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EXECUTIVE SUMMARY

Project Name	Education City
Project Location	Deh Chuhar, Gaddap District Malir, Karachi
Project Proponent	Project Implementation Unit, Government of Sindh, Karachi
EIA Consultant	CGD Consulting Pvt. Ltd.

The Education City (EC) Project is a hallmark of the present Government to empower the youth with knowledge, skills and institutions making investment in our valuable Human Resources. It is going to be hub of excellence with world class infrastructure. The Government of Sindh is aimed to make an ambitious and visionary investment in our people and economy by creating the EC. The Government of Sindh has resolved that development and advancement will only come with an internationally recognized Educational System which may be achieved by fostering the interaction of various disciplines, culture and ideas. EC will have a far reaching impact into the future and will serve as a model of achievement for many to follow. Education City project aims to provide a superb environment and facilities for both teaching and studying, backed by outstanding learning institutions and technological research centers. Besides, the project will accommodate at least 150,000 students, generate direct employment approximately 200,000 and will trigger the enormous economic activity in the province. Education City is planned 50 Kilometers outside Karachi covering approximately an area of 8,921 acres. EC will house over 50 nationally and internationally acclaimed institutions.

The Master Plan has been prepared for education City project which governs the area for next 30 years. The total area of Project that is estimated for Development is about 9000 Acres (approximately). The Master plan is designed for next 30 years with estimated total population growth of project area up to 5 to 7 million.

The current Project falls under Schedule- III section I of subsection 5 (Large Scale public facilities) of IEE/EIA Regulation notified Karachi dated the 03rd September, 2021 of Environmental Protection Act and thus requires Environmental Impact Assessment- EIA.

The Environmental Impact Assessment has been prepared during entire Master Planning Stage of Education City Project in order to obtain Environmental Approval /NOC from Environmental Protection Agency EPA-Sindh. In accordance with the Sindh Environmental Protection Act, distinct Environmental Impact Assessment and NOC approval will be required for owners during construction stage of each of the sub project such as educational institutions, river channelization, roads, housings, urban forest development and commercial and residential buildings etc.

The international practice for conducting environmental assessments for master planning projects suggest that a Strategic Environmental Assessment (SEA) Study should be carried out for such projects by considering the nature of project the strategic level impacts have been evaluated and included in this EIA report.

The approach adopted for carrying out the EIA study includes review of the available data, analysis of collected data, establishing environmental baseline survey of the project related to physical, ecological & social environment, impact identification and suggesting mitigation measures and preparation of environmental and disaster management plan.

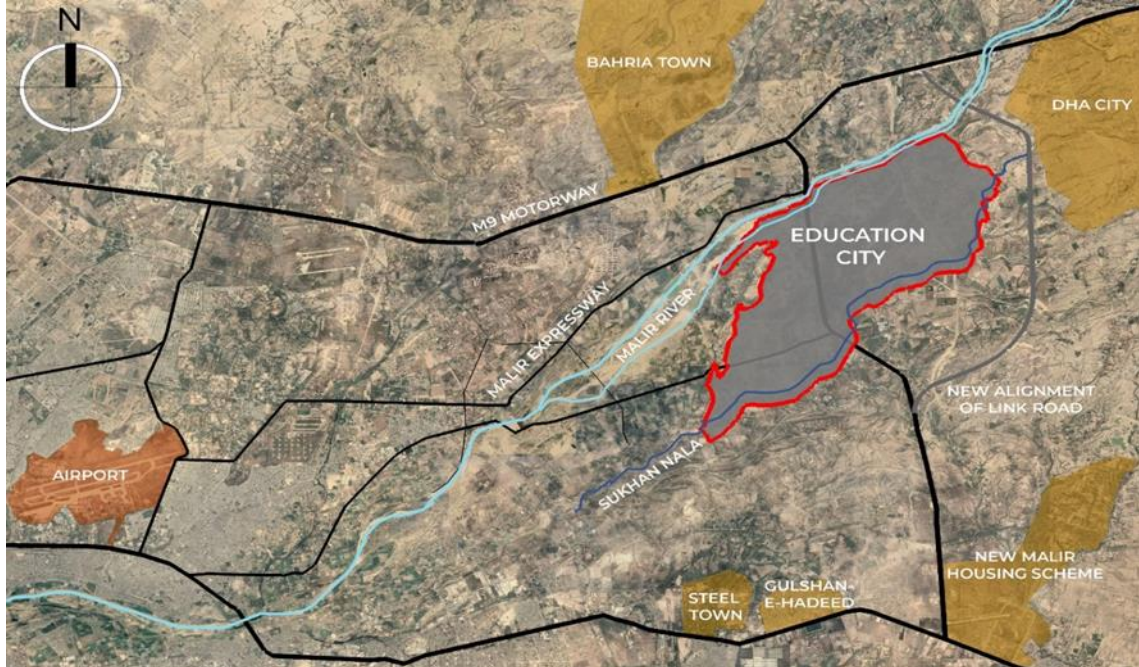


Figure ES-1: Location Map of Education City

The project components comprise of (3) three phases. All phases consist of commercial, residential, recreational and Amenities Including; roads, institutes, green spaces, hospital facilities, mosques, low to midrise buildings.

Details of phase I as follow:

In Phase – I the construction of project area will be covered based on institutional setups, road networks, green spaces and miscellaneous areas including Sewage Treatment Plant, National and International Universities, Commercial areas, Mosques, Parks, Schools and Colleges in different blocks and a graveyard.

Detailed Area Covered in Phase – 01

DETAIL OF AREAS COVERED IN PHASE-1	
INSTITUTES	AREA ac
AKU	1067.7
B MEDICAL COMPLEX	50.6
BB CITY COLLAGE	50.1
CADET COLLAGE	96.7
ELEMENTRY COLLAGE	5.3
FPS	28.4
HABIB UNIVERSITY	198.0
INDUS UNIVERSITY	80.5
INFORMATION TECH	193.5
JUDICIAL ACADEMY	98.2
NEW PORT INSTITUTE	19.0
QAU	201.2
SIR SYED UNIVERSITY	223.2
SIUT	100.2
SMIU	102.3
SZAB COLLAGE	48.3
SZABIST	326.5
ZMU	55.4
OTHERS	
ROADS	604.2
GREEN SPACE	228.7
MISCELLANEOUS	1111.3
TOTAL	4889.4

Amenities:

The area details of amenities and facilities are defined below in the table.

Table 1.1: Details of Amenities in Project Area			
S. No.	Land Use	Area (acres)	Percentage
1	Institutions	4321.39	48.35 %
2	Proposed	238.03	11.36 %
	Settlements	778.86	
	Total Residential	1015.89	
3	Commercial	550.43	6.15 %
4	Parks	531.24	13.25 %
	Protected Open Spaces	307.63	
	Water Bodies	345.47	
	Total Recreational	1184.34	
5	Amenities	242.46	2.71 %
6	Graveyards	118.3	1.33 %
7	Urban Farming	159.88	1.79 %
8	Roads, Services etc.	1346.65	15.06 %
	Total	8939.34	100.00 %

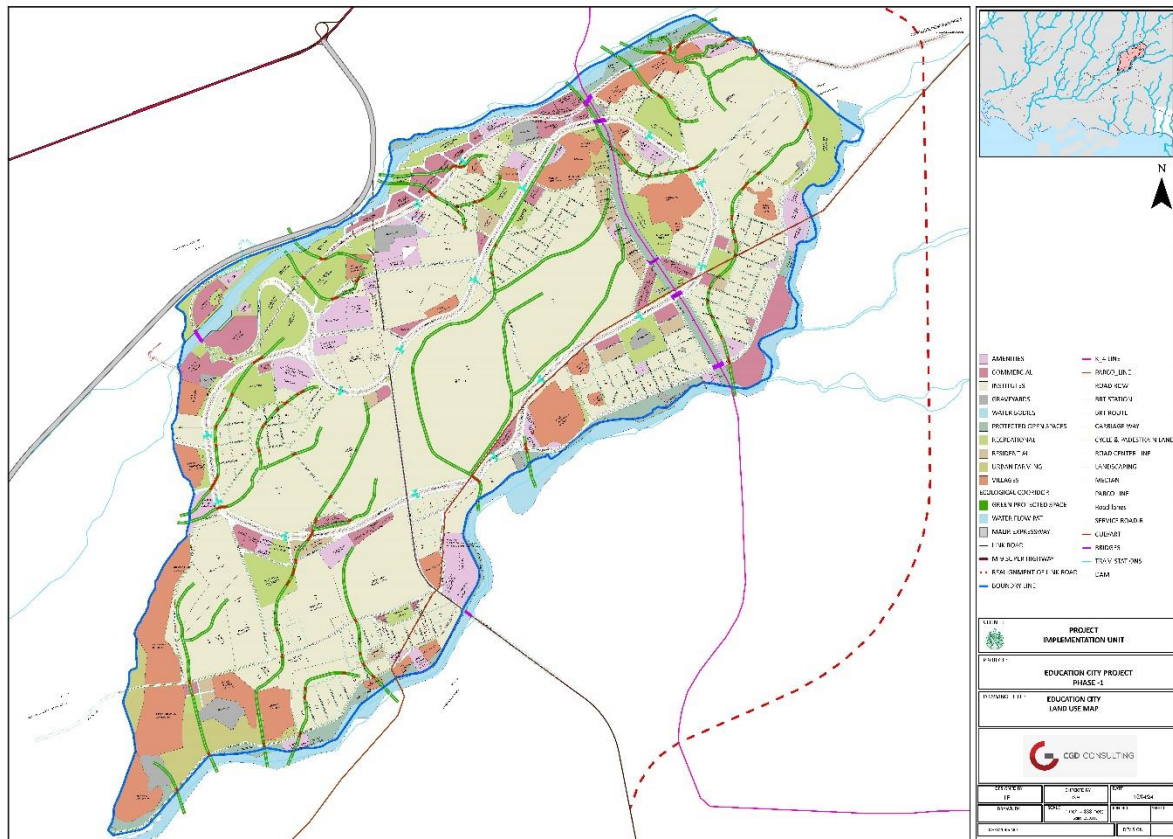


Figure ES-2: Lay out Plan/Master plan

Potential environmental impacts of the proposed Education City project on different features of micro and macro-environment are assessed pertain to planning, construction and operation of Education City comprising all infrastructure and amenity facilities in all 03 phases of the project.

The screening process proceeds by identifying the potential environmental aspects of siting the project, identifying the potential environmental impacts at pre-construction, construction and operational stages of the project and identifying the residual impacts after adoption of mitigation measures that may be needed at the outset of activities. The impacts on environmental resources from the proposed project will be short term and temporary in nature.

The Master Plan reviewed by the team of consultants found that at the Planning level some very innovative measures are already taken to keep the Climate Impact balance due to the construction and upcoming anthropogenic activities, the following are the climatic considerations

- The entire Master Plan is established between the Malir Rivers and Sakhon River and some old perennial tributaries are vertically connected between the two important rivers. There is a potential natural water flow which is currently clogged due to low flow or small natural encroachments,
- The planning is done in such a way to restore all such tributaries and allow the natural water flow and planting urban forest in the right of way of the tributaries which will be working as lungs (consuming carbon emissions and providing fresh oxygen) for the proposed education city.

- The natural water definitely flows because the level differences between the two Rivers are approximately 40 feet from Malir to Sukhan (see contour maps). Once the natural flow of water will be restored, providing food to grow the urban forest which helps aesthetic beauty, ecological balance and capture tons of carbon dioxide from the anthropogenic activities.
- The Master Plans show the Water Bodies in Blue color and Urban Forest running parallel in green color.
- The land which are earmarked to most of the institutes are bound to develop only 33% of land in most of the cases and up to 50% in few cases, green areas and portion for trees will be separate planned in the individual master plan of the particular institutes. A consultation workshop with all institutes will be arranged to follow the climate mitigation policy.
- Pedestrian trails are planned at the distance of 800-meter workable reach to different clusters for small needs of day to day activities. The larger crowd of the education city will definitely be youth, hence 800-meter walk and cycle are promoted to curb the unnecessary emissions from vehicular mobility.
- Similarly, the institutes internal mobility will be based on by walk and cycling, hence motor transport is discouraged.
- In the proposed Master Plan, the vehicular movement is discouraged; the plan is to connect the City BRT with Internal BRT and Tram system. This will decrease the use of individual vehicular mobility. Usually in Karachi city an individual emits 3-4 tons of Carbon Dioxide yearly if any person commute 70 kilometer daily on his individual 02-wheeler or 04-wheeler vehicles. Education City will provide public transport so such emissions will not be occurred.
- All street lights are planned to be powered through Solar based power, hence no impact for Street Lighting.
- All institutes are bound to generate at least 30% of power through alternate source of energy (wind, solar, may be biogas or any other means), hence carbon dioxide emission reduction is already planned.
- Complete wastewater treatment and recycling for the green areas, current Municipal Water demand to start the project will be 19 MGD, 80% expected wastewater generation and all the treated wastewater will be used in planting so the gaseous emissions from wastewater will be controlled through treatment and recycling.
- Institutes will be bound to initiate the source separation and source collection of Solid Waste. The Solid Waste being generated will be collected as three types of wastes (recyclables, organic waste and the remnants). 70% of the waste will be reused and recycled. The remaining 30% of the unwanted material will only be disposed of at the already operational landfill site (Gond Pass) situated at the Surjani Town.
- The institutes will be bound to use the Natural Lighting, Natural Ventilation system as much as possible to reduce the power consumption during the day time. Hence optimization of energy is already there to reduce the carbon dioxide emissions.



- All agricultural parcels are intact and untouched in the proposed Master Plan, no crop yield disturbance and no any ecological agricultural disturbances are expected. The villages are taken care and no one is shifted and disturb, the plan is to improve the live style of the residents of such villages and improve basic amenities like water supply, wastewater and solid waste management. The villagers will be part of business plan to sell the commodity items like eggs, vegetables, milk, meat in the local market to better earn livelihood. Once such consumables items are available within the Education City there is no any carbon emissions in getting these items transported from 100 miles far areas. The carbon balance will be maintained.
- At the Policy level, all institutes will be invited to develop a mechanism where the carbon emissions during the construction shall be reduced at maximum through use of natural materials and low carbon impact materials. All construction parcels carbon emissions logbook will be maintained and carbon sequestration strategies will be adopted to bring the education city development close to the Zero Carbon.
- Further assessment is underway and a strategy will be adopted to curb the carbon emissions from the Education City and in future any improvement is required through amendments in the Byelaws will be done.
- For protection of the ecological environment from planned activities in Education City included urban forestation to improving air quality, reducing urban heat island effect, enhancing biodiversity, and providing aesthetic and recreational value.
- Plantation will be done in project area after completion of project by Using Miyawaki Techniques which promises solutions to the environmental issues by rapidly and efficiently restoring degraded land, absorbing carbon dioxide emissions and preserving biodiversity creating a dense native forest in the process. Also introduce botanical gardens, these gardens in the protected zone can provide habitat for local wildlife and contribute to biodiversity conservation.

MASTER PLAN DESIGN CRITERIA – WITH ADOPTION OF A SEPARATE APPROVED EDUCATION CITY BYE-LAWS

CG Consultants preparing the Master Plans for Environmental Impact Assessment Report evaluated the document and found that no doubt if all measures, guidelines and procedures provided in the documents are adopted the City developed as smart city with sustainable development approach and will be very close to operate on the principals of zero carbon emissions. Some of the highlights of the Bye-Laws are chalked below

- Zoning Guidelines and Land Use Classification is done in a very balance way, the FAR and land development is proposed environmentally not create any Latent Heat of Island effect, means the average temperature of the area will not be increased probably due to the anthropogenic activities.
- The agricultural parcels of 500 acres and above for the agricultural activities and orchards will remain intact, in addition due to the planned water front the ground water recharges will be certain to get more surface and ground water for the use of cultivation. The agri-economy will improve and also support Education City day to day requirements.
- Detailed architectural guidelines are provided in the Bye-Laws provided for the Sustainable Buildings approach with all measures to use Natural lighting and air circulation, use of alternate source of energy minimum 30% is a must case which helps in less consumption of power to be produced by oil and gas. Alternate source of energy improves the overall environmental impact in the areas.
- Separate chapter and Guidelines in the Construction Bye-Laws for efficient use of energy, water, grey water, heat alternate sources and underground water detailing the use of green and insulated roofs, solar water heaters, energy efficient elevators and escalators, which will be used during the planning, design and execution stage for all the projects. The above guidelines are fully developed keeping in view the development of smart city.
- Education City Board before the initiation of the project, developed a comprehensive Master Plan along with a full-fledge Construction Bye-Laws which illustrates, guides and control the development patterns, utility management and day to day commercial, educational, residential, agricultural, livelihood and other affairs.
- The Bye-Laws document has aimed to produce the set of Construction By-Laws for the Education City Project, Karachi as per the approved Master Plan with the objective to enable the Education City Board to initiate the future development of Sindh Education City as per the spirit of the approved Master Plan and in line with globally recognized planning and building standards and practices. The document will provide guidance to ensure the sustainable development besides encouraging a friendly environment for Education City. The Construction by-laws compiled for the development of Education City is itself a very comprehensive document for sustainable development of Education City and same will be followed in conjunction with the guidelines provided in the EIA report.

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Chapter 1 INTRODUCTION

1.1. General

It was unanimously agreed by almost all the consultation participants that the project is necessary for and incorporation the needs of growing population of Karachi. However, most of the participants are of the view that Strategic Level Environmental Impacts and their mitigations should be added in the project during EIA study.

This Environmental Impact Assessment, thereafter; EIA report documents clearly and impartially the environmental and social impacts of the proposed project i.e. **Education City (EC)**, and proposes relevant measures for mitigation, the significance of effects and the concerns of the interested public and the communities affected by the proposed project.

The **Education City (EC)** Project is a hallmark of the present Government to empower the youth with knowledge, skills and institutions making investment in our valuable Human Resources. It is going to be hub of excellence with world class infrastructure. The Government of Sindh is aimed to make an ambitious and visionary investment in our people and economy by creating the EC. The Government of Sindh has resolved that development and advancement will only come with an internationally recognized Educational System which may be achieved by fostering the interaction of various disciplines, culture and ideas. EC will have a far-reaching impact into the future and will serve as a model of achievement for many to follow. Education City project aims to provide a superb environment and facilities for both teaching and studying, backed by outstanding learning institutions and technological research centers. Besides, the project will accommodate at least 150,000 students, generate direct employment approximately 200,000 and will trigger the enormous economic activity in the province.

The EIA report has been prepared in compliance with the mandatory requirements of Section 17 of Sindh Environmental Protection Act, 2014, which states that **“no proponent of a project shall commence construction or operation unless he has filed with the Agency an initial environmental examination or environmental impact assessment and has obtained from Agency approval in respect thereof”**. Sind Environmental Protection Agency, thereafter; SEPA shall review the IEE & EIA and accord approval subject to such terms and conditions as it may prescribe or require.

Since the proposed project shall be located in Sindh Province, hence this EIA Report will be submitted to Sindh Environmental Protection Agency for review and subsequent issuance of “No Objection Certificate (NOC)”. Further coordination for environmental monitoring activities will continue with Provincial EPA i.e. EPA Sindh which has been duly authorized to follow-up and enforce environmental monitoring compliance of the project.

M/S Nexus Consulting hired by the management authority of the proposed project to perform an Environmental Impact Assessment (EIA) and evaluate the project's environmental and social feasibility. They took into account various aspects such as air quality, water resources, land usage, noise levels, biodiversity, climate change impact, carbon footprint estimation and factors relevant to human well-being. The EIA involved gathering data on the current conditions of the project area, identifying potential environmental and social effects, and creating an Environmental Management Plan (EMP) to minimize any negative impacts.

Additionally, they proposed implementing a post-project environmental monitoring program to ensure ongoing compliance with the regulations outlined in the Sindh Environmental Protection Act.

1.2. Overview of Project

The Education City (EC) is a flagship project of the current government aimed at equipping the youth with knowledge, skills, and institutions that invest in our valuable human resources. It will be a hub of excellence with state-of-the-art infrastructure. The Government of Sindh is committed to making a bold and visionary investment in its people and economy by developing this project to world-class standards. The Government of Sindh believes that progress and advancement can only be achieved through an internationally recognized educational system, which can be fostered through the exchange of various disciplines, cultures, and ideas. EC will have a far-reaching impact on the future and will serve as a shining example for many to follow.

The Education City project aims to provide a first-rate environment and facilities for both teaching and learning, supported by top-notch educational institutions and technological research centers. The project will accommodate at least 150,000 students and create approximately 200,000 direct employment opportunities, leading to substantial economic activity in the province. Education City will be located 50 kilometers from the center of Karachi, covering an area of approximately 8939.34 acres. EC will be home to over 50 nationally and internationally renowned academic, research, and technology-oriented institutions.

In general, following are silent features of the Education City:

- Approximately 8939.34 acres of land was notified as Education City.
- Core elements of EC are local and international educational and health institutions that will provide solutions to Pakistan's challenge of higher education.
- Opportunity and attraction to remain and study in Pakistan. Educational institutions will create the opportunity for private R&D businesses as a component of EC.
- Residential and commercial development though restricted for the purpose of Education City only, will provide 'quality of life' or 'character of community' that is typical of educational communities.
- Land has been earmarked for institutions

1.3. Mission & Vision of Education City

The concept of Education City has evolved out of the desire of successive Governments to empower the people by imparting them with the knowledge and skills comparable with the best international standards. Education City aims to be a nerve-centre of excellence, which would bring together the best of the intellect in the country and from abroad and to provide an environment most conducive to learning. Realizing that a nation's greatest resource is its human resource, Education City is being developed with a view to meeting the challenges of an ever-changing and complex world and to make Sindh and its capital Karachi a leader in quality education as well as research and development. It is intended to be a hub for the imparting and generation of knowledge in the presence of world-class infrastructure and campus facilities and a pool of highly qualified academics. It shall provide a chance to collaborate with like-minded people and the opportunity to transform ideas into reality.

1.4. Location & Size of Project

The Government of Sindh has earmarked 8939.34 acres of land in Deh Chuhar, Gaddap District Malir, Karachi for Education City project, on link road between National Highway and Super Highway. It is an ideal location for establishing such educational institutions with large campuses because of spacious and well-established landscape.

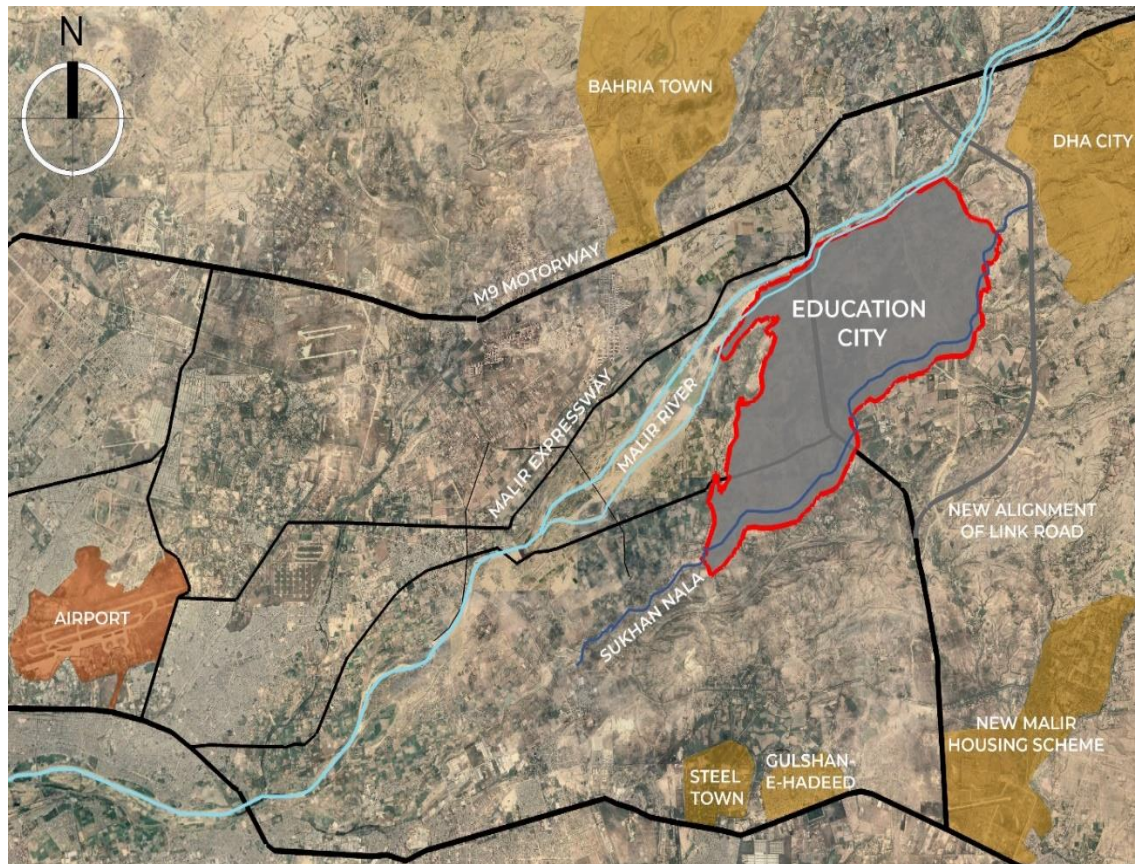


Figure 1-1: Project Study Area Map

1.5. Project Proponent – Education City (Project Implementation Unit, Government of Sindh, Karachi)

Overview

The project Implementation unit Investment Department has been established with broad-based responsibility of promotion of investment in all sectors of the economy; facilitation of local and foreign investors for the speedy materialization of their projects, and to enhance Sindh's international competitiveness contributing to economic and social development.

The investment Department of Project Implementation Unit assists companies and investors who intend to invest in Sindh as well as facilitates the implementation and operation of their projects. The wide range of services provided by the Investment Department includes providing information on the opportunities for investment and facilitating companies that are looking for joint venture partners. The Department acts as a focal point of contact for prospective investors, both domestic and foreign to provide all necessary information and assistance in coordinating with other Government departments/agencies.

Vision

To develop and create an investment-friendly environment to boost economic activity and add value to all sectors of the economy while encouraging public-private partnership for the development of Sindh

History:

The Sindh Board of Investment was founded in 2009 as directorate under the Administrative Control of the Chief Minister's secretariat.

In response to the ever-evolving global economic landscape and the need to harness Sindh's vast potential for promoting and facilitating investments in the province. As a result, the Sindh Board of Investment was established granting it the necessary administrative control and support to fulfill its mandate effectively.

In 2010, recognizing the growing importance of investment promotion and facilitation in the province of Sindh, the Sindh Board of Investment (SBI) underwent a significant transformation. Its status was elevated to that of an independent department, aptly named the Investment Department.

The Investment Department faced its share of challenges and changes. In 2012, the department was de-notified, and made Board again, leading to a shift in its administrative structure.

Despite this change, the commitment to promoting investment and economic development in Sindh remained resolute. The Finance Department worked in coordination with other relevant authorities to continue the efforts initiated by the Investment Department and ensure seamless continuity of investment promotion activities in the province.

In 2017, the Government of Sindh undertook another significant transformation, reverting the status of the Sindh Board of Investment back to the Investment Department.

The history of the Investment Department of the Government of Sindh stands as a testament to the government's dedication to creating an environment that fosters economic growth, attracts investments, and empowers businesses. With each transformation and adaptation, the department remained steadfast in its mission, constantly evolving to meet the challenges and opportunities presented in the pursuit of a prosperous and vibrant future for Sindh.

1.6. Need for the Development of Education City Project

The concept of Education City has evolved out of the desire of successive Governments to empower the people by imparting them with the knowledge and skills comparable with the best international standards. Education City aims to be a nerve-centre of excellence, which would bring together the best of the intellect in the country and from abroad and to provide an environment most conducive to learning.

Education City is envisioned as a central hub for the dissemination and creation of knowledge, supported by top-notch infrastructure, campus amenities, and a talented pool of well-qualified educators. It will provide a platform for collaboration among individuals who share similar aspirations and offer the prospect of turning ideas into tangible achievements. Recognizing that the most valuable asset of a country is its people, the development of Education City aims to address the demands of a constantly evolving and intricate global

landscape. The goal is to position Sindh, along with its capital Karachi, as a frontrunner in delivering high-quality education, research, and development.

1.7. Categorization of Project

Sindh Environmental Protection Act 2014 & SEPA Review of IEE/EIA Regulations 2014 define Schedule (I & II) of project falling under the requirement of EIA or IEE. This EIA study has, for environmental classification of the project into Schedule I or II, taken account of requirement of the SEPA (review of EIA/IEE) Regulations 2014 which defines Schedules as follows:

Schedule I

A project falls in Schedule I, if they have adverse environmental impacts, but of lesser degree or significance and all the mitigation measures to handle the impact is manageable. Such types of projects need IEE report including EMP.

Schedule II

Projects are Schedule II if they generate significant adverse environmental impacts that require a complex management plan or if the project is located within or pass through:

- Wildlife sanctuaries,
- National parks,
- Other sanctuaries,
- Areas declared by the Government of Pakistan as environmentally sensitive,
- Areas of international significance (e.g. protected wetland as designated by the RAMSAR Convention), or
- Areas designated by the United Nations Educational, Scientific, and Cultural Organization (UNESCO) as cultural heritage sites.

This category of projects requires EIA report including a detailed Environmental Management Plan (EMP). The current project falls in Schedule II of the Sindh EPA (Review of EIA/IEE) Regulations 2014 Category I. Urban Development & Tourism (3): **“Land use studies and urban plans (large cities)”** requiring an EIA study.

1.8. Objectives of Environmental Impact Assessment

The objective of the Environmental Impact Assessment is to fulfil the requirement for obtaining an environmental permit from the Sindh Environmental Protection Agency (SEPA). EIA report will form a part of the documentary evidence in support of a permit application to the EPA.

The main objectives of the Environmental Impact Assessment (EIA) for the Education City Project provide recommendations to mitigate negative impacts and maximize benefits on all aspects of the surrounding environment (physical, biological and social). The objectives outlined for this EIA study are as follows:

- **Assess Environmental Impacts:** The EIA aims to identify and evaluate the potential environmental impacts that may result from the development and operation of the Education City Project. This

includes assessing impacts on air quality, water resources, land use, biodiversity, noise levels, and other relevant environmental factors.

- **Determine Social Impacts:** The EIA also considers the potential social impacts of the Education City Project. This involves assessing how the project may affect local communities, including their socio-economic conditions, health and safety, cultural heritage, and overall quality of life.
- **Establish Baseline Data:** The EIA gathers baseline data on the existing environmental and social conditions in the project area. This information serves as a reference point for comparing and evaluating the potential impacts of the Education City Project.
- **Mitigate Adverse Impacts:** The EIA identifies measures and strategies to mitigate any adverse environmental and social impacts that may arise from the project. This includes developing an Environmental Management Plan (EMP) that outlines specific actions to minimize, mitigate, or compensate for negative effects.
- **Ensure Compliance with Regulations:** The EIA ensures that the Education City Project complies with relevant environmental laws, regulations, and standards. It helps to identify any legal requirements or permits necessary for the project's implementation and operation.
- **Support Sustainable Development:** The EIA promotes sustainable development by considering the long-term environmental, social, and economic implications of the Education City Project. It aims to strike a balance between development objectives and the protection of natural resources and community well-being.

1.9. Acquiring Project Specific Data

A detailed review of the following available documents of the project was conducted:

- TOR'S.
- Detail Maps of the Project Sites
- Integrated Master Plan Project area
- Strategic Development Plan for EC Project
- Site Details
- Existing Situation and Proposed Plans

The basic objective of the review was to fully understand the Project and the extent of the developmental activities. The review of studies helped to assess the nature and extent of the impacts related to the planning and implementation of the proposed project activities.

After collection of the physical, ecological and social environmental and social data from both primary and secondary sources; a critical analysis was made to assess the existing baseline conditions and potential impacts.

1.10. Literature Review

While the project details were being acquired, desktop study was also initiated simultaneously to draft environmental baseline information of the project area. The desktop study comprised of literature review, collection of updated authenticated published/printed data on the physical and social environment related to the focused area. The same was also used to delineate the scope of surveys which would then form the basis of environmental assessment.

1.11. Stakeholder Consultation

A stakeholder consultation was undertaken to document the concerns of the local community and other stakeholders, and to identify issues that may require additional assessment in order to address these concerns. Stakeholder consultation was conducted during the survey with following objectives:

- To inform the Stakeholders, Communities about the project
- To gather feedback from primary and secondary stakeholders of project
- To identify relevant potential issues, including the socioeconomic impacts of the project, and corresponding mitigation measures.

During the stakeholder consultation process for the project, following key considerations were focused:

- Identification of sensitive receptors in the area
- Concerns of the nearby villages about the project

1.11.1 Environmental/Social Aspects Identification

Aspects are those elements which are the cause of positive or negative environmental impacts. It includes activities performed during construction and operation phases. The EIA process requires development of an inventory of all possible environmental and socio-economic aspects, which provide the basis of categorization and evaluation of impacts and their likelihood to occur due to the materialization of the project.

1.11.2 Environmental Impacts Assessment and Mitigation Measures

Based on the developed aspects inventory, experts analyzed the aspects for their logical outcome as potential impacts on the physical and social environment. These impacts have been identified, assessed and weighed for different activities during construction, commissioning and operational phases of the project. Mitigation and control measures were also proposed for various activities of projects in order to minimize the potential impacts during the life span of the project.

1.11.3 Environmental Management and Monitoring Plan

In the light of impacts identified and mitigations proposed an Environmental Management Plan (EMP) is developed which has a pivotal role in assigning tasks to personnel for the environmental management and implementation of mitigation measures as well as to monitor its effectiveness throughout the life cycle of the project. It also provides monitoring plans/procedures to be followed for checking and compliance maintenance of environmental quality and legal requirements through suggested mitigation measures.

1.11.4 Screening of Potential Environmental Impacts and Mitigation Measures

After thorough review of the field notes, collected data, extent of the proposed project activities and detailed discussions with the stakeholders, the potential impacts during planning and implementation stage of Project were assessed. Further measures were proposed to mitigate the negative impacts and to enhance the positive impacts. The potential impacts and mitigation measures were assessed covering the following parameters:

- Strategic Environmental Issues and Mitigation
- Environmental problems associated with the construction stage
- Environmental problems resulting from Project operation stage

1.11.5 Preparation of Environmental Management Plan (EMP)

An EMP depicting the mitigation measures and monitoring plan has also been developed. Institutional capacity building of the Client has also been reviewed and enhancement was proposed for the effective implementation of the EMP.

1.12. Documentation Review and Conclusion

This is the final step to complete the environmental assessment and compile all the work done in shape of a report. Report writing started just after the initiation of environmental assessment. The report is written by experts of EMC and compiled by the office staff in coordination with the experts. At the end of the study, the entire report is reviewed by the team leader followed by recommendations and conclusion in the light of the assessment.

1.13. Structure of EIA Report

This document is structured as follow:

Chapter 1 provides an introduction to the report and project; Chapter 2 describes the legislative and policy framework governing the project; Chapter 3 provides an overall description of the project; Chapter 4 gives analyses of the various alternatives considered; Chapter 5 provides general environmental and social baseline conditions of the project, Chapter 6 assesses the overall environmental impacts of the project and recommends appropriate mitigation measures, Chapter 7 provides an EMP, DMP, RPF and institutional arrangements Chapter 8 presents the concerns of major stakeholders, Chapter 9 presents conclusions and recommendation. Annex-I contains Ecological Study Annex II contains Environmental Monitoring Results, Annex III is the photolog.

1.14. EIA Study Team

A team of experienced professionals drawn from various disciplines and having relevant experience of conducting Environmental and Social assessments participates in the preparation of an Environmental Impact Assessment Report. The study team collaborated during a comprehensive survey of the project site discussions with the proponents and stakeholder's, collection and analysis of data, conducting surveys and spot analysis and preparation of the report in consultation with specialists. Services of other experts were also availed on need basis and a researcher compiled secondary and socio-economic data of the project area. This Environmental Impact Assessment has been prepared by the following core team:

S. No	Professional	Designation
1.	Engr. Muhammed Khalid	Environmental Expert
2.	Mr Munib Ali	Environmentalist
3.	Mrs Syed Kanwal	Environmentalist/Project Coordinator
4.	Syeda Urooj Fatima	Climate Change Expert
5.	Dr. Noureen Farooq	Ecologist
6.	TBP	Sociologist
7.	Engr Zain	Project Manager
8.	Engr. Nabeel Hassan Shiakh	Senior Design Engineer
9.	Mr. Adnan Ali	Draftsman
10.	Shahrukh Ahmed	Field Surveyors

Chapter 2 ENVIRONMENTAL LEGISLATION, REGULATIONS AND GUIDELINES

2.1. Policy, Legal and Administrative Framework

This Chapter prescribes the policy framework and legislative application, which is essential to examine all aspects of the project, dealing with conservation of environment, structural development and anticipated operational activities. The project is specially designed to comply with all requirements of the General and Special law applicable in Pakistan and particularly in Sindh. Apart from compliance of the legal requirements, the Project intends to address the prevailing degradation aspects of the Education city project by adopting mitigation measures as well as developing special infrastructure to achieve project objectives

2.2.1 National Environmental Policy, 2005

The National Environmental Policy provides an overarching framework for addressing the environmental issues facing Pakistan, particularly pollution of fresh water bodies and coastal waters, air pollution, lack of proper waste management, deforestation, loss of biodiversity, desertification, natural disasters and climate change.

It also gives direction for addressing the cross-sectional issues as well as the underlying causes of environmental degradation and meeting international obligations.

The National Environmental Policy, while recognizing the goals and objectives of the National Conservation Strategy, National Environmental Action Plan and other existing environmental related national policies, strategies and action plans, provide broad guidelines to the Federal Government, Provincial Governments, Federally Administered Territories and Local Governments for addressing environmental concerns and ensuring effective management for their environmental resources.

The National Environmental Policy aims to protect, conserve and restore Pakistan's environment in order to improve the quality of life for the citizens through sustainable development.

2.2.2 National Drinking Water Policy

The National Drinking Water Policy provides a framework for addressing the key issues and challenges facing Pakistan in the provision of safe drinking water to the population. The overall objectives of the policy are to provide guidelines that will allow consistency and conformity in the provision of drinking water on sustainable basis, provide a financial framework within which the provision of water supply that can be undertaken in a cost-effective equitable and sustainable manner and gives key strategies to help in enhancing access to safe drinking water supply.

2.2.3 The Biodiversity Action Plan

The Biodiversity Action Plan, 2000 has been the most significant direct step towards addressing the issue of loss of biodiversity. It details the current status, trends, direct & indirect causes of loss of biodiversity; its principles, goals and aims; proposals for an action plan including planning & policies, legislation, identification and

monitoring, in situ & ex situ conservation, sustainable use, research and training, public education and awareness, Environmental Impact Assessment, information extraction and financial resources etc.

The Wild Birds and Animals Protection Act 1912¹, the West Pakistan Wildlife Protection Ordinance 1959, the Wildlife Protection Rules 1972, provide for the protection of flora and fauna in the territory, including vegetation and protected forests.

Through perusal of this legislation, it is evident that Wild Bird and Animal life will not be disturbed due to commissioning and operation of Education City Project.

2.3 Administrative Framework

Environmental issues are governed by three levels of government viz. Federal, Provincial and Local. The Ministry of Environment at the Federal level, oversees the affairs of environment in the country. The Government of Sindh (GOS) has designated its Ministry of Environment and Alternative Energy, to administer matters related to environment in Sindh. The Sindh EPA is directly under the Ministry of Environment and Alternative Energy.

2.3.1 Institutional Setup for Environmental Management

The highest environmental body in the country is the Pakistan Environmental Protection Council (PEPC), which is presided over by Chief Executive of the country. Other bodies include the Pakistan Environmental Protection Agency (Pak-EPA), provincial EPAs (for four provinces, AJK and Northern Areas), and Environmental Tribunals. The roles, responsibilities and authorities of PEPC and the EPA's are defined in the PEPA 1997.

The PEPC has been formed by the Federal Government. Its members include the President of Pakistan, or someone appointed by the President, as the Chairperson; the Minister of the Ministry of Environment, Local Government and Rural Development as the vice-Chairperson; Governors of the Provinces; Ministers in charge of the subject of environment in the Provinces; Secretary to the Federal Government in charge of the Ministry of Environment, Local Government and Rural Development; Director General Federal EPA; heads of other federal and provincial departments; environmentalists and community representatives including scientists. The functions and powers of the Council include formulation of national environmental policy, enforcement of PEPA 1997, approval of the NEQS, incorporation of environmental considerations into national development plans and policies and provide guidelines for the protection and conservation of biodiversity in general and for the conservation of renewable and nonrenewable resources.

The Federal government has also formed the Federal EPA, which is headed by a Director General and has wide-ranging functions given in PEPA 1997. These include the preparation and coordination of national environmental policy for approval by the PEPC, administering and implementing the PEPA 1997 and preparation, revision or establishment of NEQS.

¹ The Wild Birds and Animals Protection Act 1912 (Act No. VIII of 1912 dated 18.09.1912)

The Provincial Environmental Protection Agencies are formed by the respective Provincial Governments. A Director General who exercises powers delegated to him by the Provincial Government heads each Provincial EPA. IEEs and EIAs are submitted to provincial EPAs for approval.

2.4 Statutory Framework

The constitution of Pakistan contains provision for environmental protection and resource conservation. The constitution mentions environmental pollution and the ecology as a subject in the concurrent legislative list, meaning that both the provincial and federal government may initiate and make legislation for the purpose. 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.

Several laws exist for the protection of the environment. Some of these laws are Federal and the rest Provincial in character. The promulgation of the Environmental Protection Ordinance 1983 was the first codifying legislation on the issue of environmental protection. This was indeed a consolidated enactment to plug the gaps and remove defects/deficiencies in the legislation. The promulgation of this ordinance was followed, in 1984, by the establishment of the Pakistan Environmental Protection Agency, the primary government institution dealing with environmental issues. Significant work on developing environmental policy was carried out in the late 1980s, which culminated in the drafting of the Pakistan National Conservation Strategy. Provincial environmental protection agencies were also established at about the same time. The National Environmental Quality Standards were established in 1993.

Prior to the 18th Amendment to the Constitution of Pakistan in 2010, the legislative powers were distributed between the federal and provincial governments through two ‘lists’ attached to the Constitution as Schedules. The Federal list covered the subjects over which the federal government had exclusive legislative power, while the ‘Concurrent List’ contained subjects regarding which both the federal and provincial governments could enact laws. The subject of ‘environmental pollution and ecology’ was included in the Concurrent List and hence allowed both the national and provincial governments to enact laws on the subject.

However, as a result of the 18th Amendment this subject is now in the exclusive domain of the provincial government. The main consequences of this change are as follows: i) The Ministry of Environment at the federal level has been abolished. Its functions related to the national environmental management have been transferred to the provinces. The international obligations in the context of environment will be managed by various ministries and departments of the federal government, ii) The Pakistan Environmental Protection Act 1997 (PEPA 1997) is technically no longer applicable to the provinces. The provinces are required to enact their own legislation for environmental protection.

2.4.1 Sindh Environmental Protection Act, 2014

Legislative assembly of Sindh province of Pakistan passed the bill on 24th February 2014 to enact Sindh Environmental Protection Act 2014. The Act envisages protection, improvement, conservation and

rehabilitation of environment of Sindh with the help of legal action against polluters and green awakening of communities.

It equally lays emphasis for the preservation of the natural resources of Sindh and to adopt ways and means for restoring the balance in its eco-system by avoiding all types of environmental hazards.

Environmental Protection Council (EPC): It has been formed consisting of Chief Minister as Chairman with Minister in charge of Environment Protection Department, Addl. Chief Secretary, Planning & Development Department, Government of Sindh and Secretaries of Environment, Finance, Public Health Engineering, Irrigation, Health, Agriculture, Local Government, Industries, Livestock & Fisheries Forest & Wildlife, Energy, Education Departments Government of Sindh and Divisional Commissioners of Sindh. Non-official members are also included (i.e. representatives of Chamber of Commerce & Industry and from medical or legal professions etc.) along with DG, EPA & two Members of Provincial Assembly also form part of EPC.

The functions and powers of EPC include coordination & supervision of provisions of Act, approving provincial environmental & sustainable development policies & SEQs, provide guidance for protection & conservation, consider annual Sindh Environmental Report, deal with interprovincial and federal provincial issues, provide guidance for bio safety and assist Federal Government in implementation of various provisions of UN Conventions.

Sindh Environmental Protection Agency (SEPA): SEPA would be headed by Director General (DG) with the aim to exercise the powers and perform the functions assigned to it under the provisions of Act and the rules and regulations made there under. The Agency shall have technical and legal staff and may form advisory committees.

The Agency shall administer and implement the provisions of Act and rules and regulations. It shall also prepare environmental policies, take measures for implementation of environmental policies, prepare Sindh Environment Report and prepare or revise Sindh Environmental Quality Standards. SEPA shall also establish systems and procedures for surveys, surveillance, monitoring, measurement, examination, investigation research, inspection and audit to prevent and control pollution and to estimate the costs of cleaning up pollution and rehabilitating the environment and sustainable development. SEPA would also take measures for protection of environment such as to promote research; issues licenses for dealing with hazardous substances, certify laboratories, identify need for or initiate legislation, specify safeguards etc. SEPA would also encourage public awareness and education regarding environmental issues.

SEPA would have powers to enter or inspect under a search warrant issued by Environmental Protection Tribunal or a Court search at any time, any land or building etc. where there are reasonable grounds to believe that an offence under this Act has been or is being or likely to be committed. SEPA may also take samples, arrange for testing or confiscate any article in discharge of their duties.

The Act has also provided for Sindh Sustainable Fund derived from various sources such as voluntary contributions or fees generated etc. This fund is utilized for protection, conservation or improvement of environment.

Salient Features

Section 11: No person shall discharge or emit or allow the discharge or emission of any effluent waste, pollutant, noise or adverse environmental effects in an amount, concentration or level which is in excess to that specified in Sindh Environmental Quality Standards.

Section 12 & 13: No person shall import hazardous waste into Sindh province and handle hazardous substances except under licenses etc.

Section 14: No person shall undertake any action which adversely affects environment or which lead to pollute or impairment of or damage to biodiversity, ecosystem, aesthetics or any damage to environment etc.

Section 15: This section deals with regulation of motor vehicles banning emission of air or noise pollutants being emitted from them in excess of allowable standards.

Section 17: This section states that no proponent of a project shall commence construction or operation unless he has filed with the Agency an initial environmental examination or environmental impact assessment and has obtained from Agency approval in respect thereof. SEPA shall review the IEE & EIA and accord approval subject to such terms and conditions as it may prescribe or require. The agency shall communicate within four (04) months its approval or otherwise from the date EIA is filed failing which the EIA shall deemed to have been approved.

Section 21: Where agency is satisfied that the discharge or emission has occurred in violation of any provision of this act or rules etc. then it may, after giving an opportunity to person responsible, by order direct such person to take such measures within specified period. The agency under this section has been empowered to immediately stop, prevent or minimize emission, disposal etc. for remedying adverse environmental effects.

Section 22: The person who fails to comply with section 11, 17, 18 and 21 shall be punishable with a fine which may extend to five million rupees, to the damage caused to environment and in the case of a continuing contravention or failure, with an additional fine which may extend to one hundred thousand rupees for every day during which such contravention or failure continues. And, where a person convicted under sub-sections 1&2 had been previously convicted for any contravention of this Act, the Environmental Protection Tribunal (EPT) may, in addition to punishment, award imprisonment for a term that may extend up to three years, or order confiscation or closure of facility etc.

Section 23: Where any violation of this Act has been committed by any of employee of any corporate body, then, that employee shall be considered to be guilty of environmental pollution.

Section 25: This section allows for establishment of Environmental Protection Tribunals.

2.4.2 Sindh EPA (Review of IEE/EIA) Regulations, 2014

The Sindh Environmental Protection Agency (Review of EIA/IEE) Regulations 2014, define Schedules (I & II) of projects falling under the requirement of IEE or EIA.

Schedule I: A project falls in Schedule I if it is likely to have adverse environmental impacts, but of lesser degree or significance and all the mitigation measures to handle the impact is manageable. Such types of projects need IEE report including EMP.

Schedule II: Projects are categorized in Schedule II if they generate significant adverse environmental impacts that require a comprehensive management plan, or if the project is located within or passes through: a) Areas declared by the Government of Pakistan as environmentally sensitive (National Parks/Sanctuaries/Game Reserve), b) Areas of international significance (e.g. protected wetland as designated by the RAMSAR Convention), or c) Areas designated by the United Nations Educational, Scientific and Cultural Organization (UNESCO) as cultural heritage sites.

According to Sindh Environmental Protection Agency Regulation, 2014, a project falling in any category listed in Schedule II shall file an EIA with the Sindh Environmental Protection Agency (SEPA). Within urban development the **Housing schemes above 10 acres** are placed in Schedule II thus requiring an EIA.

Filing: Regulation 9 requires submission of ten hardcopies and two electronic copies accompanied by an application form (schedule-V), copy of receipt of payment of review fee, NOC from relevant departments (where applicable) and environmental checklist (if project falls in schedule III).

Preliminary scrutiny: Regulation 10 states that within 15 days of report submission the agency shall review the report and inform the proponent for submission of any additional information.

Review: The agency shall review the IEE report within 60 days after issuing confirmation of completeness as per Regulation 9. It shall also conduct an experts' committee meeting or solicit views from concerned advisory committee.

Validity: Regulation 18 defines the validity period of approval of an IEE or EIA to be three years from date of construction and must start within three years of report approval. A three-year extension at a time may be granted upon the agency's discretion with or without the submission of a fresh IEE or EIA.

Monitoring: Sub-regulation 20 requires the submission of a report to agency on completion of construction of project and after issue of confirmation of compliance, the submission of annual report summarizing operational performance of the project with reference to conditions of approval and maintenance and mitigation measures adopted by the project.

2.4.3 Sindh Environmental Quality Standards, (SEQS)

With the SEPA Act, 2014 the Sindh EPA revised the Environmental Quality Standards (EQS) with full consultation of the private sector, industrialist, trade and business associations and NGOs and approval of Sindh Environmental Protection Council has developed Sindh Environmental Industrial Wastewater, Effluent, Domestic Sewerage, Industrial Air Emission, Ambient Air, Noise for vehicles, Air Emissions for Vehicles and Drinking Water Quality Standards 2015 vide Notification No. EPA/TECH/739/2014. Project proponent is committed to comply with the applicable Sindh-EQS in letter and spirit.

Table 2.1: Sindh Environmental Quality Standard for Ambient Air

Pollutant	Time-weighted average	Concentration in Ambient Air	Method of measurement
Sulfur Dioxide (SO ₂)	Annual Average*	80µgm ³	Ultraviolet Fluorescence Method
	24 hours**	120µgm ³	
Oxides of Nitrogen as (NO)	Annual Average*	40µgm ³	Gas Phase Chemiluminescence
	24 hours**	40µgm ³	
Oxides of Nitrogen as (NO ₂)	Annual Average*	40µgm ³	Gas Phase Chemiluminescence
	24 hours**	80µgm ³	
O ₃	1 hour	130µgm ³	Non dispersive UV absorption method
Suspended Particulate Matter (SPM)	Annual Average*	360µgm ³	High volume Sampling, (Average flow rate not less than 1.1m ³ /minute)
	24 hours**	500µgm ³	
Respirable Particulate Matter (PM10)	Annual Average*	120µgm ³	B Ray absorption method
	24 hours**	150µgm ³	
Respirable Particulate Matter (PM2.5)	Annual Average*	40µgm ³	B Ray absorption method
	24 hours**	75µgm ³	
Lead (Pb)	Annual Average*	1µgm ³	ASS Method after sampling using EPM 2000 or equivalent Filter paper
	24 hours**	1.5µgm ³	
Carbon Monoxide (CO)	8hours**	5mg/m ³	Non Dispersive Infra Red (NDIR) method
	1hours	10mg/m ³	
*Annual arithmetic mean of minimum 104 measurements in a year taken twice a week 24 hourly at uniform interval.			
**24 hourly / 8 hourly values should be met 98% of the in a year. 2% of the time, it may exceed but not on two consecutive days.			

Table 2.2 shows the standards for motor vehicle noise.

Table 2.2: The Motor Vehicle Noise		
Parameter	Standards (maximum permissible limit)	Measuring method
Noise	85dB(A)	Sound-meter at 7.5meter from the source

Table 2.3 shows the proposed national environmental quality standard for noise.

Table 2.3: Sindh Environmental Quality Standard for Noise					
S. No.	Category of Area / Zone	Effective from 1 st January, 2015		Effective from 1 st January, 2015	
		Limit it in dB(A) Leq*			
		Day Time	Night Time	Day Time	Night Time
1	Residential area (A)	65	50	55	45
2	Commercial area (B)	70	60	65	55
3	Industrial area (C)	80	75	75	65
4	Silence Zone (D)	55	45	50	45
Note: 1	Day time hours: 6.00 a. m to 10.00 p. m				
2	Night time hours: 10.00 p. m to 6.00p. m				
3	Silence zone; Zone which are declared as such by competent authority. An area comprising not less than 100 meters around hospitals, educational institutions and courts.				
4	Mixed categories of areas may be declared as one of the four above-mentioned categories by the competent authority.				
*dB(A)Leq	Time weighted average of the level of sound in decibels on scale A which is relatable to human hearing.				

The SEQS for effluents are shown in Table 2.4.

S. #	Parameter	Into Inland Waters	Into Sewage Treatment	Into Sea	unit
1	Temperature or Temp. increase	<3	<3	<3	°C
2	pH value (H ⁺)	6-9	6-9	6-9	
3	Biological Oxygen Demand (BOD) ₅ at 20°C	80	250	80	mg/l
4	Chemical Oxygen Demand (COD)	150	400	400	mg/l
5	Total Suspended Solids (TSS)	200	400	200	mg/l
6	Total Dissolved Solids (TDS)	3500	3500	3500	mg/l
7	Oil and Grease	10	10	10	mg/l
8	Phenolic Compounds (as Phenol)	0.1	0.3	0.3	mg/l
9	Chloride (as Cl ⁻)	1000	1000	SC	mg/l
10	Fluoride (as F ⁻)	10	10	10	mg/l
11	Cyanide (as CN ⁻)total	1.0	1.0	1.0	mg/l
12	An-ionic detergents (as MBAS)	20	20	20	mg/l
13	Sulphate(SO ₄ ²⁻)	600	1000	SC	mg/l
14	Sulphide (S ²⁻)	1.0	1.0	1.0	mg/l
15	Ammonia (NH ₃)	40	40	40	mg/l
16	Pesticides	0.15	0.15	0.15	mg/l
17	Cadmium	0.1	0.1	0.1	mg/l
18	Chromium (trivalent and hexavalent)	1.0	1.0	1.0	mg/l
19	Copper	1.0	1.0	1.0	mg/l
20	Lead	0.5	0.5	0.5	mg/l
21	Mercury	0.01	0.01	0.01	mg/l
22	Selenium	0.5	0.5	0.5	mg/l
23	Nickel	1.0	1.0	1.0	mg/l
24	Silver	1.0	1.0	1.0	mg/l
25	Total toxic metals	2.0	2.0	2.0	mg/l
26	Zinc	5.0	5.0	5.0	mg/l
27	Arsenic	1.0	1.0	1.0	mg/l
28	Barium	1.5	1.5	1.5	mg/l
29	Iron	8.0	8.0	8.0	mg/l
30	Manganese	1.5	1.5	1.5	mg/l
31	Boron	6.0	6.0	6.0	mg/l
32	Chlorine	1.0	1.0	1.0	mg/l

2.5 Other Relevant Laws & Regulations

2.5.1 The Forest Act, 1927

The Forest Act deals with the matters related with protection and conservation of natural vegetation/habitats. In that regard it empowers the concerned agency to declare protected and reserved forest areas and maintaining the same. In spite of the fact that it recognizes the right of people for access to the natural

resources for their household use, it prohibits unlawful cutting of trees and other vegetation. The permission is required prior to undertaking any tree cutting from the area under the charge of Forest Department of Sindh.

The proposed Education city constructive zones does not include any reserve/protected forest area.

2.5.2 Sindh Wildlife Protection Ordinance, 1972

This ordinance provides for the preservation, protection and conservation of wildlife by the formation and management of protected areas and prohibition of hunting of wildlife species declared protected under the ordinance. The ordinance also specifies three broad classifications of the protected areas that includes i) National parks ii) Wildlife sanctuaries and iii) Game reserves. Activities such as hunting and breaking of land for mining are prohibited in national parks, as are removing vegetation or polluting water flowing through the park. Wildlife sanctuaries are areas that have been set aside as undisturbed breeding grounds and cultivation and grazing is prohibited in the demarcated areas. Nobody is allowed to reside in a wildlife sanctuary and entrance for the general public is by special dispensation. However, these restrictions may be relaxed for scientific purpose or betterment of the respective area on the discretion of the governing authority in exceptional circumstances. Game reserves are designated as areas where hunting or shooting is not allowed except under special permits.

The proposed project area does not include any protected area or Game Reserve etc. The site under discussion falls in protected and wildlife area for, environment and ecology. For this sustainable development of project will be implement for project.

2.5.3 Pakistan Penal Code, 1860

The Pakistan Penal Code deals with offences where public or private property and/or human lives are affected due to the intentional or accidental misconduct of an individual or body of people. In the context of environment, the Penal Code empowers the local authorities to control noise, noxious emissions and disposal of effluents. The NEQS enforced by the EPAs supersede the application of this legislation on industries and municipalities. The Penal Code, however, can provide a basis for the client to coordinate its activities with the local authorities to ensure that its construction activities do not become a cause of public nuisance or inconvenience.

2.5.4 The Antiquities Act, 1975

It ensures the protection of Pakistan's cultural resources. The Act defines "antiquities" as ancient products of human activity, historical sites or sites of anthropological or cultural interest, national monuments, etc. The Act is designed to protect these antiquities from destruction, theft, negligence, unlawful excavation, trade and export. The law prohibits new construction in the proximity of a protected antiquity and empowers the GoP to prohibit excavation in any area that may contain articles of archaeological significance. Under the Act, the Project proponents are obligated to ensure that no activity is undertaken within 61 m (200 ft.) of a protected antiquity and to report to the GoP's Department of Archaeology any archaeological discovery made during the course of the project.

The federal Department of Archaeology maintains a master register containing basic and vital information on the protected monuments and sites including full measurements of the protected areas, description, location and Government Notification number with date of protection. The central directorate general of Archaeology has a separate list which is continuously updated as and when new sites are declared as protected.

In Pakistan at present there are 387 notified sites which are covered by Federal Antiquities Act. Karachi alone has over 200 buildings declared as “Protected Heritage” by the Government of Sindh.

Up to date copies of this protected area list will be sought by the proponent to avoid confusion at any later stage in development; as it is an on-going process to bring new sites within official notification. For this reason, contact with the relevant Provincial or Federal Department of Archaeology should be sought by the proponent early during the feasibility/conceptual stage of project development.

2.5.5 Hospital Waste Management Rules, 2014

The Hospital Waste Management Rules provides guidelines for hospital waste management in detail. These rules help in proper segregation, collection, transportation, storage, disposal and incineration of waste generated during the various operations of Health care facility.

Section 4: requires that there shall be Hospital Waste Management Plan based on recognized standards which shall include waste management points, categories of waste being generated and schedule of waste collection etc.

Section 8: emphasizes waste treatment before its disposal by thermal, chemical, irradiation incineration or filtration etc.

Section 9: The waste shall be disposed of in accordance with procedure mentioned in Schedule-I

Section 10: describes quick emergency response as per Hospital Waste Management Plan in case of accidents or spillage.

Section 11: requires maintenance of waste record.

Section 12: requires immunization of all employees responsible for managing hospital waste.

Section 13: states that an authorized officer may inspect any Hospital located within area of his jurisdiction.

Section 14: asks mandatory requirement of license from Agency for handling of hazardous wastes. Schedule-I mentions types of waste category, color coding, container type, treatment and disposal details.

2.5.6 The Land Acquisition Act, 1894

The Land acquisition is governed under LAA 1894 which is primary law for land acquisition in Pakistan. The Land Acquisition Act 1894, as amended from time to time, is the primary law for the purpose of land acquisition in the Province of Sindh. The Act provides for acquisition of land for public purpose.

The land acquisition process starts with publication of Section 4 followed by land survey, land price estimation and formal declaration with exact measurements and the government's intent to acquire land. As per LAA 1894 provisions the market value is determined by the LAC on the basis of transactions recorded in the land mutation registers preceding one year of issuance of notification under section-4, for each village (revenue estate) separately and are communicated to the EA for depositing the cost of land in treasury under revenue deposits head to be placed at disposal of the LAC. Depositing of estimated land cost is pre-requisite for further processing of land acquisition. However, to reduce the chances of arbitrary assessment of land prices by single authority and ensure transparent and fair assessment of land compensation in strict compliance with the provisions LAA 1894 and LAA Rule 1983 the BOR established District Price Assessment Committees (DPAC) in each district to assess compensation and issued guidelines for expeditious disposal of land acquisition cases.

During inquiry under Section-11 the APs are informed about the compensation rates for all lost assets including land and their claims and objections about compensation rates, apportionment of compensation and any other objections raised by the interested persons are heard and responded by the LAC before announcement of award. The LAC also informs about the grievance redress mechanism available to APs under LAA 1894 in case of disagreement on award. The land for Education City has been acquired by the project proponent.

2.5.7 Civil Aviation Rules, 1994

It was made in exercise of the powers conferred by Civil Aviation Ordinance 1960, Pakistan Civil Aviation Authority Ordinance 1982, Aircraft (Removal of Danger to Safety) Ordinance 1965 and the Telegraph Act 1885.

Section 3 – Safe Guarding at Aerodromes (68) Limitation of obstructions: “No person shall erect any temporary or permanent structure, nor position a vehicle or other mobile object on or in the vicinity of any aerodrome to which these rules are applicable, that will be within the clearance area, or will protrude through an obstacle limitation surface, at that aerodrome”.

2.5.8 Sindh Building Control Ordinance 1979

The Sindh Building Control Ordinance, 1979 was promulgated on 3rd March 1979 to provide for regulation of the planning, construction control and demolition of the buildings Section 14 of the Ordinance, also authorizes demolition of building, but as it is evident from its provisions, it gives the Authority for demolition on different grounds, which are related to the unstable condition of building. It categorizes a particular type of building which is likely to collapse or it's dangerous as to cause harm to human life or property.

2.5.9 Employment of Child Act, 1991

Article 11 (3) of the constitution of Pakistan prohibits employment of children below the age of 14 years in any factory, mines or any other hazardous employment. In accordance with this Article, the Employment of Child Act (ECA) 1991 disallows the child labor in the country. The ESA defines a child to mean a person who has not completed his/her fourteenth years of age. The ECA states that no child shall be employed or permitted to work in any of the occupation set forth in the ECA (such as transport sector, railways, construction and ports) or in any workshop wherein any of the processes defined in the Act is carried out. The processes defined in the Act include carpet weaving, bidi (kind of a cigarette) making, cement manufacturing, textile, construction and

others). **Proponent and its contractors will be bound by the ECA to disallow any child labor at the project sites or camp sites.**

2.6 National Environmental Guidelines

2.6.1 Pakistan Environmental Assessment Procedures

The Federal EPA has prepared a set of guidelines for conducting environmental and social assessments. The guidelines derive from much of the existing work done by international donor agencies and NGOs. The package of regulations, of which the environmental and social guidelines form a part, includes the PEPA 1997 and the NEQS. These guidelines are listed below followed by comments on their relevance to proposed project:

Policy and Procedures for Filing, Review & Approval of Environmental Assessments, Pakistan Environmental Protection Agency, September 1997:

These guidelines define the policy context and the administrative procedures that govern the environmental assessment process from the project pre-feasibility stage to the approval of the environmental report. The section on administrative procedures has been superseded by the Sindh IEE/EIA Regulations 2014. The package of regulations prepared by PEPA with relevance to this EIA includes:

- Policy and Procedures for Filing, Review and Approval of Environmental Assessments;
- Guidelines for the Preparation and Review of Environmental Reports;
- Sectoral Guidelines for Environmental Reports - New township development
- Guidelines for Public Consultation

Policy and procedures for filing, review and approval of environmental assessments: These guidelines define the policy context and the administrative procedures that will govern the environmental assessment process, from the project pre-feasibility stage, to the approval of the environmental report. According to the procedures laid out in the policy guidelines, IEE's or EIA's are to be filed with the EPA of the province where the project is to be implemented. The PEPA has, however, been given the right to review any environmental report at any time and the power to revoke the decision of the provincial EPA, if it deems this to be necessary. Projects have been classified in the policy guidelines by expected degree of adverse environmental impacts.

Projects which have comparatively lower environmental issues and can be managed by less extensive analysis are included in Schedule-I.

Guidelines for the preparation and review of environmental reports: It requires proponents to prepare terms of reference for the environmental assessment reports. It requires that all studies should contain baseline data on the area and must contain an assessment of the potential environmental impacts and the recommended mitigation measures.

Sectoral guidelines for environmental reports - New township development: These guidelines are prepared to look specifically at the Environmental impacts resulting from constructing housing estates and townships in Pakistan. The guidelines examine the alternatives on site and technology and impacts on the social and physical

environment, during the construction and operation phases of the project and devices proposals for mitigation measures.

Guidelines for public consultation: These guidelines are intended to provide assistance throughout the environmental assessment of project by involving the public which can lead to better and more acceptable decision-making. Public involvement, undertaken in a positive manner and supported by a real desire to use the information gained to improve the proposal, will lead to better outcomes, and lay the basis for ongoing positive relationships between the participants.

The guidelines define the "objectives of consultation" as follows: Public involvement is a feature of environmental assessment and can lead to better and more acceptable decision-making. It can be time consuming and demanding, yet without it, proposals are seldom soundly based, and there is likely to be antagonism from affected people.

The Guidelines for Public Consultation introduces effective ways to inform the contents of the project to the general public during the planning stage & that eventually consensus building toward the implementation of project is reached.

Incorporating public involvement into the stages of environmental assessment is explained in the guidelines that public consultation meeting has to be carried out after the works on "developing options, and assessing and mitigating impacts" for comments and assessment.

The submission and approval procedure for the EIA is summarized below:

- The EIA report shall be submitted, together with a review fee and form included as Schedule-V of the Sindh IEE/EIA Regulations 2014.
- The SEPA shall conduct a preliminary scrutiny and reply within 15 working days of the submittal of the report a) confirming completeness, or b) asking for additional information, if needed, or c) returning the report requiring additional studies, if necessary.
- The SEPA is required to make every effort to complete the EIA review process within four months of the issue of confirmation of completeness.
- SEPA shall call for a Public Hearing for the project to invite all the concerned persons to raise concerns on the project.
- Following the Public Hearing, SEPA shall constitute a Committee of Experts to assist the agency in review of the EIA.
- The approval granted at the end of the review process is valid for three years for start of construction.
- Once project construction has been completed, the proponent is required to submit a request to the SEPA for confirmation of compliance. An environmental management plan for the operation phase is to accompanied with the request.
- The SEPA is required to communicate its decision within four months of receipt of the request. The project can commence operation only after it has received approval from the SEPA.

2.7 International Environmental Guidelines

2.7.1 World Bank Guidelines on Environment

The principal World Bank publications that contain environmental guidelines are listed below.

- Environmental Assessment-Operational Policy 4.01. Washington, DC, USA. World Bank 1999.
- Environmental Assessment Sourcebook, Volume I: Policies, Procedures, and Cross-Sectoral Issues. World Bank Technical Paper Number 139, Environment Department, the World Bank, 1991,
- Environmental Assessment Sourcebook, Volume III: Guidelines for Environmental Assessment of Energy and Industry Projects. World Bank Technical Paper No. 154, Environment Department, the World Bank, 1991.
- Pollution Prevention and Abatement Handbook: Towards Cleaner Production, Environment Department, the World Bank, United Nations Industrial Development Organization and the United Nations Environment Program, 1998.

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

The Sourcebook identifies a number of areas of concern, which should be addressed during impact assessment. It sets out guidelines for the determination of impacts, provides a checklist of tools to identify possible biodiversity issues and suggests possible mitigation measures. Possible development project impacts on wild lands, wetlands, forests etc. are also identified and mitigation measures suggested. The Sourcebook also highlights concerns in social impact assessment and emphasizes the need to incorporate socio-economic issues in EIA exercises.

The EHS guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP).

2.7.2 IFC General EHS Guidelines

The EHS guidelines published by IFC are technical reference documents that address IFC's expectations regarding the industrial pollution management performance of its projects. They are designed to assist managers and decision makers with relevant industry background and technical information. This information supports actions aimed at avoiding, minimizing, and controlling EHS impacts during construction, operation and decommissioning phase of a project or facility.

Environmental issues associated with the construction and maintenance activities may include, among others, noise and vibration, soil erosion and threats to biodiversity including habitat alteration and impacts to wildlife.

Examples of the impacts addressed in the General EHS Guidelines include:

- Construction site waste generation;

- Soil erosion and sediment control from materials sourcing areas and site preparation activities;
- Fugitive dust & other emissions (e.g. from vehicle traffic, land clearing activities & materials stockpiles);
- Noise from heavy equipment and truck traffic;
- Potential for hazardous materials and oil spills associated with heavy equipment operation and fueling activities.

2.8 International Environmental Treaties

Pakistan is a signatory to various international treaties and conventions on the conservation of the environment and wildlife protection. The country is thus obliged to adhere to the commitments specified in these treaties.

2.8.1 ILO Conventions

Pakistan has been a member of the ILO since 1947 and has thus far ratified 36 conventions. Of these, 33 are in force, whereas 3 have been denounced. The fundamental conventions which are being implemented across Pakistan through applicable labor laws include:

- C029 - Forced Labor Convention, 1930 (No. 29);
- C100 - Equal Remuneration Convention, 1951 (No. 100);
- C105 - Abolition of Forced Labor Convention, 1957 (No. 105);
- C111 - Discrimination (Employment and Occupation) Convention, 1958 (No. 111);
- C138 - Minimum Age Convention, 1973 (No. 138) Minimum age specified: 14 years;
- C182 - Worst Forms of Child Labor Convention, 1999 (No. 182).

2.8.2 Climate Change Policy

The National Climate Change Policy provides a framework for addressing the issues that Pakistan faces or will face in future due to the changing climate. The policy highlights vulnerabilities of various sectors to climate change and their appropriate adaptation measures. Furthermore, the policy highlights the issues such as disaster preparedness, capacity building, institutional strengthening, technology transfer and international cooperation. The policy thus provides a comprehensive framework for the development of Action Plan for national effort on adaptation and mitigation.

2.8.3 National Disaster Risk Policy

This policy document introduces a proactive and anticipatory approach by laying special emphasis on risk assessment, prevention, mitigation and preparedness, with the aim of creating a resilient nation. The policy aims to reduce socio-economic vulnerabilities to disaster in specific area as well as dealing with the environmental and other hazards that trigger them.

2.8.4 Waste & Pollution

Basel Convention on the Control of Trans boundary Movement of Hazardous Wastes and their Disposal, 1989.

2.8.5 Biodiversity & Protection of Plants and Animals

- Convention on the Biological Diversity, 1992

- Cartagena Protocol on Bio safety to the Convention on Biological Diversity, 2000
- Convention on International Trade in Endangered Species of Wild Fauna & Flora (CITES), 1973
- International Plant Protection Convention, 1997
- Ramsar Convention, 1971 for the Conservation and wise use of natural resources and includes all aspects of wetland conservation
- IUCN red list published by IUCN and includes those species that are under potential threat of extinction. These species have been categorized as endangered, vulnerable in decline, lower risk and data deficient.

2.9 INTERNATIONAL REGULATIONS AND POLICIES

As Pakistan is a member of a number of international organizations like United Nations Organization (UNO), Organization of Islamic Countries (OIC), South Asian Association for Regional Corporation (SAARC), Economic Corporation Organization (ECO), etc., so it has to follow the international protocols and obligations related to the environmental perspective. The protocols and obligations related to the proposed project are as under:

2.9.1 The Convention on Conservation of Migratory Species of Wild Animals, 1979

The Convention requires the countries to take action to avoid endangering migratory species. Species covered in the Convention should be given special attention during EIA and monitoring, and any impacts identified should be mitigated to acceptable levels.

2.9.2 The Rio Declaration, 1992

The Rio Declaration comprises twenty-seven principles which address such important issues as; sustainable development to integrate environmental Protection into the development process; common but differentiated responsibilities to conserve, protect and restore the earth's ecosystems; public participation and information access at the national level, reduce and eliminate unsustainable patterns of production and consumption.

2.9.3 Convention on Wetlands (Ramsar Convention), 1971

The broad aim of the Convention on Wetlands (Ramsar, Iran, 1971) is to halt the worldwide loss of wetlands and to conserve those that remain through wise use and technology transfer. Contracting Parties have made commitments to:

- Designate at least one site that meets the Ramsar criteria for inclusion in the list of Wetlands of International Importance.
- Protect the ecological character of listed sites.
- Include wetlands conservation within their national land-use planning.
- Establish nature reserves on wetlands and promote wetland training.

Chapter 3 PROJECT DESCRIPTION

3.1. Location of the Project

The Government of Sindh has earmarked 8939.34 acres of land in Deh Chuhar, Gaddap District Malir, Karachi for Education City project, on link road between National Highway and Super Highway. It is an ideal location for establishing such educational institutions with large campuses because of spacious and well-established landscape.

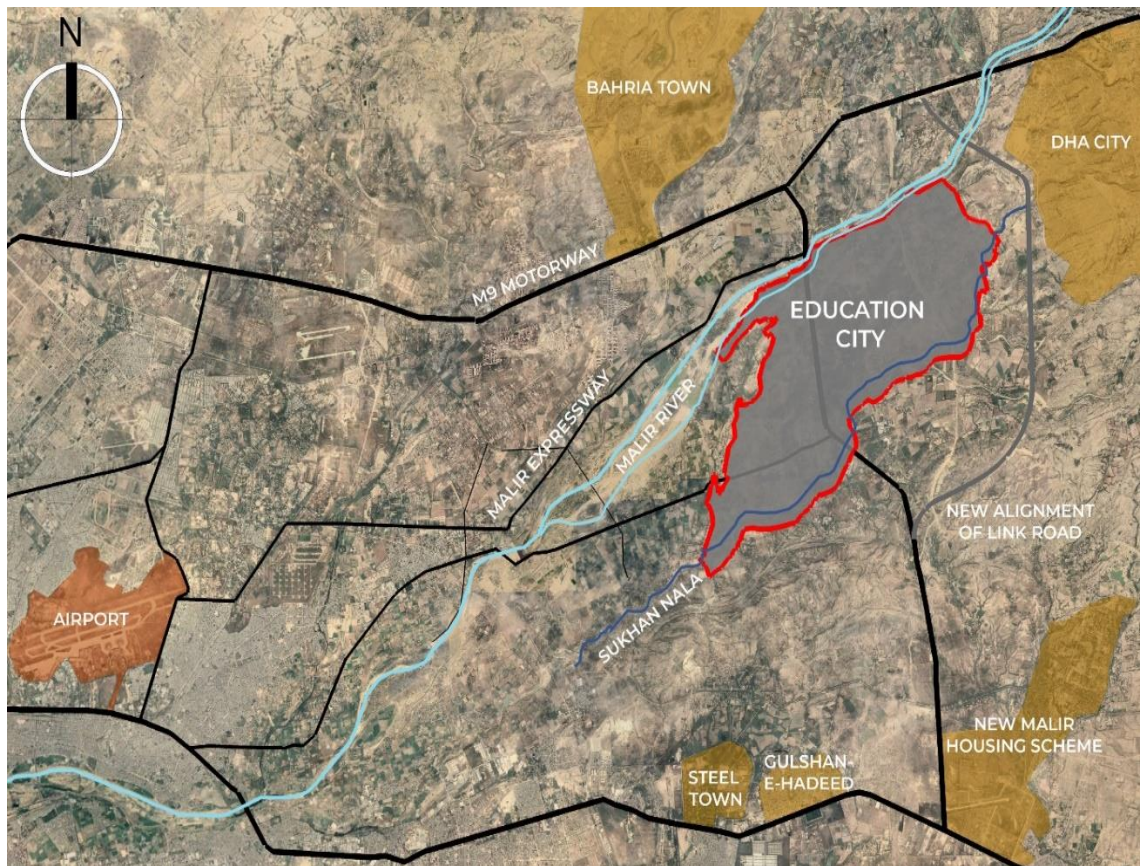


Figure 3-1: Project Study Area Map

3.2. Strategic Development Plan for the Project

The main feature for strategic development plan for Education City Project is as under:-

1. Core elements of EC are local and international educational and health institutions that
2. Will provide solutions to Pakistan's challenge of higher education.
3. Opportunity and attraction to remain and study in Pakistan
4. Educational institutions will create the opportunity for private R&D businesses as a component of EC.
5. Residential and commercial development though restricted for the

purpose of Education City only, will provide 'quality of life' or
'character of community' that is typical of educational communities.

6. Land has been earmarked for institutions Strategic Development
Plan design until year 2050

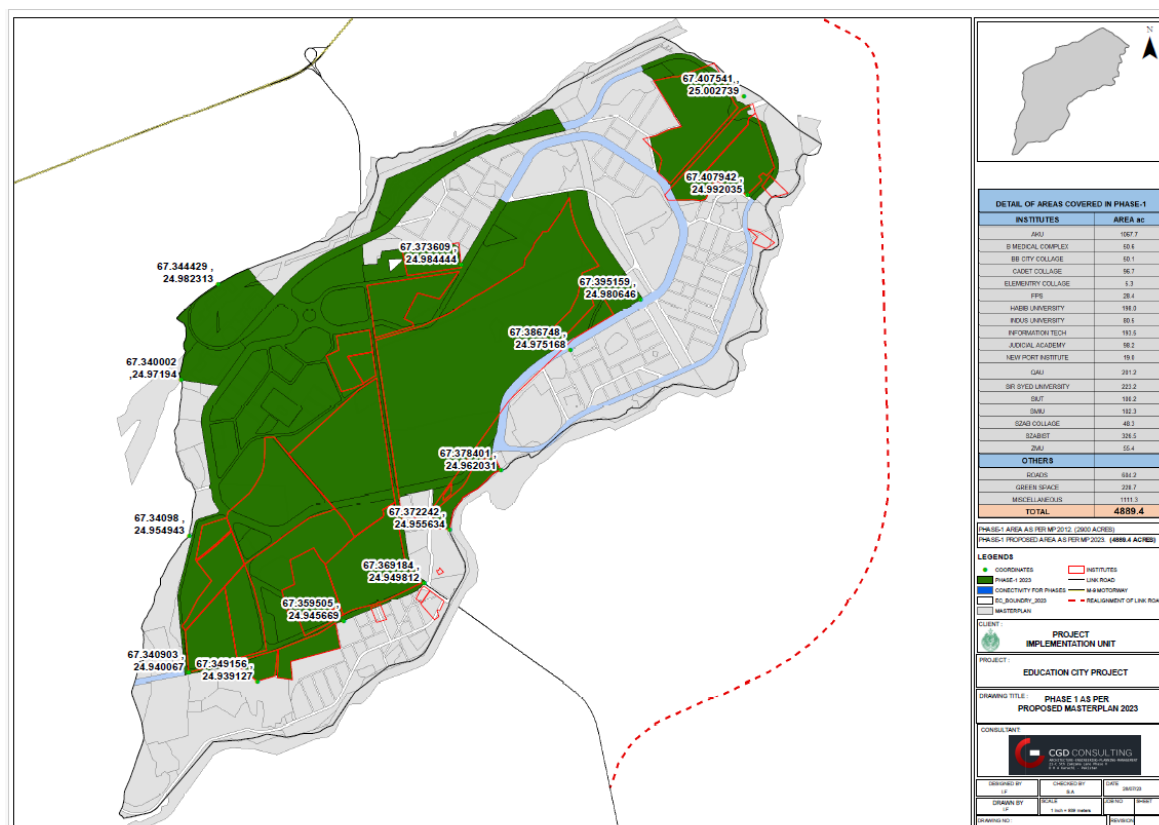


Figure 3-2: Design Parameters for Phase I

3.2.1. Strategic Development Plan design until year 2050

The concept of Education City revolves around the concept that the education system acts as an essential element for a citywide development and reciprocally city development acts as an essential element for education development. Similarly, an education city is also characterized as ecofriendly, carbon-neutral, netted, culturally sensitive, sustainable, and smart settlement based on knowledge economy. Accordingly, the Education City envisions itself. The importance in EC is given as under:-

Cultural Identity: This aspect emphasizes the importance of preserving and celebrating the rich cultural heritage of the Sindh province. In the process of urban development, it's crucial to maintain the cultural identity of the region, promote local arts, traditions, and festivals, and ensure that the architectural landscape reflects the cultural essence of Sindh.

Education City will embrace the integration of traditional arts, culture, and creativity into its urban form. While incorporating art ordinations, cultural events, and creative spaces, Education City can foster an environment that celebrates diversity, stimulates imagination, and enhancing overall well-being of its population. The preservation and integration of existing 29 villages—having 5092 households and around 25,000 indigenous

population within the project area stands alone as the most important element culturally rooted and inclusive master planning strategy for the education city.

City Linkage and Hierarchy: Being well-netted refers to creating a robust and efficient transportation and connectivity network within urban areas and connecting them with the surrounding regions. This includes well-planned road networks, public transportation systems, pedestrian-friendly pathways, and reliable internet connectivity. In essence, the concept of education city—especially in the backdrop of information age embraces networking system connectivity rather than traditional hierarchical system of human settlements.

Smart Innovative City: Given the rapid advancements in technology and their application, Education City will embrace the Smart City concepts such as Artificial Intelligence (AI), Internet of Things (IoT), e-commerce, e-commuting, e-learning, and webinars to name a few. This transformative approach revolves around the integration of human and social capital through technology-based solutions. The objective is to achieve efficient, sustainable, and resilient development while ensuring a high quality of life. This will be accomplished through multi-stakeholder partnerships at the local, regional, provincial, national, and international level—fostering collaboration and innovation.

Knowledge City: Moving towards a knowledge-based economy means promoting education, research, innovation, and technology. Investing in quality education, vocational training, and research institutions will help build a skilled and competitive workforce that can contribute to the growth of knowledge-intensive industries. In line with the Economic Base Theory of urban development the knowledge-based economy—in the form of tertiary level education and IT industries acts as basic industries. Accordingly, the knowledge-based economy of the education city is expected to exhibit multiplier effect for the economy of Education City.

Sustainable City: Education City aims to integrate policies that promote inclusivity, efficiency, climate change adaptation, disaster resilience, and risk management—ultimately contributing to sustainable and resilient urban development. Sustainability stands at the very hard core of the education city's vision. Urban planning should prioritize resource management, waste reduction, water conservation, and responsible land use planning and management to ensure sustainable development in the long run. Recognizing the significance of the SDGs in shaping a better future, the government of Sindh, in collaboration with UNDP Pakistan, has established the SDGs Support Unit at the Planning & Development Board. As part of the National Initiative for SDGs, this unit plays a crucial role in driving SDGs implementation across various projects—including the Education City project. Education City's commitment to sustainable development aligns closely with the SDG Goal 11: Sustainable Cities and Communities. This goal calls for inclusive urban planning and management; preservation of cultural and natural heritage; and the strengthening of ties between urban and rural communities for social, economic, and environmental progress.

Eco city: To combat climate change and reduce environmental impact, urban development in Sindh should focus on becoming carbon-neutral. This can be achieved by adopting renewable energy sources, promoting green transportation systems, implementing energy-efficient infrastructure, and encouraging sustainable practices in industries and households. Taking knowledge industry as the economic engine of the education city will pave the way for a carbon neutral and ecofriendly urban development example in Pakistan vis-à-vis the region.

The Master Plan of the project is given as under:-

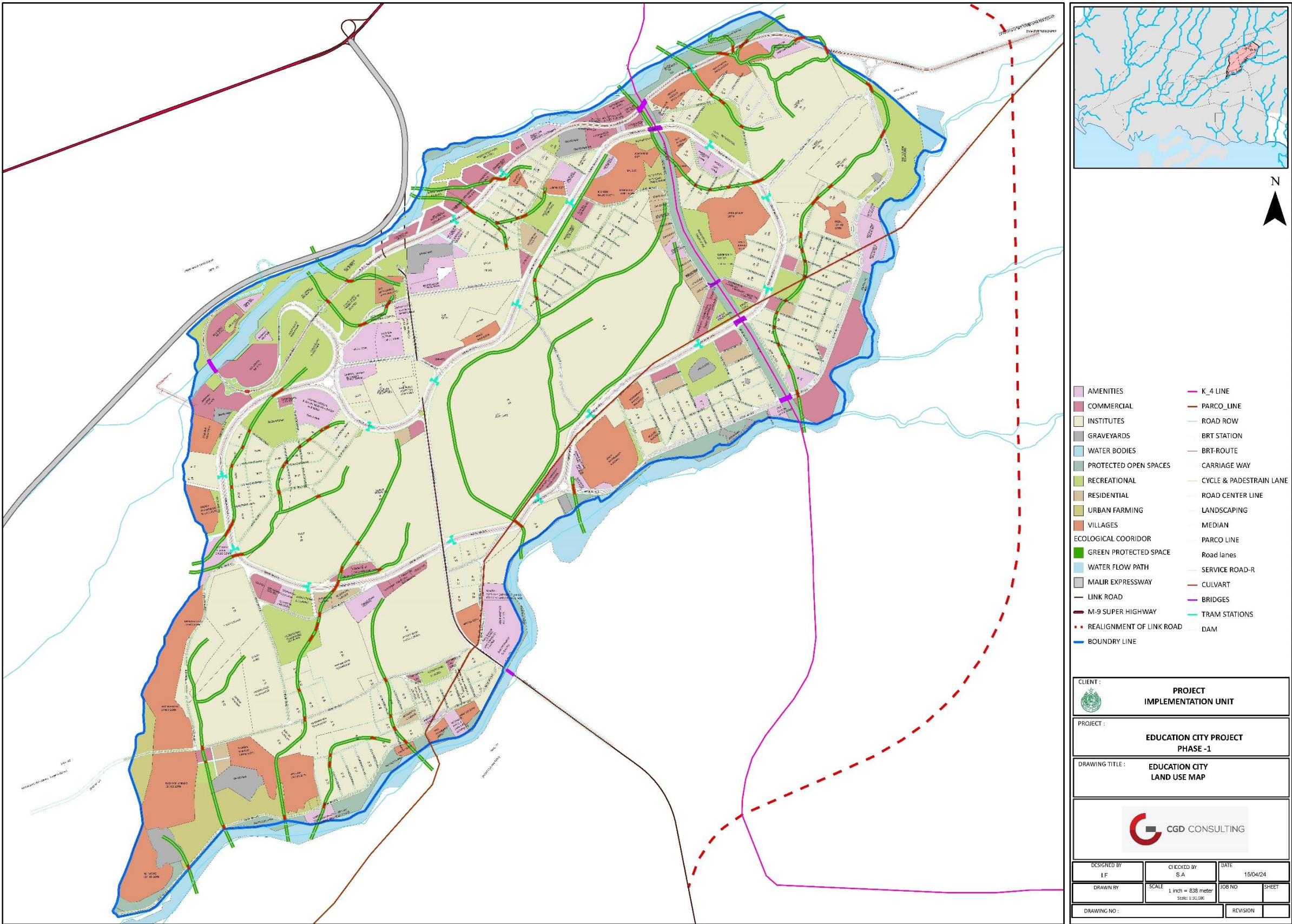


Figure 3-7: Master Plan of the Project

3.2.2. Project Phases

The project is divided in to three phases, Each Phase comprise of 10 years so time line for overall implementation of master plan is 30 years. The project area interval for 10 years are define under following tables:

Summary Phase Wise Population by Surface Area					
Phase	Institution	Residential	Commercial	Amenity	Total
Phase 1	499,283	73,292	474,353	14,758	1,061,686
Phase 2	420,244	69,862	78,317	13,346	581,769
Phase 3	181,734	11,458	10,333	5,625	209,151
Total	1,101,261	154,612	563,003	33,728	1,852,605
Settlement Population is 25000 approx. in 2023 and will be 53000 approx.in 2060					
Note: Provision of Transit Population are not included in the Projections.					

Population Projection for Clusters @ Medium Density Factor						
Cluster Wise	Total Area	Preliminary Population	Projected Population 2030	Projected Population 2040	Projected Population 2050	Projected Population 2060
Cluster 1	566.29	59,898	71,159	87,881	108,533	134,039
Cluster 2	678.48	71,765	85,257	105,292	130,036	160,594
Cluster 3	1022.69	108,173	128,510	158,709	196,006	242,067
Cluster 4	1091.41	115,442	137,145	169,374	209,177	258,334
Cluster 5	603.58	63,842	75,844	93,668	115,680	142,864
Cluster 6	720.39	76,198	90,523	111,796	138,068	170,514
Cluster 7	623.97	65,999	78,407	96,832	119,588	147,691
Cluster 8	1250.01	132,217	157,074	193,986	239,573	295,873
AgroTech	608.25	64,336	76,431	94,392	116,575	143,970
Total	7165.07	757,870	900,350	1,111,932	1,373,236	1,695,946

Figure 3-8: Project Phases

3.2.3. Land use

The major land uses can be grouped as follows:

- **New City Centre:** High rise commercial/residential/retail/government.
- **Primarily Residential:** with local services and local employment.
- **Knowledge Industries:** Further education/research/high tech parks/Information Technology.
- **Central Business Districts:** High rise commercial/residential/retail.
- **Medical City:** with tourism resorts.

- **Theme Park:** Mughal Gateway Project and extension.
- **Relocations:** Regeneration/service industries/affordable housing.
- **Innovation City:** innovation industry.
- **Technology City:** logistic/ technological industries /trade and exhibition centers.
- **Logistics:** Warehousing/dry port/freight interchange/strategic park and ride.
- **Governmental City:** Governmental institutes, offices and diplomatic enclave
- **Financial City:** big cooperate offices, head offices and financial centers, stock markets etc.
- **Eco City:** Including cultural facilities/sports stadia/parkland/ forestry/agriculture/ Eco ponds.

Green Area

The total green area proposed in form of reserved for Parks consisting of area 531.24 Acre, Protected Open Spaces 307.63 acres and Urban Farming area will be comprises of 159.88 acres of total land.

3.2.4. Road Hierarchy Plan

A hierarchy of road network is required to serve the access and mobility requirements of the project area with efficiency, safety of all road users regardless of travel mode.

Road layouts and configuration is to be flexible in commensurate with land use and travel capacity requirements. Road network is not only to serve the area mobility but need to support the land uses and businesses around. It has to cater for movement of all modes including pedestrians, cycling, transits and vehicles, providing convenience of travel and safety for all modes.

Key parameters to determine the configuration and layout of the road network are land use and capacity.

The network is required to equally meet with the service levels of vehicular and non-motorized travel with environmental consideration and aspirations of the area community.

Varying land use patterns along the road are to be reflected in the layout and configuration of the road adjusting it to meet the needs of surrounding area. In high density and compact areas better usage of transit becomes crucial, provision of wider walkways and bike ways become more vital together with greater network / multi-modal connectivity.

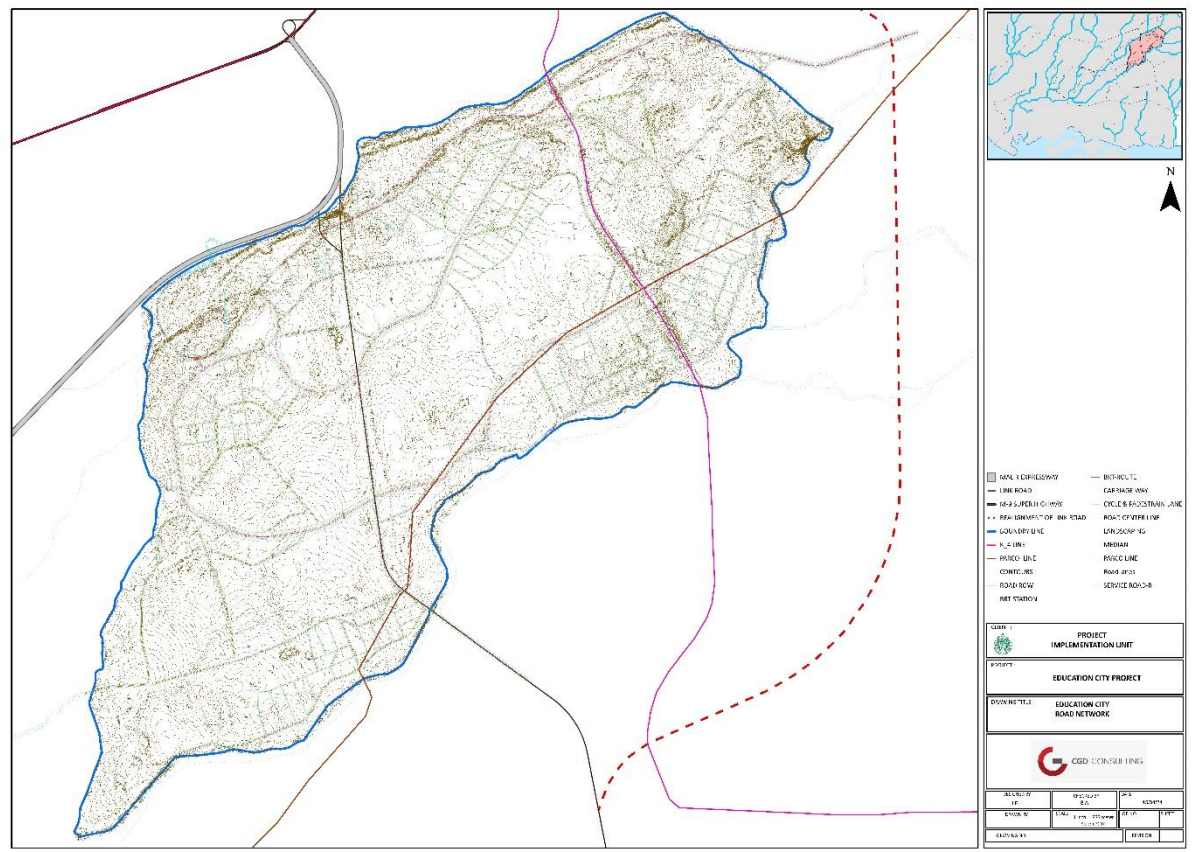


Figure 3-11: Road Hierarchy Plan

3.2.4.1. Transit Network

The aim of the transit network is to learn from the lessons of established cities that are paying the price of abandoning transport planning in favor of prioritizing roads and creating dead zones that are only accessible by car. As a result urban devastation occurs as road become wider, busier and more and more congested, killing off the life on the street. The retro fitting of public transport further exacerbates the problem, resulting in costly and clumsy interventions into the urban fabric, that further destroy the character of the city.

In a new city the aim is not to repeat the current situation, the opportunity exists to plan both the city and the transit network right from the start. In this way an integrated transit system deals with how an individual makes the journey from their front door to any number of destinations using a combination of transport modes ranging from individual and collective. The backbone of the system is mass transit that allows rapid travel between urban centers, the more robust the mass transit, the less strain there is on the surrounding network, transport planning is all about dealing with peak capacities during rush hours, at the beginning and end of the working day along with school finishing times. The next level in the hierarchy is the network of feeder routes that transport passengers comfortably, swiftly and efficiently to the mass transit. The more comfortable and efficient, the greater chance of ridership. As is often the case, people will choose to drive in private vehicles because they do not want to deal with the stress of waiting for, then finding a seat on a crowded bus that takes twice as long to get to the destination, meaning that bus-based transit will appeal mostly to those who do not have a choice. In planning terms, there are many ways to combat this, firstly is the planning of urban nodes where a greater proportion of the population live within walking distance of the Mass Transit, secondly is the planning of transit feeder routes that are more direct and separate from the routes

used by private vehicles. Thirdly is the provision of safe walking and cycling routes that permit people to get to the mass transit without having to deal with the dangers and pollution caused by traffic.

In terms of creating a sustainable city, capital cost is outweighed by whole life cost, and higher investment in the appropriate transit system will have other benefits such as not needing to build as many roads, freeing up more land for development and creating a living experience that is far better than the current situation and will create neighborhoods where people will want to move to. People are far more likely to want to live next to a green boulevard serviced by silent, electric trams than they are a noisy six lane highway, that is always congested with exhaust fumes coming in their windows, With global concerns regarding energy security and the availability of oil, new cities need to be planned to reduce energy usage, as energy costs using the business as usual scenario are only going to become more expensive, and a key component to this is the transit network, a light rail system, even a heavy rail system can be fully powered from renewable sources, and offers a smooth, comfortable journey that is unencumbered by vehicular traffic, studies on recently implemented light rail systems have revealed a rapid uptake in ridership, and reduction in private vehicle usage in those areas.

The proposed strategy, places transport interchanges and urban nodes at stations on the existing rail network, forming rapid links with the existing Karachi City and surrounding cities and urban areas. All primary and secondary roads are planned with a transit corridor running down the middle, along with cycle ways and footpaths running along either side. The transit routes are linked with the existing and proposed Transit network. Transit stations are located at plazas that are framed by mixed use developments, each forming an urban node where pedestrian priority reduces the primacy of vehicular traffic. These nodes are also linked by an independent network of bicycle tracks and pedestrian ways are also suggested through the project area. The river is also used as a transit network through a system of water buses that form direct routes between nodes.

3.2.4.2. Pedestrian Road and Zones

Pedestrian zones also known as auto-free zones and car-free zones, and as pedestrian precincts are areas of a city or town reserved for pedestrian-only use and in which some or all automobile traffic may be prohibited only cycles can be permitted on: They are instituted by communities who feel that it is desirable to have pedestrian-only areas. Converting a street or an area to pedestrian-only use is called pedestrianization.

Pedestrian zones and roads have a great variety of attitudes or rules towards human-powered vehicles such as bicycles, inline skates, skate boards and kick scooters. Some have a total ban on anything with wheels, others ban certain categories, others segregate the human-powered wheels from foot traffic, and others still have no rules at all. Many of Middle Eastern casbas have no wheeled traffic, but use donkey-driven or hand-driven carts for freight transport.

SHEDULE OF ROADS			
ROW	LEGEND	LENGTH	X-SECTION
100 METER		18.8 KM	3-3LANE
60 METER		20.8 KM	3-3LANE
45 METER		2.70 KM	3-3LANE
30 METER		35.9 KM	2-2LANE
15 METER		54.6 KM	NO VEH.

Figure 3-12: Schedule of Road Plan

3.2.5. Water Channels

In addition to the main river channel, secondary channels form waterfront settings that will become high value locations for development, promoting healthy lifestyles that add further value to the living environment. During the wet season, the channels will act as collectors for surface water, ecological reserves are formed in key locations along the channels in line with the environmental strategy for the project in addition to providing varied settings for parks that

will become major attractors for the development. The formation of wetlands will mitigate the amount of surface water run off that is discharged back into the river, acting as a controlling measure to assist in the flood management strategy.



Figure 2.1 Picture of Dumlottee Well No. 8

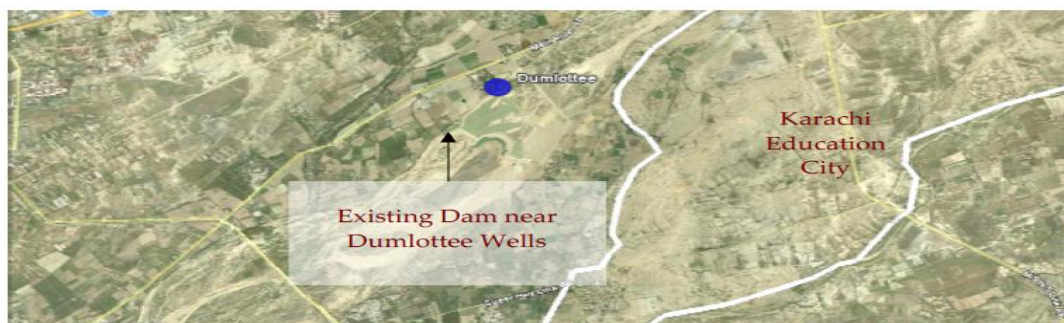


Figure 3-13: Water Channels

3.2.6. Storm Water Drainage Network

Storm Water Drainage Network will be designed considering the rain-fall history of the area or rainfall intensity, duration and frequency curves of Karachi. The storm water disposing network will be consisting of storm water drains (open or closed), pipe drains, Inlet chambers, storm water manholes, box and pipe culverts and outfalls. This network will collect storm water of open spaces roads and buildings and dispose off storm water into natural Nullah.

3.2.7. Electric Pylons and Buffer Space Plan

The electrical pylons are major constrain to the development of site, they are health hazard to public health. A buffer of 50 m has to be provided on both side of the pylon and no public activity can be proposed on that buffer, in that case valuable land will be lost.

The total electricity requirement of the project will be 7000 MW. The electricity requirement of new city will be fulfilled by following means.

LESCO

Renewable Energy like Solar Farms

3.2.8. Natural Gas Requirement

About 100,000 Mega liter of natural gas will be needed for new city. The natural gas requirement will be full filled by SNGPL, Biogas and LPG.

3.2.9. Water Requirement

The total water requirement for the new city will be 1400 cusecs based on standard of 72 gallons per day per capita. 70 % of water requirement will be fulfilled from ground water resource while another 30 % will be fulfilled form canal water treatment. Water supply system plan of project area are shown in figure below:

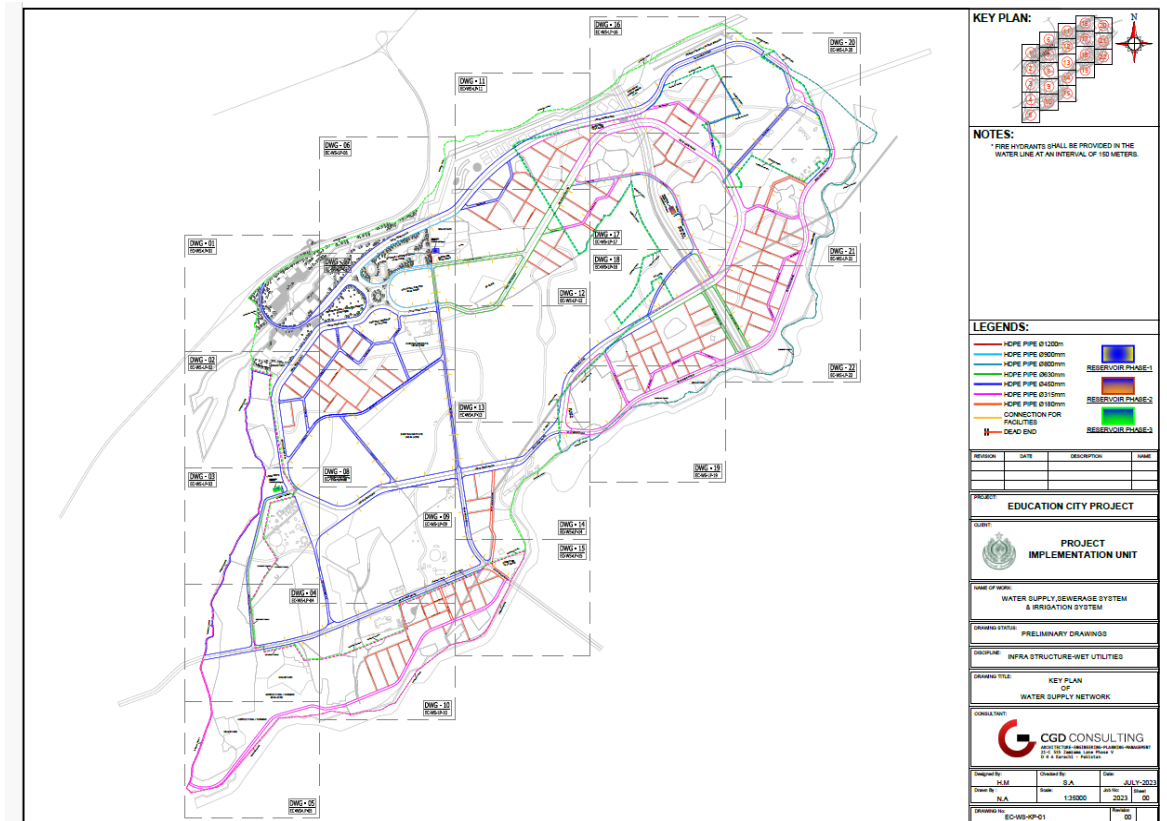


Table 3-4: Water Supply system of the design project

3.2.10. Utility Area

According to the calculated utility loads the tentative sizes for proposed utility units are shown in the figure. The proposed utility units housed within the utility plot are Grid Stations, substation, combined irrigation and firefighting station, firefighting and irrigation storage tanks, facility management building and sewage treatment plant.

The integrated solid waste management system in which most of the waste will be recycled, reuse, and recovery and used in other processes. Only part of the waste will be disposed as landfilled outside the project area.

3.2.11. Sewage Network

The External sewage Network will be designed to collect sewage from the residential and commercial area to the sewage treatment plant considering the sewage generation of the project area. The sewage network will be designed by gravity to avoid pumping as far as possible. The self-cleaning velocity of the sewage will be maintained to avoid choking and silting of sewer. Greasy materials and oil are the major causes to choke the sewage system therefore grease trap/ oil traps will be provided at grease / oil generation sources like Service Stations, Kitchens of Hotel, canteen & restaurants, etc. to avoid Grease/Oil in sewage system.

The Sewage Treatment Plant(s) (STP) will be provided for the project to dispose off the sewage in the nearest natural nullah considering the requirement of World Health Organization (WHO) and National Environmental Quality Standards (NEQs) and to reuse for irrigation purpose. Small units of package type treatment plant may be provided at numbers of locations or a large conventional Sewage Treatment Plant may be proposed for complete project as per the technical and financial feasibility and phase wise development of scheme.

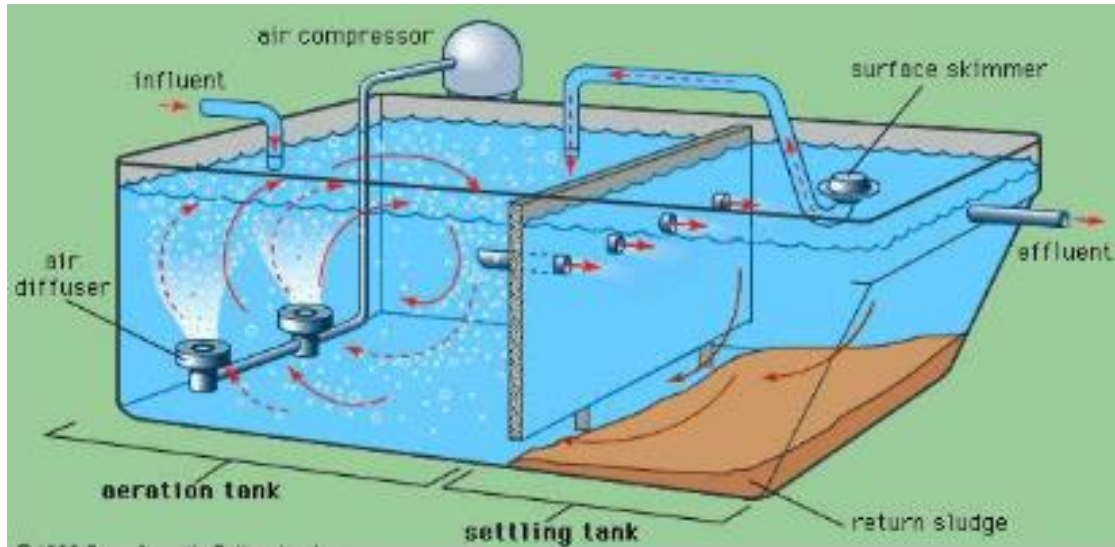


Figure 3.1: Mechanism of Packaged Type Sewage Treatment Plant

Irrigation Network will be designed to reuse the wastewater of the project. It will reduce the potable water demand of the project and will supply water resource to be used for making project green and pleasant. The network will supply irrigation water to all the green areas of the project.

3.2.12. Fire Fighting System

The External Firefighting System of the project will be designed as per National Fire Protection Association (NFPA). NFPA-14 will be used to design firefighting network and NFPA-20 will be used to design fire water pumps. The Fire Hydrant will be proposed as per NFPA – 14 especially for the commercial areas of the project.



Figure 3.2: Firefighting equipment

3.2.13. Solid Waste Management

The system of solid waste management is typically composed of operational activities such as Storage, Collection, Treatment and Disposal. The solid waste generated after completion of Project will be segregated into hazardous and non-hazardous types. The latter type will mainly be domestic wastes consisting of food wastes, used papers and packaging wastes, plastic wastes, office stationery etc.

The total solid waste generation for 12.8 million populations is approximately 11000 tons per day based on 0.85 kg per capita per day. The solid waste generation for phase I –approx. 5500 tons, phase II- 3700 tons, and phase III-

1600 tons. Consequently, already working LWMC if given responsibility would have more work load to manage such huge quantity of waste. Municipal solid waste produced from new city if not managed properly, will cause aesthetic problems and also produce odor along with the spread of many diseases. Health care activities lead to the production of medical waste that if not managed can cause severe health impacts. The Solid waste management plan provided for the EC is based upon the comprehensive and integrated program for managing solid waste in an economically sound and environmentally safe manner. The plan followed the waste hierarchy i.e. Avoid (Source Reduction), Segregation at Source, Reusing materials, Recycling and Processing Materials, Energy Recovery Prior to Disposal and at last disposal in landfill by internationally approved method.

The SWMP for EC works on integrated solid waste management system in which most of the waste will be recycled and used in other processes. Only part of the waste will be disposed as landfilled.

For EC a WMC (Waste Management Company) will be responsible organization in order to implement the plan of SWM (Solid waste management). The new solid waste management company will be developing for management of the solid waste of new city.

The Hospital Waste Management Plan should be developed and implemented for the Medical city as part of proposed project. Hospital waste would be segregated, collected and disposed in accordance with the Hospital Waste Management Rules, 2005.

The solid waste would be segregated at source. The hazardous waste would mainly be consisting of the hospital wastes. Hazardous and Non-Hazardous wastes shall be segregated and disposed of by SEPA approved waste management Contractor.

Chapter 4 SCREENING OF ALTERNATIVES

4.1. General

Karachi is the metropolitan and 1st largest city of Pakistan and the capital city of Sindh province. Karachi is the capital of the province of Sindh, and the largest city in Pakistan. Located on the coast of the Arabian Sea, north-west of the Indus River Delta, the mega city is the largest city, original capital and cultural, economic, philanthropic, educational, and political hub, as well as the largest port, of the country.

The metropolitan area along with its suburbs comprises the world's second most populated city, spread over 3,530 square kilometers. The city credits its growth to the mixed populations of economic and political migrants and refugees from different national, provincial, linguistic and religious origins who have largely come to settle here permanently.

It is locally termed as the City of Lights for its liveliness and the City of The Quaid, for not only being both the birth and death place of Quaid-e-Azam Muhammad Ali Jinnah the founder of Pakistan but also his home after 1947. Residents and those born in the city are called "Karachiites".

Under the circumstances, the planned sustainable new city having modern infrastructure with all basic facilities is the need of time. The Education city Project is the first of its kind that have high quality planned urban development with conversion of dyeing rivers channel (Malir River, Sukhan Nala and Nehr e Khayyam in to perennial fresh water body. The revival of these water bodies channel have overall positive impact on entire eco-system with increase in environmental benefits and recreational activities. The development of planned sustainable new city with all basic facilities has overall positive impact in terms of land in order to stop the urban sprawl of existing Karachi city and reduce pressure on natural resources. Karachi city limits will be secured and all new development links to the new city (Education City). Therefore, in the light of the above discussion the development of new city is very much needed. Therefore, NPO is not acceptable for the project.

4.2. No Project Alternative

The No Project option in respect to the proposed project implies that the status quo is maintained. This option is the most suitable alternative from an extreme environmental perspective as it measures non – interference with the existing conditions. This option will however, involve several losses both on the project developer and the community as whole. The No Project Option is the least preferred from the socio-economic and partly environmental perspective due to the following factors:

- The economic status of the city of Karachi and the local people would remain unchanged.
- No housing provided to alleviate a critical shortage in the city.
- Discouragement for investors to produce this level of modern master – planned housing.
- No employment opportunities will be created for thousands of local people who will work in the project area.
- Increased urban poverty

From the analysis above, it becomes apparent that the “No Project alternative” is not suitable keeping in view the current socio-economic situation and need of housing in the city.

4.3. Location Alternatives

Location alternatives are not possible by considering the fact of consistent increasing boundaries of Karachi by process of urban sprawl and status of current state of pollution in two water bodies surrounded the education city project. The new city will be benefit to limit the Karachi boundaries

4.4. The Proposed Development

This alternative involves constructing several institutes, hospitals facilities and residential buildings according to the plans put forth by the Education City. It would bring about positive outcomes such as generating employment opportunities for a significant number of individuals, many of whom would be hired from the surrounding community. Moreover, this type of development, when considered as a whole, would lead to noticeable economic advantages for the community. Additionally, the proposed project would contribute positively to the social infrastructure and overall residential growth in the area.

Given that the site has limited vegetation and lacks surface water, the plant communities present are sparse and diverse. They only contain a portion of the species typically found in this region. Notably, there were no native, rare, threatened, or endangered species discovered at the site.

4.5. Sitting Alternatives

The proponent has selected the project site at Karachi for Education City project, It is an ideal location for establishing such educational institutions with large campuses because of spacious and well-established landscape, Land availability, Minimization of community disturbance, Minimum resettlement and economic displacement, Seismicity, Safety and Security, Environmental benefits

It is an undeniable fact that the population growth in Karachi is surpassing previous projections. Karachi, which is Pakistan's largest metropolitan region and the capital of Sindh province, has experienced even more rapid growth. From 1998 to 2011, the population of Karachi increased from 9.8 million to 14.9 million, with an addition of over 5 million people. This growth rate is unprecedented in any other metropolitan region worldwide. Given Karachi's geographical location, the only feasible direction for urban expansion is towards the north, along the Karachi Northern Bypass.

The northern and northeastern areas of Karachi offer not only elevated landscapes but also possess natural environmental factors that make them visually appealing and have great potential for wind and solar power. There are already numerous housing schemes established in this region, including Bahria Town Karachi, DHA City Karachi, Gulshan-e-Maymar, Seven Wonder City, Makkah City, Sindh Employees Housing Scheme, Gulshan-e-Tasleem Phase II, and Karachi Golf City. Consequently, this area has become a highly profitable location for housing schemes, resembling a valuable asset.

4.6. Alternative for Technology & Construction Material

The proposed project will utilize contemporary materials that are accepted both locally and internationally to ensure compliance with public health, safety, security, and environmental aesthetic standards. Priority will be given to energy and water-saving equipment, while still considering cost and availability. The construction of concrete pillars and walls will involve the use of locally sourced stones, cement, sand, steel metal bars, and fittings that meet the requirements set by the Pakistan Standards and Quality Control Authority, as well as relevant international construction standards.

Several alternative technologies are available for consideration, such as the traditional brick and mortar approach, prefabricated concrete panels, or even temporary structures. The choice of technology will depend on factors such as the size of the plot and the available funds. Available options include concrete frame construction, timber construction, prefabricated space frame construction, and steel frame construction. The selection of technology will be based on its cost-effectiveness.

4.7. Criteria for Selection of Wastewater Treatment Technologies

The wastewater treatment facilities are selected after due consideration of pertinent technical, operational and economic factors, limitations and constraints. The key factors, deciding the selection of the treatment system include:

Cost-effectiveness: This factor is important in selection from among the available alternatives. It is expressed in terms of unit cost to provide the basis for comparison between different options. Economy of scale often reduces the unit of treating wastewater but is not necessarily cost-effective in cases where wastewater flows are not high enough to allow the technology to perform in the delivery of product in qualitative and quantitative terms.

Life-cycle cost: This includes installation cost and operation costs, which are usually distributed over the life of the project to provide a common basis of comparison between different options.

Land requirement: This is a crucial factor in the technology evaluation because of limitations of land use and areas available for ETPs and the auxiliaries. Also, procurement of additional land may be expensive. Likewise construction of a conveyance system specifically for the ETPs may not prove economically viable.

Operation and maintenance: This is required for ETPs specially for developing countries as highly skilled and organized manpower is not readily available (or if available usually may not be retained due to lower salary structure) for the O&M operations in water sector.

Reliability: It is a measure of how well a system performs in relation to its design efficiency without breakdown or failure to treat wastewater to meet effluent quality objectives. Reliability also needs to be associated in ETP designs with simplicity of operation and ease of maintenance. Reliable systems that require highly skilled operators and high or frequent maintenance would be less appropriate and least desirable.

Performance: This is usually measured in terms of percent removal (efficiency) or be expressed as typical treated effluents concentrations (residual concentration in effluent). Influent concentrations and treated effluents concentrations required to meet effluent quality standards determining whether performance of a particular treatment process/unit is acceptable i.e. compliance with the regulatory standards of discharge into receiving bodies.

Ability to meet standards: This is a primary criterion for the effluent quality undergoing treatment to be met for discharge into receiving bodies. In Sindh according to Environmental Protection Act 2014, every wastewater/effluent discharging system has to meet Sindh Environmental Quality Standards prior to discharge to any receiving body.

Adaptability to variation in influent quality: It is a critical parameter for ETPs because wastewater (influent) quality tends to be more variable than conventional municipal wastewater characteristics which remain more or less uniform.

Adaptability to varying flow rate: This may also be an important criterion for ETPs as the participating industrial units have highly variable flow rates during the day as well as the seasons.

Ease of construction: This is desirable for ETPs construction in developing countries since simple design requires less skilled manpower.

Provision for upgrading: This is essential for planning and designing. The treatment plant must cater for the future hydraulic and organic loading through expansion in the treatment unit.

Availability of equipment: The continuous availability of material and auxiliary equipment for operation and maintenance of the treatment plant must be a primary consideration in the design of ETPs.

Post installation service/chemical delivery: Generally, systems that minimize post installation service are desirable.

If chemicals are used, it is critical that they are readily available locally.

Personnel skill level: Operations requiring low level personnel skill are usually preferred for ETP operations and maintenance. This provides simplicity of operation and ease of maintenance in addition to reduction in cost.

Power requirements and consumptions: Generally, options that require little or low power inputs are preferred for ETPs to those that use large amounts of power. Self-sustained systems with no electrical or electrically operated mechanical systems are usually preferred and designed to avoid power inputs.

Residue production and cost of disposal: Sludge is a by-product of treatment process and if not adequately stabilized then it is not suitable for land application or disposal without proper/sanitary landfill. If sludge treatment is not available, its minimization optimization is much desirable.

Potential for effluent use/reuse: Depending upon the quality of effluent arising from the treatment units from the ETP, the potential for use and application of effluent/treated wastewater can be identified and suggested. Hence use or reuse of effluent is an added feature of ETPs.

Potential for air emissions: some treatment processes have greater potential for producing obnoxious odors than gaseous emissions. These need some form of additional controls to lessen odors.

Evaluation of treatment alternatives usually involves selecting among best available solutions of problems related to treatments capable of meeting the wastewater quality standards and local environmental standards. Typically, preliminary engineering design and cost analysis are based on specific wastewater characteristics and the purpose of treatment. ET management system is required to be cost effective in catering to the needs of treatment of effluent different characteristics.

The best and preferred method according to the above analysis and comparison of different techniques is as follows:

Preliminary: Grit Chamber → Equalization

Primary: Clarification → Sedimentation

Secondary: Activated sludge process

4.8. Criteria for the Selection Solid Waste Management Technologies

The Education City With approximately 01 Million of Human population who will be residing, working, studying and visiting, the proposed Education City generates Solid Waste from Day to day activities. The solid waste being generated through various activities need to be dealt with a scientific approach. The following are the areas where expected Solid Waste being generated as per the Master Plan, Waste generation from; Institutions, Residential, Settlements, Commercial areas, Recreational areas, Agricultural and Urban Farming and Roads (Manual and Mechanical Sweeping).

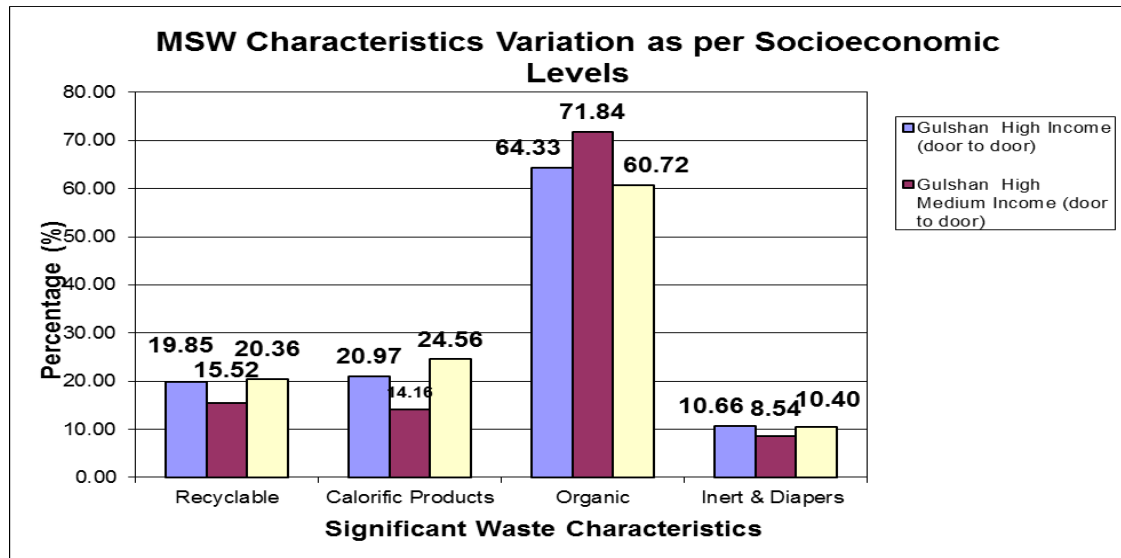
4.8.1. Integrated Solid Waste Management Approach Design Principles

Design Principles for the five segments of Integrated Solid Waste Management proposed approach for Education City:

Waste Generation profile of the Education City			
Sr. No	Population	Year	Expected Waste Generation in Tons per Day @ 0.59 Kg/person/day
01	945,545	2023-2024	558 Tons /day
02	1,403,384	2040	828 Tons/day
03	2,233,230.	2060	1318 Tons/day

4.8.2. Waste Compositional Studies and projections

The rate of generation of waste is taken as 0.59 kg/person/day, as per the last waste compositional studies carried by the SSWMB in 2021-22 and waste compositional studies carried by Karachi Municipal Corporation in 2013 and the guidelines provided under the Education City Construction Bye-Laws. The figure given below provides that 60-70% organic waste, 20% recyclable and rest is 10-20% waste to be landfilled.



4.8.3. Waste Storage Facility

The Waste will be stored in each institute independently by providing separate bin collection system. Three bins collection system is proposed to collect separately the as per the requirement at field as well as defined in the Construction Bye-Laws under the guidelines of Solid Waste Management Page # 66.

- 1) Green Color Bins - Organic Waste (Precooked food ruminants and cooked food ruminants)
- 2) Blue Bins - Recyclable Waste (Paper, Plastic, Cardboard, Tetra Pack, Hairs, Iron, and other related recyclable materials)
- 3) Yellow Color - Rest of the waste (Like Dirt, silt, sweeping waste, non-recyclable materials)

240 Liters separate color bins will be purchased by the Institutes as per the actual requirements. One bin can cater approx. 40 to 70 Kg of waste which can manage the waste generation of about 122 persons maximum @ 0.59 kg/person/day.



4.8.4. Waste Collection & Transportation

The Green Color Bins and Blue Color Bins will be collected through separate waste collection vehicles and transport to the recyclable station to be established at Education City. Orange Color Bins will only be transported to the landfill site.

Green Color Bins Transportation

Out of 558 tons, expected 60% are organic waste which is 335 Tons which is transported to the Composting Facility to be established at the Education City.

In addition to the 335 tons once all the Institutes are operational and produce waste upto 335 tons, yard waste (green waste and grass clippings) approximately 50 tons will be added to the waste stream and transport separately to the Composting Facility.

Blue Color Bins Transportation

Out of 558 tons, expected 20% are recyclable waste which is 112 Tons which is transported to the Material Recovery Facility where the waste will be sorted into the different recyclable streams and transport to the outside recyclable plants initially. In case in future any recycling station for paper and other recyclable requirement which is economically acceptable will be implemented through private investment.

Orange Color Bins generates some 111 tons /day out of 558 tons/day will only be transported to the landfill site.

4.8.5. Treatment & Disposal

Various Waste Treatment options explored as per the guidelines of Education City By-laws and is provided below, however as per the actual needs at ground the composting process for the conversion of organic waste into humus like substance (local fertilizers) are very much required at the Education City for agricultural and horticulture purposes.

It is the controlled decomposition of organic materials, such as leaves, grass, food scraps and other municipal wastes, by microorganisms. The result of this decomposition process is compost, a crumbly, earthy-smelling, soil-like material. So the compost will be used for the horticulture purpose, a comprehensive guidelines are attached to develop a composting facility at Education City. Material Recovery Facility (MRF) will be established for sorting for various different types of recyclable material and bailing for further transport to the recycling industry.

Only the waste which is not recyclable and inert in nature will be transported further to the Government Owned/SSWMB landfill site where it is disposed of according to the Standard Operating Procedures of SSWMB outside the Education City premises.

4.9. Solid Waste Management Alternatives

The proposed project is expected to generate a significant amount of solid waste, particularly during its operational phase, due to the large number of residents anticipated to inhabit the completed homes. It is advisable to implement an integrated solid waste management system. Firstly, the proponent will prioritize waste reduction at the source by raising awareness about solid waste management among both the management and residents. Secondly, recycling, reuse, and composting of waste will be the secondary priority, necessitating the implementation of a source separation program. Recyclable materials will be sold to waste buyers. Lastly, if necessary, the proponent will consider sanitary landfilling as the final option. The nearest designated landfill sites available in proximity to the project site are the Jam Chakro Landfill site, located approximately 50 km away, and the Dhabeji Landfill Site (which is not yet constructed), located approximately 25 km away. After segregating the waste, compostable materials can be disposed of in a landfill, which is the most viable solid waste management option for the waste generated from the Education City project.

Chapter 5 ENVIRONMENTAL & SOCIAL BASELINE

5.1. PHYSICAL ENVIRONMENT

Detailed description of the physical resources is covered under the subjects of topography, geology, soil condition, climate, surface and ground water resources, and seismology. Most of the information is collected from secondary sources. Respective departments were approached by the project team members and information was collected with the help of checklist, other studies and reports were referred and reviewed for the verification of information.

5.1.1. Topography

Project site lies within the two perineal rivers Malir and Liyari. Topography of project site varies from 130ft-150ft above mean sea level (ASML). The maximum contour in the project surrounding is 220ft and minimum is 130ft. The contour map of project area

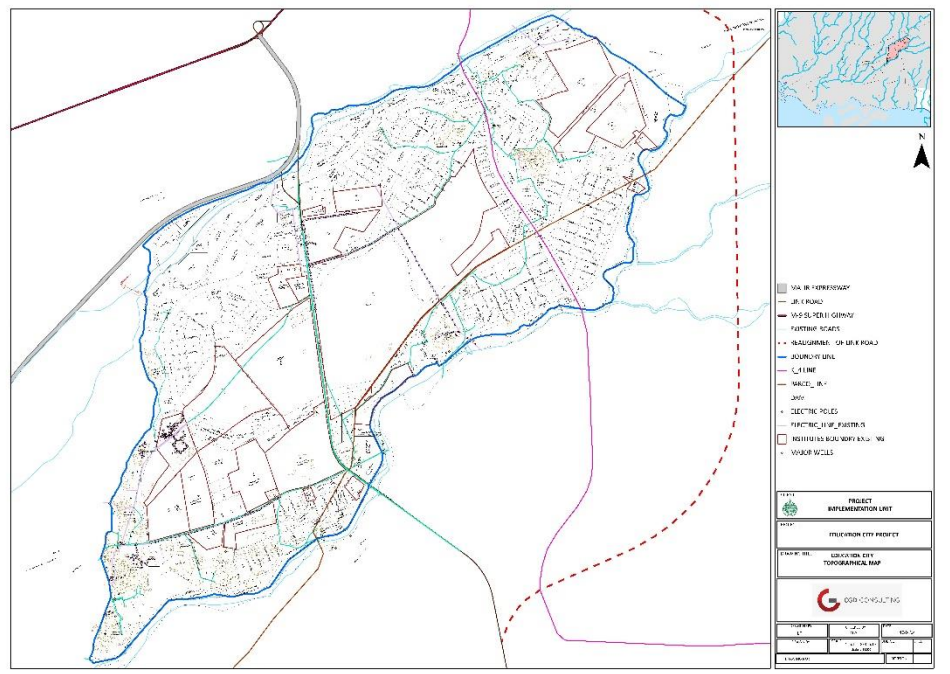


Figure 5-1: Topographic Map of Project area

5.1.2. Geology

The proposed area represents the surface geological exposures ranging in age from Middle Oligocene to Miocene to Recent. The major structural control of the area is in the form of en-catchment and bank of Malir river deposits. Meanwhile, towards the super highway this anticlinal structure is followed by the syncline and the town of Karachi is a River valley deposit.

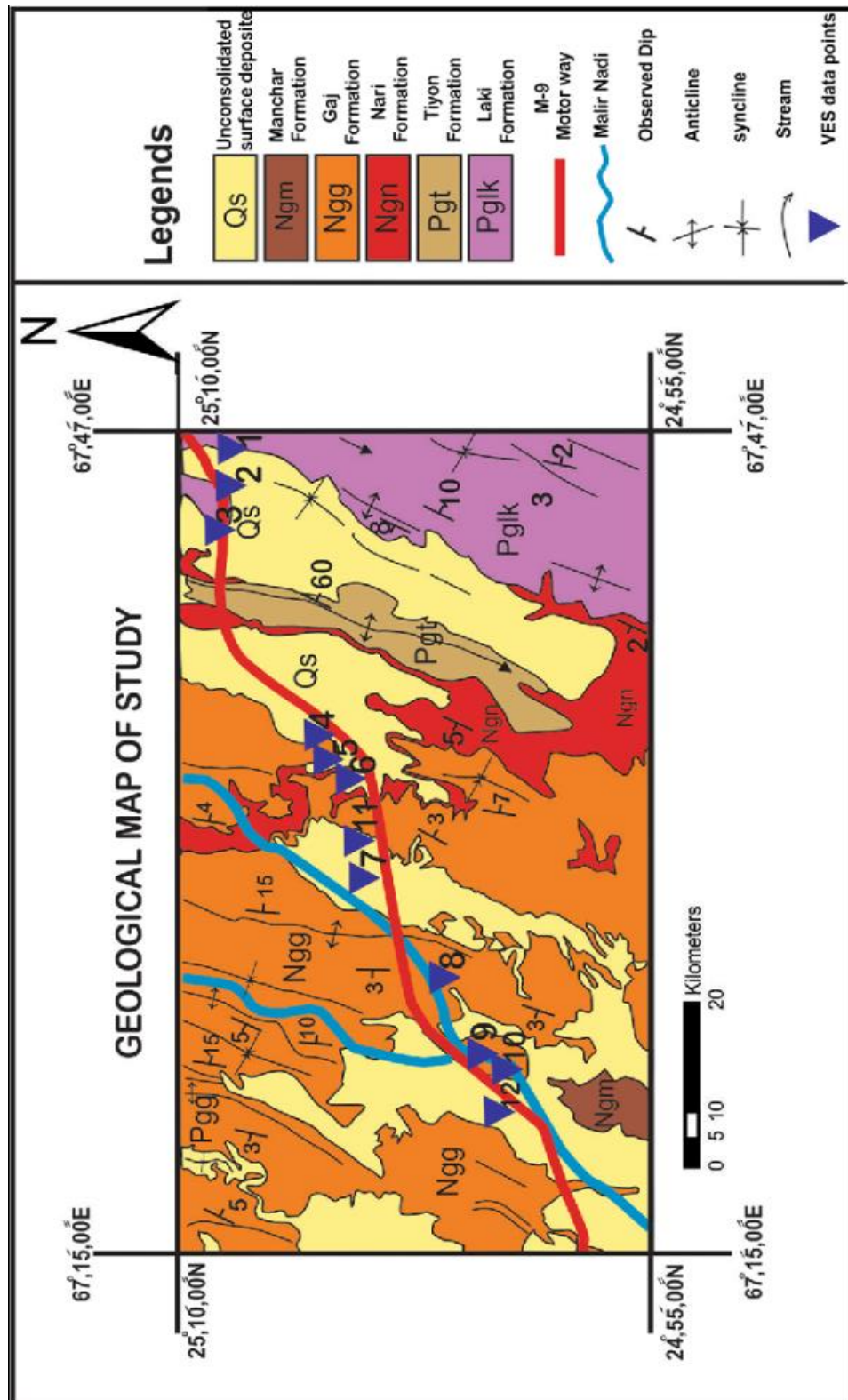


Figure 5-2: Geological Map of study area showing lithology pattern

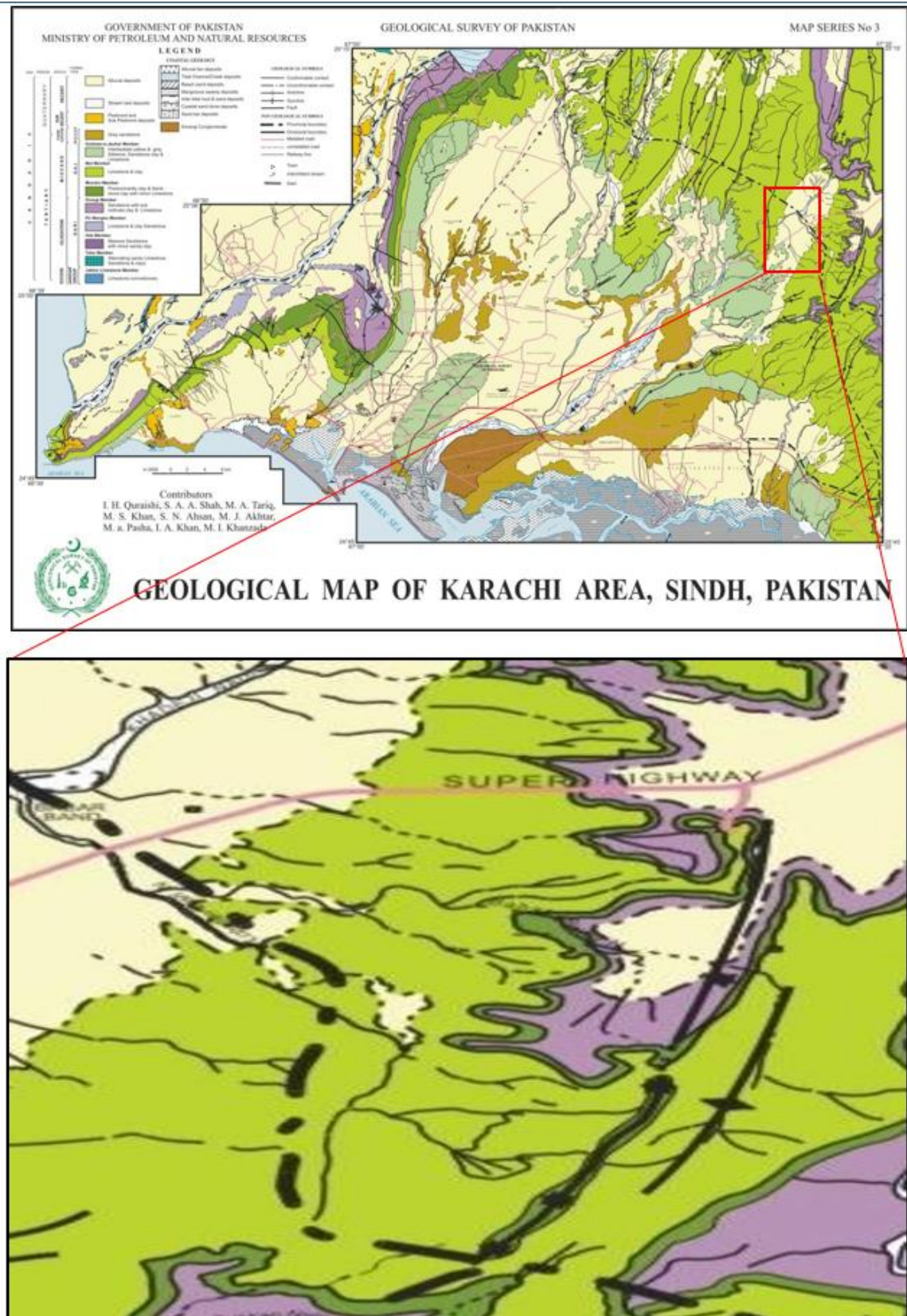


Figure 5-3: Geological Map of study area

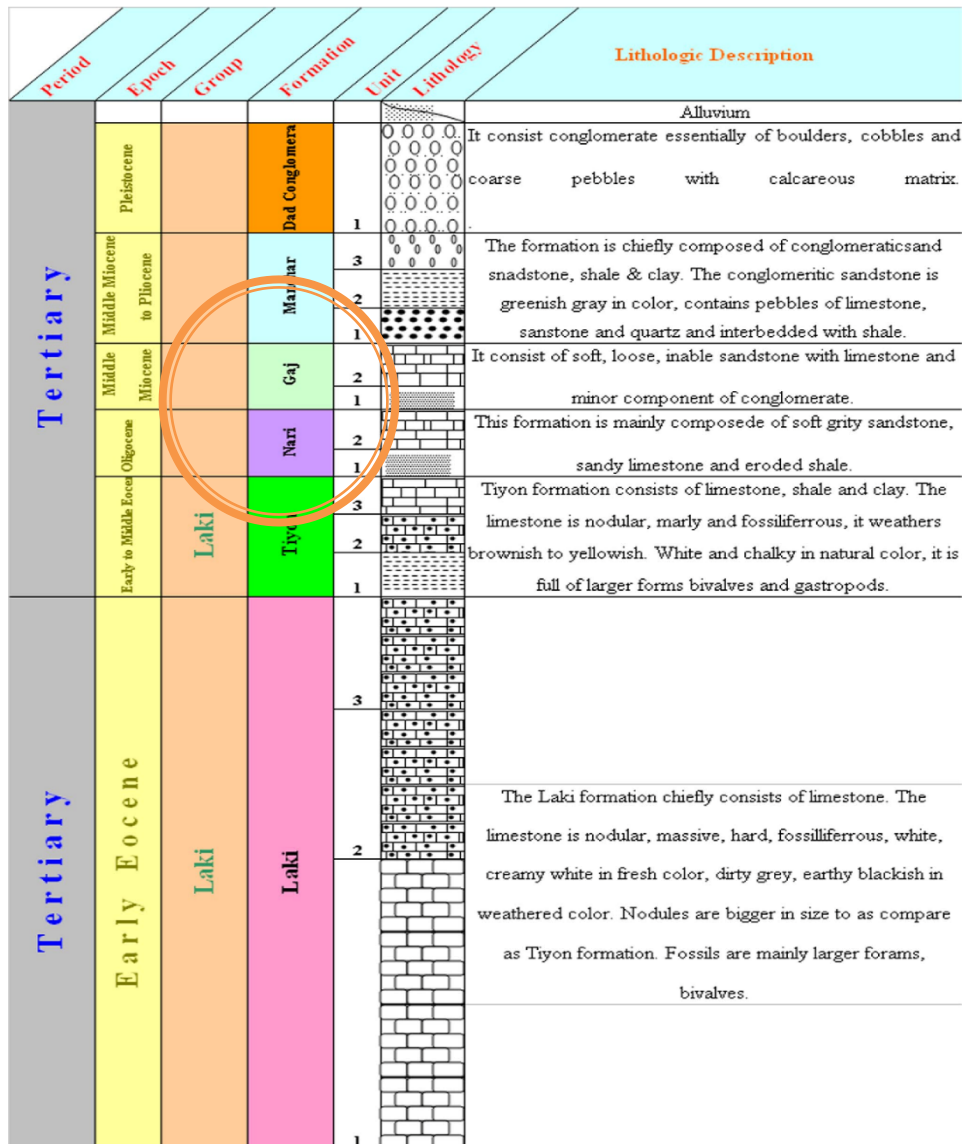


Figure: 5-3: Stratigraphic column of study area circle showing lithological formation of area

5.1.3. Seismology

The seismicity map of Pakistan shows that the earthquake zones have been hit by earthquakes a number of times, but the depth of their epicenter is not usually lower than 33 km. The map also shows the yellow line, which marks the frequency zones as well as the fault lines. It also shows that the yellow line on entering the Arabian Sea bifurcates into one that travels along the coastline and the other goes southwest. This indicates that there are quite a few other active faults in Lower Sindh, including a thrust-and-fold belt extending northward parallel to the transform fault separating India from Asia, and the Rann of Kutch fault system trending westward towards Jhimpir, Karachi city and Makran Coast bordering the Arabian Sea. The map does not show the presence of the unique Mud Volcanoes, which are still active on the Baluchistan coast as a result of impact of the Indian Plate under the Arabian Plate.

Seismic activity in the macro-environment of Project area is caused by the dynamics of slow but constant relative motion of the active Karachi Triple Junction (KTJ) of three major tectonic plates viz. the Indian Plate, the Arabian Plate, and the Eurasian Plate of the earth's crust. Their corresponding fault systems comprising a subduction zone, a transform boundary, and the ancient rift system, intersect in the general vicinity of the Triple Junction. Each such

system produces a distinct type of ground motion and appears to have been reactivated, with an associated hazard risk that can be disastrous. Seismic activity in the region is the result of movement on one or more faults and mainly from intra-plate active faults, including the Karachi-Jati, Allah Bund-Rann of Kutch, Surjan-Jhimpir, and Pab.

The macroenvironment of Project site is about 200 km on the NEE, while Karachi lies approximately 160 km east of the triple junction. The western and north-trending arms of the triple junction sustain convergent and trans-current rates of 28-33 mm/yr respectively.

The presence of a recently discovered active Sonne fault indicates that the Arabian plate has been fragmented across the southwest corner of the triple junction defining a triangular plate: the Ormara plate whose velocity relative to the Arabian plate increases the subduction velocities by a few millimeters per year compared with the rate at the west. In addition to these clearly defined plate boundaries, other active structural zones have produced damaging earthquakes that have been felt in the macro environment of Project site in Deh Kohistan in the past 200 years. They include the following faults:

1. Karachi-Jati
2. Surjan-Jhimpir,
3. Pab Fault
4. Hab Fault
5. Rann of Kutch.

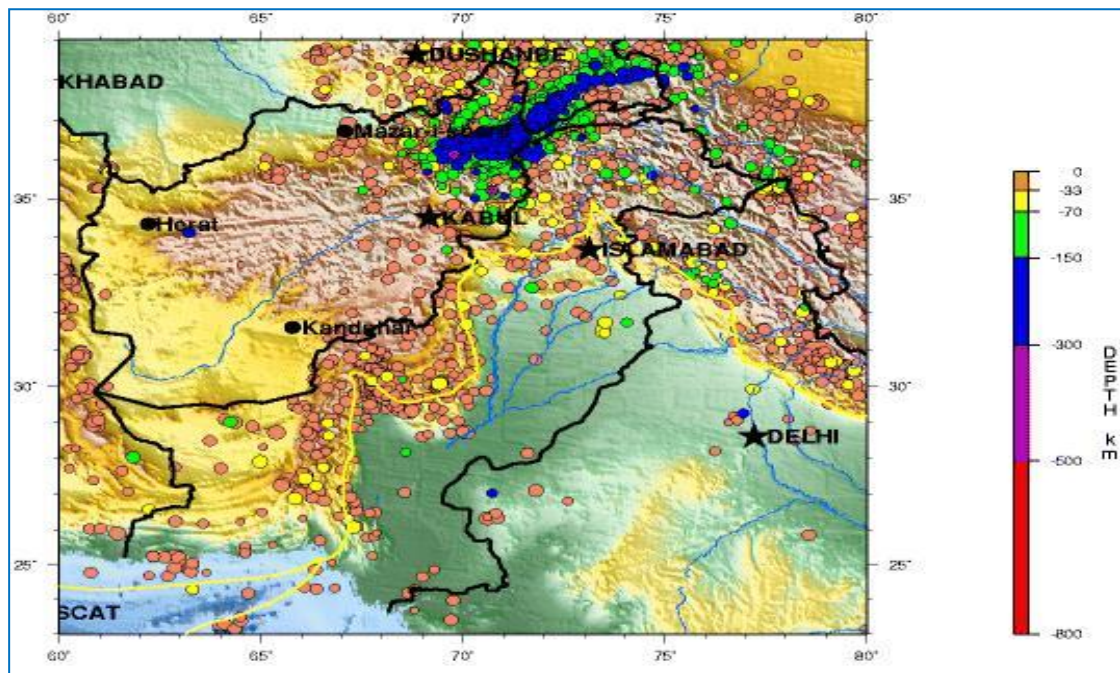


Figure 5.4: Seismicity & Natural Disasters - Pakistan, 1990-2000.

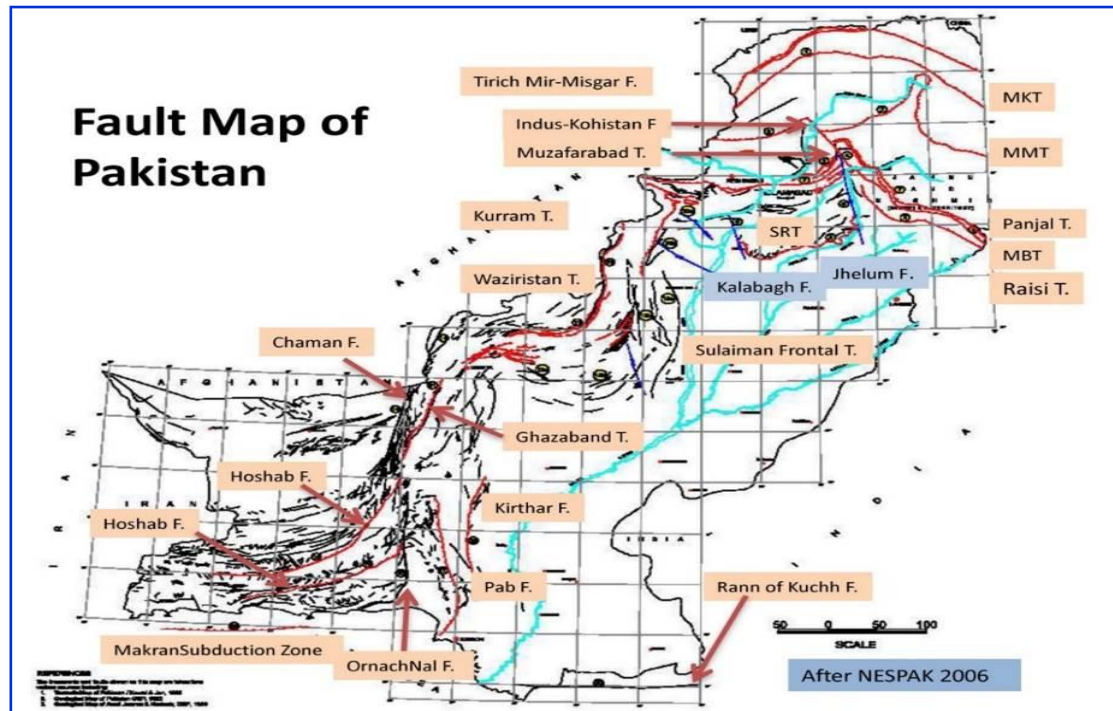


Figure 5.5: Fault Map of Pakistan

Surjan Fault: Surjan Fault, located in the Frontal Part of Kirthar fold and thrust belt, is a hinterland dipping high angle fault, which extends from Jhimpir to San area. Some NS trending thrusts along Thano Bulla Khan Ranges collectively constitute Thano Bulla Khan fault zone. A number of strike slip faults with limited aerial extent cut obliquely the strata at many places. The northern Kirthar is dominated by NE trending while southernmost part is dominated more by NW trending strike slip faults.

These N-S trending dip-slip or bedding-plane faults are active along the Kirthar Range Front. This fault cuts across the Quaternary deposits on the north of Karachi and west of Mirpur Sakro. The southern end of this fault is intersected by the northwest trending Jhimpir Fault on the west of Jhimpir. The interaction of these two faults is characterized by at least four tele-seismic events of shallow focal depth and magnitude 3-6. The maximum magnitude of the earthquake associated with the Surjan Fault is of the order of $M \approx 6.1$.

Jhimpir Fault: A number of epicenters are located on this N-W trending fault. The fault has produced an earthquake of $M \approx 5.6$ on Richter scale.

Pab Fault: This NNW-SSE trending 135 km long fault is located in the eastern part of the Pab Range. It has dislocated vertically the Quaternary alluvial fans. The maximum magnitude of the earthquake associated with this fault is of the order $M \approx 7.0$ on Richter scale.

Hub Fault: The Hub valley is traversed by this fault.

Rann of Kutch Fault: This E-W trending fault has produced earthquake of the order of $M \sim 7.6$ on Richter scale. In 1819 and 1956, this fault was responsible for severe earthquakes in Gujarat, Tharparkar and Indus delta. This fault system also known as Allah Bund Fault passes in the proximity of the Steel Mills and Karachi Nuclear Power plant. It is 225 km in length and is responsible for the production of earthquake of considerably high magnitude of up to 7.6 M on Richter scale and of IX to X intensity on the Modified Mercallis, MM scale on June 16, 1819.

Additionally a complex series of faults generally oriented easterly and slightly concave to the north have been identified through aerial photographs. They are roughly parallel to the inferred zone of rupture for the 1819 earthquake event.

Over the last sixty years, earthquakes of intensity lower than 5 on Richter scale, including those in 1945 and 1985, have struck the region comprising the macro environment and thus far they have been of minor significance. This is mainly because the earthquakes here are not "Inter-Plate" or "Plate Boundary" earthquakes which occur commonly along narrow zones that follow the edges of tectonic plates.

The tectonic fault that produced the 2002-Bhuj earthquake, which registered a massive 7.7 on the Richter scale, was part of a complex system of geologic faults that run northwest in Gujarat through the marshy Rann of Kutch, where it produced a magnitude 7.6 quake in 1819, and also ran into Pakistan. While concealed under the loose sand of the Rajasthan and Thar deserts and sediments of the Indus delta, this system of faults appears to continue to the west, passing through Karachi and while extending into the Arabian Sea, it intersects another system of faults associated with a major tectonic boundary that has produced devastating earthquakes as far north as Quetta in the past. Together these fault systems have produced historically large earthquakes within Kohistan, notably in the Pab Range, Thatta Taluka, and Jhimpir areas.

It is the Intra-plate type of earthquakes (Mid-Plate Earthquakes) that occur far away from plate boundaries. The latter type earthquakes are less frequent but are capable of releasing just as much energy in a single event as one of similar intensity along a plate boundary. These arise due to localized systems of forces in the crust sometimes associated with ancient geological structures such as in the Rann of Kutch. Thus while the October 8, 2005 mega thrust earthquake was the direct result of the interaction between Indian Plate and the Eurasian plate, the earthquakes of July, August and October 11 in the macro environment are intra-plate or Mid-Plate events.

It may be noted that no earthquake, including the 1945 Makran and 2001 Bhuj events, as well as the occasional shaking from M 4-5 earthquakes on faults in Kohistan, has ever produced documented damage anywhere. Although the 1819 earthquake was apparently similar or larger in magnitude than the 2001 Bhuj event, little damage occurred in Thatta and Hyderabad in 1819 compared to 2001 even though the former event was closer to these towns/cities.

The Table 5.2 shows the earthquake occurrences over the last forty years. The Table does not include the numerous events of magnitude less than 4.0 on Richter scale. Earthquakes of recent occurrence were recorded on July 16, 2005, followed by one on August 6, another on August 13, yet another on October 9 and then again on October 11, 2005. They were all of magnitude between 4 and 5.1 on Richter scale. The epicenter of these earthquakes was away from those listed in table. The epicenter of the most recent tremor of January 2, 2009 was 100 kilometers in the coastal region of Thatta district. It had a shallow depth of 10 kilometers and magnitude of 2.2 M on Richter scale.

Table 5.2: Epicenter, Depth, Magnitude & Intensity of Earthquakes in Macro-environment of the project area					
Year	Coordinates	Depth	Magnitude Richter Scale	Intensity MM	Location
1962	24°70'N66°00'E	0	4.50	-	Karachi
1965	25° 03'N67°76'E	40	4.50	-	Karachi
1966	25° 0N68°00' E	-	5.0	VI-VII	Jhimpir
1968	24° 61'N66°42' E	19	4.10	-	Karachi

1970	25° 28'N 66° 65' E	33	4.90	V	Karachi
1971	25° 00'N 68° 00' E	-	4.50	V	Jhimpir
1972	25° 35'N 66° 71' E	33	4.50	V	Karachi
1973	25° 00'N 68° 00' E	-	5.00	VI	Jhimpir
1973	25° 48'N 66° 33' E	57	4.90	V	Karachi
1975	25° 50'N 66° 80' E	-	4.50	V	Gadani
1975	25° 22'N 66° 59' E	33	4.90	V	Karachi
1976	24° 96'N 70° 38' E	14	4.70	V	Karachi
1984	25° 86'N 66° 41' E	33	4.70	VI	Karachi
1985	24° 90'N 67° 39' E	33	5.00	VI	Karachi
1986	25° 34'N 66° 60' E	33	4.50	V	Karachi
1992	25° 25'N 67° 76' E	33	3.60	IV	Karachi
1996	25° 06'N 66° 76' E	33	-	-	Karachi
1998	25° 69'N 66° 46' E	33	4.40	V	Karachi
1998	24° 85'N 66° 35' E	33	4.50	V	Karachi
2009	24° 31'N 67° 18' E	10	2.2	IV	Thatta

According to a map created by the Pakistan Meteorological Department, the country is divided into 4 zones based on expected ground acceleration. The areas surrounding Quetta, those along the Makran coast and parts of the NWFP, and also along the Afghan border fall in Zone 4. The rest of the NWFP lies in Zone 3, with the exception of southern parts of this province, which lie in Zone 2. The remaining parts of the Pakistani coastline also lie in Zone 3. The remaining parts of the country lie in Zone 2. According to this classification this ecosystem would be placed in Zone 2.

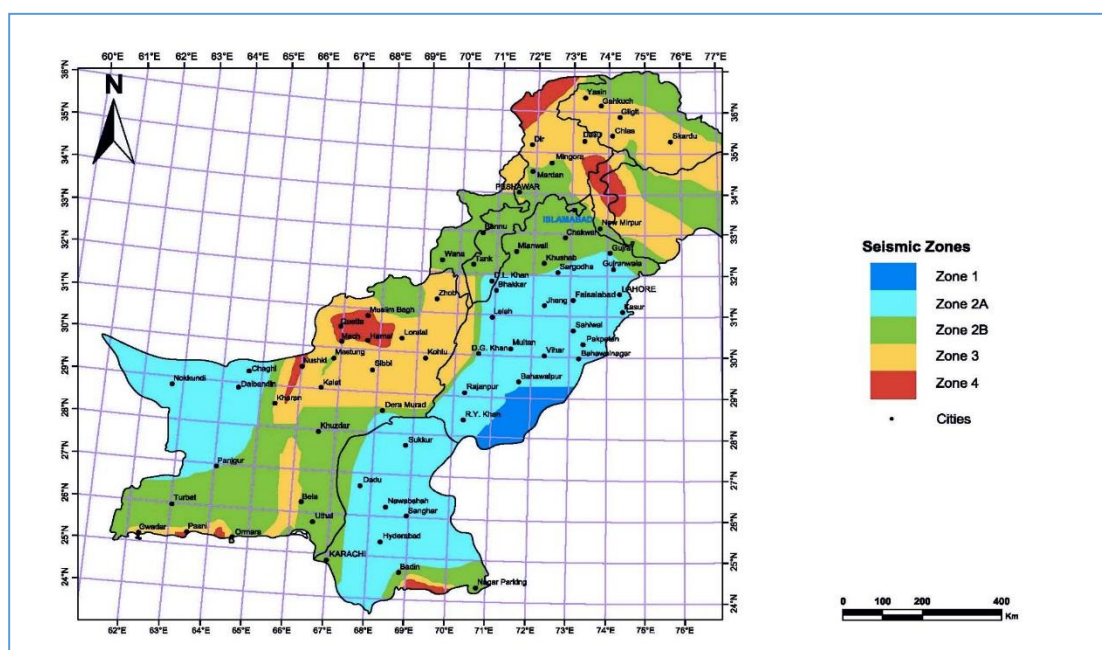


Figure 5.7: Seismic Map of Pakistan

5.1.4. Soil

The soil of Project area comprises of rock outcrops and loamy very shallow steep mountain soils of mainly arid and semi-arid zone. Soil of the Sindh Province including Project is shown in the Figure 4.6. The soil cover of the Project site is very thin due to severe wind erosion and soil erosion in the drainage basin. Most of the rocks contain limestone. Natural vegetation has almost disappeared from the surface plain. The soils are shallow, strongly calcareous silt loam with weak structure. The slope of the entire Project site is towards west to east. The outcrops comprise either bare rocks or have very shallow soils. Overall, the physical, geographical and hydrogeological features of the Project site portray the distinctive features of desertified arid land.

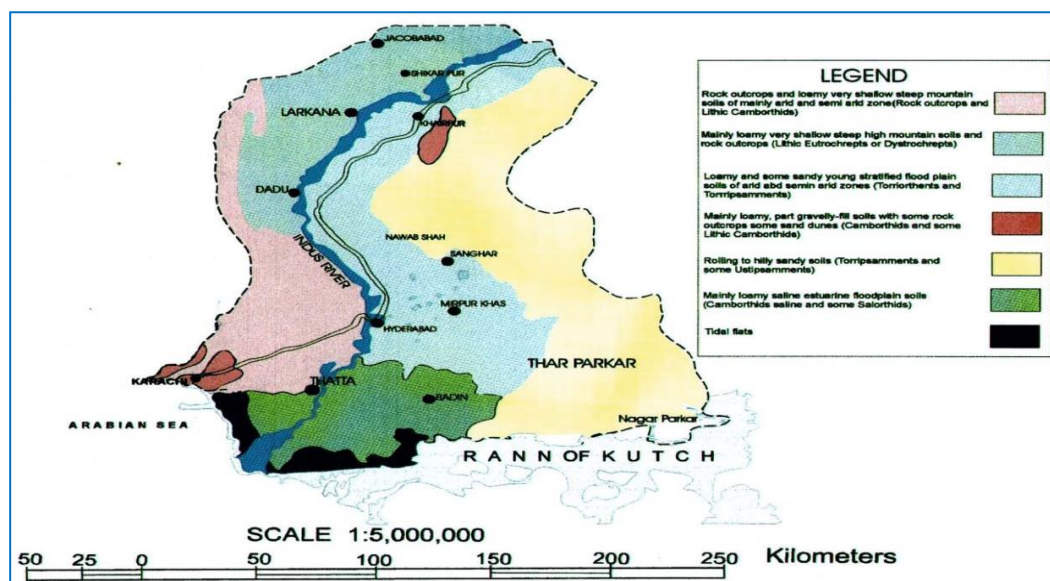


Figure 5.8: Soil Map of Sindh

Source: Study of Riverine Forest Upstream Sukkur and Downstream Kotri, 2008, WWF Pakistan

Stratigraphy

In the study area the Oligocene to Recent rocks are exposed. The Oligocene rocks are represented by Nari Formation (Orangi Sandstone). The Miocene rocks are represented by Gaj Formation (Metan Clay, Jhill Limestone and Talawa Limestone) and the Recent are represented by Alluvium (stream less Surficial Deposit).

Age	Formation	Member	Lithology
RECENT	ALLUVIUM	-----	Unsorted sand, silt and clay.
MIOCENE	GAJ	DRIG CLAY	Mainly clay with minor sand, silt and limestone.
		TALAWA L.ST	Sandy limestone with subordinate clay.
		JHILL L.ST	Limestone interbedded with clay.
		METAN CLAY	Clay with minor silt and sand.
OLIGOCENE	NARI	ORANGI S.ST	Gritty Sandstone.
		GHORA LAKI L.ST	Limestone, clay and minor sandstone.
		HALKANI S.ST	Sandstone with subordinate clay.
		PIR MANGHO L.ST	Mostly Limestone, subordinate sand and clays.
		TOBO MEMBER	Alternating sandy limestone, sandstone and clays.

Seismic Zone and Peak Ground Acceleration

The project site is located near DHA City, Karachi. According to the Building Code of Pakistan-Seismic Provisions 2007, the project area may be safely placed in Seismic Zone 2A corresponding to Peak Horizontal Ground Acceleration 0.08g to 0.16g.

Chemical Aggressiveness

The values of Sulphate content, chloride content & pH on soil samples are included in this report. The subsoil chemical test results do not show excessive quantity of harmful sulphate salts. Therefore, it is suggested that "Ordinary Portland Cement (OPC)" may be used for underground construction at all the test pit locations included in this study. It must also be ensured that a minimum concrete cover of 75 mm over steel reinforcements is provided

5.1.5. Climate

Climatically Sindh lies between two monsoons, the southwest monsoon from the Indian Ocean and the northeast or retreating monsoon deflected towards it by the Himalayan Mountains, and thus escapes the influence of both. The average rainfall in Sindh is only 6-7 in (15-18 cm) per year. The region's scarcity of rainfall is compensated by the inundation of the Indus twice a year, caused by the spring and summer melting of Himalayan snow and by rainfall in the monsoon season. These natural patterns have recently changed somewhat with the construction of dams and barrages on the Indus River.

The typical breakdown of seasons into four distinct seasons (winter, spring, summer, and autumn) is rare in the country except over the northern mountain region. This is the only area to receive snowfall in winter and the withering and blossoming of its vegetation depends on the arrival and melting of snow. Broadly speaking, the seasons in Pakistan can be better classified as (Shamshad, 1956):

- Winter, from December to March
- Pre-monsoon (summer), from April to May
- Monsoon, from June to September
- Post-monsoon, from October to November

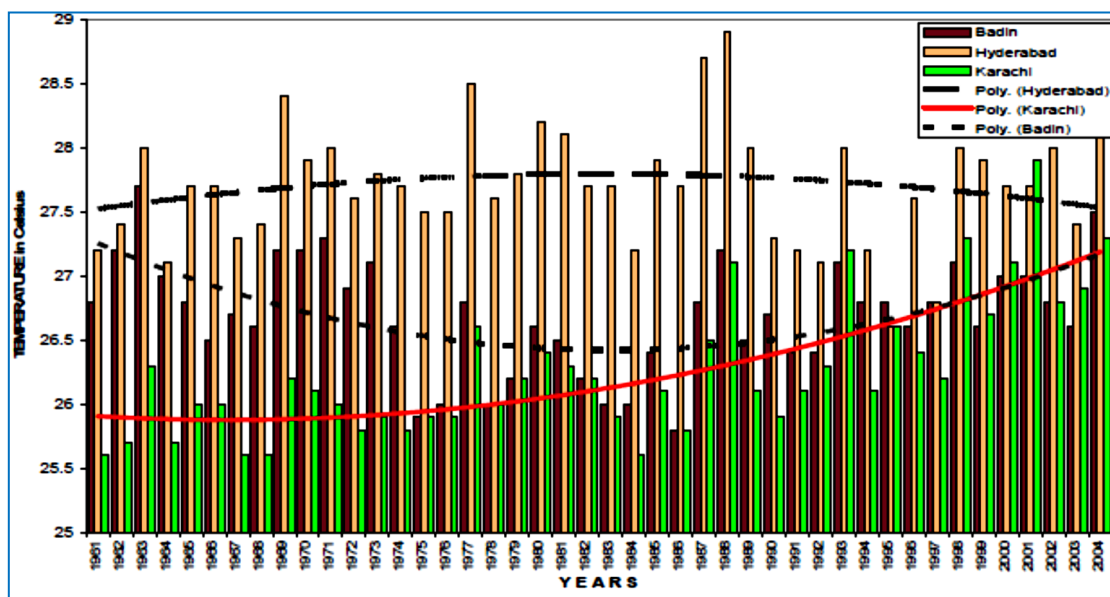


Figure 5.1: Bar chart of Temperature with polynomial curve of lower Sindh region (1981-2004)

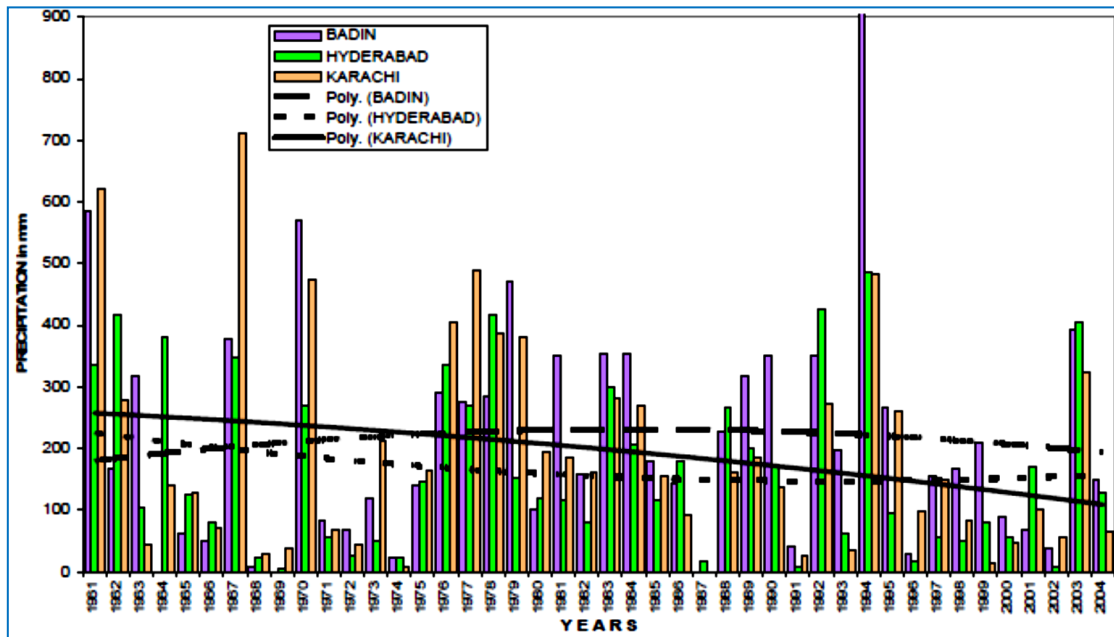


Figure 5.10: Bar chart of Precipitation showing polynomial curve for lower Sindh region (1981-2004)

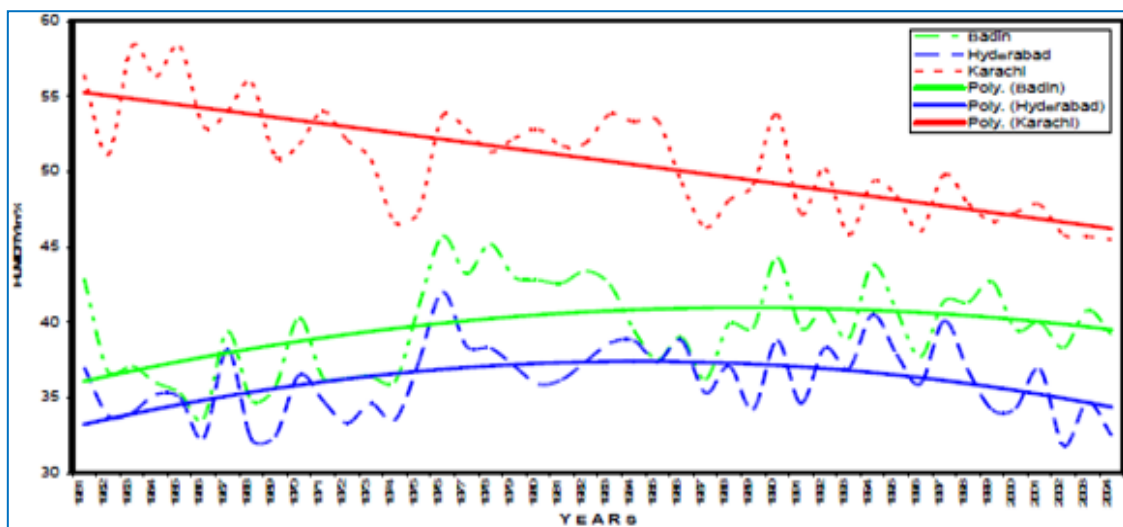
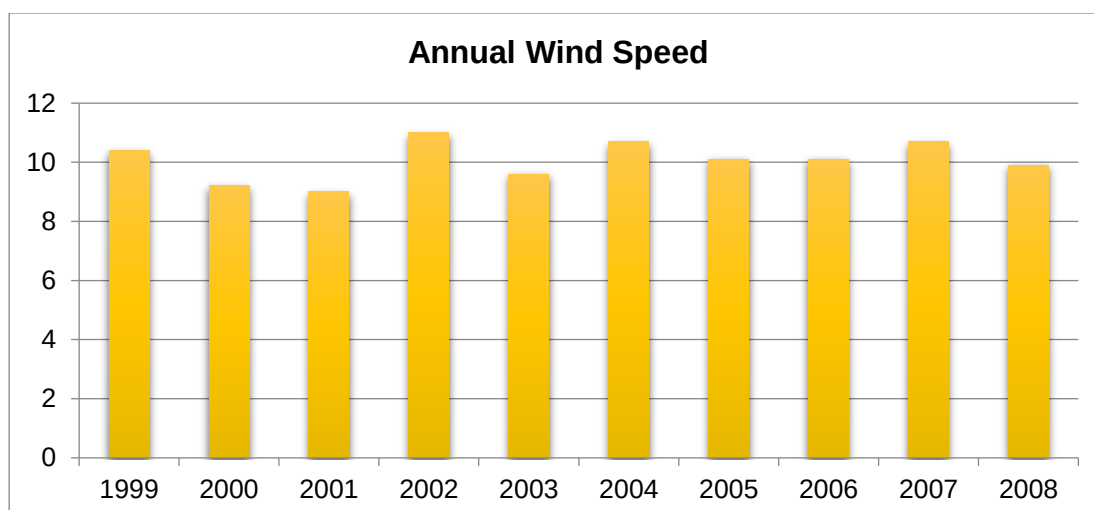
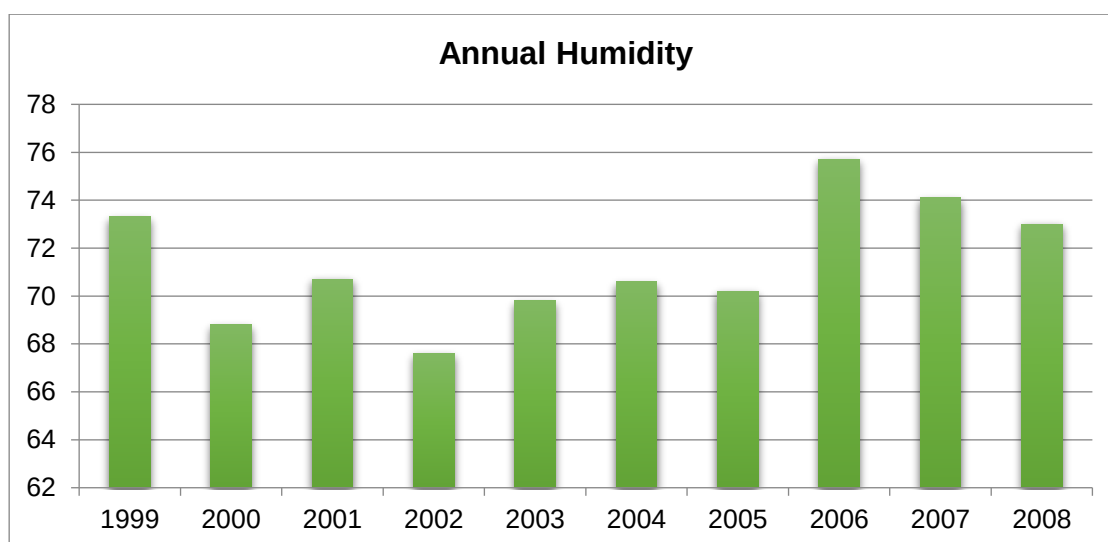
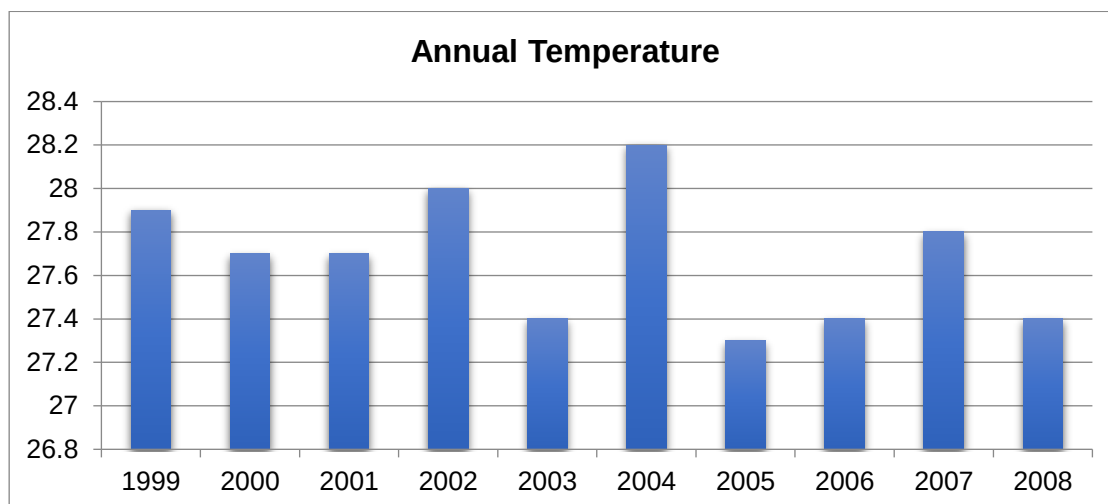
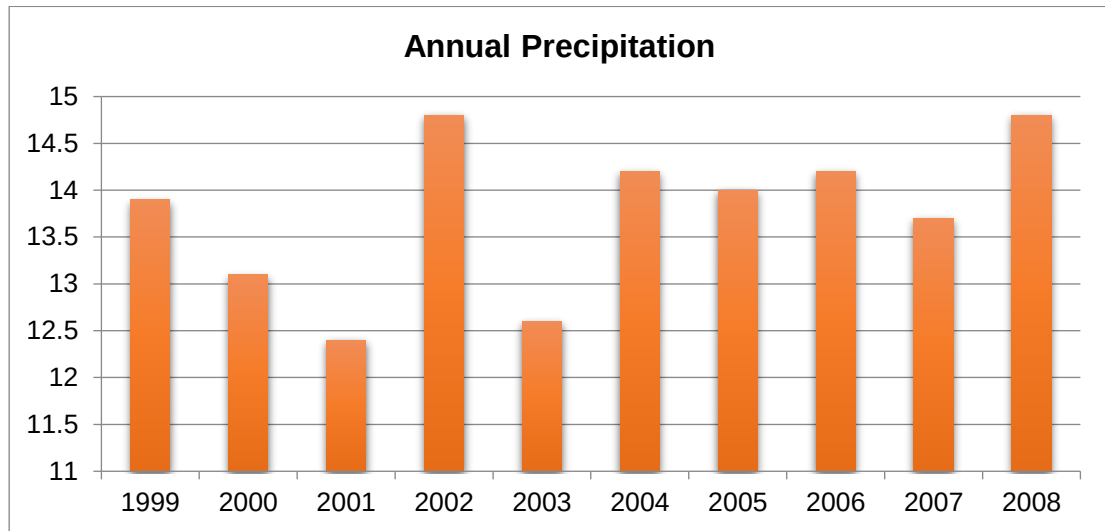


Figure 5.11: Graphical presentation of Humidity curves for lower Sindh region (1981-2004)

The climate of the district including Taluka Kotri, Thano Bula Khan, UC Manzooraabad of Manjhand Taluka, and Sehwan have moderate climate. The average annual rainfall ranges between 9 till maximum 524.9mm during the last 10 years. The mean monthly temperature in the area varies from 15.8 minimum in the January till maximum of 33.4°C in June. Winter spell is from November to February; mean monthly temperature ranges at 15°C to 21°C, average yearly wind speed is not surpassing more than 9-10 knots. Humidity normally ranges at 70% in the night and remain lingering at 30-40% in the day hours. Wind direction is from southwest to north in the summer season and from north to south in the winter season. Sand storm occurs generally in summer season. The temperature found at highest during summer (May to July), and lowest during winter (December to February).

Meteorological data of 10 years (1999-2008) in terms of mean monthly figures is depicted below in the form of Temperature, Precipitation, Humidity, Wind speed and Wind direction respectively.





5.1.6. Hydrogeology

Electrical Resistivity Survey (ERS) is conducted to focus on the subsurface geological and hydrological study for groundwater presence in the area located Educational city link road Karachi, Sindh, Pakistan. The analysis of resistivity data in conjunction with geological conditions indicates that the surveyed area is divided into two distinct zones. The first zone, comprises of locations ERS-01 to 15, exhibits very good ground water potential, while the second zone, covering locations 16 to 25, indicates moderate ground water potential. Additionally, it has been determined that the geological conditions and electrical resistivity of the first zone are favorable for ground water occurrence, whereas the second zone also shows significant ground water availability. Aquifer is based on Alluvium (Sand Bar Deposits/), Gaj and Manchar Formation.



Figure 5-12: ERS study team at the proposed project site

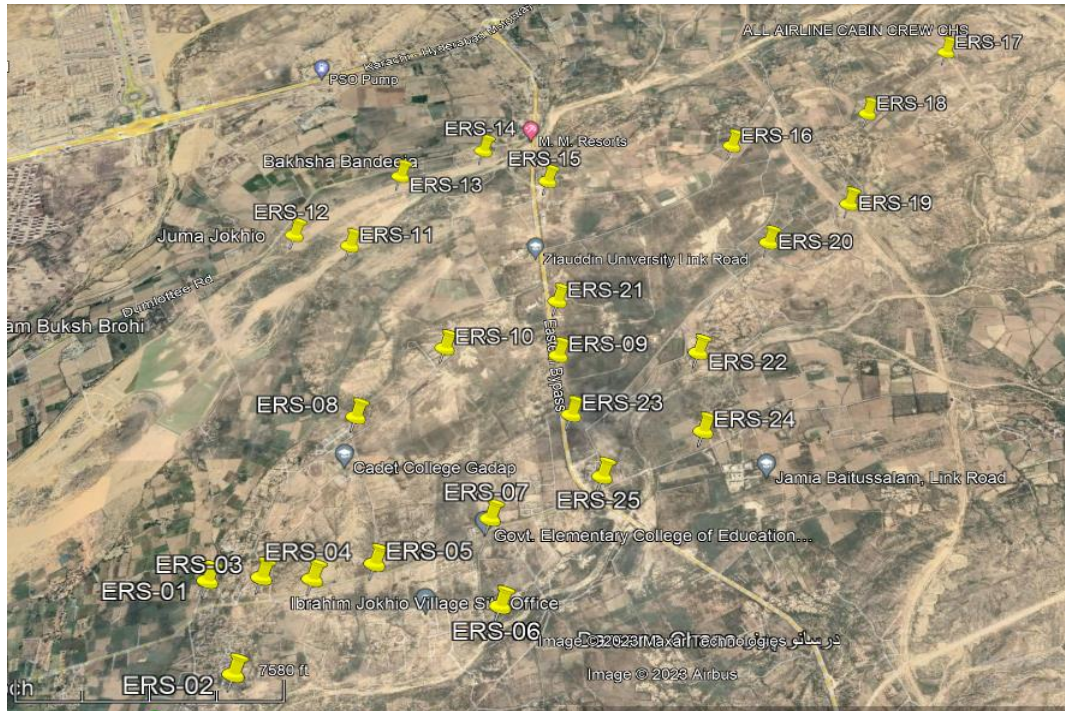


Figure 5-13: Map of study area showing location of Vertical Electrical Sounding (VES).

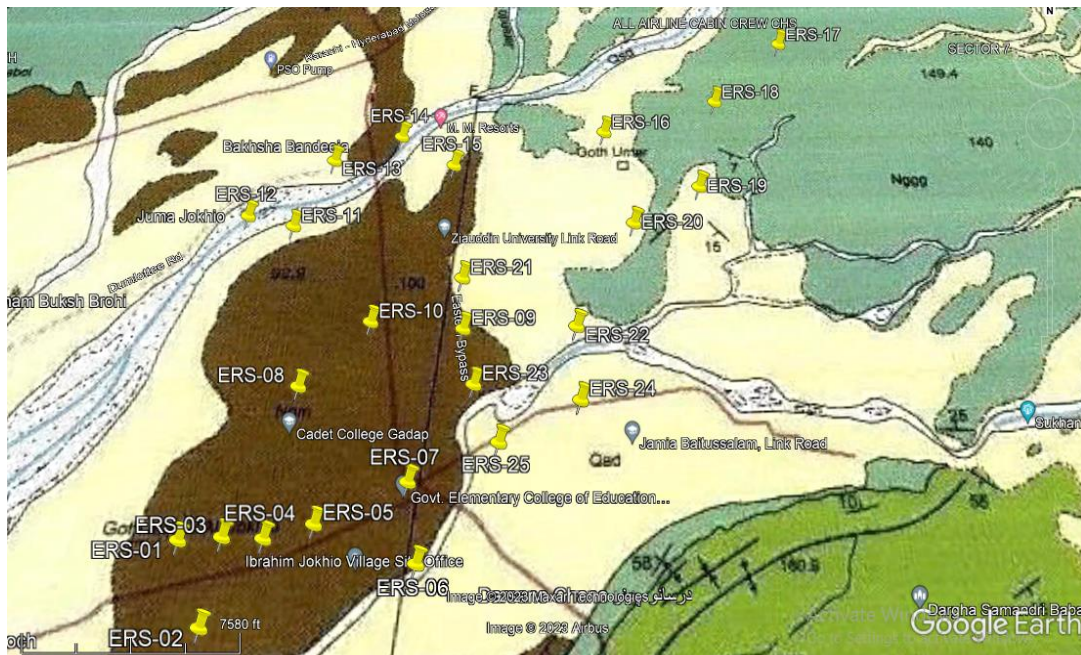


Figure 5-14: Geological Formation Map of VES locations.

5.1.7. Hydrology

Education City will conduct a Hydrological Study for the project to calculate the catchment areas and discharges of Existing Nallahs of the project. Based on the data of the Hydrological Study, small/micro level channels may be proposed to control the supply and flow of rain water. These perineal water bodies will be recharges may also reduce the potable water demand of the project.

For area roof drainage, it will be provided considering the maximum rainfall intensity. The maximum rainfall intensity of Karachi is 3" per hour. To drain the rainwater dome type water grating would be installed at roof and sand traps to collect water and trap sand for disposal of the open spaces in the building at ground floor. The rainwater will be directly drained into external storm water drain by means of rain water pipes. Based on the data of the Hydrological Study, small/micro level dams may be proposed to store rain water. These storages may also reduce the potable water demand of the project.

5.1.8. Water Resources

The water requirements of Education City Project at ultimate development are estimated at 14.2 MGD. The water requirements are expected to build gradually and about 3.55 MGD (about 25%) are required in the first 5 years of project development. For supply of water to the EC development of independent water source will be costly, time consuming and may cause conflict with other water users. From these considerations it is advisable that the water supply for EC is obtained through Karachi Water and Sewerage Board (KW&SB). Accordingly the general water supply situation for Karachi has been reviewed together with assessment of possible sources of supply for EC.

About 60 percent of the households in Karachi are connected to the water supply network. Under the present conditions, the water supply is irregular and inequitable. Water is supplied only for a few hours, generally four hours daily and that too at a very low pressure. In-equitable distribution marks the supply system as some areas receive more water, and some too little to meet their needs. There are some areas which are not connected to the system and get water on payment through tankers. There is also a serious concern about water quality. The existing filtration facilities are not enough to subject all supplies to clarifier process; about 60 percent of water is filtered and the rest is only disinfected through chlorination. Some contamination may also occur in transmission to the end consumers.

The total water demand for Karachi was estimated as 1242 MGD in year 2025 by KW&SB in Oct 2002. As regards the project area of Karachi Education City, the total water demand of the project area is expected to be around 14.2 MGD, which is slightly more than 1% of the projected demand for Karachi.

Water supply sources for EC can be grouped into following categories:

- a) Groundwater, either through pumping wells/ tubewells or by rehabilitating the Dumlottee wells system
- b) Exploitation of independent surface water sources,
- c) Sea water by using desalination plant and appropriate treatment.
- d) Supply from KW&SB System

5.1.8.1 Ground Water

Groundwater source in the vicinity of the project area includes Dumlottee wells and tubewells operated by KW&SB. Brief description of these is given below:

Dumlottee Wells

Dumlottee wells were constructed by the British government in 1883 to supply water to the city of Karachi. It is reportedly, the first piped water supply system installed for the city. The shallow wells are situated on the bank of Malir River within a stretch of about 10 km. The wells are located along the right bank of Malir River. With respect to project area, some of the wells are close to the eastern bank of the project, while the interconnection station,

where water from all Dumlootee wells is collected is located about 6 km downstream of the project site. The conveyance capacity of the conduit from the Dumlootee well field is 20 MGD. The original scheme included pumping of well water into a 5 MGD capacity stone masonry, gravity conduit, which terminated into a 5.5 MG capacity reservoir. The capacity of the system was increased to 20 MGD in 1923 by adding more wells, a 15 MGD gravity conduit and two 6 MG reservoirs (total 12 MG). The total number of Dumlotte wells is 30, however at present all wells except two are non-functional mainly due to lowering of water table because of over exploitation.

5.1.8.2 Surface Water

Major surface water sources that are supplying water to Karachi are shown in Figure below. A brief description of these sources is given in this section.



Karachi Bulk Water Supply System (Indus River)

The Karachi Bulk Water Supply system is based on utilization of water of Indus River. Karachi has an allocation of 1200 cusecs in the Water Apportionment Accord of 1991. The Bulk Water Supply system consists of conveyance of water from Indus River at Kotri Barrage. The bulk water supply scheme for Karachi obtains water from the Kinjhar Lake through the Kinjhar – Gujjo Canal. The Kinjhar lake receives supplies from the Indus river through Kalri Bagar (KB) Feeder. Presently about 580 MGD (1067 cusecs) of raw water is being supplied from this source. The raw water is treated at Karachi before supply to the distribution system. The treatment includes pre-chlorination, coagulation, flocculation and filtration through rapid sand filters and post chlorination of filtered water.

Two of the bulk supply mains, namely K-3 and the proposed K-4 pass through the project area. The K3 conduit carries 100 MGD of raw water. If KW&SB allows the EC to utilize water from K-3, then this is probably the most cost-effective and sustainable source available for the project area, raw water from the K3 conduit will be treated at EC site. The Meetings with KW&SB staff indicated that at present, the available supplies of K-3 are fully utilized. However, if water for K-4 system is allocated to Karachi, then it can be one possible source for the EC.

The proposed K-4 project is designed to provide more than 650 MGD to Karachi from the Indus in three phases which were originally planned to be completed by 2020. The project is based on increase of the approved supply of 1200 cusecs from Indus by another 1200 cusecs. As the Indus River System Authority has not agreed to increase the

share of Karachi from the Indus to 2400 cusecs, at present the status of the K4 Project is somewhat uncertain and depends on allocation of additional Indus River supplies by the Government of Sindh from its own share. The issue was discussed in a high level meeting¹ presided by the Governor of Sindh who formed a four-member committee for resolving the issue of drawing additional 1,200 cusecs of water for the Greater Karachi Water Supply Scheme, for the K-IV project, from the Indus with the top officials of the Indus River System Authority (IRSA) and to take up the matter with the presidency.

The K-IV project was conceived in 2007 and all relevant studies and feasibility reports of the project had been completed. The Governor has indicated that the Sindh government could initially allocate a quota for the project's first phase of 240 MGD which, comes to just 0.3% of the Sindh's overall water quota. It now appears that that at least phase I of K4 to supply 280 MGD may materialize in next five years. As such the water requirements of EC Project may be taken from K4 as indicated by KW&SB. As the proposed K4 conduit will convey raw water, it would be necessary to provide treatment facilities before the water can be used for EC.

Treatment will include coagulation/flocculation, filtration and chlorination. One of the benefits of using K4 is that the ground level at K4 location is higher. After treatment of water and pumping to an overhead reservoir, part of the area can be served by gravity flow or with nominal pumping.

Hub Water Supply System

A 151 ft. (46 m) high and 2,100 ft. (6400 m) long earthen dam has been constructed by WAPDA on Hub River for creating a reservoir or almost one million acre feet storage capacity for meeting the agricultural and industrial water supply requirements of Baluchistan and for supply of 89 MGD water to Karachi for domestic use. The quality of Hub Water is comparable to Indus water and therefore, similar parameters for pumping and treatment have been adopted. The water supply system comprises a 90 MGD pump house, two steel pressure mains, one 20 MG reservoir, trunk mains and primary treatment of lake water by screening and chlorination. The Hub River is a non-perennial stream and the river flows are entirely dependent on rainfall. In dry periods supply of water from Hub is drastically reduced or stops completely.

However, data on spills indicated that there is a possibility of increasing storage by raising the dam, for which proper studies are required. The Spillway has operated 7 times spilling about 4.133 MAF, which indicates that additional water is available, which could be stored to increase the yield from the reservoir. Preliminary estimates indicate that with an increase of reservoir conservation level by 3 ft about 50,000 acre ft. of additional storage may be added whereas a 6 ft increase in conservation level will add about 110,000 acre ft. of storage. If increase in yield from the dam is possible, then it can be one of the possible options for augmenting water supply for Karachi. It is suggested that KW&SB together with WAPDA should examine the possibility of increasing the height of Hub dam and increasing the water availability from the Hub source.

Hilaya Water Supply System

Hilaya water supply system consists of supply of about 20 MGD of water from Haleji Lake. The project was originally commissioned in 1943. The lake has a surface area of 17.6 sq. km and a storage capacity of 3.7 mcm (3000 acre feet). Water gravitates from the lake through a masonry conduit up to two pump houses in Gharo, each of 10 MGD capacity. Two water treatment plants of equal capacity have been constructed in Gharo where complete treatment through sedimentation, rapid sand filtration and chlorination is provided. Potable water is brought to Karachi by an RCC pipe line where it is again boosted to a 20 MGD capacity reservoir before distribution in the city.

5.1.9. Storm Water Drainage

Storm drainage pertains to safe evacuation of storm runoff generated from intense storms from the area. The storm drainage analysis is based on analysis of historic rainfall, depth-duration-frequency relationship, study of any existing storm drainage facilities in the area, evaluation of constraints in safe disposal of storm water under present conditions, establishment of storm drainage protection levels, study of runoff generating characteristics of area, delineation of catchment area, determining magnitude of storm flows at various points of interest, establishment of adequacy of various channels and culverts/bridges thereon, identification of areas needing storm water drainage improvements, formulation of needed drainage improvements proposals and cost estimation of proposed storm water drainage interventions. The approach, methodology and parameters adopted for storm water drainage is discussed in this section.

5.1.10. Environmental Monitoring, Sampling and Testing for Proposed Project

In order to determine the ambient air, noise levels, wastewater, surface water and groundwater/ drinking water quality of the study area testing was conducted for the aforementioned aspects. The sampling locations for the testing of ambient air, noise, surface water, groundwater/ drinking water and wastewater for project area.

5.1.11. Air Quality

The ambient air monitoring at a single point in these areas can be the representative of the whole area as well as the surroundings. The ambient air quality was monitored using a mobile station at location. All the air quality parameters are in compliance with SEQs. The results of ambient air quality monitoring are given in the report **Annexure – I** and photo log of ambient air quality monitoring are in **Annexure – II**.

5.1.12. Noise Level Monitoring

Noise level monitoring conducted by thirds party which is hired by Nexus Consulting representative and the results mentioned in the Annexure - I. The objective of the noise pollution survey around the project site was to identify existing noise sources and to measure the noise levels, monitoring was done at the location 24.96°95.616°N & 67.3955099°E. The pictorial evidence records are attached in **Annexure – II**.

5.1.13. Groundwater Water Monitoring

Ground water samples were collected from hand pumps & Tube well at the project area at the Month of May 2024, sample was analyzed for chemical and microbiological parameters. The analysis results of groundwater samples are compared with SEQs. The results are attached in **Annexure – I**.

5.1.14. Surface Water Sampling & Analysis

Surface water samples were collected from GPS coordinates as per mentioned table below.

Sampling	GPS Coordinates	
	Latitude	Longitude
W1	25°0'10.062°N	67° 23'4.296°E
W2	24° 59'43.116°N	67° 24'5.7°E
W3	24°57'8.568°N	67°22'28.998°E
W4	24°57'49.236°N	67°22'58.194°E

Surface water samples were also collected from Malir River bed on May 2024, samples were further analyzed by EPA approved Laboratory its parameters. The analysis results of water samples are compared with SEQs. The results

of surface water quality monitoring are attached in **annexure – I**. The detailed monitored report and photolog for surface water quality are also attached in **annexure – II**.

5.1.15. Baseline Monitoring Team

The following environmental parameters; ambient air, noise levels, wastewater, surface water and groundwater/drinking water quality monitoring of the project area was done by third party, the Biodiversity/Ecological impact assessment of the EC project study was done by Ecological Expert Dr. Noreen Farooq hired by Nexus Consulting.

5.1.16. Natural and Biological Environment

Methodology: Data in respect of fauna and flora were gathered from both primary and secondary sources. The sampling was done in the entire area ensuring that the representative locations were sampled for each habitat and the maximum possible number of species belonging to each habitat was recorded. Secondary data were collected through information obtained from the local communities. Some information was also available about the fauna of the area collected during various faunal studies conducted previously in the area.

Standard direct and indirect methods were applied to record the occurrence, distribution and status of the species in the area which included Line Transect Method, Point Count Method, Roadside Counts and Track/Sign Counts.

The vegetation surveys were carried out by laying 20' x 20' quadrates within the study area. The plant communities were determined within the various habitats of the project area.

5.1.17. Flora

The project area is mainly consisting of patches of wild vegetation. The significant trees include Neem (*Azadirachta indica*), kikar (*Acacia nilotica*), followed by Buttonwood (*Conocarpus erectus*), drumstick tree (*Moringa oleifera*), while herb comprise Meadow rue (*Thalictrum foliolosum*), Cutleaf groundcherry (*Physalis angulate*), False Amaranth (*Digera muricata*), Aloe vera (*Aloe barbadensis*) and Mango melons, a fruit plant (*Cucumis melo*) whereas in shrub Apple of sodom (*Calotropis procera*), Morning Glory (*Ipomoea Carnea*), Cotton (*Gossypium hirsutum*), South Indian Treebine (*Cissus vitiginea*), Cactus pear, Prickly pear (*Opuntia ficus-indica*) and bush plant, Kapok bush or desert cotton (*Aerva persica*), have been observed, which belongs to 14 families, Meliaceae, Fabaceae, Combretaceae, Moringaceae, Ranunculaceae (herb), Solanaceae (herb), Amaranthaceae, Asphodelaceae, Cucurbitaceae, and Apocynaceae, Convolvulaceae, Malvaceae, Vitaceae, Cactaceae, Amaranthaceae respectively. All floral species are capable to withstand penetrating heat during most of the year and survive mainly on moisture contents. Neither endemic species nor IUCN Red List registered species was found in the study area. In malir nadi district, variety of crop is being cultivated in agricultural land. Along sukhani river the area is covered by kikar trees. This wild vegetation can be replaced by other fruitful trees and the kikar wood can be utilized.

Flora species observed in project area

		
Meadow rue <i>Thalictrum foliolosum</i>	Apple Of Sodom <i>Calotropis procera</i>	Drumstick tree <i>Moringa oleifera</i>
		
Buttonwood <i>Conocarpus erectus</i>	Kikar <i>Acacia nilotica</i>	Cutleaf groundcherry <i>Physalis angulata</i>
		
Desert cotton <i>Aerva persica</i>	Neem <i>Azadirachta indica</i>	Cotton <i>Gossypium hirsutum</i>

		
Cactus pear, Prickly pear <i>Opuntia ficus-indica</i>	South Indian Treebine <i>Cissus vitiginea</i>	Bush Morning Glory <i>Ipomoea Carnea</i>
		
Mango melons <i>Cucumis melo</i>	False Amaranth <i>Digera muricata</i>	Aloe vera <i>Aloe barbadensis</i>

5.1.18. Fauna

Insects

Common tiger butterfly (*Danaus genutia*), Cabbage white butterfly (*Pieris rapae*), house flies (*Musca domestica*), wasp (*Polistes flavus*), dragonfly (*Anisoptera spp.*), carpenter bee (*Xylocopa spp.*), and Blister Beetle (*Mylabris Pustulata*) have been observed.

Birds

Among the birds, Common myna (*Acridotheres tristis*), Rock Pigeons (*Columba livia*), House sparrow (*Passer domesticus*), Crow (*Corvus splendens*), Koel (*Eudynamys scolopaceus*), Black Kite (*Milvus migrans*), Common Babbler (*Argya caudata*), Domestic Duck (*Anas platyrhynchos*) have been reported in the area.

Reptile

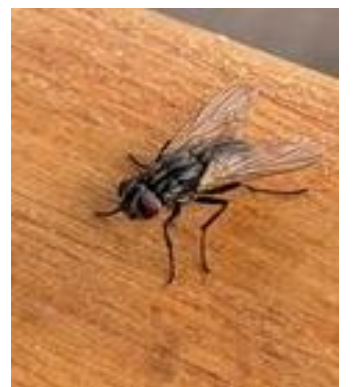
Monitor lizard (*Varanus bengalensis*) has been reported from the area.

Mammals

Among mammal squirrel (*Funambulus palmarum*) and bat (*Papistrellus coromandra*) are generally found.

Fauna species observed in project area

		
Common myna <i>Acridotheres tristis</i>	Babbler bird <i>Argya caudata</i>	Rock Pigeon <i>Columba livia</i>
		
Koel <i>Eudynamys scolopaceus</i>	House sparrow <i>Passer domesticus</i>	Crow <i>Corvus splendens</i>

		
Black Kite <i>Milvus migrans</i>	Carpenter bees <i>Xylocopa spp.</i>	Dragon fly <i>Anisoptera spp.</i>
		
Domestic Duck <i>Anas platyrhynchos</i>	Cabbage white butterfly <i>Pieris rapae</i>	Common tiger butterfly <i>Danaus genutia</i>
		
Squirrel <i>Funambulus palmarum</i>	Indian Pipistrelle (Bat) <i>Papistrellus coromandra</i>	House Fly <i>Musca domestica</i>

		
Monitor Lizard <i>Varanus bengalensis</i>	Wasp <i>Polistes flavus</i>	Blister Beetle <i>Mylabris Pustulata</i>

5.2. Socio Economic Environment

The proposed education city lies in Deh Chuhar, which is part of historical Malir Oasis, while administratively, it lies in the Union Council Darsano Chhanno of Malir District. According to the locally available history, the proposed city's land has been part of historic route for trade caravans coming from north via Thatta and going towards Makran coastal belt and further west. The area has a rich history going back to centuries, which can be substantiated from the graves within the area and also narrated by the locals; as the history transferred from generations to generation through historical narrative and anecdotes, as it usually happens in such rural settings. Various tribes inhabit the area, out of which Jukhio tribe is the largest and the dominant. While majority are Sunni Muslims in the area, however, it is found that before partition Hindus were financially powerful, but they left after partition.

Traditionally, the people were engaged in agriculture, as the land was fertile, fed by sweet water from nearby Malir River and the sub-soil sweet water, additionally livestock was also an important means of earning. However, the agriculture and livestock both declined with the passage of time, as the urbanization started neighboring city of Karachi, sub-soil sweet water starting to become rare because of the over extraction of Malir river soil, which was essential for the sub-soil water retention during rains, and thus aquifers depleted, and also rain patterns changed as climate changed. Agriculture and livestock were no more rewarding for the local people, who, with the passage of time became part of the urbanization in Karachi and opted to become employees of the government and private organizations and served largely as gardeners and other low pay-scale workers. This is partly because the literacy rate is quite low generally, however, exceptional cases of individuals are there who went through the literacy ladder and enjoyed prominent positions in the government and the private sector.

Currently there are 29 villages, having 5092 number of houses in total and 25460 number of people living the area. The population is increasing with the rate of 2 percent, thus will 29244 in 2030. Any development in the area cannot neglect the local people, their history, their culture, their traditions, spaces and aspirations and above all their right to live in their locality and benefit out of the development taking place. The socio-economic profile of the area, comprising of proposed education city, is being proposed and developed.

5.2.1. Demographics and Social Profile

Population Density

Population	Households (HH)	Average HH size	Total Area (sq. Km)	Density Pop. (sq. km)
28721	4103	7	36	797.8

Table 1 Population and Population Density

According to the HH survey population density has been calculated as 677.8 square kilometers. The area was calculated from the official document of the Sindh Government Investment Department i.e., 36 sq. km approximately². The average household size is 5 and the overall population of education city is calculated 25460 as per the HH survey.

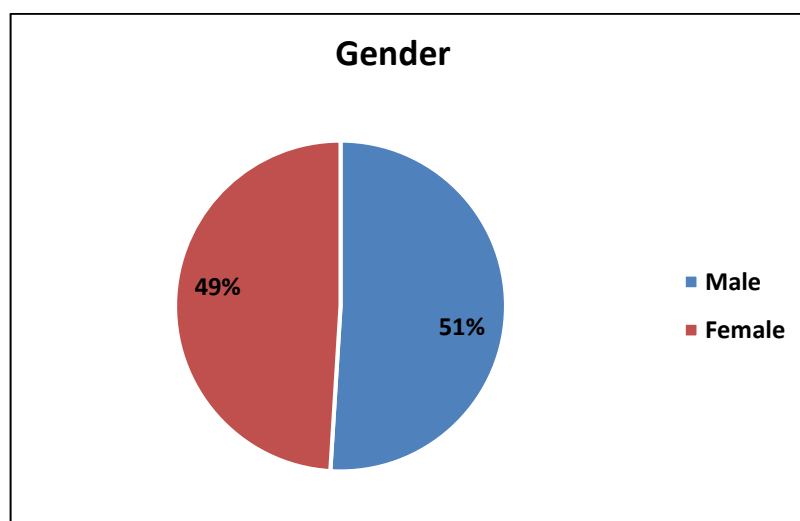
Gender Ratio

² <https://sindhinvestment.gos.pk/education-city>

Gender Ratio	Frequency	Percentage
Male	2098	51
Female	2017	49
Total	4115	100

Table 2 Gender Ratio

According to the data collected in the HH survey, the Gender ratio is equivalent however, the Male population is slightly high than the female population.



Graph 1 Gender Ratio

Growth rate

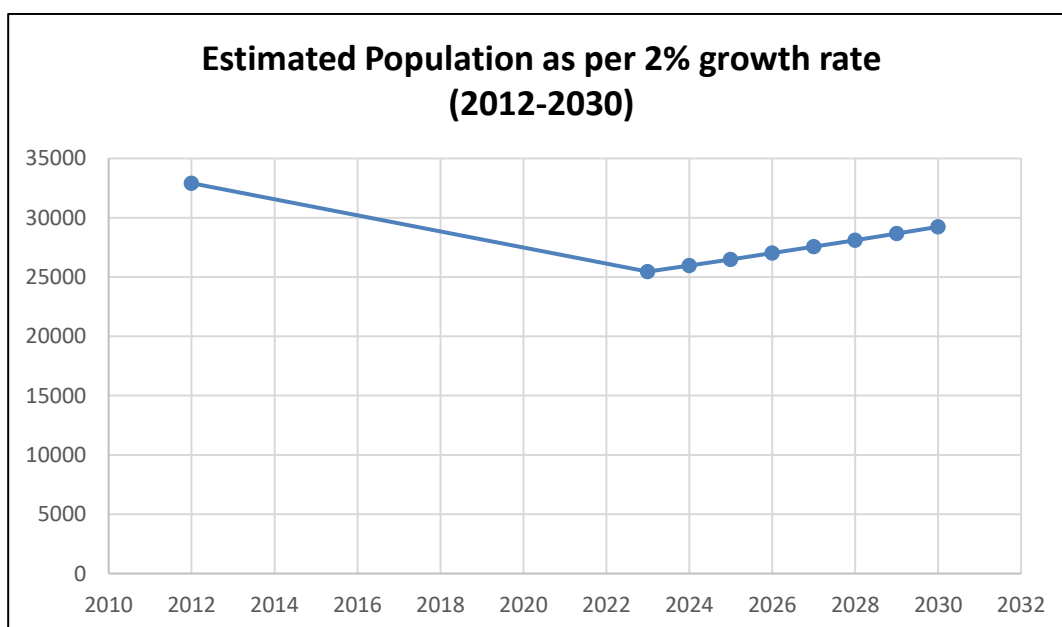
For growth rate calculation, the 2012 survey by the consultant is used as the starting point, while the data received from the current survey provides the second point of reference.

$$\begin{aligned}
 \text{Growth rate} &= \left[\frac{\text{Previous Pop. (2012)} - \text{Current Pop. (2023)}}{\text{Previous Pop. (2012)}} \times 100 \right] \\
 &= \left[\frac{32916 - 25460}{32916} \times 100 \right] \\
 &= 22.6 \times 11 \text{ (difference between 2012-2023)} \\
 \text{Growth rate} &= \mathbf{2 \text{ percent growth rate per year}}
 \end{aligned}$$

The population growth rate has been calculated as 2 percent per year growth according to the survey data. The predicted population of Education City would be 29244 as per the mentioned growth.

Year	Total Population	Added Population as per 2% growth rate
2012	32916	
2023	25460	509
2024	25969	519
2025	26489	530
2026	27018	540
2027	27558	551
2028	28109	562
2029	28671	573
2030	29244	

Table 3 Estimated Population in 2023



Graph 2 Future Projection of Population

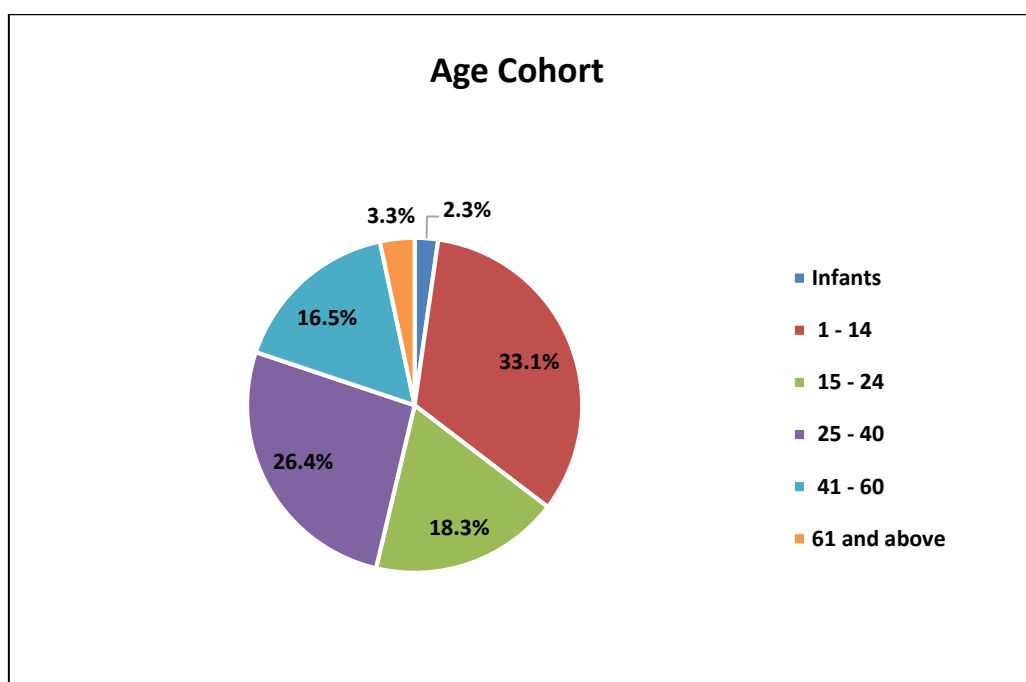
Growth rate is calculated from the following formula we took 2012 population as base year population to calculate the per year growth.

Age Groups/cohorts

Age Cohort	Frequency	Percentage
Infants	93	2.3
1 - 14	1363	33.1
15 – 24	754	18.3
25 - 40	1088	26.4
41 - 60	680	16.5
61 and above	137	3.3
Total	4115	100.0

Table 4 Age Group / Cohort

The highest population age i.e., 33.1 percent as per the data of 800 HH is between 1-14. However, the second highest population belongs to the young adult (25- 40) age cohort. The lowest age cohort belongs to the senior citizens group.



Graph 3 Age Cohort

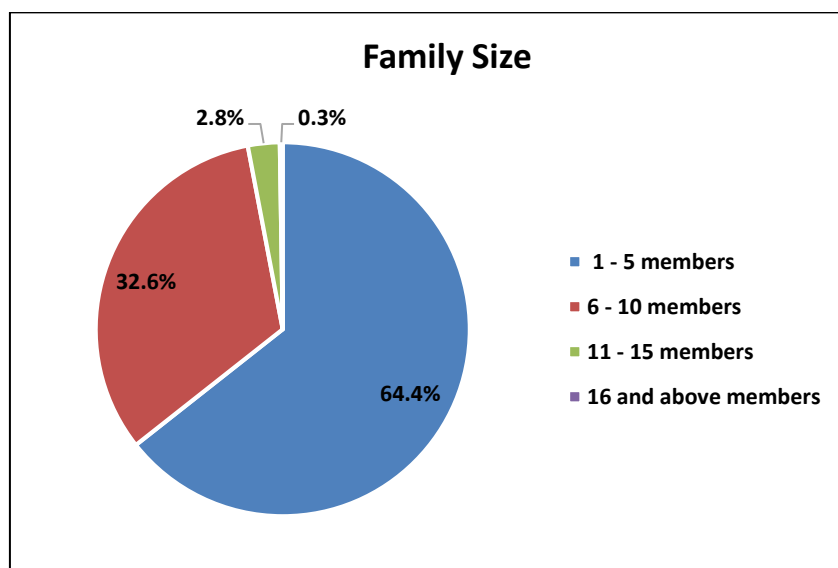
Family Structure/ Household Size

Family Size	Frequency	Percentage
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1 - 5 members	515	64.4
6 - 10 members	261	32.6
11 - 15 members	22	2.8
16 and above members	2	0.3
Total	800	100.0

Table 5 Family Size of HH

According to the data, the average household size is 5 members each, with the highest proportion of family members found among 1 – 5 family members as shown in the above table.



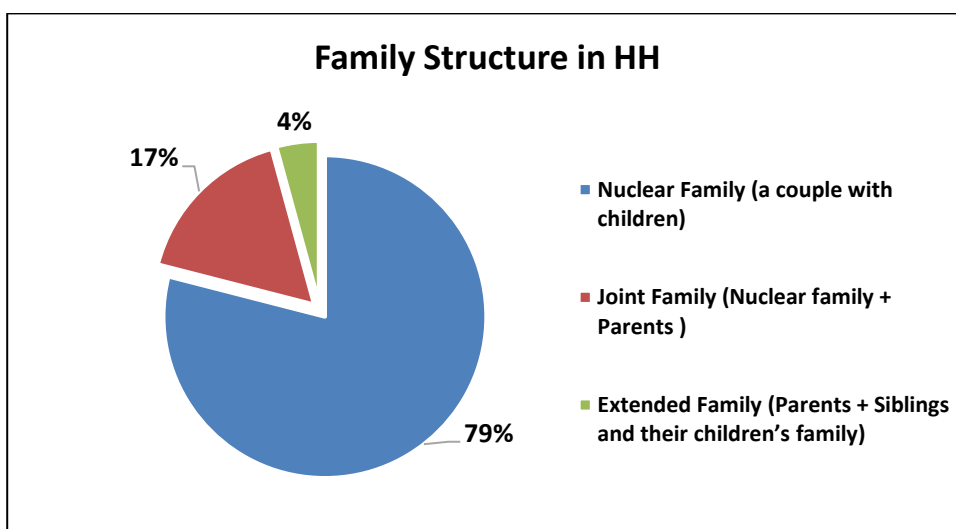
Graph 4 Family Size

Family Structure	Frequency	Percentage
Nuclear Family (a couple with children)	632	79
Joint Family (Nuclear family + Parents)	134	17
Extended Family (Parents + Siblings and their children's family)	34	4
Total	800	100

Graph 5 Family Structure

Most of the family live in the nuclear family structure in the household that consists of a married couple with their children. Here the household's definition is taken from the census that describes a household from the house's

kitchen. All family members are reliant on and are responsible for the management of the house's kitchen chores and finances.



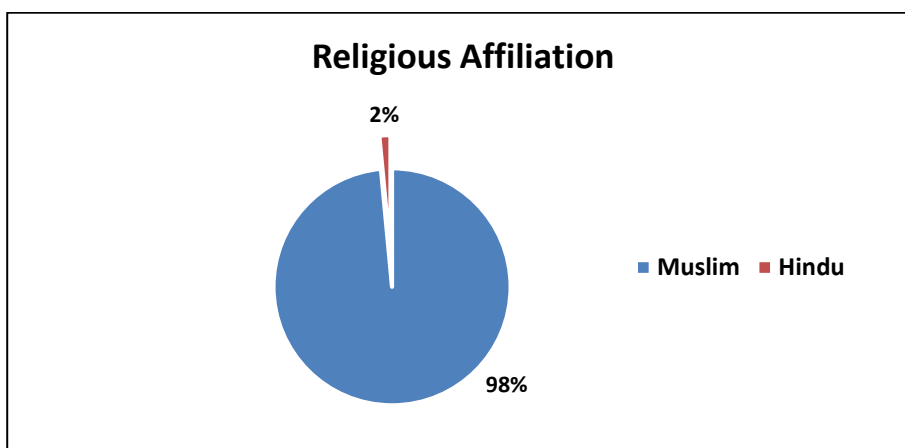
Graph 6 Family Structure

Religious Affiliation

Religious Affiliation	Frequency	Percentage
Muslim	788	99
Hindu	12	2
Total	800	100

Table 6 Religious Affiliation

As per the data based on the 800-household survey, about 99 percent of the household's (HH) religious affiliation is with Islam. However, about 1 percent of households belong to the Hindu religion. Further, none of the households were found to be any other religion other than both mentioned religions.



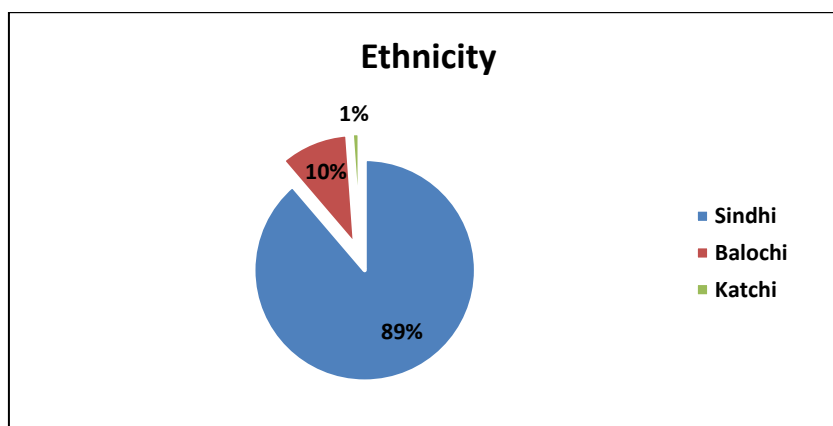
Graph 7 Religious Affiliation

Ethnicity

Ethnicity	Frequency	Percentage
Sindhi	710	89
Balochi	81	10
Katchi	9	1
Total	800	100

Table 7 Ethnic Groups

The most dominant ethnic group has been found in Sindhi which is 89 percent of overall 800 HH. Most of the household members belong to the Sindhi ethnicity. The second dominant ethnic group which is 10 percent consists of the Balouchi-speaking group.



Graph 8 Ethnicity

Income Group

As per the survey results, the majority of households' monthly income is between the income bracket of PKR 25,000 – 40,000 (43 percent), and two more income brackets which are in the second majority are PKR 20,001- 25,000 and less than PKR. 20,000 having 20 and 21 percent respectively. Very few households' monthly incomes are above PKR 60,000.

HH Monthly Income	Frequency	Percentage
Less than PKR 20,000	165	21
PKR 20,001-25,000	164	20

PKR 25,001-40,000	345	43
PKR 40,001-60,000	106	13
PKR 60,001 and above	20	2.5
Total	800	100.0

Table 8 Monthly Income of HH

Migration pattern (in and out)

According to the data, only 2 percent of families out of 800 households migrated from different places within the city or outside the city. 98 percent of families claimed that they or their families live in the place before partition.

Where did they migrate	Frequency	Percentage
From a Rural area of Sindh	3	23.1
From a Rural area in Punjab	2	15.4
From a Rural area of Baluchistan	2	15.4
From inside areas of Karachi	5	38.5
From outside areas of Karachi	1	7.7
Total	13	100.0

Table 9 from where do they migrate

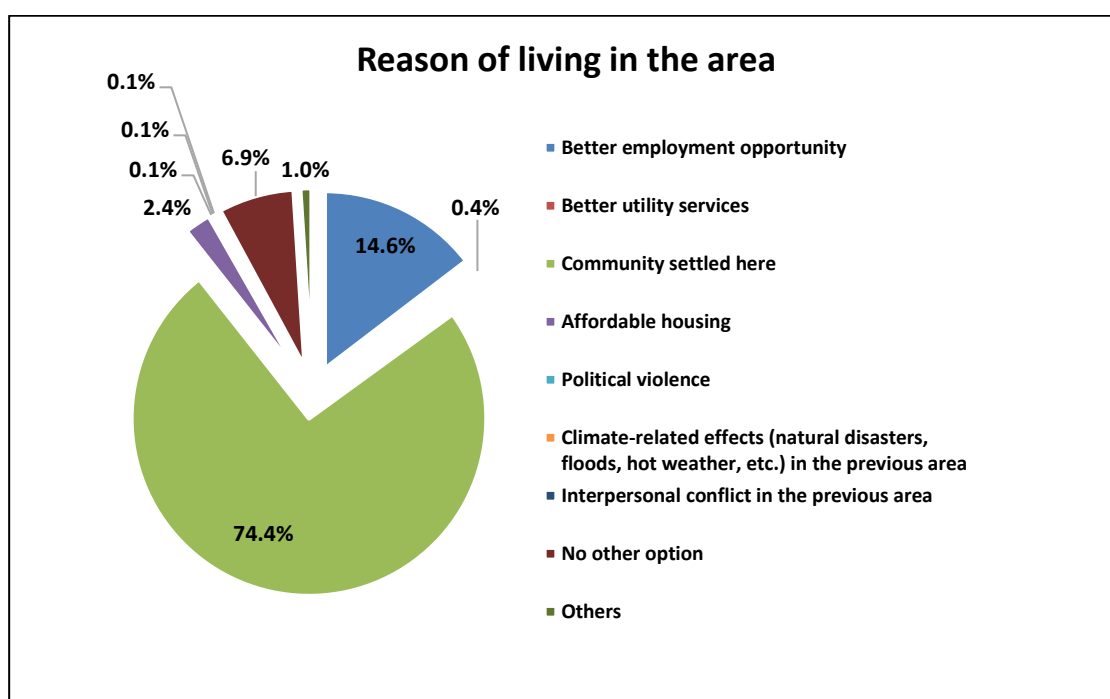
The above-mentioned table identifies from where the family migrated to education city. It states mostly families migrated from the inside area of Karachi, then from rural areas of Sindh and the rest migrate from the rural part of Punjab and Baluchistan.

Reason of living in the area	Frequency	Percentage
Better employment opportunity	117	14.6
Better utility services	3	0.4
Community settled here	595	74.4
Affordable housing	19	2.4
Political violence	1	0.1

Climate-related effects (natural disasters, floods, hot weather, etc.) in the previous area	1	0.1
Interpersonal conflict in the previous area	1	0.1
No other option	55	6.9
Others	8	1.0
Total	800	100

Table 10 Reasons of Living in Education City

Within the 98 percent out of 800 families who did not migrate from anywhere, about 75percent claimed the reason for living in education city is to stay near their community.



Graph 9 Reasons of living in Education City

Disability rate

According to the data disability or the rate of specially challenged population is quite low. Only 1 percent of the population have disabilities both physical and mental.

Types of disabilities in HH Members	Frequency
Blind	3
Mental Disability	10

Physical Disability	17
Polio	5
Total	35

Table 11 Types of disabilities in HH members

35 members among all households who have disabilities, most of the members in the overall household have physical disabilities like physically handicapped persons.

Table 12 Typology of disabilities as per Age of HH member

Gender-wise Typology of Disability	Male	Female	Total
Blind	3	0	3
Mental Disability	5	5	10
Physical Disability	7	10	17
Polio	3	2	5
Total			35

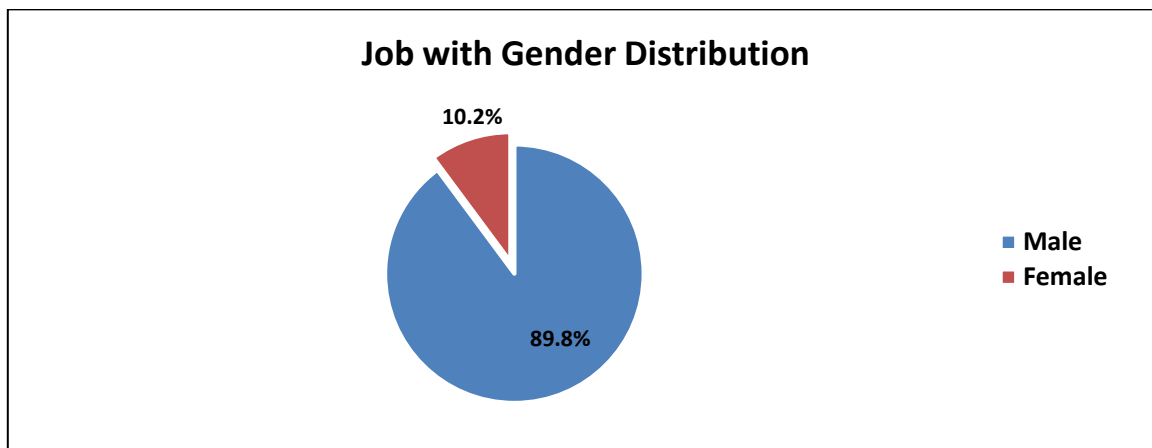
Table 13 Gender-wise distribution of typology of disabilities

5.2.2. Economic Profile

Workforce Population and its Related Details

The total respondents, 76.1 percent reported to be employed and 24.9 percent mentioned that they do not have any means to earn.

Of those employed 89.8 percent are males and a mere 10.2 percent are females. The statistics are contextual and different from national averages. According to the Labour Force Survey (LFS) 2020-21, overall employment to population ratio of Pakistan is 42.1 percent and this ratio is higher in male (64.1 percent) as compared to female (19.4 percent)

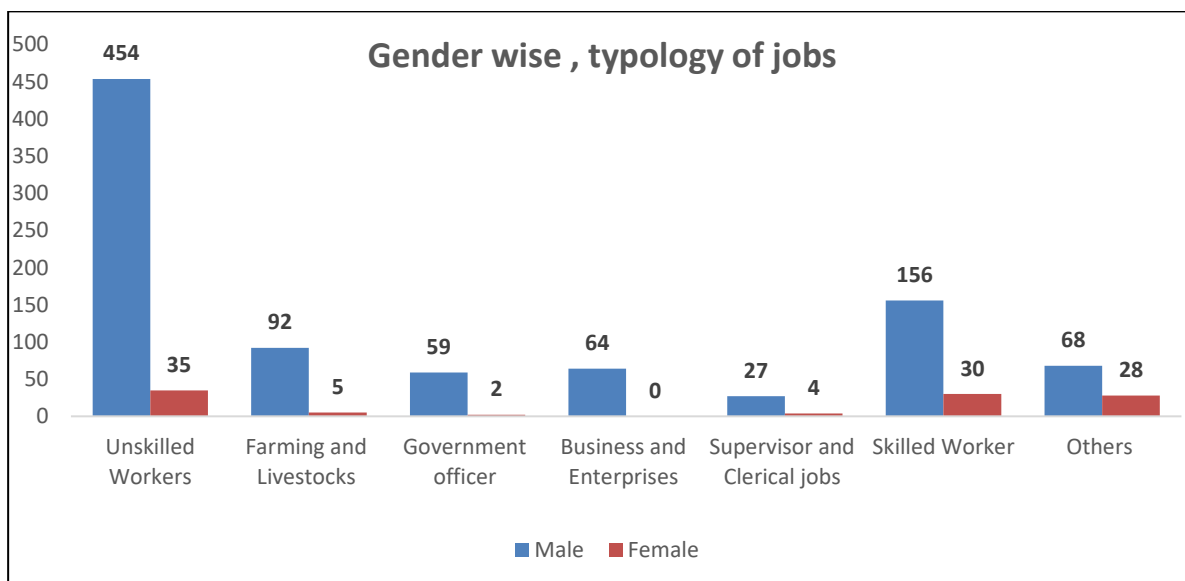


Graph 10 Job with gender distribution

The typology of work is skewed towards unskilled labor force as 47.8 percent mentioned unskilled work as their source of earning. Of those 47.8 percent 93.8 percent are manual laborers and of the 18.6 percent skilled laborer 50.3 percent are drivers. Another 9.5 percent mentioned farming and livestock rearing as the means of livelihood. The variable of livelihood and that of education and migration apparently seems to be associated and any further investigations would be a learning point.

Typology of jobs	Male	Female	Total	Percentage
Unskilled Workers	454	35	489	47.8
Farming and Livestock's	92	5	97	9.5
Government officer	59	2	61	6.0
Business and Enterprises	64	0	64	6.3
Supervisor and Clerical jobs	27	4	31	3.0
Skilled Worker	156	30	186	18.2
Others	68	28	96	9.4
Total	920	104	1024	100.0

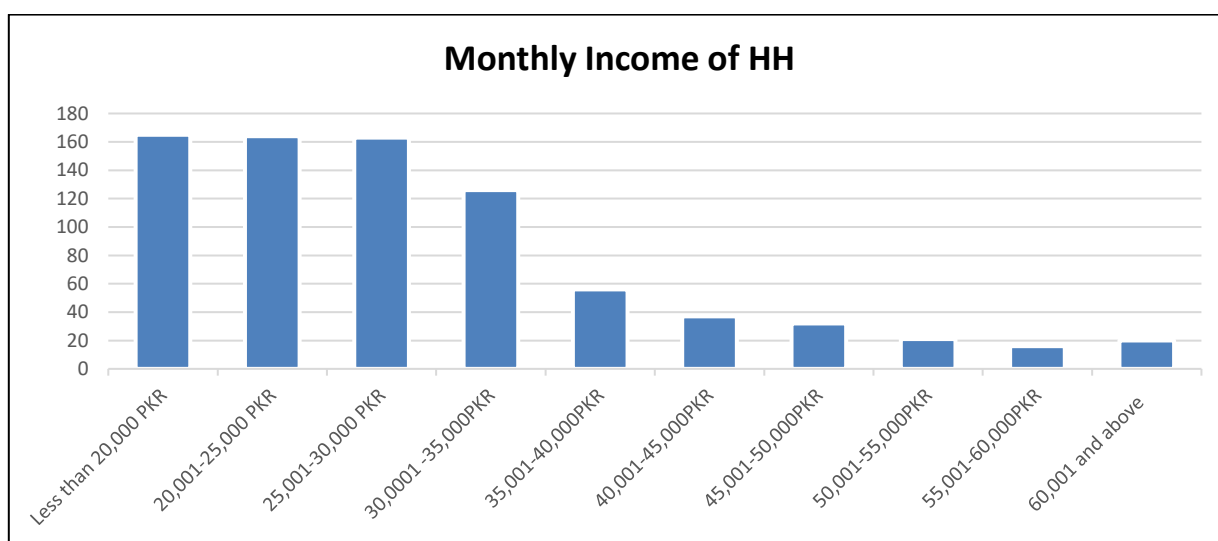
Table 14 Typology of jobs among genders



Graph 11 Typology of Jobs as per gender's distribution

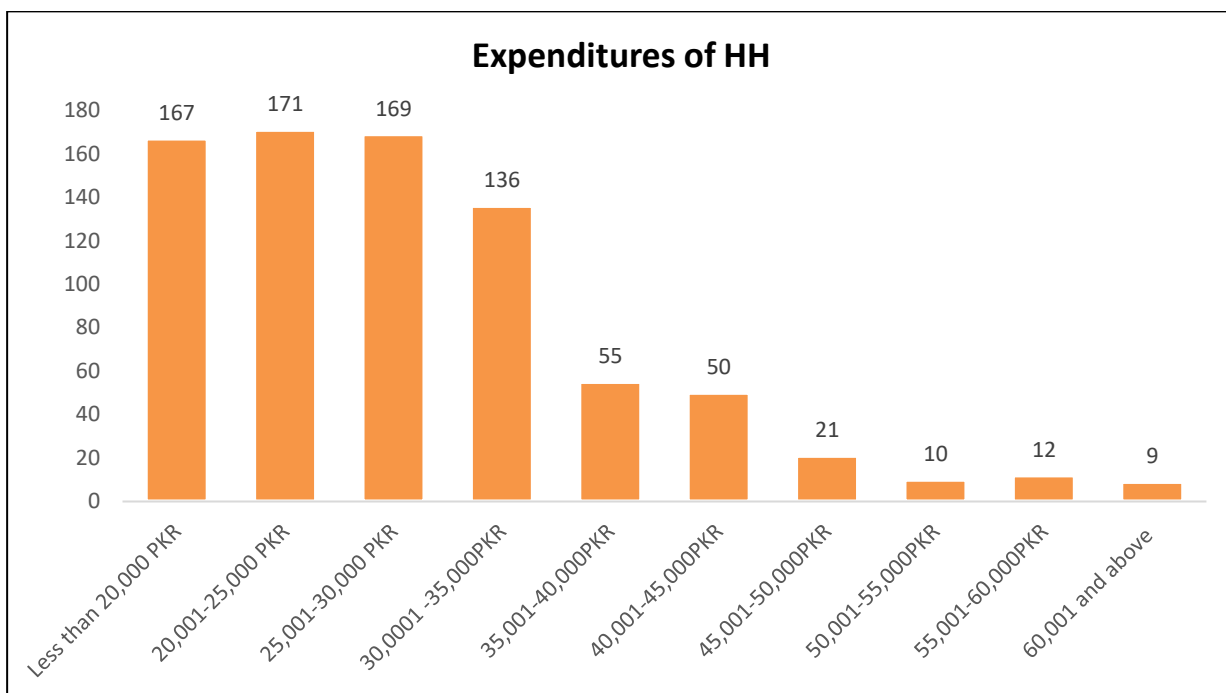
Income and Expenditure

Of the total respondents 61.5 percent mentioned that their house hold income is less than or equal to Rupee 30,000.



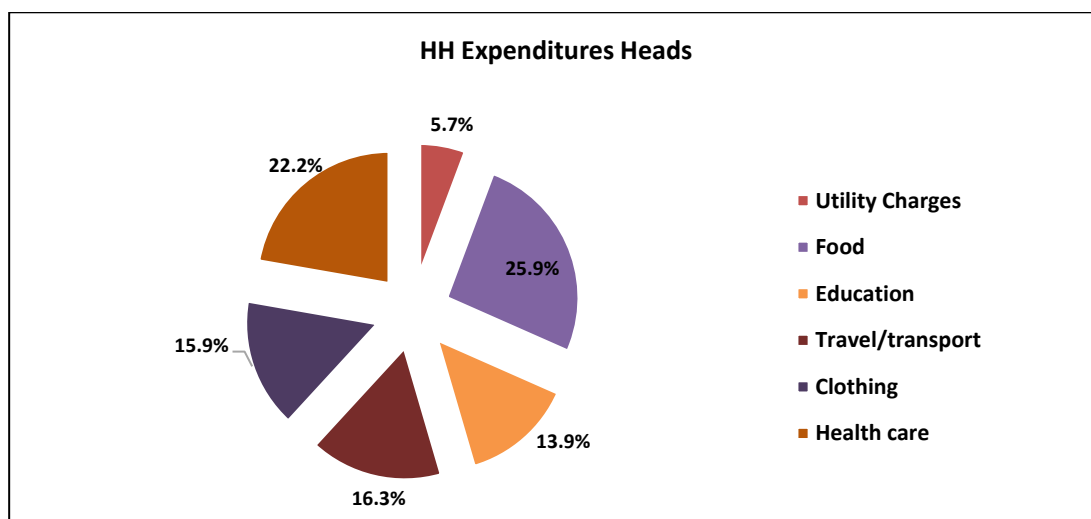
Graph 12 Monthly income of HH

As per the survey the household expenditures varies considerably. A considerable 20.9 percent mentioned less than Rupee 20,000 as their monthly house hold expenditure. Another, 21.4 percent mentioned anywhere between Rupee 20,000 and 25,000 and another 21.1 percent mentioned between Rupee 25,000 and Rupee 30,000. Adding up the above-mentioned percentages, 63.4 percent of the respondents mentioned Rupee 30,000 for less as their household expenditure. It synchronizes with the minimum national per month wage as set by GoP in March 2023: Rs, 32,000.



Graph 13 Expenditure of HH

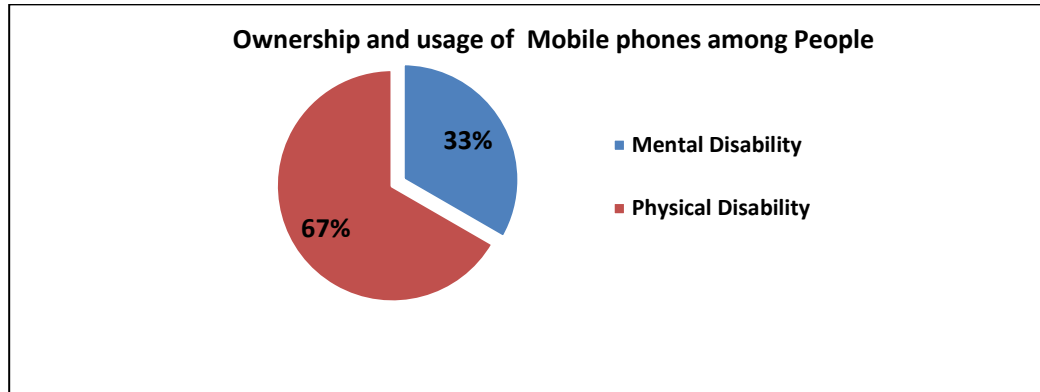
Food occupies the major chunk of the pie as 25.9 percent of the respondents mentioned it as a major expense and the findings about the other expense that would have policy implications is on health care: 22.2 percent. High expenses in both heads beat the traditional concepts of plenty of food and good health, associated with village dwellers. The next big share is of travel and transport: 16.3 percent.



Graph 14 Expenditure Heads of HH

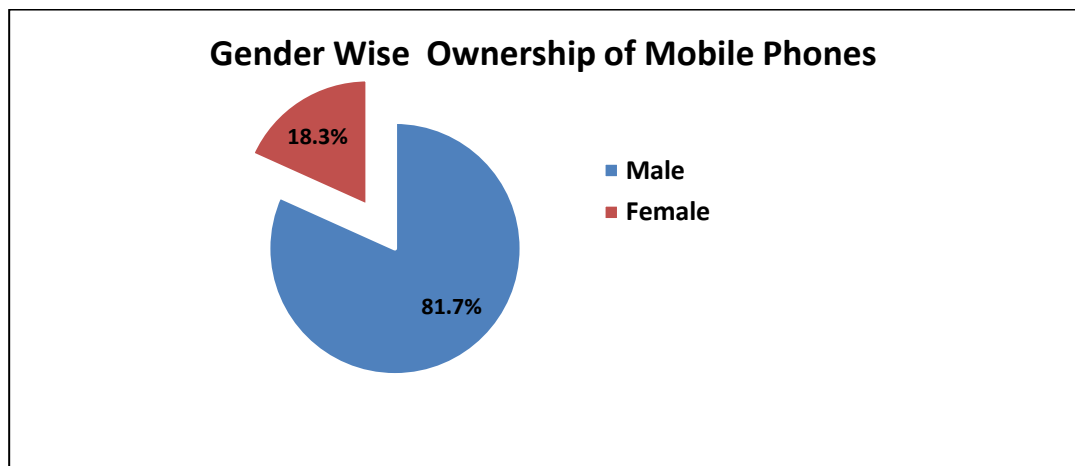
Ownership and use of Mobile Phone

The use and possession of mobile phone often proves to be a good indicator of economic status and of the gender relationship. 76 percent declined to be in possession of any type of mobile phone, though rest 24 percent do have mobile phones.



Graph 15 Ownership and usage of mobile phone

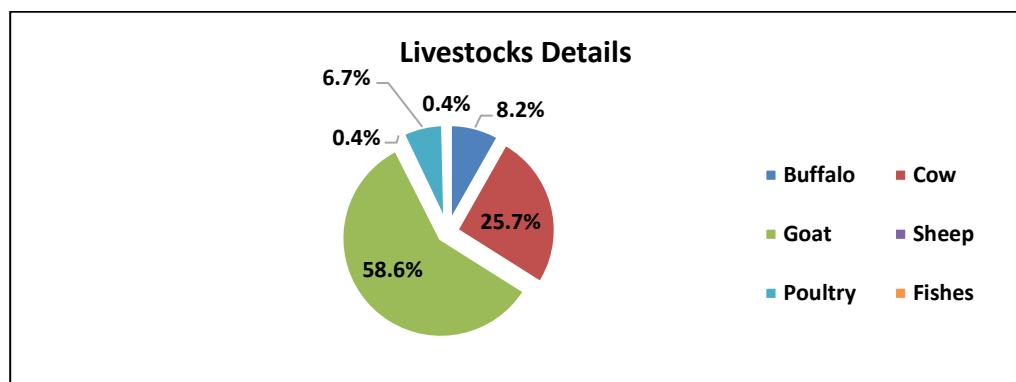
Out of those 24 percent, who possess a mobile, the configuration of use is skewed towards males. Only 18 percent of the females have mobile phones available with them.



Graph 16 Gender-wise ownership of mobile phones

Agriculture and Livestock

25 percent of the household have livestock from the overall surveyed HH. All these livestock is also a part of the household's monthly income. The majority of the households have Goats (58.9%) in their house.



Graph 17 Livestock's Details

5.2.3. Educational Profile

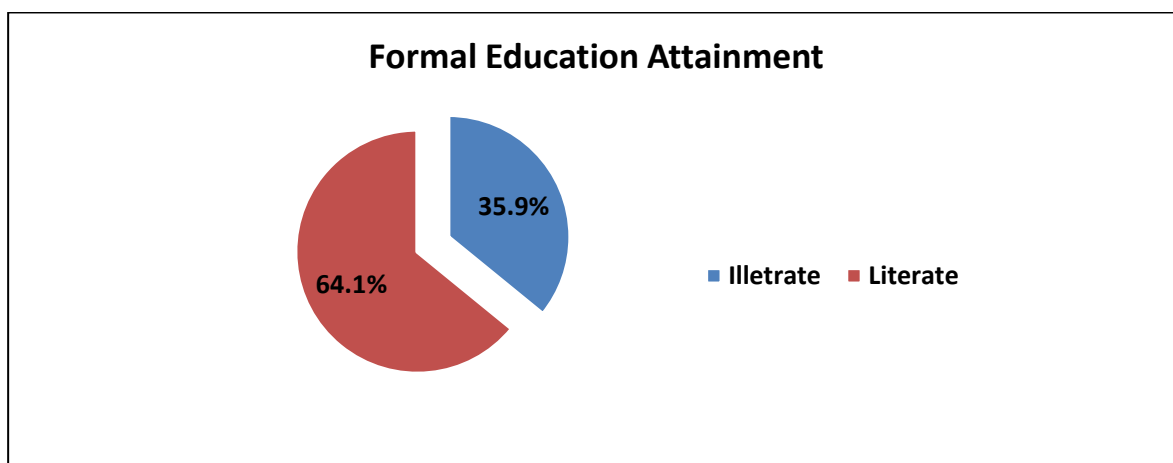
This Survey of 800 Households in the area proved to be quite beneficial to understand the situation of education in the area. The results helped in formulating a general idea of the areas where efforts can be made to improve the situation. More than half of the population is literate but the literacy rate can still not be perceived as high. Dropout rates are also concerning as a large number of people leave their education after primary level. Nonetheless, the focus on education has increased, not exponentially, but the attitude has shifted towards educating the younger generations. However, for some people, the level of education within the area is not entirely satisfactory which leaves them the option to travel outside the area for study purposes. The reasons behind this perception are mentioned in this section which can aid in generating an informed plan for proposing interventions. Also, the most prominent mode of transportation for daily commutes to the schools is motorbikes, which shows that the students either drive to the schools by themselves or some family member accompanies them. This highlights the need to introduce proper and organized commuting services, especially for students.

Literacy Rate

According to the survey results, more than half of the people (64.1%) have received formal education but efforts are still required to ensure that the other 35.9% of the people get access to formal education as well.

Formal Education Attainment	Frequency	Percentage
Illiterate	1477	35.9
Literate	2638	64.1
Total	4115	100.0

Graph 18 Formal Education Attainment



Graph 19 Formal education attainment

181 respondents mentioned that they discontinued their education after primary level due to unconfirmed reasons.

School going Age (5 – 18) dropouts	Frequency
Dropouts	181

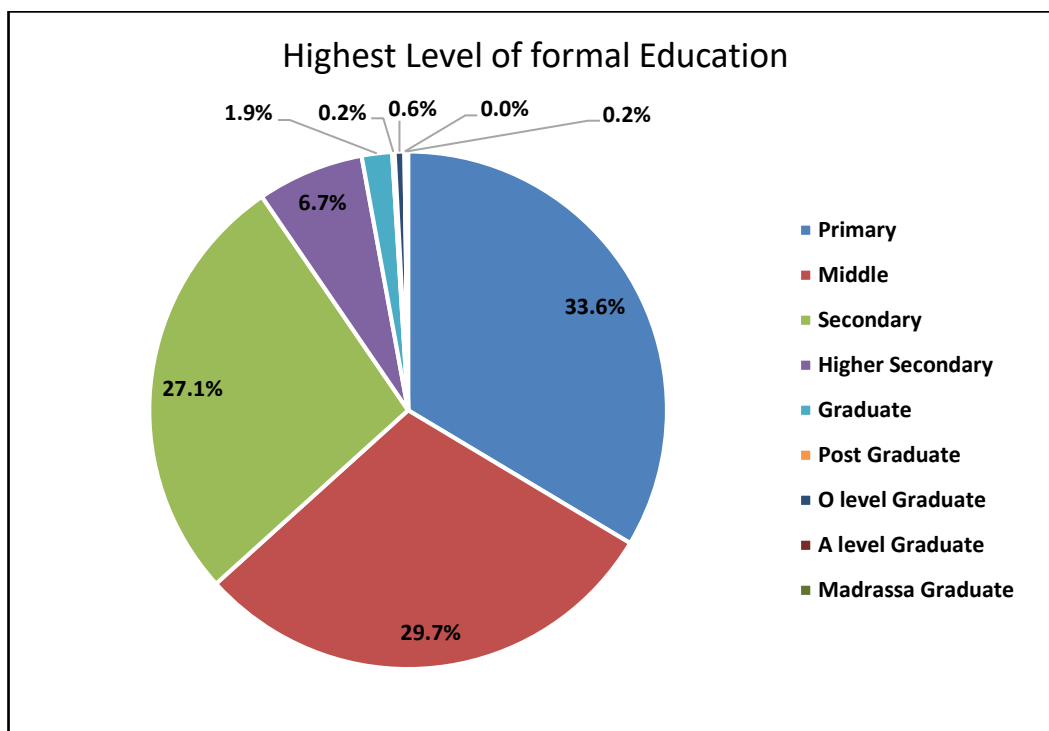
Table 15 School-going age dropouts

Level of Formal Education

Survey data shows that the majority of the population (27.1%) among the literate has only pursued education till matriculation with the highest ratios of primary (33.6%) and secondary level (29.7%). Intermediate is done by a minority of 6.7% whereas graduate and postgraduate degree holders are almost negligible.

Highest Level of formal Education	Frequency	Percentage
Primary	886	33.6
Middle	784	29.7
Secondary	716	27.1
Higher Secondary	176	6.7
Graduate	50	1.9
Post Graduate	4	0.2
O level Graduate	16	0.6
A level Graduate	1	0.0
Madrasa Graduate	5	0.2
Total	2638	100.0

Table 16 Highest level of education attainment



Graph 20 Highest level of formal education

Data on age-wise education level shows that education till matriculation was not completely prioritized earlier in the age group groups 41 and above but with time, the number of people acquiring matriculation-level education increased. This shows that the focus on education has increased in the younger generations.

Age-wise Highest Level of Education	5 - 14 Years	15 - 24 Years	25 - 40 Years	41 - 60 Years	61 and above Years	Grand Total	Percentage
1-4 School class	540	77	94	100	20	831	32.2
5-8 School class	254	227	187	95	18	781	30.3
Matriculation (9- 10 Class)	16	262	313	107	15	713	27.7
O level Graduate		9	5	2		16	0.6
A level Graduate			1			1	0.0
Intermediate		60	84	30	2	176	6.8
Graduate		8	28	12	2	50	1.9
Post Graduate			4			4	0.2

Madrassa Graduate		4	1			5	0.2
Total	810	647	717	346	57	2577	100.0

Table 17 Age wise data on highest level of education of family members

The gap in education level between males and females is not entirely substantial till the primary level. But as the grade increases, a noticeable difference is witnessed in the responses mentioned. However, among the uneducated population, the ratio of women is slightly higher than men.

Gender-wise Level of Education	Male	Female	Grand Total	Percentage
1-4 School class	480	406	886	33.6
5-8 School class	422	362	784	29.7
Matriculation (9- 10 Class)	416	300	716	27.1
O level Graduate	7	9	16	0.6
A level Graduate	0	1	1	0.0
Intermediate	109	67	176	6.7
Graduate	29	21	50	1.9
Post Graduate	2	2	4	0.2
Madrassa Graduate	3	2	5	0.2
Total			2638	100.0

Table 18 Gender wise data on the highest level of education among family members

Gender-wise, School going age dropouts	Male	Female	Grand Total
Drop outs	91	90	181

Table 19 Gender wise data on school going age dropouts' ratio

Prevalence of Religious Education

Prevalence of religious education in the area is moderate as the survey shows 50.4% positive responses. And 49.6% people claimed of not acquiring any sort of religious education.

Religious Education	Frequency	Percentage
Yes	2076	50.4

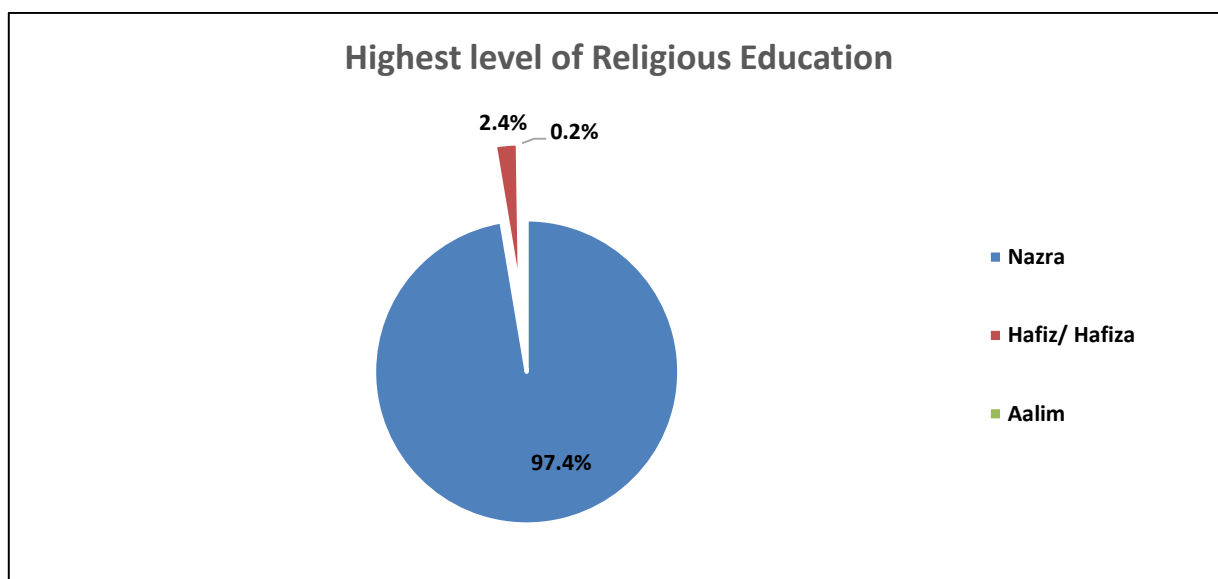
No	2039	49.6
Total	4115	100.0

Table 20 Religious education attainment in family members

And even among those who acquire it, almost all of them (97.4%) only get to the Nazra level with very few hafizs (2.4%) and even fewer aalims (0.2%). This depicts that religious education is not the priority of the locals without any considerable reason mentioned by them.

Highest level of Religious Education	Frequency	Percentage
Nazra	2021	97.4
Hafiz/ Hafiza	50	2.4
Aalim	5	0.2
Total	2076	100.0

Table 21 Highest level of religious education



Graph 21 Highest level of religious education

Female learners are slightly greater than male learners at Nazra level with almost equal ratio of hafiz/hafizas and aalims.

Gender wise level of religious education	Male	Female	Total	Percentage
Nazra	975	1046	2021	97.4
Hafiz	23	27	50	2.4

Aalim	3	2	5	0.2
Total			2076	100

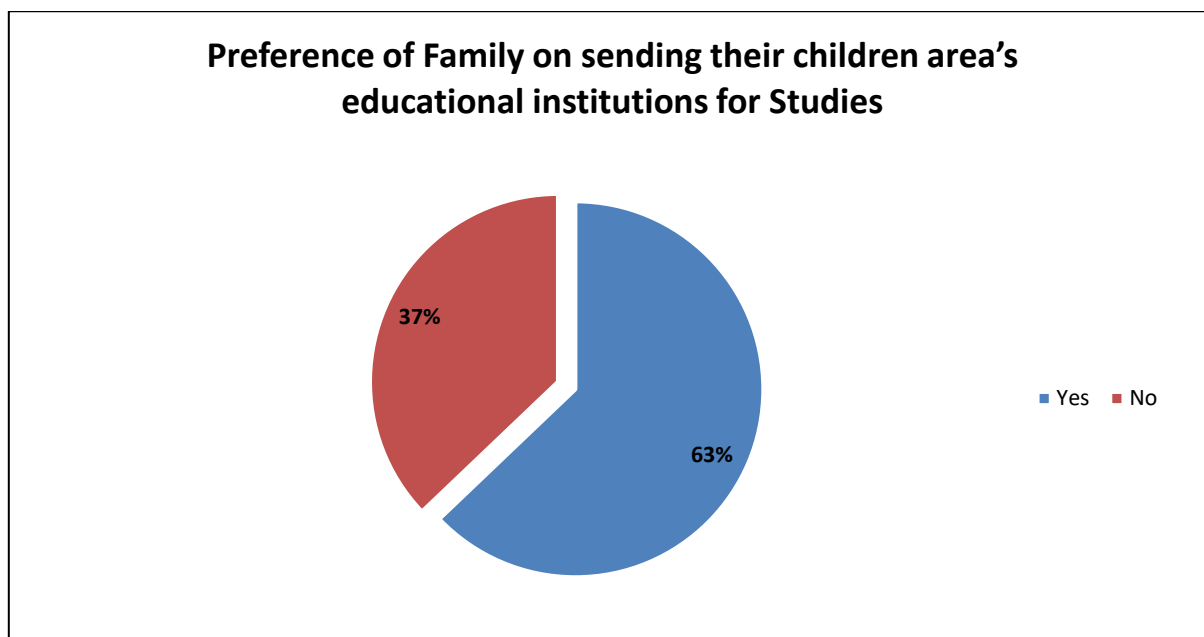
Table 22 Gender wise, highest level of education

Provision of Educational Institutions in the Area

According to the survey, majority of the locals (63%) prefer going to educational institutions within the area. However, 37% of the locals, which also makes up a large number, do not go to institutions located in the area.

Preference of Family on sending their children area's educational institutions for Studies	Frequency	Percentage
Yes	503	63
No	297	37
Total	800	100

Table 23 Preference of family on sending their children area's educational institutions for studies



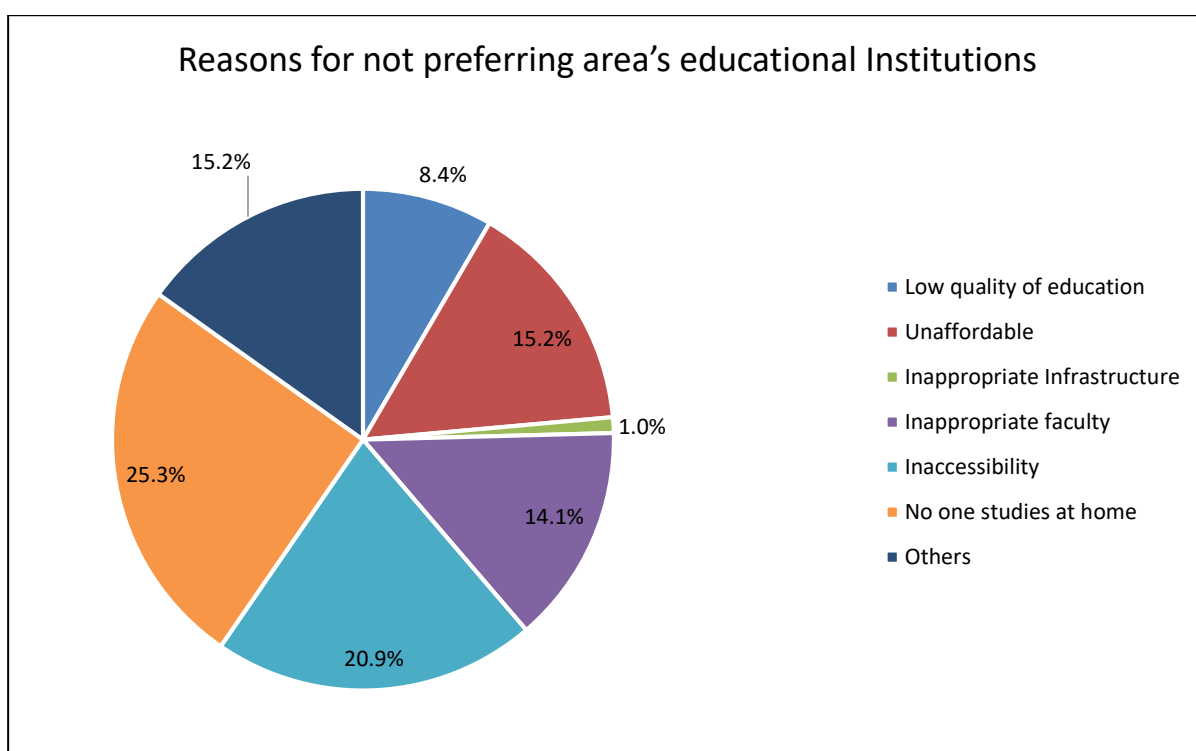
Graph 22 Preference of family on sending their children area's educational institutions for studies

A variety of reasons were mentioned by the respondents for not choosing area institutes. Other prominent reasons except largely given reasons of lack of accessibility (20.9%) and that there is no focus on education within the family (25.3%) are unaffordability (15.2%), inappropriate faculty (14.1%) and low level of education (8.4%). Very few responses (1.0%) were related to poor infrastructure of the buildings.

Reasons for not preferring area's educational Institutions	Frequency	Percentage
--	-----------	------------

Low quality of education	25	8.4
Unaffordable	45	15.2
Inappropriate Infrastructure	3	1.0
Inappropriate faculty	42	14.1
Inaccessibility	62	20.9
No one studies at home	75	25.3
Others	45	15.2
Total	297	100.0

Table 24 Reasons for not preferring areas of educational institutions



Graph 23 Reasons for not preferring area's educational institutions

15.2% of the respondents chose the 'others' option for not attending institutes within the area. When asked further clarification, the factors pointed out were unavailability of school by a majority of 29 respondents. 2 responses worth mentioning were the unavailability of English medium schools in the area.

18% of the respondents mentioned that their family member/s travel outside the area for educational purposes.

A significant portion of students who travel outside their local area are school-going students (61%). Some college-going (17%) and madrasa students (16%) also prefer studying from institutes outside the area while very few (3%) university students show their preference of out-of-area universities.

Enrollment in Educational Institutions located outside the area	Frequency	Percentage
School	114	61
College	32	17
University	5	3
Madarsa	29	16
Any other	6	3
Multiple Selection	186	100

Table 25 Enrollment in educational institutions located outside the area

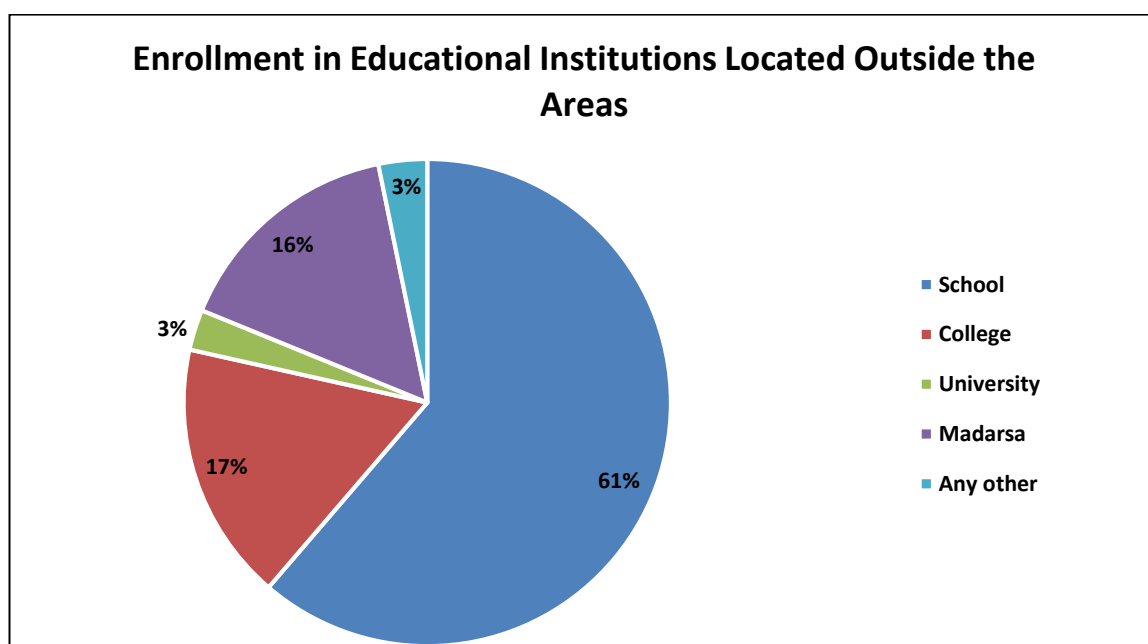


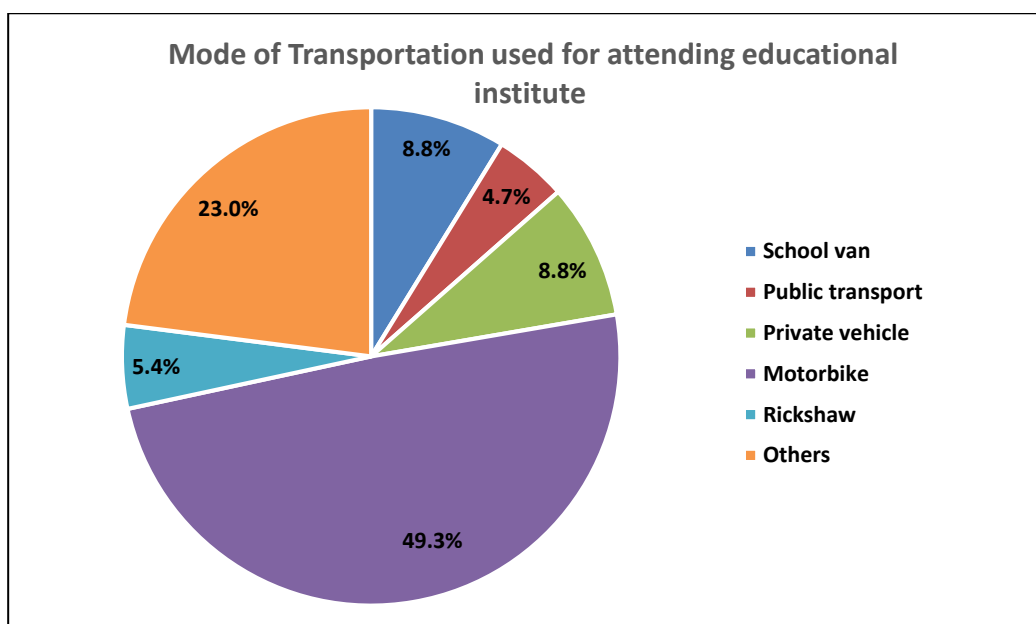
Table 26 Enrollment in educational institutional located outside the areas

3.3.5 Mode of Transportation for School

The primary mode of commute to the schools is motorbike with 49.3% of the people using it. Private vehicle, school van, public transport and rickshaw are other options of transport used by comparatively fewer people for daily commute to schools.

Mode of Transportation used for attending educational institute	Frequency	Percentage
School van	13	8.8
Public transport	7	4.7
Private vehicle	13	8.8
Motorbike	73	49.3
Rickshaw	8	5.4
Others	34	23.0
Total	148	100.0

Table 27 Modes of transportation used for attending educational institutes



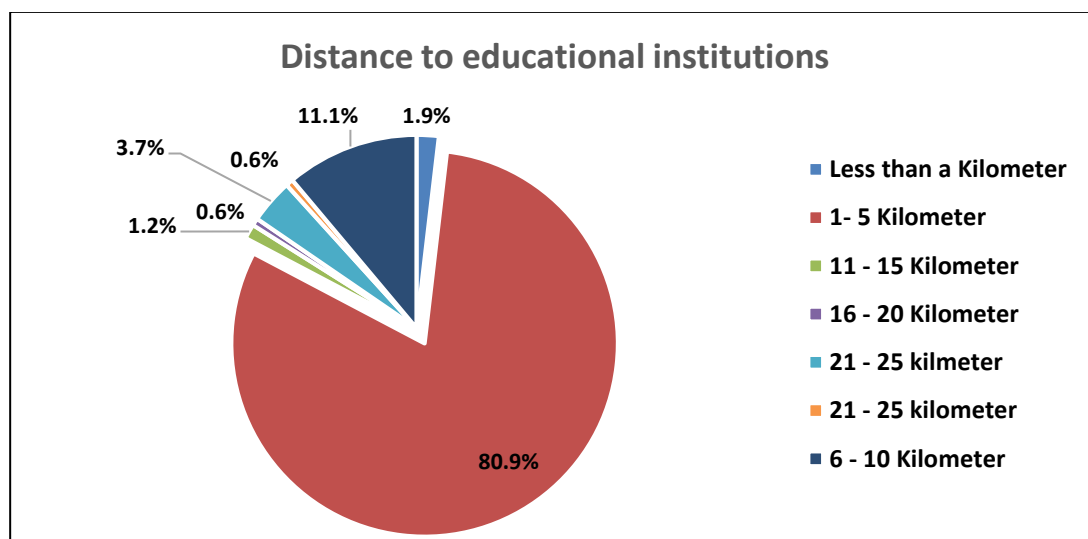
Graph 24 Modes of transportation used for attending educational institutes

Proximity to Institutions

While the survey showed diverse responses with only 1.9% of the total respondents travelling less than a kilometer, 1.2% have a daily commute of 11-15km, 0.6% with 16-20km distance travel, a large part of the population i.e. 80.9% travel at a distance of 1-5 km away from their place of living. 11.1% of the students travel about 6-10km to their educational institute.

Distance to educational institutions	Frequency	Percentage
Less than a Kilometer	3	1.9
1- 5 Kilometer	131	80.9
11 - 15 Kilometer	2	1.2
16 - 20 Kilometer	1	0.6
21 - 25 kilometer	6	3.7
21 - 25 kilometer	1	0.6
6 - 10 Kilometer	18	11.1
Total	162	100.0

Table 28 Distance to educational institutions



Graph 25 Distance to educational institutions

Chapter 6 ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION

Assessing and mitigating the environmental impacts of various projects and activities is crucial for sustainable development and the protection of ecosystems. The specific anticipated environmental impacts and the appropriate mitigation measures will depend on the nature of the project or activity. Here's a general framework for understanding and addressing anticipated environmental impacts and mitigation measures:

Mitigation measures have been proposed to reduce, minimize or compensate for the identified potential negative impacts and their adoption has been recommended.

This assessment identifies potential environmental impacts and their significance. The following are some common environmental impacts:

Habitat Destruction: Construction or development can lead to the destruction of natural habitats for wildlife and plant species.

Air Quality: Emissions from industrial processes, transportation, or energy production can contribute to air pollution and impact human and ecosystem health.

Water Pollution: Runoff from construction sites or industrial facilities can contaminate water bodies with chemicals and sediment.

Noise Pollution: Construction and industrial activities can disrupt local communities and wildlife.

Climate Change: The release of greenhouse gases can contribute to climate change, affecting ecosystems and weather patterns.

Resource Depletion: Extraction of natural resources, such as minerals and timber, can deplete finite resources.

Mitigation Measures: Once the potential environmental impacts are identified, mitigation measures can be designed and implemented. Common mitigation strategies include:

- a. **Habitat Restoration:** If natural habitats are impacted, measures like habitat restoration, reforestation, or the creation of new habitats can help offset the damage.
- b. **Emission Control:** Implement technologies and practices to reduce emissions of air pollutants, such as using cleaner energy sources or installing pollution control devices.
- c. **Stormwater Management:** Implement systems for managing stormwater runoff to prevent soil erosion and water pollution.
- d. **Noise Barriers:** Erect barriers or employ construction techniques to reduce noise pollution.
- e. **Renewable Energy:** Transition to renewable energy sources to reduce carbon emissions and combat climate change.
- f. **Resource Efficiency:** Implement measures to reduce resource consumption, recycle materials, and promote sustainability.

1. **Monitoring and Compliance:** After mitigation measures are put in place, ongoing monitoring and compliance are essential. This ensures that the environmental impacts are mitigated effectively, and adjustments can be made if necessary.
2. **Public and Stakeholder Engagement:** Engaging with the public and stakeholders is vital to gather input, address concerns, and foster transparency in the decision-making process.
3. **Regulatory Compliance:** Ensure that the project or activity complies with local, regional, and national environmental regulations and standards.
4. **Environmental Impact Reporting:** Periodic reports should be generated to assess the effectiveness of mitigation measures and address any emerging issues.

It's important to note that the specific mitigation measures and the extent of mitigation required will vary based on the project's scale, location, and environmental context. Additionally, various countries and regions have their own regulations and guidelines for conducting EIAs and implementing mitigation strategies. Consulting with environmental experts, regulatory agencies, and local communities is critical in the process of identifying and addressing anticipated environmental impacts.

6.1. Impact Assessment Methodology

- Potential environmental impacts of the proposed Project on different features of micro and macro-environment pertain to construction and operation phase.

The screening process proceeds by identifying the potential environmental aspects of siting the project, identifying the potential environmental impacts at pre-construction, construction and operational stages of the project and identifying the residual impacts after adoption of mitigation measures that may be needed at the outset of activities. The impacts on environmental resources from the proposed project will be short-term and temporary in nature.

A systematic strategy was developed to provide an assessment of the likely impacts on the micro and macro-environment of the Project site. The strategy included:

- Review of General Guidelines;
- Identification of potential environmental impacts by conducting survey, public consultation;
- Assessment of the intensity and significance of potential impacts by obtaining expert opinion and carrying out environment analysis;
- Defining mitigation measures to reduce impacts to as low as practicable;

Guidelines and checklists were used for the verification of permissible levels of environmental parameters during project operation and classification of the site with respect to its pollution status, soil, and ecology.

The environmental aspects of the project were identified by situation analysis related to present land use, damage to vegetation, noise and other forms of nuisance during construction at site, air pollution due to fugitive dust emission and operation of equipment during construction, air pollution due to burning of wastes.

6.2. Assessment of impacts at the construction and operation stages of the Project

6.2.1. Land Disturbance

Land disturbance due to construction is a common and often significant environmental impact associated with construction projects. Land disturbance can have various adverse effects on the environment, including habitat destruction, soil erosion, water pollution, and disruption of local ecosystems.

To mitigate these impacts, there are several strategies and best practices that construction projects can implement:

6.2.2. Erosion and sediment control

- Install erosion control measures: Implement sediment basins, silt fences, and erosion control blankets to prevent soil erosion and sediment runoff.
- Properly manage stormwater: Implement stormwater management systems to control and treat runoff from construction sites, preventing pollutants from entering water bodies.

6.2.3. Management of contaminated storm water

- Managing contaminated storm water resulting from construction activities is essential to prevent environmental pollution and protect water quality. Construction sites can generate a variety of pollutants, including sediment, chemicals, heavy metals, and oils, which can be carried by storm water runoff into nearby water bodies.
- Maintain detailed records of storm water management activities, including inspections, monitoring results, and any corrective actions taken.

6.2.4. De-watering work sites

Dewatering at construction sites involves the removal of excess water from the site to create a safe and dry working environment. This process is commonly necessary for various construction activities, particularly when the water table is high, and it can help prevent flooding, maintain stability, and facilitate construction work.

6.2.5. Dust control

Dust control is a crucial aspect of construction to minimize the environmental and health impacts associated with airborne dust particles. Construction sites often generate significant amounts of dust, which can be harmful to workers, nearby communities, and the environment. Implementing effective dust control measures is essential to mitigate these impacts

6.2.6. Excavation

The provision of foundation will require excavation below ground level. Once removed, the void space is likely to impact the integrity of the soil in the surrounding. To maintain the stability of excavation and to protect foundations of adjacent structures, retention measures such as bracing or shoring can be used to retain the soil during the construction of basement. It is essential to keep the excavation dry and excavation should be performed during dry season. It is imperative that system should have adequate water proofing to make sure moisture doesn't ingress into the retention system and basement.

Mitigation Measure

- Fencing and obscuring the construction site to reduce the perception impact was undertaken.
- During the construction of basement, it would be advisable to monitor the excavation cuts and if found necessary, shoring/bracing may be employed. It must be ensured that the excavation is done in dry season.
- The neighborhood will be notified with adequate signage at the very start of the project. Site will be appropriately covered all around to contain the fugitive dust emission within the microenvironment. The impact of the activity will be continuously monitored by IMC since it is apprehended that the residents in the immediate neighborhood are likely to be exposed to dust fall hazards.

6.2.7. Construction Waste

Typical solid waste generated during construction includes wasted concrete, steel and wooden scaffolding, cement bags, excavated soil, wood remains etc. It is envisaged that the quantum of earth fill material will be enormous since excavation will be deeper down. The waste generated has the potential to cause adverse impact on the surroundings if not properly managed and disposed to approved dumpsites by approved waste contractors. The excavated waste has the potential to block nearby drainage channels that could ultimately cause localized flooding, particularly during the monsoon season. Irregular storage of this waste may pose health hazards to the workers at site and more so to the school going children and residents in the neighborhood.

The following measures have been recommended for management of the excavation procedure and disposal of construction wastes:

Mitigation Measure

- Site will be properly cordoned off by placing curtains all around.
- Unusable wastes will be transported to approved dumpsites.
- Excavated soil will be disposed of through the regular channel of the approved disposal contractor.
- Proper solid waste containers of adequate capacity will be provided to cater to daily waste generation.

6.2.8. Topography and Geology

The Project is not likely to impose additional stress on topographical parameters and hence no significant impacts are envisaged. The siting of the project demands careful planning and evaluation of load bearing capacity of the soil to ensure the stability of the proposed structure. In view of the project stability requirements requirement, piling has been proposed. As such the stability of the project is ensured and is not likely to impose additional stress on the sub-soil structure and hence no significant impacts are envisaged.

6.3. NOISE AND VIBRATION

Depending on the construction equipment used and its distance from the receptors, the commuters and residents in the neighborhood may be exposed to intermittent and variable noise levels. During the day such noise results in general annoyance and can interfere with sleep during the night.

In general, human sound perception is such that a change in sound level of 3 dB is clearly noticeable, and a change of 10 dB is perceived as a doubling or halving of sound level. The noise in the project area will increase during construction and completion of the proposed project and may result in disturbance to the nearby receptors unless it is contained within the appropriately fenced and covered site of the Project.

Baseline noise measurements were obtained through continuous monitoring for a 24-hour period at the project site. It was found from the noise monitoring that the typical average noise level in the project area was >70 dB (A). The

Sindh Environmental Quality Standards for noise require that the sound level in residential and commercial areas should not exceed 55 dB (A) and 65 dB (A) respectively during day time and 45 dB (A) and 55 dB (A) respectively during the night time.

Mitigation Measures

- Restraining the use of noisy equipment to suit to the conditions of the living environment namely 65 dB (A) during the day and 55 dB (A) during the night.
- Reducing equipment noise at source by proper design, regular maintenance & repair of construction machinery and equipment.
- Minimizing noise from vehicles and back-up power generators by use of proper silencers and mufflers.
- Use noise-abating devices wherever needed and practicable.

Vibration

Vibration during construction can result from various activities, including heavy equipment operation, pile driving, blasting, and other construction processes. These vibrations can have both short-term and long-term effects, potentially leading to structural damage, discomfort for residents, and environmental impacts.

- Implement a vibration monitoring program to continuously measure and record vibration levels. Monitoring helps ensure compliance with regulatory limits and provides data for adjusting construction methods.
- Use vibration isolation techniques for sensitive equipment or structures, such as isolating equipment foundations from the ground to reduce vibration transmission.
- Use vibration barriers or walls to contain vibrations and protect sensitive areas.
- In cases where construction-induced vibrations could potentially damage nearby structures, consider reinforcing or retrofitting those structures to mitigate damage.

6.4. Solid Waste Generation and Management

- **Construction Phase:** The construction phase of the project is expected to generate wastes including; packing waste; scrap, excess construction materials and debris, domestic wastes from construction camp, empty containers and drums, used lubricating oils and chemicals etc.
- The impact of solid waste disposal would be significant if the waste management is not carried out appropriately. This may adversely affect the health of workers, cause soil pollution, and deteriorate the quality of surface water and groundwater. Also, if excessive wastes are generated, recyclable wastes are not recycled, wastes are scattered, handling of wastes will result in contamination, and wastes are improperly disposed of, the result would be serious degradation of the environment.
- Waste generated as a result of construction activity will be inherently less reactive and chemically inert under normal conditions however, its handling and storage may pose adverse impacts of minor nature which could be controlled by employing the recommended mitigation measures in the EMP.

Mitigation Measures

- A waste management plan will be developed for the construction stage of the project. The following will be the key elements of the waste management system:
 - Separate bins will be placed for different type of wastes - plastic, paper, metal, glass, wood, and cotton.

- Recyclable material will be separated at source. The recyclable waste will be sold to EPA certified waste contractors for recycling.
- Non-hazardous non-recyclable wastes such as kitchen wastes will be disposed of in landfill site managed by municipal administration or approved waste manager/contractor.
- No wastes will be dumped at any location outside the site boundary.
- All hazardous waste will be separated from other wastes. Hazardous wastes will be stored in designated areas with restricted access and proper marking. Hazardous wastes will be disposed of through approved waste manager/contractor.
- Surplus construction materials including partially filled chemical and paint containers will be returned to suppliers. Inert construction wastes will be disposed of onsite as fill material or sold as scrap to contractors.
- Records of all waste generated during the construction period will be maintained. Quantities of waste disposed, recycled, or reused will be logged on a Waste Tracking Register.
- Training will be provided to personnel for identification, segregation, and management of waste.
- **Operation Phase:** The solid waste will mainly include food waste, paper and packaging material, plastic bottles and glass.
- If not properly managed and disposed of this can pose serious environmental threat of pollution not only to the residents and visitors to the complex but also to the surrounding settlements.
- Solid waste management however remains an unresolved problem in Karachi. Several options have been proposed and also implemented but none of them could resolve the problem. The solution perhaps lies now in the attempts that the Sindh Solid Waste Management Board has launched on. The SSWMB has taken a holistic view of the situation and has integrated a number of options that may at least partly alleviate the heavy impact which Karachi is faced with.

Mitigation Measures

- The following measures would reduce the negative impacts of solid waste disposal:
 - The solid waste shall be collected through garbage chute at dedicated site.
 - All solid waste shall be segregated into organic and recyclable waste at source and then collected, stored, and transported for ultimate safe disposal.
 - Handling & disposal of solid waste shall be managed by a dedicated waste management contractor.
 - The solid waste management plan developed will be implemented and facilities for collection, storage and transportation will be established and organized.

6.5. Wastewater Generation & Disposal

Construction Phase: Disposal of domestic effluent from the construction site has to be adequately managed so that the wastewater flows into the regular channel and does not contaminate the soil and groundwater of the site or its surrounding.

Mitigation Measures

The following mitigation measures will be adopted during stages of construction:

- Wastewater generated will be routed to the nearest drain / sewerage system.
- Sewage will not be mixed with any other waste.

Operation Phase: Small quantities of hazardous wastewater may be produced during the maintenance activities in the building (such as oily water etc.). The source of wastewater will include toilets, washrooms, laundry and kitchen.

This wastewater would comply with the SEQS values provided that other hazardous wastes (i.e., paints etc.) are not mixed with it. The discharges from kitchen, canteen and other sources will be provided grease traps to separate the oily waste that will be disposed of responsibly through EPA approved contractor.

Mitigation Measures

Following mitigation measures will be adopted for effective management of wastewater during the operation stage of project:

- Waste water will be treated at source and the grey water will be separated from black and recycled into a separate channel for use in the washrooms. This is expected to substantially reduce the water footprint. The final discharge would be routed to the existing municipal drain/sewerage system.
- Waste segregation measures would be employed to minimize entry of solid waste into the wastewater stream.
- Water conservation strategies will be employed to avoid wastage of water.

6.6. Ambient Air Quality

The major source of air pollution during the construction phase may have been dust emission due to earth works and gaseous emissions from construction equipment. The major source of air pollution during the operation phase when the Project is functional will be the pollutant emissions from the stand-by generators.

Impacts from each source and proposed mitigation measures are likely to be as follows:

Dust Emission: Particulate matter emitted during construction activities results in deterioration of ambient air quality in the vicinity of the source and is usually a nuisance to the neighborhood and the communities in the neighborhood besides the construction workers. Dust emission from construction site is a concern particularly if the site is near residential areas. The main health hazards emanate from particles smaller than 10 microns (PM_{10}) in particular $PM_{2.5}$ as they are respiration able. These particles are sufficiently charged to assume the properties of aerosols which on reaching the receptors have heavy impact on the respiratory system and on the surface of furnishings of the living environment. The impact on the environment would be considered significant if there is an increase in suspended particulate matter within and beyond the boundaries of the project site due to activities at the site, or if the dust affects local property or results in complaints from the community.

- Potential sources of particulate matter emission during construction activities include earthworks (dirt or debris pushing and grading), exposed surfaces/storage piles, truck dumping, hauling, vehicle movement on unpaved roads, and concrete batch mixing. The quantity of dust that is generated on a particular day depends on the magnitude and nature of activity and the atmospheric conditions prevailing on the day. Availability of Ready-mix on commercial scale has considerably reduced the level of emission of fugitive and construction sites are no longer required to have a batching plant.

Mitigation Measure

The following mitigation measures have been recommended:

- Water sprinkling and monitoring to ensure adequate suppression of dust will be a regular activity as long as the excavation activity lasts.
- Dust emission from soil piles and aggregate storage stockpiles will have to be reduced by appropriate measures like keeping the material moist by sprinkling of water at appropriate frequency and regularly monitored by IMC.

Availability & use of ready-mix on commercial scale will considerably reduce the level of emission of fugitive at the project site.

- Construction materials that are fragile and vulnerable to raising visible dust will be transported only in securely covered trucks to prevent dust emission during transportation.
- The exposure of construction workers to dust needs to be minimized by provision of dust masks and mandating the workers to wear them.

Vehicle and Equipment Exhaust: Combustion exhaust from vehicles and construction equipment can affect the ambient air quality of the site surroundings. The impact would be potentially significant when the ambient air quality deteriorates due to emissions from construction equipment and machinery or the construction generators etc. beyond the guidelines especially at the environmental receptors in the neighborhood. The exhaust emissions will include particulate matter, hydrocarbons, oxides of nitrogen, sulphur, and carbon.

Mitigation Measure

- All vehicles, generators and other equipment used during the construction will be properly tuned and maintained in good working condition in order to minimize emission of pollutants.
- The stack height of the generators during operation phase will be vented through vertical stacks to minimize exposure at ground level.
- The noise and air emission from the Project as a whole will be contained within its microenvironment by measures engrained in the design of the building. The mechanical area will be provided with noise abatement devices. Generators emissions will be controlled to acceptable levels by segregating their locations and timely maintenance.
- In order to compensate for the increase and footprint of carbon and water vapor it would be desirable for proponent of project to undertake plantation of large number of trees with dense canopy at the nearest public park/green belt in consultation with the Independent Monitoring Consultant (IMC).

6.7. Ecological Environment

Protecting the ecological environment on a construction site is essential to minimize the impact of construction activities on local ecosystems and wildlife. Construction projects often disturb natural habitats and can introduce pollutants and disrupt local biodiversity.

Here are some strategies and practices to consider when aiming to protect the ecological environment during construction:

- Avoid construction in ecologically sensitive areas such as wetlands, wildlife habitats, and areas with endangered or threatened species.
- Establish protective buffer zones around sensitive areas to prevent disturbance.
- If natural habitats are impacted, undertake habitat restoration and enhancement efforts to offset the damage.
- Plant native vegetation to restore ecosystems and create wildlife corridors.
- Design the project to minimize land disturbance, reducing the area of affected habitats.
- Use techniques like phased construction to limit the construction footprint
- Implement sediment and erosion control measures to prevent soil erosion and protect nearby water bodies.
- Use silt fences, sediment basins, and erosion control blankets.

- Develop a plan for the protection of wildlife during construction, which may include fencing, signage, and safe passage options.
- Avoid activities that could disturb nesting birds or breeding wildlife during their sensitive periods.
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Protecting the ecological environment during construction requires a combination of proactive planning, effective mitigation measures, and ongoing monitoring. Collaboration with environmental experts, regulatory agencies, and local communities is often necessary to ensure the responsible and sustainable completion of construction projects.

6.8. Socio-economic Environment

- Health, Safety and Environment are major components of the Environmental Management Plan (EMP) of which monitoring of the environmental performance is an integral part. The proponent has to ensure strict adherence to the measures and guidelines stated in the EMP and the contractor must be made to follow the Standard Operating Procedures (SOPs) for construction activities.
- It is not unusual to observe that construction workers are left on their own to protect themselves from imminent hazards. Accidents usually occur at unprotected sites and are incident on unprotected workers. HSE considerations require that precautions must be taken against even the most insignificant impacts.
- Major social concerns during the construction stage arise when: i) the stakeholders are not informed about the project or its schedule of operations; ii) the site is not appropriately cordoned off to restrain outsiders from entering the site; iii) construction crew invariably ignores or sidetracks the mandatory requirement of wearing PPEs; iv) construction crew is not pre-trained to be aware of the likely hazards during various stages of the project; v) even if they are trained on awareness and provided the PPEs the lukewarm attitude of the supervisors does not oversee the follow-up of HSE procedures/SOPs.
- Safety risk assumes substantial proportion in densified areas of urban centers. Under the circumstances there is need for strict compliance with the HSE procedures and accidents incident on non-observation of HSE procedures must be keenly monitored and recorded to ensure the safety of both workers and citizens. For this purpose, the contractor will be required to maintain a record of procedures on Health, Safety and Environmental Management Plan and Standards Operating.

Procedures in addition to the following:

- Provide alternative traffic arrangement/detours, if necessary, so that traffic can be distributed and move on different roads; and, ensure that public/residents association is informed about such traffic diversions;

- Provide information to the public through media – daily newspapers and local cable television (TV) services about the need and schedule of work, and alternative routes;
- Maintain transparency of the project, public information/caution boards must be provided at the work site – information shall inter-alia include: project name, cost and schedule; executing agency and contractor details; nature and schedule of work; traffic diversion details, if any; entry restriction information; competent official's name and contact information for public complaints.
- Restraining access to the public from the site by enclosing/barricading the construction area; providing warning boards and sign boards and positioning security guards throughout the day and night, 07/24;
- Ensuring provision of PPEs (helmet, hand gloves, boots, masks, safety hoists when working at height, etc.) and making sure that all workers do wear them;
- List the code of conduct and standard operating procedures (SOPs) to be followed during different stages of construction;
- Employ an Environmental, Health and Safety (EHS) expert on site;
- Provide on-site Health and Safety Training for all site personnel;
- Report accidents to the authorities promptly, and maintain records on regular basis
- Temporary inconveniences due to construction works will be minimized through planning and coordination with community members and organizations e.g., Traffic Management Authorities.
- Maintain the service roads in good condition to allow smooth traffic movement; provide necessary personnel to guide and control the traffic.
- The proposed Project will create employment during its construction and operation phase. The Project will create employment opportunities after completion. This also includes staff directly involved in the operation and management of the facilities that include the project management, the staff engaged by the residential flat owners, shop owners, domestic servants, security personnel, and drivers.
- Most of the workforce will consist of local people. The generation of employment is likely to be a major positive impact arising from the proposed development.
- The Table presented below illustrates an analysis of the socioeconomic impacts on the two domains of socioeconomic environment viz. macro-environment and microenvironment. It may be seen from the Table that both domains have impact that are positive. The Project would promote economic uplift and raise the status of the commercial enterprises and social status as well as lifestyle of the community resident in the microenvironment of project area. Creation of jobs and promotion of business and commercial activities is an additional feature of the proposed project.

Table 5.1: Nature and Degree of Positive Socioeconomic Impacts

Nature of positive impact	Degree of impact	Description
I. Construction Phase:		
Job opportunity	Positive Impact	Generate unskilled, semi-skilled and skilled jobs as construction laborers and other service providers.
Wider economic impact	Positive Impact	Economic impact in terms of generating opportunities for other business-like sourcing of man and material supplies for specialized jobs.
II. Operation Phase		

Job opportunity	Major Positive Impact	Generate large number of jobs in various positions both in managerial, supervisory and subordinate positions.
Improvement in quality of life	Major Positive Impact	Provide safe and secure environment for social, cultural, and commercial activity
Enhancement of quality of environment	Major Positive Impact	Benefit the macro-environment by adopting Public Park/greenbelt as a social responsibility

6.8.1. Cultural Resources

There are no protected or otherwise cultural or archaeological sites in the microenvironment of the project site and hence no impact of the project will occur on cultural or archaeological resources.

6.8.2. Land-use and Aesthetics

The Project falls in the category that permits the designated land-use; the Project will add the skillfully and sustainably designed mixed-use housing scheme as a landmark to the skyline of Karachi and produce positive impact on the aesthetics of the urban environment.

The Project is designed as a self-contained building; with 24-hour security system all over the building the designers have ensured that the concerns on invasion of privacy are alleviated and eased. The Project would thus achieve its objective of providing a secure and safe educational building at an attractive location. This being a positive impact would be an indicator of achievement of the objectives of the Project.

- No mitigation measures will be required.

6.8.3. Impacts Rating

The following Checklist for the Project provides the screening of potential environmental impact on different components of ecosystem.

Screening Questions	Yes	No	Remarks
A Project Siting Is the project area.....?	√		
Densely Populated?		√	Spars residential setups
Heavy with Development Activities?	√		The densification has open doors for such development activities
Adjacent to or Within Any Environmentally Sensitive Areas?		√	Outside the corridor of impact
Cultural Heritage Site		√	Outside the corridor of impact
Protected Area		√	Outside the corridor of impact

Wetland		√	Outside the corridor of impact
Mangrove		√	Outside the corridor of impact
Estuarine		√	Outside the corridor of impact
Buffer Zone of Protected Area		√	Outside the corridor of impact
Special Area for Protecting Biodiversity		√	Outside the corridor of impact
Bay		√	Outside the corridor of impact
B. Potential Environmental Impacts			
Will the Project Cause...?			
Impacts on the sustainability of associated sanitation and solid waste disposal systems and their interactions with other urban services.		√	Taking cognizance of the situation, the proponent has already paid heavy amount as its share for the augmentation of utility services of the area concerned
Deterioration of surrounding environmental conditions due to rapid urban population growth, commercial and industrial activity, and increased waste generation to the point that both manmade and natural systems are overloaded and the capacities to manage these systems are overwhelmed?	√		Densification of the roads without a masterplan has taken no cognizance of the centripetal force mentioned above. This omission is likely to result in catastrophes on road. The issue must be resolved through a strategic solution to a cumulative problem.
Degradation of land and ecosystems (e.g., loss of wetlands and wild lands, coastal zones, watersheds and forests)?		√	Not envisaged
Dislocation or involuntary resettlement of people		√	Not envisaged
Dislocation of indigenous communities and Disadvantaged population		√	Not envisaged
Degradation of cultural property, and loss of cultural heritage and tourism revenues?		√	Not envisaged
Occupation of low-lying lands, floodplains and steep hillsides by squatters and low-income groups, and their exposure to		√	Not envisaged

increased health hazards and risks due to polluting industries?			
Water resource problems (e.g., depletion/ degradation of available water supply, deterioration for surface and ground water quality, and pollution of receiving waters?		√	Not envisaged, better management & conservation practices will be followed
Air pollution due to urban emissions?		√	Minor
Social conflicts between construction workers from other areas and local workers?		√	Not expected
Road blocking and temporary flooding due to land excavation during rainy season?		√	Not envisaged but will be mitigated if some such situation emerges through better management practices
Noise and dust from construction activities?		√	Minor but will be minimized and localized into the microenvironment through best management practices
Traffic disturbances due to construction material transport and wastes?		√	The Project involves major construction activity. State of the art technology will be used. Construction material transportation to the site will be managed through recognized access roads and adoption of good management practices
Temporary silt runoff due to construction?		√	Not envisaged but will be mitigated if some such situation emerges through better management practices.
Hazards to public health due to ambient, household and occupational pollution, thermal inversion, and smog formation?		√	Not envisaged but will be mitigated if some such situation emerges through better management practices and implementation of Environmental Management Plan
Water depletion and/or quality degradation?		√	Best management practices and conservation practices will be followed in view of constraints on availability

Overplaying of ground water, leading to land subsidence, lowered ground water table, and salinization?		√	Conservation practices will be followed and excessive use will be avoided
Contamination of surface and ground waters due to improper waste disposal?		√	Solid and Liquid waste Disposal system will be in place to prevent possible contamination of water resources
Pollution of receiving waters resulting in amenity losses, fisheries and marine resource depletion, and health problems?		√	Solid and Liquid waste Disposal system will be in place to prevent possible contamination of receiving waters.
Overall Rating		√	Moderate Impacts and can be mitigated through implementation of standard operating procedures as part of Environmental Management Plan.

Chapter 7 ENVIRONMENTAL MANAGEMENT PLAN

The EMP provides a delivery mechanism to address adverse impacts, to enhance project benefits and to introduce standards of good practice to be adopted for all project works.

The primary objectives of the EMP are to:

- Outline mitigation measures recommended in the EIA and define the responsibility and timing for the implementation of these measures;
- Develop monitoring mechanism & identify parameters that can confirm the implementation of the mitigation of these measures;
- Define roles and responsibilities of the project proponent for the implementation of EMP and identify areas where these roles & responsibilities can be shared with other stakeholders and
- Define the requirements necessary for documenting compliance with the EMP and communicating it to all concerned regulatory agencies.

For each impact, or activity, which could give rise to an impact, the following information is presented:

- Mitigation measure that will be implemented;
- The person(s) responsible for ensuring full implementation of the mitigation measure;
- The parameters that will be monitored to ensure effective implementation of the mitigation measure;
- The timing for the implementation of the action, to ensure that the objectives of the mitigation are fully met.

7.1. Structure of the EMP

The EMP consists of the following section.

- Legislation and guidelines.
- Organizational structure and roles and responsibilities;
- Mitigation management's matrix
- Environmental monitoring program
- Change management plan
- Training Program

7.2. Legislation and Guidelines

The EIA has discussed in detail all the legislation and guidelines (chapter 2) which has relevance to the project. **M/s Project Implementations Unit** shall ensure that the construction and operation of project is conducted in conformance to relevant legislations and guidelines and guidance is sought as and when required. The proponent shall also ensure that the key project management staff is aware of these legislations and guidelines. SEQs for municipal and industrial effluents, selected gaseous pollutants from industrial sources and motor vehicle exhaust and noise have been provided in Chapter 2.

7.3. Organizational Structure and Roles and Responsibilities

7.3.1. Organizational Structure

The proposed project includes the following main organization:

- **M/s Project Implementations Unit** as the project proponent and owners of the EMP.
- The construction contractor as well as contractor required during the operational phase (e.g., waste contractor) as the executors of the EMP.

These organizations will have the following roles and responsibilities during the project activities.

7.3.2. Roles and Responsibilities

A. General

Project Proponent: The Project Proponent will be responsible for ensuring the implementation of the EMP. A person holding a senior position will be responsible for the overall environmental performances during the proposed project. The person will be responsible for ensuring the implementation of the EMP by the Proponent and all project contractors. The proponent's Site Representative (SR) will be responsible of implementation of the EMP and liaison with project contractor and stakeholders at site regarding environmental issues during the construction phase. Further the person holding a senior position in the Proponent team will also be responsible for monitoring EMP's compliance and provided technical support in environmental issues.

Project Contractors: For the proposed project, the Proponent will appoint construction contractor for different field operations. Various contractor will also be hired during the operation phase of the building (e.g., waste contractors). The contractors will be responsible for implementation of, or adherence to, all provisions of the EIA and the EMP and with any environmental and other codes of conduct required by the proponent. Overall responsibility of the contractor's environmental performances will rest with the person holding the highest management position within the contractor's organization reporting to their management. The contractor's site managers will be responsible for the effective implementation of the EIA and the EMP. The contractor's HSE officers will have functional responsibilities to ensure implementation of or adherence to the EMP.

B. Planning and Design of the Operations

Details of project Activities: Details of the project activities are provided in section 2 of the EIA report. Following approval of the EIA, any changes to the proposed activities will be handled through the change Management Plan provided in this EMP.

Approvals: No-objection Certificate (NOC)/Approval from SEPA will not relieve the proponent of other legal obligation and hence the Proponent and project contractors will obtain all other relevant clearance and necessary approvals required by the Government of Sindh and Relevant departments prior to commencing the respective operations.

Contractual Provision: Adherence to the requirements of the EIA and EMP in terms of environmental mitigation will be required from all project contractors and thus EMP will form part of their contractor with the Proponent.

C. Implementation of the Operation

Co-ordination with Stakeholders: The Proponent will ensure that co-ordination with the regulators and other stakeholders on environmental & social matters is maintained throughout construction & operation phase of the project.

Monitoring: The Proponent and the contractors will ensure that monitoring of the project activities is carried out throughout the project. The site representative will monitor all project activities during the construction and operation phase. He will keep a record of all non-conformances observed and report these along with actions to the Proponent management in Karachi for further action. The site representative will also report any impacts anticipated along with his recommendation for further action.

Emergency Procedures: The Proponent and the contractors will prepare contingency plans to deal with any emergency situation that may arise during the construction and operation e.g., major oil spills, medical evacuation & communicate these to the regulatory agencies if required by these agencies.

Approvals: The project contractor will be responsible for obtaining all relevant approvals such as approvals for waste contractors, water source & others as specified in Mitigation Management Matrix.

Trainings: The project contractors will be responsible for the selection and training of their staff capable of completing the project activities properly and efficiently. The contractors will be responsible for providing training to their staff members according to the training program. The training program is discussed briefly in section 7.7.3.

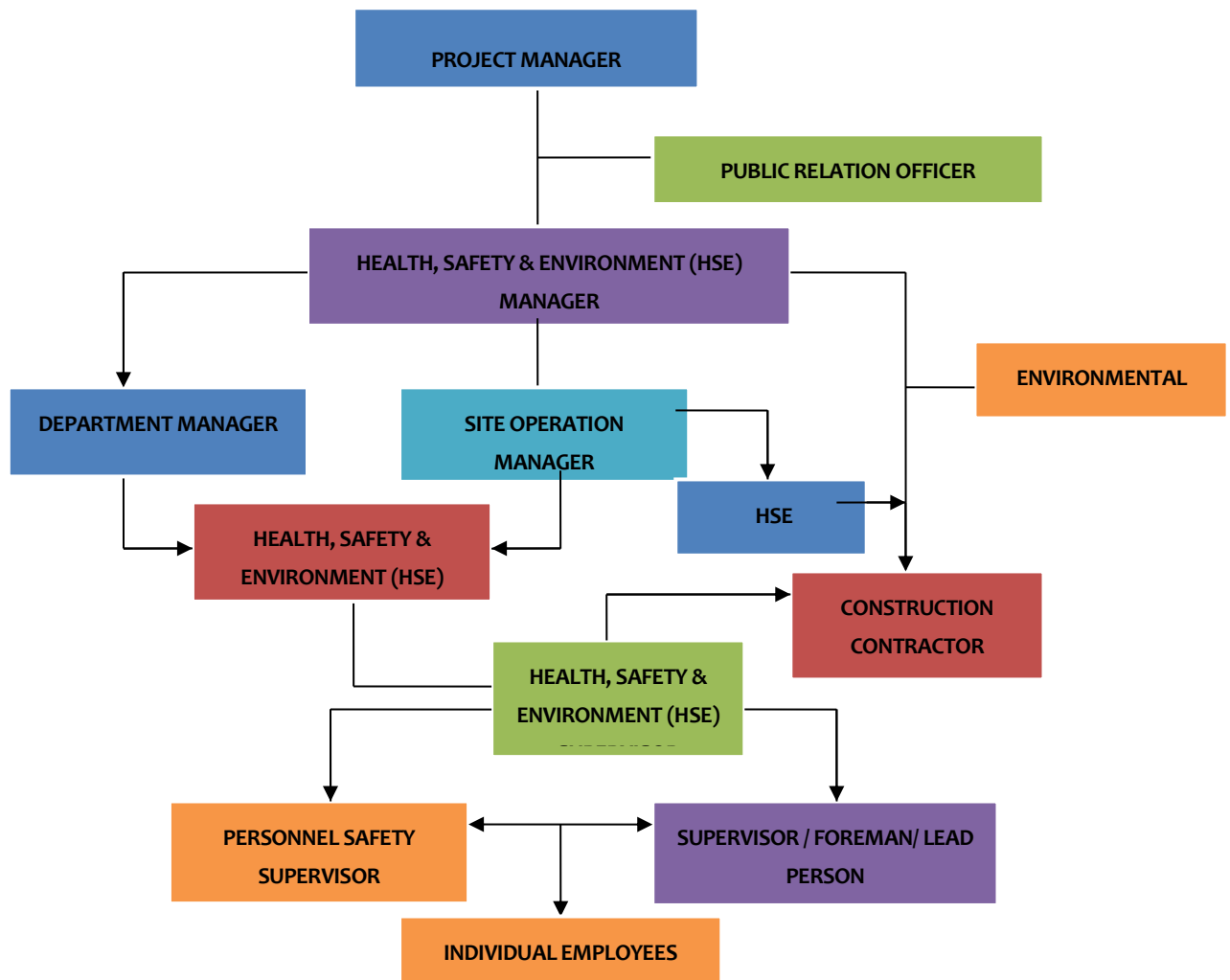
D. Communication and Documentation

The Proponent and the contractor will ensure that the communication and documentation requirements specified in the EMP are fulfilled during the construction and operation phase.

Change Management: The EIA for the proposed project recognizes that changes in the operation or the EMP may be required during the project activities and therefore provides a Change Management Plan to manage such changes. Overall responsibility for the preparation of change management statements will be with Proponent's site representative.

Restoration: The Proponent along with the construction contractor will be responsible for the final restoration of work areas.

SUGGESTED ORGANOGRAM FOR ENVIRONMENTAL MANAGEMENT



7.4. Maintenance of the EMP

EMP needs to be revised on timely basis to keep up-to-date as per the requirements comes up regularly. Therefore, outlining the responsibilities and activities associated with the maintenance of the EMP is essential. The responsibilities of the Construction Contractor should be detailed and procedures for requesting EMP revisions should also be outlined. EMP revision procedures must include requirements for notification of the appropriate government and municipal agencies so that their role is also played in the overall management process.

7.5. Environmental Health and Safety Management System

Environmental, Health and Safety Management System is essential for the care of EHS issues which should outline mitigation measures and best management practices. This management system recommends carrying out a complete assessment, evaluating, monitoring, identifying and control all potential hazards and risks arise during the construction and operation phases of the proposed project. It needs to ensure that the Health and Safety Plan (HSP) along with the Health and Safety Rules is established and enforced. The Plan should outline roles, responsibilities and expected outcomes with respect to the environmental health and safety management of the construction &

operation phase of the Project. These measures should be implemented to ensure that no significant adverse environmental, health and safety impacts are created by activities associated with the construction of the project.

Protection of the public and workforce health and safety during both construction and operations is the prime responsibility of proponent. Utilizing expert personnel and the Environment, Health and Safety Management System (EHSMS), the potential health and safety hazards and risks will be identified and assessed, then the subject of substantial planning, organization, procedures for various facility are developed.

7.5.1. Health and Safety during Construction Phase

Worker Health & Safety Management Plan will also be outlined to implement mitigation measures and best management practices. The plan should be implemented to ensure that no significant adverse worker's health and safety issues arise from activities associated with the construction of the project.

Potential hazards for workers in construction include:

- Falls (from heights);
- Trench collapse;
- Scaffold collapse;
- Electric shock and arc flash/arc blast;
- Failure to use proper personal protective equipment; and
- Repetitive motion injuries.

7.5.2. Health and Safety during Operation Phase

Since the project is a high-rise development, occupational health & safety issues need to be addressed managed effectively to ensure safety of its occupants in particular and the neighborhood in general.

7.6. Emergency Response Plan

Emergency may be defined as a sudden event causing or has the potential to cause serious human injury and/or environmental degradation of large magnitude. The best "cure" for an emergency is, of course, "prevention". The probable emergency situation can be:

- Serious fire or explosion
- Major gas leakage.
- Major Spillage
- Natural calamity such as heavy rain, flooding, dust storm or earthquake, cyclone, etc.
- Bomb threat or any sabotage/terrorist activity
- Any other incident involving all or large part of the premises and its workers.

Emergency Response Management is provided by a small team of senior managers (the "Control Committee") who in turn will direct all response activities through the Emergency Response Unit.

7.6.1. Objectives

The main objective of this plan is to establish the general guidelines for the actions to be taken in the event of fires, explosion, emergencies, accidents, disasters and sabotage, aimed at minimizing their effects and consequences, in order to protect:

- The lives of own or third-party personnel present in the building's facilities.
- The lives of the occupants of the Project
- The lives of the nearby residents & communities coming into the direct influence of the building's area.
- The lives of the ecological systems located in the surroundings of the Project.

7.6.2. Emergency Response Manuals

Based on the Risk Assessment the proponent should prepare written emergency preparedness and response plans/procedures for the building to cover emergency situations that could occur. It may be required that Emergency Response Manuals will be developed for various situations arising.

7.7. Environmental Compliance Reporting, Documentation and Trainings

The management will be responsible for the regular audit and review of the environmental management and monitoring plan. This will include both on-site auditing and review of performance reports. Additional onsite inspections and investigations will be undertaken in the event of significant environmental incidents. These will be undertaken in conjunction with the IMC. The management will participate in the audits and inspections and investigations. The management will also be responsible for regular review of the environmental performance of the site and site personnel, and for the reporting on the implementation of commitments made in the EMP.

In particular, there will be:

- Periodic audit reports.
- A review and improvement of the EMP.

Management recognizes that periodic external compliance audits and inspections will be made through a third-party consultant (IMC) to monitor, assess and validate the level of performance and compliance pursuant to the commitments made in the accepted Environmental Management Plan. The monitoring reports shall also be submitted to Sindh Environmental Protection Agency (SEPA) on regular intervals.

Training: It an important step for the implementation of the EMP. All the employees will require to be trained to work appropriately on EMP. EHS Manager will organize trainings in consultation with HSE Officer. It will make sure that employees understand the Environment, Health and Safety issues. Trainings should be arranged on regular basis with notification that it should be attended all respective employees.

HSE Officer will determine the training requirements during both phases. Induction will be the basis of all training courses for contractor & subcontractor during construction phase.

Trainings identified in EMP are given below:

- Site induction course
- Training for emergency response and preparedness

- Training for familiarization with site environmental controls

7.8. Mitigation Management Matrix

The Mitigation Management Matrix will be used as a management & monitoring tool for implementation of the mitigation measures required by the EIA. Mitigation management matrix for construction and operation is provided in the table 7.1. The matrix lists down the following:

- The mitigation measure recommended in the EIA.
- The person/organization directly responsible for adhering to or executing the required mitigation measures.
- The parameters which will be monitored to ensure compliance with the mitigation measures;
- The timing at which the mitigation or monitoring has to be carried out.

It is highlighted that although responsibilities for executing and monitoring mitigation measures have been delegated to different persons, The Proponent will hold the primary and overall responsibility for ensuring full implementation of the EMP.

7.9. Environmental Monitoring Programme

The objective of the environmental monitoring during the construction & operation phase will be as follows:

- To check compliance of the contractors with the EMP by monitoring activities of the project on a daily basis. This will be called compliance monitoring.
- To monitor impacts of the operation in which there has been a level of uncertainty in prediction such as impacts of noise, water abstraction etc. and to recommend mitigation measures if the impacts are assessed to be in excess of or different from those assessed in the EIA. The aim will be attained through effects monitoring.
- To achieve these objectives, the following monitoring programme will be implemented.

7.9.1. Compliance Monitoring

Compliance monitoring will be carried out to ensure compliance with the requirements of the EIA and to document and report all non-compliances. The mitigation management matrix provided in the EMP will be used as a management and monitoring tool. The contractor's HSE Officer will be responsible for monitoring the compliance of their organization with the relevant EMP requirements. Proponent's site representative will monitor the contractor's compliance and will also ensure that during construction each activity system and plan is in place for effective compliance monitoring. The site representative will make regular checks on the contractor's works; keep records of all non-compliances observed during the execution of the project activities; & the details of all remedial actions taken to mitigate the project impacts.

7.9.2. Effects Monitoring

The effects monitoring requirements have been detailed in Table 7.2. An independent monitoring consultant (IMC) will be responsible to carry out the required effects monitoring during the construction and operation phase.

7.9.3. Environmental Reporting

A. Final Monitoring Report (Construction Phase)

After completion of construction phase, a final monitoring report will be prepared by Proponent's site representative. The report will include the following:

- Introduction.
- Details of the Project Activities.
- Natural Resource used during the Project.
- List of Non-compliances recorded.
- Effects of the Project on Communities and Physical Resources.
- Photographic Records
- Approvals provided during the project
- Change managements statements
- Trainings
- Conclusions

B. Annual Environmental Monitoring Reports (Operation Phase)

The project proponent shall prepare annual environmental monitoring reports describing the conduct of the operation phase for project along with details of the effects monitoring conducted annually during the operation phase of the project. The report shall be submitted to the SEPA.

7.10. Change Management Plan

The EIA for the proposed project recognizes that changes in the operation or the EMP may be required during the construction and operation and therefore provides a Change Management Plan to manage such changes. The management of changes is discussed under two separate headings, Additions to the EMP and Changes to the Operation and the EMP.

7.10.1. Changes to the EMP

The EIA and the EMP have been developed based on the best possible information available at the time of the EIA study. However, it is possible that during the conduct of the proposed operation additional mitigation measures based on the findings of environmental monitoring during the operation may have to be included in the EMP. In such cases following actions will be taken:

- A meeting will be held between The Proponent and the concerned project contractors. During the meeting, the proposed addition to the EMP will be discussed and agreed upon by all parties.
- Based on the discussion during the meeting, a change report will be produced collectively, which will include the additional EMP clause and the reasons for the addition.
- The report will be signed by all parties and will be filed at the site office: A copy of the report will be sent to The Proponent and contractor head offices.
- All relevant project personnel will be informed of the addition.

7.10.2. Changes to the Operation

The change management system recognizes three orders of changes:

A. First Order:

A first order change is one that leads to a significant departure from the project described or the impacts assessed in the EIA and consequently require a reassessment of the environmental impacts associated with the change. Example of first order change includes change in location of proposed project. Action required in this case will be

that the environmental impacts of the proposed change will be reassessed by The Proponent and sent to the SEPA for approval.

B. Second Order

A second order change is one that does not result in the change in project description or impacts that are significantly different from those detailed in the EIA. Example of second order changes includes extension in the site area. Action required for such changes will be that The Proponent will reassess the impact of the activity on the environment & specify additional mitigation measures if required and report the changes to SEPA.

C. Third Order

A third order change is one that does not result in impacts above those already assessed in the EIA, rather these may be made site to minimize the impact of an activity such as:

- Increase in project workforce;
- Change in layout plan.

The only action required for such changes will be to record the change in the Change Record Register.

7.11. Training Programme

Environmental training will form part of the environmental management system. The training will be directed towards all personnel for general environmental awareness.

7.11.1. Objectives

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

7.11.2. Roles and Responsibilities

The contractors will be primarily responsible for providing environmental training to all project personnel on potential environmental issues of the project. The contractors will be responsible to arrange trainings and ensure the presence of targeted staff.

7.11.3. Training Programme

The environmental awareness, EIA and EMP training will be carried out during the project activities.

A. Training log

A training log will be maintained by the contractors. The training log will include:

- Topic
- Date, time and location
- Trainer
- Participants

B. Training Needs Assessment

In addition to the training specified in the training log special/additional trainings will be provided during the project activity. The criteria to assess the need of training will be based on the following:

- When a specified percentage of staff is newly inducted in the project
- When any non-compliance is repeatedly reported refresher training will be provided regarding that issue.
- When any incident/accident of minor or major nature occurs. Arrival of new contractor/sub-contractor.
- Start of any new process/activity.

C. Training Material

The contractors will develop & prepare training material regarding environmental awareness, sensitivity of the area, EIA, EMP and restrictions to be followed during the project. Separate training material will be prepared for each targeted staff.



Table 7.1: Environmental Management Plan (EMP)				
S.#	Impact and Mitigation Measures	Responsibilities	Monitoring	Timing
1	Land Use and Soils			
1.1	The construction activities will be planned to minimize disturbance to soil	Proponent, CC	Monitoring compliance	During construction phase
1.2	To the extent possible, equipment and materials would be staged in areas that have already been disturbed	Proponent, CC	Monitoring compliance	During construction phase
1.3	Movement of construction equipment will be restricted to work areas only to avoid unnecessary disturbance to soil	CC	Monitoring compliance	During construction phase
1.4	Routes of water tankers, dumper trucks and other project vehicles will be monitored for any signs of soil disturbance & road damage	CC	Monitoring compliance	During construction phase
1.5	Area showing signs of unstablized soil conditions will be compacted and watered	Proponent, CC	Monitoring compliance	During construction phase
1.6	The assessment of settlement within affected zone due to dewatering will be conducted prior to dewatering	CC	Monitoring compliance	During construction phase
1.7	The affected zone of settlement, if identified will be monitored regularly during dewatering activity	Proponent, CC	Monitoring compliance	During construction phase
1.8	Proper drainage will be provided to construction camp, construction site, especially near excavations and around proposed facility	CC	Monitoring compliance	During construction phase
1.9	Vehicle speed will be regulated and monitored to avoid excessive dust emissions	CC	Monitoring compliance	During construction phase
1.10	Total land uptake by the project and associated facilities will be kept to the minimum	Proponent, CC	Monitoring compliance	During construction phase



1.11	Periodic trainings will be provided to drivers on mitigation measures related to off-road travel and speed limits	Proponent, CC	Check training records	During construction phase
1.12	The Project will have a storm water collection system so that the storm water effluent has minimal sediment load	Proponent, CC	Monitoring compliance	During design and construction phase
2	Air Quality			
2.1	Dust Emissions			
2.1.1	Water will be sprinkled daily or when there is an obvious dust problem on all exposed surfaces to suppress emission of dust. Frequency of Sprinklings will be kept such that the dust remains under control, particularly when wind is blowing towards the receptors	CC	Monitoring compliance	During construction phase
2.1.2	Dust emissions from soil piles and aggregate storage stockpiles will be reduced by appropriate measures. These may include: → Keeping the material moist by sprinkling of water at appropriate frequency → 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 emissions. → Locating stock piles out of the wind direction	CC	Monitoring compliance	During construction phase
2.1.3	All roads within the proposed Project will be paved as early as possible after the commencement of construction work. Until the roads are paved, they will be sprinkled regularly to prevent dust emission. Other temporary tracks within the site boundary will be compacted and sprinkled with water during the construction works.	Proponent, CC	Monitoring compliance	During construction phase



2.1.4	Project traffic will maintain a maximum speed limit of 20km/hr on all unpaved roads within the proposed site area.	Proponent, CC	Check speed of vehicles	During construction phase
2.1.5	Construction materials that are susceptible to dust formation will be transported only in securely covered trucks to prevent dust emission during transportation.	CC	Monitoring compliance	During construction phase
2.1.6	The exposure of construction workers to dust will be minimized by provision of dust masks.	CC	Check for dust masks	During construction phase
2.2	Vehicle Equipment and Exhaust.			
2.2.1	All vehicles, generators and other equipment used during the construction will be properly tuned and maintained in good working condition in order to minimize emission of pollutants.	Proponent, CC	Maintenance records of vehicles and equipment	During construction phase
2.2.2	The stack height of the generators during operation phase will be vented through vertical stacks to minimize exposure at ground level	CC	Monitor compliance	During construction phase
2.3	Generator Emissions			
2.3.1	The option of using natural gas as fuel in the back-up generators should be explored.	Proponent, Generator Vendor	Monitor compliance	During design phase
2.3.2	The generator will be properly tuned and maintained in good working condition in order to minimize exhaust emissions	Proponent	Check maintenance records	During operation phase
2.3.3	The diesel generator should be used for a very short duration with the power switched back to the main power supply as quickly as possible.	Proponent	Monitoring compliance	During operation phase
2.3.4	NOx emission reduction techniques should be employed on a regular basis	Proponent	Monitor NOx emissions	During operation phase
3	Construction Noise			
3.1	Reduce equipment noise at source by proper design, maintenance and repair of construction machinery and equipment	Proponent, CC	Check maintenance records	During construction phase



3.2	Minimize noise from vehicles and power generators by use of proper silencers and mufflers.	Proponent, CC	Monitor compliance	During construction phase
3.3	Use noise-abating devices wherever needed and practicable.	Proponent, CC	Monitor compliance	During construction phase
4	Water Sourcing			
4.1	A complete record of water consumption during construction and operation phase will be maintained	Proponent, CC	Check water consumption records	During construction and operation phase
4.2	If a new water well is to be installed, it will be designed to abstract water preferably from deep aquifer not being used by local communities	Proponent, CC	Monitor compliance	During construction phase
4.3	Water conservation program will be initiated to prevent wastage of water.	Proponent, CC	Monitor compliance	During construction and operation phase
4.4	The water supply lines will be checked and repaired for leaks in order to reduce wastage of water.	Proponent, Maintenance Contractor	Check maintenance records	During operation phase
4.5	Recycle grey water for use for toilet flushing	Proponent	Monitor compliance	During operation phase
4.6	Ensure that water efficient sanitary fittings are used throughout the development e.g., low flush toilets, water efficient shower heads, and aerators on faucets.	Proponent, CC	Monitor compliance	During construction and operation phase
5	Soil Contamination			
5.1	Fuels, lubricants, and chemical will be stored in covered bounded areas, underlain with impervious lining	Proponent, CC	Monitor compliance	During construction phase
5.2	Maintenance of vehicles and equipment will only be carried out designated areas. The area will be provided with hard surface or tarpaulin will be spread on the ground to prevent contamination of soil	Proponent, CC	Monitor compliance	During construction phase



5.3	Vehicles will only be washed at designated areas.	CC	Vehicle Inspection record	During construction phase
5.4	Regular inspections will be carried out to detect leakage in construction vehicles and equipment	Proponent, CC	Check inspection / maintenance records	During construction phase
5.5	Appropriate arrangements, including shovels, plastic bags and absorbent materials, will be available near fuel and oil storage areas	CC	Monitor compliance	During construction phase
5.6	Contaminated soil will be removed and properly disposed after treatment such as incineration etc.	Proponent, CC	Monitor compliance	During construction phase
6	Traffic			
6.1	Heavy traffic during construction phase will come to the project site during late night hours.	Proponent, CC	Traffic record	During construction phase
6.2	Project vehicles shall not be fitted with pressure horns	CC	Monitor compliance	During construction phase
6.3	During construction, regulate speed of vehicles	Proponent, CC	Monitor compliance	During construction phase
6.4	Designated parking areas will be provided for different type of project vehicles within and around the project site	Proponent, CC	Monitor compliance	During construction phase
6.5	Manage vehicle movement to avoid traffic jam and long queues	Proponent, CC	Monitor compliance	During construction and operation phase
6.6	Prepare, implement and monitor the traffic management plan	Proponent	Monitor compliance	During construction and operation phase
6.7	Vehicles to use designated parking areas during operational phase.	Proponent	Monitor compliance	During operation phase
6.8	Parking of vehicles alongside the road should be prohibited at all time.	Proponent	Monitor compliance	During construction and operation phase
7	Wastewater Generation			
7.1	Wastewater Generation During Construction			



7.1.1	Wastewater generated at the campsites will be stored temporarily in septic systems comprising of septic tanks from where it will be routed to a nearest drain/sewerage system.	Proponent, CC	Monitor compliance	During construction phase
7.1.2	At the time of restoration, septic tanks will be dismantled in place and backfilled with at least 1m of soil cover above the surrounding natural surface level	CC	Monitor compliance	After the completion of construction phase
7.2	Wastewater Generation During Operation			
7.2.1	The grey water will be recycled to be re-used again in toilets and kitchens etc.	Proponent	Monitor compliance	During operation phase
7.2.2	Black water will be temporary stored in septic tanks and will be discharged into a nearby out fall sewer via trunk sewer	Proponent, CC	Monitor compliance	During design, construction & operation phase
7.2.3	Waste segregation measures would be employed to minimize entry of solid waste into the wastewater stream	Proponent	Monitor compliance	During operation phase
7.2.4	Water conservation strategies will be employed to avoid wastage of water	Proponent	Monitor compliance	During operation phase
8	Solid Waste Generation and Management			
8.1	Solid Waste Generation and Management During Construction			
8.1.1	Separate bins will be placed for different types of wastes- plastics, paper, metal, glass, wood, and cotton.	Proponent, CC	Monitor compliance	During construction phase
8.1.2	Recyclable material will be separated at source. The recyclable waste will be sold to waste contractors for recycling	Proponent, CC	Monitor compliance	During construction phase
8.1.3	Non-hazardous non-recyclable wastes such as construction camp kitchen wastes will be disposed off in landfill site through municipal administration or approved waste contractor.	Proponent, CC	Monitor compliance	During construction phase



8.1.4	No waste will be dumped at any location outside the proposed site boundary.	Proponent, CC	Monitor compliance	During construction phase
8.1.5	All hazardous waste will be separated from other wastes. Hazardous wastes will be stored in designated areas with restricted access and proper marking. Hazardous wastes will be disposed off through approved waste contractors.	Proponent, CC	Check hazardous waste disposal records	During construction phase
8.1.6	Surplus construction materials including partially filled chemical and paint containers will be returned to suppliers. Inert construction wastes will be disposed of onsite as fill material or sold as scrap to contractors.	Proponent, CC	Check waste records	During construction phase
8.1.7	Records of all waste generated during the construction period will be maintained. Quantities of waste disposed, recycled, or reused will be logged on a Waste Tracking Register	Proponent, CC	Check waste record register	During construction phase
8.1.8	Training will be provided to personnel for identification, segregation, and management of waste	Proponent, CC	Check training records	During construction phase
8.2	Solid Waste Generation and Management During Operation			
8.2.1	Waste generation will be minimized by adopting waste management strategy of reduce, reuse and recycle	Proponent	Monitor compliance	During operation phase
8.2.2	A waste management plan will be prepared, implemented and monitored for the safe collection, storage and treatment/disposal of the building waste	Proponent	Monitor compliance	During operation phase
8.2.3	Records of all waste generated will be maintained. Quantities of waste disposed, recycled, or reused will be logged on a Waste Tracking Register	Proponent	Check waste tracking register	During operation phase



8.2.4	Training will be provided to personnel for identification, segregation, and management of waste	Proponent	Check training records	During operation phase
8.2.5	All inert and non-hazardous construction wastes will be disposed to the existing tipping sites within or outside of the city limits	Proponent, Waste Contractor	Monitor compliance	During operation phase
8.2.6	Hazardous wastes will be disposed of through waste management contractors who will identify suitable disposal options for these wastes such as recycling, metal recovery, incineration or bioremediation etc.	Proponent	Monitor compliance	During operation phase
8.2.7	Various waste containers for waste collection should be placed at appropriate locations in the building	Proponent	Monitor compliance	During operation phase
8.2.8	Waste storage areas should be located within the facility and sized to the quantities of waste generated, with the following design considerations: Hard, impermeable floor with drainage, and designed for cleaning/disinfection with available water supply, Secured by locks with restricted access designed for access and regular cleaning by authorized cleaning staff and vehicles Protected from sun, and inaccessible to animals/Rodents Equipped with appropriate lighting and ventilation Segregated from food supplies and preparation areas Equipped with supplies of protected clothing, and spare bags/containers	Proponent, CC	Monitor compliance	During operation phase
9	Seismicity			
9.1	No specific mitigation measures other than to construct the facility in accordance with UBC Zone 2B	Proponent, Structure Design Consultant, CC	Monitor compliance	During project design phase
10	Sustainability			
10.1	Best practice of energy efficiency will be incorporated in the building design	Proponent, CC	Monitor compliance	During project design phase



10.2	Buildings to be constructed with high levels of thermal insulation	Proponent, CC	Monitor compliance	During project design phase
10.3	Ensure that HVAC system, refrigeration equipment and fire suppression equipment do not contain HCFC's or Halons	Proponent, CC	Monitor compliance	During project design phase
11	Socio-Economic Impacts			
11.1	Deliveries should be programmed to arrive and routed to minimize disturbance to residential areas, hospitals and offices.	Proponent, CC	Monitor compliance	During construction phase
11.2	Designated parking areas will be provided for different type of project vehicles within and around project site	Proponent, CC	Monitor compliance	During construction & operation phase
11.3	Areas earmarked for amenity and commercial infrastructure will not be used for other purposes after construction	Proponent	Monitor compliance	During construction & operation phase
11.4	Employment preference will be given to residents of the project area	Proponent, CC	Monitor compliance	During construction & operation phase
11.5	Local contractors will be given preference for hiring equipment and machinery during operation	Proponent, CC	Monitor compliance	During construction & operation phase
11.6	Ensure maximum quantity of water to be treated and reused in order to lessen its burden on the existing sewerage system.	Proponent	Monitor compliance	During design, construction & operation phase
11.7	Locals, surrounding business and city government are kept on the same page during all stages of the development of the project.	Proponent	Monitor compliance	During construction phase
11.8	A complaint register will be maintained on site during construction to record complaints of the nearby residents.	Proponent	Provision of complaint register	During construction phase



Table 7.2: Environmental Monitoring Plan					
Ambient Air Quality Sampling Plan					
Phase	Parameters	Locations	Frequency	Duration	Standards
Construction	SOx, NOx, CO, O3, PM2.5, PM10 Lead, SPM	At the interface of project site and residential community	Monthly	Continuous for 8 hours* in a full working day	SEQS
Operation	SOx, NOx, CO, O3, PM2.5, PM10 Lead, SPM	At the interface of project site and residential community	Quarterly	Continuous for 8 hours* in a full working day	SEQS
Drinking Water Quality Sampling Plan					
Stages	Parameters	Locations	Frequency	Duration	Standards
Construction	Heavy metals, TDS, TSS, pH, Total Coliform, Faecal Coliform	Ground water source and other sources	Monthly	Grab sampling	SEQS for drinking water
Operation	Heavy metals, TDS, TSS, pH, Total Coliform, Faecal Coliform	Drinking water sources	Quarterly	Grab sampling	SEQS for drinking water
Wastewater Quality Sampling Plan					
Stages	Parameters	Locations	Frequency	Duration	Standards
Construction	BOD, COD, DO, TSS, TDS, pH, NO ₃ , SO ₄ , Oil & Grease)	Camp site discharge points into drains	Monthly	Grab sampling	SEQS
Operation	BOD, COD, DO, TSS, TDS, pH, NO ₃ , SO ₄ , Oil & Grease)	Effluent from wastewater treatment plant	Monthly	Composite sampling / Grab sampling	SEQS
Noise Level Sampling Plan					
Stages	Parameters	Locations	Frequency	Duration	Standards
Construction	Decibels [dB(A)Scale]	At the interface of project site & residential community	Monthly	Continuous for 8 hours in a full working day	WHO Noise Guidelines
		7 m from the equipment at construction site			
Operation		At the interface of project site & facing road	Quarterly		SEQS for Noise
		7 m from the equipment at construction site			
Solid Waste					
Stages	Parameters	Locations	Frequency	Duration	Standards
Construction	Waste generation rate, waste composition; recyclables and non-recyclables, hazardous waste	At main solid waste collection point from where the waste is transported from site	Monthly	24-hour sample collected during week days	Best Practices
Operation	Waste generation rate, waste composition; recyclables and non-recyclables, hazardous waste	At waste transfer facility of the project site prior to off-site disposal	Quarterly	24-hour sample collected during week days and holidays	Best Practices

7.12. Provincial Disaster Management Authority PDMA - Sindh

The Provincial Disaster Management Authority (PDMA) of Sindh is responsible for disaster management and emergency response in the province of Sindh, Pakistan. In the case of the Education City Project, the PDMA plays a crucial role in ensuring institutional arrangements to mitigate and respond to potential disasters and emergencies. The institutional arrangements of the PDMA in the context of the Education City Project are designed to ensure a proactive and coordinated approach to disaster management. By integrating risk assessment, planning, capacity building, and response coordination, the PDMA aims to enhance the resilience of the Education City Project and minimize the impact of potential disasters or emergencies on the educational complex and its occupants.

The Education city need to involve PDMA in the development of policies, guidelines, and standard operating procedures related to disaster management in Sindh. For the Education City Project, the PDMA would collaborates with relevant stakeholders to establish policies and procedures specific to the project, addressing potential hazards and risks associated with the construction and operation of an educational complex.

The PDMA will conduct Risk Assessment and Planning, comprehensive risk assessments to identify potential hazards and vulnerabilities in the Education City Project area. This could include assessing natural hazards such as earthquakes and floods, as well as human-made risks like fires or structural failures. Based on the risk assessment, the PDMA assists in formulating disaster management and emergency response plans tailored to the Education City Project's unique requirements. The PDMA would need to facilitates capacity building and training programs to enhance the disaster management capabilities of stakeholders involved in the Education City Project. This includes training faculty, staff, and students on emergency response protocols, conducting drills and simulations to practice evacuation procedures, and providing guidance on first aid and basic life-saving skills.

The PDMA need to collaborates with relevant authorities to establish early warning systems for potential hazards affecting the Education City Project area. This may include the installation of seismic monitoring systems, weather monitoring stations, or flood warning systems. The PDMA ensures that timely and accurate information regarding potential disasters is disseminated to the Education City Project management and stakeholders, enabling them to take necessary precautions and initiate appropriate responses.

The PDMA serves as a coordinating body, facilitating collaboration among various stakeholders involved in the Education City Project. This includes government agencies, educational institutions, emergency services, and other relevant organizations. The PDMA promotes information sharing, joint planning, and collaborative decision-making to ensure a coherent and effective response in case of a disaster or emergency situation. In the event of a disaster or emergency, the PDMA supports resource mobilization efforts to ensure the availability of necessary equipment, supplies, and services for the Education City Project. This may involve coordinating with relevant government agencies, non-governmental organizations, and private sector entities to mobilize resources such as search and rescue teams, medical facilities, temporary shelters, and relief supplies.

In case of a disaster, the PDMA assists in coordinating post-disaster recovery and rehabilitation efforts for the Education City Project. This includes assessing damage, facilitating the restoration of infrastructure and services, and supporting the affected population, including students and staff, in their recovery process.

Chapter 8 PUBLIC CONSULTATION

8.1. GENERAL

The participation of project stakeholders in project planning, design and implementation are now universally recognized as an integral part of environmental & social impact assessment. Local communities, their representatives, government departments, national and international NGOs and the civil society at large may all be able to contribute to and benefit from, the dialogue directed at identifying and resolving key project-related issues. Stakeholder consultation has become an important requirement of the EIA study after the enactment of the guidelines for public consultation under the Pakistan Environmental Protection Act (PEPA) 1997. After the 18th Amendment to the Constitution, the Government of Sindh passed the Sindh Environmental Protection Act 2014, which also stresses the importance of engaging with the concerned primary and secondary stakeholders during the EIA study.

While in the short-term, the impacts might be felt only in the microenvironment of the project, in the long-term, the impacts may also spread to other nearby neighborhoods and activities including traffic management, the swift passageway for fire tenders and ambulance and stress on existing utilities. Instead of these perceived impacts, meaningful engagement with the project stakeholders has been carried out to identify the potential positive and negative impacts, assess the magnitude of these impacts from a social perspective and prescribe solutions that identify Best Management Practices (BMPs) in the construction and operations of the proposed project. In this chapter, an overview of the various stakeholders has been given, the engagement interventions carried out with the stakeholders and the concerns and suggestions raised by them

8.2. IDENTIFICATION OF STAKEHOLDERS

To better understand the different stakeholder groups for this project, a stakeholder mapping exercise has been carried out whereby the different stakeholder groups and their interests in the project are discussed in this section:

8.2.1. Local People/Neighborhood

Individuals or groups in the vicinity of the project site are informed regarding the project background and context. Due to their proximity to the project site, they are often the most vulnerable stakeholders and therefore, consultation with these stakeholders is carried out throughout the project life. The consultation exercise provides an opportunity to appraise the stakeholders regarding the consultation process, identify likely project impacts, and record concerns of local communities. Moreover, intensive stakeholder engagement during the planning stage of the project provides a basis for reducing the trust deficit and encourages confidence-building.

8.2.2. Proponent

The main aim of the project proponent is to accomplish the objectives of the project through cost-effective and sustainable project activities. To this end, the project proponent has to recognize that strong associations and responsive relations with stakeholders would go a long way to achieve the project objectives. Therefore, the proponent has to strive to engage stakeholders at all levels from the outset; inform them regarding project goals, design and alternatives. Moreover, they have to keep trying to create public understanding and acceptance of the proposal through a commitment to implement the promised objectives. They have to accomplish the project through general acceptance

of the design and keep improving through the use of public inputs on alternatives and mitigation measures.

8.2.3. Government Agencies

The government agencies involved in the EIA process is mandated to have their policy and regulatory responsibilities addressed in impact analysis and mitigation consideration. For the competent authority, an effective public involvement program will ensure a project proposal that effectively incorporates environmental and social concerns. During the EIA review, the most important concern for SEPA is a transparent public consultation process and a strong stakeholder engagement plan that can address the concerns and suggestions of all stakeholders.

8.2.4. NGOs/Interest groups

Comments from NGOs and specific interest groups often provide a useful policy perspective on the project's methodology and implementation mechanisms. For example, due to the vast exposure of certain NGOs and interests groups, alternative measures for reaching the project goals may be advised that is more environmentally friendly and socially acceptable.

8.2.5. Primary and Secondary Stakeholders

Primary stakeholders are those who have a direct interest in the project which includes residents, commercial entities and institutions falling in the immediate environs of the project area. Secondary stakeholders include the relevant government agencies and public interest groups which may indirectly influence or be influenced by the project. The concerns and input from both primary and secondary stakeholders are important to identify the issues arising from the construction and/or operation phase of the project and propose mitigation measures that minimize the negative project impacts and enhance the positive ones.

Within the project vicinity, the primary stakeholders are the residents of Ali Nawaz Jokhio Goth, Baksho Jokhio Goth, Daad Muhammad Jokhio Goth, Dolo Goth, Faqeer Muhammad Baloch Goth, Fazal Muhammad Jokhio Goth, Haji Adam Rind Baloch Goth, Haji Hussain Baloch Goth, Haji Muhammad Jokhio Goth, Haji Siddique Baloch Goth, Ibrahim Baloch Goth, Ibrahim Jokhio Goth, Jaam Mehar Ali Goth, Kamil Bakik Goth, Khair Muhammad Khaskheli Goth, Khamiso Khan Jokhio Goth, Laal Muhammad Baksh Goth, Maula Baksh Baloch Goth, Mehmood Jamot Goth, Moeem Baloch Goth, Muhammad Rahim Khaskheli Goth, Nabi Baksh Bakik Goth, Qadeer Khaskheli Goth, Ramzan Jokhio Goth, Rano Jokhio Goth, Raza Muhammad Jokhio Goth, Siddique Jokhio Goth, Umar Jamot Goth and Haji Khamisoo Baloch. The secondary stakeholders for this project include the utility companies that operate in the area, as well as the regulatory authorities, mandated to ensure environmental protection in the city, which falls under the remit of SEPA and compliance with building and construction laws which is looked after by Education City by-laws. The primary and secondary stakeholders for the proposed project have been identified in the table below.

8.3. CONSULTATION FEED BACK

Conclusively, it is found that the 29 villages surveyed within the boundary of education city are going through transformation; from agriculture based rural society to an urbanized society. However, the transition towards an urbanized society is low both in terms of spatial configuration, density and socio-economic indicators such as education level and alternative job opportunities. In this background, the

development of the proposed education city carries the ethical requirement for the local empowerment on several levels. Firstly, the history of the area, evident in its spaces such as the graveyards, the orchards and other heritage structures should be preserved, the history, also evident in the local folklore and anecdotes should be persevered for the future generations. Secondly, the new development should be able to accommodate the current villages, and should be ameliorated in a way that the local lives are not disturbed, their right of way is not hindered, both physically and socially. Thirdly, the development should not only follow “no-damage” policy, but it should also be able to make the local community progress, improve their living standards; in that health services and education services for the locals should be considered essential. The employment for the locals should not be limited to the non-skilled low-pay-scale job opportunities, but it should create programmes to develop local talent into skilled individuals, affordable opportunities for higher education should be made easy for the locals through priority quota or other appropriate tools. The centuries old love and knowledge for agriculture and livestock should not go in waste, in fact it should be made part of the development, firstly by introducing protected zones for the agriculture innovation which the incoming universities could adopt for experimentation and development, involving and training the locals.

Chapter 9 CONCLUSIONS AND RECOMMENDATIONS

9.1. Conclusion

Project implementation unit Government of Sindh indent to construct the Education City at district Malir. The concept of the Education City revolves around the concept that the education system acts as an essential element for a citywide development. Education city is also characterized as ecofriendly, carbon-neutral, netted, culturally sensitive, sustainable, and smart settlement based on knowledge economy.

According to the Environmental Impact assessment it is concluded that the impacts of the construction and operation of the “Education City” is minimal and can be mitigated by the effective EMP which is included with this EIA report. The screening process has through review of literature, primary as well as secondary baseline data, and expert judgment, made assessment of the potential impacts of said activities on the physical, biological, and socioeconomic environment of the Project. Mitigation measures have been proposed to reduce, minimize or compensate for the identified potential negative impacts and their adoption has been recommended. The proposed project is a self-contained building having its own back-up power generation, water supply supplemented by filtration plant and sewage treatment, recycling and disposal system in addition to commitment for the provision of required parking space. This being a positive impact would be an indicator of achievement of the objectives of the Project.

9.2. Recommendation

It is recommended that mitigation measures proposed in impacts and mitigation chapter and Environmental Management Plan should be adequately implemented during all stages of project. Recommendation for (EMP) in order to counter the significant negative impacts, a detailed EMP has been developed that includes the proposed mitigation measures against the strategic impacts along with defining the roles and responsibilities of each organization. If this EMP is implemented then impacts will be minimized or made negligible and positive impacts will be enhanced.

In order to maintain the urban forestation of the EC project, it is recommended that all trees must be mapped/plotted project specific and it should be in the guidelines and bye-laws of Education City and a project specific Trees Management and Protection Plan. Education City Management shall also establish a full-fledged Horticulture Department appointing professionals and field staff privately. A team shall be appointed to secure the environmental degradation, protect the biodiversity, and monitor the carbon footprints. Once Consultant Group prepared the Biodiversity report providing the policy level guidelines for protection of protected areas and implement biological projects like (Urban Forest, Botanical Gardens, Green Areas, Parks etc.) identifying various plant and tree species to be planted and flourish in areas.

The Sukhun River in the project site not receiving ample water to run the agricultural activities. Once Sukhun River is filled with water only in the rain period the ground water also replenish (as the river bed is earthen). Some areas have ground water which is sweet and also portable, however, a mechanism shall be made that Sukhun River keep with water round the year. If this has been happened the Master Plan shall be made in such a way that all agriculture lands and orchards adjoining to the river shall restored with all activities.



The Education City Projects the first of its kind that have high quality planned urban development with conversion of larger barren land into urban city and to recharge perennial fresh water bodies within the project area. The major recommendations needs to be implemented during the implementation of Strategic Development Plan for Education City Project, after the detail environmental assessment, it is concluded that the strategic development plan of Education City project is feasible at proposed location only if recommendations/mitigations suggested in this EIA report are implemented in true spirit. The strategic mitigations suggested in the report are sufficient to successfully implement the master plan.