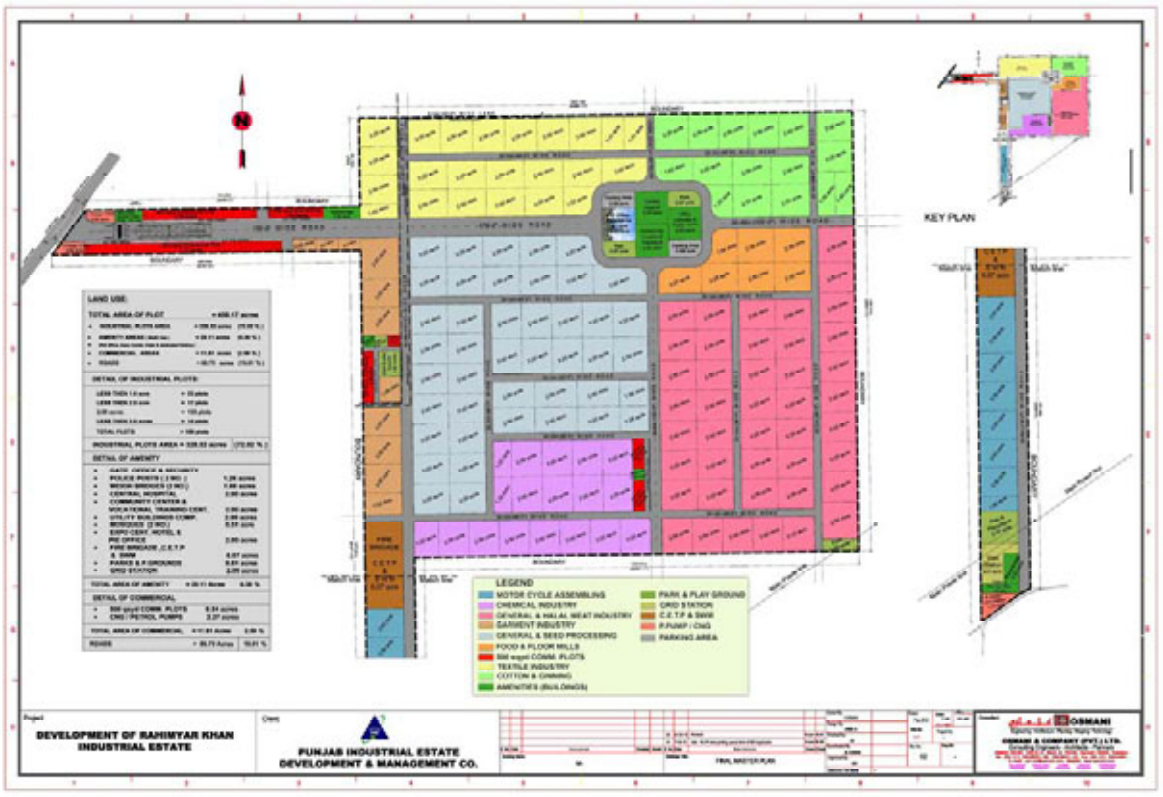
ENVIRONMENTAL IMPACT ASSESSMENT (EIA) OF RAHIM YAR KHAN INDUSTRIAL ESTATE (RYK-IE)

(FINAL REPORT)



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1. INTRODUCTION

District Rahim Yar Khan located in extreme Southern Punjab, geographically, enjoys a central location in Pakistan and has great potential to become as one of the Industrial Hubs of Pakistan. It is also in great proximity with rest of three provinces. To achieve a true benefit from the coming regional cooperation and worldwide introduction of Pakistani products as per international quality standards, Punjab Government has decided to launch different industrial estates in the Province and to improve the infrastructure in existing industrial estates. In this context, they have initiated an industrial estate in Rahim Yar Khan very recently (Figure 1).

R. Y. Khan is a very important city in Punjab, which is producing export quality products, notably, Cotton, Sugar, Fertilizer, Soap, Cosmetic etc. Unfortunately, unplanned and haphazard expansion of the City alongwith the absence of any Master Plan, permits little room to planned Industrial Estate. To meet the requirements of modern era and to overcome the burden of unplanned industrial expansion in District R. Y. Khan, Government of Punjab has planned to establish an Industrial Estate at the National Highway (N-5) in R. Y. Khan District, named as, Rahim Yar Khan Industrial Estate (RYK-IE) in 2011, which is about 15-20 minutes drive both from Rahim Yar Khan and Sadiqabad Cities (Figure 2 and Figure 3).

1.1. PROJECT PROPONENT

The development of proposed Project of RYK-IE will be carried out by the Punjab Industrial Estate (PIE) which is owned by Government of Punjab. PIE established by the Government of Punjab for the expansion of Industrial areas to facilitate a chain of new industrial estates along with upgrading the existing ones in a dynamic and innovate manner and providing solutions to the problems of prospective entrepreneurs. Seed money has been provided by the Government of Punjab, which will be utilized for the development of new upcoming Planning industrial estates.

1.2. LOCATION OF THE PROJECT SITE

RYK-IE, enjoy a very unique location between two cities of Punjab, *i.e*., Rahim Yar Khan and Sadiqabad. It is only 15-20 minutes drive away from Rahim Yar Khan and from Sadiqabad. The RYK-IE is located at the National highway (N-5), have good access to National railway line and very good proximity to Rahim Yar Khan International Airport. The RYK-IE is also easily accessible from Indus Highway through a link road. A minor canal (Sinawar) is also passing near to the Project site. The proposed site of RYK-IE is only 2.5 Km

away from the National Railway, about 12.5 km from the city of Rahim Yar Khan (Figure 3). A combined effluent treatment plant (CETP) is also proposed to treat the industrial wastewater discharge before its disposal.

Figure 1: The Site of RYK - IE

Figure 2: Location Plan of the Project

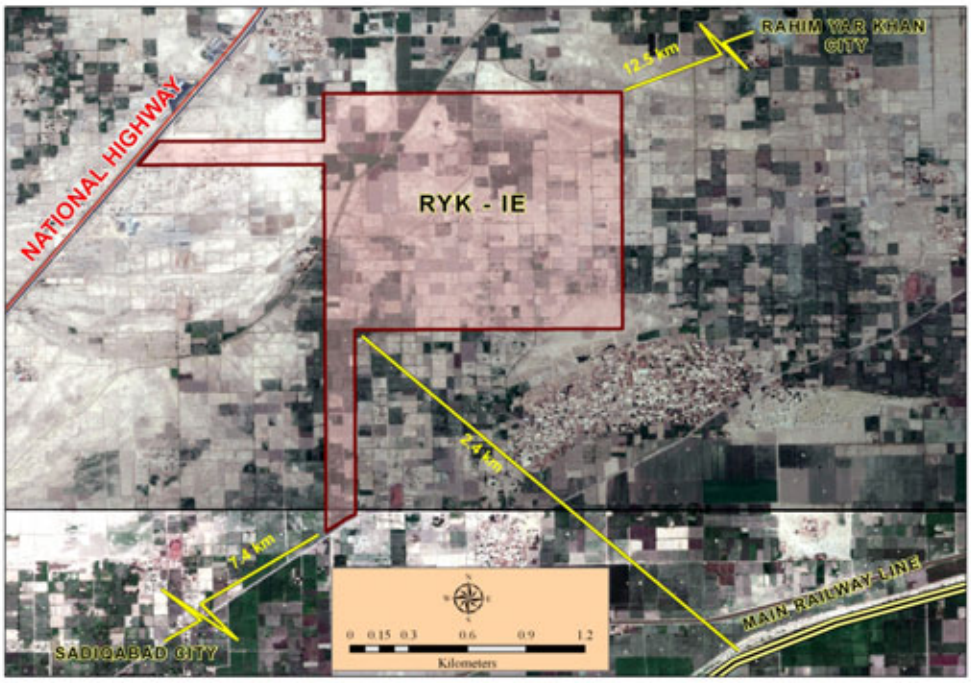


Figure 3: Strategic Location and Adjoining Areas

1.3. POSITIVE IMPACTS OF THE PROJECT

It is world known phenomena that an industrial estate establishment brings prosperity to the local community and businesses which materialized into regional and national wealth. Hence, development of RYK-IE in the sight of PIE will provide direct and indirect benefits such as:

- Poverty alleviation and generation of jobs in the Area;
- Revenue generation after selling the industrial plots to the industrialists;
- Reduction in environmental pollution due to good in-house environmental practices such as solid waste and wastewater management;
- Bringing foreign investors in Pakistan that generates revenue, ultimately it will bring development and facilities in the community. As Rahim Yar Khan already has very good connection with the investors of UAE, therefore, it is likely that it would be improve further;
- Peace of mind in business and ideal working conditions for the local residents;
- Better communication network by roads, railway and presence of cell companies and also ease in haulage of raw materials and finished commodities;
- Increase in textile, Fertilizer, Soap technology and chemicals production that will also increase the overall revenue at the local government level; and

- Professional training opportunities for skilled and non-skilled workers

1.4. REGULATORY REQUIREMENTS

In the awake of national and international awareness about environment the consciousness in Pakistan is very high in this regard The Pakistan Environmental Protection Act, 1997 makes it mandatory for the project proponents to carry out an Environmental Impact Assessment (EIA) of development projects and incorporate environmental and social mitigation measures as part of the project planning. Pak-EPA regulations (SRO 339 (I)/2000) state that an EIA is required for the Projects falling under Schedule II. The proposed Project falls under Schedule II Category B, therefore, an EIA is mandatory for the proposed RYK-IE Project.

The National Environmental Quality Standards (NEQS) define the limits for pollutants in industrial and municipal effluents, and in gaseous emissions from industries and vehicles. Extending the NEQS to air quality is revised and implemented. The Land Acquisition Act, 1894 regulates the acquisition of land and built-up property and damage to other assets such as crops, trees, and infrastructure. last but not the least, as a result of this development few people will be displaced and their livelihood erase to exist in this context. The Draft National Resettlement Policy, 2002 of the government is intended to address the rehabilitation and resettlement of disrupted populations and the restoration of their livelihoods, providing a basis for managing the resettlement needs arising from the project. To carryout above mentioned task following objectives has been set forth.

1.5. OBJECTIVES OF EIA STUDY

The specific objectives of this Environmental Impact Assessment (EIA) Study are:

1. To provide the environmental and social baseline conditions of the project area:

2. To identify adverse environmental and social impacts associated with proposed RYK-IE Project;

3. To propose mitigation measures for potential impacts of the project during the construction and operational phases; and

4. To develop an Environmental Management and Monitoring Plan (EMMP) for adverse environmental impacts.

1.5.1. Assumptions and Limitations

As the project is at planning stage, *i.e*., Master Plan has been developed (Figure 5) for the Project and detailed design is still to be carried out after due approval of the Master Plan from the concerned authorities, so only outlines of the proposed developmental works are available and due efforts have been made to visualize the impacts due to implementation of the Project. For this purpose, detailed discussions were made with PIE as well as design staff. In absence of the detailed design some of the components of the Project, estimation/assumptions has been made and it has been considered in the preparation of this EIA Report.

2. APPROACH AND METHODOLOGY ADOPTED FOR EIA

The main EIA procedures that will be adopted during this EIA, are summarized in the following Flow-Chart (Figure 4). The scoping of the project will review the design, construction and implementation phases. The baseline studies will provide the existing conditions of the project area and record of the environmental characteristics. The probable impacts will outlined in the mitigation chapter, whereas, at the end a Comprehensive and Environmental Management Plan (EMP). At various stages the feedback of PIE will be sought and incorporated.

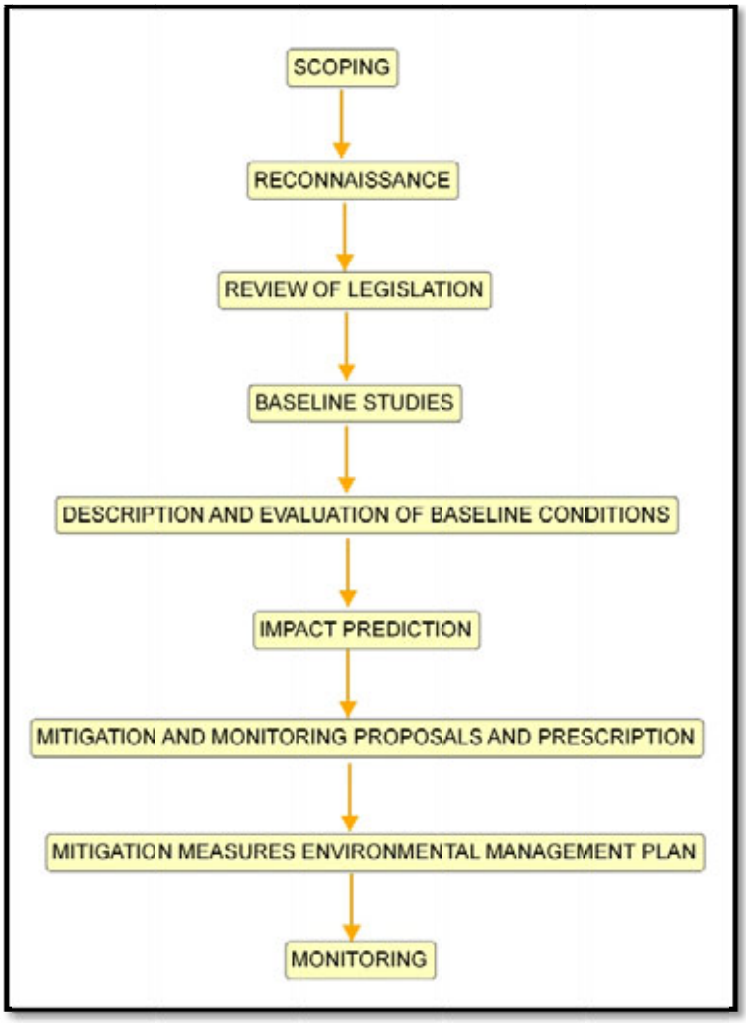


Figure 4: Methodological Framework

2.1. REVIEW OF MASTER PLAN

A detailed review of the Project was carried out to truly understand the Project and extent of the developmental activities and their potential impacts. Detailed meetings were also held with Client to ensure the consistency of the proposed facilities. The review of Master Plan helped the EIA team to visualize nature

and extent of the impacts related with implementation and operation of the proposed RYK-IE. The analysis of design plot allocation have been reviewed and reported.

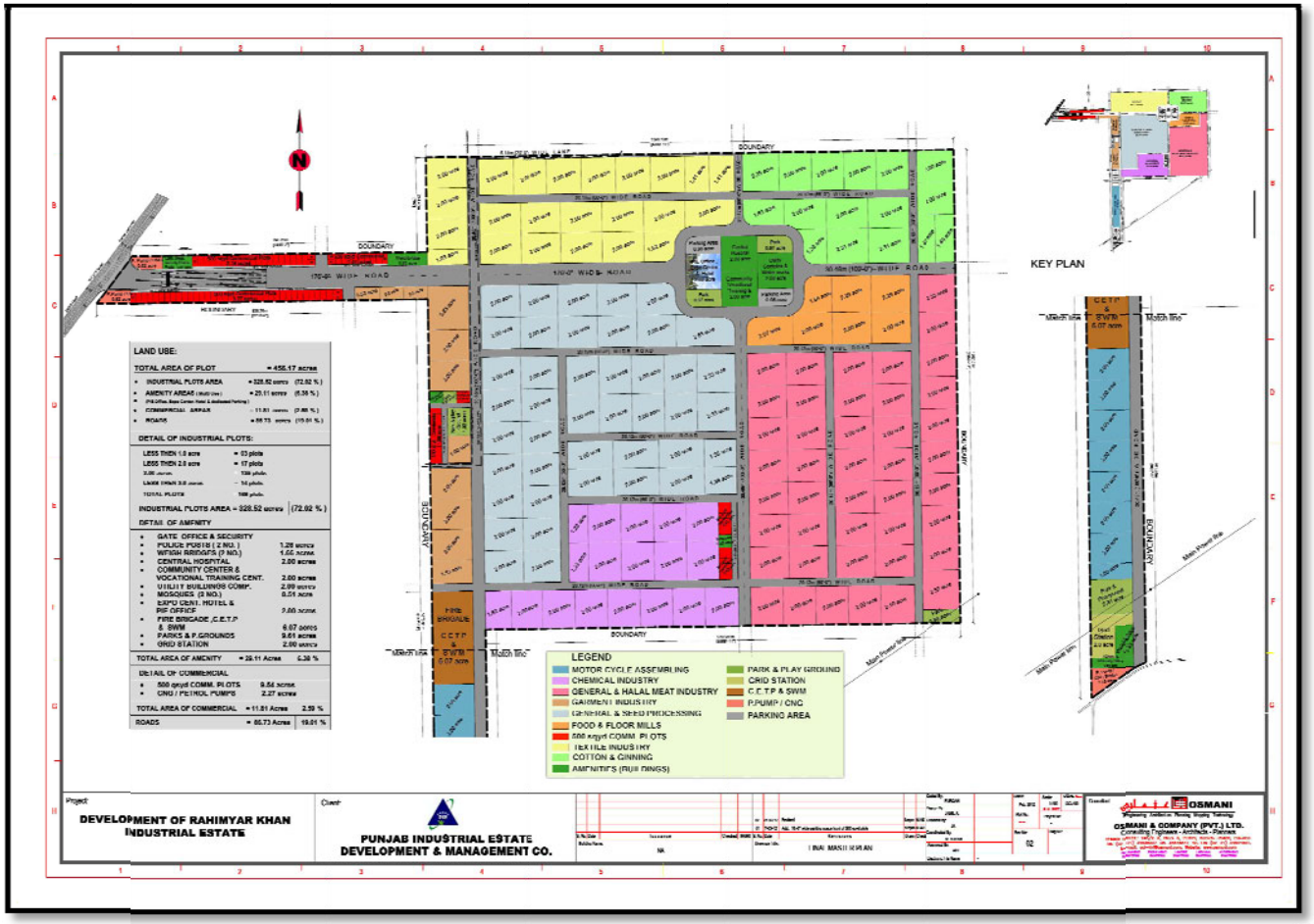


Figure 5**:** Master Plan of RYK-IE

2.2. DELINEATION OF STUDY AREA

To conduct the EIA study, delineation of the Study Area is very important to evaluate the primary and secondary impacts of the Project. The delineation of the Study Area normally depends upon the nature of the Project, *i.e*., either project is of linear nature like development of road, railway track, canal, etc. or consolidated area like development of residential colony, industrial estate, dam, etc. The area selected for the site of RYK-IE is of rectangular type with two extended corridors. Keeping in view the potential impacts of the Project, the EIA study area is designated one km beyond the project area's limits. However, incase of severity of the impacts, this limit extends more than 1 km to note down the impacts on water quality, air and biological resources. For this purpose, a detailed buffer of 10 Km is drawn, especially to monitor the sensitive environmental and cultural areas around the Project area (Figure 6). The delineation of the project area demarcated with the help of advanced DGPS devices to fix the boundary more accurately and precisely.

Figure 6**:** Delineation of the Project Area through DGPS Techniques

2.3. RECONNAISSANCE SURVEY OF PROJECT AREA

Prior to start the detailed environmental and social survey of the Project area, a reconnaissance survey was conducted by a team of environmental and social experts to familiarize themselves with the local conditions and setting of the Project area. This survey also helped to plan the detailed survey investigations. During reconnaissance survey, the main information regarding

general topography of the area, social set-up, settlement around the proposed project were recorded which were very helpful during detailed survey. The reconnaissance survey was conducted in the last week of September 2011. (Figure 7). Basic information about the project area and its environs has been gathered.

Figure 7: A View of RYK - IE Sites during Reconnaissance

2.4. REMOTE SENSING ANALYSIS

It is very important to use available remote sensing based web resources to map the up to date existing land use and Land Cover which is important to extract the existing environment and to visualize the impacts of the project. This has been achieved with the help of Google earth imageries, an image mosaic of GeoEye Satellite (USA) has been captured (Figure 8) through 106 clips for the recent data of July 22, 2010. With the help of this image the entire land use and land cover has been picked-up through on-screen vectorization techniques. This has been extensively completed for the project area and for the one Km buffer of RYK-IE were also mapped and plotted. Furthermore, important areas in 10 Km buffer area also captured through this mosaic.

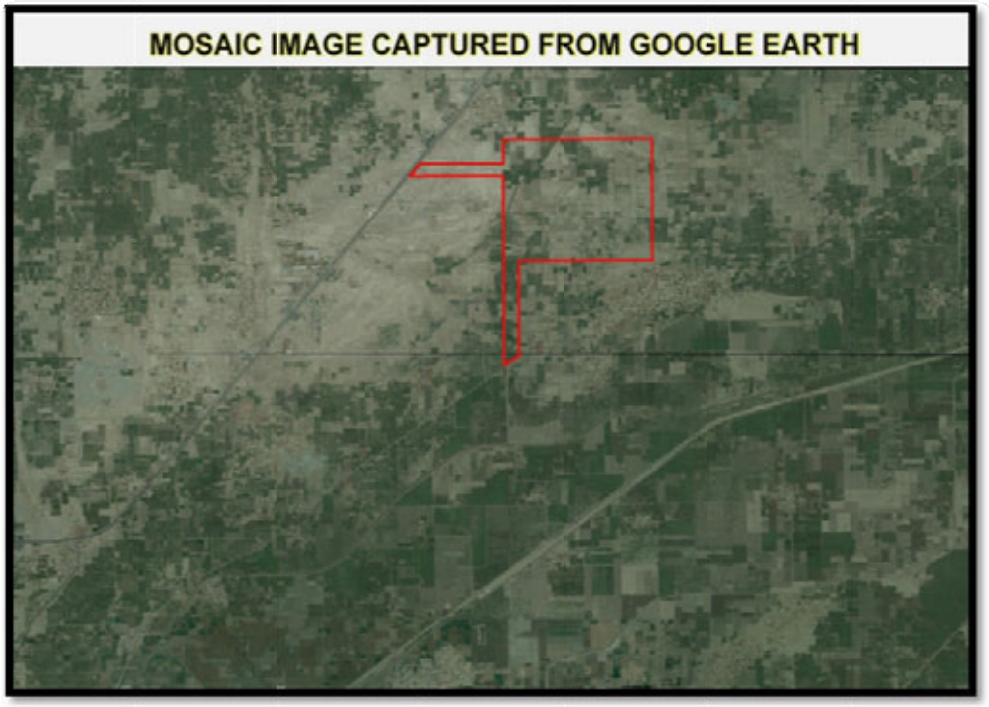


Figure 8: A GeoEye Mosaic Image of the Project Area and Environs

2.5. ENVIRONMENTAL BASELINE SURVEY OF THE PROJECT

Prior to start of the baseline environmental survey, a checklist was prepared based on the Master Plan and reconnaissance survey.

2.5.1. Physical Environment

To collect the information on physical environment, a checklist was prepared and included the following main parameters:

a. Soils including type of soils, erosion, stability and contamination during project implementation.
b. Land use pattern of the area including agricultural crops, barren lands, residential lands, etc.
c. Buildings including residential, commercial and animal use for complete / partial relocation.
d. Cultural properties like mosques, shrines, mazars, graveyards etc.
e. Archeological monuments and historical sites.
f. Available energy / mineral resources.
g. Other private/public infrastructure like telephone poles, hand pumps, tube wells etc.
h. Drainage aspects of the Project area.
i. Water resources availability both surface and groundwater.
j. Water Quality

k. Air Quality
l. Noise Level. The major items, which were considered for physical, biological and social environment are discussed in the subsequent paragraphs.

2.5.2. Biological Environment

Under biological environment, the following main parameters were covered:

a) Forests and game reserves existing along the Study Area;
b) Existing Flora along the project area and the status of Plant species;
c) Trees to be cut due to project implementation;
d) Wet lands within the vicinity of the project area;
e) Bird species especially migratory birds;
f) Identification of Endangered species both for fauna and flora;
g) Wild Life in the project area;
h) Beneficial plants and animals in the project area; and
i) Aquatic life including fish resources (if any)

2.6. SOCIAL BASELINE SURVEY OF THE PROJECT AREA

The social baseline survey was carried out in almost all vicinities around RYK-IE to accomplish the following specific objectives:

- To identify the potential project affected persons in the project demarcated area;
- To identify poor and vulnerable groups, and strategies to ensure that such groups should get benefit from the project;
- To ensure adequate public/ stakeholder consultations and participation; and
- To identify the need for developing a resettlement policy framework for the potential affectees.

Stakeholders' identification was carried out to ascertain which group(s) of people is affected by the project, and the extent of that impacts, based on their proximity to the Project.

Based on the delineation of the project corridor, the following two categories of stakeholders were identified for the purpose of the social assessment:

a. Potential project-affected persons (PAPs) residents/ businesses (owners, tenants, owner cum tenant and absentees), agriculture/barren land

holdings, located within the project area, and subject to a direct impact requiring relocation.

b. The general population residents along the project corridor or in the area of influence who may be subject to an indirect impact on their residences or access to the workplaces during the construction period.

The social impact assessment was based on two surveys:

- A socioeconomic baseline survey to develop overall socio-economic conditions of the population settled along the project corridor.
- A survey to identify the number and status of potential project-affected persons (PAPs) settled in the project area.

2.7. DATA ENTRY AND ANALYSIS

After collection of environmental and social data from both primary and secondary sources, data were entered into a digital Database:

a. Database to evaluate the results; and
b. Identification of the impacts of the projects both positive and adverse impact of the project area identified for the final cost benefit analysis.

2.7.1. Impact Assessment and Mitigation Measures

After thorough review of field notes, data collection of proposed project activities and detailed discussions with stakeholders and design team, the potential impacts of the Project were assessed and measures were proposed to mitigate the negative impacts and to enhance the positive impacts.

2.8. PREPARATION OF ENVIRONMENTAL MANAGEMENT PLAN

An Environmental Management Plan (EMP) depicting the mitigation measures and monitoring plan was also developed. Institutional capacity building of PIE was also reviewed and enhancement was proposed for effective implementation of EMP.

To conduct the study a multidisciplinary team was involved comprising Engineers, Ecologist, Environmentalists, Geographers, Economists, Surveyor and sociologists. List of team members involved to prepare the report are provided here.

THE EIA STUDY TEAM

1.	**Mr. Asim Osmani**	Director (Engineer)
2.	**Dr. Jamil Kazmi**	Team Leader (Geographer/ Social Scientist)
3.	**Ms. Narjis Zahra**	Coordinator (GIS Specialist)
4.	**Dr. Saima Shaikh**	Ecologist
5.	**Mr. Haider Abbas**	Economist/Sociologist
6.	**Mr. Atif Shahzad**	Environmentalist
7.	**Mr. Imran Khan**	R.S Specialist
8.	**Mr. Khan Shahbaz**	GPS Expert / Surveyor
9.	**Mr. Raheel Akhtar**	GIS Technician
10.	**Mr. Raees Ahmed**	Surveyor

3. REVIEW OF LEGISLATIVE FRAMEWORK

The success of environmental and social effectiveness assessment in ensuring that development projects are environmentally and socially effective depend on the capability of regulatory framework for environmental management. Sustainable development is a concept that has emerged over the past three decades to describe a new framework aimed at economic and social development whilst maintaining the long-term integrity of the ecological and social system. The principles of sustainable development are in the process of being incorporated into national policies and legislation in Pakistan through various statutory instruments.

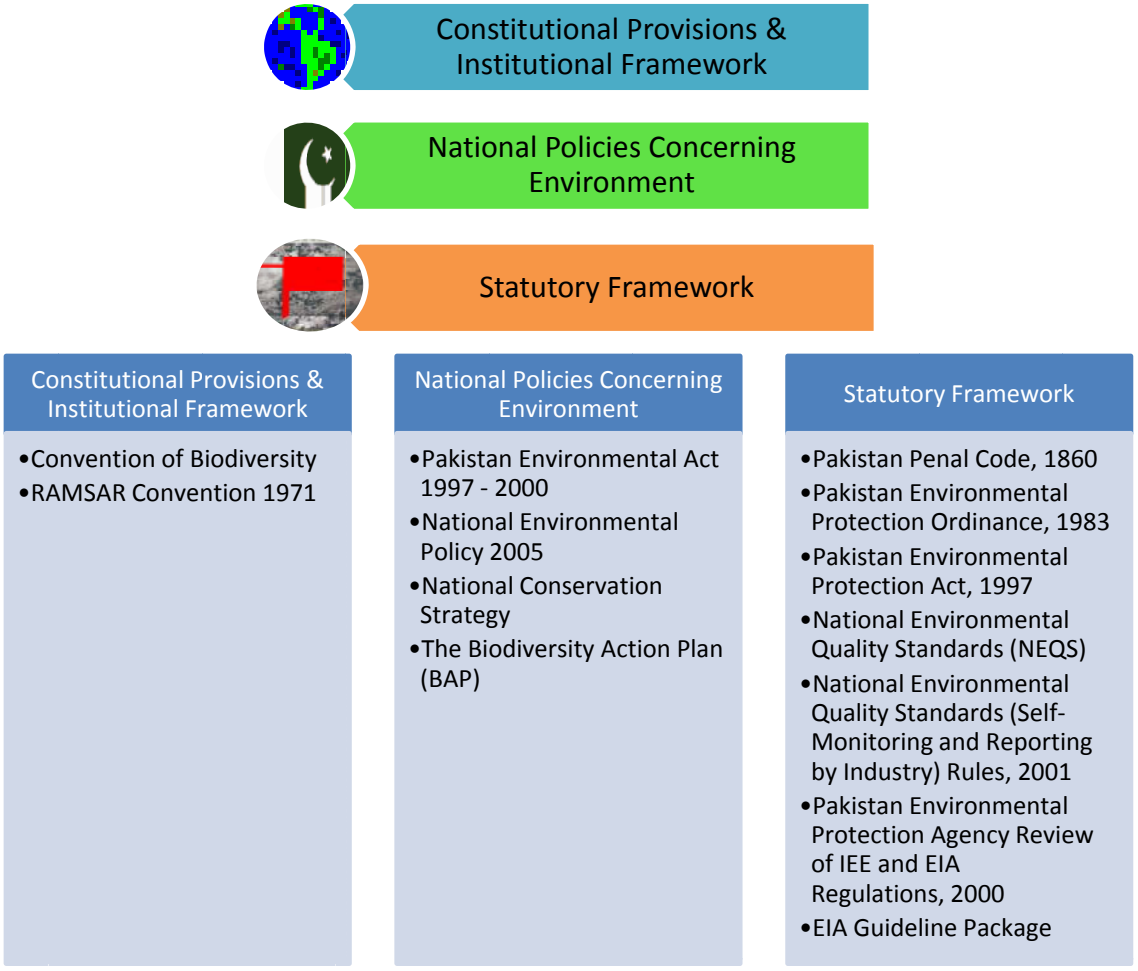


Figure 9: Legislative Framework applicable for the Environmental Analysis of Industrial Areas

Therefore, this chapter describes the current national policies, legal framework for assessment of the proposed project in the context of the environment and sustainable development (Figure 9). This includes both local

and international frameworks and the institutions that exist in Pakistan that may influence the environmental management, of the proposed project.

3.1. CONSTITUTIONAL PROVISIONS AND INSTITUTIONAL FRAMEWORK

According to the Constitution of Pakistan, the legislative power lies with the Federal parliament and the legislative assemblies of the four provinces of Pakistan. The Fourth Schedule of the constitution provides two lists of issues. One list, the Federal Legislative List, includes issues on which only the Federal government has legislative powers. The second list, the Concurrent Legislative List includes issues on which both the Federal and the Provincial governments have legislative powers. If a particular legislation passed by a provincial assembly comes into conflict with a law enacted by the national assembly, then according to the constitution, the Federal legislation will prevail over the provincial legislation to the extent of the inconsistency.

The subject of 'environmental pollution and ecology' is included in the concurrent list of the constitution. Thus, allowing both the Federal and Provincial Governments to enact laws on the subject. To date, only the Federal Government has enacted laws on environment, and the provincial environmental institutions derive their power from federal law. However, after 18th amendment these powers has been transferred to the provincial government.

Article 9 of the constitution defines the right to life as a fundamental right in these words "No person shall be deprived of life or liberty save in accordance with law". The Supreme Court of Pakistan in its judgment in the case Shehla Zia and others vs WAPDA (1994) declared that the right to a clean environment is part of the fundamental constitutional right to life. (Siddiqui, 2000).

The Ministry of Environment, Local Government and Rural Development is responsible for environmental issues at federal level. The NCS unit within the Ministry ensures implementation of the National Conservation Strategy.

The Pakistan Environmental Protection Agency (PEPA) at the Federal level is responsible for administering the provisions of the Environmental Protection Act. It is responsible to ensure compliance with the National Environmental Quality Standards (NEQS), develop monitoring and evaluation systems and initiate legislation when necessary.

The Provincial Environmental Protection Agencies (Environmental Protection Directorate in Punjab) are responsible for environmental planning and

development, approval of Initial Environmental Examination (IEE) and Environmental Impact Assessments (EIA) of new projects at provincial level.

After the empowerment of local community through the local government ordinance Schedules 4 and 8 of this Ordinance pertain to environmental pollution. Under the Ordinance, the district government officers (District Officers Environment) are also authorized to restrict the activities causing pollution to air, water or land and even they can seal the polluting units. Wildlife conservation and management is also a provincial subject. Provincial Wildlife and Forestry departments are responsible for implementation of provisions of provincial Wildlife Protection Ordinances, Acts and Regulations.

3.2. NATIONAL POLICIES CONCERNING ENVIRONMENT

Relevant national policies concerning environmental issues were explored and are discussed below:

3.2.1. National Environmental Policy 2005

The National Environmental Policy (NEP) was approved by the Pakistan Environmental Protection Council (PEPC) in its 10th meeting on 27th December 2004 under the chairmanship of the Prime Minister of Pakistan and thereafter approved by the Cabinet on 29th June 2005. NEP is the primary policy of Government of Pakistan that addresses the environmental issues of the country. The broad goal of NEP is, “To protect, conserve and restore Pakistan’s environment in order to improve the quality of life of the citizens through sustainable development”. The NEP identifies the following set of sectoral and cross-sectoral guidelines to achieve its goal of sustainable development.

3.2.1.1. Sectoral Guidelines

Water and sanitation, air quality and noise, waste management, forestry, biodiversity and protected areas, climate change and ozone depletion, energy efficiency and renewable, agriculture and livestock, and multilateral environmental agreements are included as sectoral guidelines.

3.2.2. Cross Sectoral Guidelines

Guidelines cover poverty, population, gender, health, trade and environment, environment and local governance, and natural disaster management. The NEP suggests the following policy instruments to overcome the environmental problems throughout the country:

- Integration of environment into development planning;
- Legislation and regulatory framework;
- Capacity development;
- Economic and market based instrument;
- Public awareness and education; and
- Public private civil society partnership.

NEP is a policy document and does not apply to projects. However, Proponent should ensure that the project should not add to the aggravation of the environmental issues identified in NEP and mitigation measures should be adopted to minimize or avoid any contribution of the project to these areas. (MoE, 2005)

3.2.3. National Conservation Strategy

Before the approval of National Environmental Policy (NEP) the National Conservation Strategy (NCS) was considered as the Government's primary policy document on national environmental issues. At the moment this strategy just exists as a national conservation program. The NCS was developed over a nine-year period (1983-1992) after an extensive consultation process. The Federal Cabinet approved the NCS in March 1992, as the principal policy document for environmental management in the country.

The National Conservation Strategy (NCS) is a broad-based policy statement aimed at achieving environmentally sustainable economic and social development in Pakistan. The three overriding objectives of the NCS are:

- Conservation of natural resources;
- Sustainable development; and
- Improved efficiency in the use and management of resources.
- Three operating principles are identified to achieve these objectives. These are:
- Greater public participation in development and environmental management.
- A merging of environment and economic decision-making.
- Lasting improvements in the quality of life.

The NCS sets out the basic guidelines for an integrated effort aimed at protecting the environment and natural resources of the country. This broad framework provides a comprehensive point of reference for all agencies,

departments, private sector companies, financial institutions, and donor agencies for undertaking systematic efforts to bring about an effective change for sustainable development.

The NCS proposes policies in 14 primary, secondary, and tertiary sectors. Of these, the policies and measures proposed in nine sectors (agriculture, forest management, rangeland rehabilitation, livestock management, water resources, wildlife, mineral resources, energy, and human settlement) do not have direct relevance to the proposed project. The policies proposed in industrial development, and pollution controls are relevant to the proposed project. The policies for these sectors include the following:

1) **Industrial development**: Development and enforcement of effective pollution controls; promotion of clean industrial processes and recycling; establishment of incentives for environmentally beneficial or benign industries; development of a policy for sitting of industries in areas of low environmental sensitivity; building awareness within industry

2) **Pollution control**: Promotion of domestic wastewater treatment technologies that provide for recovery and reuse of water, nutrients, and organic matter; focusing on the regulatory approach for industrial discharge; supporting recovery and use of heavy metals from industrial effluents; promoting biological methods of wastewater treatment wherever practicable; giving priority to areas where there is a risk of groundwater contamination; promotion of proper maintenance of motor vehicles, industrial boilers, and furnaces; encouragement of higher fuel efficiency in motor vehicles; undertaking environmental impact of Zone siting; promotion of reuse and recycling; encouraging marketing assistance for effective use of scavenging systems.

3.2.4. The Biodiversity Action Plan (BAP)

The Plan, which has been designed to complement the NCS and the proposed provincial conservation strategies, identifies the causes of biodiversity loss in Pakistan and suggests a series of proposals to conserve biodiversity in the country.

The BAP recognizes that an EIA must be as a tool at a project level to identify environmental effects of a proposed project and to plan for reducing adverse effects. The BAP further stipulates that an EIA needs to be initiated at an early stage of project development and that public participation in the review of potential effects is important.

3.2.4.1. Statutory Framework

The key environmental laws that have relevance for the proposed project are discussed as under:

3.2.5. Pakistan Penal Code, 1860

The prime legal framework that deals with the environmental issues lies in the form of Pakistan Penal Code (PPC), 1860. This defines the penalties for violations concerning pollution of air, water bodies and land. Sections 272 and 273 of this Act deal with the adulteration of food or drink. Noise pollution has been covered in Section 268, which defines and recognizes noise as a public nuisance. “A person is guilty of a public nuisance who does any act or is guilty of an illegal omission which causes any common injury, danger or annoyance to the public or to the people in general who dwell or occupy property in the vicinity, or which must necessarily cause injury, obstruction, danger or annoyance to persons who may have occasion to use any public right.”

3.2.5.1. Pakistan Environmental Protection Ordinance, 1983

In 1983, the Government of Pakistan issued Pakistan Environmental Protection Ordinance (PEPO). Under Section 8 of Pakistan Environment Protection Ordinance (PEPO) 1983, it was necessary to carry out IEE / EIA for all development projects, but there were no IEE / EIA regulations under that ordinance.

3.2.5.2. Pakistan Environmental Protection Act, 1997

The Pakistan Environmental Protection Act (PEPA), 1997 is the basic legislative tool empowering the government to frame regulations for the protection of the environment. The act is applicable to a broad range of issues and extends to air, water, soil, marine, and noise pollution, as well as to the handling of hazardous wastes. The key features of the law which are directly related to the proposed project are:

- Section-11 (1): "Subject to the provisions of this Act and the rules and regulations made there under no person shall discharge or emit or allow the discharge or emission of any effluent or waste or air pollution or noise in an amount, concentration or level which is in excess of the National Environmental Quality Standards.”

- Section-12 (1): "No proponent of a project shall commence construction or operation unless he has filed with the Federal Agency an Initial

Environmental Examination (IEE) or, where the project is likely to cause an adverse environmental effect, an Environmental Impact Assessment (EIA), and has obtained from the Federal Agency approval in respect thereof".

- Section-14: "Subject to the provisions of this Act, no person shall generate, collect, consign, transport, treat, dispose of, store, handle or import any hazardous substance except (a) under a license issued by the Federal Agency and in such manner as may be prescribed; or (b) in accordance with the provisions of any other law for the time being in force, or of any international treaty, convention, protocol, code, standard, agreement or other instrument to which Pakistan is a party"

The Pak-EPA has delegated the power of review and approval of environmental assessments to the provincial environmental protection agencies. As the proposed project will be located in Punjab province, it falls under the jurisdiction of the EPA Punjab. The following table shows the major environmental legislation of Pakistan. (EPA Pakistan, 1997).

Table 1: Major Environmental Legislation of Pakistan

SECTOR	LEGISLATION
Environmental protection	• The Pakistan Penal Code (1860) • Pakistan Environmental Protection Ordinance, No. XXVII of 1997
Land use	• The Land Improvement Loans Act (1883) • The Punjab Development of Damaged Areas Act (1952) • The Punjab Soil Reclamation Act (1952) • The West Pakistan Agricultural Pests Ordinance (1959) and Rules (1960) • The Islamabad (Preservation of Landscape) Ordinance (1966) • The Punjab Development Cities Act (1976) • The Baluchistan, NWFP, Punjab and Sindh Local Government Ordinance(s) (1979/80) • The NWFP Salinity Control and Reclamation Act (1988)
Water quality and resources	• The Pakistan Penal Code (1860) • The Canal and Drainage Act (1873) • The Factories Act (1934) • The Baluchistan Ground Water Rights Administration Ordinance (1978) • The Baluchistan, NWFP, Punjab and Sindh Local Government Ordinance(s) (1979/80) • On-Farm Water Management and Water Users' Associations Ordinance (1981)

SECTOR	LEGISLATION
	• Indus River Water Apportionment Accord-(1991) • Statutory Notification S.R.R. 742 (1993)
Air quality	• The Pakistan Penal Code (1860) • The Factories Act (1934) • The West Pakistan Prohibition of Smoking in Cinema Houses Ordinance (1960) • The Motor Vehicles Ordinance (1965) and Rules (1969) • The Baluchistan, NWFP, Punjab and Sindh Local Government Ordinance(s) (1979/80) • Statutory Notification S.R.R. 742 (1993) • Statutory Notification S.R.R. 1023 (1995)
Noise	• The West Pakistan Regulation and Control of Loudspeakers and Sound • Amplifiers Ordinance (1965) • The Motor Vehicle Ordinance (1965) and Rules (1969)
Toxic or Hazardous Substances	• The Pakistan Penal Code (1860) • The Explosives Act (1884) • The Factories Act (1934) • The Agricultural Pesticides Ordinance (1971) and Rules (1973)
Solid wastes and effluents	• The Factories Act (1934) • The Baluchistan, NWFP, Punjab and Sindh Local Government Ordinance(s) (1979/80) • Pakistan Environmental Protection Ordinance, No. XXVII of 1997
Marine and fisheries	• The West Pakistan Fisheries Ordinance (1961) • Baluchistan Sea-Fisheries Ordinance (1970) and Rules (1971) The NWFP • Fisheries Rules (1976) • Territorial Waters and Maritime Zones Act (1976)
Forest conservation	• The Punjab Forest (Sale of Timber) Act (1913) • The Forests Act (1927) • The NWFP Hazara Forest Act (1936) • The West Pakistan Firewood and Charcoal (Restrictions) Act 1964 • The Punjab Plantation and Maintenance of Trees Act (1974) • The Cutting of Trees (Prohibition) Act (1975) • The NWFP Management of Protected Forests Rules (1975) • The Baluchistan, NWFP, Punjab and Sindh Local Government Ordinance(s) (1979/80) • The NWFP (Conservation and Exploitation of Certain

SECTOR	LEGISLATION
	Forests in Hazara Division) Ordinance (1980) • The NWFP Forest Development Corporation Ordinance (1980)
Parks and wildlife conservation protection	• The West Pakistan Ordinance (1959) • The Kohat Marzri Control Act (1954) • The Sindh Wildlife Protection Ordinance (1972) and Rules (1972) • The Punjab Wildlife (Protection Preservation Conservation and Management) Act (1974) and Rules (1974) • The Baluchistan Wildlife Protection Act (1974) and Rules (1975) • The NWFP Wildlife (Protection Preservation Conservation and Management) Act (1975) and Rules (1976) • The Pakistan Plant Quarantine Act (1976) • Islamabad Wildlife (Protection Preservation Conservation and Management) Ordinance (1979/80) • The Baluchistan, NWFP, Punjab and Sindh Local Government Ordinance(s) (1979/80) • Export and Control Order (1982)
Mineral development	• The Regulation of Mines and Oil-Fields and Mineral Development • (Government Control) Act (1948)
Cultural environment	• The Antiquities Act (1975) • The Punjab Special Premises (Preservation) Ordinance (1985)
Livestock	• West Pakistan Goats (Restriction) Ordinance (1959) • West Pakistan Punjab Animal Slaughter Control Act (1963) • The Grazing of Cattle in the Protected Forests (Range Lands) Rules (1978) • Pakistan Animal Quarantine (Import and Export of Animals and Animal Products) Ordinance (1979/80) • The Baluchistan, NWFP, Punjab and Sindh Local Government Ordinance(s) (1979/80)
Public health and safety	• The Pakistan Penal Code (1860) • The Boilers Act (1923) The Public Health (Emergency Provisions) • Ordinance (1944) • The West Pakistan Factories Canteen Rules (1959) • The Baluchistan, NWFP, Punjab and Sindh Local Government Ordinance(s) (1979/80) • The West Pakistan Epidemic diseases Act (1979/80)

3.2.6. National Environmental Quality Standards (NEQS)

The NEQS were first promulgated in 1993 and have been amended in 1995 and 2000. The NEQS specify the following standards:

a. Maximum allowable concentration 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).
b. Maximum allowable concentration of pollutants (16 parameters) in gaseous emissions from industrial sources.

3.3. NATIONAL ENVIRONMENTAL QUALITY STANDARDS (SELF-MONITORING AND REPORTING BY INDUSTRY) RULES, 2001

These rules are drafted by the Federal Environmental Protection Agency (Pak-EPA) and approved by the Federal Government. Under these rules, industrial units are responsible for self -monitoring and reporting environmental monitoring data to Federal EPA. Some of the pertinent sections of these rules are reproduced below:

Para (3): "Responsibility for reporting. - All industrial units shall be responsible for correct and timely submission of Environmental Monitoring Reports to the Federal Agency".

Para (4): "Classification of industrial units. - On the basis of the pollution level of an industrial unit, the Director-General shall classify the unit into category “A”, “B” or “C” for liquid effluents, and category “A” or “B” for gaseous emissions:

Provided that till such time as the pollution level of an industrial unit is determined, it shall be classified according to the type of industry to which it belongs, as shown in Schedule I for liquid effluents and in Schedule II for gaseous emissions".

Para (5): "Category-A industrial units.

1. An industrial unit in category “A” shall submit Environmental Monitoring Reports on monthly basis

a) In respect of liquid effluents, for priority parameters listed in column 3 of Table A of Schedule III: Provided that during start-up or upset conditions, priority parameters mentioned in column 4 of Table A of Schedule III shall be recorded on hourly basis;

b) In respect of gaseous emissions, for priority parameters listed in Table B of Schedule III.

2. An industrial unit in category “A” shall maintain a record of the times during which start-up and upset conditions occur, and shall mention the total time elapsed in such conditions in its monthly Environmental Monitoring Report".

Para (6): "Category-B industrial units- An industrial unit in category “B” shall submit Environmental Monitoring Reports on quarterly basis.

a) In respect of liquid effluents, for priority parameters listed in Table A of Schedule IV;

b) In respect of gaseous emissions, for priority parameters listed in Table B of Schedule IV".

Para (7): "Category “C” industrial units. - An industrial unit in category “C” shall submit Environmental Monitoring Reports on biannual basis for priority parameters in respect of liquid effluents listed in Schedule V".

Para (11): "Monitoring conditions of EIA approval. - The provisions of these rules shall be in addition to, and not in derogation of, the monitoring conditions laid down in an EIA approval". (MoE, 2001)

3.3.1. Pakistan Environmental Protection Agency Review of IEE and EIA Regulations, 2000

The PEPA, 1997 provides for two types of environmental assessments: IEEs and EIAs. EIAs are carried out for projects that have a potentially ‘significant’ environmental impact, and IEEs are conducted for relatively smaller projects with a relatively less significant impact. The IEE-EIA Regulations, 2000, prepared by the Pak-EPA under the powers conferred upon it by the PEPA, 1997 categorizes projects for IEE and EIA. Schedules I and II, attached to the IEE-EIA Regulations, 2000, list the projects that require IEE and EIA, respectively.

The Act defines the term ‘project’ as ‘any activity, plan, scheme, proposal or undertaking involving any change in the environment and includes alteration, expansion, repair, decommissioning or abandonment of existing buildings or other works, roads or other transport systems, factories or other installations.

The proposed project also came under the above defined term and it also falls in the Schedule II of the IEE and EIA Regulations, 2000.

The proposed project falls in the schedule II of IEE and EIA Regulations, 2000. Therefore, as per section 12 of the Pakistan Environmental Protection Act, the proposed project requires an EIA.

The IEE-EIA Regulations, 2000 also provide the necessary details on the preparation, submission, and review of IEEs and EIAs. The following is a brief step-wise description of the approval process:

1. A project is categorized as requiring an IEE or EIA using the two schedules attached to the Regulations.

2. An EIA or IEE is conducted as per the requirement and following the Pak-EPA guidelines.

3. The EIA or IEE is submitted to the concerned EPA—provincial EPAs if the project is located in the provinces or the Pak-EPA if it is located in Islamabad.

4. A fee, depending on the cost of the project and the type of the report, is submitted along with the document.

5. The submittal is also accompanied by an application in the format prescribed in Schedule IV of the Regulations.

6. The EPA conducts a preliminary scrutiny and replies within 10 days of the submittal of a report, a) confirming completeness, or b) asking for additional information, if needed, or c) returning the report requiring additional studies, if necessary.

7. The EPA is required to make every effort to complete the IEE and EIA review process within 45 and 90 days, respectively, of the issue of confirmation of completeness.

8. When the EPAs accord their approval subject to certain conditions:

    - Before commencing construction of the project, the proponent is required to submit an undertaking accepting the conditions.

- Before commencing operation of the project, the proponent is required to obtain from the EPA a written confirmation of compliance with the approval conditions and requirements of the EIA.

- An Environmental Management Plan (EMP) is to be submitted with a request for obtaining confirmation of compliance.

9. The EPAs are required to issue confirmation of compliance within 15 days of the receipt of request and complete documentation.

10. The EIA approval is valid for three years from the date of accord. (EPA Pakistan, 2000)

A monitoring report is to be submitted to the EPA after completion of construction, followed by monitoring reports during operation according to the provisions of Self-Monitoring and Reporting (by Industry) Rules, 2001.

3.4. EIA GUIDELINE PACKAGE

The Federal EPA, in collaboration with other key stakeholders, including Provincial EPA's and Planning and Development Division from both the Federal Government and the provinces, other Agencies, NGO's representatives of Chambers of Commerce and Industry, and academics and consultants, prepared a package of comprehensive procedures and guidelines for environmental assessment in Pakistan. It is emphasized that the various guidelines may be read as a package; reliance on the sectoral guidelines alone will be inadequate.

The principal documents are:
Policy and Procedures for the filing, review and approval of environmental assessments, which set out the key policy and procedural requirements. It contains a brief policy statement on the purpose of environmental assessment and the goal of sustainable development, required that environmental assessment be integrated with feasibility studies. Defines the jurisdiction of the Federal and Provincial EPAs and P&Ds. Lists the responsibilities of proponents, and lists the duties of Responsible Authorities. It provides schedules of proposals that require either an Initial Environmental Examination (IEE) or an Environmental Impact Assessment (EIA).

Guidelines for the preparation and review of Environmental Reports, is a longer and more descriptive document, which covers:

- The Initial Environmental report (scoping, alternatives, site selection and format of IEE).

- Assessing impacts (identification, analysis and prediction, baseline data, significance).

- Mitigation and impact management (and preparing an environmental management plan).

- Reporting (drafting style, main features, shortcoming and 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 & budgeting).

- Guidelines for public consultation (in preparation), which covers:

- Consultation, involvement and participation.

- Stakeholders.

- Techniques for public consultation (principles, levels of involvement, tools, building trust).
- Effective public consultation (planning, stages of EIA where consultation is appropriate).

- Consensus building and dispute resolution.

- Facilitating involvement (including the poor, women, building community and NGO capacity).

Guidelines for sensitive and critical areas (in preparation), which will identify sensitive and critical areas in Pakistan, in relation both to the natural environment and to cultural aspects.

Detailed sectoral guidelines, being prepared progressively, including Major thermal power stations, Major chemical and manufacturing plants, Industrial

estates, New township development, Major roads, Sewerage schemes, Oil and gas exploration have been drafted, following a format with specific guidance and requirements on:

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

3.5. ADMINISTRATIVE ARRANGEMENTS FOR INDUSTRIAL ESTATES

3.5.1. Federal Level Arrangements:

3.5.1.1. Ministry of Industries

At the federal level, Ministry of Industries placed majority of efforts regarding development of Export Processing Zones (EPZs), Industrial Estates and industrial estates. The first EPZ was opened in Karachi in 1984 and zones were subsequently developed in Risalpur, Saindak, and Sialkot. In these zones the value proposition for investors is that machinery, equipment, and materials can be imported duty free; land is provided at low rates; labor laws are relaxed; and that foreign exchange restrictions do not apply.

3.5.1.2. Export Processing Zone Authority (EPZA)

The Export Processing Zones Authority (EPZA) was established in Pakistan through Ordinance IV of 1980 with the mandate to plan, develop and operate Export Processing Zones in Pakistan. EPZA is an organization under the Ministry of Industries run by a Board of Directors.

An Export processing zone is a specialized industrial bonded estate where special facilities and incentives are provided to produce goods under one window operation, mainly for export abroad. Thus EPZ is a district physical area where Customs Tariff is not applied and hence bonded to distinguish from the rest of Tariff area Controls by the Customs under especially drafted EPZ Customs Rules.

The Export Processing Zones Authority of Pakistan (EPZA) seeks to promote the efficient allocation of resources to maximize the benefits of exporting goods around the world. The Authority provides facilities to enable investors to attract foreign investment and establish commercial enterprises, thereby creating new jobs and fostering the growth of new technology industries for the benefit of Pakistan. The government has empowered the Authority to accomplish these goals through the organization of external cooperation programs throughout Pakistan.

Under the Charter of the Export Processing Zones Authority of Pakistan, the government has permitted the establishment of industries from a diverse selection of technology areas within a Zone. Electronics, computer, and internet based products and services can be produced and marketed.

3.5.1.3. The Trade Development Authority of Pakistan (TDAP)

TDAP is a body corporate established on 8 November, 2006, under a Presidential Ordinance. The Ordinance will be tabled in the Parliament as an Act for approval. The TDAP is the successor organization to the Export Promotion Bureau (EPB) and is mandated to become a dedicated, effective and empowered organization that is professionally managed. TDAP, as part of its trade 'development' mandate, as opposed to 'export promotion' only, will be dedicated to the 'holistic' development and promotion of goods and services for exports globally. TDAP in this enhanced responsibility and role will create direct linkages with stakeholders, local and abroad, aiming for a 'Quantum Leap' in exports. The administrative ministry of the TDAP will be the ministry of commerce.

3.5.2. National Industrial Estates Development and Management

Company (NIP) National Industrial Estates Development & Management Company (NIP) has been established as a special initiative of the Ministry of Industries, Production and Special Initiatives, Government of Pakistan. NIP, a subsidiary of Pakistan Industrial Development Corporation (PIDC), is a public-private partnership established to develop focused industrial growth in Pakistan by developing world class Industrial Estates in the country. The company is incorporated under Section 42 of the Companies Ordinance 1984 and is limited by guarantee having share capital.

3.5.3. Provincial Level Arrangements

At the provincial level, Industrial Estates are usually developed by the provincial MoI. (Ministry of Industries) PIE which are under the Punjab MoI, are the primary developers of zones in that province. Other departments such as the Small Industries Corporation, Ministry of Textiles, and Ministry of IT are also involved in setting up zones specific to their areas of focus.

3.5.4. Punjab Industrial Estates Development and Management

Company (PIE) PIE was incorporated in 2003 by the Ministry of Industries of the Punjab government to develop Industrial Estates throughout the province. The organization is set up as a Public Private Partnership (PPP) where the Board of Directors consists of 12 private sector directors and four public sector directors. The organization's mission is to develop the infrastructure of Industrial Estates, bring in investors and then eventually transfer management to a management board.

3.5.5. Regulations for Establishment of Industrial Estates

Regulations for setting up industrial estates and parks are fairly minimal in Pakistan. When a provincial government wishes to develop a new zone, there are few requirements from the federal government outside of the bureaucratic aspects of getting land, utilities, and transportation set up. Managers from PIE and SITE all confirm that they have very little need to go through the federal government when planning new projects.

Within the zones, the management companies tend to develop their own bylaws regulating investor approval processes and building codes. For establishment of industrial estate investors must submit a feasibility analysis and planning documents to PIE for approval. NIP will have similar requirements, but will also ask for historical audited financial statements. The approvals process for each of these institutions is unique based on the rules passed by their boards of directors.

3.5.6. International Regulations

3.5.6.1. Requirement of World Bank

The World Bank and other international finance Agencies require all projects funded by these agencies to be constructed and operated in an environmentally responsible manner. All projects that receive funding must

therefore comply with appropriate World Bank Group environmental policies and guidelines.

3.5.6.2. World Bank Guidelines on Environment

The Pak-EPA recommends using World Bank (WB) environmental guidelines for areas where there may be a gap in the national guidelines. The principal World Bank publications that contain environmental guidelines are listed below:

- Pollution Prevention and Abatement Handbook 1998: Towards Cleaner Production. (World Bank, UNIDO, and UNEP, 1999)

- Environmental Assessment Sourcebook, Volume I: Policies, Procedures, and Cross-Sectoral Issues.

- Environmental Assessment Sourcebook, Volume III: Sectoral Guidelines. (World Bank, 1991)

The first two publications listed above provide general guidelines for conducting an EIA, and address the EIA practitioners themselves as well as project designers. While the Sourcebook in particular has been designed with Bank projects I n mind, and is especially relevant to impact assessments of large-scale infrastructure projects, it also contains a wealth of information useful to environmentalists and project proponents.

The Sourcebook identifies a number of areas of concern that should be addressed during impact assessment. It lists activities that may have significant negative consequences for biodiversity, and mentions loss of habitat resulting from mining and mineral exploration as one such activity. It sets out guidelines for determining the project impact in such cases, provides a checklist of tools to identify possible biodiversity issues, and suggests possible mitigation measures. Possible project development effects on wild lands, wetlands, forests, etc., are also identified, and mitigation measures suggested. The Sourcebook also highlights core concerns in social impact assessment and emphasizes the need to incorporate socioeconomic issues into environmental impact assessment exercises.

4. PROJECT DESCRIPTION AND MASTER PLAN REVIEW

The proposed project involves establishment of a state-of-the-art Modern Industrial Estate facility for Commercial Purposes along with the basic and advanced necessities required for providing standardized commodities to the region by curtailing the impacts on environment. To achieve the goal of sustainable development the proposed project envisages the construction of Industrial units along with the development of infrastructure like roads, sewerage system, electricity, Sui gas, cell Towers and water supply system

Figure 10: Site of Rahim Yar Khan Industrial Estate at N-5
(mid-point of Sadiqabad and R. Y. Khan Cities)

The existing land area of the project is about 456 Acres, which will be housed in different industrial units. The essential components and facilities of a modern Industrial estate such as the Sewerage System, Combined Effluent Treatment Plant (CETP), Electricity, Carpet Roads, Solid waste collection, Vocational centers and Disposal station and other components will be available to meet the demands of the area and industrialist.

The proposed activities at proposed site will include the following:

- Demarcation of the Project Area;
- Designing and distribution of the Project Area;

- Civil Work;
- Provision of Basic Facilities; and
- Operational Activities

The ultimate goal is to provide well plan infra-structures which will facilitate the concerned people for the entire industrial paraphernalia under one roof.

4.1. PROJECT OBJECTIVES

Rahim Yar Khan Industrial Estate project aims to provide developed plots for industries with most modern utilities and facilities based on the modern planning principles. In present circumstances the Industrial growth is the key for the economic growth of a Pakistan. In order to achieve this goal it is the dire need of today's time to establish such industrial estates for the promotion of Industrialization in the Country. Main focus of this project is to restore sustainable development so that it would be a self supporting project that leads to open the means of employment for the local as well as for the entire region. With this project there will be a boost in manufacturing and trading businesses as it incorporate various types of industries.

4.2. REVIEW OF MASTER

Master plans are long range plan which usually integrate infra structure requirements for existing and future outlay of land use with environment assessment planning principles.

An organized Estate is the popular demand of the local industrialist where all relevant facilities will be provided under one roof and it should be away from the populated areas of the city. The proposed location is highly ideal as it is on the brink of the National highway (N-5), have good linkage with Pakistan Railways line and Indus Highway.

4.3. PLANNING CHARACTERISTICS

To provide an efficient and organized Industrial Estate a Master Plan for RYK-IE has been developed by keeping the fallowing division of the estate. A well qualified team of professionals of the consultant has prepared. The Master Plan of RYK-IE on the fallowing principles.

1. Long Life Roads;
2. Most Modern Utility Facilities;
3. Industrial Plots ranging from 2 acres to 40 acres;
4. Combined Effluent Treatment Plant (CETP)

5. Vocational Training Centers
6. Basic Amenities and Commercial Spaces; and
7. Green Areas with indigenous Flora

4.4. PLANNING CONCEPT ADOPTED

Following principals of planning were adopted for designing of this project.

1. A well defined Master Plan conforming to land-use, zoning regulations and environment standards. (Figure 5);

2. Efficient movement pattern of goods and personnel with the design of collector and arterial road network;

3. Minimum Extravagance for Infrastructure;

4. Secondary and Primary infrastructure should be intensively utilized without wasting resources;

5. A system wide approach to planning which relates to infrastructure either geographical or by particular function or with a specific landuse

4.4.1. Focused / Introvert Physical Planning (for odd Shaped Plot)

1. Controlled sizes of clusters to be created as per the modern concept of industrial town planning to avoid the agglomeration of the traffic generators

2. Focused location of common amenities and creation of a balanced land-use.

4.4.2. Interdependence of Communal & Infrastructural Planning

1. The sizing, placement and inter connection of industrial plots planned in such a manner that it remains coherent, with the provision of infrastructural standards.
2. The entire range of development will have equitable access to infrastructural facilities.

4.5. SALIENT FEATURES OF LAND-USE

The land use is design and divided in such a manner that would provide maximum benefits to industries, labors and visitors of this industrial estate:

4.6. LAND-USE DISTRIBUTION

Following Land use plan is adopted to effectively divide RYK-IE into meaningful and logical units.

i.	**Industrial Plots**	72.02% (max)
ii.	**Amenities**	
	i. Roads / Parking	19.01% (min)
	ii. Parks & Playgrounds	6.38% (min)
iii.	**Commercial**	2.59% (max)

4.6.1. Entry Complex

1. Entry complexes at both entrances.

2. These will be properly housed with:
   a. Administration offices;
   b. Security office;
   c. Public / private office (related to trade and industry); and
   d. Car park

3. All visitors shall report here and will properly guided to the intended industry.

4. Goods and material entering / leaving the estate shall also be monitored at the entrances.

4.6.2. Road Network

A properly develop road network is the key of success for the industrial projects, as these roads are important for the reception of row materials and distribution of industrial goods. Hence, in RYK-IE a well thought road network has been proposed for faster and safer accessibility.

1. A main spinal road of 176’ feet width has been proposed at the, inside the site leads to all parts of estate for a smooth flow of traffic.

2. Lateral roads of 100’ feet width connect to the main road well distributed with RYK-IE.

3. Minor roads branch out from the main and lateral roads and provide access to different zones.

4. The main road is 4-lane dual carriage-way with service roads and parking facility on both sides.

5. Inside each zone a pattern of secondary roads provides approach to individual plots and other commercial or amenity facilities.

6. Roads are aligned to facilitate future development outside the estate

7. All roads are wide enough for long trailers and containers.

Transportation systems represent an important element during the planning process. A suitable and efficient road network within the development will logically ensure safe and efficient circulation of vehicles and commuters throughout that development. This is achieved through the provision of adequate and appropriate transportation facilities that are able to serve the expected traffic demand at the appropriate levels of service.

The project roads under this project can be broadly classified into following functional classes of roads:

1. Principal arterial, serving major traffic flow within the development as well as traffic flow towards and from the development to other areas; typically having right of way of 176ft.

2. Minor arterial partially serving as collector roads for traffic plying on collector road as well as local road for abutting properties; typically having right of way of 100ft.

3. Collector & Minor roads, collecting local traffic generated from each zones within the development; typically having right of way of 66ft.

PUNJAB INDUSTRIAL ESTATE DEVELOPMENT & MANAGEMENT CO.
DEVELOPMENT OF RAHIMYAR KHAN INDUSTRIAL ESTATE
ROAD NETWORK SUMMARY

S.NO.	ROAD NAME	R.O.W.	DESIGNED ROAD LENGTH (METER)
1	MAIN BOULEVARD	53.64M / (176ft)	2149.00
	Subtotal		***2,149.00***

S.NO.	ROAD NAME	R.O.W.	DESIGNED ROAD LENGTH
1	1st AVENUE	30.48M / (100ft)	1826.70
2	2nd AVENUE		274.93
3	CENTRAL AVENUE-A		878.35
4	CENTRAL AVENUE-B		274.93
	Subtotal		***3,254.91***
1	STREET-1A	20.12M / (66ft)	103.72
2	STREET-1		642.51
3	STREET-2		424.88
4	STREET-3		424.88
5	STREET-4		642.51
6	STREET-5		576.20
7	STREET-6		415.15
8	STREET-7		415.15
9	STREET-8		576.03
10	STREET-9		878.44
11	STREET-10		274.93
12	STREET-11		415.15
13	STREET-12		230.34
14	STREET-13		236.89
15	STREET-14		229.80
16	STREET-15		230.26
17	STREET-16		642.51
	Subtotal		***7,359.36***
1	STREET-2 A	12.19M / 40ft	140.94
	Subtotal		***140.94***
2	STREET-17	6.096M / 20ft	642.51
	Subtotal		***642.51***
		Total	***13,546.71***

4.6.3. List of Amenities as proposed by the consultant for the Industrial Estate

4.7. SERVICES

1. FIC Administration Offices
2. Expo Centre
3. (Human Resource Development) HRD
4. Petrol/Gas Stations
5. Auto-Service
6. Bus / Truck Terminals
7. Weigh Bridges
8. Fire Fighting
9. Hospital
10. Mosque
11. Security
12. Police Station

4.7.1. Utilities

1. Electric Grid Station
2. Water Works
3. Sewerage Treatment Plant
4. Storm Water Drainage
5. Gas Distribution Centre
6. Satellite-Earth Station
7. Telephone Exchange
8. Utility lines for electric, water, sewerage, gas, phone & cable (to be under-ground)
9. Solid Waste Disposal System

4.7.2. HRD / Academic

1. Vocational Training
2. I T Training
3. Adult Literacy Centre
4. Employment Exchange

4.7.3. Recreation Centers

1. Recreation club
2. Gymnasium / Fitness Centre
3. Play Grounds
4. Park & Garden
5. Swimming Pool

4.7.4. Commercial

1. Post Office / PCO
2. Clinic
3. Bank
4. Canteen
5. Hotels / Motels
6. General Shops

4.8. SPECIFICATIONS & DESIGN CONSIDERATIONS

4.8.1. Road works

1. Long-life Roads to be provided
2. Based on Traffic Forecast, Asphaltic Binder Course, Aggregate Base Course, Granular Sub-Base and Asphaltic Carpet to be provided
3. Pipe Sleeves to be provided at regular distances to minimize future road cutting requirements for utility lines
4. Proper Storm Water drainage system / Surface drainage to be provided
5. CC Road Curbs, Pavement marking, Road Signs and properly designed Traffic Signals to be provided
6. Beautification proposals will be made where-ever possible.

4.8.2. Water supply works

1. Use of PVC or GRP or DI Pipes to be assessed for maintenance free Operations.
2. Storage Tanks to be provided at strategic points to ensure equitable water distribution.
3. Pumping to be minimized by using gravity flow as much as possible.

4.8.3. Sewerage / Effluent disposal works

1. Use of RCC Pipes and / or FC Pipes to be made
2. Sewage / Effluent Drainage flow to be optimized by providing gravity flow as much as possible and minimizing pumping
3. Environmental Consideration regarding Effluent Treatment will be assessed
4. Environmental Control Strategy viz-a-viz NEQS and Pre-treatment policy will be framed for enforcement by the Client.

4.8.4. Storm water drainage

1. Adequate sized RCC pipes and / or RCC Covered drains to be provided;
2. Gravity flow to be maximized; and
3. Disposal Points to be properly assessed and storm water disposal to be divided into multiple disposal points to avoid chocking

5. ENVIRONEMNTAL BASELINE CONDITIONS

5.1. GENERAL

This section describes the baseline conditions, which cover the existing physical, ecological, and socio-economic environment of the Project Area. Information on these aspects has been derived from the desk study of available data, field visits to the project area as well as information obtained through visits to the Government departments and other relevant agencies.

Information regarding physical environment is collected within project area as well as the study area. While in case of biological and social environment, efforts were made to collect the information in one km around the project area for detailed Land cover classes and even up to 10 km buffer data in-case of any direct or indirect impacts were envisaged.

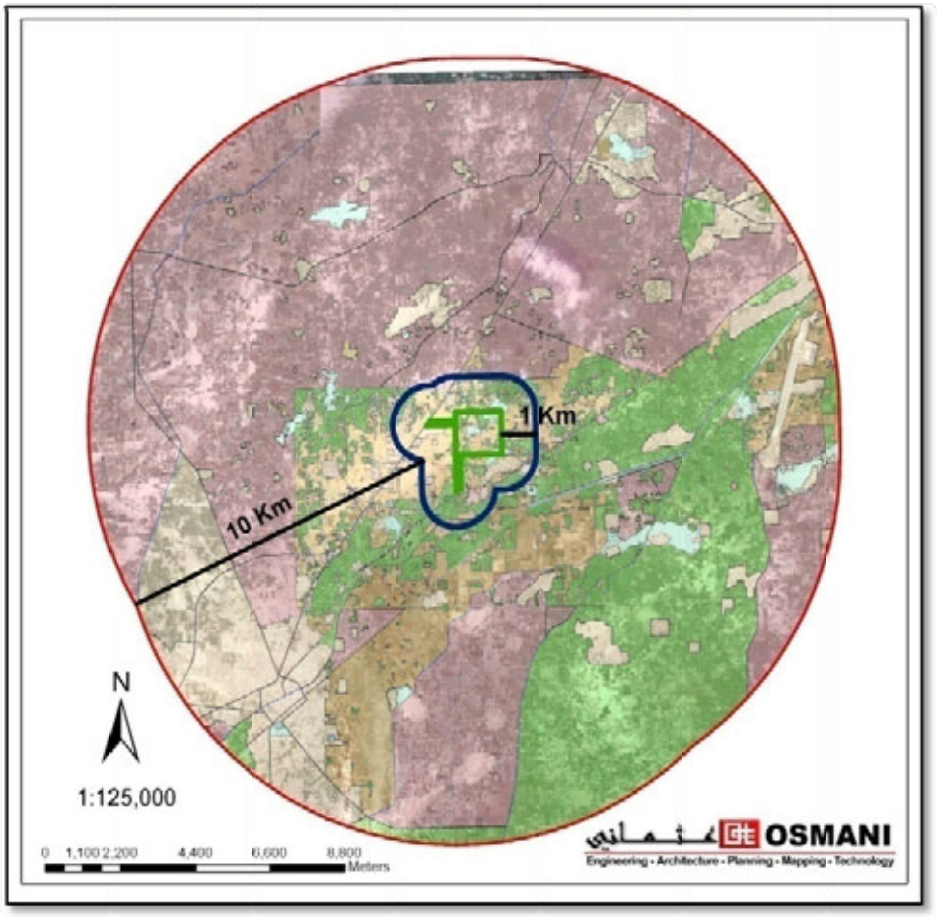


Figure 11: 1 km and 10 km Buffers around the Project Area

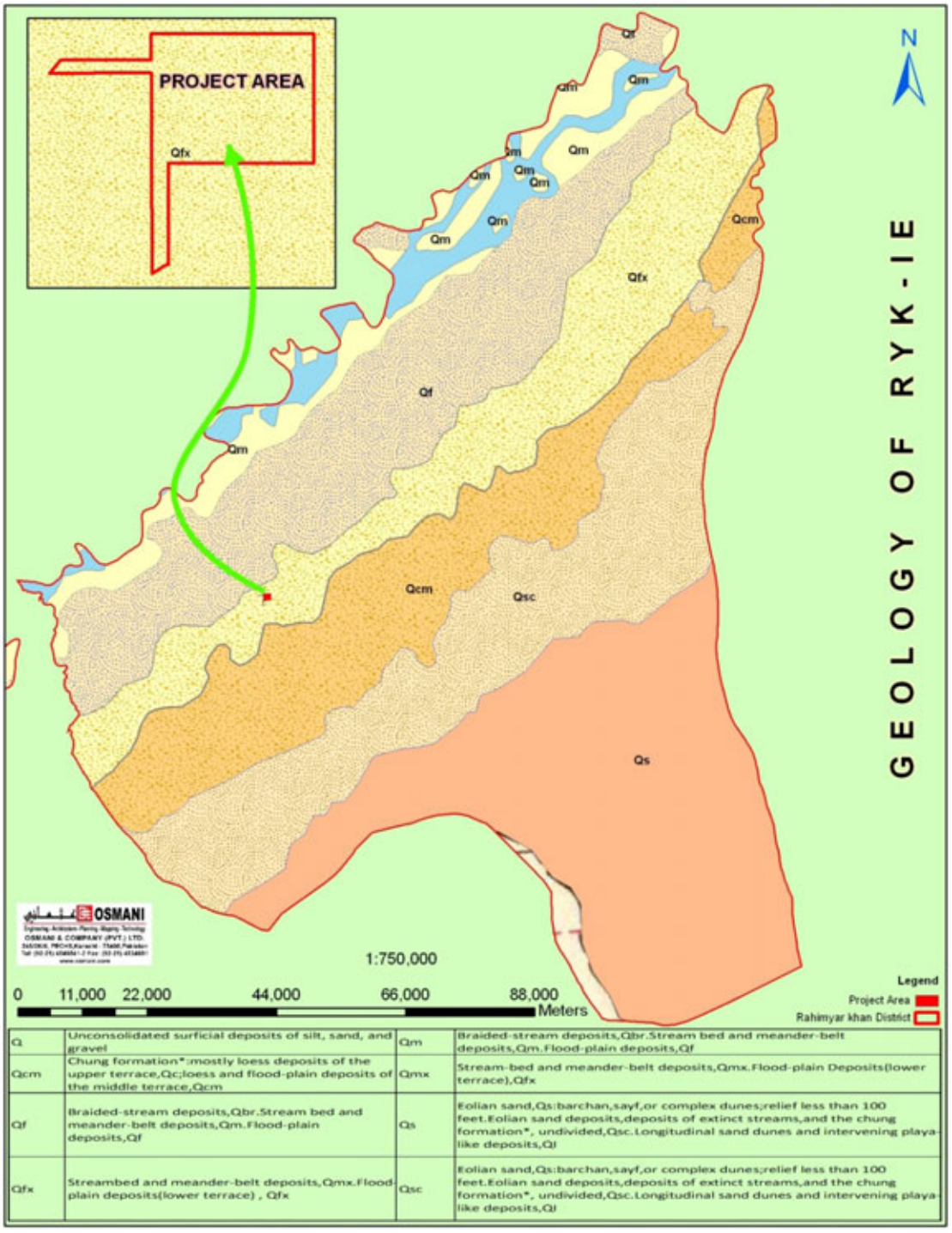
5.2. PHYSICAL ENVIRONMENT

Following basic physical characteristic are briefly explained to note down the general characteristic of the area.

5.2.1. Geology

Punjab Province mostly comprises of plain areas lying in Indus Basin formation. Rahim Yar Khan District lies between Indus basin and Cholistan Desert formation the project area lies on un-deformed Indian plate rock with a recent sedimentary cover (Figure 12). The project area only falls within one geological category of flood plain deposits. Fortunately, no fault line has been noted and the area is not seismically active.

Major portion of the Punjab Province falls in the Indus Plain, which geologically originated in Late Pleistocene period by deposition of sediments from the Himalayas into abyssal sea. In early days the sediments were carried by two river systems, viz., Indus and Ganges. Later in the geological history, the Ganges River changed its course from westward to eastward. Later, the Indus River and its five major tributaries, viz., Jhelum, Chenab, Ravi, Bias and Sutlej, carved the deposits of the early river systems.



Q	Unconsolidated surficial deposits of silt, sand, and gravel	Qm	Braided-stream deposits,Qbr.Stream bed and meander-belt deposits,Qm.Flood-plain deposits,Qf
Qcm	Chung formation*:mostly loess deposits of the upper terrace,Qc;loess and flood-plain deposits of the middle terrace,Qcm	Qmx	Stream-bed and meander-belt deposits,Qmx.Flood-plain Deposits(lower terrace),Qfx
Qf	Braided-stream deposits,Qbr.Stream bed and meander-belt deposits,Qm.Flood-plain deposits,Qf	Qs	Eolian sand,Qs:barchan,sayf,or complex dunes;relief less than 100 feet.Eolian sand deposits,deposits of extinct streams,and the chung formation*, undivided,Qsc.Longitudinal sand dunes and intervening playa-like deposits,Ql
Qfx	Streambed and meander-belt deposits,Qmx.Flood-plain deposits(lower terrace) , Qfx	Qsc	Eolian sand,Qs:barchan,sayf,or complex dunes;relief less than 100 feet.Eolian sand deposits,deposits of extinct streams,and the chung formation*, undivided,Qsc.Longitudinal sand dunes and intervening playa-like deposits,Ql

Figure 12: Geology of Project Area and District Rahim Yar Khan

5.2.2. Soils:

In spite of level differences between the various landforms, the land area falling within one landform is nearly level. The soils generally range from loamy sand to sandy. The lands are extensively cultivated under irrigation from canal systems off-taking from Indus River. Hand Pumps Groundwater is also extensively exploited for irrigation purposes by installing deep and

shallow tube-wells. The major soils in the project area mainly loamy clay and loamy sandy soils (Figure 13)

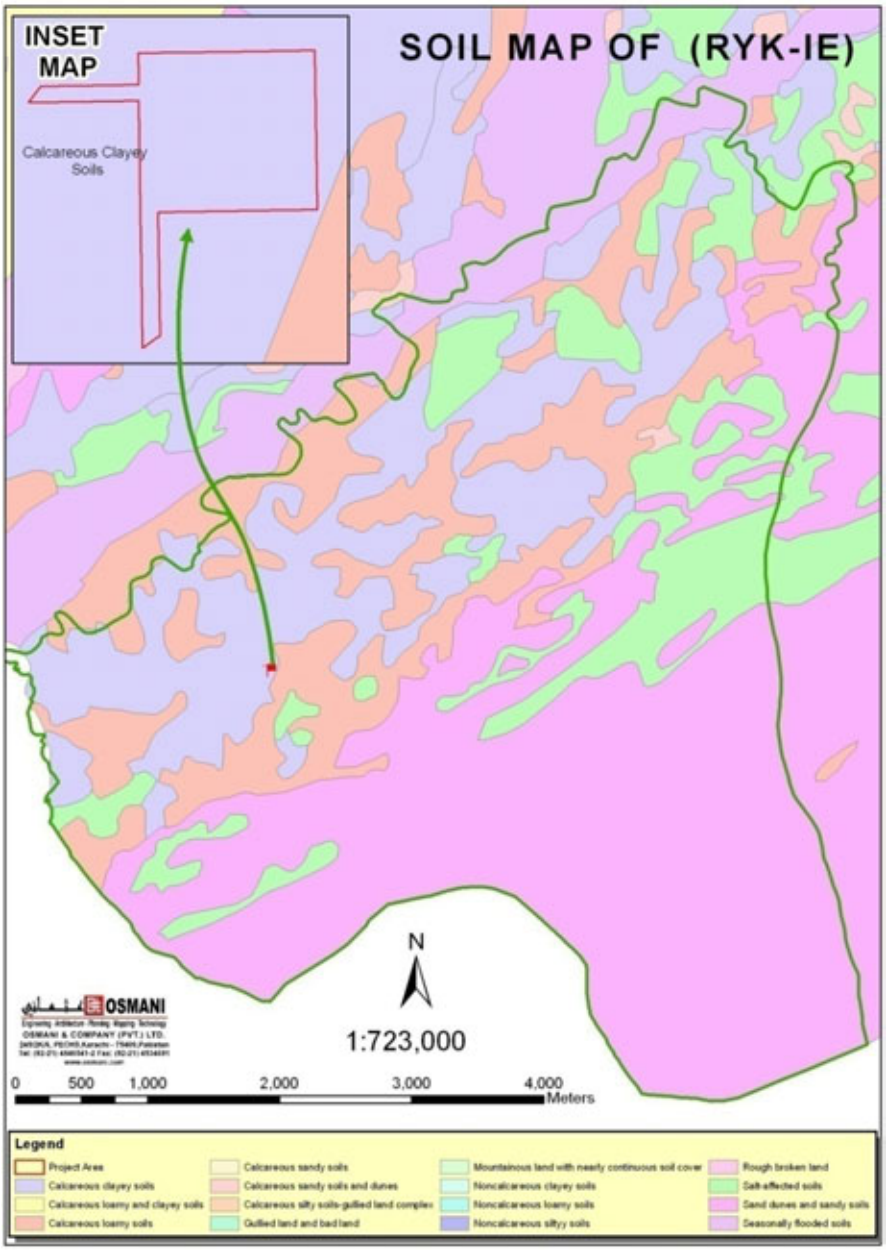


Figure 13: Soil Map of Project Area

5.2.3. Land Use

The project site was an agricultural area and contains many fields, which include few orchids and irrigated fields. However, the area was captured by PIE and it is totally abundant and no agricultural activity so far has been reported. Furthermore, few buildings (About 6, covering 1.6 acres) which are uninhabitated and totally abundant, beside few small drains and about seven tube wells were also part of the project area. The crop fields were containing

saline area (Kallar) as well. As depicted in the Table-2 and Figure-13 (before the possession of PIE in July 2010), most of the area is under fallow (53%) class, even at the time of agricultural practices, followed by 26% of the cultivated area. This was further supplemented by the Open Land. Now the entire land is abundant and no agricultural activity is found except grazing (Figure 14).

Table 2: Land cover areas with percentages in Project area

Land Cover	Area in Sq Meters	Percentages
Buildup Land	43,197.26	2.34
Crop Cultivation	492,854.04	26.69
Open Land	327,736.24	17.74
Water Bodies	895.10	0.05
Fallow Land	982,239.26	53.18
Grand Total	**1,846,921.90**	**100.00**

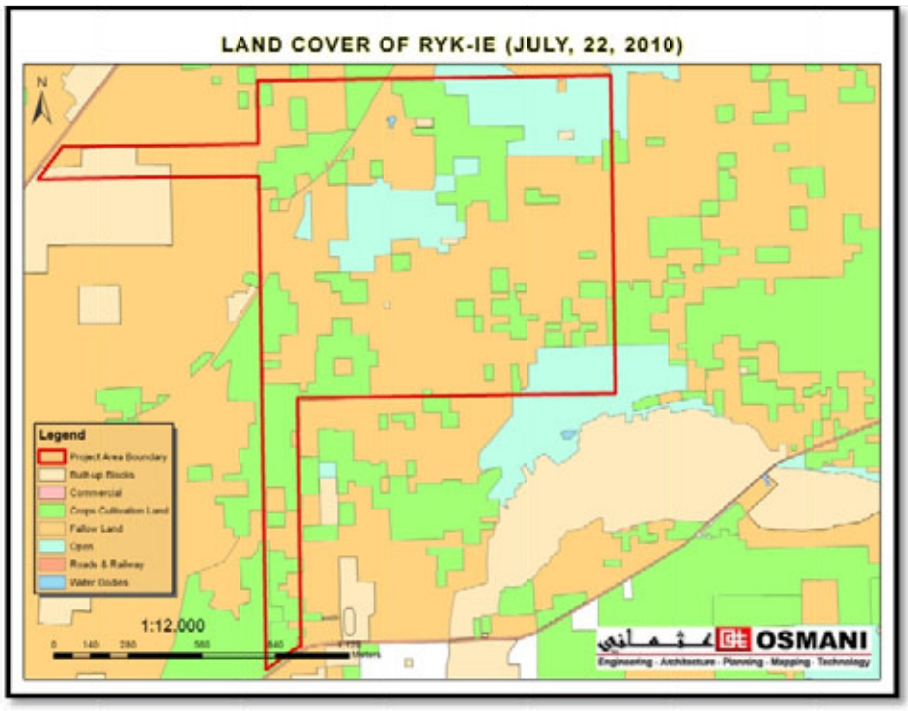


Figure 14: Landuse and Landcover of the Project Area

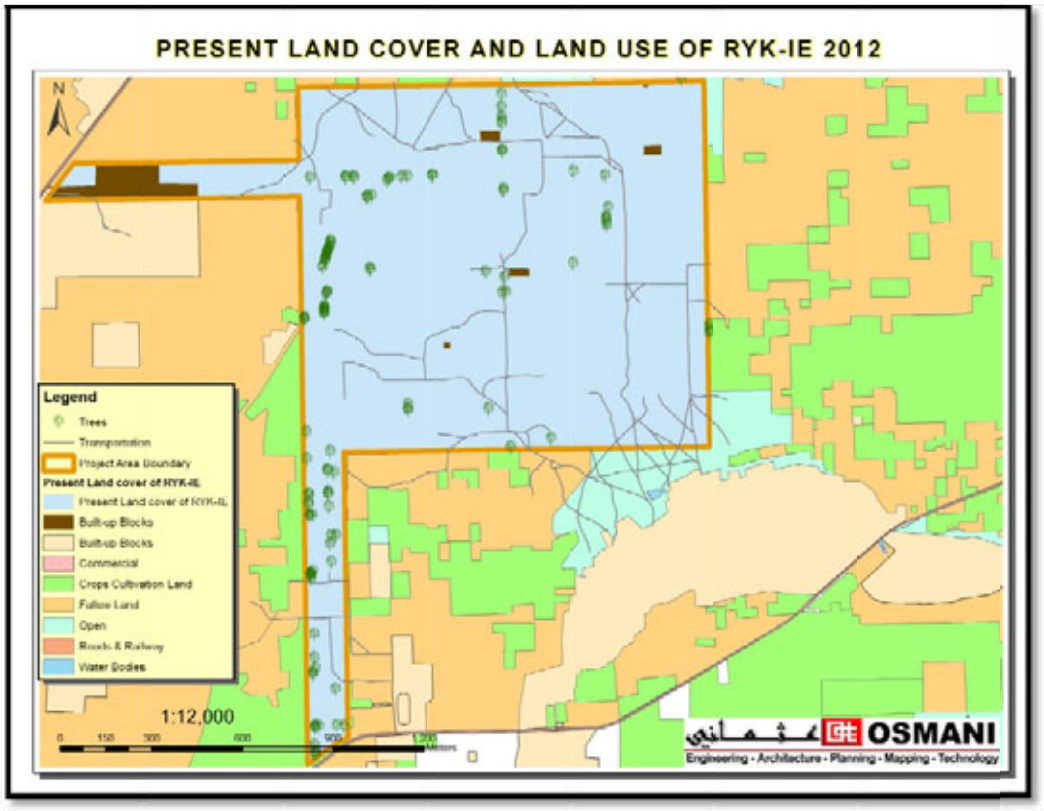


Figure 15: Present Landuse and Landcover of the Project Area

Figure 16: RYK-IE Site (an abundant agricultural Land turned into grazing land)

5.2.4. Topography

Topographically, the project area is quite uniform. The topographic variation is ranging from 77 to 82 feet above sea-level. As it is obvious from (Figure 17)

that at one point a small elevated place in the north east of the project area is identified and as a small amount of height 4 to 7 feet during the topographic survey a depression at the western side of the project is also recorded. About 74 % of the project area is uncultivated while remaining 26% was cultivated land by irrigation water as well as ground water through tube wells. The land adopted for RYK-IE is part of agricultural land, which is after the possession of PIE is totally abundant the only activity is little grazing.

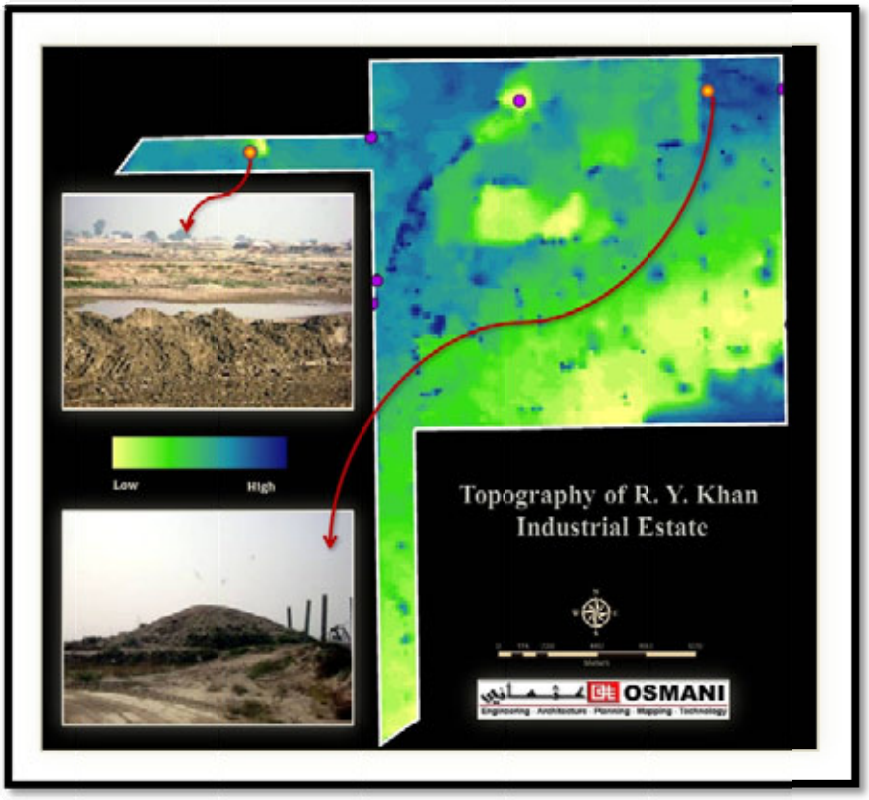


Figure 17: Topographic Variation within RYK - IE

5.2.5. Hydrology

The components of hydrology and source of water are divided into the following sections:

5.2.5.1. Surface Water

The Indus Plain does not have a well-defined natural drainage. The introduction of irrigation system therefore resulted in surface and subsurface drainage problems resulting in water-logging and salinity, which has continued to aggravate over the period. This has adversely affected the socio-economic conditions of the large rural population by impairing agricultural production and also creating health hazards.

In spite of these efforts, water-logging has not been completely eradicated. Consequently, pockets of wetlands resulting from the water logging are encountered in the plains Rahim Yar Khan. The signs of water-logging and salinity are visible in the project area, as some areas are completely salined. Notably the surface water is available in the form of canal, water channels and few Ponds (Figure 18, Figure 19, Figure 20).

Figure 18: A Link Canal Passing near

Figure 19: A Small Water Channel in RYK - IE

Figure 20: A Pond in Goth Adam Sahaba near RYK - IE

5.2.5.2. Ground Water

The ground water resources are available in abundance in the Project Area. Ground Water Table (GWT) exists at a depth of about 40 to 60 ft below Natural Ground Level (NGL). To meet the agriculture and drinking requirements, 7 tube-wells were installed in the Project area. Which are not in use now because of the termination of agricultural activities. Boring points and Hand Pumps are quite obvious in and around RYK-IE (Figure 21 and Figure 22)

Figure 21: A Bore Pipe for the with drawl of Ground Water in RYK - IE

Figure 22: A Hand-pump Located in RYK - IE

5.2.5.3. Water Quality

The potable water samples were collected and analyzed to get an idea of quality of water available at project site. The ground water was collected from the hand pumps, Nala and Bore hole in the community areas. The water quality results are provided in (Table 8);

5.2.6. Climate

Nearest meteorological station to the project area is about 54 Km from the project site is in Khanpur Therefore, significant information has been collected and detailed are presented in the following tables and graphs. Recently, a weather station Rahim Yar khan airport is also established but its historical data are not good enough to study a climatic cycle. Following physical parameters of climate were collected and analysed.

5.2.6.1. Temperature

The climate of the district Rahim Yar Khan is generally hot and dry in summer and cold and dry in the winter. The summer season is comparatively longer. It starts in April and continues till October. The winter season goes from November to March .However, the month of March and November are pleasant.

In the Project area, January is the coldest month with mean daily minimum temperature 4.4^{o}C and the June is the hottest month with mean daily maximum temperature of 42.4^{o}C. However, in the Project area summer is very hot and winter is very cold. Temperature variations are tremendously high in the Project Area. Table 3 average always waxing and waning from 6 to 38^{0}C with very high extreme in June 4 July. (Figure 23) Although the highest

time temperature is quite pleasant because of the proximity of Cholistan desert The relative humidity is highest from July to January, where as the dry spell start in April and that till to June.

Table 3: Month wise temperature, Precipitation and relative Humidity

MONTH WISE TEMPERATURE, PRECIPITATION AND RELATIVE HUMIDITY				
RELATIVE HUMIDITY ,1960-98				
Month	Average Temperature		Precipitation	Relative Humidity
	Maximum	Minimum	(in mm)	(Percentage)
January	21.8	4.4	4.4	57.5
February	24.4	7.3	5.3	52.0
March	30.2	12.8	5.5	46.4
April	37	18.5	2.7	35.2
May	41.7	23.6	5.1	33.4
June	42.4	27.2	2.8	41.7
July	30.9	27.3	27.5	53.4
August	38.4	26.3	23	57.7
September	37	23.1	15.5	56.9
October	34.8	16.3	1.2	50.0
November	20.4	10.1	0.7	53.7
December	23.5	5.3	3.3	59.5
Annual	**33.5**	**17**	**100.3**	**49.8**

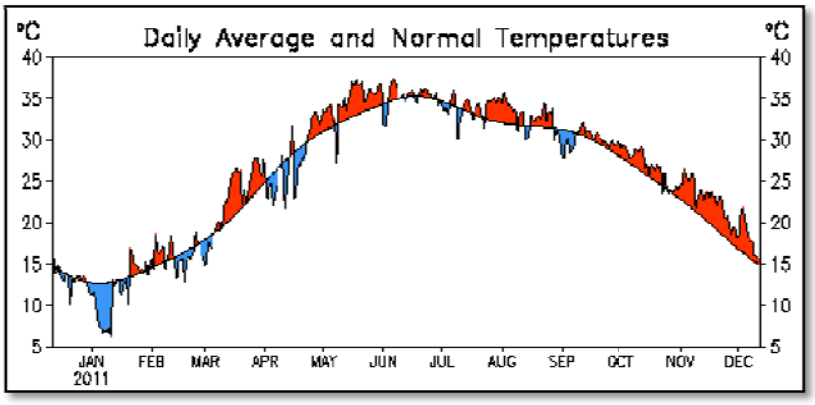


Figure 23: Month wise Average and Normal Temperature

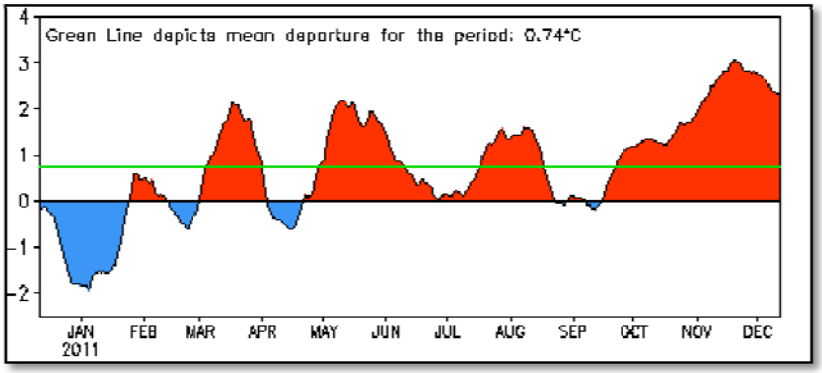


Figure 24: Daily Mean Temperature

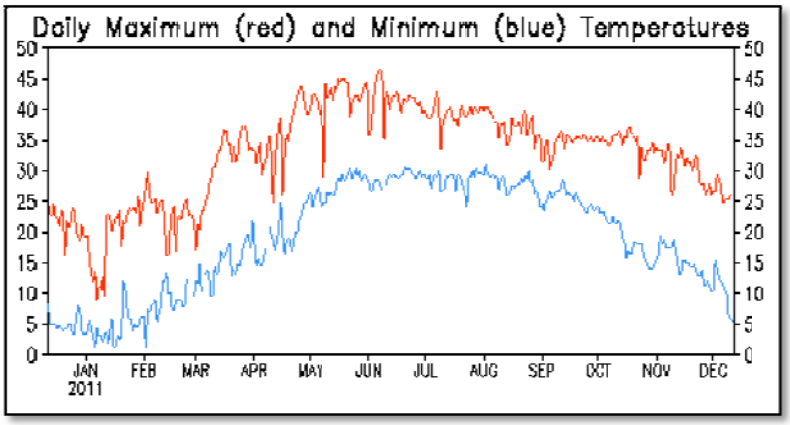


Figure 25: Maximum and Minimum Mean Temperature

The variation between maximum and minimum from 10- 20 ^{0}C (Figure 25) the mean departure from the daily mean is about 0.74^{0}C. Which is quite range full from October – January (Figure 24)

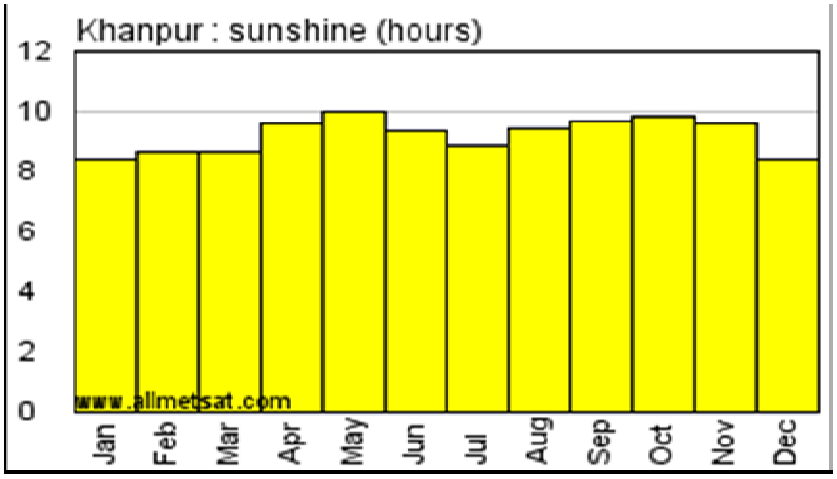


Figure 26: Khanpur Sun shine hours

Sunshine hours generally range from 8-10 hours, good enough to dry the appropriate industrial product. sunshine hours will also be important to store and protect sensitive industrial commodities.

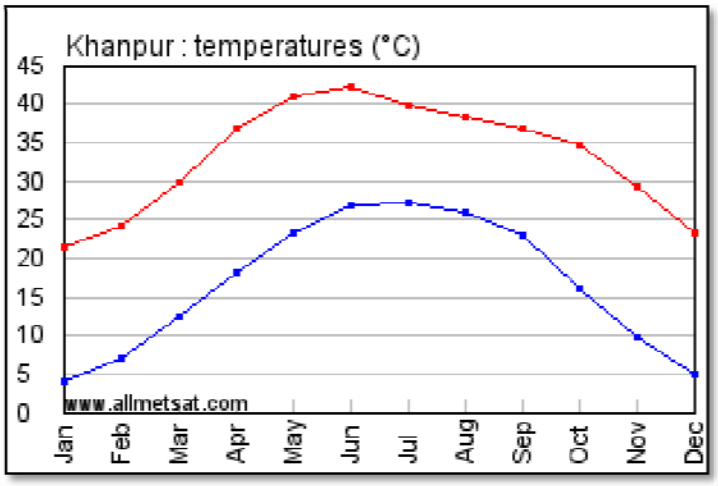


Figure 27: Mean Monthly Maximum and minimum Temperature of Khanpur

5.2.7. Wind

The wind direction in winter months is north-east and in summer south-west with average yearly speed varying from 1.13 to 3.75 m/s. The wind pattern is almost typical of many south and central locations of Pakistan The Wind is generally strong blowing from NE to SW where as in Winter relatively weaker winds blow from SW to NE (Figure 28) wind velocity and direction is important to study the dispersion of industrial emission.

Figure 28: Wind Rose of RYK-IE

5.2.8. Rainfall

Generally there is a little rainfall and at the times almost none. Average monthly rain fall recorded at Khanpur observatory is given as under. The area is quite dry and arid and mostly receives monsoon rain from July- September (Figure 29).

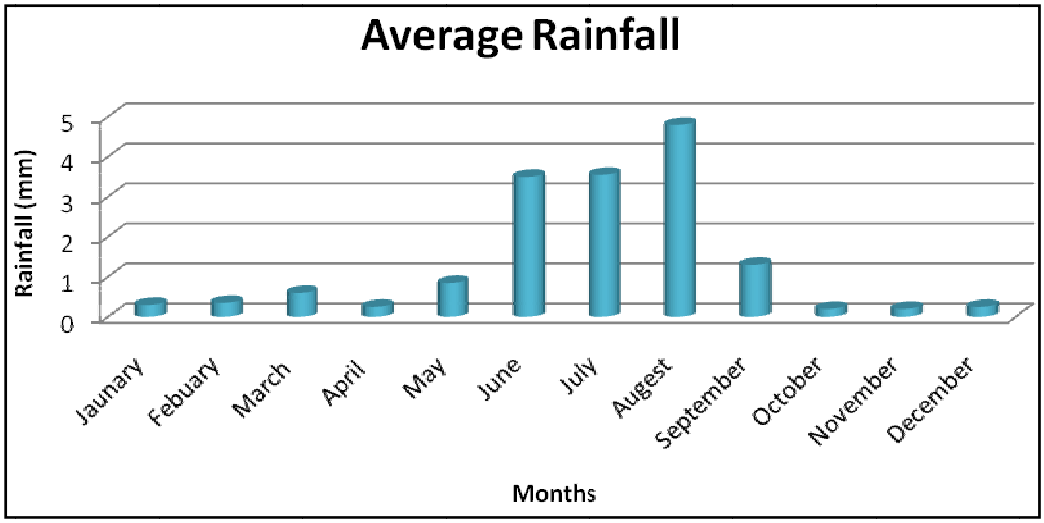


Figure 29: Average Rainfall

5.2.9. Ambient Air Quality and Noise Level

Information on ambient air quality in rural areas is totally missing. This is mainly because air pollution is primarily a hazard for urban areas where the increasing number of industries and vehicles is increasingly concentrating the pollutants in air and also prevents them from being dispersed. As far as rural areas are concerned the air quality has not been a problem, except near sources of noxious and large emissions, such as industries. Therefore, no attention has been given in that direction.

A short environmental monitoring was conducted in the Project area. The ambient air quality was monitored at N5 and Basti Adam Sahaba. The quality of air may be affected with the presence of brick kilns.

5.3. BIOLOGICAL RESOURCES

5.3.1. General

Once rich in natural vegetation the land use pattern of the Indus Basin and other areas has greatly been modified for want of land for cultivation. This has changed the pattern of flora wherever irrigation was possible.

The total geographic area of Rahim Yar Khan District 1,767,484 acres out of which 1,493,342 acres is cultivated and 274,142 acres is uncultivated. No wild life sanctuaries, forest areas etc. are located in or near this site.

5.3.2. Flora

It is better to explain the flora as a protective layer of Earth which simply guards the land from the different major and minor hazards. Flora is not only protects the land but also an indicator of hydrology, Soil efficiency and also the home of different fauna. To notify the diversified flora in the project area an extensive flora survey was conducted and a list of existing flora was developed (Table 4) (Figure 30).

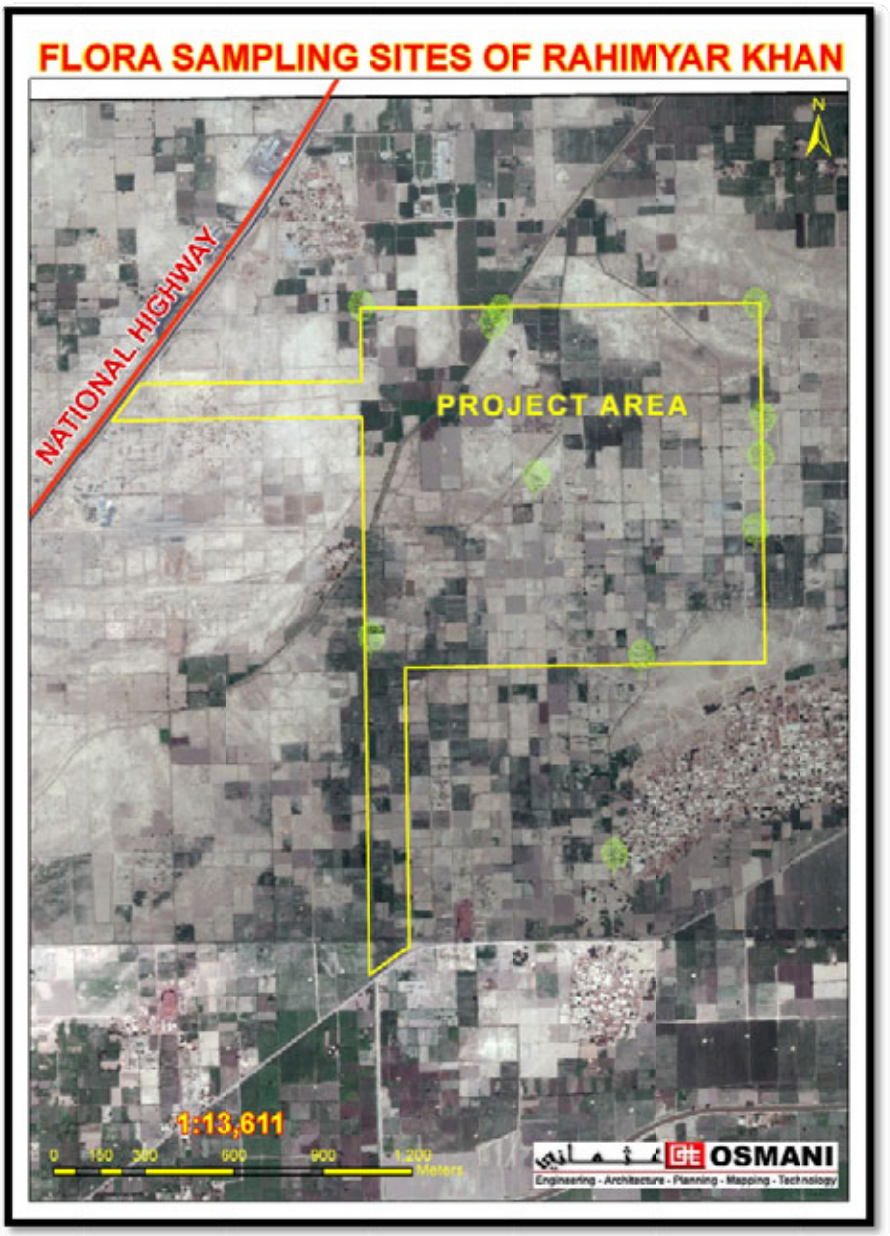


Figure 30: Flora Sampling Site in RYK-IE

5.3.3. Existing Flora

As observed during the field visit in the project area the most dominant species are Acacia nilotica, Calotropis procera and Capparis deciduas (Table 4). For this purpose a detailed flora survey conducted in which both individual and communities were recorded (Figure 31). The only alien species noted was Prosopis juliflora (Figure 35).

Table 4: Existing Flora

S. No.	Botanical Name
1	*Acacia nilotica*
2	*Aerva javanica*
3	*Albazia lebback*
4	*Calotropus procera*
5	*Caparis deciduas*
6	*Casurina equcitifolia*
7	*Dalbergia sissoo*
8	*Lycium Edgeworthi*
9	*Maerua arenaria*
10	*Melia azedarach*
11	*Pheonix decteliferous*
12	*Prosopis Cineriria*
13	*Prosopis juliflora*
14	*Salsola imbricate*
15	*Salvadora oleoides*
20	*Salvadora persica*
21	*Trianthema pentandra*
22	*Ziziphus nummularia*

A total of 22 plant species were recorded. No Species were recorded as vulnerable or endangered. Although Prosopis cineraria, Salvedora olieodis and Capparis decidua are endangered species which must be taken care off in project area but observed in abundance in the area and vicinity.

5.3.4. Flora Sampling Map

In the following sections important plant species were discussed which may have good market and industrial value for many upcoming industries. (Figure 30)

5.3.4.1. Flora Community

Usually a community plant established, when on a single location a cluster of plants are agglomerated (three or more than three) vareity of plants were found which we often termed as the plant community mostly in the project area common plant communities were available with Aerva jivanica, Salsola and Capparis deciduas. These plants are actually the indicator of the seasonal water availability in the project area (Figure 38).

Figure 31: Typical Plant Community in RYK – IE (Aerva jivanica, Salsola, Capparis deciduas)

Most important plant species, which may have the industrial worth, are discussed below:

5.3.4.1.1. Salvadora Persica

Other than plant communities many individual plants were identified in the project area. For instance; Salvadora persica or commonly known as peelu is one of the most important medicinal plants with having a market potential because it is used in the toothpaste and also for making the gum inflammatory medicines (Figure 32)

Figure 32: Salvadora Oleodis

5.3.4.1.2. Melia Azedarach

Another plant species is Melia azedarach, which is widely spread in and around the study area specifically the areas where human settlements were found. Melia azedarach is much more similar to Azedarachta indica. It is commonly used in the medicines especially its bark, leaves and fruit is very useful for the body itching and acne. Beside this the adult tree of Melia is provide a good shelter and very commonly used for the sitting area in the village (Goth) (Figure 33).

Figure 33: Melia azedarach

5.3.4.1.3. Salsola Species

Shrubs were also found in the project area with other trees and plant communities. Salsola species is also found as shrub in the project area on medium scale normally grows with other plant species. Salasola consider as highly tolerant plant species and mostly used as the ornamental shrub in different gardens and parks (Figure 34).

Figure 34: Salsola Species

5.3.4.1.4. Prosopis Juliflora

In the project area the only one alien species were Prosopis juliflora, which were found in many places. Prosopis juliflora is invasive species which were disturbed the local ecosystem alot and rapidly eliminating the indigenous species. P. Juliflora is an opportunistic weed and may convert into a tree based on the availability of the suitable environmental conditions. In the project area P. juliflora were found on large scale in the form of both weed and tall trees. (Figure 35).

Figure 35: Prosopis juliflora in the Study area

5.3.4.1.5. Acacia Nilotica

Acacia nilotica or commonly known as Babul is native to Africa and Asia. A plant species widely spread in the project area, and normally found in the form of tall trees. It is used in the herbal medicines especially for diarrhea and also used as animal fodder.

Figure 36: Acacia nilotica

5.3.4.1.6. Aerva javanica

Aerva javanica or wild cotton plants were found in project area on medium scale.

Figure 37: Aerva javanica

Calotropis procera is a shrub or tree with lavender flowers and cork-like bark. The wood yields a fibrous substance that is used for rope, fishing line and thread.Calotropis procera also has tannins, latex, rubber and a dye that are used in industrial practices The water treatment potential of latex of Calotropis procera on domestic and industrial waste water has shown that it has good

coagulatory and clarifying properties.It reduced the turbidity, colour, odour, pH, microbial load, and total Coliforms of all highly turbid samples (P< 0.001). The water treatment potential of latex of Calotropis procera on turbidity, pH, odour, microbial load and total Coliforms reduction is not only of good economic importance but could be the most cost effective alternative method to prevent pollution. Calotropis procera plays an important role in improving soil fertility and improved soil water holding capacity.The root bark is febrifuge, anthelmintic, depurative, expectorant, and laxative.The powdered root promotes gastric secretions and useful in asthma, bronchitis, and dyspepsia.Dried whole plant is good tonic, expectorant, depurative and anthelminthic.

Figure 38: Calotropis Procera

The extracts of Capparis decidua work as green inhibitor, which are nontoxic and biodegradable.Ker it is necessary to develop environmentally acceptable and less expensive inhibitors.Natural product can be considered as a good source for this purpose.To reduce the corrosion problem in environment inhibitive effects of various naturally occurring substances like Datura stramonium, Calotropis gigantea,Capparis decidua,Prosopis juliflora have been evaluated as effective corrosion inhibitors The inhibition increases with increased additive concentration.Capparis decidua ethanolic extract is a corrosion inhibitor and can be replace toxic chemicals.

Figure 38: Capparis deciduas

Figure 39: Lycium edgworthi

5.3.5. Proposed Flora

After recording existing flora which may be affected by construction activities, it is recommended to promote some wild indigenous and ornamental of vegetation removed plants. It is highly recommended that the alien species should not be promoted and indigenous species should be encouraged to restore the smooth functioning of the eco-system Most of the characteristics of the proposed flora which also part of the existing indigenous culture is defined and explained. However, in the proceeding sections characteristics of some of the remaining proposed flora is given in (Table 5).

Table 5: Proposed Flora

S. #	BOTANICAL NAME
1	*Acacia nilotica*
2	*Aerva jivanica*
3	*Albazia lebback*

S. #	BOTANICAL NAME
4	*Calotropus*
5	*Caparis decidua*
6	*Casurina equcitifolia*
7	*Dalbergia sissoo*
8	*Lycium Edgeworthi*
9	*Maerua arenaria*
10	*Melia azedarach*
11	*Pheonix decteliferous*
12	*Prosopis Cineriria*
13	*Salsola barysoma*
14	*Salsola imbricata*
15	*Salvadora oleoides*
16	*Trianthema pentandra*
17	*Ziziphus nummularia*

Figure 40: Proposed Trees in the project site

5.4. FAUNA

Field surveys for the observation of fauna were conducted during November, 2011 to collect baseline information. During the survey the distribution of Mammals, Birds and Reptiles of the Project area were documented. Line transect method was applied to record various species of the animals. Tracks and signs of animals were also taken into consideration.

Observations were made with the help of spotting scopes and binoculars along with hand held GPS. Field Guides such as a Roberts (2005), Grimmette et,al.(2008) and Ahmed (1998) were used for the identification of the various species.

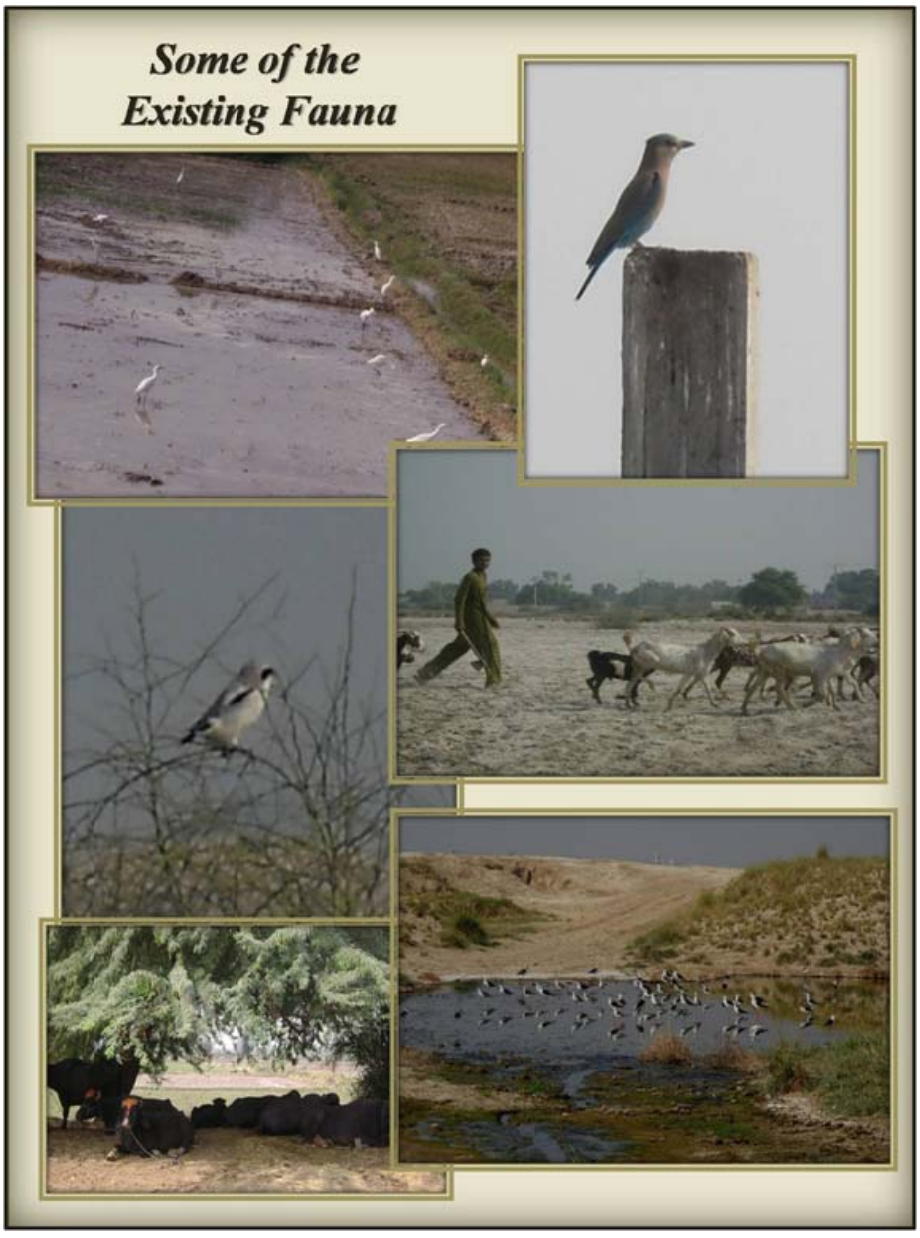


Figure 41: Existing Fauna

Table 6: List of Mammals in the Project Area

S.NO	ENGLISH NAME	SCIENTIFIC NAME
1	House Shrew	Suncus murinus
2	Northern Palm Squirrel	Funambulus pennantii
3	Roof Rat	Rattus rattus
4	Domestic Cat	Felis Catus
5	Pie Dog	Canis familaris

Most common mammals species found in the area are shown in (Table 6) most of them are highly common and urbanized

Table 7: List of Birds in the Project Area

S.NO	NAMES
1	Intermediate Egret
2	Snipper
3	Red Wettled Lap wing
4	Shrike
5	Indian Roller
6	Black Winged Stilt
7	Lark
8	Pond heron
9	Vega bond

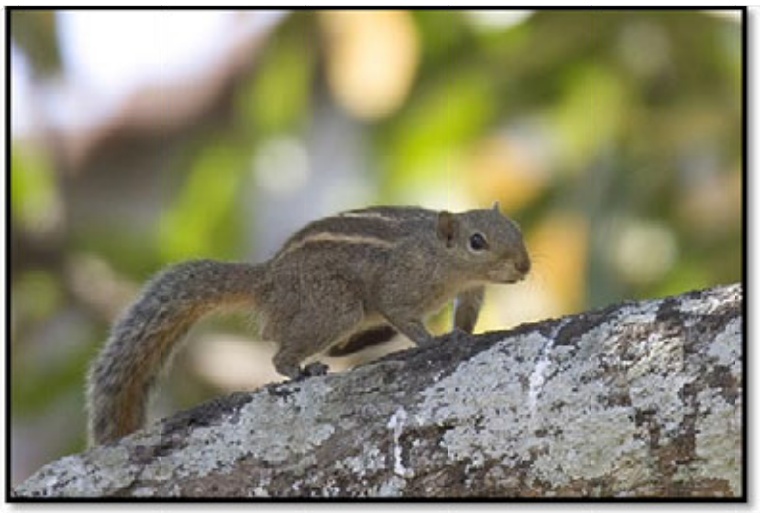


Figure 42: Squirrel

The only reptile which was observe during the day time in the project vicinity is Squirrel (Figure 43) Among Mammals, Northern Palm Squirrel is quite common along with Rodents such as Rats, Mice and Shrews which are dependent on human habitations nearly.

5.5. BIRDS

Surface water sources, good vegetation and relatively low human activities attract many birds at the project site. Most of birds are highly common and migratory birds could also be seen at large numbers. Few invasive and threatened species were also recorded from the project area. Following birds were documented during the field visits: (Table 7) and (Figure 44).

Figure 43: Existing Birds in RYK-IE

The Black Kite (Milvus migrans) is a medium-sized bird of prey in the family Accipitridae, which also includes many other diurnal raptors such as eagles, buzzards and harriers (Figure 45).This kite is found in good number in the project area.

Figure 44: Black Kites

Figure 45: Black Winged Stilt

Figure 46: Common Myna

The Common Myna or Indian Myna (Acridotheres tristis) also sometimes spelled Mynah, is a member of the starling family. It is a species of bird native to Asia with its initial home range spanning from Iran, Pakistan, India and Kazakhstan to Malaysia and China. An omnivorous open woodland bird with a strong territorial instinct, the Myna has adapted extremely well to urban environments (Figure 46).The Common Myna is readily identified by the brown body, black hooded head and the bare yellow patch behind the eye. The bill and legs are bright yellow. There is a white patch on the outer primaries and the wing lining on the underside is white. The sexes are similar and birds are usually seen in pairs. This is a common bird of the area, found everywhere. It nests on the ground, laying two or three eggs. Its food is weed seeds and insects, the latter especially in the breeding season. Smallish lark, slightly larger and plumper than the Skylark also found in the area. It has a long spiky erectile crest. It is greyer than the Skylark, and lacks the white wing and tail edges of that species (Figure 47).

Figure 47: Creasted Lark

In flight it shows reddish under wings. The body is mainly dark-streaked grey above and whitish below. The House Crow (Corvus splendens), also known

as the Colombo Crow is a common bird of the Crow family that is of Asian origin but now found in many parts of the world, where they arrived assisted by shipping. It is between the Jackdaw and the Carrion Crow in size (40 cm in length) but is relatively slimmer than either. The forehead, crown, throat and upper breast are a richly glossed black, whilst the neck and breast are a lighter grey-brown in color. The wings, tail and legs are black. There are regional variations in the thickness of the bill and the depth of color in areas of the plumage (Figure 48).

The House Sparrow (Passer domesticus) is a species of passerine bird of the sparrow family Passeridae. It is a chunky little bird, with feathers mostly different shades of brown and grey and often played an excavanger role in the project area (Figure 49).

Figure 48: House Crow

Figure 49: House Sparrow (Passer domesticus)

The House Sparrow is a chunky bird, typically about 16 cm (6 in) long,[3] with measurements ranging from 14 to 18 cm (5.5–7 in). It has a large rounded head, a short tail, and a stout bill. In weight, the House Sparrow generally ranges from 24 to 39.5 g (0.84–1.4 oz). Weight varies by sex, with females usually smaller than males. Younger birds are smaller, males are larger during the winter, and females larger during the breeding season.

The Indian Roller (Coracias benghalensis), also called the Blue Jay in former times is a member of the roller family of birds. They are found in southern Asia from Iraq to Thailand and are best known for the aerobatic displays of the male during the breeding season. They are very commonly seen perched along roadside trees and (Figure 50).

The Indian Roller is a stocky bird about 26–27 cm long, the breast is brownish and not blue as in the European Roller. The crown and vent are blue. The primaries are deep purplish blue with a band of pale blue. The tail is sky blue with a terminal band of Prussian blue and the central feathers are dull green. The neck and throat are purplish lilac with white shaft streaks.

Figure 50: Indian Roller

Figure 51: Little Browned Dove

The Little Egret forms a super species with the Snowy Egret (Egretta thula) with the Little Egret being present in the Old World while the Snowy Egret is found in the New World. It is partially migratory with more northern populations migrating south during the northern winter.

Figure 52: Little Green Bee Eater

The Green Bee-eater (Merops orientalis), (sometimes Little Green Bee-eater) is a near passerine bird in the bee-eater family. They are mainly insect eaters and they are found in grassland, thin scrub and forest often quite far from water. Several regional plumage variations are known and several subspecies have been named.

It is about 9 inches (16–18 cm) long with about 2 inches made up by the elongated central tail-feathers. The sexes are not visually distinguishable. The entire plumage is bright green and tinged with blue especially on the chin and throat. The crown and upper back are tinged with golden rufous. (Figure 52).

Figure 53: Long Tailed Bush Warbler

The Purple Sunbird (Nectarinia asiatica) is a small sunbird. Like other sunbirds they feed mainly on nectar, although they will also take insects, especially when feeding young. They have a fast and direct flight and can take nectar by hovering like a hummingbird but often perch at the base of flowers. The males appear all black except in some lighting when the purple iridescence becomes visible. Females are olive above and yellowish below (Figure 55).

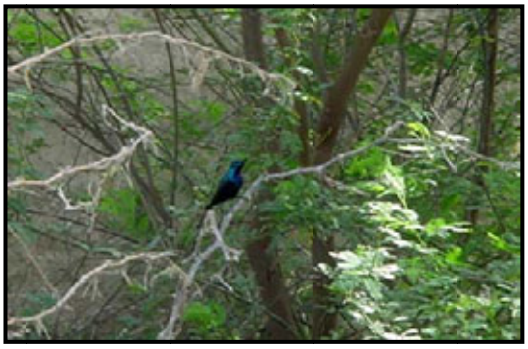


Figure 54: Purple Sunbird

Figure 55: Red Vented bulbul

They feed mainly on nectar but also take fruits and insects.

The Red-vented Bulbul (Pycnonotus cafer) is a member of the bulbul family of passerine birds and has become an invasive species in the area. It is resident breeder in tropical southern Asia from India and Sri Lanka east to Burma and southwestern China.

Figure 56: Red Wattled Lapwing

In summer plumage their black cap and white cheeks makes them look more like Common Terns than Black Terns but they have the short, broad wings and tails typical of 'marsh terns' and their under parts are such a deep grey that the white cheeks stand out boldly. In juvenile plumage, they have a dark mantle recalling the saddle effect which is a key feature of White-winged Black Terns. In a Whiskered Tern, however, this saddle is paler, browner and is noticeably interrupted by pale scaly markings. Also, the rump is not as conspicuously white as on a White-winged Black Tern and the wings of a Whiskered Tern are a more uniform grey.

The White-eared Bulbul (Pycnonotus leucotis) is a member of the bulbul family. It is found in mid and southern Iraq, southern Iran, Afghanistan, Pakistan, north-western India, and Arabian Peninsula. The species was earlier considered a conspecific of Pycnonotus leucogenys. This species is very similar in appearance to the Himalayan White-cheeked Bulbul Pycnonotus leucogenys but smaller and uncrested and with a larger white cheek patch (Figure 57).

Figure 57: White Eared Bulbul

It has a pale bare eye-ring. The vent is orange yellow. Sexes are alike. It is found in scrub forest and gardenland. Also found in flocks or pairs in the mangroves, gorging on the fruits of the Meswak bush. Usually seen in pairs or small groups. It feeds on fruits and insects, and breeds in March-June.

5.6. NATIONAL PARKS, RESERVED FOREST WILD LIFE SANCTUARIES

In the Project Area or in its close vicinity or even upto 10 km from Project site, no national park, reserved forest, games reserves and wild sanctuaries were observed. Similarly, no cultural and archeological site was found in the project area.

5.6.1. Migratory Birds

As no major water body exist in close vicinity of the Project Area, so no migratory birds were observed in the area. Nevertheless, surface water may attract seasonal migratory birds.

5.6.2. Endangered Species

No floral and faunal endangered species were observed in the Project as well as study area.

5.7. SOCIAL AND CULTURAL ENVIRONMENT

5.7.1. Administrative Setting

Rahimyar Khan District comprises of four Tehsils, there are three municipal committees and five town committee in the district and it has a population of 3,141,053 (about 52% male & 48% female). District has got literacy rate of 33.1% out of which female rate is about 21%. size is about 7 marlas.

5.7.2. Settlement Pattern

The urban population was 616,582 or 19.6 % of total population of the district which grew at an average of 4.3 per cent during 1981-98 and had decrease from 4.7 per cent observed during 1972-81. There are three municipal committee and five town committee in the district.

There were 1,504 Mauzas (the small revenue unit in 1998. of which 93 had population over 5 thousand, 381 had 2 to 5 thousand, 292 had one to two thousand, 489 had under one thousand person while 249 were un-inhabited. The statistics also indicate that in rural areas the labour force is mostly attached with agriculture and allied occupations, while in urban areas it is attached with industries, trade and services. R. Y Khan district has some concentration of Industries but it is all unplanned. Therefore, a site has been selected to provide industrial units in a dynamic and innovative manner which provides all industrial facilities under one roof.

5.8. DEMOGRAPHIC CHARACTERISTICS OF THE POPULATION IN THE STUDY AREA

An effort was made to collect the socio-economic information through structured questionnaires relating to the demographic features of the population resided in the study area. The demographic features include the

information on ethnicity/tribes, size of households, gender composition, and literacy status of the population in the project area.

5.8.1. Project Affected Persons

As mentioned earlier, the Project was require to acquire an area of about 456 acres and almost all land parcels belongs to private ownership and private land. Out of total land, about 26% land was under cultivation through irrigated water or by installing tube-wells by private owners and remaining 74% was barren/open/saline/uncultivated. In addition to land, some trees and other infrastructure also existed in the Project area which may also be disrupted by the Project activities.

5.9. CULTURAL, RELIGIOUS AND OTHER STRUCTURES

No cultural structures are located inside the proposed industrial estate.

5.10. HISTORICAL AND ARCHEOLOGICAL SITES

No site of historical and archeological importance was observed within the Project as well as study area.

5.11. AIR QUALITY

As the site is located on N-5, it may partially be affected with Vehicles emission on N-5. Through traffic is quite low at the time of survey but it may affect air quality during traffic jams another important thing is the presence of Brick Kilns around the project area (Figure 58). About 12 Brick Kilns are situated around RYK-IE, fortunately enough only three could brings some particulates matters only in the winter with winds of quite low intensity. Whereas in summer winds will keeps away the emission from the project site. After establishing industries in the RYK-IE the emission will not affect any adjoining settlements both in summer and winter.

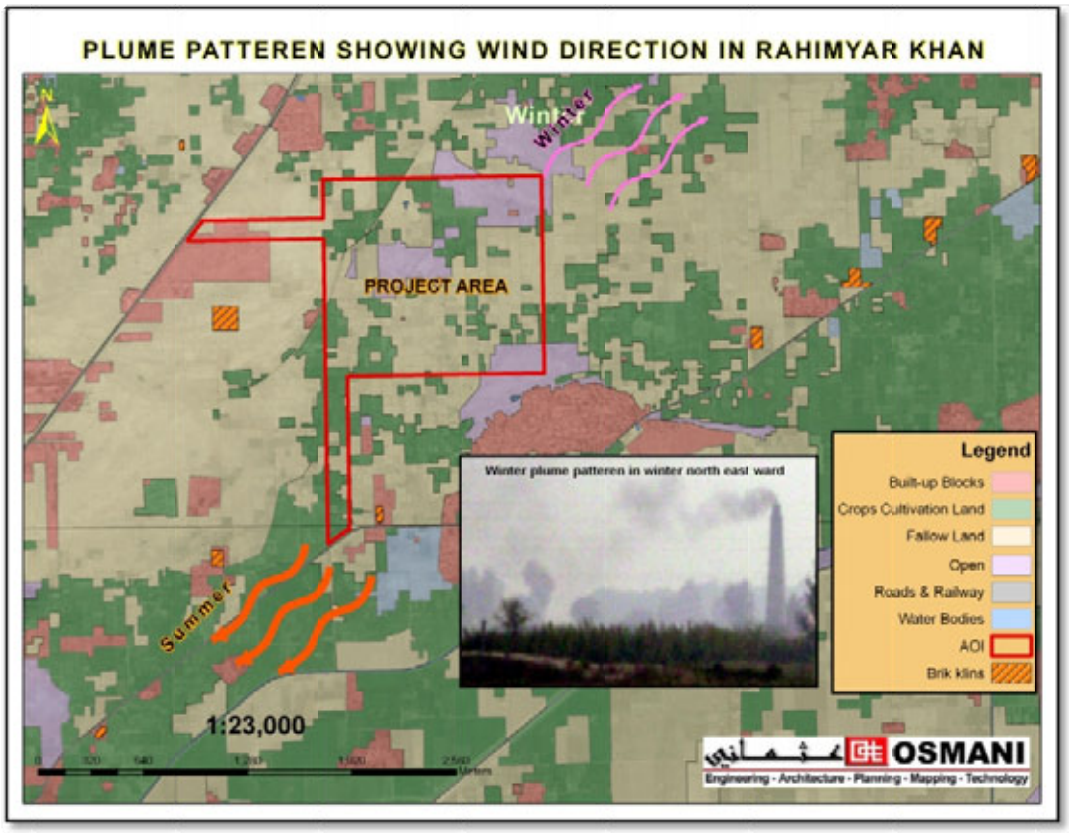


Figure 58: Wind direction and Brick kilns around RYK-IE

5.12. WATER SAMPLING

Being agricultural area, the quality of water is quite good. Nevertheless, about 12 brick kilns located around the project area. Especially in winter for the evaluation of the water quality, about 14 samples were collected from and around the project area. These samples were collected from bore holes, Tube well, canals and hand pumps. The samples were collected in two liters sterilized bottles. The samples were taken to water testing labs of institute of Environmental studies, University of Karachi. After the analysis of water samples Following Results were products (Figure 59).

Figure 59: Water Sampling of Surface Water in RYK – IE

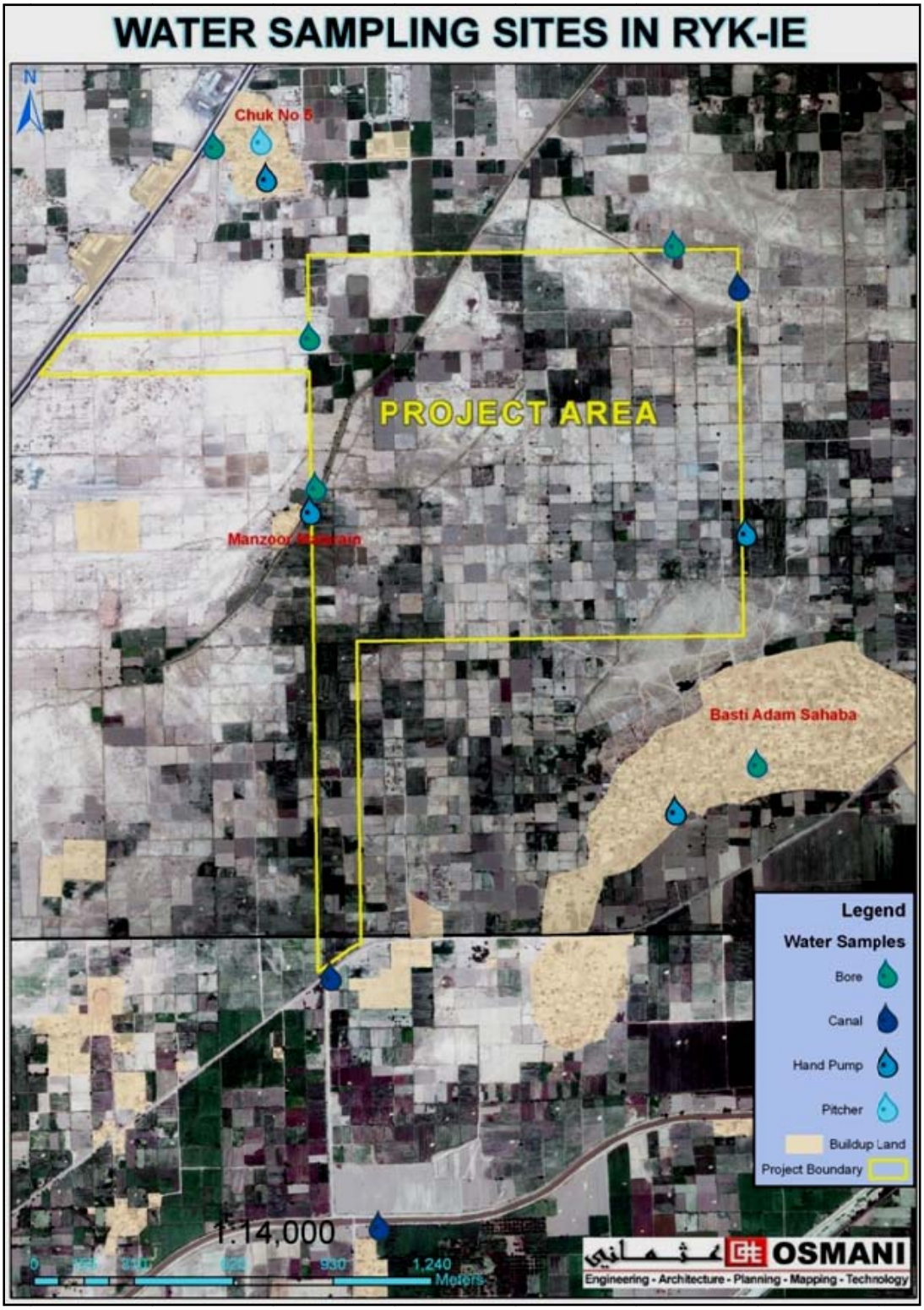


Figure 60: Location of water Sampling Sites in RYK-IE

5.12.1. Groundwater and Surface water

The land mass of District Rahim Yar Khan, where the project site is located can be safely divided into two parts - the fertile land and the desert of

Cholistan. The proposed project site is located in the fertile part of the land which is one among the food baskets of Pakistan. Canal water and underground sweet water are the two main sources of water for irrigation. The project site is plain. Under ground water being sweet in most of the areas, it is used for irrigation through tube wells. The total land mass of 14,83,000.0 acres of Rahim Yar Khan District is irrigated from the underground sweet water through tube wells numbering 39,771 and canals.

Water samples were collected from various points in the project area during the field survey for water quality analysis. These samples were handled as per Pakistan Environmental Protection Agency (PEPA) sampling procedures. Turbidity, pH, Total Suspended Solids (TSS), Total Dissolved Solids (TDS), Hardness (as CaCO3), Calcium (as CaCO3), Sulphate, Chlorides and Arsenic were ascertained to generate primary data about the existing water quality of the project area prior to the construction of RYK Industrial Estate (Figure 62-Figure 68). These tests were conducted according to the guidelines laid down by the American Public Health Association (1992).

The results of the chemical analysis of different water samples collected from different locations in the project area are presented in Table 8. Results showed that there is no critical issue concerning with groundwater quality in the project site.

Parameters for which chemical or physical data are available; the Indus River water meets the WHO drinking water quality criteria. Indus river water is acceptable chemically for human consumption and agricultural uses. In addition suspended solids can be removed by settling prior to potable or agricultural use.

Moreover, the acquired water quality data was grouped using multivariate cluster analysis (Figure 69). Result revealed that sites 5, 7, 8, 11 and 13 have similar characteristics while sites 1, 4, 2, 9 and 3, 6, 10, 12 were grouped in different groups due to their comparable characteristics.

Furthermore, the overall water quality with respect to pH, turbidity, TSS, TDS, hardness, calcium and chlorides were interpolated (Figure 61–Figure 68) using Inverse Distance Weighted (IDW) technique. All the interpolated layers were developed using ArcGIS 9.3 software. After interpolation it is observed that major portion of RYK Industrial Estate contains medium levels of all the water quality parameters analyzed.

Moreover, Northeastern part of RYK Industrial Estate has high pH, turbidity and TSS while levels of calcium, chloride, hardness and TDS were quite low.

Southeastern part of RYK Industrial estate contains low levels of calcium and chloride, medium levels of pH, turbidity and hardness whereas the levels of TDS and TSS were at higher side. Southwestern part of RYK Industrial Estate has medium levels of all analyzed parameters except TDS which is at lower side. Finally, the northwestern part of RYK Industrial Estate holds high turbidity, TDS and hardness levels, medium TSS levels and low levels of pH, calcium and chlorides.

The detail analysis of water quality at the vicinity of RYK Industrial Estate concludes that most of the water quality parameters are under WHO guidelines. In addition, the ground and surface water are in better condition and they can be used as potential source of fresh water at the Industrial Estate.(Figure 60).

Table 8: Water quality analysis of RYK Industrial Estate and nearby village

S.No.	pH	Turbidy (NTU)	TSS (mg/l)	TDS (mg/l)	Hardness (mg/L)	Calcium (mg/l)	Sulphate (mg/L)	Chlorides (mg/L)	Arsenic (mg/L)
1	6.8	10.85	218	1696	436	61	63	135	0.005
2	7.2	1.61	351	855	476	82	75	165	0.001
3	7.6	10.48	212	260	316	71	48	52	0.002
4	7.1	7.68	342	1695	508	58	51	119	0.001
5	7.4	1.18	156	664	528	146	82	147	0.001
6	7.1	1.40	93	735	388	88.17	64	155	<0.001
7	7.6	3.09	102	943	588	123.4	86	600	<0.001
8	7.2	1.70	104	747	544	130	102	350	<0.001
9	7.8	3.22	178	1061	416	111	91	200	0.005
10	7.0	8.27	154	260	500	106	66	250	<0.001
11	6.9	2.88	98	1054	616	93	78	550	<0.001
12	7.5	13.68	87	876	308	122	69	500	0.001
13	7.1	1.06	148	933	736	136.2	113	700	0.001
WHO	-	**5**	**-**	**1000**	**-**	**-**	**250**	**250**	**-**

(Source: Institute of Environmental Studies, University of Karachi and PCSIR laboratories Complex, Karachi)

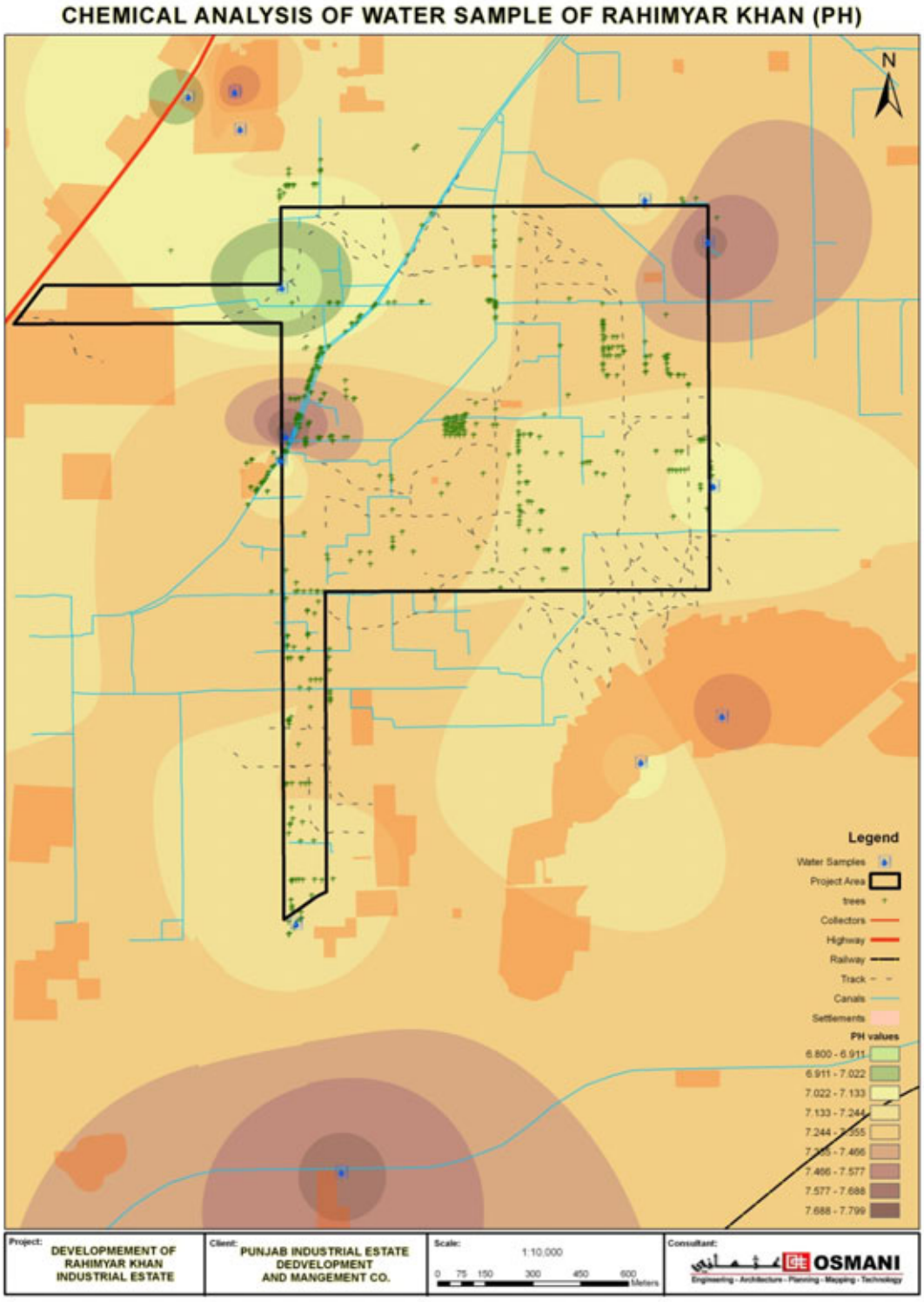


Figure 61: Interpolated Layer of pH at the study area

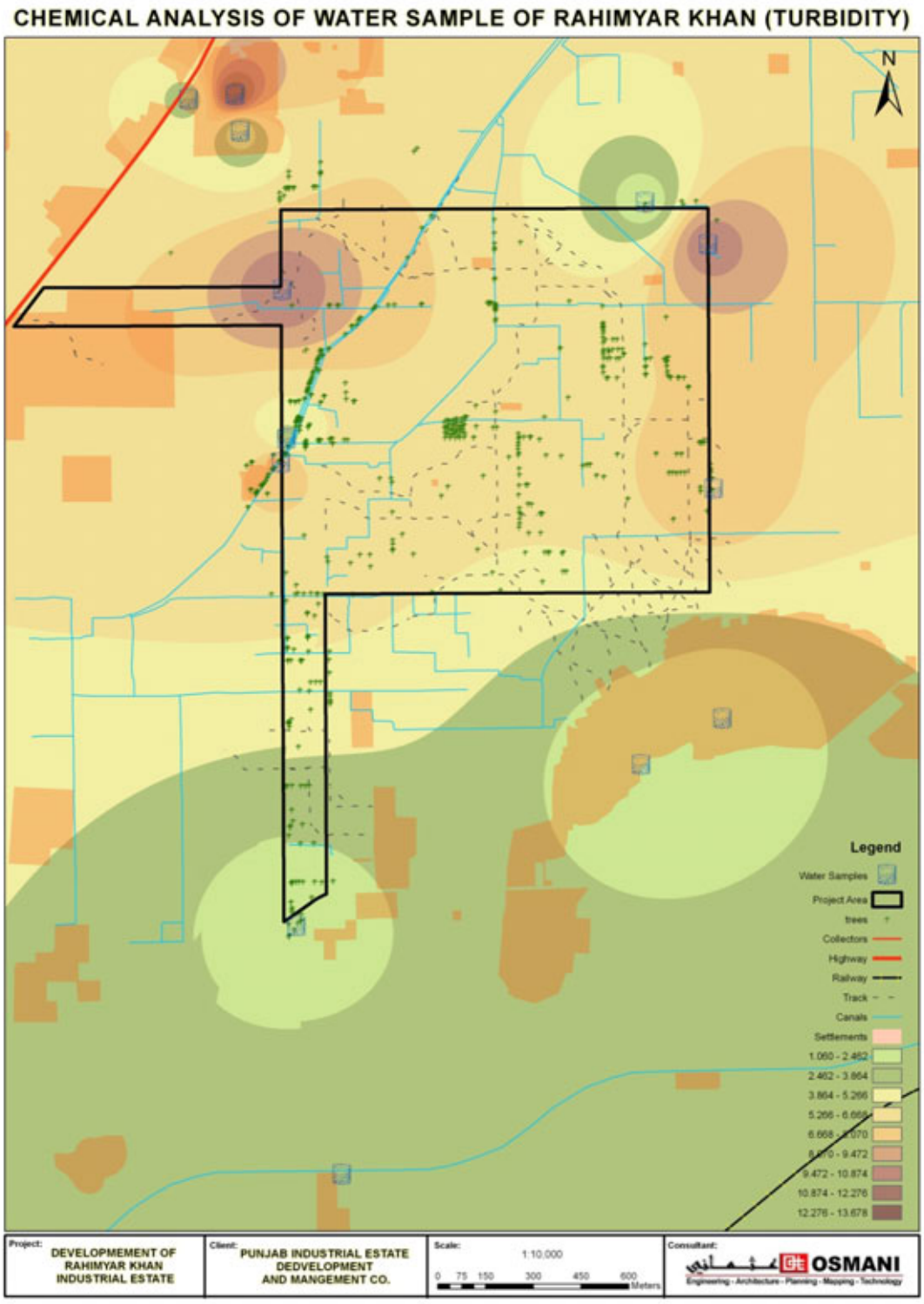


Figure 62: Interpolated Layer of Turbidity at the study area

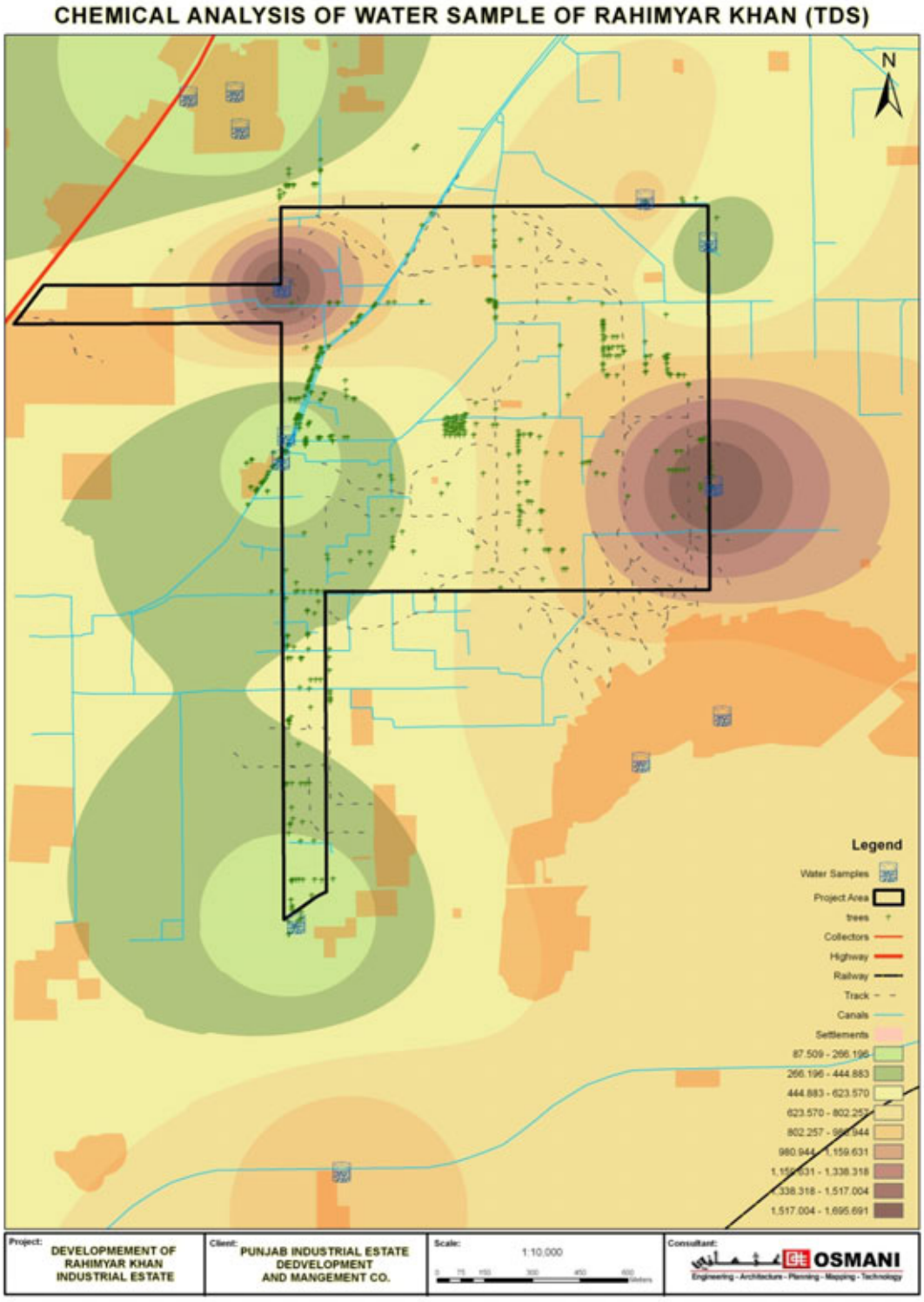


Figure 63: Interpolated Layer of TDS at the study area

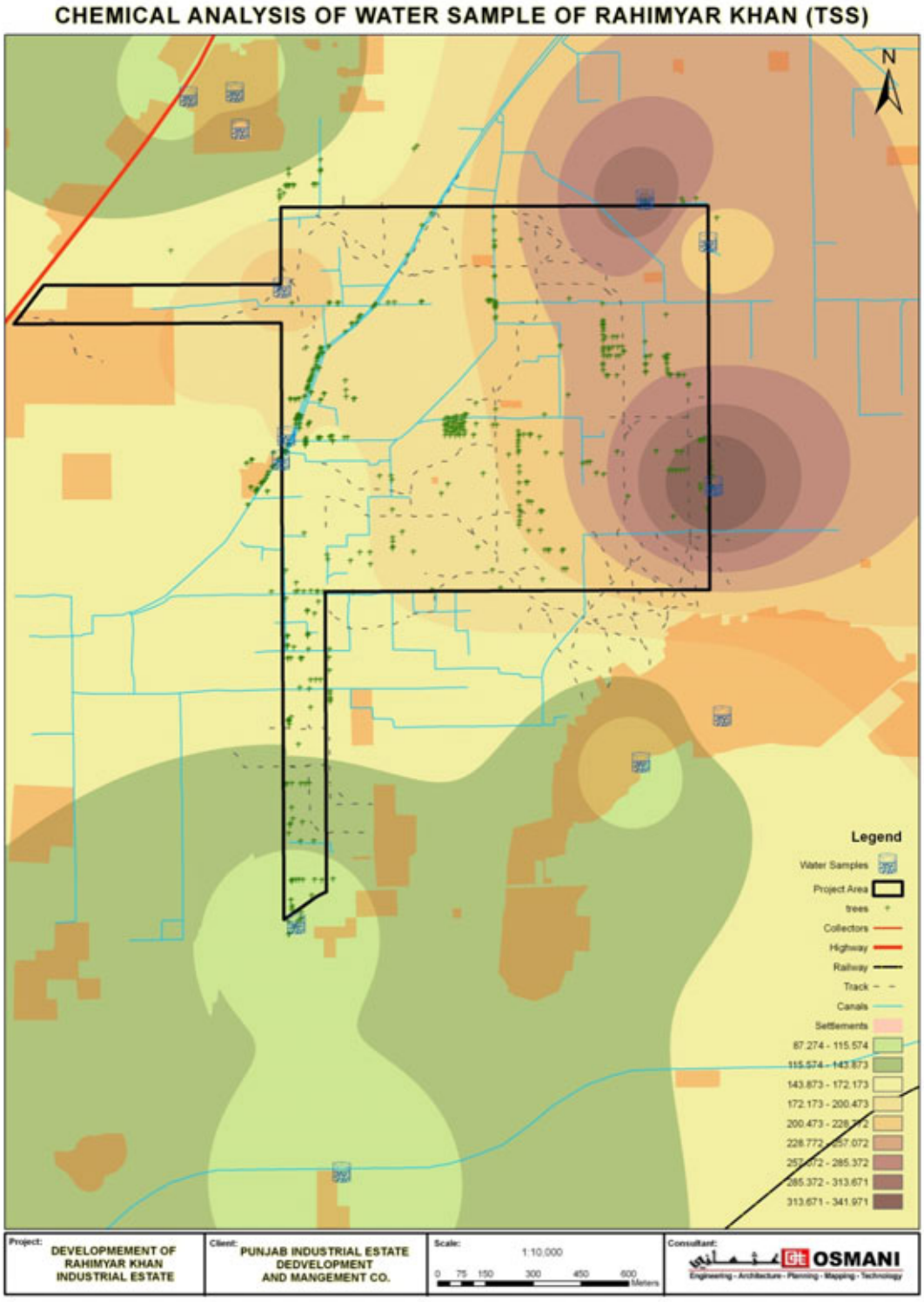


Figure 64: Interpolated Layer of TSS at the study area

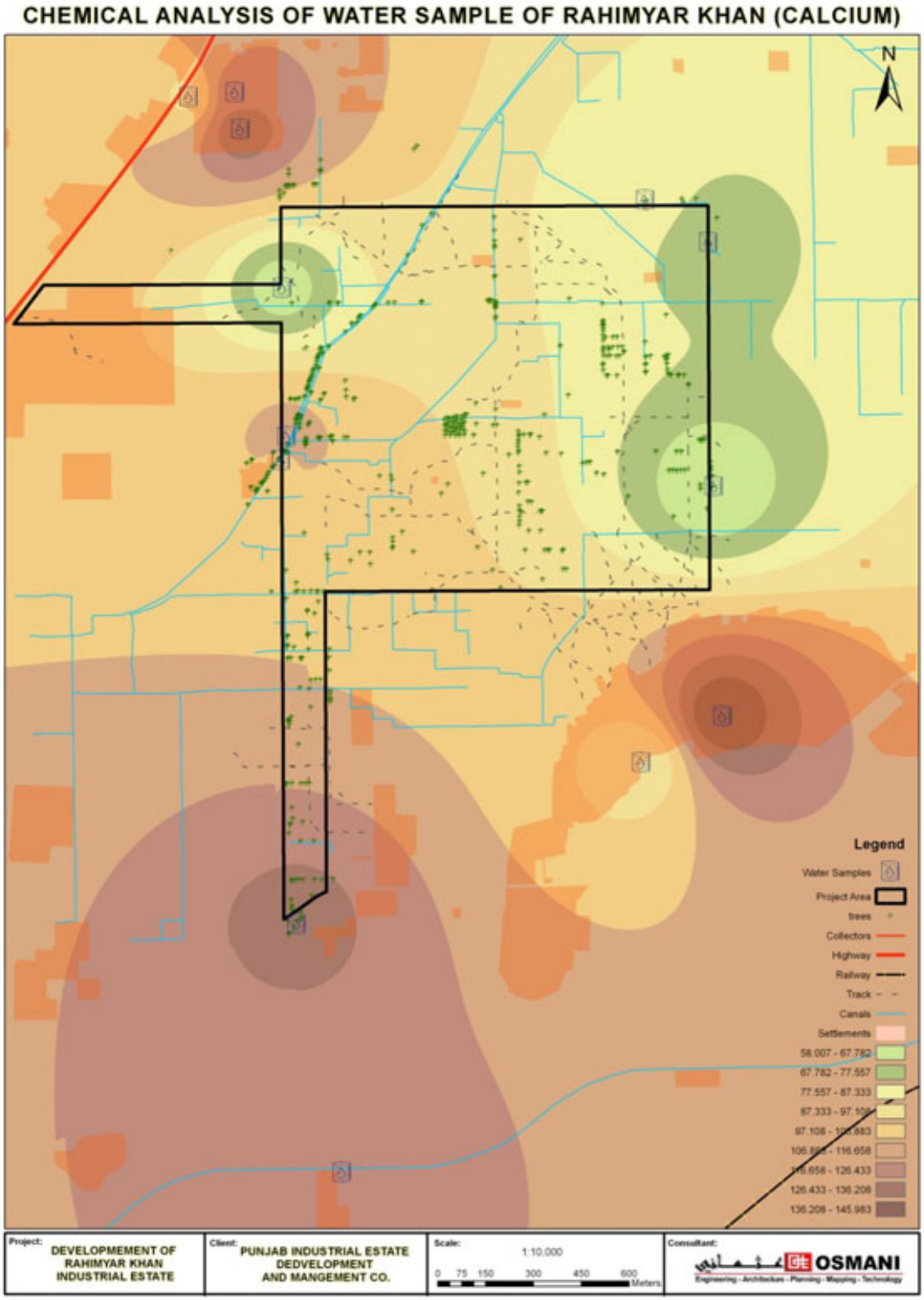


Figure 65: Interpolated Layer of Calcium at the study area

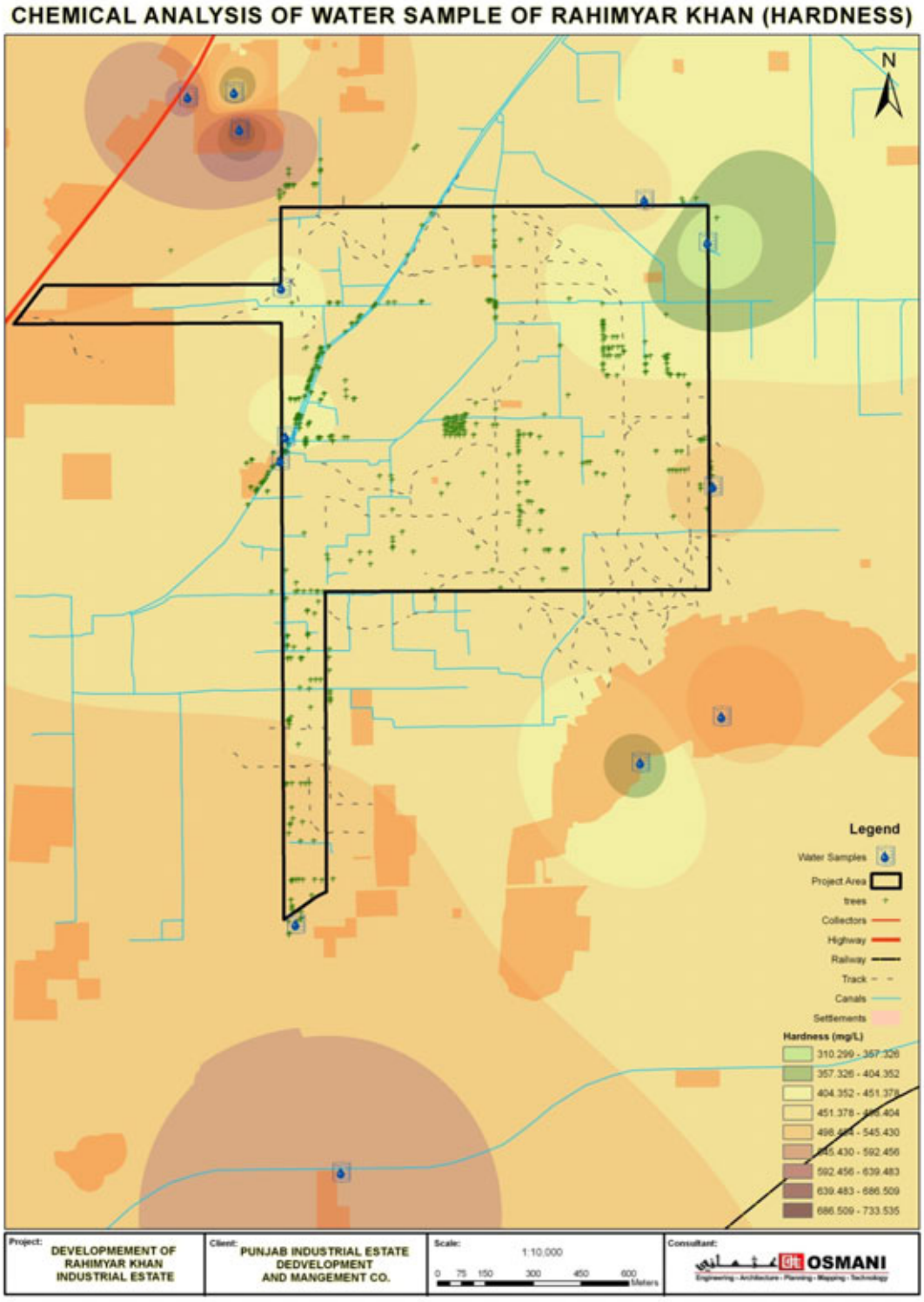


Figure 66: Interpolated Layer of Hardness at the study area

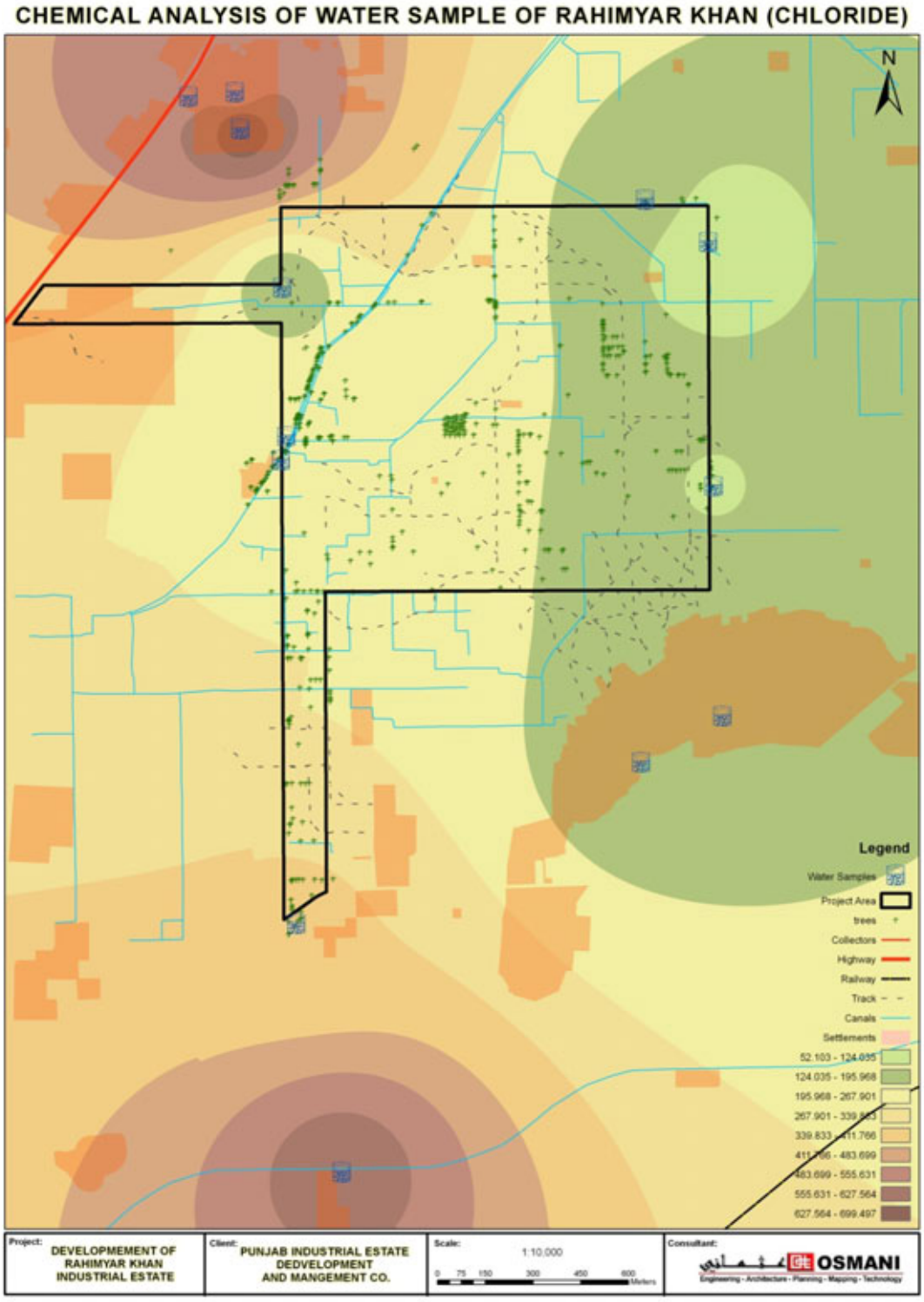


Figure 67: Interpolated Layer of Chloride at the study area

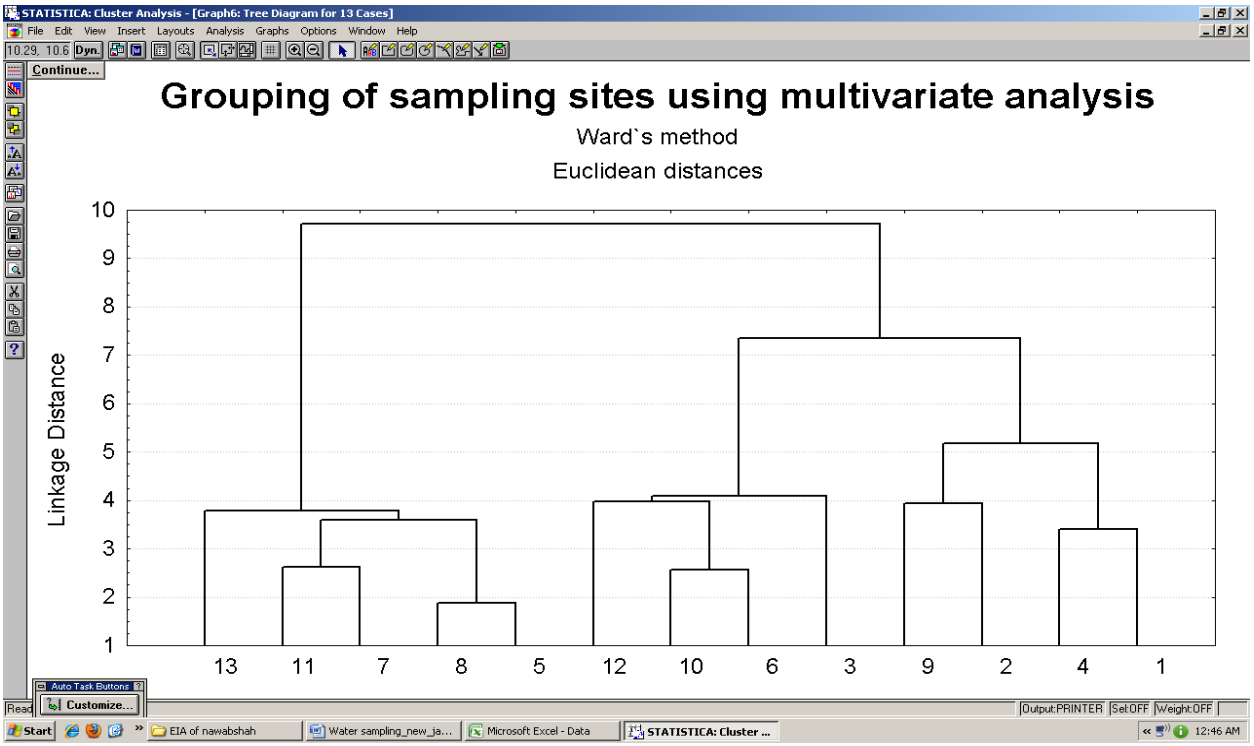


Figure 68: Grouping of sampling sites using multivariate analysis

6. ENVIRONMENTAL IMPACTS ASSESSMENT

Any project or development would certainly have negative and positive impacts on the environment. The negative impacts must need to identify as their mitigation measures must be drafted before the implementation. Therefore, this Chapter identifies the potential impacts due to the implementation of RYK-IE on the physical, ecological and social environment of the project area. The chapter also identifies measures that will help to mitigate the project's adverse environmental effects and enhances positive impacts.

6.1. PHYSICAL ENVIRONMENT

Without any qualms the project physically influenced physical environment of the project area, the notable impacts discussed below:

6.2. IMPACTS ON LAND RESOURCES

This section explains how the proposed project will affect the land use, soil erosion and contamination, and describes mitigation measures to manage these impacts.

6.2.1. Land Acquisition

There are basically two types of land acquisition viz, permanent and temporary.

6.2.2. Permanent Land Acquisition

The Project will require acquiring of 454 acres of land, mostly agricultural land acquired both by the Government and Private owners will be affected due to land acquisition activities. This agricultural land now abundant after paying compensation to the farmers for the last 10 months. The evidence of water-logging and salinity is quite prominent at few spots.

6.2.3. Temporary Acquisition of Land

The contractors will require temporary acquisition of land for:

- Sources of borrow material/earth fill;
- Removal of Bushes and few trees;
- Aggregate quarries;
- Disposal sites and procedures for safe disposal of surplus construction and waste material; and

- Access roads for transportation and communication, etc.

In general, areas used to acquire borrow material will be impacted most significantly, followed by those used to install asphalt plants. Utilizing land for project activities may induce temporary as well as permanent changes in the existing land use pattern.

6.2.4. Land Productivity and Use

- The major impact on land use changes will be the conversion of agriculture land into industrial land;

- Due to proposed project construction and operation of this Industrial Estate, other industrial activities may start in the vicinity of area, where at present there is no such type of activity. This may cause negative impact on the existing environment;

- The loss of the fertile plough layer and a drop in the elevation of borrow areas will decrease land productivity;

- Potential conflicts may emerge with landowners regarding the resettlement on compensation issues;

- Borrow pits and other landscape depressions if left open, may prove hazardous to human beings, livestock and wildlife;

- Open pits containing water are potential sources of mosquito breeding if left stagnant, and can create health problems;

- Surface run-off from the impervious surface of the proposed carriageway can further aggravate the flooding of embankment sides during the operation stage; and

- Induction of infrastructural development works may change the local drainage pattern of the area. This can cause pounding in the vicinity of the Project area in rainy season, which ultimately affect the current use of land patterns.

- Construction activity may cause dust and smoke emission may be injurious to the residents of adjacent settlements

6.2.5. Soil Erosion and Land Sliding

1. Soil erosion may occur in the workshop areas as a result of improper runoff drawn from the equipment washing-yards and improper management of construction activities.

2. Due to development of project area, velocity of runoff will be increased, which will ultimately enhance the soil erosion.

3. Once the proposed and existing roads (after rehabilitation) return to normal operation, it will be subject to a natural depreciation as high embankments become increasingly prone to soil erosion.

6.2.6. Soil Contamination

- Scraped materials, if not disposed of properly, may contaminate soil resources.

- Lands may get contamination from the spillage of chemicals like fuels, solvents, oils, paints and other construction chemicals and concrete. This normally happens when these materials are transported in open or loosely capped containers.

- The possible contamination of soil by oils and chemicals at campsites, workshop areas, and equipment washing-yards may limit the future use of land.

- A large quantity of solid waste will be generated by the Project during operational stage. If this solid waste was not properly disposed off, it will contaminate the soil resources especially during monsoon season.

- Some chemicals used in laying of water supply pipe joints, sheathing on electric wires and cables are hazardous and toxic in nature. All the carbon based compounds are toxic to varying degrees. Hydrocarbon group of chemicals are toxic and fuel, petrol, diesel and all the lubricants are too toxic in nature. In case proper care is not taken for handling, storing and transportation of these toxic substances may cause damage to the health of the workers as well as their spills will contaminate the soil.

6.2.7. Mitigation Measures

The mitigation measures, which will be carried out in design stage, construction as well as operation stages for land resources are as under:

6.2.8. Land Acquisition

The acquisition of permanent land has been carried out as per Land Acquisition Act, 1894 and the affectees have been compensated as per applicable laws and policies. For this purpose, process of land acquisition was initiated in March 2011 by notification u/s 4 of the Land Acquisition Act, 1894. Cost of land was assessed as per market value/updated record of Revenue Department by the District Price Assessment Committee R. Y. Khan. Damages of trees, crops, tubewells and buildings/structures was conducted by the staff of Revenue department along local Revenue staff and lists were forwarded to the Agriculture Department and Building Department for confirmation the evaluation prices.

Under Sections 9 and 10 of Land Acquisition Act, 1894, notices were issued to the interested persons and acquiring agency for hearing of their objections in 2011 in Revenue Office of District Government and was provided a chance to the affectees to resolve any issues related with land acquisition and about all affected persons was attended this hearing.

After modifying the compensation/entitlement values, affected persons was made payment as per market value in addition to a payment of compulsory acquisition charges and land was awarded to the PIE in 2011.

Land for extracting borrow material will be acquired directly from private landowners by the contractor. The staff of the PIE and Supervisory Consultants will monitor the process of restoration and will ensure, through the terms of the construction contracts that landowners are compensated according to the terms of the lease agreements, and the restoration actions agreed upon by the contractors are duly carried out.

6.3. LAND PRODUCTIVITY AND USE

- Damage to the agriculture land due to implementation of the Project will be a permanent loss and it is expected that due to increase income of the local people and availability of more job resources due to the Project, yield of adjoining agricultural land will be increased which will compensate to this loss up to greater extent.

- The expected mushroom industrial growth around the Industrial Estate should be properly controlled by formulating and enforcing the law.

- Project facilities will be located at a minimum distance of 1000 m from existing settlements and other sensitive sites.

- As far as possible, waste/barren land, *i.e*., areas not under agricultural, residential or forestation use, and natural areas with a high elevation will be used for borrow material and setting up project facilities.

- Where the use of adjacent agricultural land is unavoidable for borrow of earth material, the top 30 cm of the plough layer will be stripped and stockpiled for redressing the land after the required borrow material has been removed.

- The excavation of earth fill will be limited to an approximate depth of 50 cm. This practice will be applied uniformly across the entire extent of the farmland unit acquired for borrowing earth material.

- Where deep ditching is to be carried out, the top 1m layer of the ditching area will be stripped and stockpiled. The ditch will initially be filled with scrap material from construction and then leveled with the stockpiled topsoil to make it even with the rest of the area. It shall be ensured that the scarp does not contain any material, which may produce leachates or contaminate the soil.

- Ditches or borrow pits that cannot be fully rehabilitated will be landscaped/converted into fishponds to minimize erosion and to avoid creating hazards for people and livestock.

- The Project works have been designed in line with natural drainage to ensure that local drainage pattern should not be disturbed.

- Side drains will be constructed to prevent flooding on the carriageways. In development areas, side drains will be constructed along the road shoulders; in open areas, a drain will be constructed along the toe of the embankment.

Proper storage place of each type of material to be used during the construction to be build to avoid any hindrance to natural slope.
Contractor will be made responsible for the clearing of left over material at the site. In this regard prior to the start of work, contractor should submit the site restoration plan. Site restoration plan should be as pragmatic as possible.

6.4. SOIL EROSION AND LAND SLIDING

Good engineering practices will help control soil erosion both at construction sites and in peripheral areas, particularly in borrow areas and along transportation tracks. These will include the following measures:

- Low road embankments will be protected from erosion by planting indigenous grasses and low height trees that can flourish under project site conditions.

- High road embankments will be protected by constructing stone pitching or a riprap across the embankment. This practice will also be applied along cross-drainage structures where embankments are more susceptible to erosion by water runoff.

- The Design Consultants will be required to include appropriate measures for slope protection, *i.e*. vegetation cover and stone pitching, in the detailed construction drawings and implement them accordingly.

- Main drainage courses within the proposed development area should be lined to avoid erosion.

- Growing of creepers and planting local fast growing and deep rooted species will act as sponge and will significantly help in reducing soil erosion.

- A tree plantation program will be developed to reduce the soil erosion cutting of existing trees will be kept at minimum level and for every tree cut two trees must be planted

6.4.1. Trees to be Planted

In the project area from the cultivated fields about 500 trees may have to be cut as per design requirements during implementation of the Project. As these scattered trees are small in number, their replacement will be made good by planting new trees on both sides of the main, lateral and minor roads.

Keeping in view the saline and water logged conditions in the project area a number of trees might be planted as a part of the project on both sides of the roads. Saline areas, which are lying unutilized by the communities, could be rehabilitated following proper soil amendments, preparation and choice of suitable species.

Table 9: Trees showing successful growth include the following

S.No.	Botanical Name
1	Acacia nilotica
2	Aerva jivanica
3	Albazia lebback
4	Calotropus
5	Prosopis cineraria
6	Caparis decidua

The detail of trees to be cut is extracted through ground surveys and satellite imageries.

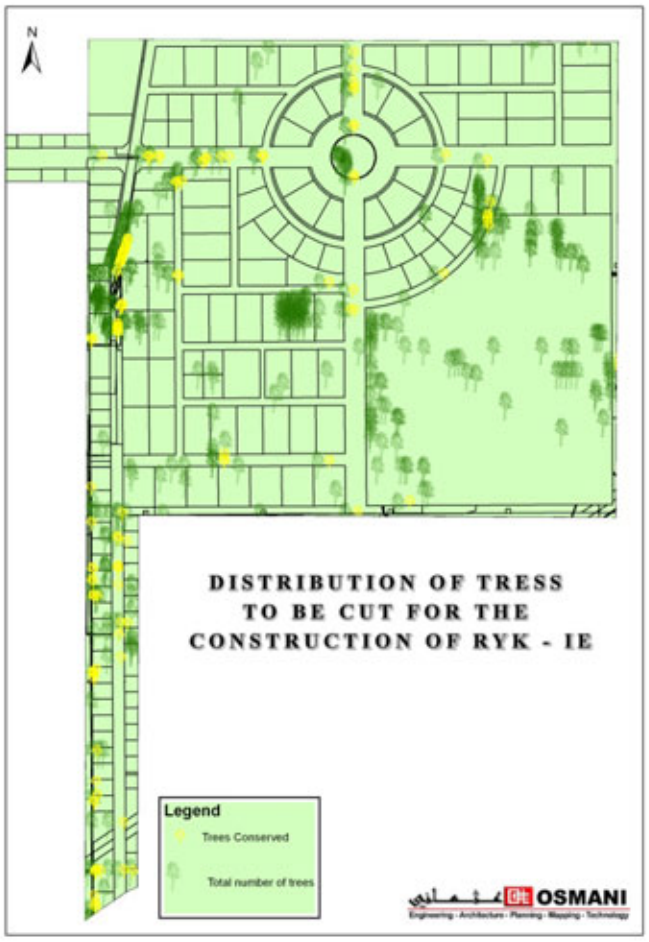


Figure 69: Existing Trees at the Site of RYK-IE

Impacts

Total number of trees = 904
Trees to be Affected = 500
Trees conserved /readjusted = 404

Main species proposed in the project area:

- Dalbergia sissoo (shisham),
- Tamarix aphylla
- Morus alba (Mulberry), and
- Eucalyptus camaldulensis (sufaida).

To facilitate the widening and expansion of roadside plantation need to be removed and disposed accordingly after completion of roads new plantation with more intensity shall be carried out in two rows of trees on either side of roads Trees may be planted, each at a distance of 50 ft from the other on both sides of the 250 ft wide spinal road, 150 ft wide lateral roads and 66 ft. minor roads. For each tree to be cut, two trees to be planted to conserve the biodiversity.

6.4.2. Soil Contamination

The following practices will be adopted to minimize the risk of soil contamination:

- The contractors will be required to instruct and train their workforce in the storage and handling of materials and chemicals that can potentially cause soil contamination.

- Solid waste generated during construction and at campsites will be properly treated and safely disposed of only in demarcated waste disposal sites.

Oil leakages, chemicals and other materials will be minimized by providing appropriate storage places depending on the type of material for storage. Oil and other lubrication material should be stored in water proof tanks especially built for oil storage. These tanks should be built away from the main road and residential areas. Access to these tanks should only be allowed to concerned personnel. Safety equipment like fire extinguishers should be placed near to these places along with signs for danger and fire.

Workers must be familiar with the Material Safety Data Sheets (MSDS) of each chemical used at site. MSDS are provided with each chemical drum.

Chemicals will be stored as per their MSDS. Utmost care should be taken during the handling of these chemicals. Accidental spills of fuels or other materials pose a potential for contamination of soils. Precautions should be

taken to prevent spills and all workers should be trained in proper handling, storage and disposal of hazardous or toxic materials.

Proper solid waste storage will be adopted for the project such as:

- Fiber glass Waste Bins with lids and easy unloading mechanism should be placed throughout the Project Area.
- Separate bins for recyclable materials should be provided.
- All garbage or other putrid waste should be securely wrapped in recycled papers or similar material bags.
- All cans, bottles, or other food containers would be rinsed free of food particles and drained before being placed in collection containers.
- Collection containers should be kept tightly sealed or covered at all times. Solid waste must not protrude or extend above the top of the container.

Keeping in view the quantities and composition of solid waste generated from different clusters, it is proposed that the solid waste collection, transportation and disposal system should be designed. The solid waste management system should involve the following major operations:

6.4.3. Collection of Waste

As far as solid waste generated from commercial and institutional area is concerned, it is proposed that manual and vehicular system of collection be adopted.

The vehicular system of waste collection is not only fast but also convenient. However, in case of industrial waste collection, it is proposed that each industry should be responsible to transport the waste upto the storage place or transfer station located within or outside the project area.

6.4.4. Storage Place / Transfer Station

For storage of the solid waste at industrial level it is proposed that two types of waste bins should be placed within the premises of each industrial unit to contain organic and inorganic waste separately. This arrangement will segregate the waste at point source. Finally the organic waste will be transferred to the transfer station and inorganic waste will be recycled or reused. However, if any toxic or hazard waste is encountered it will be properly land fill through appropriate measures.

From the transfer station, waste will be transported to the sanitary landfill site. The solid waste system shall consist of the following:

6.4.5. Land Fill Site

It is proposed that instead of providing all the above facilities by owner, the solid waste system can be handled by private Contractors who will be responsible for providing all the facilities for collection of solid waste up-to its disposal at the land fill site. This matter shall be worked out before the process of disbursement for timely completion of the project. During the design of the land fill site facility, the following important factors shall be considered:

- Availability of cover materials
- Provision of effective drainage system
- Leachate collection and disposal system
- Provision of geo-membranes such as HDPE etc.
- Fire prevention arrangements
- Ground water protection system such as vertical walls etc.
- Operational and management plan

6.4.6. Impacts on Water Resources

This section explains how the proposed project will affect the water resources use, contamination of water bodies and groundwater, siltation of surface water resources and alterations in drainage pattern; the section also describes mitigation measures to manage these impacts.

6.5. USE OF LOCAL WATER SUPPLIES

Local water supplies will need to be tapped to meet campsite and construction requirements, bringing its use into competition with local use.

6.6. CONTAMINATION OF SURFACE AND GROUND WATER RESOURCES

- Surface and subsurface water resources in the vicinity of the proposed project site may be contaminated by fuel and chemical spills, or by solid waste and effluents generated by the kitchens and toilets at construction campsites.

- Irrigation channel may become silted by borrow material in the runoff from the construction area, workshops and equipment washing-yards.

- During operation stage, about 3-7 imperial MGD of wastewater from industrial units, commercial and offices is expected to be generated. If proper disposal of wastewater will not be provided, it may contaminate natural streams/canal.

- If cross-drainage structures are not adequately maintained, culverts and water channels tend to become choked with debris and eroded soil, adversely affecting the quality of surface water.

- Seepage of polluted water during monsoon season through garbage areas will deteriorate the groundwater quality during operation stage of the Project.

- During the rainy season storm water that would be finally disposed off through open drainage system may contain certain types of pollutants such as grit, suspended solids, oil, grease, etc. These pollutants could exist on the outside paved areas of industrial units, surface of primary and secondary road network, and open unpaved areas and may contaminate the existing water resources.

6.7. SILTATION OF IRRIGATION CHANNEL

- Irrigation channels may get siltation by borrow material in the runoff from the construction area and cutting/blasting of rocks in the project area.

- During operation of the project, due to increased runoff, soil erosion will take place, which will ultimately silt up the nearby surface water resources.

- Road embankments restricting cross-drainage, and causing the land on either side of the embankment to flood in case of heavy rains, may cause natural streams and irrigation channels to become silted.

7. MITIGATION MEASURES

Measures to mitigate the adverse impact on water resources and surface drainage patterns will be incorporated into the project design and are discussed below:

7.1. USE OF LOCAL WATER SUPPLIES

- In the project area, prior to start of construction activities, the availability of water will be assessed to evaluate the impacts on the community resources.

- No existing water resources under the use of community will be exploited by the Contractor for campsite facilities as well as construction purposes without consultation with concerned community.

- Availability of water for campsite facilities and construction purposes will be ensured by the Contractor prior to start of construction activities. Irrigation channel passing through the Project site, if water is to be exploited from the irrigation channel, permission would have to be taken from Irrigation and Power Department of Punjab.

7.2. CONTAMINATION OF SURFACE AND GROUND WATER RESOURCES

- Camps will be located at least 500 m away from the nearest local settlement to prevent the contamination of community-owned water resources like wells, hand pumps, shallow wells, etc.

- Construction camps will be established in areas with adequate natural drainage channels in order to facilitate flow of the treated effluents.

- Wastewater effluent from contractors' workshops and equipment washing-yards will be passed through gravel/sand beds to remove oil/grease contaminants before discharging it into natural streams/drains. According to local laws, the BOD5 concentration in sewage must be brought down to less than 80 ppm before being discharged into a natural stream with a capacity to dilute the effluent further by 10 times.

- Borrow pits and natural depressions with pre-laid impervious liners will be used to dispose of scarified/scraped asphalt (if involved), and then covered with soil. This will check potential groundwater contamination.

- Retention work will be carried out on roadside drainage channels as per the drainage design to prevent silting. Similarly, new drains will be constructed for proper drainage of the area. It will reduce the siltation of natural streams.

- It is suggested that wastewater from industrial processes and sanitary sources should be properly treated before its disposal or reuse. The wastewater treatment process depends on the concentration and type of wastewater, whereas the degree of treatment depends on the required effluent quality and its final re-use.

- For proper treatment of the wastewater generated from the Industrial Estate, project has made provision of combined effluent treatment plants to cater for a quantity of about 3-7 MGD. The plant will be designed for the following influent and effluent characteristics.

Table 10: Characteristic of waste water

Stage of Waste Water	**Characteristics of the Wastewater**		
	BOD_5 (mg/l)	**COD (mg/l)**	**TSS (mg/l)**
Influent	350	900	300
Effluent	30	150	30
Percentage Removal	91.4	83.3	900

To bring the quality of influent within limit as specified in above table, will be responsibility of individual industrial units. For this purpose each, industry will be responsible to treat the effluents following the National Environmental Quality Standards (NEQS) as referred in 3.2.6 Other than above mentioned effluents, individual industries will also be responsible for in house treatment following the NEQS limits.

- Treated wastewater will be disposed of into the nearby ditch drain and it will be ensured that treated waste water should never be allowed to dispose of into the canal distributory flowing through project area.

- To minimize the wastewater quantity, efforts will also be made for reuse of the water within industry after primary treatment (if possible).

- Recycling of wastewater from one process and one industry to another inside the industrial city.

- Use of treated effluent as make-up water wherever possible.

- To design systems that recycle water repeatedly for the same purpose e.g. cooling of towers.

- It is recommended to provide a retention pond outside the project at the ct boundary of Basti Adam Sahaba and would be integrated with the proposed storm water drainage system. The primary objective of these ponds is to provide primary treatment to the polluted rain water. The major purification process within the retention pond is sedimentation. During the sedimentation suspended solids will be removed by gravitation. Settling of these sorts of particles will remove inorganic as well as organic pollution. However, it is recommended to provide oil skimmers at the top of these ponds for removal of oil that would be appeared at the surface of the pond during the sedimentation process.

- To protect the ground water, surface water and soil contamination, provision of geo-membrane at the solid waste management sites (land fill site).

7.3. SILTATION OF NATURAL STREAMS AND IRRIGATION CHANNELS

- Appropriate locations and required capacities for new cross-drainage structures across road embankments, intersecting natural streams and irrigation channels, to protect nearby agricultural land and settlements from flooding. It will also reduce the chances of siltation of the streams due to un-disturbed flow.

- Main drainage courses within the proposed development area should lined to avoid erosion. Steep bed slopes will be avoided

- It will be ensured that storm water drains and road drainage system are periodically cleared to maintain water flow.

7.3.1. Impacts on Ambient Air Quality and Noise Level

This section discusses the impact of the construction and operation on the ambient air quality and noise levels in the proposed Project Area. It also describes the mitigation measures to manage these impacts.

7.4. AMBIENT AIR QUALITY

Air quality will be affected by the fugitive dust and emissions from the construction machinery, and vehicular traffic during the construction phase. Emissions may be carried over long distances, depending on wind speed and direction which generally varies with seasons, the temperature of the surrounding air, and atmospheric stability.

The critical sources of air pollution during the construction phase are listed below:

- Asphalt plants that generate toxic emissions containing unburnt carbon particulates, sulfur compounds, and dust from aggregate preparation
- Quarry areas that generate fugitive dust during the rock blasting and crushing.
- Earth haulage trucks that generate dust, particularly during loading and unloading processes.
- Commissioning of Project will affect the air quality in the area due to the increase in traffic volume and frequency.
- Most of the industries in each industrial sector will cause air emissions resulting in deterioration of ambient air quality and ultimately effecting human health. NOx and SOx will be dry deposited around the emission sources and when carried away may cause wet deposition in the form of acid rain.

7.5. NOISE LEVEL

Noise generated by the construction machinery during the project construction and subsequently by vehicular traffic during operation stage is likely to affect the project area particularly the sensitive receptors like schools, hospitals etc. However, no sensitive receptor has been observed within the project area.

Industrial units such as construction material industry, marble industry, textile industry will create noise and vibrations. The direct affectees of this noise pollution will be the workers working in the Industrial Estate.

7.5.1. Mitigation Measures

The following measures will be implemented to mitigate the impacts on the ambient air quality and noise level:

7.6. AMBIENT AIR QUALITY

- Good engineering practices will be used during the rock blasting at quarry areas to minimize the impact of dust emissions.

- The existing quarries will be used to borrow the aggregate materials.

- Quarry areas and asphalt plants will be located at least 500 m downwind from populated areas, and Contractors' camps, to minimize the impact of dust emissions.

- Asphalt and concrete batching plants will be equipped with dust control equipment such as fabric filters or wet scrubbers to reduce the level of dust emissions.

- Vehicles and other construction machinery should be properly tuned and maintained, so as not to emit any smoke.

- The NEQS applicable to gaseous emissions generated by the construction vehicles, equipment and machinery will be enforced during the construction works.

- Where dust emissions are high, katcha tracks will be overlain with shingle or surface treated. Where necessary, dust emissions will be reduced by a regular sprinkling of water for keeping the dust settled, at least twice a day.

- Haul-trucks carrying, earth, sand, aggregate and other materials will be kept covered with tarpaulin to help contain construction materials being transported within the body of each carrier between the sites.

- Emissions of SOx, NOx and PM are anticipated to be common air pollutants in case of Industrial Estates. For PM control gravitational settling chambers, cyclones, fabric filters or electrostatic precipitators can be installed. However, selection of air pollution control devices should be done carefully keeping in view its removal efficiency and its economical viability.

- Sulfur oxides are the gases of principal concern in furnace exhausts. It has been demonstrated that wet scrubbers provide good control for both sulfur oxides and particulates. Usage of multi-tube cyclones may remove varying amounts of these pollutants. It has been reported that treating the exhaust streams with an alkaline spray converts gaseous sulfur oxides to solids which can then be collected as particulates.

- Control systems for air pollution control will generate solids. These presently have little or no economic value and are not considered to be an attractive source of chemicals. Generally, these solids are best disposed of by recycling to other industrial process or through land filling.

- Control of gaseous emissions arising from fuel sources can be achieved by changing to fuels having a lower content of certain pollutants, such as sulfur.

- PIE will set up a system to monitor the air quality in the project area in accordance with the accepted international standards. The system will cover protocols for sampling and analysis, assessment of air quality at sensitive locations, reporting, and information sharing. PIE will coordinate all the efforts in this area with the EPD Punjab and local authorities.

- Ensure the proper tuning of the construction vehicles.

7.7. NOISE LEVELS

- PIE will set up a system to monitor the noise levels in the project area near the construction activities.

- To facilitate the EPD Punjab in enforcing noise standards as prescribed in the NEQS.

- During operation stage of the Project, proper mitigation measures will be provided to the sensitive sites (like hospitals, schools, training centers, etc) including vegetative barrier, double glazed windows, etc.

- Noise generated from the plant machinery such as Generators, Turbines and other moving parts will be reduced by using protective covers made of noise absorbing material. All the noise generating machinery will be placed inside the power plant and industrial units building to reduce the noise levels for outside of these units. Workers working near the noise generating machines will be strictly required to use ear muffs and other appropriate measures.

7.8. BIOLOGICAL ENVIRONMENT

The impact on flora and fauna and corresponding mitigation measures are described in the following paragraphs:

7.8.1. Impacts on Flora and Fauna

7.8.1.1. Flora

7.8.1.1.1. Trees

In the project area from the cultivated fields about 500 trees may have to be cut as per design requirements during implementation of the Project. As these scattered trees are small in number, their removal will cause no significant negative environmental impact. As a matter of fact, farmers themselves cut these trees on maturity or whenever they require them for domestic use or to supplement their income and plant new trees in their place.

7.8.1.1.2. Shrubs

The selected area is generally devoid of shrubs and no significant impacts are envisaged due to removal of shrubs.

i. Trees and Bushes

The following mitigation measures will be adopted to alleviate the adverse impacts on the tree growth of the area.

- Landholders will be paid compensation for the loss of their standing trees, in accordance with the prevailing market rates. The landholders may be allowed to salvage the wood of the affected trees.

- A tree plantation program will be incorporated into the detailed design not only to compensate the loss of trees but also to enhance the esthetic view as well as to reduce the air and noise problems.

- Existing access tracks will be used for borrow of construction material and new paths will be constructed only in case when no existing path is available to avoid damage to the existing trees and bushes.

- While making paths for carriage of construction materials to the site care will be taken that minimum land is utilized and minimum area is disturbed. Cutting of trees should be avoided by making diversions.

- The camps and workshop facilities will be established on barren land; however, if such type of land is not available, it will be ensured that minimum clearing of the vegetation occurs and minimum damage to trees and undergrowth is ensured.

- The Contractor's staff and labour will be strictly directed not to damage any vegetation such as trees or bushes in the nearby areas.

- Contractor will provide the fuel wood/gas cylinders at the camps for cooking purposes and cutting the trees/bushes for fuel will not be allowed.

7.8.1.2. Fauna

7.8.1.2.1. Mammals and Reptiles

During the construction phase, there will be negative impacts on the mammals and reptiles of the area. Mammals, such as squirrel, jackal etc. will avoid these areas for fear of being hunted. Same will be the case with reptiles; some reptiles might be killed during the digging and dragging operations.

7.8.1.2.2. Birds-Avi Fauna

Birds will try to find shelter and food somewhere else and will tend to move away from the Project site for fear of being hunted/trapped.

7.8.1.2.3. Migratory Birds

Construction of the RYK-IE will not have any impact on the migratory birds, because the proposed site is far away from the main sanctuaries or water bodies and game reservoirs.

i. Mammals and Reptiles

- Hunting and harassing of wild animals shall be strictly prohibited and Contractors will warn their labour.

- Lights used in the camps, during construction activities will be kept to the minimum requirement. In the wildlife sensitive areas, upward scattering lights will preferably be used.

- Vehicle speed will be controlled to avoid incidental mortality of small mammals and reptiles.

- Periphery of the camps will be fenced and gated to check the entrance of the wildlife into the construction camps.

- Camp wastes harmful to wildlife should be properly disposed off/dumped.

ii. Birds

Although no significant impacts have been envisaged on the birds but even staff working on the project should be given clear orders, not to shoot snare or trap any bird.

iii. Migratory Birds

As no impacts have been envisaged, so no mitigation measures are required.

7.8.1.2.4. Fauna

7.9. SOCIOECONOMIC AND CULTURAL ENVIRONMENT

This section describes the impact of the proposed Project on local communities, construction workers, indigenous and vulnerable people as well as on structures or sites of cultural and religious significance.

7.9.1. Social Impacts

7.9.1.1. Impacts on Local Communities/Workforce

The area's surrounding communities will be affected during the construction and operation phases as follows:

- During the construction phase the general mobility of the local residents and their livestock in and around the project area is likely to be hindered.
- Unmonitored construction activities, e.g. blasting may create an accident risk for the local residents particularly their children at quarry areas.
- Usage of Community's common resources like potable water, fuel wood etc. by Contractor workforce may create conflicts between the community and the Contractor.
- Community will have to face the noise and dust problems during the construction phase and air and noise emissions during operation stage.
- Induction of outside workers in the Contractor labor may cause cultural issues with the local community.

- Theft problems to the community by the Contractor workers and vice versa.

- Pollution of community resources during construction and operation stages.

7.9.1.2. Loss of Income

- Local people will lose their business activities due to implementation of the Project particularly persons settled in the project area. The business activities including shops, agricultural crops and other misc. activities.

- Induction of unmanaged wastewater during construction and operation stages into the nearby lands may restrict their current usage for agricultural purposes.

7.9.1.3. Gender Issues

- As the project area lies close to the rural areas and rural community, women activities in the field may become affected due to the construction activities.

- The rural women normally use the open field latrines and their privacy may suffer due to the project activities.

- The induction of outside labor may create social and gender issues due to the unawareness by them of local customs and norms. It will also cause hindrance to the mobility of local women.

7.9.1.4. Indigenous, Vulnerable and Women Headed Households

- During the social field survey of the project, no indigenous group of people was identified. So, no impact on the indigenous people is envisaged due to the implementation of the project.

- Income of vulnerable people *i.e*. squatters settled on Government land may be affected due to the implementation of the Project, like relocation of their infrastructure, loss of land, crops, trees, etc. The owners of the affected structures identified during the field visits are also falling below the poverty line.
- No women headed household was identified during the social survey of the Project.

7.9.1.5. Safety Hazards

- Occurrence of accidents/incidents during the construction and operation stages may occur to the workers.

- During the operation stage, people believe that they will be prone to danger due to the current flows from towers, breaking of conductors, etc by the transmission line.

- Safety of general public at blasting sites may be under threat.

8. PUBLIC CONSULTATION

Public consultation is a very important component of any development project because public perception is a key to success for the implementation of the project. On the other hand, it builds the sense of ownership and affiliation of the local people with the proposed project. For this purpose, a questionnaire base socioeconomic survey has been arranged and the relevant information on RYK-IE from the local people has been gathered during the third week of November 2011 In this regard, all the settlements within the vicinity of RYK-IE have been selected. A survey has been conducted for the settlement of Basti Adam Sahaba, Basti Manzoor Malarain and Chak No 5 situated around RYK-IE. The largest of these settlements is Basti Adam Sahaba having more than 700 houses and Manzoor Malarain is only having 15-20 houses, whereas, Chak No.5 located at N-5 rapidly expanding with 60 houses which will be further expanded very soon after the establishment of RYK-IE. As it is obvious from (Figure 74). That there were total 34 respondents randomly selected from the localities out of which 70% from Basti Adam Sahaba only 17% from Chak No 5 and rest from Basti Manzoor Malarain.

Figure 70: One to one consultation in Basti Adam Sahaba

Figure 71: Group consultation near RYK-IE

The data Gathered through questionnaire is compiled and analyzed through spread sheet analysis.

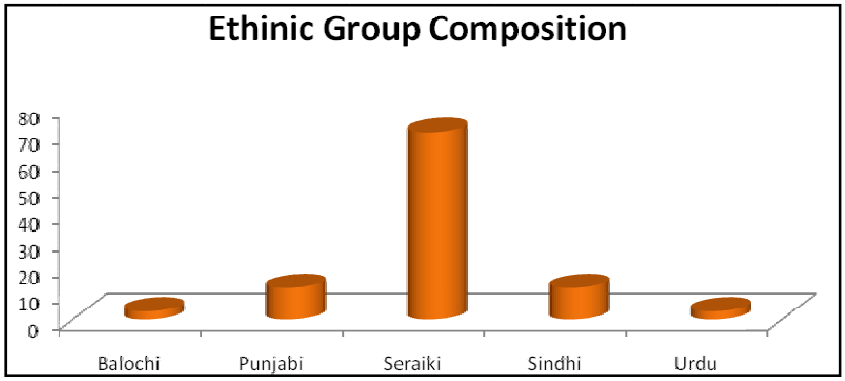


Figure 72: Ethnic groups composition in the vicinity of RYK-IE

It has been found that Mother tongue of most of the respondents or the majority language is Seraiki about 70%, whereas Punjabi and Sindhi account for 12% each Figure 73. The age of respondent falls within 21-40, however, young age people of 18-20 and above 40 were also consulted (Figure 75) Al most all respondent were males and majority of them were the head of the family as well.

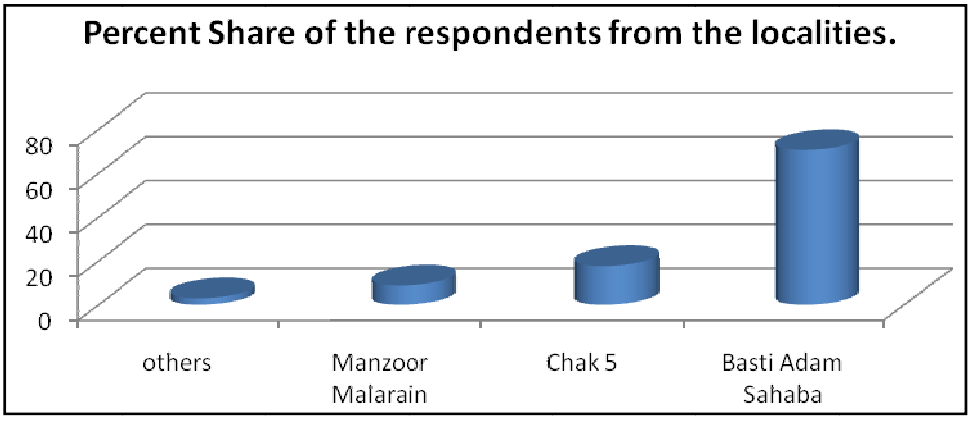


Figure 73: Percent Share of the respondents from the localities

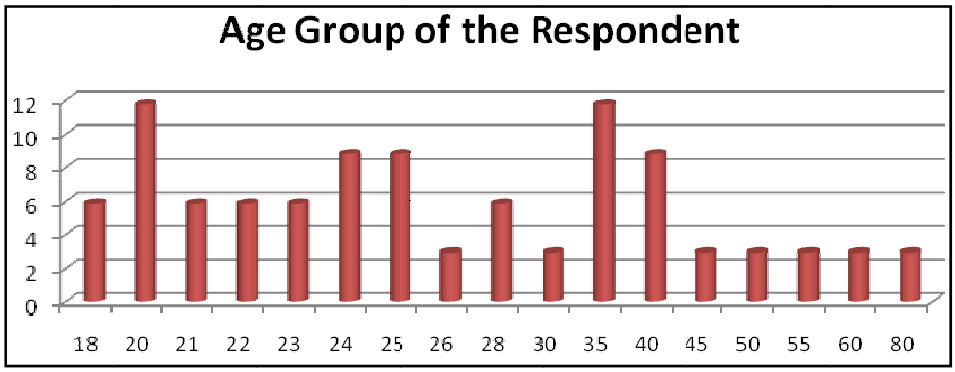


Figure 74: Age Group of the Respondent

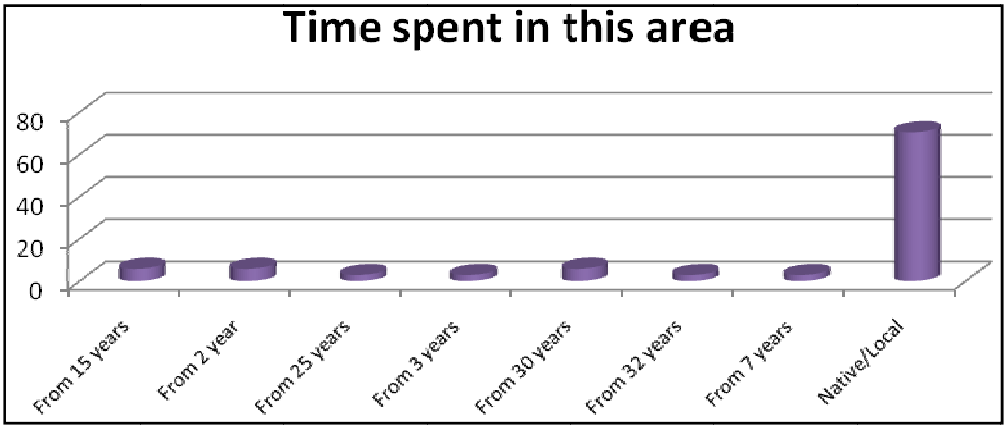


Figure 75: Duration of Living of local people

Regarding the question on the origin of the respondents, about 70% of the respondent replied than they are in this area since their birth, nevertheless, most of respondent living in the area from more than five years. Similarly, most of the people are here since their birth only few come here from Sindh, Khanewal , Rahim Yar Khan and Sadiqabad.

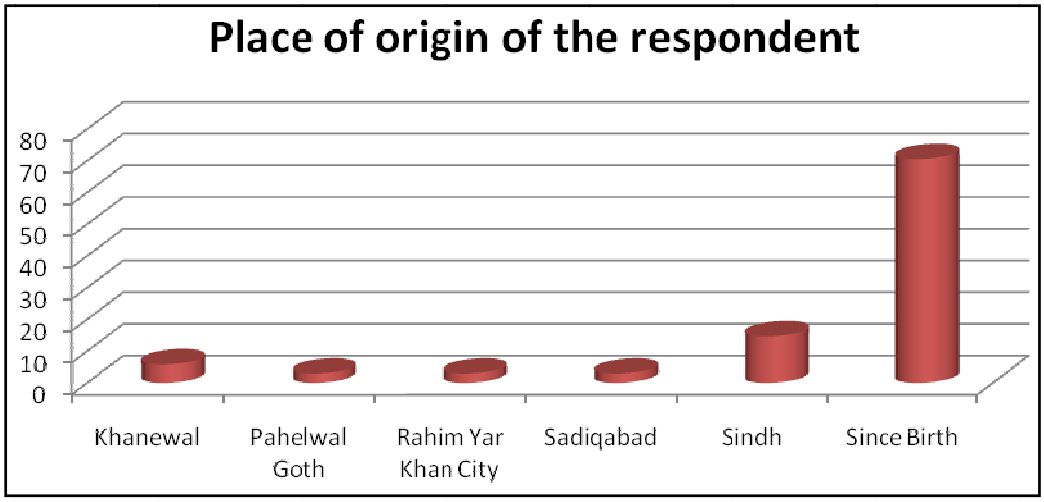


Figure 76: Place of origin of the respondent

On question regarding their preference of this area, they mainly come here because of their relatives.

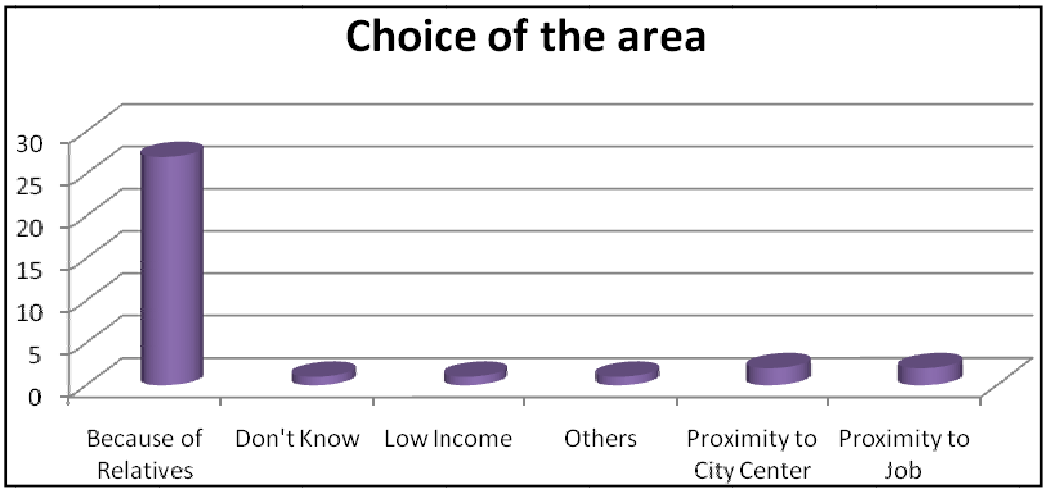


Figure 77: Choice of the area

About 94% of peoples are well aware about the industrial Estate project. This awareness has also been raised up because of the compensation of the land to the local people.

The people are generally well aware of the benefits of this project, as about 94% are in the favor of the project for the generation of jobs and good local economy

As revealed from the data about 91% people see this project as major trust in the local economy for the local population.

Majority of the respondent area concerned about the expected pollution as usually generated by such projects.

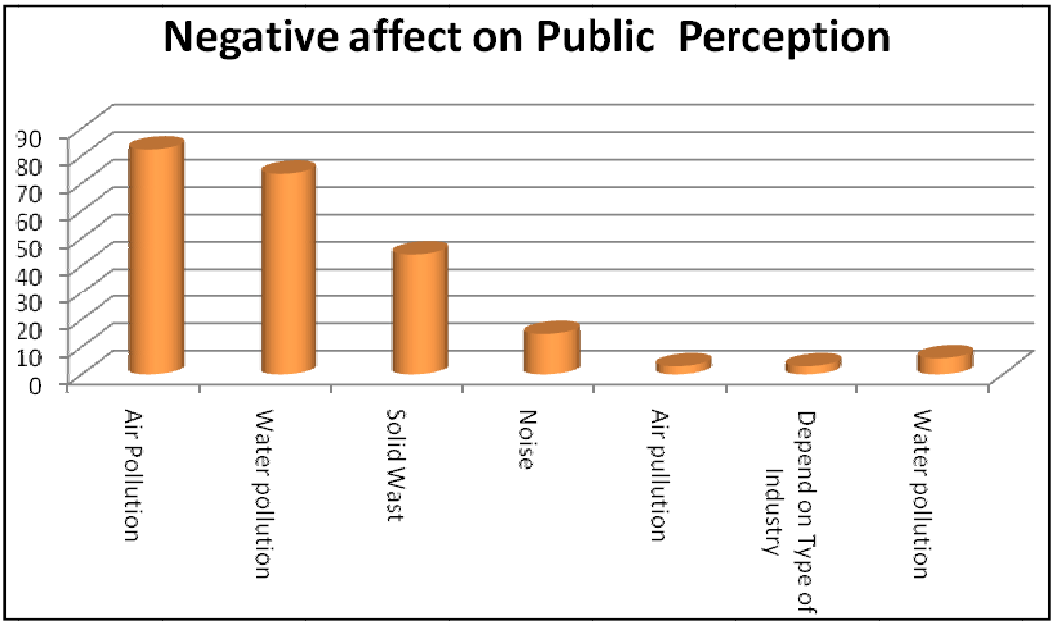


Figure 78: Negative effect on Public Perception

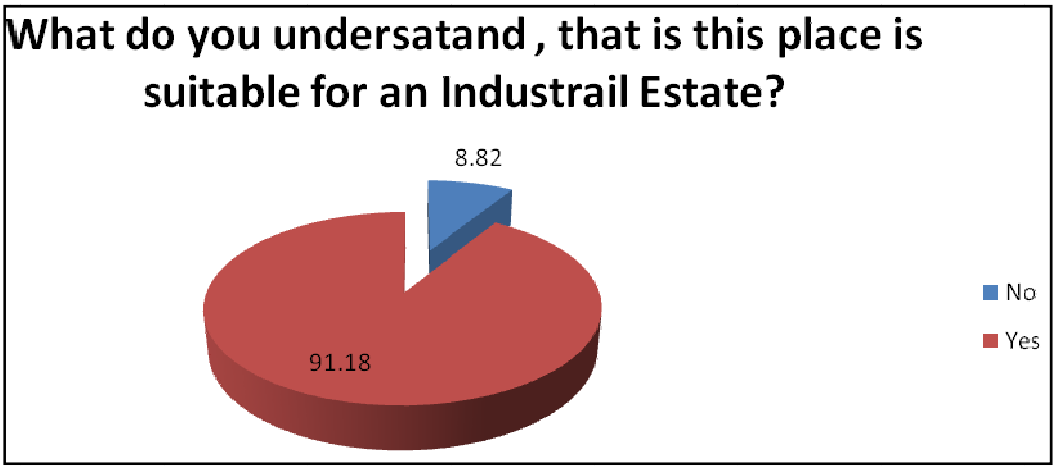


Figure 79: Perception of Local people

Majority 91% of the respondents are strongly supporting this estate at this location as this has proximity to N-5 and neighboring cities.

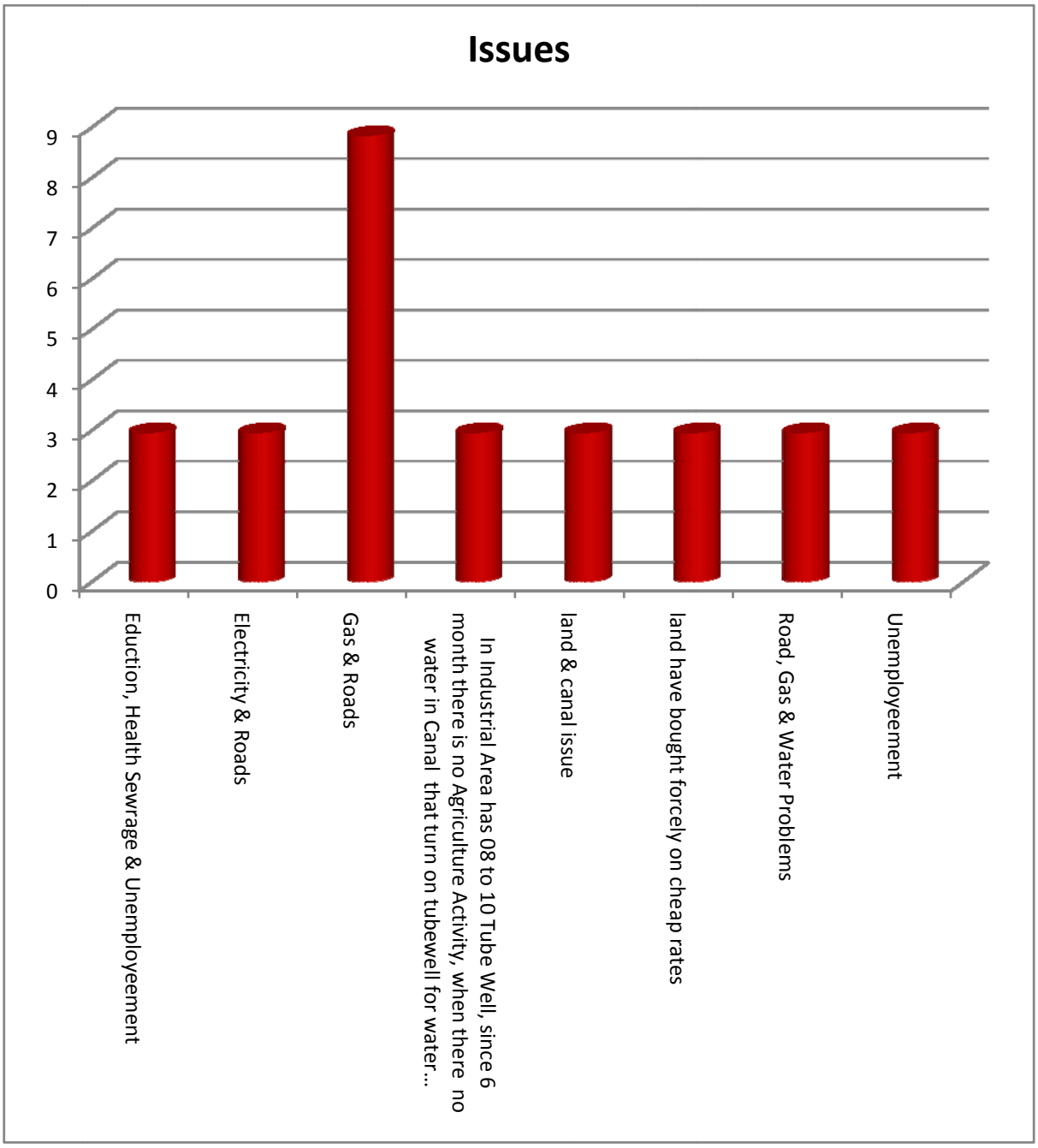


Figure 80: Local public Issues

About 70% respondents were not been able to identify any significant issue. However, some of the respondent are concerning with the access road and supply of Sui Gas in the area they would like to see these utilities very soon in the project area.

9. ENVIRONMENTAL MANAGEMENT PLAN

This chapter provides Environmental Management Plan (EMP) of the proposed project. This EMP describes the mitigation and management measures to address the environmental issues during construction and operation phases of the project.

9.1. OBJECTIVES OF THE ENVIRONMENTAL MANAGEMENT PLAN

The EMP has the following objectives:

- To outline functions and responsibilities of responsible persons.
- To state standards and guidelines, which are required to be achieved in terms of environmental legislation.
- To outline mitigation measures and environmental specifications which are required to be implemented for all phases of the project in order to minimize the extent of environmental impacts and to manage environmental impacts associated with the proposed Rahim Yar Khan Industrial Estate (RYK-IE).
- To prevent long-term or permanent environmental degradation.
- To identify training requirements at various levels.

9.2. SCOPE OF ENVIRONMENTAL MANAGEMENT PLAN

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

9.2.1. Design and Construction Phase

This section of the EMP provides management principles for the construction phase of the project. Environmental actions, procedures and responsibilities as required within the construction phase are specified. These specifications will form part of the contract documentation and, therefore, the Contractor will be required to comply with the specifications to the satisfaction of the Project Manager and Environmental Control Officer, in terms of the construction contract.

9.2.2. Operation and Maintenance Phase

This section of the EMP provides management principles for the operation and maintenance phase of the project. Environmental actions, procedures and responsibilities as required from proponent within the operation and maintenance phase are specified.

This EMP is a dynamic document which will be updated as required on a continuous basis. Any amendments made, must be submitted to both the Environmental Officer and Project/Plant Manager for approval prior to implementation.

9.2.2.1. Roles and Responsibilities

The organizational roles and responsibilities of the key players are summarized below:

9.2.2.2. Roles

Proponent: The project proponent will undertake overall responsibility for compliance with the EMP. Proponent will carry out verification checks to ensure that the contractors are effectively implementing their environmental and social requirements.

Contractors: The contractors will implement the majority of environmental and social mitigations as required by their contract with proponent. The contractors will carry out field activities as part of the proposed project. The contractors are subject to certain liabilities under the environmental laws of the country, and under its contract with proponent.

9.2.2.3. Management Responsibilities

The responsibilities of the client and contractor are briefly described below:

- Primary responsibilities:
  - As regards environmental performance during the project, the Chief Executive (or officers nominated by him) of the proponent in will assume the primary responsibilities on behalf of both the project proponent and contractor.
  - Proponent's Project Manager will be responsible for EIA and EMP compliance throughout the project on behalf of the company itself.

- Proponent will coordinate with the concerned government departments.

- Project management and control during construction:

  - Carrying out construction activities in an environmentally sound manner during the project, will be the responsibility of the contractor's site manager.

  - Proponent's Construction representative will be responsible for the overall environmental soundness of all field operations.

- Project management and control during operation:

  - Operation of RYK-IE in an environmentally sound manner will be the responsibility of the chief executive of the Proponent Company or person nominated by him.

  - Proponent's EHS will be responsible for the overall environmental soundness of all field operations.

9.3. COMPONENTS OF THE EMP

The EMP consists of the following components:

- Mitigation Plan.
- Monitoring Plan.

9.3.1. Mitigation Plan

The mitigation plan is a key component of the EMP. It lists all the mitigation measures identified in the EIA and the associated environmental or social aspect.

9.3.1.1. Mitigation Plan for Design & Construction Phase

The mitigation measures for design & construction phases of project are presented in (Table 11). The measures are organized under the following environmental aspects of the project activities during construction phase:

- Construction noise.
- Ambient Air Dust.
- Vehicle and equipment exhaust.
- Soil contamination.

- Soil Erosion.
- Water Management.
- Waste water.
- Solid Waste.
- Storage and handling of hazardous substance.
- Hindrance in Aviation Traffic
- Occupational Health and safety.

9.3.1.2. Mitigation Plan for Operation Phase

The mitigation measures for plant operation are presented in Table 12 the measures are organized under the following environmental aspects of the project activities:

- Design stage environmental aspects
- Air Emissions.
- Ground Water Withdrawal.
- Effluents.
- Operational Noise.
- Impacts on Flora & Fauna.
- Solid Waste Management.
- Storage and handling of hazardous substance.
- Hindrance in Aviation Traffic
- Occupational Health and Safety.
- Disaster & Emergency Response Management.

9.3.2. Monitoring Plan

Environmental monitoring is a vital component of the environmental management plan. It is the mechanism through which the effectiveness of the environmental management plan in protecting the environment is measured. The feedback provided by the environmental monitoring is instrumental in identifying any problem and planning corrective actions.

9.3.2.1. Objectives of Monitoring

The main objectives of the environmental monitoring will be:

- To provide a mechanism to determine whether the authorities responsible for the project are carrying out the project activities in conformity with the EMP.

- To identify areas where the impacts of the projects are exceeding the criteria of significance and, therefore, require corrective actions.

- To document the actual project impacts, comparing them with the predictive ones, on physical, biological, and socioeconomic receptors, quantitatively where possible, in order to design better and more effective mitigation measures.

- To provide data for preparing the monitoring reports to be submitted to the regulatory authorities (EPA Punjab).

9.3.3. Environmental Monitoring Plan

The detailed monitoring plan will be finalized prior to commencement of the construction. The monitoring requirements assessed in the EIA are presented in (Table 12) and (Table 13) for the construction and operation phases respectively.

Table 11: Mitigation Plan for Design & Construction Phase

Sr. No	Environmental or Social Aspects	Measure	Responsibility
	Design Stage Environmental Aspects	Selection of adequate land *i.e.* not prime agriculture land Selection of environmental friendly technologies Provision of treatment facilities like recovery plant and recycling units etc Provision of combined effluent treatment plant Provision of proper sewerage and solid waste management system Propose adequate roads, sewerage, drainage, electricity etc in the design Propose raising of road level to mitigate flood disaster	Proponent & Design Consultant
	Construction Noise Control Plan	Periodic surveys will be conducted for noise levels from construction equipments, operational machinery and vehicles.	Construction Contractor
		All high noise activities will be scheduled during the day time	Construction Contractor
		Blowing of horns will be prohibited and construction traffic will be kept to a minimum during night time	Construction Contractor
	Ambient Air Dust Control Plan	Water will be sprinkled on all exposed surfaces to suppress emission of dust	Construction Contractor
		Frequency of sprinkling will be kept such that the dust remains under control.	Construction C ontractor

Sr. No	Environmental or Social Aspects	Measure	Responsibility
		Dust emission from soil piles and aggregate storage stockpiles will be reduced by keeping the material moist by sprinkling of water at appropriate frequency or erecting windshield walls on three sides of the piles such that the wall project 0.5m above the pile, or covering the pile, for example with tarpaulin or thick plastic sheets, to prevent emission.	Construction Contractor
	Vehicle and Equipment Exhaust Control Plan	All vehicles, generators and other equipment used during the construction will be tuned and maintained in good working condition in order to minimize emission of pollutants	Construction Contractor
		The stack height of the generators will be at least 3 m above the ground	Construction Contractor
	Soil Contamination	Spill prevention trays will be provided and used at refueling locations	Construction Contractor
		On-site maintenance of construction vehicles and equipment will be avoided as far as possible.	Construction Contractor
		In case on-site maintenance is unavoidable, tarpaulin or other impermeable material will be spread on the ground to prevent contamination of soil.	Construction Contractor
		Regular inspections will be carried out to detect leakages in construction vehicles and equipment.	Construction Contractor
		All vehicles will be washed in external commercial facilities.	Construction Contractor
		Fuels, lubricants, and chemicals will be stored in covered bounded areas, underlain with impervious lining.	Construction Contractor
		Appropriate arrangements, including shovels, plastic bags and absorbent materials, will be available near fuel and oil storage areas.	Construction Contractor
		Contaminated soil will be removed from the site and taken to the incineration.	Construction Contractor
		Emergency plan for spill management will be prepared and inducted to the staff for any incident of spill	Construction Contractor
	Soil Erosion	The corridor that is disturbed during construction will be kept to a minimum.	Construction Contractor
		The construction site will be properly marked	Construction Contractor
		The movement of machinery will be restricted to the construction area	Construction Contractor
		Soil erosion control measures (e.g. silt fences, rip rap) will be undertaken where necessary during construction	Construction Contractor
		The construction sites will be restored as close as possible to their pre-project conditions after completion of construction activities. For this purpose a Reinstatement Plan will be prepared that may include the following: a. Removal of debris, excess construction material, cable, machinery parts or timber	Construction Contractor

Sr. No	Environmental or Social Aspects	Measure	Responsibility
		b. Disposal of surplus soil c. Repair to damaged or blocked drainage d. Filling of all ditches and pits e. Soil erosion control measures where necessary	
	Water Management	Potable Water Supply: a. The provision of potable water and safe drinking utensils at various points on the site.	Construction Contractor
		Water Conservation: b. Create awareness and encourage the construction workforce to use water sparingly such that there is no water wastage. c. Negotiate the use of water for any purpose with the appropriate authorities and obtain written approval. d. The contractor will not make use of/collect water from any other source than those pointed out to them as suitable for use.	Construction Contractor
	Waste Water Management	e. The Contractor will submit a site design of waste / foul water management systems as part of the environmental management plan for prior approval	Construction Contractor
		f. All water discharged from the works including effluent from sewage treatment, wash water and storm-water from workshops and refueling areas, as well as all runoff from areas with pollution potential will comply with national effluent standards.	Construction Contractor
		g. Plan the layout of wash areas, batching areas and workshops with the following guidelines in mind: h. Optimise the layout to minimize disturbance to the environment and to neighbors i. Concrete slabs must slope towards a conservancy tank so that run-off water can be collected. These tanks must be emptied, at least once a week or when they are 60% full.	Construction Contractor
	Solid Waste Management	Where possible, construction wastes on site must be reused or recycled	Construction Contractor
		The Contractor must familiarize themselves with the definitions of waste and the handling, storage and transport of it as prescribed in the applicable environmental legislation.	Construction Contractor
		Integrated waste management on site will be carried out by applying, in order of preference, waste avoidance, reuse, recycling and disposal.	Construction Contractor

Sr. No	Environmental or Social Aspects	Measure	Responsibility
		Burning of waste material will not be permitted except under special circumstances and with prior approval of the Site Manager.	Construction Contractor
		The adequate facilities must be provided and maintained for waste collection (e.g. bins) at strategic locations around the site camp such as the office, garage, parking, housing facilities and locations where food is consumed.	Construction Contractor
		Waste will be sorted at source (*i.e*. the separation of tins, glass, paper etc). Recycled waste of this sort will be collected by a local contractor.	Construction Contractor
		There must be supply of waste bins/skips throughout the site at locations where construction personnel or laborers are working. The bins must be provided with lids and an external closing mechanism to prevent contents from blowing out, and must be scavenger proof to prevent animals attracted to waste. Bins must be emptied on a regular basis and the waste removed to the construction camp where it must be contained in scavenger, water and windproof containers until disposed	Construction Contractor
	Storage and Handling of Hazardous Substances	Any spills will be rendered harmless and arrangements made for appropriate collection and disposal including cleaning materials, absorbents and contaminated soils.	Construction Contractor
		Ensure that spill kits are available on site to clean up spills and leaks.	Construction Contractor
		Obtain any storage and disposal permits / approvals necessary and comply with the conditions attached to such permits and approvals.	Construction Contractor
		Ensure that only designated areas are used for the handling or storage of construction materials.	Construction Contractor
		The Contractor will furthermore be responsible for the training and education of all personnel on site who must be handling the material about its proper use, handling and disposal as well as spill response.	Construction Contractor
		An emergency procedure for dealing with spills must be established.	Construction Contractor
		Hazardous chemicals used during construction must be stored in secondary containers. The relevant Material Safety Data Sheets (MSDS) must be available on site.	Construction Contractor
		Adequate and approved facilities for the storage and recycling of used oil and contaminated hydrocarbons must be provided. Such facilities must be designed and situated with the intention of preventing pollution of the surrounding area and environment.	Construction Contractor
		Identify and maintain a register of all activities that involve the handling of potentially hazardous substances, as well as devise and supervise the implementation of protocols for the handling of these	Construction Contractor

Sr. No	Environmental or Social Aspects	Measure	Responsibility
		substances. This will include all fuels, oils, lubricants and greases.	
	Hindrance in Aviation Traffic	The terms and conditions of the NOC from Civil Aviation Authority (CAA) and the Airport Management and relevant legislations must be strictly adhered with.	Construction Contractor & Proponent
		The excessive dust generation must be controlled by the Wet methods *i.e*. sprinkling on regular basis	Construction Contractor & Proponent
		Fire fighting system and emergency response plan must be effectively implemented to avoid an outbreak of fire which could lead to generation of excessive smoke.	Construction Contractor & Proponent
		Open dumping of solid waste especially food waste must not be thrown other than specified containers and the containers must be provided with lid to prevent the gathering of the scavenging birds.	Construction Contractor & Proponent
		Solid waste management plan must be developed with considerations of this potential impact as well and then implemented in letter and spirits.	Construction Contractor & Proponent
	Occupational Health & Safety (OHS) Management	A Health and Safety Management Plan will be developed in respect of construction worker safety. This plan must be in line with Proponent's HSE Policy and relevant legislation.	Construction Contractor
		A health and safety officer/SHE Officer must be employed to monitor project activities for any potential problems.	Construction Contractor
		Contractors must adhere to the prescriptions of the relevant health and safety legislation and standards. The Contractor must familiarize himself and his employees with the contents of the aforementioned Legislation.	Construction Contractor
		The Contractor must implement adequate and mandatory safety precautions relating to all aspects of the operation. Such safety measures and work procedures/instructions must be communicated to construction workers.	Construction Contractor
		The wearing of safety equipment on site is mandatory for all personnel and construction team members. Minimum requirements must include the wearing of an approved safety helmet and safety boots. Ensure that all laborers are supplied with the appropriate safety equipment.	Construction Contractor
		Existing fences must be maintained throughout the construction period. All temporary fencing must be removed on completion of the contract.	Construction Contractor
		Speed limits must be enforced in all areas, including public roads and private property to avoid, spreading of dust and potential accidents.	Construction Contractor
		Spillages of chemicals or fluids must be cleaned up immediately using the appropriate procedures.	Construction Contractor

Table 12: Mitigation Plan for Operation Phase

Sr. No.	Environmental or Social Aspects	Measure	Responsibility
	Air Pollution Management	The RYK-IE must be modeled and designed so as to ensure stack emissions and ambient air quality will fall within the levels acceptable for regulatory bodies (*i.e*. within NEQS and where NEQS are not provided international standards must be complied with).	Proponent
		The RYK-IE must be fitted with the appropriate NOx mitigation, control equipment (wet scrubber) to minimize the production of NOx.	Proponent
		Dust control mechanisms must be utilized including the following: Boilers and diesel generator fitted with filters to reduce the amount of dust being released, filters maintained on a regular basis, any open areas must be vegetated and watered and if necessary mulched to protect surfaces from drying out, and all roads on-site must be sealed for vehicle access.	Proponent's Environment Manager
		All operational equipment must be maintained according to industry standards. This will ensure that emissions, odors and dust from stacks continue to fall within standards.	Proponent's Environment Manager
2	**Ground Water Management**	Ground water quality must be inspected periodically to identify any adverse effect on ground water.	Proponent's Environment Manager
		All zone area and chemical usage areas must be paved.	Proponent's Environment Manager
		Potentially contaminated water must be directed to a settling tank. Oily water must be removed from the site by a licensed contractor.	Proponent's Environment Manager
		Any run-off that is discharged from the site must be uncontaminated.	Proponent's Environment Manager
3	**Waste Water Management**	The CETP must be installed for the treatment of wastewater	Proponent's Environment Manager
		All water discharged from the works including effluent from sewage treatment, wash water and storm-water from workshops and refueling areas, as well as all runoff from areas with pollution potential will comply with national standards.	Proponent's Environment Manager
		The chemical analysis of the crops grown on treated waste water will be carried out on regular basis at least once for every seasonal crop to avoid the intake of contaminated food.	Proponent's Environment Manager
4	**Operational Noise**	In order to reduce the overall noise level to	Proponent's

Sr. No.	Environmental or Social Aspects	Measure	Responsibility
	Control	acceptable levels, final design of RYK-IE will ensure the level of noise from the operation must be limited to levels guaranteed by the manufacturers.	Environment Manager
		Noise from activities at the zone site during the operation must be within acceptable limits (according to the standards discussed previously), taking into consideration that maintenance activities may be required at the outside of working hours, for example, in the case of emergencies.	Proponent's Environment Manager
		Periodic monitoring of noise level will be carried out inside RYK-IE and outside at a distance of 25m around the boundary wall of RYK-IE.	Proponent's Environment Manager
		All other noise mitigation measures required to make the facility compliant with the relevant standards must be implemented to minimize the noise impacts associated with the development	Proponent's Environment Manager
5	**Fauna and Flora**	Implementation of a site rehabilitation and landscaping program	Proponent's Environment /Horticulture Manager
		Use of indigenous plants in landscaping and rehabilitation activities	Proponent's Environment /Horticulture Manager
		Plantation of fragrance producing trees to avoid odor problems (If any produces)	
		The operation and maintenance staff may not harm or kill any fauna during the operation and maintenance of the RYK-IE.	Proponent's Environment Manager
6	**Solid Waste Management**	Where possible wastes on RYK-IE must be reused or recycled	Proponent's Environment Manager
		Integrated waste management on RYK-IE will be carried out by applying, in order of preference, waste avoidance, reuse, recycling and disposal.	Proponent's Environment Manager
		The adequate facilities must be provided and maintained for waste collection (e.g.bins, containers) at designated locations within the RYK-IE.	Proponent's Environment Manager
		Waste will be sorted at source (*i.e*. the separation of tins, glass, paper etc). Recycled waste of this sort will be collected by a local contractor.	Proponent's Environment Manager
		Each industrial unit would be the responsible for the supply of waste bins/skips throughout the site at locations where construction personnel or laborers are working. The bins must be provided with lids and an external closing mechanism to prevent contents from blowing out, and must be scavenger proof to prevent animals attracted to waste. Bins	Proponent's Environment Manager

Sr. No.	Environmental or Social Aspects	Measure	Responsibility
		must be emptied on a regular basis and the waste removed to the construction camp where it must be contained in scavenger, water and windproof containers until disposed	
		Segregated waste would be disposed off according to its disposal requirement *i.e*. either recycled or reused, either incinerated or land filled	
		Open dumping of solid waste would be strictly prohibited as it would attract scavengers and ultimately create problems for flight operations of nearby airport.	
7	**Storage and Handling of Hazardous Substances**	Any spills will be rendered harmless and arrangements made for appropriate collection and disposal including cleaning materials, absorbents and contaminated soils.	Proponent's OHS Manager
		Ensure that spill kits are available on site to clean up spills and leaks.	Proponent's OHS Manager
		The (OHS) Manager will furthermore be responsible for the training and education of all personnel handling the material about its proper use, handling and disposal as well as spill response.	Proponent's OHS Manager
		An emergency procedure for dealing with spills must be established.	Proponent's OHS Manager
		Hazardous chemicals must be stored in containers made up of appropriate material, clearly labled and marked with relevant safety sign. The relevant Material Safety Data Sheets (MSDS) must be available on site.	Proponent's OHS Manager
		Adequate and approved facilities for the storage and recycling of used oil and contaminated hydrocarbons must be provided. Such facilities must be designed and situated with the intention of preventing pollution of the surrounding area and environment.	Proponent's OHS Manager
		Identify and maintain a register of all activities that involve the handling of potentially hazardous substances, as well as devise and supervise the implementation of the handling of these substances. This will include all fuels, oils, lubricants and greases.	Proponent's OHS Manager
8	**Occupational Health & Safety Management**	A Health and Safety Management Plan will be developed in respect of worker safety.	Proponent's OHS Manager
		OHS manager must adhere to the prescriptions of the relevant health and safety legislation and standards.	Proponent's OHS Manager
		Adequate and mandatory safety precautions relating to all aspects of the operation. Such safety measures and work procedures/instructions must be communicated to all the workers.	Proponent's OHS Manager

Sr. No.	Environmental or Social Aspects	Measure	Responsibility
		The wearing of safety equipment on operation of RYK-IE is mandatory for all personnel while entering in the operational areas of RYK-IE.	Proponent's OHS Manager
		Specific fire fighting measures must be considered and equipments must be placed on positions easily visible and accessible.	Proponent's OHS Manager
		Speed limits must be enforced in all areas of the RYK-IE, including public roads and private property to avoid potential accidents.	Proponent's OHS Manager
		Smoking will be restricted to only designated smoke corners outside the main plant building	Proponent's OHS Manager
		Emergency Telephone Numbers and appropriate warning sign boards, clearly denoting warning procedures and emergency exit routes, must be demonstrated at relevant locations in the facility.	Proponent's OHS Manager
		Periodic Safety training must be carried out and each visitor must be trained with necessary instructions before visiting the plant	Proponent's OHS Manager
9	**Disaster & Emergency Response Management**	A disaster management plan will be developed after the complete risk assessment of the RYK-IE process, operations and storage facilities.	Proponent's OHS Manager
		Emergency response plan and procedures will be developed such as: Emergency notification / alarm procedures including names and telephone numbers of internal and external emergency service Evacuation routes, maps, route signs etc. Directions to showers, wash stations, fire extinguishers etc.	Proponent's OHS Manager
		Special squad will be trained to cope up the emergency situations	Proponent's OHS Manager
		Regular drills will be carried out to check the effectiveness of the emergency response plan and the training of the special squad.	Proponent's OHS Manager
	Hindrance in aviation traffic	Same Environmental Management Plan as proposed for construction phase of RYK-IE.	

Table 13: Monitoring Plan for Construction Phase

Project Activity and Potential Impact	Objective of Monitoring	Parameters to be Monitored	Measurements	Location	Frequency	Responsibility
Disturbance due to noise from construction activity	To determine the effectiveness of noise abatement measures on sound pressure levels	Ambient noise level near receptors	A-weighted noise levels – 24 hours, readings taken at 15 s intervals over 15min. every hour, and then averaged	At three locations on the RYK-IE boundary and three location at the receptor level. At two point along the RoW	Baseline before start of construction: On three typical working days and one weekend During construction: Once every four weeks on a typical working day	Contractor's Environment officer
	To determine the effectiveness of noise control measures on the sound pressure level of the noise sources	Source noise level of generators, major equipment and large vehicles	A-weighted noise levels measured at 7.5 m from the source in four directions. Measurement should be taken at full throttle, typical operating and idling conditions	7.5 m from the source in four direction	Once in a month	Contractor's Environment officer
Air Quality: Dust emissions from construction	To determine the effectiveness of dust control program on dust at receptor level	PM10 (particulate matter smaller than 10 microns) concentration at receptor level	1-hr and 24-hr concentration levels	At three representative locations	Baseline before start of construction: On three typical working days During construction: Once every four weeks on a typical working day	Contractor's Environment officer

Project Activity and Potential Impact	Objective of Monitoring	Parameters to be Monitored	Measurements	Location	Frequency	Responsibility
equipment working on construction sites	Visible dust		Visual observation of size of dust clouds, their dispersion and the direction of dispersion	construction sites	Once daily during peak construction period	Contractor's Environment officer
Air Quality: Exhaust emissions from generators and construction equipment	To determine the effectiveness of gaseous emission control measures on source emission	Gaseous emission rates from generators and other key equipment	CO, NOX, SO2 and PM. Measurement should be taken at full throttle, typical operating and idling conditions	Exhaust	Baseline when the equipment is inducted in pool and once three months subsequently	Contractor's Environment officer
Ground Water Contamination due to leakages of oil and chemicals on ground	To determine the effectiveness of spill and leakage control measures	Inspection of ground water quality during and after the construction	Chemical and Biological analysis of all parameters given in WHO guidelines	Tube-wells at construction site	On monthly basis	Contractor's Environment officer
Waste water due to activities of	To determine the effectiveness	Inspection of waste water quality during the construction	Chemical analysis of all parameters given in	Waste-water collection and discharge points at construction site	Monthly Basis	Contractor's Environment officer

Project Activity and Potential Impact	Objective of Monitoring	Parameters to be Monitored	Measurements	Location	Frequency	Responsibility
construction	of CETP		NEQS			
Soil Contamination due to leakages of oil and chemicals on ground	To determine the effectiveness of control measures taken to minimize the risk of spillages of oil and chemicals	Procedures in place to handle liquids and availability of procedures and equipments for emergency response incidents	Visual inspections and Chemical Analysis	Fuel, Chemical and Waste Storage Sites	Monthly inspections	Contractor's Environment officer
Waste Disposal Insufficient procedures for waste collection, storage, transportation and disposal	To check the availability of waste management system and implementation	Inspection of waste generation, collection, segregation, storage, recycling and disposal will be undertaken at each site of the project activity	Visual inspections	Waste Collection & segregation sites at construction	Once daily	Contractor's Environment officer

Table 14: Monitoring Plan for Operation Phase

Project Activity and Potential Impact	Objective of Monitoring	Parameters to be Monitored	Measurements	Location	Frequency	Responsibility
Noise Disturbance due to noise from Plant operation	To determine the effectiveness of noise abatement measures on sound pressure levels	Ambient noise level near receptors	A-weighted noise levels – 24 hours, readings taken at 15 s intervals over 15 min. every hour, and then averaged	Complete Noise level Survey	On bi-annually basis	Environment Manager
	To determine the effectiveness of noise control measures on the sound pressure level of the noise sources	Source noise level of RYK-IE operation activities	A-weighted noise levels measured at the source in four directions. Measurement should be taken at full throttle, typical operating and idling conditions	From the source in four direction	Quarterly Basis (after every 3 month)	Environment Manager
Air Quality: Stack emissions from the process stacks, boilers, generators	To determine the effectiveness of gaseous emission control measures on source emission	Gaseous emission rates , and pollutant concentration from generators and other key equipment	CO, No_X, So_2 and PM. Measurement should be taken at full throttle, typical operating and idling conditions	Stacks	Quarterly Basis (after every 3 month)	Environment Manager
Ground Water Contamination due to leakages of oil and chemicals on ground	To determine the effectiveness of spill and leakage control measures	Inspection of ground water quality	Chemical and Biological analysis of all parameters given in WHO guidelines	Tube-wells at RYK-IE site, and in the vicinity of the plant owned by local community	On monthly basis	Environment Manager

Project Activity and Potential Impact	Objective of Monitoring	Parameters to be Monitored	Measurements	Location	Frequency	Responsibility
Waste water due to activities of construction	To determine the effectiveness of CETP	Inspection of waste water quality being discharged	Chemical analysis of all priority parameters of the NEQS	Waste-water discharge points	Quarterly Basis (after every 3 month)	Environmental Manager
Soil Contamination due to leakages of oil and chemicals on ground	To determine the effectiveness of control measures taken to minimize the risk of spillages of oil and chemicals	Procedures in place to handle liquids and availability of procedures and equipments for emergency response incidents	Visual inspections and Chemical Analysis	Fuel, Chemical and Waste Storage Sites	Monthly inspections	OHS Manager
Waste Generated:	To check the availability of waste management system and implementation	Inspection of waste generation, collection, segregation, storage, recycling and disposal will be undertaken at each site of the project activity	Visual inspections and quantification of waste components generated	Waste disposal facility *i.e*. landfill site	Once in week	Environmental Manager

10. CONCLUSIONS AND RECOMMENDATIONS

10.1. CONCLUSIONS

Based on the Master Plan, Preliminary Design, environmental and social field surveys, and impacts assessment of the proposed RYK-IE, R. Y. Khan Project, it may be concluded that although there are some significant negative impacts but would be of short term during the construction stage. However, there are a few negative impacts that would be expected during the operational stage but their intensity can be reduced by taking appropriate measures. The environmental issues related with the Project Activities are summarized as under:

Physical impacts like soil erosion, soil contamination, water contamination, air pollution, high noise level, etc. are of temporary nature during the construction stages. However, during the operational stage by adopting abatement technologies such as treatment plants (activated sludge system), air bags, electrostatic precipitators, development of buffer zones and green areas the intensity of negative impacts could be minimized to acceptable thresholds. Detailed impacts and mitigation measures have been discussed in the Environmental Management Plan.

During operational stages the disposal of waste will become a problem. Therefore, a proper mitigations have been adopted in the preliminary design including wastewater treatment plant, safe and environmental friendly disposal of solid waste and control of gaseous emissions at source. The standards to be followed both for wastewater treatment and gaseous emissions have been discussed and reported.

The project involves cutting of few trees existing in the project area which is being replaced by two trees at each tree cut. However, there are trees in the Study Area, which may be cut by the Contractor staff to meet the camp site fire wood requirements. So, Contractor should use gas cylinders at camp site to fulfill the fire wood requirements and will ensure that trees should not be cut by the workers.

No forest area or wildlife sanctuary exists within the vicinity of the Project Area, which may be affected by the Project. Few reptiles like lizards and mammals like squirrel; and few birds like dove, Indian Roller, Shrike and house sparrows will be disturbed by the Project activities and may have to move into nearby areas. This will be a temporary insignificant impact.

Land Acquisition for the Project has been made as per LAA, 1894 and Project is committed to provide any alternative site for squatters which are entitled for compensation under LAA, 1894.

Temporary land on lease for establishment of Contractor's camp facilities will be required and criteria for selection of land and establishment of facilities has been provided in the appropriate Chapters.

The other social issues like safety of general public and workers, security problems, community accessibility issue, women accessibility to fields for their daily routine life etc. will be of temporary nature and proper mitigations have been provided in EMP.

A comprehensive EMMP has been developed identifying the impacts, mitigation measures, agencies responsible for implementation, monitoring and auditing of the proposed measures. EMMP also provides the roles and responsibilities of the agencies responsible for mitigation, monitoring and auditing of EMMP. The EMMP also provides the proposed institutional setup for effective implementation of the mitigation measures, monitoring parameters, and training of PIE, Contractors and Supervisory Consultant staff, to enhance their capacity. As the EIA Study has been carried out at Master Planning and Preliminary Design Stage of the Project, so a change management plan has been provided in the EMMP to cater the changes that may occur at detailed design and even during construction and operation stages of the Project. Similarly, generic guidelines for HSE, EMS, Hazardous Waste Management, Waste Minimization, etc. have also been provided in EMMP at industrial estate level which will help to prepare detailed management plans for estate and individual units on later stage by the PIED and private investors.

It may be concluded that if proper mitigation measures as given in this report be implemented, the Industrial Park will cause the least effect on the area's existing environmental and social setting. On the other hand, it is expected that Project will generate large number of employment opportunities to the residents of the area.

10.2. RECOMMENDATIONS

Although comprehensive mitigation measures have been proposed in the report to minimize the negative impacts and to enhance the positive impacts of the Project, however, major recommended mitigation measures are summarized as under:

Soil erosion, water contamination, air pollution and high noise levels should be controlled with the use of good engineering practices including land management, selection of abatement devices, and use of proactive measures, selection of proper sites, etc. The abatement technologies as mentioned in appropriate sections and chapters that should be adopted especially during the operational stage of the project.

Contractor should take due care of the local community and its sensitivity towards local customs and traditions.

EMMP proposed in should be implemented in the true spirit.

In order to address these issues formulation of laws and change in future plans of the relevant district administration will be required. Therefore, it is suggested that PIE should coordinate with the relevant district administration of R. Y. Khan District along with the department related with Planning and Development Department of Punjab at all stages of the project. This will provide awareness of issues to be dealt by relevant government departments and administration. This coordination will help relevant authorities to develop or mould their future strategies proactively to address the anticipated issues likely to arise in the vicinity of the Industrial Estate.

The findings of the EMS as per ISO 14000, Hazardous Waste Management framework, and WHO recommendations for any unforeseen conditions arise at operation stage, or change in characterization of the effluents should also be incorporated in the report as mentioned in change management plan.