001
- Factories Act, 1934
- The Mines Act, 1923
- National Mineral Policy, 2013
- Punjab Mining Concession Rules, 2002
- Land Acquisition Act, 1894, [updated May 7, 2011]
- The Punjab Wildlife (Restoration, Preservation, Conservation and Management) Act & Rules, 1974
- The Punjab Plantation & Maintenance of Trees Act, 1974
- Canal and Drainage Act, 1873
- The Fire Wood and Charcoal (Restriction ) Act, 1964
- Motor Vehicles Ordinance, 1965
- Agriculture Pesticides Ordinance, 1971
- The Antiquities Act, 1975
For the assessment of the environmental impacts of the proposed project on air, water and noise according to the international legal framework, this report has also incorporated the requirements of the "Pollution Prevention and Abatement Handbook" by the World Bank Group- effective July 1998 and IFC EHS Guidelines.

13. **Condition of Existing Environment**

13.1 **Topography & Geology**

The proposed project site is lies in the “Salt Range”, north of River Jhelum and south of Islamabad. Motorway M-2 is at a distant of about 20 km from the site. The project site falls in “minor to moderate damage area”.

The area of the proposed project development (cement plant and mine) is open scrub land that is used partly for grazing, and gathering as a source of wood for fuel. The result is an area denuded of vegetation other than low lying scrub. Soils of the Plant site area are calcareous loamy to calcareous clayey. Limestone mine area land photo is presented as Figure – E.6 and cement plant area in Figure – E.7.

Groundnut and wheat are the major crops cultivated on the large scale in Chakwal District. There are some areas in district where the ownership of the lands is rest with the landlord families but generally the people living in the district are the owners of the lands.

![Image of the project site](image-url)
Fruit orchards, especially of citrus, have been planted but only small area owing because of the shortage of water. Fair size of loquat orchards are established in Tehsil Kallar Kahar and Choa Saidan Shah. Farming is done with the conventional methods. Turnip, Cauliflower, Tomato, Lady Finger, Onion and Carrot are main vegetables grown in the district. A large number of rose gardens have been planted by the farmers in Choa Saidan Shah and Kallar Kahar area and the quality of roses produced at this place is probably better than the roses produced at any other place in the country.

Water resources are not adequate in district especially for irrigation purpose only 8% area gets water for the irrigation purpose. Chakwal is rain fed district and there is no irrigation system in Chakwal. There are natural springs in Tehsil Choa Saidan Shah. There is also a natural lake in Kallar Kahar area but the water of the lake is not used for any purpose. There is no river that passes through proposed development area.

Ground water at the Plant area is indicated to be located at a depth of 45 to 60 meters. APML is in the process by carrying out a hydrological study of the area.
13.2 Fisheries & Aquatic Biology

The area has only one natural water body located 20 kms from Kallar Kahar. The lake has been declared a game reserve. Some fish species are found in the lake and it is also habituated by migratory birds. There is no commercial fishing activity in the plant area.

13.3 Forestry - (Flora & Fauna)

The proposed plant area does not fall within any Government forest area. The nearest reserve forests are Dharam Tirath and Ramhilawan located at distance of 3.8 and 3.2 kms, respectively, from plant site as shown in Figure – E.8.

Chakwal District lies in the subtropical, semiarid zone and mostly is covered by dry deciduous scrub. The under bush consists mainly of saryala, khawi, mesquite and karir.
The Area around Plant site has following fauna:

- Reptiles
  - Snakes
  - Lizards

- Birds
  - Sissies
  - Sparrows
  - Doves

There are no protected habitats within the proposed development areas nor are they considered to be “Critical Habitat” as defined by IFC’s Performance Standard 6 “Biodiversity Conservation and Sustainable Natural Resources Management”. Although some plants and reptiles found, these species are widespread at a national level.

13.4 Cultural and Other Heritage
The only site of heritage is Katasraj Temple, which is located about 2 km from the plant site. Katasraj Mandir is a Hindu temple complex situated in Katas village near Choa Saidan Shah. There are no historical monuments around the project site.

A graveyard is located in the top north-western corner of the plant site. This graveyard will be outside the Plant boundary/fence. Independent access to the graveyard will be provided.

13.5 Existing Socio-Economic Conditions
Choa Saidan Shah Tehsil of Chakwal District has 6 union councils with estimated total population of 132,000 - 115,000 rural and 17,000 urban.

Because of limited income, most of the common people live a marginalized status of life. Work within the agricultural and industrial sectors is the main livelihood. The old traditional and simple life, typical of the Punjab villages, is the prevailing cultural and aesthetic characteristic of the life style of the majority of the people.
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 systems prevail and people reap the fruits of this system. Most of the families are quite coherent. There is a rising trend in the society to change their old traditional socioeconomic pattern of life.

14. **Impacts During Construction**

The main direct ecological impact resulting from the construction phase of the project will be the loss of vegetation associated with the “clearance” at the limestone mine area, the cement plant and construction camp sites and the access road alignments. With soil and vegetation removed, the habitat for fauna will readily move away when site clearance takes place.

Trans-locating vegetation on a large scale is unlikely to be feasible. However, APML plans to establish forest nurseries in association with its projects. Tree seedlings are used (i) to provide physical screening of the mine and cement plant sites and (ii) for subsequent site restoration. The establishment of nursery in relation to the proposed project site should assist with short-term mitigation and longer term on and off-site restoration of damaged habitat.

Vegetation loss at the mine site cannot be avoided, but successful restoration, improvement and long term management of the surrounding areas for conservation and productive uses will provide significant compensation.

With regards to emissions to air, construction activities can generate dust that can cause a nuisance to local residents and cause a health risk to construction workers. As the nearest residential receptors are approximately 1 km from the main development site it is considered unlikely that there will be an impact on local people. The main risk is considered to be the exposure of workers on site. Dust control measures, together with the use of appropriate personal protective equipment and appropriate maintenance of vehicles will be used to mitigate this impact. The impact of emissions of vehicle exhaust gases on air quality is considered negligible.
Potentially polluting materials will be carefully stored in suitable containment in order to reduce the risk of pollution incidents from spills and leaks.

In order to manage the domestic effluent produced at the site which will be an issue particularly during construction with the large numbers of workers present at the site, a sewage treatment plant will be constructed.

Due to the semi-natural rural character of the proposed site, the transitory visual impacts of construction works are expected to be moderately adverse due to the introduction of prominent structures and construction equipment. However, the topography of the area will provide a natural level of screening of the works and the layout of the site will be sensitively planned to use this to minimise negative visual impacts.

The effects of the traffic generated by the construction phase are likely to be moderately adverse when considered within the context of the relatively low volumes of traffic that passes through the local area daily.

Finally, any noise associated with construction activities is likely to have negligible impact. Measures to reduce construction noise levels will be included in the Environmental Management Plan and Monitoring Programme.

Overall, with the exception of the impacts on ecology within the boundary of the development area, the construction activities are transitory, and are considered likely to have a minor adverse impact on dust levels and a moderate adverse visual impact.

15. **Impacts During Operation**

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

- Impacts on air quality as a result of emissions from the cement production process and dust from the mining activities and crushing and grinding processes.
- Impacts associated with noise, particularly the impact of noise on nearby human receptors.
• Impact on the surface water regime (hydrology) by changes to the natural drainage of the landscape within the development area and potential emissions of fine particles (suspended solids) into the water as a result of the industrial activities. Potential release of contaminated effluents into the surface water drainage
• Impacts of transport.

Each of these potential issues is addressed in the following sections.

Effects on Local Air Quality
A detailed study of the potential atmospheric emissions from the proposed cement works was undertaken for the proposed development, using Air Dispersion Model (ADM). This study addressed the emissions to air which may occur during the normal operation of the cement kiln, as well as the minor emissions of fine particulate matter from other process stacks. The aim of this study was to assess the effects of these emissions in terms of ground level pollutant concentrations at ground level. These changes in local air quality were then compared with the Pakistan National Quality Standards (NEQS), IFC EHS Guidelines as well as the international World Health Organisation (WHO) guidelines.

The result of ADM run are presented below:

<table>
<thead>
<tr>
<th>Table - E.1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>APML - AIR DISPERSION MODEL - RESULTS SUMMARY</strong></td>
</tr>
<tr>
<td>Parameters</td>
</tr>
<tr>
<td>Kiln Stack</td>
</tr>
<tr>
<td>- Maximum 1- Hour Concentration, µg/m³</td>
</tr>
<tr>
<td>- Maximum 24- Hours Concentration, µg/m³ See Note (**)</td>
</tr>
<tr>
<td>- Max. Annual Ave. Concentration, µg/m³ See Note (**)</td>
</tr>
<tr>
<td>- Distance to Maximum, meters</td>
</tr>
<tr>
<td>IFC/WHO, Stack Emissions , mg/Nm³, (‘) See Note</td>
</tr>
<tr>
<td>Pakistan - NEQS, Concentration in Ambient Air, µg/m³</td>
</tr>
</tbody>
</table>
The overall conclusion from the dispersion modelling study is that when the plant is in operation future air quality will be well within the Pakistan NEQS, IFC EHS Guidelines and WHO guidelines specified for the protection of human health. These limits are set well below the levels at which there are any observable effects on human health or respiratory function in order to protect vulnerable individuals within the population. On that basis, it is concluded that there will be no adverse health effects in the local population due to the operation of the cement plant.

It was concluded that at all sensitive receptors, the maximum changes in sulphur dioxide, carbon monoxide, particulate matter and annual average nitrogen dioxide concentrations due to plant operation are a small fraction of the relevant air quality criteria, and future air quality will remain well within these criteria. Given the likely very good existing background air quality in these largely rural locations, air quality will remain well within the hourly limit value.

With mitigation measures implemented that there will be no significant effects on air quality either as a result of dust emissions from the mine or due to vehicle emissions.

**Other Operational Effects**

**Noise**

APML is committed to comply with Pakistan NEQS and IFC EH Guidelines and with this approach it can be estimated that noise levels generated from the cement production plant are unlikely to cause disturbance in any of the nearby communities during the evening or night. The mining activities are away from any
community and the location of the mine provides natural screening of noise to the communities.

Changes in traffic on the local road network when the plant is operational would not give rise to perceptible changes in noise. The new access/link roads likely to avoid any property which not be affected by increases in noise from traffic using them.

Vibration is unlikely to be perceptible from any aspect of the project. The company has committed to implement appropriate noise management practices in all aspects of the design and operation of the cement plant, mine and transport.

In order to minimise impact of blasting at the limestone mine, the operator will use internationally recognised techniques of blasting to minimise the blast wave and therefore reduce any impact of the blasting. Also, blasting will be limited to the daytime.

**Ground, Surface Water and Groundwater**

The operation of the facility will incorporate measures to prevent releases to ground, surface water and groundwater. Present, indications are that these will be appropriate to the nature and scale of the installation and that significant impacts should not occur.

**Raw Material Use and Waste Management**

The bulk of the raw materials used in the production process will be obtained locally from the limestone and clay mines. Available information indicates that the company have thoroughly investigated the nature of the raw material reserves and that there should be nonissues associated with the use of in appropriate raw materials leading to significant emissions to air from the process. Further, on line testing in the production process will ensure that no unsuitable materials will enter the process. The process produces no waste and dust that is collected will be recycled back into the process.

Waste effluent produced will be treated using a most advanced and recent treatment technology and wastewater treatment plant which will be permanently
situated at the site. The treatment plant will be designed to take into account the load placed during the maximum number of persons on site.

**Transport**

At full capacity operation the project will involve following vehicular transport.

- Off Highway, within plant & mine, 175 loads per day of 75 tonnes capacity each.
- Highway, in/out, 964 loads per day of 25 tonnes capacity each. The project will provide a trucks lay area at entrance to the Plant.

In addition, about 20 vehicles will be plying in/out of the plant carrying plant personnel.

New access road to the cement plant will be developed, connecting the Kallar Kahar – Choa Saidan Shah Road. This new connection would directly serve the plant avoiding any interference with any village traffic. An access road to the mine area will be built within APML acquired area.

The limestone will be transported to the cement plant by means of a belt conveyor. Heavy trucks will be used for clay transportation and haulage activities within the mine and access roads built by APML. As the road from the limestone mine is remote from residential areas, it is not expected that there will be any public exposure to emissions from these vehicles.

Coal unloading at Port Qasim and transportation to cement plant site has the potential to generate fugitive dust. The fugitive dust can be reduced by:

- Importing coal without fines and larger sizes.
- Importing coal with moisture content ranging at 7% to 8%. This will also lessen fire hazard.
- Using tarpaulin covers during transportation.
- All coal offloading, handling and storage of coal at the factory will be conducted in enclosed sheds. In addition fine mist water sprays will also be provided for the coal stockpile areas.
The APML is already in discussion with Pakistan Railways to extend their existing system to as far as close to their plant site. As soon as Railways develops a plan of the railway extension then APML seriously consider its implementation, as it will reduce the load on present road network and also provide rail facilities to the local population.

16. **Impacts During Decommissioning**

No detailed assessment of environmental impacts associated with decommissioning can be made at present. The plant has an expected lifespan of over 50 years and so only general principles can be established at the present time.

In broad terms, the process of decommissioning is likely to give rise to impacts similar to those experienced in the construction phase. The methods and techniques selected are expected to be in accordance with national and international standards prevailing at the time of decommissioning. Decommissioning will require the:

- Removal of all surface equipment and units;
- Potential removal of hardstanding and surface cover;
- Abandonment of sub-surface utilities or filling and abandonment as appropriate;
- Reinstatement of the site and all project areas to pre-construction conditions. With regards to the rehabilitation of the mine during operation, the works shall be conducted on an on-going basis in accordance with the accepted timetable set out in the planning proposals to the Authorities.

17. **Social and Economic Issues**

The key impacts of the proposed development relate to two main aspects and these are:

- Employment of construction workers and operation of the construction camp.
- Employment opportunities for local people.
No details on living conditions and the design of the compare available at this stage, but mitigation measures for the provision and review of this information and the monitoring of worker quality of life is identified by the EIA. Major emergencies will be dealt with in Hospitals in Choa Saidan Shah or Chakwal.

People living in the vicinity of the project have identified a strong preference for livelihoods to be provided in the form of employment by the new cement plant. APML is developing a compensation plan for resettlement people of affected “RUPPER” village.

A total of 350 new jobs are expected to be generated when the mine and plant become operational. It is expected that the Plant’s establishment will encourage further secondary or induced employment.

On the overall basis it is concluded that socio-economic conditions of the people still needs drastic improvement. People do face hardship regarding basic amenities, education, health and employment.

**Grievance Redress Mechanism**

Grievance redress mechanism has been developed as part of the EIA report. The developed mechanism shall be applicable for resettlement and during plant & mining operation.

18. **Public/Stakeholders Consultation**

Public consultation was carried with people from four villages situated near the plant & mine location: Khajula, Dulmial, Tatral and Maghal. The total population of these villages is about 50,000. In all, 177 stakeholders participated in the consultation process.

As a result of the Public Consultation, the following recommendations are made:

- The management of the Project should measure up to the positive expectations of the people of the area and offer them maximum employment opportunities.
Environmental protection according to the legal national & international requirements should be ensured throughout the project operational life, thus guaranteeing protection of the environment and human health.

Sustainable development approach through conservation of natural resources management is the best strategy.

The plant management should offer technical training opportunities to the local youth.

Implementation of the Environmental Management Plan and Environmental Monitoring Plan, as recommended in this report, should be ensured.

APML have discussed the possibility of relocation of the village “Rupper”, with the inhabitants /residents. This is a small dhoke/village comprising of 32 houses with a population of 175 people. The people are willing to be shifted to another nearby location. APML is currently negotiating a comprehensive agreement with them for the purchase of land and the relocation of the villages to a nearby location.

APML will use its reasonable endeavors to support and develop the local community and will construct and maintain an appropriate hospital and girl school for the area as part of its ongoing Corporate Social Responsibility programme. APML will also build an access road/path and water supply for the Khajula Village.

APML is also in consultation with the Pakistan Railways to extend their railway network to near the plant site. When implemented, this will reduce the freight congestion on the road network as well as provide a passenger service to local community.
19. Conclusion

It is concluded that the project will be run in an environmentally sustainable order and in full compliance with the Pakistan Environmental Protection Act (PEPA) 1997, rules, regulations and the National Environment Quality Standards (NEQS) & IFC EHS Guidelines. The project, therefore, provides the necessary safeguards for the protection of all the elements/segments of 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 “state of the art” environmental management and mitigation measures which APML as a foreign company is very accustomed to, the project will not have any adverse impact on the environment and the surrounding community.
1.0 DESCRIPTION OF THE OBJECTIVES OF PROPOSAL

This chapter of the Environment Impact Assessment (EIA) Study Report presents the information relevant to the undertaking of the EIA carried out by Aftec (Pvt.) Limited for the establishment of a cement manufacturing facility near Choa Saidan Shah, District Chakwal, Punjab, Pakistan. Details of the project title and project proponent, and EIA consultants are discussed below.

1.1 Project Title & Proponents

1.1.1 Project Title

The proposed cement project to which this EIA relates is “Asian Precious Minerals Limited – Cement Project” (APML), Choa Saidan Shah, District Chakwal.

1.1.2 Proposed Project Proponents

Proponent of proposed project is Asian Precious Minerals Limited ("APML" or the “Company”). APML was formed as a holding company seeking to obtain and manage assets as a mining investment and exploration company. It is a business company incorporated in the British Virgin Islands on 2 June, 2004 as African Precious Minerals Ltd, which successfully realised a return on investment for its shareholders through a number of gold exploration projects in South Africa. It subsequently changed its name to Asian Precious Minerals Ltd on 17 May, 2012, to focus on its limestone and potash projects in Pakistan. APML has its Head Office located at:

House No. 03, Street No. 11, Sector F-8/3
Islamabad, Pakistan.
Phone: +92-51-2853333, Fax: +92-51-2854444

APML management structure is presented as Appendix – 1.1
It is the intention of the Asian Precious Minerals Limited (APML) to expand their operations in Pakistan by the development of a new cement manufacturing facility on a green field site adjacent to the raw material deposits leased by APML.

It is envisaged that the plant will be capable of a clinker production of a minimum of 7,200 tonnes per day which is approximately equivalent to a production of 2,641,206 tonnes of cement per annum.

It is further envisaged that the plant will be fully commissioned by early 2019.

1.2 EIA Consultants

This Environmental Impact Assessment Study has been carried out by Aftec (Pvt.) Limited, 20, Gulberg-5 Lahore, in association with Integrated Environment Consultants located at 2nd Floor, Office # 7, Anwar Tower, 99-Shadman, Lahore, Pakistan. Aftec is the lead consultant. Detail of the EIA Assignment Team is presented in Chapter 12.

1.3 Overview & Existing Situation

Cement manufacturing in Pakistan has been a growing Industry. Most analysts believe that the sector looks even stronger in the fiscal year 2015 - 16, as domestic demand has grown at 16% during year 2014 - 15 from previous year. It is probably the only sector that has enjoyed all the support of domestic as well as global trends for over years which has resulted in continuous increase in the sector’s profitability.

One of the biggest factors upon which industry officials and analysts are banking on is the better allocation of funds for the public sector development programme (PSDP) in current budget that is expected to increase local cement consumption. Improvements in the market scenario improved the fundamentals of not only big, but also mid-size cement producers. Pakistan has regular export market for cement.
In addition, China is assisting Pakistan in the establishment of China – Pakistan Economic Corridor (CPEC) which will include development of energy sector, roads, railway and Special Economic Zones.

The Central Asia Regional Economic Cooperation (CAREC) Program was initiated in 1997. CAREC’s goal is to improve living standards and to reduce poverty in CAREC countries through more efficient and effective regional economic cooperation. Spanning nearly 4,000 kilometers across Central Asia, the CAREC Program includes 10 countries in the Central Asia region. Under CAREC program the CAREC countries will be linked to Gwadar Port using three corridors, following CPEC corridors.

With CAREC and CPEC implementation the demand in Pakistan cement sector will grow thus also benefiting APML and cement industry. CPEC establishment is likely to improve Pakistan GDP at high rates.

1.4 Asia Premier Cement Limited [APML]

Asian Precious Minerals Limited, the holding company, intends to establish a Cement Plant near Choa Saidan Shah, District Chakwal.

APML Cement Project area is situated in the Chakwal District of Punjab province, which is the largest, wealthiest, and most developed of Pakistan’s three major provinces. It is also the most populous, with 90 million out of overall population of 190 million, with a rapidly developing middle class.

The proposed Project is almost equidistant from the capital of Pakistan, Islamabad to the North West and Lahore, capital of Punjab to the South East, and is some 1,600 km from Karachi in Sindh Province. The area is generally known as the “Salt Range”, as it holds vast deposits of sodium chloride, and the world’s second largest salt mine is 20 km from the proposed APML Project. Islamabad and Lahore are two of the largest cities in Pakistan, well developed and urbanised, and are 275 km apart. There is considerable traffic between the two along a modern six-lane highway running directly past the APML Project. The highway leads directly to port Qasim in the South and China in the North.
Much of the product from the cement plants is moved by road along this route. Almost 80% of Pakistan’s demand for cement comes from this region.

Location of proposed APML project is shown in Figure – 1.1. There are three other cement producers (DG Khan, Bestway, and Lafarge, (now PakCem) in the immediate vicinity, and Dandot Cement close to Khewra, as shown in the map below (Figure – 1.1). Apart from abundant availability of limestone raw material another factor making the location attractive is the proximity to both Afghanistan and Northern India. There is an easy access to these sizeable potential markets from the plant location. The Chinese plans to revitalise the old ‘Silk Route’ will bring access to new markets.

Figure – 1.1 [Courtesy Google Earth]

Most significantly, the APML Project sits on the new China Pakistan Economic Corridor (CPEC) which will link the new Chinese-built and operated deep-sea commercial port of
Gwadar in the South and to the Chinese border in the North of Pakistan, via the Lahore to Islamabad motorway which passes directly by the APML Project.

Chinese firms are currently constructing a 300 MW power plant within 5 km of the APML Project and there are over 1,500 Chinese labourers based within close vicinity of the APML Project offices. CPEC project areas have been declared a ‘Special Economic Zone’ by the Government of Pakistan.

APML proposed cement plant will have an installed capacity of 7,200 tonnes of clinker per day. Limestone & Clay quarries will in the vicinity of the plant.

Location of Plant and limestone lease area are shown in Figure – 1.2

Figure – 1.2 [Courtesy Google Earth]
Discussions are currently underway between APML and the Pakistani Railway authorities to bring a rail line directly to the area. This would provide a significant advantage to the local area and proposed Project. The rail line installed will provide passenger services to the area population as well as transport of inflow & outflow materials from the project. As yet, this option has not been considered in the project cost, it will be evaluated as soon as reasonable costs estimates become available from the Pakistan Railways. The Company is giving this factor serious consideration.

### 1.5 Purpose & Scope of the EIA Study

According to the Pakistan Environmental Protection Act (PEPA) Appendix 1.2, Section 12- Initial environmental examination, and environmental impact assessment: “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 effects an environmental impact assessment, and has obtained from the Government Agency approval in respect thereof.” It is this legal requirement from the Government of Pakistan that this Environmental Impact Assessment (EIA) report has been prepared to get Environmental Approval (EA) from the Environmental Protection Department (EPD), Government of Punjab, Lahore.

This EIA report has been prepared according to the category defined in Schedule – II of “Pakistan Environmental Protection Agency (review of IEE and EIA) Regulation 2000”- Appendix 1.3.

The World Bank undertakes environmental screening of each proposed project to determine the appropriate extent and type of Environmental Assessment required. The Bank classifies the proposed project into one of four categories, depending on the type, location, sensitivity, and scale of the project and the nature and magnitude of its potential environmental impacts. Two important categories are:
• CATEGORY A
Projects expected to have significant adverse social and/or environmental impacts that are diverse, irreversible, or unprecedented.

• CATEGORY B
Projects expected to have limited adverse social and/or environmental impacts that can be readily addressed through mitigation measures.

The proposed APML Cement Project will fall under Category – B, according to the World Bank classification.

This report provides detailed basic project specific information and facts; including especially among others environmental, economic, social, etc., enabling its assessment and justification that the project will meet the requirements of environmentally sustainable practices; both during construction and regular production stages; as desired under the Pakistan Environmental Protection Act 1997 Appendix - 1.2, the Punjab Environmental Protection Act, 1997 (amended 2012) Appendix – 1.2 (a), the National Environment Quality Standards – Appendix – 1.4 and the rules and the regulations thereof. Even further, in the compliance with the Equator Principles, the World Bank standards- “Pollution Prevention and Abatement Handbook, World Bank Group, Effective July 1998” and International Finance Corporation’s Environmental, Health and Safety Guidelines which are too stringent than the NEQS, will be applied during project operations.

The EIA Report describes relevant legal framework applicable to the project. The Report also describes the way the project activity will add to economic, social, agricultural, cultural development and welfare of the people of the area.

The Report provides details as how the project activities will not leave adverse impacts on any segment of environment, human health, environmental settings including soil, water, aquatic life, air, vegetation, crops, trees, plants, forestry, structures, wildlife, biodiversity, historical buildings or else. The Report also highlights the positive impacts of the project activity. It gives a systematic run down as to how the project will bring
financial uplift to the people of the area by directly providing jobs and contributing to the economy of the country.

The EIA Report provides details and sources of the raw materials up to ultimate production of cement. At the same time, it gives an account of all types of wastes to be generated during construction and regular operation of the project and their disposal, in an environmentally sustainable order.

As desired under the “Guidelines for the Preparation and Review of Environmental Reports October 1997/2000” Appendix – 1.5, 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).

v- Description of existing and expected conditions (boundaries adopted to study various aspects of the study).

vi- Evaluation of the impacts and their mitigation (assessment of any impact on the local population, relevant environmental data, gaps in knowledge, compliance with relevant environmental standards, assessed significance of the impacts, possible measures for avoiding or mitigation the impacts).

vii- Environmental management plan, monitoring plan and proposed training (description of the actions, schedule for implementation, assigning responsibility for implementation, monitoring program to assess performance, reporting and reviewing procedures and outline of training needs).
Details are available in the individual and respective sections of this report.

1.6 EIA Study Methodology

The main purpose of this study was to determine if the project is feasible from the environmental viewpoint.

The study has reviewed and documented baseline situation and analyzed possible potential impacts of developing the project. Recommended mitigation measures have been included for potential adverse impacts and enhancement measures for the positive ones. In addition the study recommended monitoring programme to be followed during subsequent phases of the project so as to ensure the project remains environmentally sound.

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

Methodology
The following methods were used in undertaking this study:

Literature review
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 stakeholder, district officials, local leaders and other key informants who will be affected by the project.
2.0 DESCRIPTION OF THE PROPOSAL AND ITS ALTERNATIVES

The proposed cement plant (the Project) implementation activities consist of engineering, design, construction, installation and start-up & operation of 7,200 tonnes per day clinker and cement manufacturing facility that will be located near Choa Saidan Shah, District Chakwal, Punjab Province. The plant will be installed off Choa Saidan Shah – Kallar Kahar Road (located about 1.5 km north of the road). Location of the proposed plant, limestone and clay lease area are shown in Figure – 2.1.

Prior to grant of limestone lease, the Director General of Mines addressed all the related environmental issues. In order to demonstrate its seriousness and long term commitment to safeguard the interests of local community and environments, APML agreed on the advice of the Directorate General of Mines and Minerals, Punjab and local community to reduce the applied for area from 6460.53 acres to 2381.07 acres. This

Figure – 2.1 [APML Leased & Plant Area]

[Courtesy Google Earth]
reduction was meant to address concerns raised by the communities having a cement factory and limestone mine close to educational institutions and archeological sites and impacts on water resources of nearby villages. This was done by creating a sufficient buffer between the proposed Cement Plant with the following establishments:

i. Katas Cadet College,
ii. Katas Raj Temples Complex,
iii. Punjab School of Mines (PSM); Katas
iv. Population centers comprising the town of Choa Saidan Shah and nearby villages of Khajula, Katas, Dulmial, Dhoke Rupper and Tatral.

Figure – 2.2 presents location of APML cement plant and lease area; various villages, Katas Raj Temple; Bestway Cement lease area; and Choa Saidan Shah.

Figure – 2.2
2.1 The Status of the Proposal in the Project Cycle (pre-feasibility, feasibility or detailed design)

The feasibility study for the Project is under completion. The Islamabad Electric Supply Company has agreed to meet Project’s electricity requirement from its 132 KV transmission line.

The feasibility study contains the details of the financial and technical aspects of the project and other necessary issues in totality as required by any industrial project installation. It shall ensure environmental soundness of the project in accordance with the requirements of the Pakistan NEQS (Appendix – 1.4) and the rules and regulations made under the PEPA 1997.

2.2 Description of the Planning, Design and Implementation Stages

2.2.1 Planning

As the project is at its feasibility study stage. This EIA study is a basic and necessary part of the overall planning for the project and will be integrated into the feasibility study.

2.2.2 Design

Deliberations on plant designing and detailed engineering studies are in progress. After the completion of these studies, selection of EPC contractors, and final over all detailed engineering is going to be undertaken. Thereafter, plant fabrication and procurement of equipment & machinery will commence.

Simultaneously, background basic work on various multifarious technical aspects of the project is being carried out. Necessary design related information has been gathered. Generation of background environmental site specific data and conducting of public consultations has been undertaken and is submitted and further process of land acquisition is under progress.
2.2.3 Project Implementation schedule

Tentative project implementation schedule is presented below. Final schedule will be available after selection of EPC contractors.

- Land Purchase, EIA Approval, other local issues               May 2016
- Selection EPC and other Contractors                        June 2016
- Initiation of Supply & Construction Activities             August 2016
- Completion Plant & Machinery Installation                  November 2018
- Pre-commissioning & Startup                                December 2018
- Commercial Production                                       January 2019

The above schedule shows that, it will take about 34 months from basic construction to commercial production.

2.3 The Requirements for Raw Materials, Water, Cooling Water, Fuel, Energy and Equipment:

2.3.1 Raw materials

Annual raw materials requirements are summarized in the table below and described in detail in the following sections of this report.

<table>
<thead>
<tr>
<th>Description</th>
<th>Tonnes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limestone</td>
<td>3,834,345</td>
</tr>
<tr>
<td>Clay (silica)</td>
<td>6,516</td>
</tr>
<tr>
<td>Iron</td>
<td>8,958</td>
</tr>
<tr>
<td>Gypsum</td>
<td>163,429</td>
</tr>
</tbody>
</table>

2.3.1.1 Raw Materials Overview

All quantities listed above are based on expected operational parameters at 85% capacity utilization.
2.3.1.2 Limestone

Major raw material for the manufacture of cement is limestone (CaCO₃). This will be provided by a mine to be established on the limestone concession as per the mining license attached, Appendix – 2.1. There is high grade as well as low grade material and these will be blended, in conjunction with the auxiliary materials, to achieve a cement to ISO standards.

2.3.1.3 Clay (Silica)

APML will mine clay from its own leased located near the plant site. The mined clay will be brought to the plant by road. The clay deposits falls within the radius of 5 Km of the plant.

2.3.1.4 Other Materials

The auxiliary materials will be gypsum and iron. These are available from existing mines and quarries within a radius of 20 km from the plant.

There is a source of iron available close to the site. This will need a mining facility to be established as it will be required so as to maintain a high level of chemical consistency in the feed to the new kiln.

Gypsum, a cement additive, will be sourced and transported to the plant as required. This may be natural gypsum or synthetic gypsum. The gypsum will be transported to the plant by road initially.

2.3.2 Fuel

Coal will be used as main fuel with use of furnace oil & diesel oil during startup and emergency.

2.3.2.1 Coal

Imported coal will be brought to the cement plant by road from Karachi, most probably imported from the Kumba Grootegeluk coal mines near Ellisras in the Limpopo Province
or from the Kumba Leeupan coal mine near to Delmas, both in South Africa. The Project will require 240 000 tonnes of coal per annum at 85 % capacity utilization.

### 2.3.3 Electricity

Power will be made available from Islamabad Electric Supply Company Limited (IESCO). A 132 kV transmission line crosses the intended raw material deposit area and is not far from the proposed plant site. A new incoming substation will also need to be constructed by APML. At a maximum power consumption of 110 kWh/tonne of cement the maximum demand will be 35 MW. The plant will, however, have a guaranteed power consumption of < 95 kWh/t of cement produced. To cater for contingencies and other consumers such as a colony and putting the plant into production, the supply must be capable of a maximum demand of 50 MW (installed load). IESCO letter of commitment to supply requisite electricity of APML is attached as Appendix – 2.2.

Waste gas heat power generation will also be available from the plant; this could be as much as 12 MW. This will offset power from IESCO once the plant is on full production.

### 2.3.4 Water Supply

Hydrological study of the Project area is being carried out. At present surface water or sub-surface water source is not available within plant site. According to local sources ground water is available near area at a depth of 45 to 60 meters, which needs to be confirmed. In surrounding villages, Dulmial & Tatral, hand pumps have been installed for domestic use. Agriculture in the area around the plant is dependent on rains.

No water is available on site at present, this will need to be bored for. If the water bored for is not potable a suitable purification plant will be installed for domestic water use only.

It is envisaged that the plant will be designed for dry process, water consumption will therefore be for plant cooling evaporative losses and for domestic use only. The plant will be designed to use minimum water. Water requirement is estimated at 3,800 to 4,000 tonnes/day, including requirement for housing colony and other domestic use.
Tentative water balance (Figure – 2.3) for the proposed plant is shown below and will be finalized after detailed plant engineering.

Figure – 2.3 [Tentative Water Balance]

2.3.5 Site Location & Plant Layout

The proposed plant site boundary primarily falls within mainly inhabited and presently unused area, except Village “Rupper” located extreme north-east corner of proposed plant area. This is a small dhoke/village comprising of 32 house with population of 175 people. Population of this village will be relocated/resettled. They have agreed to be relocated and resettle them to another nearby place. APML is negotiating a comprehensive agreement with them for purchase of land and exploring the possibility at two different nearby locations to relocate them.
Figure – 2.4 presents overall plant area, tentative plant layout and showing the “Rupper” village. Plant layout will be finalized after the selection of EPC contractor.

![Figure – 2.4 [Tentative Plant Layout]](image)

The area of the plant site selected is comprised of approximately of 963.58 hectares (2381 acres). This area does not include housing colony, which will be located at different area on purchased land.

Elevation at the plant layout varies from 709 to 735 meters, average elevation at 720 meters above sea level.
Figure – 2.5 indicates the plant location along with nearer villages, town and all cement plants in the vicinity of the proposed APML cement plant. The plant site is located at about 1.5 km north of Kallar Kahar – Choa Saidan Shah Road.

Approximate distance of various villages, towns, nearby cement plants and forest reserves is presented below:

<table>
<thead>
<tr>
<th>Village, Town, Forest, etc.</th>
<th>Distance, km</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choa Saidan Shah</td>
<td>4.0</td>
</tr>
<tr>
<td>Katas</td>
<td>1.7</td>
</tr>
<tr>
<td>Khajula</td>
<td>3.7</td>
</tr>
<tr>
<td>Tatral</td>
<td>2.5</td>
</tr>
<tr>
<td>Dulmail</td>
<td>2.6</td>
</tr>
<tr>
<td>Maghal</td>
<td>8.5</td>
</tr>
<tr>
<td>Khairpur</td>
<td>15.0</td>
</tr>
<tr>
<td>Khokhar Bala</td>
<td>13.0</td>
</tr>
<tr>
<td>Ramhilawan Reserve Forest</td>
<td>3.2</td>
</tr>
<tr>
<td>Dharam Tirath Reserve Forest</td>
<td>3.8</td>
</tr>
</tbody>
</table>
### ASIAN PRECIOUS MINERALS LIMITED – EIA REPORT CEMENT PROJECT

<table>
<thead>
<tr>
<th>Plant Site</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bestway Cement Plant</td>
<td>3.3</td>
</tr>
<tr>
<td>DG Khan Cement</td>
<td>12.5</td>
</tr>
<tr>
<td>PakCem</td>
<td>17.0</td>
</tr>
</tbody>
</table>

Plant Site & leased areas coordinates are as below:

#### Plant Area Coordinates

<table>
<thead>
<tr>
<th>Point</th>
<th>Latitude</th>
<th>Longitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
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<td>72.958100°</td>
</tr>
<tr>
<td>B</td>
<td>32.743400°</td>
<td>72.943700°</td>
</tr>
<tr>
<td>C</td>
<td>32.738298°</td>
<td>72.942893°</td>
</tr>
<tr>
<td>D</td>
<td>32.733600°</td>
<td>72.955200°</td>
</tr>
</tbody>
</table>

#### Limestone Lease Area Coordinates

<table>
<thead>
<tr>
<th>Point</th>
<th>Latitude</th>
<th>Longitude</th>
</tr>
</thead>
<tbody>
<tr>
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<td>32° 44' 03.3&quot;</td>
<td>72° 56' 47.7&quot;</td>
</tr>
<tr>
<td>B</td>
<td>32° 44' 22.9&quot;</td>
<td>72° 56' 22.7&quot;</td>
</tr>
<tr>
<td>C</td>
<td>32° 44' 52.8&quot;</td>
<td>72° 56' 07.0&quot;</td>
</tr>
<tr>
<td>D</td>
<td>32° 44' 54.9&quot;</td>
<td>72° 55' 11.1&quot;</td>
</tr>
<tr>
<td>E</td>
<td>32° 44' 59.8&quot;</td>
<td>72° 54' 59.7&quot;</td>
</tr>
<tr>
<td>F</td>
<td>32° 45' 27.5&quot;</td>
<td>72° 55' 01.2&quot;</td>
</tr>
<tr>
<td>G</td>
<td>32° 45' 30.1&quot;</td>
<td>72° 53' 52.7&quot;</td>
</tr>
<tr>
<td>H</td>
<td>32° 45' 37.5&quot;</td>
<td>72° 53' 35.4&quot;</td>
</tr>
<tr>
<td>I</td>
<td>32° 45' 38.9&quot;</td>
<td>72° 55'08.6&quot;</td>
</tr>
<tr>
<td>J</td>
<td>32° 45' 18.8&quot;</td>
<td>72° 55'30.5&quot;</td>
</tr>
<tr>
<td>K</td>
<td>32° 45' 16.2&quot;</td>
<td>72° 56' 35.8&quot;</td>
</tr>
<tr>
<td>L</td>
<td>32° 45' 40.0&quot;</td>
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</tr>
<tr>
<td>M</td>
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<tr>
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<td>72° 58' 21.6&quot;</td>
</tr>
<tr>
<td>O</td>
<td>32° 44' 34.4&quot;</td>
<td>72° 58' 47.8&quot;</td>
</tr>
<tr>
<td>P</td>
<td>32° 44' 24.0&quot;</td>
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<tr>
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<td>72° 58' 30.4&quot;</td>
</tr>
<tr>
<td>R</td>
<td>32° 44' 47.0&quot;</td>
<td>72° 57' 52.6&quot;</td>
</tr>
</tbody>
</table>
2.3.6 The Mine & Development Plan

Quarrying and Mining are two different terms but probably because of their similar practical application they are often mixed together. The difference is unfortunately not very clear. Both, mining and quarrying are done for extraction of minerals and stones. Anything extracted from above the surface of earth is known as quarrying whereas extraction of buried material below the surface is mining. Mining is the major field and has got much more utility. In quarrying we restrict ourselves to outer layers of rock and gradually move inward but in mining, we straightaway target the desired location and extract the required material using some compatible technique.

In this report Mining means – “An excavation or system of excavations made for the purpose of, or in connection with, the extraction of limestone, being neither a mine nor merely a well or borehole or a well and borehole combined”. This is surface mining of limestone rock. In this type of mining the deposit usually is either massive, bedded or lenticular, and is suitable for bench mining. On the other side, Pakistan Mines Act, 1923, does not define quarry of stone specifically and the stone excavation is included in the broad definition of mine in Section 3(f), which is reproduced as under:

<table>
<thead>
<tr>
<th>POINT</th>
<th>Latitude</th>
<th>Longitude</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
<tr>
<td>B</td>
<td>32.76125°</td>
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<tr>
<td>C</td>
<td>32.75603°</td>
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<td>D</td>
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<td>F</td>
<td>32.73425°</td>
<td>72.94662°</td>
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<td>G</td>
<td>32.73970°</td>
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<tr>
<td>H</td>
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<td>72.93528°</td>
</tr>
<tr>
<td>I</td>
<td>32.74839°</td>
<td>72.92532°</td>
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<tr>
<td>J</td>
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<td>72.92564°</td>
</tr>
<tr>
<td>K</td>
<td>32.75566°</td>
<td>72.89293°</td>
</tr>
</tbody>
</table>
“Mine” means any excavation where any operation for the purpose of searching for or obtaining minerals has been or is being carried on, and includes all works, machinery, tramways and sidings, whether above or below ground, in or adjacent to or belonging to a mine.”

Generally a open pit mine includes the following:

(a) All the surface mineral workings;
(b) Tips (even if they are outside the site boundary);
(c) Storage of minerals, including stockpiles;
(d) Areas used for the preparation of extracted materials for sale (this includes crushing, screening, washing, drying and bagging);
(e) The buildings and structures at the mine that are used for the working of the mine;
(f) Common areas (for example quarry roadways and railways, but not public roads or railways under the control of a rail company);
(g) Sites where prospecting with a view to the extraction of minerals is carried out and activities in a quarry includes:
   (i) Being prepared for extraction of minerals;
   (ii) Where mineral extraction or preparation takes place as part of a work activity;
   (iii) Where work to prevent water or other material flowing into an adjacent mine takes place – even after mining has finished;
   (iv) Being prepared for abandonment, for example landscaping.

Mining Development & Operation

The major raw materials required to feed the 7,200 ton per day kiln are:

- High grade limestone 3,139,450 tonnes per annum
- Low grade limestone 428,107 tonnes per annum
- Limestone Filler 266,788 tonnes per annum
- Clay (Silica) 6,516 tons per annum

All of these materials will be extracted from within the APML Mining Lease Area.
The mine operation will be based on working an effective 12 hours per day and 6 days per week. The designed capacity of the limestone crushing, for both high grade combined with low grade, is 1,572 tonnes per hour. The product size will be (minus) 80 mm. No stockpiles of limestone will be built at the quarry.

The limestone and clay mining will be done separately and simultaneously depending upon nature of occurrences and geology of the deposits. Scope of mining operation for the two minerals is given below:

The demand of gypsum and iron/laterite raw material shall be fulfilled by out sourcing from the nearby operative pits/quarries because of small size of demand and other operational factors. Therefore, it has been presumed that small gypsum and laterite quarries would not be economically viable for this project.

Figure – 2.6 shows the location of limestone and clay quarries adjacent to the Cement Plant.

![Location of Plant & Limestone & Clay Mines/Quarries]
1. Limestone

**Location**

The limestone raw material requirement will be mined from the ridge some 1,000 meters to the north of the proposed Cement Plant location as shown in the conceptional drawing of limestone quarry/mine development and operation (Figure – 2.7) below:

![Conception Drawing, Limestone Mine](image)

**Figure – 2.7 [Conception Drawing, Limestone Mine]**

In geological terms the limestone material is “young” and relatively soft, but it will still require drilling, blasting and crushing. Air compressors will be used for drilling.

The limestone deposit consists of two thick limestone bands (20 + 50 meters) separated by a thin shale (3 meters). The entire limestone zone including the shale will be mined in 10 meter benches. The total thickness to be mines is
therefore some 73 meters. This limestone occurs at surface on the southern portion of the mine and is some 30 meters below surface on the northern extremity of the mine.

The material that occurs above the limestone is low grade limestone and clay. This material will be mined as low grade limestone and clay. This material will be mined in the same way as the limestone, except where it is very soft it will be dug by excavator and not blasted. This material will be mined from the northern area of each 10 meter bench.

From each 10 meter bench high grade limestone will be from the southern portion and low grade from the northern portion. The mining face on each level will be orientated north-south and mining will proceed in either an easterly or westerly direction. There will always have at least two levels operating at any one time. This is necessary to cater for the need to blend the limestone from different areas as well as to ensure that balance between high and low grade is maintained.

Because the “overburden” consists of low grade limestone and clay it means that this material will not be discarded. However, stripping of 1 - 3 meters of topsoil at surface will be done and stored in a designated area for future re-vegetation purposes.

Accordingly, the skyline will not be broken and mine access will be the least visible area. This means that the mine should mostly be hidden from general view.

The access to the mine will be at the 790 meter level. All water on levels above this will be drained naturally via this access. Levels below this will require a sump to be developed in the pit from where the water can be pumped out.

A water storage area below the access point will be created. This will ensure that no water is fed directly to natural streams. The water will then be used to control dust in the mine and access roads.
All trees & larger bushes will be cut and supplied to the local community as firewood.

**Access Road**
The access road from the Cement Plant to the limestone area will follow a route which passes to the West of the plant and then crosses the valley to ascend the limestone ridge at a gradient of <1:10 to an elevation of 780 meters above sea level. The access road will be constructed to a width of 22 meters and will be constructed to the standard required to transport laden 80 tonne capacity haul trucks.

**Haul Roads**
Haul roads will be constructed within the mining pit to a width of 22 meters at a maximum gradient of 1:10. The roads will be constructed to the standard required to operate fully laden haul trucks of an 80 tonnes capacity.

**Crusher**
The crusher will have an output of 1,572 tonnes per hour and consist of an apron feeder and an impact crusher. Dust at the crusher will be controlled by the use of bag filters as well as water sprays.

**Transportation Mode to Plant**
The crushed limestone will be transported from the crusher to the blending beds at the cement plant, by means of an overland conveyor. The conveyor capacity will be 1,600 tons per hour. The total length of the conveyor will be 1,500 meters.

**Methods to be used for Blasting/Drilling**
Blast holes of 200 mm will be drilled using a “Down-The-Hole” (DTH) drill rig. Face heights will be 10 meter. Blasting will be carried out using emulsion explosives.

**Sources & Abatement Measures for Noise & Dust Control**
In order to prevent dust emissions during the transport of extracted materials, the following techniques will be employed: The overland conveyors will be
covered; a simple, linear layout will be applied to minimize the number of transfer points; cleaning of return belts in the conveyor belt systems; storage of crushed and pre-blended raw materials in covered or closed bays.

The crusher will be fitted with dust suppression systems. All haul roads will be treated with “Dustex” or similar dust suppression materials. Roads will be watered regularly using a water-bowser truck.

DUSTEX is an organic, non-toxic sand and soil stabiliser with the properties required of a good binder to prevent wind erosion. The powder is hygroscopic and absorbs moisture from the atmosphere and binds the water in the ground.

**Plan for Storing & Handling of Overburden and other Reject Material from Mining Operation:**

There will not be any waste or reject material produced by the mining operation. Topsoil overlying the limestone will be stripped and stored in a designated area to be used for re-vegetation of disturbed areas.

2. **Silica/Clay**

A total of 6,516 tonnes of silica/clay material will be mined per annum. The mining area will be located immediately to the West of the Cement Plant.

No blasting will be required and the material will be “free dug” by hydraulic excavator and hauled by truck to the plant raw material storage area.
2.3.7 Cement Manufacturing Process

An overview of the cement manufacturing process is shown below:

![Diagram of cement manufacturing process]

**Figure – 2.8 [TYPICAL LAYOUT OF A CEMENT MANUFACTURING PROCESS]**

2.3.8 Plant Description

1. Raw Material Storage

**Limestone**

The limestone from the quarry will be stored in two longitudinal stockpiles of 80,000 tonnes each, depending on the limestone analysis. The limestone will be recovered by a dedicated reclaimer. Provision is to be made to double the storage of the limestone in the future.

**Silica and Iron**

Silica and iron will be stored in 1,000 and 7,000 tonnes stockpiles respectively, and will be recovered by front end loader. A receiving system for clay and iron from road trucks, will be required.
Coal and Gypsum
Coal and gypsum will be brought in by road, and will be discharge into an enclosed hopper from where the coal and gypsum will be transported by conveyor to their respective covered storage stockpiles. The gypsum will need to be crushed before transporting to the stockpile area.

Provision is to be made to store 12,000 tons of gypsum and 40,000 tons of coal, this is to cater for a supply of 60 days due to imports. Recovery will be by front end loader.

2. Raw Meal Preparation

Raw Mill Feed
The raw materials will be recovered from the raw material stores and will be fed via bins and weigh feeders to the raw mill to ensure that the chemical composition of the raw meal is within requirements.

Five bins, one for each of the raw materials, will be required. Each will be equipped with bin level control.

The feed to the raw mill will be controlled by weigh feeders under each of the bin. The bins will provided with dust control system.

At all stages of raw material preparation, appropriate methods will be used to prevent the escape of air-born dust emissions. These include the use of enclosed conveyors and storage, minimization of material drops, numerous nuisance dust collectors, and the use of electrostatic static precipitator(ESP) for the cooler and primary bag filter for the kiln/raw mill exhaust gases which are used for drying of the raw materials. All bag filters will be designed and operated to ensure particulate emissions below 30 mg/Nm$^3$ and the ESP to below 100 mg/Nm$^3$ including all other point sources, cement grinding, and coal grinding, in accordance with industry standards.
Raw Mill

The raw mill will be a vertical spindle mill (VRM). The raw mill drive will be from the mill motor, through a suitable reduction gearbox to the raw mill.

The raw milling circuit will be closed with a third generation high efficiency separator thus ensuring a suitable feed particle size distribution to the kiln.

Preheater gasses will be used to dry the raw materials in the mill if required. The circuit will be designed to allow for gas re-circulation from the mill exhaust fan back to the inlet of the mill. A mill bypass duct will be installed to allow for mill shutdowns.

De-dusting

The kiln and the raw mill will be de-dusted by primary bag filter. The returned dust will be returned to the kiln feed hopper or to the raw meal silos. Provision will be made to protect the filters from too high temperatures by providing an air dilution facility to the system. Opacity meters will be provided in the exhaust gas stack.

Raw Material Blending

Product from the raw mill will be transported to the blending/kiln feed silos where final chemical adjustment will take place before being fed to the preheater/kiln.

The blending silo will have a mixing chamber for blending and will have a capacity sufficient for two days with a reserve of 20% to allow for efficient blending.

Extraction from the bottom of the silo will be via discharge air-slides and dosing valves to the kiln feed hopper. The fluidisation and extraction air will be provided by positive displacement blowers. Provision will be made to keep the kiln feed hopper at a constant level. The raw meal will be transported to the feed point on the preheater by elevator.
The system will be provided with suitable de-dusting equipment which will comply with international standards.

3. Preheater and Kiln

It is envisaged that the preheater will be a twin stream five stage preheater so as to provide sufficient heat for drying of the raw mill feed. The waste gas from the preheater will be fed to a boiler for waste heat recovery and the generation of steam for the waste heat recovery steam turbine for power generation.

The preheater will be equipped with pendulum flap valves and splash boxes between the stages.

A service elevator will be provided for passengers and the handling of refractory materials for the preheater. Access to each platform shall also be by stairs with at least two access points at each level. Water will be available on each preheater level.

Adequate access will be provided to the preheater fan. Air blasters shall be fitted to the preheater as required and as indicated by operation of the kiln and preheater.

The kiln will be supported by three stations and will be driven by a variable frequency drive of adequate power and torque to be able to turn the kiln in an unbalanced state.

4. Clinker Cooler

The cooler will be of the cross bar type with adequate reserve to accommodate kiln flushes and to allow the clinker to be cooled to a maximum of 60 °C above ambient.

Clinker lumps will be crushed by either a rolls or a hammer crusher. The cooler grate drive can be either mechanical or hydraulic. If hydraulic then a separate room must house the hydraulic pumps and lubrication systems. This room must be adequately ventilated so as to control the ambient temperature in the room. Suitable oil coolers must be provided.
The clinker from the cooler will be conveyed by steel pan conveyors to the clinker storage facility. Provision will be made to accommodate off-spec clinker.

From the kiln the clinker will pass through the cooler to recover as much heat as possible for the kiln. The cooled clinker will then be transported to the clinker storage system.

Excess hot gas from the cooler, after extraction of secondary and tertiary air has been extracted will be fed to a boiler, as per the preheater gas, for the recovery of heat for the waste heat generation of steam for the waste heat recovery steam turbine for power generation.

**De-dusting**

Preheater and cooler de-dusting will be via ESP and the dust emissions will comply with international standards of not more than $100 \text{ mg}/\text{Nm}^3$.

Suitable provision shall be made to cool the gasses to the de-dusting equipment should an over temperature be experienced. This may be by dilution of the gasses with ambient air by rapid acting vents. Provision will be made in the fans to accommodate this additional air.

5. **Clinker Storage**

This will be a facility with 100,800 tonnes (14 days) live capacity for clinker and a 500 tonnes facility for off spec clinker. Provision will be made to be able to feed the off spec clinker back into the system at a controlled rate. The clinker storage facility will be adequately de-dusted.

The feed to the cement mill may be by steel pan and belt conveyors. The feed to the cement mill feed bins may be by either the conveyors or by a large sized chain bucket elevator.

6. **Cement Milling**

The cement mill will be capable of an OPC (CEM I) and PLC (CEM II) production of 440 tonnes per hour. Two cement mills at 220 tonnes per hour each may be proposed as an alternative.
Clinker, gypsum and limestone will be stored in bins ahead of the cement mill and will be fed to the mill via weigh feeders. These conveyors will feed onto the mill feed conveyor.

The cement mills will be closed circuit, as per the raw mill. The drives will be as per the raw mill. Separators will be 3rd generation high efficiency so as to provide a consistent quality product.

Cement mill de-dusting will be via primary bag filters and will comply with the international standards for dust emission of not more than 30 mg/Nm³.

It is envisaged that the cement mill will be air cooled, but with a provision for internal water cooling if required. Industrial water will be used if required.

The product from the mill will be able to be fed to either the cement mill storage silos or to a separate surge bin to accommodate cement when the mill product is being changed. This cement must be able to be fed back to the separator system at a controlled rate for blending with the chosen product.

The cement mill building will be roofed but the sides may be left open. The building must however be designed to accept cladding against rain or noise if required.

7. Cement Storage

At present it is envisaged that the cement will be stored in four silos with a total capacity of 80,000 tonnes. The silos will be equipped with bulk loading facilities as well as the provision to feed the packing machines. Bulk tankers will be loaded under the silos while on weigh bridges.

De-dusting will be by bag filters and will comply with the international standards.

8. Packing Plant

At 85% capacity utilization cement will be bagged in about 54.4 million bags of 50 kg each. Cement bagging will be by six 6 spout rotary machine, with a capacity of 160 t/h each. Bagged cement from the machine will be transported to
six/twelve truck loading conveyors. Four bulk loading bays will be provided with capacity of 200 t/h each.

A minimum of two de-dusting bag filters must be provided for each bagging machine. Storage for 3,000,000 empty bags must be provided inside the bagging plant building.

The necessary fire-fighting sprinklers and fume exhaust systems will be provided in this building.

A suitable compressed air facility will be provided for the packing plant as a separate unit from the rest of the works. A palletising units for filled cement bags may be provided as an option.

The packing plant building will be enclosed.

9. **Coal Storage and Milling**

Coal received by road will be stored in a longitudinal stockpile. The stockpile will be covered and will be provided with a sprinkler system.

Coal from the stockpile will be recovered by front end loader to a conveyor feed hopper and will be transported to a 456 tonnes feed bin ahead of the coal mill and will be weigh fed to the mill.

The coal mill will a VRM of the gas swept, gas re-circulation type. The mill will be fitted with a high efficiency separator. As the mill will be gas swept a gas re-circulation facility with dampers will be provided to recirculate the exit gas from the fan back to the inlet of the mill. Product from the mill will be stored in a 230 tonnes pulverised fuel silo fitted with suitable outlets to the kiln and pre-calciner firing systems.

The plant will be provided with suitable de-dusting filters and explosion flaps where required. An inertising and fire-fighting system must be provided. The coal mill building will be enclosed.
10. Plant Cooling Water

A cooling tower, preferably with sealed radiators, will be provided for the cooling of the plant re-circulating cooling water. The plant cooling water will be treated if required.

11. Air Compressors

An adequate compressed air supply will be provided to service all requirements of the plant.

The compressors will be connected to a compressed air distribution system. Compressed air receivers with adequate volume should be placed at strategic positions throughout the plant so as to minimise pressure drops on the plant.

Compressor noise must be limited by noise hoods, if required.

A standby compressor must be provided to allow for maintenance of the compressors. Instrument air will be oil free and dry.

12. Water

Water distribution systems will be provided for the various types of water required to operate such a plant.

The following additional provisions will be made:

- Suitable pumps will be provided for the fire-fighting network. A diesel stand-by pump will be provided for the fire-fighting system.
- A fire-fighting system with fire hydrants will be provided.
- Rain water from the plant will be collected into the drainage pond for possible reuse in the plant.
- The plant cooling water will be in closed circuit and should only require replacement due to evaporative losses.
- The drinking water system will be provided with potable water.
- Sewage water will be treated by septic tanks or by anaerobic/aerobic treatment plant, in which case the water, after sterilisation, will be returned to the industrial water ponds.
• Potable water will be provided throughout the plant.

13. Water Treatment
This will include:
• Filtration by sand filter (gravity or pressure type) for the raw water from the bore holes (wells) or the pond.
• Possible additives unit.
• Storage reservoir.
• Water recycling and cooling.

14. Plant Control
The plant control will make use of the latest technology to provide accurate and fast control, and will include the necessary protective and interlocking systems consistent with a plant of this nature. The plant may be computer controlled.

Suitable UPS facilities must be provided for the plant control. The control of the plant will be from a centralised control room, except for the packing plant. The plant must be designed to be operated with a suitable number of staff, including operating, maintenance, laboratory, administrative, maintenance and general staff. The packing plant will be controlled from the packing plant building.

15. Power
The plant will take its power from the Islamabad Electric Supply Company Limited (IESCO) 132 kV distribution system. A high voltage incoming substation must be provided for with all HV switchgear, metering, isolators, circuit breakers, etc. The complete supply of all power requirements, including the incoming HV switch rooms and switch gear will be provided for. This includes plant transformers, cabling, cable racking, motors, MCC’s, PLC’s, all control equipment, instrumentation, etc.

It is envisaged that motors over 1000 kVA will be of 11 KV units, unless these are variable frequency motors in which case the required voltage will be applied. The low voltage on the plant will be 420 volts.
Lightening arrestors will be installed at appropriate buildings and locations.

16. Buildings
All the necessary buildings such as offices, maintenance workshops, laboratory, MCC rooms, HT switch rooms, centralised control room, ablution facilities, canteen facilities, stores, etc., will be provided for.

The buildings will be brick and mortar or as required, and will comply with the local conditions and requirements.

17. Lighting
Lighting on the plant will be to internationally accepted standards. Area and perimeter lighting shall be provided and will comply with accepted standards.

18. Lifting Equipment/Hoists
Suitable lifting equipment will be provided to adequately serve the handling of service to girth gears, gearboxes, separator, elevators including silo feed elevators, and all plant requiring lifting facilities.

19. Quality Control
All laboratory requirements to operate the plant in an efficient manner will be provided for.

20. Safety
The plant will be built to comply with the requirements of the Health and Safety regulations of Pakistan.
2.3.9 Pollution Control

Pollution control measures and safeguards are key features in the operation of any industrial plant. The pollution control measures for the project will selected after identifying emissions of various pollutants, particularly air pollutants from the different stages of cement manufacturing.

Air Pollution Controls

Air pollutants generated during the operation of the Project consist primarily of particulates from quarrying, raw, and finished materials as well as fuel combustion by-products. ESP and/or Bag filters and bag houses will be employed as de-dusting equipment to control major emissions in the Kiln, Raw Mill, Grate Cooler, Coal Mill and the Cement Mill. For other emissions, a sufficient number of standardized bag filters will be installed at all transfer points at hopper, bins or silos as well as dust producing machinery (crushers, loading equipment, conveyors etc.) for de-dusting purposes.

Modern technology burners, dosing systems for fuel and kiln feed, and kiln control systems are used for the plant processes to control emissions (NOx, SOx, CO). Cyclones will also be installed to capture materials entrained in airflows, which are routed through principal process units (e.g. milling and pyro-processing stages). They are considered as pre-treatment recovery and recycling device, and assists in enhancing the efficiency of both bag house and bag filter systems.

Water Pollution Controls

The Project adopts a modern, dry process of manufacturing cement. The principal liquid effluent released from the clinker production and cement manufacturing process is equipment cooling water, which is inoffensive.

Moreover, apart from the cooling water used during the raw mill down condition to protect the bag filter, the process water will be completely reused via recirculation through water treatment systems.

All wastewater will be routed to the wastewater treatment plant prior reuse in the industrial system. The treated effluent will comply with Pakistan NEQS & International Standard for sewage effluent. Overflow cooling waters, tanker washings and floor
washings will be collected and conveyed by open drains. These process wastewaters will be channelled into a solids 'gravity' separator then to the wastewater treatment plant prior reuse in the industrial system. During the peak of construction activities (i.e. the maximum demand), the fresh water requirement will be for 1,200 persons x 100 kg water/person/day = 120 tonnes of fresh water.

Noise Controls
Most cement projects generate significant, intermittent noise levels during blasting of the limestone within the quarry. The principal noise emission sources will be associated with quarry drilling operation, motors, fans, blowers, crushers, air compressor, and mills. In-plant shielding of noise emissions will be adopted to ensure that noise levels at the boundaries are within the regulatory limits which demonstrates that the cement plant will be fully compliant with both IFC and Pakistan National Standards for noise emissions. All equipment to be employed for the plant will be designed to operate with low noise levels, and will not exceed the maximum allowable noise level for the surrounding receiving land use.

2.3.10. Fire-Fighting System
The System covers the Fire Detection and Protection System for the cement plant. The system will include the following sub-system:

- Fire-fighting water supply system
- Outdoor hydrants system
- Indoor hydrants system
- Fixed water spray system
- Dry chemical and fire extinguishers
- Foam fire-fighting system
- Gas fire-fighting system
- Fire detection and alarm system

The scope of fire-fighting system design and supply will include the whole plant area, it include main block area, transformer area, coal-conveyance area, oil tank area and other auxiliary areas. Independent high-pressure fire water supply system will be
provided for the plant. The system includes water storage tank, fire-fighting pumps and piping, etc.

2.3.11 Housing Colony

Construction Phase: Land will be made available for laying down and staff accommodation during the construction phase. The design of the construction camp will be the responsibility of the EPC Contractor. There will be three general areas:

- Container-based housing for the management. These will be removed after completion of construction phase.

- Cement block / concrete housing for lower management and supervisors. These buildings will be designed as permanent buildings and will be used for the outage workers after the plant is in operation.

- Hall style housing for the workers. These will be removed at the completion of construction.

Some temporary warehouse and fabrication shops will be built for the storage of equipment that requires protection from the weather. The fabrication shops will be used for fabrication of piping and other assemblies before installation into the plant.

Since the site is in an undeveloped area, there is adequate room for construction material & machinery laydown. Construction lay down is the area used to store equipment and material transported to the site before it is installed in the plant. One or more tree plantations will be made near the plant at the end of construction. This will provide a pleasant area and contribute to the environment.

It is planned to construct a permanent housing colony, for more than 200 persons on purchased land of 20 - 25 acres situated at about one kilometer away from the Plant. The residential colony will comprise of bachelors hotel, support complex, library, 20 apartments in shape of 5 blocks for deputy managers, managers and general manager, a guest house, TV lounge and officers mess, mosque, kids play ground, fair price shop, security rooms, internal telephone exchange, vehicles parking, lawns, divers and cooks...
compound, etc. Coordinates of the proposed Housing Colony and Hospital and colony location are shown below:

**Housing Colony Coordinates**

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<th>Longitude</th>
</tr>
</thead>
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<td>D</td>
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<tr>
<td>G</td>
<td>32.72886</td>
<td>72.9688</td>
</tr>
</tbody>
</table>

**Figure – 2.9 [Proposed Housing Colony & Plant Site]**
2.4 The Planed Operational Characteristics-Hours of Operation, Processes, Products

2.4.1 Hours of Operation
In general, the Plant will operate around the clock, in three shifts, throughout the year. Typically, there will be one annual scheduled outage of approximately 48 days duration. The outage is a scheduled shut-down period for maintenance and repair.

The quarries/mines will operate for between 10 and 12 hours per day for 6 days per week.

2.5 Visual Aids (maps of the area, site and plant layout, flow charts of production, and photographs of the site and similar projects).
These have been provided in earlier sections of this Chapter and in Chapter-1.

2.6 Comparison of Proposal Options (size, siting, technology, layout, energy, sources, & sources of raw material):

2.6.1 Size
For assessment of the project economic viability, basic parameters including product demand, and investment considerations are of major relevance. However, other important considerations also include environment, availability of adequate raw materials for its life-cycle and the basic infrastructure.

The Plant capacity of 7,200 tonnes per day of clinker has been based on economic size, potential cement domestic & exports demand, assess to sufficient quality raw materials, adequate infrastructure and electric and other sources.

2.6.2 Siting
For cement manufacturing it important that plant should be located as close as possible to main raw materials, especially limestone. Site selection needs very careful, well thought out and wise decision. Any over sight may lead to major miss fire. The most important factors for such a site selection include availability of raw material and land, existence of basic infrastructure including roads, water, manpower, proximity to electric
transmission system, project economic viability with reference to specific site, government policies for the particular site, land use policies, further expansion possibilities etc.

Environmental considerations are of also of major consideration with regard to all out environmental settings in the project area. The availability of treated effluents discharge facilities, opportunities for disposal of solid wastes in environmentally sustainable fashion and like considerations are to remain major concerns while selecting project site.

The site selected for the Project:
- Close to an excellent limestone deposit.
- Located away from the highway and visually will not disturb the local environment.
- The site will be accessible through single road from Kallar Kahar – Choa Saidan Shah Road.
- The supply of power will be provided by IESCO from its 132 KV transmission line passing close to the site.
- The limestone and clay deposits are easily accessible.
- The imported coal will be transported to the jetty near Karachi by sea and then transported to the power plant by road and later by railway when detailed assessment has been carried out by Pakistan Railways.
- Closeness to domestic and potential export markets.
- Closeness to China Pakistan Economic Corridor network.
- Availability of adequate skilled & unskilled labor.

2.6.3 Technology
The technology/process to be used for cement manufacture is state-of-art and environmentally friendly.

2.6.4 Layout
Keeping in view technical; project economics; Environmental, Health and Safety (EHS); safe operations and risk assessment factors, the lay out will be finalized after selection of EPC contractor.
2.6.5 Fuel sources
The project will consume 293,632 tonnes of imported coal per year.

2.7 Summary of the Technical, Economic and Environmental Features of the Proposal

A summary of technical, economic and environmental features of the proposal is given hereunder.

2.7.1 Technical
The technology is a proven, state-of-the-art technology and is available from many suppliers world-wide. The size of the unit is cost-effective.

2.7.2 Economic
The project at full capacity will provided about Rs. 4,000 million per annum to national exchequer as taxes. In addition, it will employ directly about 350 personnel and indirectly job opportunities to large number of people through transportation system, horticultural and sanitary services, loading & unloading of cement bags, distribution network, etc.

The proposed project represents a substantial investment of over US$470 million. The project will have positive economic impacts on the local economy, both short-term, during the construction and start-up of the power plant, and long-term, during the operational life of the power plant. The project will also have positive impacts on the regional and national economy.

2.7.3 Environmental
The proposal takes into account all necessary aspects of environmental management not only in accordance with the Pakistan Environmental Protection Act 1997 and rules and regulations made thereunder including also environmental compliance with the Pakistan NEQS and IFC & other international standards.

It has taken into consideration likely environmental impacts on the environmental settings around the project site and systematically provides solutions/safeguards against any pollution to accrue from the project activity. The most recent and efficient
equipment for abatement and prevention of all sorts of pollution be it gaseous emission, PM, effluents, noise or solid wastes will be adequately taken care of.

This proposal takes stock of the likely potential environmental impacts from the project activity and describes necessary mitigation measures to be adopted to minimize their adverse impacts. Details may be seen in appropriate sections of this report. In order to achieve the goals of environmentally sustainable operations of the project, the report especially recommends a comprehensive Environmental Management Plan (EMP), Environmental Monitoring Plan (EMtP) and last but not the least the proposal recommends training of the staff to implement effectively the recommended EMP.

An effluent (wastewater) treatment plant is to be put in place which further ensures environmentally safe practices during project operations.

Biodiversity, water, forestry, crops, vegetation, scientific, cultural, historical buildings, soil, water and heritage which constitute an important segment of environment have also been considered from environmental management point of view. The proposal also takes into account the inbuilt stringent mechanism incorporated in the designing of the plant in order to run the plant in an environmentally safe fashion.

In short, all environmental aspects in relation to the project have been duly considered and mechanism recommended to ensure environmentally safe practices during plant operation.

2.8 Manpower Requirement and Project Organization Structure

The Project will require about 350 personnel for its Plant and Mine operation. Expected maximum manpower during construction will be about 1,500 persons. Construction will start with about 500 persons and then increase to maximum, and then decrease again to about 300 persons. During cold and hot commissioning there will be about 300 contractor staff and 350 APML staff on site.

Figures 2.9 & 2.10 indicate proposed organization structure of the Company [APML].
Chapter – 2, Description of the Proposal
2.9 Transportation

At full capacity operation the project will involve following vehicular transport.

- Off Highway, within plant & quarry, 175 loads per day of 75 tonnes capacity each.
- Highway, in/out, 964 loads per day of 25 tonnes capacity each. The project will provide a trucks lay area at entrance to the Plant.
- In addition, about 20 vehicles will be plying in/out of the plant carrying plant personnel.

At present daily about 1,500 to 1,600 transport of various capacities/sizes is plying on Kallar Kahar – Choa Saidan Shah Road. The APML is already in discussion with Pakistan Railways to extend their existing system to as far as close to their plant site. As soon as Railways develops a plan of the railway extension then APML will seriously consider its implementation, as it will reduce the load on present road network and also provide rail facilities to local population.

2.10 Ultimate Mine Restoration Plan

Geologically speaking, the leased out area of APML has huge potential of high grade limestone. Therefore, workable reserves would be exhausted in more than 150 years. Excavation of stone will be done in two phases. Out of total granted area under the lease about 500 acres has been selected for the first phase for limestone quarrying. The second phase of limestone quarrying over another selected area in the lease will be selected when the reserves in the area selected for the first phase would be near depletion. Because of long time scale involved, it is difficult to predict at this stage what sort of restoration work would be required. However, the management will focus their attention to design sequential phase treatment for restoration/reclamation of any damaged land as a result of limestone quarrying/mining. APML is taking this important factor of ultimate restoration into consideration while carrying out different kind of surveys and planning and quarry/mine design.

While carrying out restoration and reclamation work the main focus would on the following:
• Ensure that worked-out areas are safe for future uses;
• Minimize visual impact/intrusion of disturbed areas;
• Re-vegetate worked-out areas with suitable plant species;
• Achieve long-term stabilization of all worked out areas to minimize ongoing erosion; and
• Monitor and manage reclaimed areas until the vegetation is self-sustaining.

Reclamation practice varies widely, depending on the type of mine, its location and the applicable legal requirements. APML will strictly follow the provisions of Environmental Protection Act, 1997 and the Punjab Mining Concession Rules, 2002. Considering its importance APML 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.

APML management will hire an environmental expert to prepare a sustainable restoration/reclamation plan in compliance with the provisions of Rule 47-2(h) of Punjab Mining Concession Rules, 2002, so that suitable action can be taken well in time to avoid double handling of materials and keeping the restoration cost to a minimum.
3.0 DISCUSSION OF THE PROPOSAL CURRENT LAND USE POLICIES AND ENVIRONMENTAL LEGAL FRAMEWORK

3.1 Land Use

The site falls within the agriculture land privately owned. Farmers in the area keep small cattle herds of poultry, sheep, goats, buffalos and cows to supplement their income.

3.2 Regulatory Framework

Governments of Pakistan is facilitating investment, both local and foreign, in industrial sector. Liberalization and industrialization in the country, as a policy of the Government are well reflected from her following initiatives:

3.2.1 Deregulation of the Economy

Deregulation is the prioritized policy of the Government of Pakistan. Under same policy there is a systematic movement towards deregulation of the economy and privatization of the state owned companies.

3.2.2 Import Policy

Import policy has been largely liberalized to a great extent through the provision of various incentives. And it is being further liberalized at a quicker pace. There is an increased reliance on development of the industrial sector and enhancement of international trade.

3.2.3 Infrastructure Facilities

In order to facilitate fast industrialization basic infrastructure facilities like roads network, fuel, water and power supply, means of transportation and communications etc. are being improved/developed speedily.
3.2.4 Incentives

In order to maintain Pakistan’s competitiveness in international markets and support viability of local and foreign investments in the country, the following incentives are available equally to both the foreign and the local investors:

- Initial depreciation allowance (IDA),
- Amortization and
- Normal tax rates.

3.3 Legal Framework

The capability of regulatory institutions for environmental management largely, ensures the success of environmental assessment for ensuring that development projects are environmentally sound and sustainable. For decision-making and policy formulation in the environmental and conservation issues, the institutional framework, as it exists in Pakistan, is described below.

3.3.1 National Environmental Regulatory/Legal Requirements:

After the 18th Amendment to the Constitution of The Islamic Republic of Pakistan-1973, the regulation & management of environment has largely been delegated to the Provinces. The Federal Ministry of Climate Change has been created which shall be controlling: Pakistan Environmental Protection Council; Pakistan Environmental Protection Agency; Pakistan Environmental Planning and Architectural Consultants Limited; Global Environmental Impact Study Centre; and federal policy, legislation, plans, strategies and programmes with regard to environmental protection and preservation, coordination, monitoring and implementation of environmental agreements with other countries, international agencies and forums.

The Pakistan Environmental Protection Agency (Pak EPA) looks after the environment related issues for the federally controlled areas and territories. Lacking laws at the provincial levels; the laws, rules, regulations etc., those already available at the federal level and operational at the provincial levels will continue as such.
3.3.2 National Conservation Strategy (NCS) - Pakistan

The National Conservation Strategy (NCS) – Pakistan, as approved by the Federal Cabinet in March 1992 is the guiding document on the environmental issues in the country (Ref. EUAD/IUCN, 1992). The NCS outlines the country’s primary approach towards encouraging sustainable development, conserving natural resources, and improving efficiency in the use and management of resources.

The NCS has 68 specific programs in 14 core areas in which policy intervention is considered crucial for the preservation of Pakistan’s natural and physical environment. The core areas that are relevant in the context of the proposed project are:

- pollution prevention and abatement;
- restoration of rangelands;
- increasing energy efficiency;
- conserving biodiversity;
- supporting forestry and plantations; and
- preservation of the cultural heritage.

The Government of Pakistan promulgated “Pakistan Environmental Protection Act” in 1977. Two organizations, the Pakistan Environmental Protection Council (Pak-EPC) and the Pakistan Environmental Protection Agency (Pak-EPA), are primarily responsible for administering the provisions of the Act. The Pak-EPC oversees the functioning of the Pak-EPA. Among its major members include representatives of the Federal and Provincial Governments especially the Provincial Environmental Protection Agencies, industry, non-governmental organizations, academia, environment experts, Federation of Chamber of Commerce and Industry and the private sector.

The Pak-EPA, through the Provincial EPAs, is required to ensure compliance with the National Environmental Quality Standards (NEQS) and establish monitoring and evaluation systems. As a primary implementing agency in the hierarchy, it is responsible for identifying the need for, as well as, initiating legislation whenever necessary. Pak-EPA is also authorized to delegate powers to its provincial counterparts, the provincial EPAs. One of the functions delegated by the Pak-EPA to provincial EPA is the review and
approval of Environmental Impact Assessment (EIA) and Initial Environmental Examination (IEE) reports of the projects undertaken in their respective jurisdictions.

3.3.3 **Pakistan Penal Code (1860)**

The Pakistan Penal Code usually called PPC is a penal code for all offences charged in Pakistan. It was originally prepared by Lord Macaulay in 1860 on the behalf of the Government of British India as the Indian Penal Code. After the partition of British India in 1947, Pakistan inherited the same code and subsequently after several amendments [e.g. Protection of Women (Criminal Laws Amendment) Act, 2006, Criminal Laws (Amendment) Act, 2004 (I of 2005), Criminal Law (Amendment) Ordinance (LXXXV of 2002), Criminal Laws (Reforms) Ordinance (LXXXVI of 2002), etc.] it is now mixture of Islamic and English Law.

Pakistan Penal Code is a general criminal law, applies all over the country, and contains specific provisions on the subject. Thus it prohibits mischief by killing or maiming animals, or damaging works of irrigation or a river or a road or a bridge or drain or firing explosive substances with intent to cause damage. The Code also prohibits public nuisance by acting negligently to spread the infection of disease or disobeying quarantine rule or causing adulteration of food or drink or drug, or fouling water or making the atmosphere noxious to health etc.

3.3.4 **Pakistan Environmental Protection Act, 1997**

The promulgation of the Environmental Protection Ordinance, 1983 was the first codifying legislation to the issue of environmental protection. Later, the Government passed the Pakistan Environmental Protection Act (PEPA), 1997, which is the basis of IEE/EIA studies carried out for the projects in Pakistan.

PEPA,1997 is a fairly comprehensive legislation and provides protection, conservation, rehabilitation and improvement of the environment. It contains concrete action plans and programs for the prevention of pollution and promotes sustainable development. The salient features of the law are:
- It covers the air, water, soil, marine and noise pollution including pollution caused by motor vehicles.
- The Act provides National Environmental Quality Standards (NEQS) for wastewater, air emissions and noise.
- Law provides clear cut guidelines for IEE/EIA for various projects as per their magnitude and anticipated impacts.
- Law also empowers Federal Government to issue notices and to enforce them for the protection of the environment.

For the effective implementation of the provisions of PEPA, 1997, Pakistan Environmental Protection Agency, headed by a Director General was constituted. On the same pattern, Provincial Environmental Protection Agencies (EPA’s) were created in all the provinces. Environmental Tribunals were also constituted according to PEPA, 1997.

The Punjab Environmental Protection (Amendment) Act 2011 covers aspects related to the protection, conservation, rehabilitation and improvement of the environment and the prevention, control of pollution and promotion of sustainable development. The Punjab Environmental Protection (Amendment) Act [PEP (A) A] 2011 establishes complete regulatory and monitoring bodies, policies, rules, regulations and national environmental quality standards.

On December 31, 1983 Under the Pakistan Environmental Protection Ordinance, a provision was made for the establishment of Provincial Environmental Protection Agency. In 1985, the Federal Government was requested to delegate powers of the Agency to the Housing Physical and Environmental Planning (HP&EP) Department. On July 1, 1987, Environmental Protection Agency (EPA), Punjab was formed. Punjab is the first province where an EPA was created in the best interest of citizens. The staff of the existing Directorate of EPCO was transferred to EPA, Punjab under the administrative control of the HP&EP Department.

On December 31, 1996, a separate administrative unit, Environment Protection Department (EPD) was formed under the Government of the Punjab. EPA Punjab was
then detached from the HP&EP Department and now works as functional unit under the EPD, Punjab.

On February 11, 1997 the Federal Government withdrew the existing Pakistan Environmental Protection Ordinance (PEPO) of 1983 and declared the Pakistan Environmental Protection Act (PEPA) 1997. The EPA, Punjab now undertakes functions as delegated under this Act.

To ensure enforcement, the act establishes regulating bodies i.e. Punjab Environmental Protection Council (PEPC) and responsible bodies i.e. Punjab Environmental Protection Department (Punjab EPD) at Provincial level. The act extends to the whole of Punjab Province.

Punjab EPD has the power to arrest without warrant any person against whom reasonable suspicion exists of his having been involved in an offence under the [PEP(A)A ] 2011, and enter, inspect and search without warrant any premises, vehicle or vessel. It also provides for seizing any plant, machinery, equipment, vehicle or substance, record or document. [PEP(A)A ] 2011 also provides the power to summon and enforce the attendance of any person and issuance of Environmental Protection Order, PO 16, an Environmental Protection Order (EPO), in relation to a person who is contravening a provision of the [PEP(A)A ] 2011.

3.3.5 Policy and Procedures for the Filing, Review and Approval of Environmental Assessments

This section sets out the key policies and procedural requirements. It contains a brief policy statement on the purpose of environmental assessment and the goal of sustainable development and requires that environmental assessment be integrated with feasibility studies. It also defines the jurisdiction of the Federal and Provincial EPA’s. It lists down the responsibilities of the proponent and states the duties of responsible authorities. It provides schedules of reports that require either an IEE or EIA.
3.3.6 Guidelines for the Preparation and Review of Environmental Reports
(November 1997/2000)

These guidelines are descriptive documents regarding the format and content of IEE/EIA reports to be submitted to EPA for “No-Objection Certificate (NOC)/Environmental Approval (EA)”. Following are the major areas, which are covered by these guidelines:

- The IEE report (scope, alternatives, site selection, format of IEE report)
- Assessing impacts (identification, analysis and production, baseline data, significance)
- Mitigation and impact management (and preparing an environmental management plan)
- Reporting (drafting style, main features, shortcomings, other forms of presentation)
- Review and decision making (role, steps, remedial options, checks and balances)
- Monitoring and auditing (systematic follow up, purpose, effective data management)
- Project Management (inter-disciplinary teams, programming and budgeting)

3.3.7 Guidelines for Public Consultations

These guidelines deal with possible approaches to public consultation (PC) and techniques for designing an effective program of consultation that reaches out to all major stakeholders and ensures the incorporation of their legitimate concerns in any impact assessment study. These guidelines cover:

- Consultation, involvement and participation of Stakeholders
- Techniques for public consultation (principles, levels of involvements, tools, building trust)
- Effective public consultation (planning, stages of EIA where consultation is appropriate)
- Consensus building and dispute resolution
- Facilitation involvement (including the poor, women, building community and NGO capacity)
3.3.8 National Environmental Quality Standards (NEQS)-1993, Amended August 2000

The National Environmental Quality Standards (NEQS) were first promulgated in 1993 and have been amended in August, 2000.

The following standards are specified therein:

- Maximum allowable concentrations of pollutants (32 parameters) in municipal and liquid industrial effluents discharged to inland waters, sewage treatment facilities, and the sea (three separate sets of numbers)
- Maximum allowable concentrations of pollutants (16 parameters) in gaseous emissions from the industrial sources

The Guidelines for “Self-Monitoring and Reporting” (SMART) [attached as Appendix – 7.1] for the industry as approved by the Pakistan Environmental Protection Council (PEPC).

A copy of the Government of Pakistan, Gazette Notification dated August 10, 2000 regarding NEQS is attached as Appendix – 1.4.

3.3.9 National Environmental Quality Standards for Ambient Air- November- 2010

The Ministry of Environment, Government of Pakistan vide its Notification, Islamabad, the 18th October, 2010 under S.R.O. 102 (1)/2010 established standards which provide the maximum allowable limits, in the ambient air, of Sulphur Dioxide (SO₂), Oxides of Nitrogen as (NOₓ) and as (NO), Suspended Particulate Matter-(SPM), Respirable Particulate Matter - PM₁₀, Respirable Particulate Matter-PM₂·₅, Lead and Carbon Monoxide (CO) [Appendix – 3.1]

3.3.10 National Standards for Drinking Water Quality - November, 2010

The Ministry of Climate Change (formally Ministry of Environment), Government of Pakistan vide its Notification, Islamabad, the 18th October, 2010 under S.R.O. 102(1)/2010 established standards for Drinking Water Quality [Appendix – 3.2]. The major quality parameters fixed depend upon Bacterial, Physical and Chemical ones.
3.3.11 National Environmental Quality Standards for Noise - November, 2010

The Ministry of Climate Change (formally Ministry of Environment), Government of Pakistan vide its Notification, Islamabad, the 18th October, 2010 under S.R.O. 102(1)/2010 established standards for Noise [Appendix – 1.4]. These standards are based on Category/zone i.e. Residential area, Commercial area, Industrial area and Silence zone. The limiting values for day and night have also been fixed for all categories/zones.

3.3.12 Sectorial Guidelines for Environmental Reports

These guidelines [Appendix – 1.5] identify the key environmental issues that need to be assessed as well as mitigation measures and project alternatives to be considered in the actual EIA. These guidelines include:

- Sector overview of the industry and the processes
  - Potential impacts on the environment
  - Mitigation measures
  - Monitoring and reporting
  - Management and training
  - Checklist of likely environmental impacts and mitigation measures

3.3.13 Guidelines for Sensitive and Critical Areas

These guidelines identify sensitive and critical areas in Pakistan, in relation both to the natural environment and the cultural aspects.

3.3.14 National Resettlement Policy and Ordinance

At this point, the only legislation relating to land acquisition and compensation is the Land Acquisition Act (LAA) of 1894. Following a national consultative process, a national resettlement policy and a related ordinance were drafted. The draft policy and the ordinance are presently being reviewed by the provinces, and have yet to be approved and notified by the government. The salient applicable features of the Draft Resettlement Policy are given below:
• The Pak-EPA will be responsible for both environment-related as well as resettlement-related matters,
• The responsibilities for implementation at a provincial level are to be delegated to the concerned provincial EPAs with overall control of the provincial Planning and Development (P&D) Departments.
• All categories of ‘loss’ arising from development projects that entail resettlement, need to be addressed: these include not only loss of land, built-up property, other infrastructure, and crops and trees, but also loss of income, job opportunities, and access to natural resources, etc.
• Vulnerable groups whose issues need to be addressed in particular include: women, children, destitute persons, tribal communities, squatters, those with usurper rights, and landless groups.
• There should be a special emphasis on consultation with affected groups when preparing a Resettlement Action Plan (RAP).

The provisions of the Draft Resettlement Policy are consistent with the requirements of the World Bank OD 4.30 on involuntary resettlement.

3.3.15 The National Forest Policy 2001 of Pakistan

This policy covers the Renewable Natural Resources (RNR) of Pakistan i.e. Forests, Watersheds, Rangelands, Wildlife, Biodiversity and their habitats. The policy seeks to launch a process for eliminating the fundamental causes of the depletion of RNR through the active participation of all the concerned agencies and stakeholders, to realize the sustainable development of the resources. It is an umbrella policy providing guidelines to the Federal Government, Provincial Governments and territories for the management of their RNR. In consonance with it, the Provincial and District Governments may devise their own policies in accordance with their circumstances.

The goal of this policy is to foster the sustainable development of RNR of Pakistan, for the maintenance and rehabilitation of its environment and the enhancement of the
sustainable livelihoods of its rural masses especially women, children and other deprived groups.

The elements of the policy are as follow:

- Population planning in critical eco-systems.
- Providing substitutes to firewood in the wooded mountains.
- Reducing the impact of socio-economic causes.
- Reducing poverty, poverty of opportunity, and powerlessness.
- Reducing political interference in the Forestry and Wildlife Departments.
- Renovating and invigorating the institutions of RNR.
- Supporting Local Governments in the sustainable development of their RNR.
- Policies for fragile natural Eco-systems.
- Riverine forests.
- Irrigated Plantations.
- Preservation of relict and unique forests.
- Wildlife.
- Rangelands and desert eco-systems.
- Planting of trees and fodders on farmlands.

3.3.16 Forest Act, 1927

All India Forest Act, 1927 was adopted by the Government of Pakistan, which was subsequently implemented by the respective provinces. Basically, the law was enacted to conserve and protect the forest resources of the country for sustainable development. It lays down Rules and Regulations for exploitation of various categories of forests such as reserved, protected or unclassified. Further, the Act spells out the licensing method for timber cutting, grazing, hunting etc. It also gives the details of magisterial powers of Forest Department officers and penalties for offences committed with regard to forest resources and products.
3.3.17 Industrial Relation Ordinance, 2002

The ordinance has been promulgated to amend, consolidate and rationalize the law relating to formation of trade unions, regulation and improvement of relations between employers and workmen and avoidance and settlement of any differences or disputes arising between them. Pakistan’s labour laws trace their origination to legislation inherited from India at the time of partition of the Indo-Pak subcontinent. The laws have evolved through a continuous process of trial to meet the socio-economic conditions, state of industrial development, population and labour force explosion, growth of trade unions, level of literacy, Government’s commitment to development and social welfare.

To meet the above named objectives, the government of the Islamic Republic of Pakistan has introduced a number of labour policies, since its independence to mirror the shifts in governance from martial law to democratic governance.

While Article 18 of the Constitution affords every citizen with the right to enter upon any lawful profession or occupation, and to conduct any lawful trade or business, the Industrial and Commercial Employment (Standing Orders) Ordinance was enacted in 1968 to address the relationship between employer and employee and the contract of employment. The Ordinance applies to all industrial and commercial establishments throughout the country employing 20 or more workers and provides for security of employment. In the case of workers in other establishments, domestic servants, farm workers or casual labour engaged by contractors, their labour contracts are generally unwritten and can be enforced through the courts on the basis of oral evidence or past practice.

The Constitution of Pakistan contains a range of provisions with regards to labour rights found in Part II: Fundamental Rights and Principles of Policy.

- Article 11 of the Constitution prohibits all forms of slavery, forced labour and child labour;
- Article 17 provides for a fundamental right to exercise the freedom of association and the right to form unions;
- Article 18 proscribes the right of its citizens to enter upon any lawful profession or occupation and to conduct any lawful trade or business;
- **Article 25** lays down the right to equality before the law and prohibition of discrimination on the grounds of sex alone;
- **Article 37(e)** makes provision for securing just and humane conditions of work, ensuring that children and women are not employed in vocations unsuited to their age or sex, and for maternity benefits for women in employment.

### 3.3.18 Punjab Environment Policy, 2015

The Punjab Environment Policy 2015 provides an overarching framework for addressing the environmental issues facing Punjab, particularly pollution of fresh water bodies, air pollution, and lack of proper waste management, deforestation, loss of biodiversity, desertification, water logging, natural disasters and climate change. It also gives directions for addressing the cross-sectorial issues, underlying causes of environmental degradation to meet national and international obligations. The theme of the Punjab Environment Policy 2015 is sustainable development in the sense of enhancement of human wellbeing.

The Punjab Environment Policy provides broad guidelines to Provincial Governments and Local Governments for addressing environmental concerns related to them and ensuring effective management, restoration, enhancement of environmental resources and ensuring their sustainable use.

The Punjab Environment Policy is a guide for actions in regulatory reform, programmes and projects for environmental conservation; and will review and ensure the enactment of legislation, by Provincial and Local Governments. The policy has been approved by the Punjab Environmental Protection Council headed by the Chief Minister Punjab under Section 4 (b) of the Punjab Environmental Protection Act 1997 (amendment Act 2012) and is enforced with immediate effect.

### 3.3.19 Punjab Industrial Relations Bill 2010

In December 2010 Punjab Assembly passed new legislation that will govern the formation of trade unions, relations between industries and their workers, and the process for the settlement of labour disputes.
3.3.20 Industrial Relations Ordinance 2011 Promulgation

The Government has promulgated Industrial Relations Ordinance 2011. The Ordinance has been approved by the President on the Advice of the Prime Minister. The Government has promulgated Industrial Relations Ordinance, 2011 in view of the current legal vacuum created due to deletion of the concurrent Legislative List through the 18th Constitutional Amendment. The Industrial Relations has also been transferred to the Provinces which have promulgated provincial laws to regulate industrial relations. However, there is no law in place to deal with Industrial Relations in the Islamabad Capital Territory or in respect of national level trade federations and for resolutions of trans-provincial industrial issues. The Parliament has yet to promulgate the Ordinance as law.

3.3.21 Pakistan Explosive Act, 1884 [updated December 6, 2014]

Under the Explosives Act, the project contractors are bound by regulations on handling, transportation and using explosives during quarrying, blasting, and other purposes.

3.3.22 National Electric Power Regulatory Authority (NEPRA) Act 1997

The NEPRA Act was approved by Parliament and signed into law in December 1997. It seeks to create an autonomous, independent regulatory authority, which will be solely responsible for the power sector. It will be responsible for the oversight of the power sector and will exercise control through its power to license power generation, transmission and distribution. It will regulate tariffs for all these activities. It will perform its functions through transparent processes to be enshrined in rules that are being framed in a transparent manner through appropriate rules.

3.3.23 Power Policy 1998

The revised power policy was implemented in 1998. The objective and intentions of the Government of Pakistan (GOP) to new policy is to move towards the creation of a competitive power market in Pakistan. It proposes to do so by restructuring and privatizing the existing thermal power generation, the power transmission and distribution functions and assets of existing public sector utilities (WAPDA/KESC), by the
creation of a fully autonomous regulatory authority, the National Electric Power Regulatory Authority (NEPRA), and through its future IPP policy.

The salient features of the Policy are;

- The basis for selection of private power project will be minimum levelized tariff through International Competitive Bidding. Variable tariffs over the life of the project will be permitted under terms specified prior to bidding. The process of selection will involve pre-qualification, issuance of a Request for Reports (RFP), bidding and evaluation of bids against bid criteria clearly laid out in the RFP.
- It is recognized that without a proper feasibility study for a particular site-specific hydel or indigenous coal based project, it will not be possible to invite competitive bids and receive firm offers. Thus, detailed feasibility studies for such projects will be prepared before bids are invited.
- Hydel projects will be implemented on a Build-Own-Operate-Transfer (BOOT) basis; to be transferred to the province in which it is situated at the end of the concession period, and thermal projects on a Build-Own-Operate (BOO) basis.
- Competitive Tariffs will comprise an Energy Purchase price and a Capacity Purchase Price with adequate provisions for escalation.

3.3.24 Provincial Local Government Ordinances, 2001
These ordinances, issued following the devolution process, establish regulations for land use, the conservation of natural vegetation, air, water, and land pollution, the disposal of solid waste and wastewater effluents, as well as matters related to public health and safety.

3.3.25 Factories Act, 1934
There is no independent legislation on occupational safety and health issues in Pakistan. The main law, which governs these issues, is the Chapter 3 of Factories Act, 1934. All the provinces, under this act, have devised Factories Rules. The Hazardous Occupations Rules, 1963 under the authority of Factories Act is another relevant legislation. These rules not only specify some hazardous occupations but also authorize the Chief Inspector of Factories to declare any other process as hazardous.
The other related laws are:

- Workmen Compensation Act, 1923
- Provincial Employees Social Security Ordinance, 1965
- West Pakistan Shops and Establishments Ordinance, 1969
- Boilers and Pressure Vessels Ordinance, 2002

Chapter 3 of the Act has general provisions on health and safety at the workplace. Provincial governments are allowed to make rules under this Act and inspectors under this Act also have discretion in defining the rules. Chapter 3 talks about various safety arrangements. This list is being provided just to show how meticulously labor law covers these issues.

- Cleanliness
- Disposal of wastes and effluents
- Ventilation and temperature
- Dust and fume
- Artificial humidification.
- Overcrowding
- Lighting
- Drinking water
- Latrines and urinals
- Spittoons
- Precautions against contagious or infectious disease
- Compulsory vaccination and inoculation
- Power to make rules for the provision of canteens
- Welfare officer
- Precautions in case of fire
- Fencing of machinery
- Work on or near machinery in motion
- Employment of young persons on dangerous machines
- Striking gear and devices for cutting off power
- Self-acting machines
- Casing of new machinery
- Prohibition of employment of women and children near cotton openers
- Cranes and other lifting machinery
- Hoists and lifts
- Revolving machinery
- Pressure plant
- Floors, stairs and means of access
- Pits, sumps, opening in floors, etc.
-Excessive weights
- Protection of eyes
- Power to require specifications of defective parts or tests of stability
- Safety of building, machinery and manufacturing process
- Precautions against dangerous fumes
- Explosive or inflammable dust, gas, etc.
- Notice of certain accidents

3.3.26 Other Relevant Laws

Some of the other relevant laws and legislations are listed below:

- The Mines Act, 1923
- The Punjab Wildlife (Restoration, Preservation, Conservation and Management) Act & Rules, 1974
- The Punjab Plantation & Maintenance of Trees Act, 1974
- Canal and Drainage Act, 1873
- The Fire Wood and Charcoal (Restriction ) Act, 1964
- Motor Vehicles Ordinance, 1965
- Agriculture Pesticides Ordinance, 1971
- The Antiquities Act, 1975
- Punjab Mining Concession Rules, 2002
3.4 Applicable International Environmental and Occupational Safety and Health Laws and Regulations

3.4.1 International and National Non-Governmental Organizations

International and national Non-Government Organizations (NGOs), such as the International Union for Conservation of Nature and Natural Resources (IUCN) and the World Wide Fund for Nature (WWF), have been active in Pakistan for some time. Both of these NGOs have worked closely with the governments at the federal as well as provincial levels and have positively contributed to the cause of environment. They have played significant role with regard to the formulation of environmental and conservation policies. And last but not the least, another the most prominent NGO namely “Sustainable Development Policy Institute (SDPI) “has also played very significant role in upholding the cause of environmental protection in Pakistan.

Environmental NGOs have been particularly active in the advocacy for promoting sustainable development approaches. Most of the government’s environmental and conservation policies, even at the provincial and federal levels, has been formulated in consultation with these leading NGOs, who have also been involved in drafting new legislation on conservation.

3.4.2 International Framework

For the assessment of the environmental impacts of the proposed project on air, water and noise according to the international legal framework, this report has also incorporated the requirements of the "Pollution Prevention and Abatement Handbook" by the World Bank Group- effective July 1998 and IFC EHS Guidelines.

Within this handbook, different guidelines are mentioned for the purpose of assessing industrial facilities with respect to their environmental compliance. In the present case, the guidelines for new thermal power plants are applicable for the preparation of the environmental impact assessment.
3.4.3 Environment Related Relevant International Agreements in Pakistan’s context

Pakistan is a party to the following treaties and agreements in furtherance of its environmental goals and programme.

<table>
<thead>
<tr>
<th>Treaty</th>
<th>Pakistan Status</th>
</tr>
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<tbody>
<tr>
<td>The Amendment to Montreal Protocol on Substance that Depleting Ozone layer</td>
<td>Signed</td>
</tr>
<tr>
<td>UN Framework Convention on Climate Change on June 13, 1992</td>
<td>Signed</td>
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<tr>
<td>Convention on the Continental Shelf on October 31, 1958</td>
<td>Signed</td>
</tr>
<tr>
<td>The Convention on High Seas on October 31, 1958</td>
<td>Signed</td>
</tr>
<tr>
<td>Convention on the Fishing and Conservation of the living Resources of the High Seas on October 1958.</td>
<td>Signed</td>
</tr>
<tr>
<td>The UN Convention on Law of the Sea on December 10, 1982</td>
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</tr>
<tr>
<td>The Convention on Territorial Sea and the Contagious Zone and the Agreement for the establishment of Network of Aquaculture Centers in Asia and the Pacific</td>
<td>Signed</td>
</tr>
<tr>
<td>The Convention on Wetlands of the International Importance on July 23, 1976</td>
<td>Ratified</td>
</tr>
<tr>
<td>The Convention on protection of the World Cultural and Natural Heritage on July 23, 1976</td>
<td>Ratified</td>
</tr>
<tr>
<td>The Convention on International Trade in Endangers Spice of Wild Fauna and Flora</td>
<td>Signed</td>
</tr>
<tr>
<td>The Convention on Conservation of Migratory Specie of Wild Animal on Dec 01, 1987</td>
<td>Signed</td>
</tr>
<tr>
<td>The Convention on Biological Diversity in 1994 and became party to the CBD, Convention duly recognizes the intrinsic value of biological diversity, genetic, social, economic, cultural, educationist, recreational and esthetic values of biodiversity and its components</td>
<td>Signed</td>
</tr>
<tr>
<td>The International Plant Protection Convention.</td>
<td>Signed</td>
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<tr>
<td>The Plant Protection Agreement for Area &amp; pacific region</td>
<td>Signed</td>
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<tr>
<td>Agreement/Convention</td>
<td>Status</td>
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<tr>
<td>The Agreement for the establishment of a convention for controlling the desert lost in eastern region of its Distribution Area in South East Asia</td>
<td>Signed</td>
</tr>
<tr>
<td>The Treaty Banning Nuclear Weapon Test in the Atmosphere, in Outer Space and under Water on March 3, 1988</td>
<td>Signed</td>
</tr>
<tr>
<td>The International Convention on Oil Pollution Preparedness Response and Corporation</td>
<td>Signed</td>
</tr>
<tr>
<td>The Convention on prohibition of Military or any other Hostile Use of Environmental Modification Techniques and Accession of Feb 27, 1986</td>
<td>Acceded</td>
</tr>
<tr>
<td>Pakistan became a party to Montreal Protocol by Ratifying the protocol and its London amendment on Dec 18, 1982. the subsequent amendments known as Copenhagen Amendment which, accelerate the phase out for rectified in Jan 1995.</td>
<td>Signed</td>
</tr>
<tr>
<td>Convention of International trade Endangerous Species (CITS)</td>
<td>Signed</td>
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<tr>
<td>World heritage Convention Ramsar Convention</td>
<td>Signed</td>
</tr>
<tr>
<td>United Nation Convention to Combat Ozone Depletion (CCD). The convention signed and ratified in 1996</td>
<td>Signed</td>
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</tbody>
</table>
4.0 DESCRIPTION OF EXISTING AND EXPECTED CONDITIONS

4.1 Spatial and Temporal Boundaries Adopted for the Various Aspects of the Study

The existing status of the environmental settings around the project site along with future likely trends of development and any change to occur in the land use pattern, especially industrialization trends, was the major considerations/spatial and temporal boundaries while taking stock of the existing and expected conditions.

4.2 Existing (baseline) Condition of the Biophysical and Socio-Economic Environment, Trends and Anticipated Future Environmental Conditions should the project not go ahead.

The proposed Plant site is located at 1.5 km north of Kallar Kahar – Choa Saidan Shah Road, about 5 km from Choa Saidan Shah Town, Tehsil Choa Saidan Shah, District Chakwal, Punjab, Pakistan. Google Earth image of the Plant site is presented in Figure 4.1.

Figure – 4.1 [Plant Site]
The access road to the Plant will be connected with existing road. The selection of the site considered nearness to the mining lease of limestone deposit. The identified site was evaluated to determine the lowest and shortest land acquisition and demolition and resettlement. The plant site selection process identified potential site on land property privately owned. Underground water is expected to be harnessed through tube wells, with locations to be determined after hydrological study is complete.

Since the proposed project will operate under strict environmental safeguards, hence the environment will remain largely pollution free. Implementation of the proposed Environmental Management Plan further guarantees protection of the environmental settings. Since all type of wastes are to be disposed off after due treatment and according to the requirements of the National Environment Quality Standards (NEQS) under the Pakistan Environmental Protection Act-1997 & IFC EHS Guidelines, therefore, this also provides safeguard against pollution from the project activity.

With operation of the project, it will provide job opportunities especially to the people of the area around the project site; Government will get large volumes of earnings in the form of taxes and GST on recurring basis. Poverty alleviation will be yet another benefit.

4.3 Environmentally Sensitive Areas of Special or Unique Value

(Physical resources of the project area: Topography and geology; Soils and Climate; water; Ecological resources: Fisheries and aquatic biology, Biodiversity, Forestry, Wildlife, scientific institutions, Socio-economic and Cultural and other heritage)

4.3.1 Physical Resources of the Project Area

4.3.1.1 Topography and Geology

Pakistan is located in north-west of South Asia, closing to Arabian sea in the south, mountains are mainly Karakoram, Himalayas, and Sulaiman Ranges; the longest river Indus runs through whole of Pakistan from the north to the south, main tributaries including Jhelum, Chenab, Ravi and Sutlej Rivers are called as “Five Waters” (i.e. Punjab) together; Khyber Pass and Bolan pass in the western border are thoroughfares that connecting Central Asia and South Asia in traditions.
The proposed project site is lies in the “Salt Range”, north of River Jhelum and south of Islamabad. Motorway M-2 is at a distant of about 20 km from the site.

Geographically it is place in the salt range and Potohar plateau, the physical features of Chakwal District are typical of the region. The south and south east is mountainous and rocky, covered with scrub forest, interspaced with flat lying plains; the north and the north east consist of softly undulating plains area with patches of rocky area, known as khuddar in the local dialect, ravines and gorges and some desert areas. The plains of the district are being cultivated, even those which lie in hilly regions and a considerable are is covered by forests.

The Salt Range forms the southern border of the hydrocarbon-bearing Pothwar Basin in northern Pakistan, along the north western margin of the Indo-Pakistani (Figure 4.2). It derives its name from the occurrence of gigantic deposits of rock salt embedded in the Precambrian bright red marls of the Salt Range Formation.

Figure – 4.2 [The Salt Range]

The Salt Range contains the most important geologic and paleontologic localities in Pakistan, and is one of the outstanding field areas in the entire world. Despite its easy accessibility, it has a wealth of geological and paleontological features. In fact, it
represents an open book of geology where various richly fossiliferous stratified rocks are very well exposed due to lack of vegetation. These include the Permian carbonate succession with its outstanding brachiopod fauna, Lower Triassic ammonoid beds (the Mianwali Formation, formerly known as "Ceratite Beds"), and Lower Tertiary marine strata with age diagnostic foraminifera.

Geological Map of Pakistan indicating the location of APML Plant site is attached as Appendix – 4.1.

4.3.1.2 Seismicity

Tectonic Map of Pakistan showing the location of APML Plant is presented as Figure – 4.3.

![Tectonic Map of Pakistan](image)

Figure – 4.3 [Tectonic Map of Pakistan]

Pakistan Earth Quake Zone Map showing Proposed Project site area is presented as Figure – 4.4. The project site falls in “minor to moderate damage area”.
4.3.1.3 Soils

Soils form major relation with environment. They influence environment by their special qualities and more so through fertility. Type of soils besides providing food, clothes or housing population serve with special food and lumber products, medicinal plants etc.

Soil should not be taken as a lifeless residual layer but it is a very dynamic element of environment in which very complicated physical, chemical and biological activities are constantly proceeding. In this way it is a dynamically changing and developing body. Soil scientists restrict the word soil to the surface material, which has come to have distinct layers or horizon over the extended period of time.

Soils have different meanings for different people. To a soil scientist it means the upper a few layers created through weather effect in which plants are grown. The
solid portion of soil is both organic and inorganic. The organic part consists of both living and decayed plant and animal materials.

Chakwal district is situated at 450 to 1050 meters above mean sea level with average annual rainfall of 850 mm. It is continuously divided into mountainous area of famous salt range, the unlevelled areas of Pothwar Plateau and fertile belt of Soan River valley. Soils of this area have derived their parent material from underlying rocks like sandstone, limestone and shale. The soils are generally homogenized with week structure and are calcareous. Chakwal District contains a large highly eroded area, either with rocks exposed to surface or lands with big gullies and cuts. Unbroken lands of thick material like gravels, stones and boulders also exist in the area. Dry farm agriculture is the main land use in the area (Soil Survey of Pakistan, 1975). The soils of Chakwal are sandy loam to loam in texture.

Figure – 4.5 [Soil Map of Punjab]
Soils of the Plant site area are calcareous loamy to calcareous clayey as shown in Soil Map of Punjab (Figure 4.5). Figure – 4.6 shows the Land Capability Map of the Punjab Province, also indicating the APML Plant site.

![Figure 4.6 [Punjab Land Capability Map]](image)

Groundnut and wheat are the major crops cultivated on the large scale in Chakwal District. There are some areas in district where the ownership of the lands is rest with the land lord families but generally the people living in the district are the owners of their lands.
Fruit orchards, especially of citrus, have been planted but only small area owing because of the shortage of water. Fair size of loquat orchards are established in Tehsil Kallar Kahar and Choa Saidan Shah. Besides Apricot, Banana, Pears, Peaches and Pomegranate are also grown in minor quantities in the district.

Farming is done with the conventional methods. Turnip, Cauliflower, Tomato, Lady Finger, Onion and Carrot are main vegetables grown in the district.

A large number of rose gardens have been planted by the farmers in Choa Saidan Shah and Kallar Kahar area and the quality of roses produced at this place is probably better than the roses produced at any other place in the country. The roses are of Desi (local) variety and are used primarily for the distillation of rose water and preparation of Gulqand (a mix of rose petals juice and sugar).

4.3.1.4 Area and Climate

Pakistan extends from 24° N to about 37° N with its western border lies close to 62° E, north eastern border extends to about 74° E and lies on the western margin of one of the major climatic regions of the world. Therefore, her climate is more continental. Reversal of wind system and variable character of monsoon are quite complex. A major part of Pakistan is dominated by dry climate. Temperature and amount of rain fall determine type of natural vegetation in any area. These physical features have great bearing on climatology of the area like the entire country; the project area has also four seasons distinctly:

- Cold weather season – December to March
- Hot weather season – April to June
- Monsoon season – June to September
- Post Monsoon season – October and November

With the arrival of summer the area becomes heated and low pressure area is created. In the month of July atmospheric pressure rises in the area under reference. The major sources of the rain fall in the area include the Monsoon Rainfall (July, August & September), Western Depression Rainfall by western depressions and Thunderstorms Rainfalls (spring & autumn rainfall).
According to the 1998 censes total area of the district is 6,524 square kilometers equivalent to 1,631,190 acres. Ecologically, the area of districts Chakwal is classified as the subtropical semi-arid and sub-humid zone and sub-mountainous in character. The rainfall varies from 400 mm in the southern to 750 mm in the northern areas.

The weather of Chakwal is hot in summer and cold in winter season. The temperature is recorded in winter is 8°C and in the period of summer the temperature raises to the level of 42°C.

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 up to around 15th September, the second, caused by Mediterranean winds lies in the last two weeks of December and the first two weeks of January.

Following weather data for Choa Saidan Shah has been obtained from “Wunder Ground”, “Weather-on-Line” and “Windfinder” web sites.

Table – 4.1

<table>
<thead>
<tr>
<th>Month</th>
<th>Temperature °C</th>
<th>Average Rainfall (mm)</th>
<th>Average snow days</th>
<th>Average Fog days</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average</td>
<td>Absolute</td>
<td>Daily</td>
<td>Monthly</td>
</tr>
<tr>
<td></td>
<td>max</td>
<td>min</td>
<td>max</td>
<td>min</td>
</tr>
<tr>
<td>January</td>
<td>18.9</td>
<td>7.9</td>
<td>30.3</td>
<td>0</td>
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<tr>
<td>February</td>
<td>22.1</td>
<td>11.2</td>
<td>29.7</td>
<td>1.3</td>
</tr>
<tr>
<td>March</td>
<td>27.4</td>
<td>15.7</td>
<td>36.2</td>
<td>4.5</td>
</tr>
<tr>
<td>April</td>
<td>33.2</td>
<td>20.1</td>
<td>42.2</td>
<td>10.3</td>
</tr>
<tr>
<td>May</td>
<td>38.8</td>
<td>25.9</td>
<td>46</td>
<td>11.8</td>
</tr>
<tr>
<td>June</td>
<td>38.7</td>
<td>27.6</td>
<td>48.8</td>
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<tr>
<td>July</td>
<td>35.4</td>
<td>27.3</td>
<td>43</td>
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</tr>
<tr>
<td>August</td>
<td>34.6</td>
<td>27.1</td>
<td>40</td>
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</tr>
<tr>
<td>September</td>
<td>34.2</td>
<td>25.2</td>
<td>39.5</td>
<td>15.5</td>
</tr>
<tr>
<td>October</td>
<td>32.1</td>
<td>19.9</td>
<td>38.6</td>
<td>12.3</td>
</tr>
<tr>
<td>November</td>
<td>27.2</td>
<td>14.2</td>
<td>38.1</td>
<td>8.3</td>
</tr>
<tr>
<td>December</td>
<td>21.5</td>
<td>9.4</td>
<td>31.4</td>
<td>-0.6</td>
</tr>
</tbody>
</table>

Table–4.2 and Figure – 4.7, below, indicate frequency of wind direction occurrences.
Table – 4.2
Choa Saidan Shah - Wind Direction Frequency, % Occurrences

<table>
<thead>
<tr>
<th>Occurrences</th>
<th>0 - 2</th>
<th>2 - 5</th>
<th>5 - 10</th>
<th>10 - 15</th>
<th>15 - 20</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>0.00</td>
<td>4.76</td>
<td>8.18</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>NNE</td>
<td>0.00</td>
<td>0.00</td>
<td>1.82</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
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<td>0.00</td>
<td>4.76</td>
<td>1.82</td>
<td>4.76</td>
<td>0.00</td>
</tr>
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<td>ENE</td>
<td>0.00</td>
<td>14.29</td>
<td>12.73</td>
<td>4.76</td>
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</tr>
<tr>
<td>E</td>
<td>0.00</td>
<td>4.76</td>
<td>10.00</td>
<td>19.05</td>
<td>20.00</td>
</tr>
<tr>
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<td>9.52</td>
<td>13.64</td>
<td>14.29</td>
<td>60.00</td>
</tr>
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<td>5.45</td>
<td>23.81</td>
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</tr>
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<td>3.64</td>
<td>9.52</td>
<td>0.00</td>
</tr>
<tr>
<td>S</td>
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<td>19.05</td>
<td>3.64</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
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<td>4.76</td>
<td>1.82</td>
<td>4.76</td>
<td>0.00</td>
</tr>
<tr>
<td>SW</td>
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<td>4.76</td>
<td>3.64</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
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</tr>
<tr>
<td>W</td>
<td>20.00</td>
<td>0.00</td>
<td>2.73</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>WNW</td>
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<td>0.00</td>
<td>0.91</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>NW</td>
<td>20.00</td>
<td>0.00</td>
<td>10.00</td>
<td>14.29</td>
<td>0.00</td>
</tr>
<tr>
<td>NNW</td>
<td>0.00</td>
<td>9.52</td>
<td>17.27</td>
<td>4.76</td>
<td>0.00</td>
</tr>
<tr>
<td>Total, All Directions</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Figure 4.7 [Choa Saidan Shah – Frequency of Wind Direction]
Table 4.3 shows the percentage wind frequency distribution in the area. Analysis indicates that wind speed is more than 5 m/s for 30% of time. This data is graphically presented in Figure 4.8.

<table>
<thead>
<tr>
<th>Percent Frequency</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
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<th>13</th>
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<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind Speed, m/s</td>
<td>1.2</td>
<td>3.4</td>
<td>13.0</td>
<td>15.5</td>
<td>15.4</td>
<td>14.1</td>
<td>9.5</td>
<td>5.8</td>
<td>4.4</td>
<td>3.5</td>
<td>3.0</td>
<td>1.2</td>
<td>0.5</td>
<td>0.3</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.2</td>
<td>0.3</td>
<td></td>
</tr>
</tbody>
</table>

The warmest month of the year is May with an average temperature of 38.8 °C. In January, the average temperature is 18.9 °C. It is the lowest average temperature of the whole year.

Choa Saidan Shah has extremes of climate; the summer season begins from April and continues till October. May/June are the hottest months. The winter seasons lasts from November to February. January is the coldest month. Rainfall Towards the end of June monsoon conditions appear and during the following two to three months
the rainy season alternates with sultry weather. The winter rain falls during January, February and March.

4.3.1.5 Water

Water resources are not adequate in district especially for irrigation purpose only 8% area gets water for the irrigation purpose. Chakwal is rain fed district and there is no irrigation system in Chakwal. There are natural springs in Tehsil Choa Saidan Shah. There is also a natural lake in Kallar Kahar area but the water of the lake is not used for any purpose. There is no river passes through Chakwal district except Soan. The Soan river enter Chakwal District from the Pindi Ghaib area, passes through Hasli-Warwal into Talagang sub division, flow across Tamman and finally falls into the Indus on the boarder of Mianwali-Kohat Districts. During the summer and rainy season there is heavy flow of water in the river, but in winter it takes the shape of a rivulet.

Ground water at Plant area is indicated to be located at a depth of 45 to 60 meters.

There are 65 mini dams constructed by the soil conservation department in the district to store the rain water the main purpose of these dams seems to lift the ground water level up. Majority numbers of these small dams are not used for irrigation purposes. Nearest dam to the Plant site is Dhoke Tahlian Dam located at about 6.6 km north.

4.3.1.6 Fisheries and Aquatic Biology

The area has only natural body located at Kallar Kahar. The lake has been declared a game reserve. Some fish species are found in the lake and it is also habituated by migratory birds. There is no commercial fishing activity in the plant area. There are some species of common aquatic plants in the lake.

4.3.1.7 Biodiversity

Mainly a country's wilderness areas and scenic landscapes with their associated flora and fauna form natural capital of a country. Both collectively and within each level, the range or variety of the resources is referred to as the “Biological Diversity”. The
contribution of the “Natural capital” is recognized at three distinct levels including genera, species, and community -habitat and ecosystem.

Pakistan comprises of a total of nine major ecological zones and the term has relevance for each of Pakistan’s administrative units—district, province, and particularly country. The greater the number of genera, species and habitats and ecosystems present within these units, the greater is the Biodiversity. It is in this background that the biodiversity of the area is discussed below:

4.3.1.7.1 Forestry - (Flora & Fauna)

Considerably large area of Chakwal district are covered by forests, most of these forests exists naturally and some planted by the forest department. 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 under bush 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 the naturally occurring species of trees, the sheesham, sufaida and to some extent the poplar trees have also been planted.

The Chakwal forest division is spread over an area of 242254 acres which is 14.85% of the total area of district. At present a total of 193560 acres of the district are under reserve forest and 48694 acres are under unclassified forest. The main reserve and unclassified forests in the district are at Diljabbah, Surullah, Drangan, Karangal, Gandala, Dalwal, Makhiala, Dandot, Chinji, Kot Kala, Simbli, Nurpur, Bagga, Sammarqand and Thirchak. Surullah (Sura) forest has been declared a Wildlife Sanctuary.
According to Divisional Forest Officer, Chakwal Forest Division (copy of letter attached as Appendix–4.2), the applied plant area does not fall in any Government forest area. Nearest reserve forest are Dharam Tirath and Ramhilawan located at distance of 3.8 and 3.2 kms, respectively, from plant site as shown in Figure – 4.9. Surla Wildlife Sanctuary is located at about 20 km distance, north-west of Plant site. Limestone mine area land photo is presented as Figure – 4.10 and cement plant area in Figure – 4.11.
Following flora and fauna are present in Chakwal district:

- **Trees**
  - Acacia Modesta (Phulahi)
  - Gymnosporia Royleana (Pataki)
  - Zizyphus Jujba (Ber)
  - Monntheeca Buxifolia (Gurgura)
  - Olea Cuspidate (Kahu)
  - Dodonea Viscose (Sanatha)
  - Tecoma Aphyla

- **Grasses**
  - Aristida Depresa (Lanb Grass)
  - Digitraia Bicornis (Pharion Grass)
  - Cymbopogon Jawarancusa (Khawi Grass)
  - Crysopogon Motanus (Khar Grass)
  - Cyprus Pilosa (Deela)
Important Wildlife of the Chakwal area
- Ovia Orientalis (Urial)
- Pavo Cristatus (Pealowl)
- Gazella Gazelle (Chinkara)
- Alectoris Chukari (Chukaor)
- Ganis Lupus (Wolf)
- Felis Chaus (Jungle Cat)
- Francolinus (Black Matridee)

Area around Plant site has following fauna:
- Reptiles
  - Snakes
  - Lizards
- Birds
  - Sissies
  - Sparrows
  - Doves
- Migratory Birds
  - Ducks
  - Wild Ducks
  - Herons

Kallar Kahar Lake is the major habitat for migratory bird’s particularly during winters.

4.3.1.8 Scientific Institutions/Colleges/Schools

Following institutions are located in the Choa Saidan Shah Tehsil.
- Technical Institute, Tevta, Choa Saidan Shah
- Vocational Training Institute, Choa Saidan Shah
- Mining Institute, Katas
- Cadet College, Katas
- Government Degree College for Women, Choa Saidan Shah
- Holy Mission School, Choa Saidan Shah (Private)
- Allama Iqbal Public School, Choa Saidan Shah (Private)
- Government Sir Syed Inter College, Katas
Boys School at Khajula
Boys School at Dulmial
Girls School at Dulmial
Private College at Dulmial
Boys School at Khairpur
Girls School at Khairpur

High and primary schools both for the boys and girls are present in the cities/villages around the project site.

4.3.1.9 Hospitals & Dispensaries
- Tehsil Headquarters Hospital, Choa Saidan Shah
- Qureshi Hospital, Choa Saidan Shah (Private)
- General Mushtaq Baig Memorial Hospital, Choa Saidan Shah, (FALAH FOUNDATION)
- Fauji Foundation Dispensary, Dulmial
- Dispensary at Khajula
- Dispensary at Khairpur

4.3.1.10 Socio-economic

4.3.1.10.1 Cultural and Aesthetic Values
Socio economic aspects are discussed under Section 4.4.

4.3.1.10.2 Cultural and Other Heritage
Only site of heritage is Katasraj Temple. Katasraj Mandir is a Hindu temple complex situated in Katas village near Choa Saidan Shah. Dedicated to Shiva, the temple has, according to Hindu legend, existed since the days of Mahābhārata and the Pandava brothers spent a substantial part of their exile at the site and later Krishna himself laid the foundation of this temple. The Pakistan Government is considering nominating the temple complex for World Heritage Site status. There are no historical monuments around the project site.
A graveyard is located in the top north-western corner of the plant site. This graveyard will be outside the Plant boundary/fence. Independent access to the graveyard will be available.

4.4 Existing Socio-economic Conditions

4.4.1 Population and Communities

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>
<thead>
<tr>
<th>Tehsils</th>
<th>Number of Union Councils</th>
<th>Population (Thousand Persons)</th>
<th>1998 Urban Population %</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Urban</td>
<td>Rural</td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td>Rural</td>
<td>Urban</td>
<td>Total</td>
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<tr>
<td>Talagang</td>
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<tr>
<td>Kalar Kahar</td>
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<td>8</td>
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<tr>
<td>Choa Syden Shah</td>
<td>1</td>
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<tr>
<td>Lawa</td>
<td>-</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>8</td>
<td>64</td>
<td>72</td>
</tr>
</tbody>
</table>


Population:
Population of Chakwal district is estimated 1,351,000 in 2013 which gives population density of 205 persons per square kilometers. The total population of the district was 1,083,725 in 1998 with the density of 166 persons per square kilometer. According to 1998 censes the urban population was 12.2% of the total population and 87.8% population was rural population. In year 2013 it is estimated that urban population is 14% and rural population is 86%. As per 1998 censes the male population of the district was 52% and female population was 48% of the total population. 44% population is estimated blow the age of 15 years.
Punjabi (Pothohari) is the predominant language being spoken in the district representing 97.7% of the population followed by Pashto spoken by 1.2%, Urdu 0.9% and Siraiki 0.2% while others speak 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, Jatt Bhuttas, Awans, Mair Minhas, Kahuts, Janjuas, Mughal Kassars, Gujjars, Syeds, Gondals, Sheikhs, and Awans.

### 4.4.2 Economy & Industries

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

There are considerable deposits of minerals in district Chakwal especially coal reserves in area of Chao Saidan Shah. There are about 246 number of coal mines exists in Chakwal. There are also reserves of lime stones and marble in Chakwal. There are 4 number of cement factories are established in district Chakwal. People are also employed in mining and cement industry...

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

All these minerals, with the exception of Gold, Copper and Gemstones are being successfully mined. The mining of Gold, Copper and Gemstones is not feasible owing to their small deposits and heavy cost required for extraction.

### 4.4.3 Cultural and Aesthetic Values

Because of limited income, most of the common people live marginalized status of life. Agriculture and work in industries are the main livelihood earning source with limited land holdings. Old traditional and simple life typical of the Punjab villages is the prevailing cultural and aesthetic characteristic of life style of majority of the people. In spite of 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 of the decisions.

Decades old culture and customs in every walks life are dominant. Old people prefer to live conservative life style. However, due to awareness and education through TV and print media, the young generation is in the process of transition in their life style. General attitude to visitors especially is quite welcoming.

Arranged marriages are mostly in practice. And these are quite successful. Print and electronic media are influencing almost all walks of life of the 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 the society to change their old traditional socioeconomic pattern of life. Print and electronic media are playing great role in bringing tangible change in the old pattern of life.

4.4.4 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. Variety of private road transport in the form of buses and wagons are available to reasonable extent.

4.4.5 Land Use Planning
The entire land use planning is carried out according to the provincial laws. Under the present Government system, the District Government is responsible for all land use planning.